



# IUSS

Bulletin



International Union of Soil Sciences®

142



# IUSS Bulletin 142

## International Union of Soil Sciences (IUSS)

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*Free download on the IUSS website.*

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# IUSS Reports

## Activities of the IUSS Presidents

During the first semester of 2023, the President of the IUSS has been actively engaged in various activities. He has been actively involved in managing the IUSS, participating in conferences and meetings, implementing the IUSS strategic plan, collaborating with international organizations, and organizing the Centennial of the IUSS. In particular:

1. Management of the IUSS and its societal activities: The President has been responsible for managing the IUSS and facilitating the transition of IUSS officers and the Secretariat. He has provided support and guidance, held online meetings, and assisted in the transition of the IUSS webpage and social media. He has also organized meetings of the President's and Executive Committees and participated in the selection procedure for hiring the Secretary member of the Secretariat.

2. Participation in conferences and meetings: The President has contributed to the organization of the IUSS stand at the EGU 2023 Conference and actively participated in the IUSS Forum and Division Committee meetings (see report). He has also participated in the selection of proposals for the Stimulus funds and the establishment of a new task force for project proposals funded by the IUSS. Additionally, He has been involved in discussions regarding modifications to the Statutes and Bye-laws and the definition of new IUSS awards.

3. Implementation of the IUSS strategic plan: The President has focused on strengthening linkages with IUSS Full members and regional societies as part of the IUSS Strategic Plan 2021-2030. He has engaged in one-to-one conversations and online meetings with national societies, organized an online forum with representatives from National Soil Science Societies (see report). He has attended the ECSSS meeting held in Vienna to discuss mutual collaboration and support, in particular for the next ECSSS Conference of Sevilla (Spain).

4. Outreach and collaboration with international organizations: The President has worked towards strengthening linkages with international scientific organizations, including attending the General Assembly of the International Science Council (ISC). He has established contacts with the President and CEO of the ISC, facilitated IUSS colleagues' involvement in ISC activities, and collaborated with the Geounions of ISC (see report). He has implemented the IUSS collaboration with the UNEP and the ISC and facilitated the appointment of IUSS Experts to participate to the survey for the ISC-UNEP Global Survey (see report). He has also represented the IUSS at the WASWAC World Conference and participated in meetings of CA4SH and IAPG.

5. Organization of the Centennial of the IUSS: The President has provided support for the organization of the Centennial Congress, promoting meetings of the organizing committee and collaborating with the Professional Conference Organization. He has established contacts with companies for sponsorships, promoted the Centennial among stakeholders, and contributed to the production of the Centennial Celebration video and a book on the history of Soil Science in Italy.

## The IUSS at the General Assembly of the International Scientific Union in Paris 9-12 May 2023

The Mid-term General Assembly (GA) of the International Science Council (ISC) was held in Paris from 9 to 12 May 2023 (<https://council.science/>) with the theme: Capitalizing on Synergies in Science. The IUSS was represented by Edoardo A.C. Costantini (President) and Victor Chude (President-Elect).

The ISC aims to be the global voice for science and is made up of approximately 230 Scientific Unions and Academies, the majority of which was represented in Paris. The IUSS is a member of the ISC and Prof. Yongguan Zhu, recipient of the von Liebig award 2022 of the IUSS, is member of the Standing ISC Committee for Science Planning 2022-2025.

The ISC is experiencing strong growth in terms of staff and activities as it strives to be the voice of science for various policymakers, including UN scientific bodies, and is supported by a wide range of funding institutions. However, this growth has necessitated updates to the statutes with regard to membership, voting, and duties, which were among the main issues addressed in the Assembly.



From right to left: the President, vice President, and the CEO of the ISC (Dr. Ardicò) at the GA of the ISC in Paris.



Prof. Yongguan Zhu and the IUSS President at the ISC meeting in Paris.

The Opening remarks was taken by Johannes Cullmann, Chief Scientific Advisor at the Office of the President of the 77<sup>th</sup> Session of the United Nations General Assembly.

The discussions on the first day of the meeting centered on adapting science to address multiple crises, including the pandemic, conflicts, and distrust in institutions. The meeting went ahead to explore the need for effective science communication to counter political pressure and online misinformation and rebuild trust.



**IUSS Poster presentation at the ISC mid-term meeting at Paris**

Conflicts threaten the entire scientific ecosystem. Data and databases are being lost, clinical trials and research data inclusive. There is need for policy and action frameworks that will allow us to protect individuals, knowledge and research and institutions. Seteney Shami, General Director of the Lebanon-based Arab Council for the Social Sciences in her presentation, said that scientists and institutions need a different approach to the idea of crisis and also refrain from the mindset that critical work can wait until things go back to the way they were. One crucial point is that there must be continuity almost at all costs despite all odds. According to Kathy Whaler, President of the International Union of Geodesy and Geophysics “Resilience and working through crises remains a consistent reality for many scientists around the world” this she said to buttress the point that some of her colleagues are based in dangerous environments and risk their lives to measure and report geophysical data to the world. Scientists operating and researchers using the data must be maintained and we make sure that those data are fully available, properly documented, properly archived for everybody to use.



**Exploring the many crises affecting science on day 1 of ISC mid-term meeting**



On the second day of the mid-term meeting, discussions continued with conversations on the importance of international science in sustainability, as well as about the next generation of scientists, the ISC's work within the global multilateral system and increasing threats to science. In Irina Bokova's (ISC Patron and Co-Chair of the Council's Global Commission on Science Missions for Sustainability) words, global science institutions have a decisive role in pushing the world to accelerate work on the UN's Sustainable Development Goals (SDG).

The sustainable development agenda is at a crossroads. There is pushback and progress is uneven. There is need for actionable knowledge that is oriented towards implementing the different goals and achieving what is in the SDG agenda; so that no one will be left behind. Getting there will require a transdisciplinary approach, merging work from experts on climate change, anthropology, sociology, agriculture, and other fields. The ISC also announced the launch of the Centre for Science Futures, a think-tank which aims to provide advice on science for policy and future of the scientific ecosystem. This initiative reflects the ISC's commitment to optimizing its services for the benefit of its members, not just for the next few years, but for the decades to come says Peter Gluckman, ISC President.



### **Guiding the Future of Science: introducing the Centre for Science Futures**

The final day discussions buttressed on the future of the ISC and updates from its network of affiliated bodies working on an array of joint science initiatives. Below are the selected few.

- The Committee on Space Research (COSPAR): which advises the UN on planetary protection, satellite dynamics and activity in space that could damage the environment, focusing on fostering cohesion between scientists and engineers working on space research, says associate director Aaron Janofsky.
- The Scientific Committee on Antarctic Research (SCAR): is preparing for the fifth International Polar Year, which will bring together scientists worldwide for coordinated research in 2032-33. SCAR provides independent scientific advice to international organizations and has been “a valuable contributor to policy discussions and also decision-making processes”, says project officer Johanna Grabow. SCAR is looking for scientists working on topics related to the Antarctic to join its research programs and working groups – as well as to share ideas about sustainability and reducing organizational carbon footprints.
- Far from the mountains and ice of Antarctica, members of the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) are continuing crucial work to keep radio spectrum bands open for science. Committee Chair, Harvey Liszt, emphasized that the tasks can be laborious, demanding a steep learning curve and offering little recognition. However, Liszt remains hopeful that more scientists will join the cause, particularly due to the escalating frequency of satellite launches in low Earth orbit, intensifying the strain on radio-based research. Liszt explained that commercial constellations unintentionally interfere with scientific research, akin to “photo bombing” in the realm of astronomy. At stake is nothing less than humanity’s ability to continue to do radio astronomy, remote sensing and remote meteorological research, as well as measuring important climate indicators like soil moisture, surface wind and ocean salinity.



**From Antarctica to Space: Updates from Affiliated Bodies on day 3 of ISC mid-term meeting**

- The Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) focuses on education about Earth-Sun connections and supporting global interdisciplinary research. President Kazuo Shiokawa updated ISC members on the Committee’s scholarship programme for graduate students and capacity-building work in Spain, Bulgaria, Côte d’Ivoire and Argentina.
- The World Climate Research Programme (WCRP) coordinates global climate research and provides evidence to the Intergovernmental Panel on Climate Change (IPCC), which is used to guide action on climate change. Its ongoing work includes climate modelling, gathering data on climate patterns and changes, and encouraging collaboration between scientists worldwide.
- ISC Members also heard from the Global Ocean Observing System (GOOS) and Global Climate Observing System (GCOS), which coordinate data collection and collaborate with international organizations. Their work helps to measure biodiversity, inform climate policy and disaster preparedness, and

measure the impact of climate change measures. “The ocean is absorbing 90% of the excess heat produced by human activities and 25% of anthropogenic carbon per year, and yet we don’t really have the models yet or all of the observations to fully understand carbon science in the ocean.”

Later in the day, ISC members heard from Terrence Forrester, Chair of the ISC Fellowship Programme Foundation Council, who gave an update on future growth and objectives of the Fellowship, which added another 57 members in December 2022 bringing the total to 123 Fellows. The programme recognizes scientists around the world who are committed to advancing science as a global public good through engaging their publics and policymakers to build open and knowledge driven societies. Affiliates and Fellows are an essential part of the ISC’s mission to provide crucial data and analysis to inform policy-makers – a vital role for science, says ISC President Peter Gluckman: “It’s critical to the world that the voice of science is heard at every level of decision-making, in honest and trustworthy ways.”

“Science, whether it’s natural or human or social sciences, has one objective: to better understand the world around us, within us, the society we live in, the planet we live on, and the universe. By providing the information of what we know, what we don’t know and the implications, we can help the world make better choices,” he says.

In conclusion, the participation of the IUSS to the GA was a great opportunity to learn about other scientific associations and, more importantly, to give voice to soil sciences through a platform to be heard by an audience that often overlooks them. The IUSS is a member of the ISC, having been a part of the ICSU since its inception, and participates in specific groups such as the Geounions and the Standing Committees on Disaster Risk Reduction and Gender Equality in Science.

By Victor Chude and Edoardo A.C. Costantini

### **Minutes of the online meeting between the IUSS President and the full members - May 29, 2023**

On May 29, 2023, a video meeting was conducted between the IUSS President and 26 representatives of national full members. The initiative was intended to be a first step toward the implementation of the forum of full members that is foreseen in the Strategic Plan 2021-2030.

The specific purpose of the meeting was to discuss various topics pertaining to the IUSS and its future goals. The following report provides a detailed account of the President's speech during the meeting and the main results of the discussion with the participants.

1. Science as a Global Public Good: The President highlighted the importance of trust in science and emphasized that science serves as a universal language that promotes dialogue, peace, and health on a global scale.
2. IUSS Pillars: The IUSS is built upon two pillars, namely science and governance. The science pillar encompasses Divisions, commissions, WGs, and the Forum. On the other hand, governance includes the Council, Executive and President's Committees, supported by the Secretariat responsible for management.

3. Ambitions of the IUSS: The President outlined the ambitions of the IUSS, which include becoming the global voice of Soil Science and ensuring the integration of Soil Science into policy decisions at all levels. The IUSS also aimed to advocate for the recognition of soil as a vital resource, comparable to water and air, for sustainable management and conservation. The IUSS is a free and autonomous organization, financed primarily by member contributions, providing a reputation for soil scientists and a collaborative space.
4. Strategic Plan: The President mentioned that the Strategic Plan had been endorsed by the EC and approved by the Council in Glasgow the previous year.
5. External Goals: The IUSS aimed to improve soil awareness, increase stakeholder engagement, and establish linkages with international scientific organizations. The communication of scientific results to promote public understanding, recognition, esteem, and engagement in soil science was identified as another key external goal. Furthermore, the IUSS sought to enhance education and outreach efforts at all levels.
6. Internal Goals: Internal goals focused on increasing the participation of IUSS members, fostering scientific publications with higher impact, supporting awards, prizes, and medals, and improving the allocation and evaluation of economic resources. The adoption of an inclusion and equity policy and their internal practice was also highlighted.
7. Annexes: Several annexes are present in the Strategic Plan, including the Publications Policy, which is aimed at supporting open science policy and practices, in line with UNESCO and ISC resolutions. The organization of electronic elections and Council meetings, as well as the IUSS diversity, equity, and inclusive policy (DEI), were also highlighted. The IUSS offers equal opportunities and fair treatment for all members.
8. Implementation of the Scientific plan: Efforts would be directed towards achieving global acknowledgement of soil's value to humanity and Earth systems, also through collaboration with international Institutions like the ISC and the GSP of the FAO.
9. Implementation for Governance: The IUSS aimed to strengthen and encourage the engagement of individuals, national, and regional members in IUSS activities, thereby enhancing the governance aspect.
10. Implementation for Management: The President emphasized the need to increase the capabilities of the Secretariat responsible for managing IUSS affairs.
11. Increasing Participation of IUSS Full Members: Various measures were proposed to increase the participation of IUSS full members, including the organization of annual Council meetings, the development of a new website with features to express interest in divisions, commissions, and WGs, and the establishment of a list of contacts appointed by national societies to facilitate information flow between countries and the IUSS. Collaboration with ISC through regional contacts, communication through social media, and the provision of information and materials for Alert and Bulletin were also mentioned. IUSS's presence in regional and national meetings is seen as crucial.

12. Next Appointments: It is announced that a Council meeting was scheduled for November-December, during which discussions on statutes and bye-laws modifications would take place.
13. Centennialius2024.org: The President announced the upcoming IUSS centennial celebration in 2024, with the theme "Our future is rooted in the past!"
14. Future Meetings: It was revealed that future meetings were planned for Nanjing in autumn 2024 and July 2026.

After the Presidential speech, a long and participating discussion occurred. The national reference delegates made the participants informed about the current main activities and those planned, furthermore, they raised some questions or remarked on some important points. The main questions and the consequent answers were the followings:

- Q. The participation of the President or his delegates to the National congresses is important.  
A. The President assured that either his presence or someone else of the President's committee will be granted on request of the National and regional soil societies.
- Q. There is a need to enhance the inclusiveness of African scientists.  
A. The President agrees and underlines the opportunity given by the fact that the current President-Elect is from Nigeria.
- Q. It is advisable to synergize the activities of national societies, in particular, for the organization of Conferences and the publication of journals.  
A. The IUSS can support the linkages and communications between the national societies mainly through the President's Committee and the Secretariat. In this regard, the national members must nominate a reference for international connections and keep the Secretariat updated with the email addresses.
- Q. There are expectations for the issue of the Genealogy book, in the perspective of the Centennial Celebration  
A. There is a task force appointed for collecting the contributions and edit the book. Several countries have already sent their contribution, but some others still must send it.
- Q. There is a need to reinforce the relationships with the Regional societies, but the issue is not easy, since the regional societies are not members of the IUSS.  
A. Although regional societies are not members of the IUSS, they are mentioned in the IUSS statutes and, on the other side, the IUSS is usually mentioned in the bye-laws of the regional societies. In practice, the collaboration can be improved by the care of both parties in supporting the reciprocal activities, for instance, in the organization of the meetings.
- Q. The new Strategic Plan is not known by everybody.  
A. It can be downloaded at <https://www.iuss.org/about-the-iuss/iuss-strategic-plan-2021-2030/>
- Q. There is a need to strengthen the Secretariat's support for the communication between national members and between them and the IUSS.  
A. The Secretariat is still in the phase of transition, but a strengthening of the Secretariat is specifically foreseen in the Strategic Plan also to face these kinds of needs. Nevertheless, the Secretariat is already operational for all communications, which must be sent to [iuss.secretariat@crea.gov.it](mailto:iuss.secretariat@crea.gov.it).
- Q. Importance of inclusiveness has been acknowledged in the Strategic Plan. To increase inclusiveness, it would be advisable to allow online participation in the IUSS events.

A. It is foreseen that the next WCSS will be hybrid as much as possible. The issue is currently rather costly and demanding, also in technical terms, but it is possible that in the next future, it will be much easier and cheaper.

The recording of the meeting is available on Zoom <https://zoom.us/rec/share/Q2WKHKzNNSjMckvnGOhOXdE-QOljq-3g-s8Z6K6ZyEPIgVDcoqA7vGQBCJJAql4R.8108JkSVNBZvAAez>

## Activities of the past president Laura Bertha Reyes Sanchez

### Global Women's Breakfast

In response to the invitation of the International Scientific Council for the IUSS to join the Global Women's Breakfast (GWB-2023) convened by the IUPAC to take place in Paris, France, the IUSS Past President was as one of the three speakers at the meeting of the Standing Committee of Gender Equity in Sciences (SCGES), and in the three brainstorming sessions after the presentations that took place on February 13. The speakers were Marie-Françoise Roy (IMU), Laura Bertha Reyes Sánchez (IUSS), and Gillian Butcher (IUPAP).

On February 14, after the Global Women's Breakfast celebration, the IUSS Past President participated in two more events: in the morning, a hybrid webinar from the Standing Committee of Gender Equity in Science on how to boost gender equality in sciences, and in the afternoon, a face-to-face meeting with ISC members to discuss future joint actions and contributions.



Intellectual Property of SCGES



Intellectual Property of Mei-Hung Chiu



## IUSS-UNAM Global Women's Breakfast 2023

Under the slogan "Breaking Barriers in Science" and with the Hashtag #GWB2023 proposed by the IUPAC, the IUSS-FES-C-UNAM-Global Women's Breakfast was held at the Academician's House of AAPAUNAM with the assistance of 100 women leaders from the academic and women leaders from the Mexican political scene.

During the event, four women leaders in sciences achievements from the University environment -the IUSS Past President between them by video- participated as speakers sharing their experiences. Finally, an open forum was organized to exchange ideas and contribute to incorporating and promoting the gender equity perspective in science through proposals for concrete actions.



**Universidad Nacional Autónoma de México**  
Facultad de Estudios Superiores Cuautitlán  
Unión Internacional de Ciencias del Suelo

**Desayuno Mundial**  
de las Mujeres

**Programa:**

- 8:30 Registro
- 9:00 Palabras de la Quim. Bertha Guadalupe Rodríguez Sámano Secretaria General de la Asociación Autónoma del Personal Académico de la UNAM
- 9:05 Palabras de la Dra. Laura Bertha Reyes Sánchez (video) Ex-Presidenta de la Unión Internacional de Ciencias del Suelo
- 9:10 Palabra de Bienvenida del Dr. David Quintanar Guerrero Director de la Facultad de Estudios Superiores Cuautitlán de la UNAM
- 9:15 Discurso de la Dra. Elizabeth Solleiro Rebolloido Instituto de Geología de la UNAM
- 9:20 Discurso de la Dra. María de la Luz Zambrano Zaragoza Facultad de Estudios Superiores Cuautitlán de la UNAM
- 9:25 Discurso de la Dra. María Isabel Belausteguigoitia Rius Centro de Investigaciones y Estudios de Género de la UNAM
- 9:30 Video de la FES Cuautitlan
- 9:35 Desayuno
- 10:30 Despedida

**Salón: Terraza Puma Casa Club del Académico**  
14 de febrero de 2023

**Objetivo:** Intercambiar opiniones, ideas y propuestas para fortalecer la equidad de género en las áreas científicas en la UNAM



As the IUSS representative to the Global Soil Partnership of FAO, the IUSS Past President Laura Bertha Reyes Sánchez participated in the 2<sup>nd</sup> Soil governance webinar "Enhancing soil governance: regional and national examples of soil legislation development", on March 9<sup>th</sup>, 2023

In answer to the invitation received and looking to strengthen the relations of the IUSS with the Branch of the Vasili Dokuchaev Soil Science Society of Uzbekistan, the current IUSS Past President Laura Bertha Reyes Sánchez opened the International Scientific and Practical Conference on the topic: Integrated Management and Reclamation of Degraded Soils to ensure food security: new approaches and innovative solutions, dedicated to the 105th anniversary of the National University of Uzbekistan named after Mirzo Ulugbek on April 19, 2023. Within the framework of the educative project "IUSS GOES TO SCHOOL" the IUSS Past President Laura Bertha Reyes Sánchez launched a Poster Contest with the theme SOIL RESOURCE IN YOUR LIFE, on April 17, 2023, in collaboration of the Mexican Soil Science Society and UNAM. Photo below corresponds to the first place of the poster contest.



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With the aim of strengthening IUSS relations with national and international Universities, the IUSS Past President, Laura Bertha Reyes Sánchez, was invited and participated as a main speaker giving the IUSS perspective on the subject and offering comments in response to multiple questions during the First International Spring Colloquium – Threatened Humanity: Who Takes Charge of the Future? On April 26, 2023, at FES-ACATLÁN, Mexico.

On May 5, 2022, the IUSS Past President Laura Bertha Reyes Sánchez was invited as principal speaker at the International Congress of Multidisciplinary Sciences. Environmental sustainability and food security: how to learn from the past to address future challenges.

IUSS Past President Laura Bertha Reyes Sánchez participated as the main speaker in the Latin American Regional Assembly of the GSP-FAO exposing the multiple actions and contributions of the National Societies of Soil Science make and offer for the advancement of the governance and sustainability of the soil resource



Photo: Intellectual Property of GSP-FAO

The Assembly was held from June 19 to 22, 2023 in Mexico City with the participation of all Latin American and Caribbean focal points and was inaugurated by the Secretary of Agriculture and Rural Development of Mexico and the FAO representative in Mexico.

### **IUSS Scientific agreements**

IUSS and IAPG have signed a MoU to improve consciousness on ethical issues applied to geoscience. A brief presentation of the IAPG and its mission follows.

### **The International Association for Promoting Geoethics (IAPG)**

*by Silvia Peppoloni*

The IAPG is a multidisciplinary, scientific network for widening discussion and creating consciousness regarding problems of ethics applied to the geosciences, in particular on the ethical, social and cultural implications of geoscience knowledge, research, practice, education and communication. Its overall objectives are:

- developing the discussion on ethical implications in research and practice of geosciences among geoscientists and into society, making geoethics an essential point of reference for any action on land, waters and atmosphere usage that all stake-holders and decision-makers must take into proper account;
- increasing the base research on geoethics and strengthening it with a scientific perspective;
- promoting geoethics values and principles through international cooperation, encouraging the involvement of geoscientists worldwide, with a special attention to those in low-income countries;
- fostering the dissemination of geoethics through websites and social networks, the publication of scientific papers, the organization of meetings and sessions/symposia on geoethics within national and international scientific events;
- encouraging the establishment of both regional and specialty groups; and
- cooperating with national and international organizations whose aims are complementary to those of the IAPG.

The achievement of the IAPG objectives will lead to the:

- identification of methods for a more effective application of geoethical values and principles in geoscience practice and research;
- reflection on the role that geoscientists can have in society and the identification of suitable forms, positions, means and actions to be adopted by them;
- growth of awareness about individual, professional, social, and environmental responsibility, both as geoscientists and as members of civil society;
- involvement of the societal communities in the idea of a common and shared “geo-heritage”, to be considered as a cultural, educational and scientific value, as well as an economic resource;
- cultural renewal in the way humans perceive and relate to the planet; and
- the sensitization towards the defense of life and the richness of the Earth.

The IAPG works to develop theoretical and practical activities covering a wide range of contents comprising: philosophy of geosciences and history of geosciences thinking; research integrity and professionalism in geosciences; working climate issues and related aspects; geoethics in georisk and disaster risk reduction; responsible georesources management; ethical and social aspects in geo-education and geosciences communication; geoethics applied to different geoscience fields including economic geology, paleontology, forensic geology and medical geology; ethical and societal relevance of geoheritage and geodiversity; sociological aspects in geosciences and geosciences-society-policy interface; geosciences for sustainable and responsible development; geoethical implications in global and local changes of socio-ecological systems; ethics in geoengineering; ethical issues in climate change and ocean science studies; ethical implications in geosciences data life cycle and big data; and ethical and social matters in the international geoscience cooperation.

IAPG Website: [www.geoethics.org](http://www.geoethics.org)

## Coalition of Action 4 Soil Health (CA4SH)

The IUSS has given its logo and collaboration to the Coalition of Action 4 Soil Health (CA4SH) [www.coalitionforsoilhealth.org](http://www.coalitionforsoilhealth.org). Following the Bonn climate negotiations, the CA4SH hosted a policy dialogue luncheon on 15 June in partnership with the British Society of Soil Science and the 4 per 1000 Initiative. The luncheon brought together soil health advocates to explore strategic policy entry points for soil health, and to develop a clear policy roadmap for action on soil health both within global and national level policy frameworks. This dialogue is well placed in advance of the upcoming UNFSS Stocktaking moment in July, and the UNFCCC COP28 in late-2023. CA4SH will again co-host the Food Systems Pavilion at the COP28.

The IUSS has been officially represented by Prof. Karl-Heinz Feger from the University of Dresden. Our colleagues from the British Society of Soil Science did a great job in organizing this political event together with the CA4SH. There were about 30 participants.

Learn more about CA4SH on their website [www.coalitionforsoilhealth.org](http://www.coalitionforsoilhealth.org).



*(Pictures been taken by prof. Feger)*

## The IUSS collaboration with the UNEP and the ISC

The United Nations Environment Programme (UNEP) has embarked on a new Strategic Foresight trajectory – for which the International Science Council (ISC) is a partner –with the view to creating a more anticipatory and future-oriented culture and developing and using collective intelligence in a more structured and systemic way.

As part of this process, UNEP is issuing a Delphi survey that will serve as the first phase of an intelligence-gathering exercise on issues that may affect the future of human wellbeing and planetary health. It seeks to specifically solicit informed views on signs of change emerging on the horizon could potentially disrupt, positively or negatively, human well-being and planetary health between now and 2030.

The survey is being disseminated to a group of experts across a wide range of disciplines, sectors, knowledge systems and geographies. In this context, the IUSS has been asked to select a panel to

take part in this survey, in their personal capacity, given their expertise and experience in addressing the challenges and root causes of issues within domains that may influence environmental outcomes.

The exercise consists of a Delphi survey that will serve as the first phase of an intelligence-gathering exercise on issues that may affect the future of human wellbeing and planetary health. It seeks to specifically solicit informed views on signs of change emerging on the horizon that could potentially disrupt, positively or negatively, human well-being and planetary health between now and 2030.

Once the survey results have been analysed, a second phase of consultations as well as global and regional sensemaking exercises will take place in the second half of 2023. UNEP's Strategic Foresight work is expected to culminate in a Global Report that will be an important contribution into the UN Summit of the Future in 2024.

The IUSS Experts that have given their availability to participate to the survey for the ISC-UNEP Global Survey represent all continents and different areas of soil sciences; they are:

1. Ozzie Abaye
2. Nithya Rajan
3. Jason Ackerson
4. Shalamar Armstrong
5. Felipe Aburto
6. Jayeoba, Olumuyiwa James
7. Anikwe, Martin Atu Ngozika
8. Christogonus K. Daudu
9. Rosa Maria Poch
10. Fabio Terribile
11. Edoardo Costantini
12. Jianying Shang
13. Yongguan Zhu
14. Alex McBratney
15. Christina Siebe

## Report from the IUSS Secretariat

### **The IUSS at EGU 2023**

The IUSS attended with a booth at the EGU in Vienna from 23 to 28 April 2023, together with the Chinese and the Italian Soil Science Societies (SISS). Gadgets and info materials of the IUSS, those of the next Inter-Congress WCSS in China, and that of the Centennial in Italy were distributed. IUSS Officers and Colleagues attended at the stand to share info and ideas for the Union and the progress in

Soil Sciences.



intellectual property Xin Song

**Intellectual Property F. Altobelli**

### **Malaysian Society of Soil Sciences**

On Monday March 27<sup>th</sup>, 2023, the Secretariat of the International Union of Soil Sciences (IUSS), entrusted to the CREA, hosted the study visit of Dr. V. Jeyanny Vijayanathan, senior research officer in the Soil Management Branch at the "Forest Plantation Programme" of the Forest Research Institute of Malaysia (FRIM). The meeting was an opportunity to establish a first contact aimed at the international cooperation with FRIM, to share the expertise on soil carbon modeling techniques and develop scientific collaborations. V. Jeyanny Vijayanathan is a member of the Malaysian Society of Soil Science, affiliated to the International Union of Soil Sciences (IUSS). The Forest Research Institute of Malaysia (FRIM) is one of the world's leading institutions in tropical forestry research. Founded in 1929 as the Forest Research Institute, it has become a body with statutory autonomy, supervised by the Ministry of Natural Resources, the Environment and Climate Change (NRECC). During the meeting, an international collaboration agreement between FRIM and CREA was signed.



intellectual property of F. Altobelli

### **IUSS Communication**

In soil we trust. This is IUSS motto. The IUSS Secretariat states that the communication team should work in order to strengthen awareness among IUSS scientists to acquire new members and new Countries. Our planet soil condition is such that demands an immediate effort from the research and science worldwide panorama. Moreover, global Institutions need strong scientific evidence in order to change policies that have been standing still for far too long. A change of pace is mandatory as a tragic evolution in the world agenda has underlined the need to act immediately and fast. To reach this goal, the importance of soil has to come out of labs and reach people everywhere and science, on its own, is not

enough: we need an informed public opinion able to influence and change the institutions. Such an ambitious plan can be accomplished only through a steady, meticulous work to be done day by day and, in this scenario, social media and website alike play a pivotal role. The CREA press office will provide IUSS with its experience to achieve these ambitious goals as all of us, before than being scientists and researchers, are human beings caring for their planet and sharing the same soil. Far too many times we hear that “what is essential is invisible to the eye” (Saint-Exupéry.) our mission is to make that visible and to do so we need the cooperation of everyone and each of you: follow us on social media, suggest topics and share our thoughts for a better future together.

### **IUSS Social media overview**

The Digital 2023 Global Overview Report states that there are 4.76 billion social media users around the world (59,4% of the world’s total population) who spend 2 hours and 31 minutes every day using social media. For these reasons we believe that, in order to have an impact, we can’t afford to overlook the social media and the coordinated communication that merge with and into them. That’s exactly the reason why we have decided to get back the social accounts: not to lose the communication done until today.

Facebook, the best channel for tracking results and targeting audience, currently has 14.679 follower (about + 500 in the last 6 months), last week we have set the official LinkedIn page that now has more than 30 followers (there is still a group that looks like a forum with 5146 users), twitter has 3935 followers and the official YouTube channel 259 ones and 50 videos.

<https://www.facebook.com/unionsoilsciences/>

[https://www.linkedin.com/company/iuss-international-union-of-soil-sciences?trk=public\\_post\\_main-feed-card-text](https://www.linkedin.com/company/iuss-international-union-of-soil-sciences?trk=public_post_main-feed-card-text)

[https://twitter.com/IUSS\\_ORG](https://twitter.com/IUSS_ORG)

<https://www.youtube.com/channel/UCX3cdAuO5QrPx0EtDPahQcg>

### **IUSS Stimulus Fund**

#### **Report for IUSS Stimulus funding for: Know Your Soil program for Youth and Soil Judging Contest**

*International Rice Research Institute (IRRI)*

*ISARC, Varanasi, UP, India*

We must educate and fascinate people about soils worldwide, starting from kindergarten up to the professionals and public as partners, to counteract or avoid further soil degradation and achieve sustainable agriculture. Soil is a connecting link between the atmosphere, hydrosphere, and lithosphere for sustain-

ing life. The pedosphere, part of the lithosphere, is the best indicator to identify and evaluate the intensified human impacts on the total environment and ecosystems. The vegetation type is a crucial soil-forming factor that potentially governs soil biota. Plants nurture a whole world of creatures in the soil that feed and protect the plants. This diverse community of living organisms keeps the soil healthy and fertile. This vast world constitutes soil biodiversity and determines the main biogeochemical processes that make life possible on Earth. Soil, a component of the pedosphere with its multifaceted benefits, needs to be observed, understood, and managed to optimize sustainable productivity in the era of global change. The soil judging contest will provide a platform for diverse participants to learn, share and upgrade their Art of knowledge on soils in different land use. This will be India's first contest on understanding the face of the Earth (soil) in forests, agroforestry, and agricultural land (anthrosols-paddy field).

The training session was conducted at Sri Sri University. Thirty enthusiastic participants from all over India participated under the guidance of 5 resource persons (Prof. Antaryami Mishra, OUAT, Bhubaneswar Odisha; Dr Sheetal Sharma, IRRRI; Prof Bhat, Sri Sri University, Cuttack, Odisha; Dr Ajay Kumar Mishra, IRRISARC, Varanasi, UP and Mr Satyajeeet Arya, Sri Sri University, Cuttack, Odisha). On the first day, the resource persons shared their knowledge and experiences with the participants and briefed them about the basics of soil properties, how to study the soil profile, and understand the diversification between 3 different land use. On the second day, a field visit was organized for 3 land uses (Agriculture, Agroforestry, and Forestry) in Chargarhia Village, Dampada Block Cuttack, Odisha. The participants were divided into 3 teams. Each team was assigned to dig the soil profile pit at different land uses and study all the 3 soil profiles.

The accepted methodology based on ISRIC - global soil information and FAO was followed for assessing soil profiles.

#### **Agriculture land-use soil profile:**

The agriculture area soil profile pit is located at latitude and longitude, respectively 20.430703 and 85.675402, Altitude of 29.84m. Its tropical climate and weather were sunny at 26°C. This location is based on the river basin and the soil is deposited by flood plain and soil is eroded in the form of rills. The agriculture area is well drained, but during paddy cultivation, In the soil is puddled and controlled drainage practices are maintained. The landform is low land, and the slope gradient is flat. Parental material is a sedimentary rock and human activity like tillage and other agriculture activities occur at this site. Around a radius 10kms the agricultural area is covered by river tributaries and mountains.

The soil horizons are similar. The O horizon is absent and horizon boundaries are wavy and the top 25 cm of the soil profile is disturbed by plowing and other agriculture practices. A horizon is situated from 0- 54 cm and below a transition of A & B horizons. B horizon is situated below 90 cm. The soil texture is clay loam, Soil colour is brown. The soil structure is medium size and moderate grade, and it is granular. The soil consistency is observed in dry was hard and wet soil was friable. Where stickiness varies from slightly sticky to very sticky with an increase in depth and also plasticity of the soil varies from plastic to very plastic. The compactness of soil is compact. The fine fibrous roots observed in A horizon. The mottles are noticed in reddish colour, in a tubular form and faint. Concretions are not seen in this soil profile. Several earthworms are seen, and earthworm channels are observed in a few. Medium size pores are noticed in the vesicular type. The soil is observed to be wet- to very wet.

#### **Agroforestry land-use soil profile:**

The Agroforestry area soil profile pit is located at the latitude and longitude 20.414625 and 85.667922, respectively, Altitude of 36m. Its tropical climate and weather were sunny at 26°C. Parental material is a sedimentary rock, and this location is based on the gentle slopes of the mountain. The soil is deposited by flood plain and the soil is eroded in the form of a sheet. The Agroforestry area is well-drained. A very gentle slope gradient is observed. In this site, Sapota, a guava plantation crop, is grown and no-tillage and other practices occur at the soil profile site. The land was used for paddy cropping around 40 years back and later, they left the soil barren. For the last 5 years, the farmer started an orchard.

The soil horizons are similar. 'O' horizon is absent and horizon boundaries are irregular and A horizon is situated from 0-40 cm and below that also a transition of 'A&B' horizons. 'B' horizon is situated below 80 cm. The soil texture is sandy loam; Soil colour is red. The soil structure is fine and weak grade and it is crumb type. The soil consistency is observed in dry and wet soil is loose. Where stickiness varies from non-sticky to slightly sticky with an increase in depth and also plasticity of the soil varies from non-plastic to slightly plastic. The compactness of the soil is loose. The fine fibrous roots are observed in A horizon and very few secondary roots with fine size are observed. The mottles are noticed in dark reddish brown colour in a tubular form and distinct. Concretions are not seen in this soil profile. Termites are seen in few numbers and termite channels are observed in very few. Very fine pores are noticed in the vesicular type. The soil is observed to be moderately moist.

#### **Forestry Land-use soil profile:**

The Forestry area soil profile pit is located at latitude and longitude, respectively 20.412383 and 85.669708, Altitude of 351m. Its tropical climate and weather were sunny at 26°C. Parental material is a sedimentary rock, and this location is based on the mountain's slopes, and the soil is deposited by transport and residual. Soil is eroded in the form of rills and gullies. The forestry area is well-drained. A very gentle slope gradient is observed. In this site, dense forest is observed, and no human activity is noticed at the site of the soil profile.

The 'O' horizon is observed in the top layer with 0-10cm, and the horizon boundary are smooth between 'O&A' horizons. A horizon is situated from 10-45 cm and below a transition of 'A&B' horizons. 'B' horizon is situated below 70 cm and the horizon boundaries are irregular. The soil texture is sandy loam; Soil colour is red. The soil structure is fine and weak grade, and it is crumb type. The soil consistency is observed in dry and wet soil is loose. Where stickiness varies from slightly sticky to non-sticky with an increase in depth and also plasticity of the soil varies from slightly plastic to non-plastic. The compactness of the soil is medium. The fine fibrous roots are observed in 'A' horizon and many secondary roots with fine size are observed. The mottles are noticed in dark reddish brown colour in a tubular form and faint. Concretions are not seen in this soil profile. Termites are seen in few numbers and termite channels are observed in very few. Very fine pores are noticed in the vesicular type. The soil is observed to be moderately moist.



Figure 1: The participants studied their soil profile in different land use. (Photo credits: Mr. Manas Rajan Sahoo & Mr. Piyush Kumar Maurya, IRRI)

The participants observed all three soil profiles and filled their monolith. On the third day, the participants gave their presentations on the soil profiles they studied in the presence of the resources faculty. Team 1 won the forestry soil profile judging, team 2 won the agriculture soil profile judging, and team 3 won the agroforestry soil profile judging. All three days after the session, participants joined the Art of living happiness program held in the evening session by Mr. Saurabh Baweja and Ms. Rupal Shah asked participants to discuss their responsibilities, needs, and how to handle good and bad times and then talked about how focusing on breathing can control your life. We had a practice session of pranayama and Sudarshan chakra to focus on breathing.

**References:**

Spaargaren, O. (2004). Soil profile description. In 1st European Summer School on Soil Survey, JRC, Ispra (VA), Italy, 21-07-2003 t/m 25-07-2003 (pp. 9-15). Office for Official Publications of the European Communities. <https://edepot.wur.nl/38105>

Guidelines for soil description. <https://www.fao.org/3/a0541e/a0541e.pdf>



Figure 2: Soil profiles of different land use. (Photo credits: Mr. Manas Rajan Sahoo, IRRI)



Figure 3: Onsite activity by participants. Participants presenting their monoliths on three different landuses. (Photo credits: Ms. Muskula Praveena, IRRI)



Figure 4: Group picture of all participants and resource faculty with Art of the living session. (Photo credits: Mr. Satyajeet Arya, Sri Sri University)

## **Report for IUSS Stimulus funding for: An online resource to promote the concept and practice of Digital Soil Mineralogy**

The James Hutton Institute, Craigiebuckler, ABERDEEN-UK

IUSS Commission 2.4 (Soil Mineralogy) has a vision to promote “modern approaches to soil mineralogy, such as data-driven approaches”. Recently, concerted effort has been made in this respect by the outgoing commission Chair and his research group resulting in the “Digital Soil Mineralogy” concept, which treats soil X-ray diffraction (XRD) data as a digital signature of soil mineralogical information. Funding from the IUSS Stimulus fund contributed towards the online hosting of a course that uses the R programming language to promote the “Digital Soil Mineralogy” concept.

All content is based on published Digital Soil Mineralogy work and associated open-source datasets, and includes:

Chapter 1: Loading, plotting and manipulating XRD data (Butler and Hillier, 2021a)

Chapter 2: Quantifying soil mineral compositions (Butler and Hillier, 2021a, 2021b)

Chapter 3: Using machine learning to predict and interpret soil properties from XRD data (Butler, 2020; Butler et al., 2018)

Chapter 4: Using cluster analysis of soil XRD data to identify mineral-nutrient relationships in African soils (Butler et al., 2020, 2019)

Chapter 5: Interplanetary comparison of soil XRD data: From Scotland to Mars (Hillier and Butler, 2019)

The course material can now be accessed here:

<http://digitalmineralogy.hutton.ac.uk/course/>

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Butler, B.M., Sila, A.M., Shepherd, K.D., Nyambura, K.M., Gilmore, C.J., Kourkoumelis, N., Hillier, S., 2019. Pre-treatment of soil X-ray powder diffraction data for cluster analysis. *Geoderma* 337, 413–424. doi:10.1016/j.geoderma.2018.09.044

Hillier, S., Butler, B.M., 2019. A terrestrial soil analogue for Martian mineralogy identified by the digital soil mineralogy concept applied to X-ray powder diffraction measurements on Earth and Mars, in: EGU General Assembly. Vienna, Austria, p. 17694.

Hillier, S., Butler, B.M., 2018. New XRD Data-Based Approaches to Soil Mineralogy. *Spectroscopy* 33, 34–36.

## News from national and regional Soil Science Societies

### Soil Science Australia

Dr. Allan E. Hewitt (MWLR), Dr Megan R. Balks (University of Waikato), and Prof David J. Lowe (University of Waikato) were recently awarded with the J.K. Taylor Gold Medal of Soil Science Australia for 2022 for their book “The Soils of Aotearoa New Zealand” (Springer, 2021).

<https://link.springer.com/book/10.1007/978-3-030-64763-6>

### Africa Soil Science Society (ASSS) (asssonline.org)

Centre for Development and Environment (CDE) - Centre for Development and Environment (CDE) (unibe.ch)  
CDE's and CDE's members' activities at the IASC Conference in Nairobi.

The XIX Biennial IASC Conference “The commons we want: between historical legacies and future collective actions” puts the commons at centre stage. The conference combines a future-oriented research and practice perspective with a look back, as many legal and structural legacies predetermine possible development pathways.

Join us at the IASC Conference from 19 – 24 June in Nairobi, Kenya!

Link: IASC Conference: information and registration

<https://iasc-commons.wildapricot.org/event-5049305>

### Organizing Committee of International Soil Science Congress (EURASIAN SOIL CONGRESS 2023) ICEFSS 2023

INTERNATIONAL SOIL SCIENCE CONGRESS ON "CLIMATE CHANGE AND SUSTAINABLE SOIL MANAGEMENT"  
Dedicated to the 100<sup>th</sup> Anniversary of Haydar Aliyev - the National Leader of Azerbaijani  
21-23 JUNE 2023, BAKU- AZERBAIJAN ICEFSSS 2023  
<https://icefsss-2023.com/>

### **Pacific Regional Society of Soil Science (PRSSS)**

2023 Soil ID Course Registration Pacific Regional Society of Soil Science (PRSSS) <http://prsss.landfood.ubc.ca/>  
Summer Soil ID Course  
Are you eager to dig some pits and hand texture some soil? If so, fill out the form below to express your interest for the PRSSS 2023 Soil ID Course, happening May 30th - June 1<sup>st</sup> on the Kamloops region

### **United States Consortium of Soil Science Associations** **Events | Soil Science Society of America**

### **News from the Latin American Soil Science Society: SLCS**

#### **Soil Science Association of Costa Rica**

X National Soil Congress, of the Costa Rica Soil Science Association, from June 12 to 14, 2023, in hybrid mode.

## News from Divisions

### **Division 1 – Soil in Space and Time**

*Division 1 deals with the soil body in the landscape context. The commissions and working groups coordinate, and harmonize research activities on observation, genesis, classification and mapping of the soil body and landscapes and communicate results to the soil science community, soil users and the general public.*

#### **Structure and Officers:**

Chair: Richard J. Heck / Canada

1<sup>st</sup> Vice Chairperson Ganlin Zhang / China

2<sup>nd</sup> Vice Chairperson: Ying Zhang / China

Vice Chairperson Centennial: Stefania Cocco / Italy

*The Chair is responsible for communication with the commissions, working groups and vice chairs.*

*Vice Chairs are responsible mostly for the organization of the Centennial Celebration and Congress of the IUSS.*

### **IUSS Division 2. Commissions and Working Groups:**

- Commission 1.1 – Soil Morphology and Micromorphology
- Commission 1.2 – Soil Geography
- Commission 1.3 – Soil Genesis

- Commission 1.4 – Soil Classification
- Commission 1.5 – Pedometrics
- Commission 1.6 - Paleopedology
- Working Group - Cryosols
- Working Group – Digital Soil Mapping
- Working Group – Digital Soil Morphometrics
- Working Group – Global Soil Map
- Working Group – Proximal Soil Sensing
- Working Group – Soil Information Standards
- Working Group – Soil Monitoring
- Working Group – Universal Soil Classification
- Working Group – World Reference Base

### **Division Chair Report**

Chair: Richard J Heck.

As will be seen further in this report, various sessions and business meetings were organized and held, by the various Commissions and Working Groups of Division 1, during the 22<sup>nd</sup> World Congress of Soil Science, in Glasgow, Scotland, 31 July - 5 August, 2022 (<https://22wcss.org/>). Similarly, Division 1 is currently contributing to the organization of the IUSS Centennial Celebration and Congress, in Florence, Italy, 19-21 May 2024 (<https://centennialiuuss2024.org/>). This report covers the period of January 2022 to June 2023.

#### **Events**

- Global Conference on Sandy Soils, Madison-WI/USA, 4-8 June 2023. Organizers Alfred Hartemink & Jingyi Huang.

#### **Recent activities**

- Establishment of “International Soil Judging Contest” Working Group, to be led by Erika Micheli / Hungary, John Galbraith / USA and Brian Needelman / USA, 26 June 2023.

#### **Planned future activities**

- In development.

### **Commission 1.1 – Soil Morphology and Micromorphology**

Chair: Fabio Terribile / Italy

Vice Chair: Adam Csorba / Hungary

*The commission deals with soil as a continuous natural body that has spatial and temporal dimensions (soil cover or pedosphere) and studies the organization of its organic and inorganic constituents on different scales from micro to macro. They closely cooperate with IUSS units dealing with palaeopedology and soil genesis.*

#### **Events**

- Archaeological Micromorphology Short Course, UCL, London, 19-27 April 2022.
- Archaeological Soil and Sediment Micromorphology Course, Athens, Greece, June 6-10, 2022.

- 8<sup>th</sup> Intensive Training Course on Soil Micromorphology, Tremp, 9-20 May 2022. This event was organized by the Dept. of Environment and Soil Sciences and the Institute of Continuing Education of the University of Lleida.
- 22WCSS technical sessions: “Soil structure: Observation, resilience and its role in ecosystem functioning” (with Commission 2.1). Co-Convenors: Stephan Peth, Richard J Heck, Fabio Terribile; ‘Progress in Digital Soil Morphometrics’ (with Digital Soil Morphometrics WG). Glasgow, Scotland, 31 July - 5 August 2022.
- 16<sup>th</sup> International Conference on Soil Micromorphology which supposed to be held at the Jagiellonian University in Kraków, Poland, from 4-8 September 2022, was cancelled due to the Russia-Ukraine conflict.
- 1<sup>st</sup> Brazilian Meeting of Soil Micromorphology, Piracicaba-SP/Brazil, November 11-15, 2022. Organizers: Selma Castro and Miguel Cooper, of ESALQ.
- 4<sup>th</sup> Latin-American Intensive Course on Soil Micromorphology (IV curso latinoamericano de micromorfología de suelos), Universidad Nacional del Altiplano de Puno, Peru, 21-25 November 2022.
- Webinar “X-ray Imaging of the Soil Porous Architecture”, Speakers: Stephan Peth , Sacha Mooney, Richard Heck; 30 May 2023.
- Webinar “An Introduction to X-ray Imaging at the Hounsfield Facility”, Speakers: Sacha Mooney and Craig Sturrock from University of Nottingham; 22 June 2023.

#### **Recent activities**

- Business meeting of Commission 1.1 Soil Morphology and Micromorphology, during the 22WCSS in Glasgow, Scotland, August 3<sup>rd</sup>.

#### **Planned future activities**

- 17<sup>th</sup> International Conference on Soil Micromorphology (ICSM), Puno – Peru, 2-4 December 2024. Special Theme: “Micromorphology Making Friends”.

#### **Awards**

- The 10th Kubiěna Medal was awarded *ex aequo* to Dr. Paul Goldberg (University of Tübingen, formerly University of Boston) and to Dr. Richard Macphail (University College, London), during the 22WCSS in Glasgow, Scotland. Both retired scientists presented a breath-taking list of publications which obtained many citations, were involved in teaching micromorphology, and are still the faces of archaeological micromorphology. Without their efforts this branch of our discipline would not be as well-developed and as popular as it is now. They both used micromorphology throughout their career, contributing to methods, applications and interpretation. Paul Goldberg and Richard Macphail are considered as the spiritual fathers of archaeological micromorphology.
- Commission 1.1 - Soil Morphology and Micromorphology has the pleasure to award the Young Micromorphologist's Publication Award 2022 to Dr. Tania González Vargas. In her paper "Brightness values-based discriminant functions for classification of degrees of organic matter decomposition in soil thin sections" (one section of her PhD) she developed a digital methodology to analyse pedofeatures in thin soil sections. Her research included high resolution images mosaic (7 x 5 cm), quantification of organic matter at different stages of decomposition.

#### **Publications**

- Since the start of 2022, three Commission 1.1 Newsletters were produced: January 2022, July 2022, and March 2023 (available through [www.soilmicromorphology.net](http://www.soilmicromorphology.net) or through the IUSS website)

## **Commission 1.2 – Soil Geography**

Chair: Sergey V. Goryachkin / Russia

Vice Chair: Eduardo Guimarães Couto / Brazil

*This Commission deals with the development and spatial distribution of soils worldwide and its many morphogenetic attributes and properties. Soil formation is understood as a complex adaptive interplay of biological and physico-chemical processes driven by environmental climate, organisms including humankind, topography including certain hydrologic features, parent material, and age of soil.*

### **Events**

- 22WCSS technical session “Soil geography: basic science and new technologies”. Glasgow, Scotland, 31 July - 5 August 2022.
- Memorial of the pronounced soil geographer Ilia Sokolov (90<sup>th</sup> anniversary). Moscow, October 2022.

### **Recent activities**

- Business meeting of Commission 1.2 Soil Geography, during the 22WCSS in Glasgow, Scotland, August 1<sup>st</sup>.
- Organization of the informal group of IUSS soil geographers, based on the sessions of the last 3-4 WCSS and personal contacts.
- Developing an online regular webinar (4-6 papers per year) “Soils of the world: typical and exotic soils of different countries and continents”. Will be based on the book series “Soils of the World”, edited by Alfred Hartemink.

### **Planned future activities**

- VIII International Conference on Cryopedology ‘Permafrost-affected Soils in the Anthropocene’, Salekhard/Labytnangi, Yamal-Nenets Autonomous District/Russia, 20-26 August 2023. To be hosted by the local Arctic Research Center of the Yamal-Nenets Autonomous District, Salekhard. Together with the IUSS Cryosol WG.

### **Awards**

- Finalizing the process of the Vladimir Fridland gold medal award preparation for the 23WCSS and organization of the relevant group on assessment of the nominations for this award.

### **Publications**

- S. Zhang, Y. Chen, Z. Zhang, S. Wang, Z. Wu, Y. Hong, Y. Wang, H. Hou, Z. Hu, T. Fei VNIR estimation of heavy metals concentrations in suburban soil with multi-scale geographically weighted regression. *Catena*, Volume 219, 2022, 106585.
- F.B. de Santana, E.C. Grunsky, M.M. Fitzsimons, V. Gallagher, K. Daly. Diffuse reflectance mid infra-red spectroscopy combined with machine learning algorithms can differentiate spectral signatures in shallow and deeper soils for the prediction of pH and organic matter content. *Catena*, Volume 218, 2022, 106552.

- Y. Uwiragiye, M.J.Y. Ngaba, M. Zhao, A.S. Elrys, G.B.M. Heuvelink, J. Zhou. Modelling and mapping soil nutrient depletion in humid highlands of East Africa using ensemble machine learning: A case study from Rwanda. *Catena*, Volume 217, 2022, 106499.
- A.G. Carshalton, M.R. Balks, T.A. O'Neill, K.R. Bryan, C.A. Seybold, Climatic influences on active layer depth between 2000 and 2018 in the McMurdo Dry Valleys, Ross Sea Region, Antarctica, *Geoderma Regional*, Volume 29, 2022, e00497
- S.V.Goryachkin. *Geography of Extreme Soils and Soil-Like Systems*. Herald of the Russian Academy of Sciences, Pleiades Publishing, Ltd (Road Town, United Kingdom), 2022, Vol. 92, No. 3, p. 335-341.

### **Commission 1.3 – Soil Genesis**

Chair: Endre Dobos / Hungary

Vice Chair: Yuji Maejima / Japan

*This Commission quantifies the fundamental physical, chemical, biological, and mineralogical processes (pedogenic) of gains, losses, translocations, and transformations occurring in soils from micro to macro scales to explain and understand profile formation. It utilizes fundamental knowledge gained from other disciplines to model dynamics and processes responsible for soil behaviour at the landscape or ecological scale. This information is integrated with that of other scientific databases to quantify environmental interactions under which soils formed in both modern and paleo times. Besides of the traditional soil genesis research, the commission maintains its focus on translating the core soil genesis knowledge into simple, easy to use and apply indicators to assess the benefits of soil improving practices and communicate them to the end-users, meaning both the farmer and the administrative segments.*

#### **Events**

- 22WCSS technical session “Soil Genesis”, Glasgow, Scotland, 31 July - 5 August 2022.
- Contribution to the 4<sup>th</sup> International Soil Judging Contest organization at Stirling, UK, 26-31 July 2022. 9 teams were registered and participated.

#### **Recent activities**

- Business meeting of Commission 1.3 Soil Genesis, during the 22WCSS in Glasgow, Scotland, August 3<sup>rd</sup>.
- Celebration of World Soil Day (5<sup>th</sup> of December), with several programs registered on the FAO site. Preparation of the soil profile of the year 2022, and exhibition at the Ministry of Agriculture, Budapest, Hungary.
- Online conference was organized in June of 2023 on “Man driven soil genesis to improve soil quality of the agricultural lands.

#### **Planned future activities**

- 7<sup>th</sup> International Soil Classification Congress (7<sup>th</sup> ISCC), in Hokkaido/Japan, in 3-9 June 2024 ([iscc2024.org/](http://iscc2024.org/)). Organization Leader: Takayuki Kobayashi.
- Contributions to the 5<sup>th</sup> International Soil Judging Contest during the 23WCSS in China, 2026.

- Development of the cooperation platform between the soil museums of the world and supporting a common virtual platform to share the georeferenced soil information available in the soil exhibitions.

#### **Awards**

- None reported this period.

#### **Publications**

- None reported this period.

### **Commission 1.4 – Soil Classification**

Chair: Cornelius van Huyssteen / South Africa

Vice Chair: David Badía-Villas / Spain

*This Commission deals with the continued development of soil classification as a means for understanding and communicating how soils can be placed into 3-dimention-al “bodies” that differ across the landscape. The Commission is also dealing with soil classification as a tool for ad-dressing environmental issues, such as the link between soil types and biodiversity, and agricultural issues that focus on how soils can be sustained and enhanced for food production.*

#### **Events**

- None reported.

#### **Recent activities**

- WRB Soil Classification Workshop, Iceland, 6-3 June 2022. The excursion took participants around Iceland, and visited two to three pedons per day that covered a range of wetlands, drylands and barren desert areas. These represent Histosols, Histic Andosols, Vitric Andosols, Gleyic Andosols and more. Questions, regarding how soils classified as Vitrisols according to the Icelandic system (basaltic barren deserts) could be classified as Andosols according to WRB, were addressed. The Andosols in Iceland represent 5% of all Andosols in the world. Organizer: Professor Ólafur (Olí) Arnalds of the Agricultural University of Iceland ([oa@lbhi.is](mailto:oa@lbhi.is)).
- Business meeting of Commission 1.4 Soil Classification, during the 22WCSS in Glasgow, Scotland, August 3<sup>rd</sup>.

#### **Planned future activities**

- WRB Field Workshop, in Catalonia, Spain, 17-23 September 2023. The workshop will travel from to Barcelona over the course of the week. Soils developed in contrasting environments, from nearly desert to the cold humid Pyrenean Mountains, and from sea level to nearly 2000 m altitude will be investigated. Many soil forming processes will be related to calcium carbonate and gypsum accumulations. As Catalonia is a Mediterranean country, with a long agricultural land use history, special attention will be given to anthropic soils (on stone-bench terraces) and to long-term irrigated soils. Organizers: Rosa Poch ([rosa.poch@udl.cat](mailto:rosa.poch@udl.cat)) and Jaume Boixadera ([jaume.boixadera@udl.cat](mailto:jaume.boixadera@udl.cat)).
- 7<sup>th</sup> International Soil Classification Congress (7<sup>th</sup> ISCC), in Hokkaido/Japan, in 3-9 June 2024 ([iscc2024.org/](http://iscc2024.org/)). Organization Leader: Takayuki Kobayashi.

#### **Awards**

- At the 22<sup>nd</sup> World Congress of Soil Science, in Glasgow, UK, the Guy Smith Medal was awarded to Dr. Peter Schad, mainly in recognition of his role in the development and promotion of the World Reference Base (WRB) international soil classification system. Peter is Professor and Chair of Soil Science at the Technical University of Munich, was Vice-chair of the IUSS working group WRB, from 2002 to 2010 and Chair from 2010 until 2022.

### **Publications**

- The 4<sup>th</sup> edition of World Reference Base for Soil Resources (2022), including the Field Guide for soil description, has been published and is available here: [www3.lis.tum.de/fileadmin/w00bds/boku/downloads/wrb/WRB\\_fourth\\_edition\\_2022-12-18.pdf](http://www3.lis.tum.de/fileadmin/w00bds/boku/downloads/wrb/WRB_fourth_edition_2022-12-18.pdf)
- 'Soils of the World' (Zech, Schad, Hintermaier-Erhard), is available in both electronic and hard-copy versions: <https://link.springer.com/book/10.1007/978-3-540-30461-6>.

### **Commission 1.5 – Pedometrics**

Chair: Alexandre Wadoux / France

Vice Chair: Simone Priori / Italy

*This Commission deals with the application of mathematical and statistical methods for the study of the distribution and genesis of soils. The goal of pedometrics (and the WGs) is to achieve a better understanding of the soil as a phenomenon that varies over different scales in space and time. The commission is very active in communication, including Twitter (<https://twitter.com/pedometrics?lang=en>), as well as regular Newsletters, called Pedometron, which provide very valuable details of the great activities of the Commission and can be accessed through their website ([www.pedometrics.org](http://www.pedometrics.org)).*

### **Events**

- 22WCSS technical session “How Pedometrics can cross boundaries and change society”. Convenors: Titia Mulder and Nicolas Saby. Glasgow, Scotland, 31 July - 5 August 2022.
- EGU 2022 sessions: “Session SSS10.2 Statistical, computational and visualization tools for assessing soil complexity and variability”, Convenor: Ana Maria Tarquis; “Session SSS10.4 Digital Soil Mapping and Assessment”, Convenor: Laura Poggio; “Session SSS10.5 Pedometrics meets remote sensing for mapping and monitoring of soils”, convenor: Titia Mulder; “Session SSS10.6 Soil Sustainability”, Convenor: Dominique Arrouays.

### **Recent activities**

- Business meeting of Commission 1.5 Pedometrics, during the 22WCSS in Glasgow, Scotland, August 3<sup>rd</sup>.

### **Planned future activities**

- 2024 Pedometrics Conference, Las Cruces-NM/USA, 5-9 February 2024.

### **Awards**

- Best paper in Pedometrics 2020 awarded to Liu et al., (2020) – this award was delayed because of COVID and a re-organization of the award committee.
- Richard Webster medal to Prof. Budiman Minasny: <http://pedometrics.org/announcement-richard-webster-medal-2022/>.

### **Publications**

- Issues 46 and 47 of *Pedometron* (editor Lei Zhang from Nanjing University), available at website ([pedometrics.org/pedometron/](http://pedometrics.org/pedometron/)).

### **Commission 1.6 – Paleopedology**

Chair: Maria Bronnikova / Russia

Vice Chair: Elizabeth Solleiro-Rebolledo / Mexico

*This Commission deals with soils as a memory of environmental change. Its research is concerned with paleosols and polygenetic soils with paleofeatures. Their studies are concentrated on pedo-lithostratigraphy of soil-sedimentary sequences, soil morphology, and micromorphology, isotope signature, biomarkers and other soil environmental proxies. One of our goals is integration into paleogeography, Quaternary and geoarchaeological research and correlation of soil record with data obtained from other paleoenvironmental records.*

#### **Events**

- The XIV International Symposium and Field Workshop on Paleopedology, planned for Russia since 2020, was shifted twice, but it had to be cancelled because of the Russia-Ukraine conflict.
- EGU 2022 Sessions: “SSS3.2 Soils and palaeosols as records of Past human land-use and environmental conditions”, co-organized by SSS3 – Soils as Records in Time and Space, CL5.2 Archives and Observations, and GM3 Weathering, Soils, and Sediment Transport; Conveners: Anna Schneider, Maria Bronnikova, Anna Andretta, Oren Ackermann. Participants of the session were invited to submit their materials to an established Special Issue of *Frontiers in Earth Science* "Soils and Palaeosols as Records of Past Human Land-Use and Environmental Conditions". Invited Editors: Anna Andretta, University of Florence, Florence, Italy; Anna Schneider, Brandenburg University of Technology Cottbus-Senftenberg, Senftenberg, Germany; Maria Bronnikova, Institute of Geography (RAS), Moscow, Russia.
- 22WCSS technical sessions: With Commission 1.6, “Soil Classification and Paleopedology”, Co-chaired by Curtis Monger, Maria Bronnikova, Bipin B Mishra, and Elizabeth Solleiro-Rebolledo. A keynote lecture "Classification of paleosols: needs, concepts, and doubts" was delivered by Prof Cezary Kabala. Commission 1.6 was also a co-organizer of Interdivisional Session 6 “Dynamics of soil erosion and land loss under past, present and future environments”, at a special request of Division 1; this session was handled by Artemi Cerdà and Maria Bronnikova, during the pre-congress period, and Chaired by Artemi Cerdà. Glasgow, Scotland, 31 July - 5 August 2022.

#### **Recent activities**

- Business meeting of Commission 1.6 Paleopedology, during the 22WCSS in Glasgow, Scotland, August 3<sup>rd</sup>.

#### **Planned future activities**

- XIV International Symposium and Field Workshop on Paleopedology, at New Mexico State University in Las Cruces, New Mexico, USA, 7-15 October 2023. Organizers: Curtis Monger and Maria Bronnikova. ([inqua.org/meetings/list/76?type=Meeting](http://inqua.org/meetings/list/76?type=Meeting))
- XV International symposium and field workshop on paleopedology (ISFWP XIV), Calabria, Italy, 2023. Academic sessions will be held at the University of Calabria, Italy. Organizer: Fabio Scarciglia, University of Calabria, Italy.

- 17<sup>th</sup> International Conference on Soil Micromorphology (ICSM), Puno – Peru, 2-4 December 2024. Special Theme: “Micromorphology Making Friends”.

#### **Awards**

- None reported this period.

#### **Publications**

- Commission 1.6 published the materials of the online 2021 commission event in the special issue of *The Boletín de la Sociedad Geológica Mexicana*, Volumen 74 Número 3; Volume 74 Issue 3 (2022): “Paleosols and ancient societies: from early humans to the industrial revolution / Paleosoles y sociedades antiguas: desde los primeros humanos hasta la revolución industrial”. Invited editors: Georgina Ibarra-Arzave, Elizabeth Solleiro-Rebolledo, Maria Bronnikova ([boletinsgm.igeolcu.unam.mx/bsgm/index.php](http://boletinsgm.igeolcu.unam.mx/bsgm/index.php)). The issue includes 12 papers. 5 papers are devoted to earthen architecture in different cultural and landscape backgrounds: sources and processing of materials and building technologies. Paleoenvironmental conditions (based on paleosol data) during occupation periods were discussed in 4 papers for different regions of the world and different periods.

#### **Working Group - Cryosols**

Chair: Alexei Lupachev / Russia

Vice Chair: vacant

#### **Events**

- None reported this period.

#### **Recent activities**

- Due to the Russia-Ukraine conflict, no activities were organized in 2022.

#### **Planned future activities**

- VIII International Conference on Cryopedology ‘Permafrost-affected Soils in the Anthropocene’, Salekhard/Labytnangi, Yamal-Nenets Autonomous District/Russia, 20-26 August 2023. To be hosted by the local Arctic Research Center of the Yamal-Nenets Autonomous District, Salekhard.

#### **Awards**

- None.

#### **Publications**

- Gubin S.V., Lupachev A.V. Approaches to the Classification of Soils of the Accumulative Seashores of Russian Northeast. *Eurasian Soil Science*, 2022, Vol. 55, No. 1, pp. 20–26. DOI: 10.1134/S1064229322010057
- S. V. Gubin, A. V. Lupachev, and A. K. Khodzhaeva Soils of Accumulative Coasts of the East Siberian Sea. *Eurasian Soil Science*, 2022, Vol. 55, No. 9, pp. 1173–1184 DOI: 10.1134/S106422932209006X
- Polyakov V, Kartoziia A, Nizamutdinov T, Wang W and Abakumov E (2022), Soilgeomorphological mapping of Samoylov Island based on UAV imaging. *Front. Environ. Sci.* 10:948367. doi: 10.3389/fenvs.2022.948367

- Paul Sanborn, Chuck Bulmer, Marten Geertsema, and Scott Smith. A proposed Folic subgroup for the Organic Cryosols. *Can. J. Soil Sci.* 00: 1–6 (2022) | [dx.doi.org/10.1139/CJSS-2021-0182](https://doi.org/10.1139/CJSS-2021-0182)
- Chebykina, E.; Polyakov, V.; Abakumov, E.; Petrov, A. Wildfire Effects on Cryosols in Central Yakutia Region, Russia. *Atmosphere* 2022, 13, 1889. <https://doi.org/10.3390/atmos13111889>
- Desyatkin, R.; Okoneshnikova, M.; Ivanova, A.; Nikolaeva, M.; Filippov, N.; Desyatkin, A. Dynamics of Vegetation and Soil Cover of Pyrogenically Disturbed Areas of the Northern Taiga under Conditions of Thermokarst Development and Climate Warming. *Land* 2022, 11, 1594. <https://doi.org/10.3390/land11091594>
- Aleksei Lupachev, Petr Danilov, Evgeny Lodygin, Yana Tikhonravova, Vladislav Butakov, Anna Usacheva, Marta Ksenofontova. Approaches for the complex assessment of polychemical pollution of permafrost-affected soils and the upper layer of permafrost. *Environmental Monitoring and Assessment* (2022) 194:594 <https://doi.org/10.1007/s10661-022-10270-x>.

### **Working Group – Digital Soil Mapping**

Chair: Laura Poggio / Netherlands

Vice Chair: Alessandro Samuel Rosa / Brazil

#### **Events**

- EGU 2022 Session (in collaboration with Pedometrics commission): Digital soil mapping meets remote sensing for soil monitoring and assessment.
- 22WCSS technical sessions: “Digital soil mapping: Advances towards Digital Soil Assessment”. Glasgow, Scotland, 31 July - 5 August 2022.
- 2nd Joint Conference of the IUSS DSM and Global Soil Map WGs. "Soil mapping for a sustainable future, Orléans, France, 7th-9th February 2023. Chair: Dominique Arrouays (Chair of the GlobalSoilMap Working Group), Co-chair: Laura Poggio (Chair of the Digital Soil Mapping Working Group).
- EGU 2023 (in collaboration with Pedometrics commission): Digital soil mapping meets remote sensing for soil monitoring and assessment.

#### **Recent activities**

- Business meeting of Digital Soil Mapping WG, during the 22WCSS in Glasgow, Scotland, August 4<sup>th</sup>.
- February 2023 (in collaboration with the WG Global Soil Map): Soil Mapping for a Sustainable Future. 2nd joint Workshop of the IUSS Working Groups Digital Soil Mapping and Global Soil Map.

#### **Planned future activities**

- Co-edition, with the Chair of the Global Soil Map WG, of a special issue of *Geoderma*, for selected papers from the 2023 Joint DSM and Global Soil map IUSS WG Conference “Soil mapping for a sustainable future”, Orléans, France, 7-9 February 2023.
- Co-organization of the next joint DSM-Global Soil map WG workshop, to be held in Bangalore/India, 2024/2025.
- Participation in the 2024 Pedometrics Conference, Las Cruces-NM/USA, 5-9 February 2024.

### **Awards**

- None.

### **Publications**

- None reported this period.

### **Working Group – Digital Soil Morphometrics**

Chair: Alfred Hartemink / USA

Vice Chair: vacant

### **Events**

- 22WCSS technical session ‘Progress in digital soil morphometrics – deeper and more precise soil observations’, Co-Convenors: Alfred Hartemink and Richard J Heck.

### **Recent activities**

- During the dedicated 24WCSS technical session, decision was taken to close the Digital Soil Morphometrics WG.
- Preliminary discussions with Chair and Vice-Chair of Commission 1.1, regarding closure of this WG.

### **Planned future activities**

- None (Working Group being closed).

### **Awards**

- None.

### **Publications**

- None reported this period.

### **Working Group – Global Soil Map**

Chair: Dominique Arrouays / France

Vice Chair: Pierre Roudier / New Zealand

### **Events**

- Communications at EGU 2022
- Communications at the WCSS 2022
- Joint business meeting with the WG DSM at the WCSS 2022
- 2nd Joint Conference of the IUSS DSM and Global Soil Map WGs. "Soil mapping for a sustainable future, Orléans, France, 7th-9th February 2023. Chair: Dominique Arrouays (Chair of the GlobalSoilMap Working Group), Co-chair: Laura Poggio (Chair of the Digital Soil Mapping Working Group).

### **Recent activities**

- Business meeting of Global Soil Map WG, during the 22WCSS in Glasgow, Scotland, August 4<sup>th</sup>.
- Ongoing co-edition of special issues (2 in Remote Sensing, 1 in Frontiers in Soil Science).
- Obtention of a grant for a research consortium (2019-2023) involving the main participants of the WG Global Soil Map (INRAE, Landcare Research, Univ. Sydney, Wageningen University, USDA, ISRIC-World Soil Information).

## Planned future activities

- Co-edition, with the Chair of the Global Soil Map WG, of a special issue of *Geoderma*, for selected papers from the 2023 Joint DSM and Global Soil map IUSS WG Conference "Soil mapping for a sustainable future", Orléans, France, 7-9 February 2023.
- Co-organization of the next joint DSM-Global Soil Map WG Workshop, to be held in Bangalore/India, 2024/2025.

## Publications

- Blackburn K.W., Libohova Z., Adhikari K., Kome C., Maness X., Silman M.R. (2022). Influence of Land Use and Topographic Factors on Soil Organic Carbon Stocks and Their Spatial and Vertical Distribution. *Remote Sensing* 14, 2846. <https://doi.org/10.3390/rs14122846>.
- Chen S., Arrouays D., Mulder V.L., Poggio L., Minasny B., Roudier P., Libohova Z., Lagacherie P., Shi Z., Hannam J., Meersmans J., Richer-de-Forges A.C., Walter C. (2022). Digital mapping of GlobalSoilMap soil properties at a broad scale: A review. *Geoderma*. Volume 409, 2022, 115567, <https://doi.org/10.1016/j.geoderma.2021.115567> Open Access.
- Gomez C., Chevallier T., Moulin P., Arrouays D., Barthès B.G. (2022). Using carbonate absorbance peak to select the most suitable regression model before predicting soil inorganic carbon concentration by mid-infrared reflectance spectroscopy. *Geoderma*. Volume 405, 2022, 115403, <https://doi.org/10.1016/j.geoderma.2021.115403>.
- Lemerrier B., Lagacherie P., Amelin J., Sauter J., Richer-de-Forges A.C., Arrouays D. (2022). Multiscale evaluations of global, national and regional digital soil mapping products in France. *Geoderma*. Volume 425, 116052. <https://doi.org/10.1016/j.geoderma.2022.116052>.
- Mendes W. de S., Demattê J.A.M., Minasny B., Silvero N.E.Q., Bonfatti B.R., Safanelli J.L., Rizzo R., da Costa A.C.S. (2022). Free iron oxide content in tropical soils predicted by integrative digital mapping. *Soil and Tillage Research* 219, 105346. <https://doi.org/10.1016/j.still.2022.105346>.
- Minai J.O., Schulze D.G., Libohova Z. (2022). Renewal of Archival Legacy Soil Data: A Case Study of the Busia Area, Kenya. *Front. Soil Sci.* 1:765248. doi:10.3389/fsoil.2021.765248.
- Padarian J., Minasny B., McBratney A., Smith P. (2022). Soil carbon sequestration potential in global croplands. *PeerJ* 10:e13740 <https://doi.org/10.7717/peerj.13740>.
- Richer-de-Forges A.C., Arrouays D., Chen S., Román Dobarco M., Libohova Z., Roudier P., Minasny B., Bourennane H. (2022). Hand-feel soil texture and particle-size distribution in central France. Relationships and implications. *CATENA* 106155. <https://doi.org/10.1016/j.catena.2022.106155>.
- Richer-de-Forges A.C., Arrouays D., Poggio L., Chen S., Lacoste M., Budiman B., Libohova Z., Roudier P., Mulder V.L., Nédélec H., Martelet G., Lemerrier B., Lagacherie P., Bourennane H. (2022). Hand-feel soil texture observations to evaluate the accuracy of digital soil maps for local prediction of particle size distribution. A case study in central France. *Pedosphere*. <https://doi.org/10.1016/j.pedsph.2022.07.009>.
- Rossiter D.G., Poggio L., Beaudette D., Libohova Z. (2022). How well does digital soil mapping represent soil geography? An investigation from the USA. *SOIL* 8, 559–586. <https://doi.org/10.5194/soil-8-559-2022>.

- Roudier P., Odgers N., Carrick S., Eger A., Hainsworth S., Beaudette D. (2022). Soilscales of New Zealand: Pedologic diversity as organised along environmental gradients. *Geoderma* 409 (2022) 115637. <https://doi.org/10.1016/j.geoderma.2021.115637>.
- Shamrikova E.V., Kondratenok B.M., Tumanova E.A., Vanchikova E.V., Lapteva E.M., Zonova T.V., Lu-Lyan-Min E.I., Davydova A.P., Libohova Z., Suvannang N. (2022). Transferability between soil organic matter measurement methods for database harmonization. *Geoderma*. <https://doi.org/10.1016/j.geoderma.2021.115547>.
- Vaudour E., Gholizadeh A., Castaldi F., Saberioon M., Borůvka L., Urbina-Salazar D., Fouad Y., Arrouays D., Richer-de-Forges A.C., Biney J., Wetterlind J., Van Wesemael B. (2022). Satellite imagery to map topsoil organic carbon content over cultivated areas: an overview. *Remote Sensing*, 14, 2917. <https://doi.org/10.3390/rs14122917>.
- Xiao Y., Xue J., Zhang X., Wang N., Hong Y., Jiang Y., Zhou Y., Teng H., Hu B., Lugato E., Richer-de-Forges A.C., Arrouays D., Shi Z., Chen S. (2022). Improving pedotransfer functions for predicting soil mineral associated organic carbon by ensemble machine learning. *Geoderma*. 116208. <https://doi.org/10.1016/j.geoderma.2022.116208>.

### **Working Group – Proximal Soil Sensing**

Chair: Asim Biswas / Canada

Vice Chair: Abdul Mouazen / Belgium

**Events** (in chronological order starting with the oldest)

- Scientific Session at WCSS 2022 at Glasgow, Scotland: Sensing soil chemical, physical and biological properties - advances and emerging techniques; Chair: Asim Biswas
- Scientific Session “Digital Agriculture”, at the 2023 Annual Meeting of the Canadian Society of Soil Science, Edmonton/AB, Canada, 23-27 May 2022. Chairs: Asim Biswas & Viacheslav Adamchuk.
- Session “Hydrophysics to support precision agriculture”, at CSSS 2022 at the 2023 Annual Meeting of the Canadian Society of Soil Science, Truro/NS, Canada, 26-28 June 2023.

### **Recent activities**

- Working Group business meeting during the 22WCSS, in Glasgow, Scotland.

### **Planned future activities**

- Spring of 2024 - Workshop at Ghent University, Belgium.

### **Awards**

- None.

### **Publications**

- Edited book: *Advances in sensor technology for sustainable crop production* (Eds) Craig Lobsey and Asim Biswas.
- Special Issue: *Application of Proximal and Remote Sensing Technologies to Soil Investigations* in *Journal of Environmental and Engineering Geophysics*.
- Allred, B., Biswas, A., Lobsey, C., Whitesell, L. (2023) Introduction to the *Journal of Environmental and Engineering Geophysics* Special Issue on the Application of Proximal and Remote Sensing Technologies to Soil Investigations. *Journal of Environmental and Engineering Geophysics* 27, vi-vii. <https://doi.org/10.32389/JEEG22-080>.

- Special Issue "Proximal Soil Sensors in Precision Agriculture"- Editor: Asim Biswas  
[https://www.mdpi.com/journal/sensors/special\\_issues/soil\\_precision\\_agriculture](https://www.mdpi.com/journal/sensors/special_issues/soil_precision_agriculture).

### **Working Group – Soil Information Standards**

Chair: Fenny van Egmond / Netherlands

Vice Chair: Rainer Baritz / Denmark

#### **Events**

- 22WCSS technical “Soil information standards and systems - current initiatives and advances”. Glasgow, Scotland, 31 July - 5 August 2022.

#### **Recent activities**

- Working Group business meeting during the 22WCSS, in Glasgow, Scotland.

#### **Planned future activities**

- None reported this period.

### **Working Group – Soil Monitoring**

Chair: Thomas Bishop / Australia

Vice Chair: vacant

#### **Events**

- None reported this period.

#### **Recent activities**

- None reported this period.

#### **Planned future activities**

- None (Working Group being closed).

### **Working Group – Universal Soil Classification**

Chair: Budiman Minasny / Australia

Vice Chair: Jingyi Huang / USA

#### **Events**

- Organized a session at the 22WCSS in Glassgow; this session included an oral presentations and poster presentations:

#### **Recent activities**

- Promote the need for a “quantitative and numerical global soil classification that unifies the existing systems and enables transfer between them” at the publication of Ten challenges for the future of pedometrics (Wadoux et al., 2021, Volume 401, 115155 <https://doi.org/10.1016/j.geoderma.2021.115155> ).
- Devised the Comprehensive Soil Classification system and produce an R package and a web interface for users (Jingyi Huang, Madison, WI,USA, 2022).
- Contacted representatives from different national and regional classification system for comparing the centroid of national/regional soil classes with the existing Universal system (online zoom meetings in Feb 2022).

- Conducted a joint soil classification comparison with Brazil, France, Russia, and South Korea (Lucia Anjos from Brazil, Erika Micheli from Hungary, Dominique Arrouays from France, Igor Savin from Russia and Sahngho Jeon from S.Korea).
- Dealt with scientific issues: definition of soil properties and analysis methods, methodological advances for merging and harmonising, etc.
- Coordinate the organisation of the Universal Soil Classification session at the 2022 WCSS in Glasgow.

#### **Planned future activities**

- Continue to update the CSCS and contact various national soil classification systems.
- Demonstrate the applicability of the CSCS.

#### **Publications**

- Hughes, P., A. McBratney, J. Huang, B. Minasny, J. Hempel, D.J. Palmer, E. Micheli. Creating a novel comprehensive soil classification system by sequentially adding taxa from existing systems *Geoderma Regional*, 11 (2017), pp. 123-140.
- Hughes, P., A.B. McBratney, J. Huang, B. Minasny, E. Micheli, J. Hempel. Comparisons between USDA Soil Taxonomy and the Australian Soil Classification System I: data harmonisation, calculation of taxonomic distance and inter-taxa variation. *Geoderma*, 307 (2017), pp. 198-209.
- Hughes, P., A.B. McBratney, J. Huang, B. Minasny, E. Micheli, J. Hempel. A nomenclature algorithm for a potentially global soil taxonomy. *Geoderma*, 322 (2018), pp. 56-70.
- Hughes, P., A.B. McBratney, B. Minasny, J. Huang, E. Micheli, J. Hempel, E. Jones. Comparisons between USDA soil taxonomy and the Australian Soil Classification system II: comparison of order, suborder and great group taxa. *Geoderma*, 322 (2018), pp. 48-55.
- Shahbazi, F., Huang, J., McBratney, A. B., Hughes, P. Allocating soil profile descriptions to a novel comprehensive soil classification system. *Geoderma*, 329 (2018), 54-60.
- McBratney, A. B., Minasny, B., Huang, J., Arrouays, D., Richer-De-Forges, A. C., Savin, I., & Jeon, S. CSCS2. 0: A comprehensive soil classification system for quantitatively identifying soils across the world. In *WCSS22 (2022, July, Glasgow, UK). Soil Science crossing boundaries, changing society*.

- **Working Group – World Reference Base**

- Chair: Cezary Kabala / Poland
- Vice Chair: Stephan Mantel / Netherlands

- **Events**

- The WRB Field Workshop 2022 was in Iceland, 5-14 June, 2022 with ca 30 participants from 12 countries (number of participants was limited due to COVID restrictions). The objectives of the workshop were: (1) to check the efficiency of WRB rules and solutions to classify soils developed from volcanic materials in Iceland, (2) to correlate the classification and map units distinguished based on Icelandic classification with WRB RSGs and Soil Taxonomy orders, (c) to discuss suggestions to the new version of WRB (2022). 22 soil profiles around Iceland represented large variability of materials, soil forming factors, and soil development that allowed high-level discussion about the principles and criteria for soils developed of volcanic materials. The final conclusions and suggestions have been submitted to WRB board.

- Members of WRB working group actively participated at the VI International Soil Classification Congress (ISCC2020+2) in Mexico. The field part started on March 22, 2022, in Quatro Ciénegas and finished on March 30 in Santiago de Queretaro. The conference part of congress (March 30 to April 1) was launched in a hybrid form in UNAM campus Juriquilla, Queretaro. The congress provided excellent opportunity to discuss the origin and classification principles of soils developed in drastically contrasting environments of Northern and Central Mexico, in particular soil rich in gypsum and carbonates, including the perified horizons. Field testing of detailed criteria for these polygenetic soils (using the WRB, Soil Taxonomy, national classifications) revealed several shortcomings and lead to many proposals to the new version of WRB classification.
- 2WCSS technical session "Advances in understanding soils as reflected by the 4th edition of the WRB". Glasgow. Glasgow, Scotland, 31 July - 5 August 2022.
- **Recent activities**
- Supporting organization of the Soil Classification and Education Conference, in Torun, Poland, 12-14 September 2022.
- **Planned future activities**
- WRB Field Workshop, in Catalonia, Spain, 17-23 September 2023.
- **Awards**
- Engage new national/regional classifications to update the system.

#### **Publications**

- IUSS Working Group WRB. 2022. World Reference Base for Soil Resources. International soil classification system for naming soils and creating legends for soil maps. 4th edition. International Union of Soil Sciences (IUSS), Vienna, Austria.

The World Reference Base for soil resources (WRB) Working Group has launched a new website:

<https://wrb.isric.org/>

The World Reference Base (WRB) is an international system for classification of soils and is designed to cater for naming any soil in the world. The WRB Working Group operates under IUSS Commission 1.4 - Soil classification.

The WRB is taught at universities in classes about soil geography and is used by students and researchers to identify soils in the field. WRB is used for mapping and naming soils and for correlation with national systems and international exchange and publications. The new website serves these user groups with information and documents from the WRB Working Group.

Since the initiation in 1994 of the Working Group, annual field tours, meetings and symposia have been organized in support of the development of the WRB soil classification system. The working group is headed by prof. Cezary Kabala (chair) and Stephan Mantel (vice-chair). The new homepage of the Working Group will be a main resource for WRB classification. On [wrb.isric.org](https://wrb.isric.org) you can find:

- Documents, publications and teaching materials
- Information about the working group (leadership and history)
- Information on field workshops (upcoming and past)
- Links to relevant sources on WRB

The Working Group will continue to build and add to these pages. Moreover, you will find announcements of the planned WRB field tours and past field tours. Please visit <https://wrb.isric.org/> for information, documents, images and publications.

The WRB Working Group is also on twitter: @WRB2022

## Report Division 2

### **Division 2 – Soil properties and processes**

Division 2 deals with “how” the fundamental science behind our discipline and the understanding of fundamental processes. Division 2 is concerned with integrating physics, chemistry, biology, mineralogy, and pedogenesis to understand the fundamental soil properties and processes that control the transport, cycling, fractionation, speciation, and bioavailability of elements and molecules. These phenomena are studied on scales ranging from the global to the atomic.

#### **Structure and officers:**

Chair: Giuseppe Corti, Italy

1<sup>st</sup> Vice Chairperson: Xiaoyuan Yan, China

2<sup>nd</sup> Vice Chairperson: Jianming Xu, China

Vice Chairperson Centennial: Stefano Mocali, Italy

*The Chair is responsible for communication with the commissions, working groups and vice chairs. Vice Chairs are responsible mostly for the organization of the Centennial Celebration and Congress of the IUSS.*

#### **IUSS Division 2. Commissions and Working Groups:**

- Commission 2.1 – Soil Physics
- Commission 2.2 – Soil Chemistry
- Commission 2.3 – Soil Biology
- Commission 2.4 – Soil Mineralogy
- Commission 2.5 – Soil Chemical, Physical, and Biological Interfacial Reactions
- Working Group - Hydropedology
- Working Group – International Soil Modeling Consortium

#### **Division Chair Report**

Chair: Giuseppe Corti, Italy

1<sup>st</sup> Vice Chairperson: Xiaoyuan Yan, China

2<sup>nd</sup> Vice Chairperson: Jianming Xu, China

Vice Chairperson Centennial: Stefano Mocali, Italy

All Division, Commissions, Working Groups, and members actively contributed to the planning of the 22<sup>nd</sup> World Congress of Soil Science (31 July - 5 August, 2022, Glasgow, Scotland) (<https://22wcscs.org/>) and are currently contributing to the organization of the IUSS Centennial Celebration and Congress (May 19-21, 2024, Florence, Italy) (<https://centennialius2024.org/>). This resulted in the submission of four scientific sessions under the auspices of the Division:

1. Life, agriculture, and productive systems in soils from Arctic, Antarctic and other cold regions (Giuseppe Corti, Silvia Imhoff, Karen Vancampenhout)
2. Soil Mineralogy: Current state and perspectives (Sofia N. Lessovaia, Edson C. Bortoluzzi)
3. Soil microbiomes – Importance for climate resilient future, degraded lands restoration and plant health control (Magdalena Fraç, Alberto Acedo, E. Kandeler)
4. Managing soil carbon and nitrogen for climate-smart and sustainable agriculture (X. Yan, P. Kim, S. Chang)

Members of Division 2 also contributed to the co-organization of sessions at the European Geosciences Union general Assembly 2023 (EGU-IUSS sessions) (April 23-28, 2023, Vienna, Austria) (<https://www.egu23.eu/>).

#### **Recent activities**

- Chair of the Division, Giuseppe Corti, is member of the Organising and Scientific Committees of the Centennial Celebration and Congress of the IUSS (May 19-21, 2024, Florence, Italy) (<https://centennialiuiss2024.org/>).

#### **Planned future activities**

- 1<sup>st</sup> Vice Chairperson, Xiaoyuan Yan, is involved in preparing the inter-congress meeting to be held in Nanjing, China, October 21-24, 2024 ([http://en.csss.org.cn/inter\\_congress\\_2024](http://en.csss.org.cn/inter_congress_2024))
- To publish an article together.

#### **Publications**

- Camponi L., Cardelli V., Cocco S., Serrani D., Salvucci A., Cutini A., Agnelli A., Fabbio G., Bertini G., Roggero P.P., Corti G., 2022. Effect of coppice conversion into high forest on soil organic C and nutrients stock in a Turkey oak (*Quercus cerris* L.) forest in Italy. *Journal of Environmental Management* 31215, 114935.
- Serrani D., Ajmone-Marsan F., Corti G., Cocco S., Cardelli V., Adamo P., 2022. Heavy metal load and effects on biochemical properties in urban soils of a medium-sized city, Ancona, Italy. *Environmental Geochemistry and Health* 44, 3425-3449.
- Serrani D., Cocco S., Cardelli V., D'Ottavio P., Borguete A.R.R., Feniassé D., Vilanculos A., Fernández-Marcos M.L., Giosué C., Tittarelli F., Corti G., 2022. Soil fertility in slash and burn agricultural systems in central Mozambique. *Journal of Environmental Management* 32215, 116031.
- Yao Y., Zhang X., Huang Z., Li H., Huang J., Corti G., Wu Z., Qin X., Zhang Y., Ye X., Fan H., Jiang L., 2022. A field study on the composition, structure, and function of endophytic bacterial community of *Robinia pseudoacacia* at a composite heavy metals tailing. *Science of the Total Environment* 8501, 15787.
- Seddaiu G., Pinna M.V., Agnelli A., Cappai C., Corti G., Demurtas C.E. Pulina A., Roggero P.P., 2023. Dynamics of soluble soil organic matter in Mediterranean maize-based forage system under organic and mineral fertilization. *Catena* 220, 106730.
- Salvucci A., Cocco S., Agnelli A., Cardelli V., Camponi L., Serrani D., Corti G., 2023. Genesis and preservation of patterned ground in permafrost non-affected soils – Central Apennines, Italy. *Geoderma Regional* 32, e00604.
- Salvucci A., Rafael R.B.A., Cocco S., Cardelli V., Camponi L., Serrani D., Feniassé D., Weindorf D.C., Corti G., 2023. Zoogenic soil horizons – termite ecosystem engineers in different agro-ecological regions of Mozambique. *Geoderma Regional* 32, e00618.
- Camponi L., Cardelli V., Cocco S., Serrani D., Salvucci A., Cutini A., Agnelli A., Fabbio G., Bertini G., Roggero P.P., Weindorf D.C., Corti G., 2023. Holm oak (*Quercus ilex* L.) cover: A key soil-forming force in controlling C and nutrient stocks in long-time coppice-managed forests. *Journal of Environmental Management* 33015, 117181.
- Serrani, D., Ferrocino I., Garofalo C., Osimani A., Corvaglia M.R., Milanović V., Aquilanti L., Cocco S., Cardelli V., Rafael R.B.A., Franciosi E., Tuohy K., Clementi F., Corti G., 2023. Soil bacterial communities under slash and burn in Mozambique as revealed by a metataxonomic approach. *Pedosphere* 33, 508 – 520.

## **Commission 2.1 – Soil Physics**

Chair: Silvia C. Imhoff, Argentina

Vice Chair: Cezary Sławiński, Poland

Commission 2 aims to: i) achieve a better understanding of the fundamental properties and processes that control the transport of matter and energy that takes place in and through the soil, including measurement and prediction in natural and managed ecosystems; ii) encourage the generation of synergistic links with other disciplines to enhance knowledge of soils and the promotion and adoption of good practices that lead to sustainable production systems.

**Events** (in chronological order starting with the oldest)

- During the Argentina Congress of Soil Science in 2022, the Chair of Soil Physics Commission, **Silvia Imhoff**, participated as speaker at two conferences. Also, she collaborated with the Soil Science Association of Argentine (AACS) in generating the space for the conference given by the Past President of the IUSS, Laura Bertha Reyes Sánchez.

- **Silvia Imhoff** joined the board of directors of the AACS in 2022, which participates as a member to the IUSS.

### **Recent activities**

- Chair of Soil Physics Commission, **Silvia Imhoff**, as a task within the AACS is collaborating with the drafting of an adapted protocol to reliably measure the stock of soil carbon under various uses (agricultural, livestock, forestry and/or silvopastoral), facilitate data analysis, and communication of the knowledge generated.

- **Silvia Imhoff** is also collaborating in the organization of the XXIX Congress of Soil Science to be held in Catamarca, Argentina.

### **Planned future activities**

- Chair of Soil Physics Commission, **Silvia Imhoff**, is working with the Soil Physics branch of the AACS in organizing a workshop that will be held at the end of this year and will focus on the measurement methodologies of the water retention curve and its use for the determination of soil quality.

- Vice-chair of Soil Physics Commission, **Cezary Sławinski**, will participate the Scientific Committee of the 14<sup>th</sup> International Conference on Agrophysics, Lublin, Poland, September 11-13, 2023.

### **Publications**

- Krzyszczak J., Baranowski P., Pastuszka J., Wesołowska M., Cymerman J., Sławiński C., Siedliska A., 2023, Assessment of soil water retention characteristics based on VNIR/SWIR hyperspectral imaging of soil Surface Soil and Tillage Research, Volume 233, September 2023, 105789
- Krzyszczak J., Baranowski P., Lamorski K., Sławiński C., Siedliska A., Bojar W., Żarski W., Żarski J., Kuśmierk-Tomaszewska R., Ahmet A. KOÇ, Çağatay S., Uysal P, Staboulis Ch., Nastis S., Theofilou A., Mattas K., Leyva C., Báez-González P., Roldán A. O., Parra O., Tkaczyk P. 2023, Impact assessment of Agri-Environment-Climate Measure (M10) of RDP 2014-2020 on Polish farmers' perception of environmental and climatic policies implementation. International Agrophysics. DOI: 10.31545/intagr/168992
- Gackiewicz B., Lamorski K, Mykola K., Sławiński Cezary, Hsu Shao-Yiu, Chang Liang-Cheng, 2022, Hybrid modeling of saturated water flow in percolating and non-percolating macroporous soil media, Geoderma, 406, 115467
- Shih Yi-Hsuan, Hsu Shao-Yiu, Huang Qun-Zhan, Lamorski Krzysztof, Hu Ming-Che, Tsao Chia-Wen, Sławiński Cezary, Shokri Nima, 2022, Euler characteristic during drying of porous media, Drying Technology , 4(40), DOI: 10.1080/07373937.2021.2007946
- Camussi G.; Imhoff S.; Antille D.; Marano R., 2022. Hydraulic performance of mole drains and validation of steady-state drainage spacing equations for Mollisols. Soil & Tillage Research. Amsterdam: Elsevier Science Bv. vol. 223. ISSN 0167-1987.
- Ghiberto P.; Baudracco J.; Heffner P.; Imhoff S., 2022. Farm dairy effluent application on an Argiudoll cultivated with alfalfa (medicago sativa L.): biomass production and persistence. Chilean Journal of Agricultural & Animal Sciences. Concepción: Universidad de Concepción. vol.38 n°3. p354 -362. ISSN 0719-3882.

- Ciacci M.B.; Micheloud N.G.; Levy M.R.S.; Rodriguez M.; Gariglio N.F.; Imhoff S., 2022. Advantages of Seeding Annual and Perennial Cover Crops Between Peach Rows. *Journal of Soil Science and Plant Nutrition*.: Springer Science and Business Media Deutschland GmbH.. ISSN 0718-9508. EISSN 0718-9516.
- Masola J.; Alesso C.A.; Carrizo M.E.; Imhoff S. 2021. Controlled traffic farming. FAO and ITPS (Eds.) *Recarbonizing global soils: a technical manual of best management practices*. Roma: Food and Agriculture Organization of the United Nations. p1 - 8. ISBN 978-92-5-133126-2
- Imhoff S.; Nicolier J.; Masola J.; Carrizo M.E.; Alesso C.A.; Ghiberto P., 2021. Application of swine and cattle manure through injection and broadcast systems in a black soil of the Pampas, Argentina. FAO and ITPS (Eds.) *Recarbonizing global soils: A technical manual of best management practices*. Roma: Food and Agriculture Organization of the United Nations. p1 - 10. ISBN 978-92-5-133126-2

## **Commission 2.2 – Soils Chemistry**

Chair: Otilio Arturo Acevedo Sandoval, Mexico

Vice Chair: Karen Vancampenhout, Belgium

**Events** (in chronological order starting with the oldest)

During the **World Congress of Soil Science (Glasgow, August 2022)**, vice-chair of Soil Chemistry Commission, **Karen Vancampenhout**:

- co-chaired Commission 2.2 session “Biogeochemical cycles in the soil - processes linking the abiotic and biotic realms”
- was an invited panel member for the Plenary Session on "How transforming land-use change could change our future" led by Dr Debra Roberts, Co-Chair of Working Group II of the IPCC
- contributed to interdivisional session 7: Soil securing humanity | Humanity securing soil (chaired by Damien Field) – title: “The Green Green Sand of Home: immersive experiences for creating soil awareness”
- contributed to interdivisional session 5: Soil science and the emerging philosophy of regenerative agriculture (Chairperson: Christine Watson) – title: A tree against hunger: Enset-based farming systems for building soil health in the tropics
- was an invited panel member to the "Meet the Journal Editors" symposium hosted by the British Soil Science Society
- contributed a poster to the Division 2 poster session entitled “A complex system approach for soil organic matter persistence”
- was a Delegate for the Soil Science Society of Belgium to the IUSS

Vice chair **Karen Vancampenhout** was on sabbatical leave during **EGU 2022 (Vienna, May 2022)**, but she was represented by her post-doc Dr. Ellen Desie. She co-chaired session SSS5.6 on “Biomarkers - the tool to trace recycling and fate of organic carbon and other elements in soil “

For the **MWECAU conference on “Climate-Smart Solutions for Tropical Mountain Environments: Research, Innovation and Policy for Building Inclusive and Resilient Societies” (Moshi, July 2022)**, vice-chair **Karen Vancampenhout** contributed as

- a member of the scientific committee and invited ‘Guest of Honour’
- several scientific contributions including a keynote on soil management in tropical environments, closing remarks and a scientific contribution on soil carbon storage in the Kilimanjaro, Pare and Usambara mountains (presented by Mr. Oforo Kimaro)
- contribution to an item on the conference and land management issues on Tanzanian television and radio

During the **EGU 2023 conference (Vienna, April 2023)**, vice-chair of Soil Chemistry Commission, **Karen Vancampenhout**:

- co-convened an oral and poster session titled “mechanisms of soil organic matter transformation, stabilization and storage (SSS5.3)”

- attended the EGU 2023 pop-up networking night
- attended the **European Confederation of Soil Science Societies general assembly** meeting
- contributed with a poster to Session SSS5.3 titled “How does edaphic context affect soil organic matter persistence”

### Recent activities

Co-chair **Karen Vancampenhout** is finalising a review publication on “Anthrosols: learning from the past to climate-proof the future” together with former commission chair Boris Jansen as a **contribution to the IUSS special issue for Soil and Tillage Research**, initiated by former division chair Hatano Ryusuke and Guest Editor Bal Ram Sing.

Co-chair **Vancampenhout** engaged in activities for making soil science accessible for the general public by several initiatives:

- Her **Massive Open Online Course** on Soils, Ecosystems and Livelihoods in the tropics ran on the educational platform EdX.org in the fall of 2022 (next edition planned for fall 2023)
- She curates a **reference collection and website** of soil monoliths : <https://ees.kuleuven.be/soil-monoliths/>
- She participated in a Belgian documentary “**Onze Natuur**” on nature and the environment
- She presented a talk and an exhibit on the 2023 **Nerland Science Festival** in May. The festival was attended by 20.000 people.
- She was granted a project by the Flemish government to build a soil science education website for secondary school pupils

Co-chair **Vancampenhout** is a **Senior Associate Editor for Geoderma**, handling numerous papers on soil processes and soil chemical properties.

### Planned future activities

**Wageningen soil conference 2023**: member of the scientific committee, invited jury member to the Rising soil star event (vice chair Vancampenhout)

Contributions to the **IUSS centennial** (sessions on soil heritage and soil carbon)

### Publications

- dos Santos S.R., Schellekens J., Buurman P., Cornelis J-T., Vancampenhout K., Lopes da Silva W.T., de Camargo P.B., Vidal-Torrado P. 2023. Selective sorption and desorption of DOM in Podzol horizons-DOC and aluminium contents of leachates from a column experiment. *Science of the Total Environment*, 872, Art.No. 162234.
- Yang Y., Geng J., Cheng S., Fang H., Guo Y., Li Y., Zhou Y., Shi F., Vancampenhout K. 2023. Linking soil microbial community to the chemical composition of dissolved organic matter in a boreal forest during freeze-thaw cycles. *Geoderma*, 431, Art.No. 116359.
- Nikolaus K., Schellekens J., Mols S., Jansen B., Briones M.J I., Desie E., Cornelis J-T., Absalah S., Muys B., Vancampenhout K. 2022. Seeing the forest for the fractions – Comparing soil organic matter fractionation methods using molecular features after forest stand conversion. *Geoderma* 430, Art. No. 116280.
- Ottoy S., Truyers E., De Block M., Lettens S., Swinnen W., Broothaerts N., Hendrix R., Van Orshoven J., Verstraeten G., De Vos B., Vancampenhout K. 2022. Digital mapping of soil organic carbon hotspots in nature conservation areas in the region of Flanders, Belgium. *Geoderma* <regional 30, Art.No. e00531.
- Jing X., Muys B., Baeten L., Bruelheide H., De Wandeler H., Desie E., Hattenschwiler S., Jactel H., Jaroszewicz B., Jucker T., Kardol P., Pollastrini M., Ratcliffe S., Scherer-Lorenzen M., Selvi F., Vancampenhout K., van der Plas F., Verheyen K., Vesterdal L., Zuo J.,

Van Meerbeek K. 2022. Climatic conditions, not above- and belowground resource availability and uptake capacity, mediate tree diversity effects on productivity and stability. *SCIENCE OF THE TOTAL ENVIRONMENT* 812 Art.No. 152560.

### **Commission 2.3 – Soils Biology**

Chair: Alberto Acedo Becares, Spain

Vice Chair: Magdalena Frac, Poland

**Events** (in chronological order starting with the oldest)

Chair of Soil Biology Commission, **Alberto Acedo**, organised the following online events:

#### **Year 2022**

1. Know Before you Grow: Predicting the effectiveness of Biologicals. (172 attended)
2. BeCrop: The Advisor's tools for data driven input recommendations (95 attended)
3. Input Performance Verification & Recommendation (91 attended)
4. Virtual Roundtable: Emerging Technologies for Ag Input Manufacturers (112 attendees)
5. Gestión del riesgo de enfermedades en cultivos con BeCrop® (22 attendees)
6. Estrategias para mejorar el rendimiento de los cultivos (45 attendees)
7. Next Steps for Regen Ag Lab and BeCrop Technology: Q&A With Lance Gunderson (82 attendees)
8. Key facts about product performance in tomato plants and soil microbiome (78 Attendees)
9. Wheat Roots in Soil Health (80 attendees)
10. What Can Entomopathogenic Nematodes do for Soil Health? (84 attendees)
11. Biofertilizers as an important tool in agriculture (91 attendees)
12. Crop Disease Risk Management with BeCrop® (76 attendees)
13. Biological Strategies for Improving Farmland Yields (103 attendees)
14. The Power of Soil Biology Data in Guiding Farm Practices (120 attendees)

#### **Year 2023**

1. Growing Success: Monitoring Impact of Biologicals in Your Soil (161 attendees)
2. Microbial Nutrition in Citrus Agriculture (147 attendees)
3. Elevate Your Soil Health Expertise: Utilizing BeCrop Tools to Enhance Crop Advising (71 attendees)
4. Mejora tus conocimientos sobre la salud del suelo con BeCrop (29 attendees)
5. Full Circle Approach to Soil Testing: How BeCrop Test and Haney Test go hand-in-hand (130 attendees)
6. BeCrop as a Product Development Tool (93 attendees)
7. Exclusive BeCrop Advisor Webinar (24 attendees)

Vice-chair of Soil Biology Commission, **Magdalena Frac**, organised on-line events for promotion of soil biodiversity and microbiome importance during the meetings of microBIOME AGRO LIVING LAB (24.10.2022, 15.11.2022, 19.12.2022, 20.02.2023, 27.03.2023, 24.04.2023, 31.05.2023) (<http://microbiome.ipan.lublin.pl/>). At the scientific level, the specific objectives of microBIOME AGRO LIVING LAB are to: describe the microbial genetic and functional diversity of soils; evaluate the microbiome and mycobiome of soils and crops, including trophic and functional guilds with determination of pathogenic and antagonistic microorganisms; assess the microbial activity and diversity in soil ecosystem under the influence of different bioproducts; determine the effectiveness of developed bioproducts against the key fungal plant pathogens.

Chair of Soil Biology Commission, **Alberto Acedo**, has been participating as speaker at:

## Year 2022

1. BioAg World Congress (Valencia - Spain)
2. World Living Soils Forum [Moet] (France)
3. Biome and Biocontrol (Madrid - Spain)
4. ABIM (Switzerland)
5. Charla en Palencia (Spain)

## Year 2023

1. Smart and Green Virtual conference (Virtual)
2. Fruit Logistica (Germany)
3. Wine and The climate Crisis (virtual)
4. Global Soil Biodiversity Conference (Ireland)
5. IV Boron Day (Guatemala)
6. Mundial Congress of the vineyard and the wine (Cadiz - Spain)
7. International Microbioma 2023 (Murcia - Spain)
8. Vision Conference (USA)
9. Innovation Forum Future of Food (USA)
10. World Agritech (USA)

## Recent activities

- Vice-Chair of Soil Biology Commission, **Magdalena Frąc**, proposed one session for the conference 100 years of soil science past achievements and future challenges in Florence in Italy in 2024: SOIL MICROBIOMES – IMPORTANCE FOR CLIMATE RESILIENT FUTURE, DEGRADED LANDS RESTORATION AND PLANT HEALTH CONTROL – Lead convener: Magdalena Frąc (Institute of Agrophysics, Polish Academy of Sciences), Co-conveners: Alberto Acedo (Biome Makers Inc., USA), Ellen Kandeler (University of Hohenheim, Stuttgart, Germany). This session will cover all aspects of soil microbiomes including benefits and risks, approaches, methods and mechanisms, as well as impacts of various factors on soil microbiomes.
- Vice-Chair of Soil Biology Commission, **Magdalena Frąc**, organised VII National Microbiological Symposium “Metagenomes of Various Environments”, which was organised under scientific auspices of IUSS Soil Biology Commission. Symposium was held on 20-21.06.2023 (<https://metagenomy2023.ipan.lublin.pl/>).



## Planned future activities

Chair of Soil Biology Commission, **Alberto Acedo**, is preparing a working group to develop a guide of good practices on soil metabarcoding data generation and comparison together with (FAO, EU, Soil health Institute, Biome Makers).

Further, he will be involved in the following for the **next months of the year 2023**:

1. *Wageningen soil conference (Netherlands)*
2. *3rd Edition of Global Conference on AGRICULTURE AND HORTICULTURE (Valencia - Spain)*
3. *European Healthy Soils (Switzerland)*
4. *IV Congreso Palmero CPAL 2023 (Guatemala)*
5. *Fruit Attraction*
6. *2023 National Cooperative Soil Survey Conference (USA)*
7. *Sustainable Agronomy Conference (USA)*
8. *Tech Hub Live (USA)*
9. *Healthy Soil Summit (USA)*
10. *ASA, CSSA, SSSA International Annual Meeting (USA)*
11. *Eco Ag Conference (USA)*

### **Awards**

Revolutionary Achiever Award 2023 by BioAg World Congress. This award recognizes Dr. Acedo's contributions to the industry through real innovation and tangible success for agricultural stakeholders.

### **Publications**

- Acin-Albiac M., García-Jiménez B., Marín Garrido C., Borda Casas E., Velasco-Alvarez J., Serra N.S., **Acedo A.** 2023. Lettuce Soil Microbiome Modulated by an L- $\alpha$ -Amino Acid-Based Biostimulant. *Agriculture* 13, 344. <https://doi.org/10.3390/agriculture13020344>
- **Fraç M.**, Hannula E.S., Bełka M., Salles J.F., Jedryczka M. 2022. Soil mycobiome in sustainable agriculture. *Front. Microbiol.* 13:1033824. 10.3389/fmicb.2022.1033824
- Gobbi A., **Acedo A.**, Imam N. *et al.* 2022. A global microbiome survey of vineyard soils highlights the microbial dimension of viticultural *terroirs*. *Commun Biol* 5, 241. <https://doi.org/10.1038/s42003-022-03202-5>
- Maçik M., Gryta A., Sas-Paszt L., **Fraç M.** 2023. New insight into the soil bacterial and fungal microbiome after phosphorus biofertilizer application as an important driver of regenerative agriculture including biodiversity loss reversal and soil health restoration. *Applied Soil Ecology* 189, 104941. <https://doi.org/10.1016/j.apsoil.2023.104941>
- Mondello V., Lemaître-Guillier C., Trotel-Aziz P., Gougeon R., **Acedo A.**, 2022. Schmitt-Kopplin, P.; Adrian, M.; Pinto, C.; Fernandez, O.; Fontaine, F. Assessment of a New Copper-Based Formulation to Control Esca Disease in Field and Study of Its Impact on the Vine Microbiome, Vine Physiology and Enological Parameters of the Juice. *J. Fungi* 8, 151. <https://doi.org/10.3390/jof8020151>
- Siegieda D., Panek J., **Fraç M.** 2023. Plant and soil health in organic strawberry farms – Greater importance of fungal trophic modes and networks than  $\alpha$ -diversity of the mycobiome. *Applied Soil Ecology* 188 (2023) 104925. <https://doi.org/10.1016/j.apsoil.2023.104925>

### **Commission 2.4 – Soil Mineralogy**

Chair: Sofia N. Lessovaia, Russia

Vice Chair: Edson Campanhola Bortoluzzi, Brazil

*The Commission aims at*

Many functions of soils are related either directly or indirectly to soil mineralogy. The commission on Soil Mineralogy seeks to encourage and support the study, through both research and teaching, of all aspects of the minerals found in soils, and their relationships to and interactions with other soil components, such as organic compounds. Soil minerals may be inherited from parent materials, and they may be transformed and neofomed by processes like weathering. Knowledge of minerals in the soil environment may inform studies of the genesis and classification of soils as well as their management, behaviour, conservation, and fertility. Studies of soil mineralogy benefit

from many advanced instrumental methods applied across nano- to landscape scales. The vision of the commission is to promote modern approaches to soil mineralogy, such as data driven approaches, and especially those approaches that seek to advance understanding of the roles of soil minerals in relation to sustaining and enhancing the functions soils.

**Events** (in chronological order starting with the oldest)

- During the General Assembly of the European Geoscience Union 2022 (Vienna, Austria & Online | 23–27 May; [www.egu22.eu/](http://www.egu22.eu/)), xx sessions have been convened and chaired:

**Recent activities**

- Edson Bortoluzzi (speaker), Live titled “How would agriculture be without industrial fertilizers?”. 7 April, 2022. Brazilian Society of Soil Science. <https://youtu.be/tCWK4cUUpCw>
- Edson Bortoluzzi (speaker), Conference titled “Alternative source of nutrients” made to the 1<sup>o</sup> Symposium on Agriculture Production at the Federal University of Santa Maria. 7-8 July, 2023. <https://app.ciente.studio/simpa2023>
- Sofia Lessovaia (speaker) During the XVII IC Conference (Turkey, Istanbul, 25–29 July 2022, <https://icc2022.aipea.org/>) participating in Session “The role of clays in critical zone architecture and function” - title of the presentation “Silicate rock weathering and transformation to clayey soil material in cold regions”.
- Edson Bortoluzzi (speaker), Conference titled “Characteristics and potentiality for using rock-powder in agriculture” XII Brazilian Congress of Rice (CBAI) 26-29 July, 2022.

**Planned future activities**

- Organization of the XXIII Latin American Congress of Soil Science (CLACS) and XXXVIII Brazilian Congress of Soil Science (CBCS): “Solos Floripa 2023”. 30 July - 4 August, 2023. <https://sbcs.iweventos.com.br/solos2023>
- In CLACS/CBCS 2023, Session Nanotechnology applied to soil science and agriculture will be chaired by E. Bortoluzzi (Nanotechnology and Soil Mineralogy: emphasis in soil genesis, Sofia Lessovaia speaker) & (Nanotecnología en las Ciencias del Suelo: Principios y Aplicaciones, Fabian Fernandez-Luqueño speaker).
- In CLACS/CBCS 2023, Session Minerals: from nutrient source to soil interaction composed from two conferences will be chaired by Jessé Fink (Environmental Mineralogy, E. Bortoluzzi speaker) & (Relationship between soil mineralogy and anthropogenic process, Antônio Azevedo speaker).
- Contributing to the organization of the IUSS Centennial Celebration and Congress (May 19-21, 2024, Florence, Italy) (<https://centennialiu2024.org/>): Soil mineralogy: current state and perspectives (Sofia N. Lessovaia, Lead Convener; Edson Bortoluzzi, Co-Convener), submitted for “Soil sciences impact on basic knowledge”.
- Contributing to the scientific commission of the 4<sup>o</sup> International Congress of Hydrosedimentology, Porto Alegre-Brazil: 30 November - 1 December, 2023 (E. Bortoluzzi scientific commission member) (<https://www.congresso-hidrossedimentologia.com/>)

**Awards**

- Productivity Researcher from the CNPq (National Council for Scientific and Technological Development from Brazil – Pq 1D)

**Publications**

- **Bortoluzzi E.C.**, Garibotti A., Tiecher T., dos Santos D., Moterle D., Fiorin J. 2022. Revisiting Limestone Quality for Soil Liming Purpose. *Minerals* 12(12), 1522. <https://doi.org/10.3390/min12121522>
- Perdoncini D.M., Dalacorte L., Oliveira L.F.S., Ramos C.G., **Bortoluzzi E.C.**, 2022. Adsorption of Pollutants from Liquid Swine Manure Through the Application of Metabasalt Rock Powder. *Water Air Soil Pollut*, 233:191. <https://doi.org/10.1007/s11270-022-05663-0>

- Korchagin J., Escosteguy P., **Bortoluzzi E.C.** 2022. Nutrient transfer in rangelands under rock powder amendment. *Journal of Plant Nutrition and Soil Science* 185(5), 656–667. <https://doi.org/10.1002/jpln.202200059>
- Tiecher T., Ramon R., Andrade L.C., Camargo F.A.O., Evrard O., Minella J.P.G., Laceby J.P., **Bortoluzzi E.C.**, et al. 2022. Tributary contributions to sediment deposited in the Jacuí Delta, Southern Brazil. *Journal of Great Lakes research* <https://doi.org/10.1016/j.jglr.2022.02.006>
- Desyatkin R.V., **Lessovaia S.N.**, Okoneshnikova M.V., Ivanova A.Z., Platonova N.V. 2023. Permafrost-affected soils of the Alazeya River basin: properties, mineralogy, and classification. *Eurasian Soil Science* 56(2), 111–121. <https://doi.org/10.1134/S1064229322601767>
- Tonello M.S., Moterle D.F., Tiecher T., Merten G.H., Petry C., **Bortoluzzi E.C.** 2023. Copper transfer from vineyard watershed: mineralogy and copper forms. *Journal of Sedimentary Environments*. <https://doi.org/10.1007/s43217-023-00134-w>

## Working Group - Hydropedology

Chair: **Johan van Tol**, South Africa

Vice Chair: Xiaoyan Li, China

**Events** (in chronological order starting with the oldest)

- During the 22<sup>nd</sup> World Congress of Soil Science (Glasgow, Scotland | 23–27 May) there was a session on hydropedology which convened and chaired jointly by Hans-Jörg Vogel and Johan van Tol.
  - The 4<sup>th</sup> Hydropedological conference were held together with the Kirkham conference (Skukuza, South Africa | 28 August – 2 September). Two hydropedological sessions were convened. The keynote speaker was Emeritus Professor Johan Bouma with the title: *Hydropedology as an Important Tool to Characterize Ecosystem Services in line with the Land-Related UN-Sustainable Development Goals (SDG)*

## Recent activities

- Finalising Guidelines for integrating Hydropedology in Wetland delegation guidelines and policy for South Africa.

## Awards

- Prof Dr. Hans-Jörg Vogel, former chairperson of the IUSS Hydropedology Working Group received the “Don and Betty Kirkham Soil Physics Award” at the Kirkham Conference in Skukuza, South Africa.

## Publications

- Li X., Ma Y., Zuo F., 2023. Introduction to hydropedology (in Chinese). Science Press of China.
- Smit I.E., van Zijl G.M., Riddell E.S., **van Tol J.J.**, 2023. Downscaling legacy soil information for hydrological soil mapping using multinomial logistic regression. *Geoderma*, <https://doi.org/10.1016/j.geoderma.2023.116568>
- **Van Tol J.J.**, van Zijl G.M., 2022. South Africa needs a hydrological soil map: a case study from the upper uMgeni catchments. *Water SA*, 48(4) 335 – 347. <https://doi.org/10.17159/wsa/2022.v48.i4.3977>.
- Harrison R.L., **van Tol J.J.**, Amiotte-Suchet P., 2022. Hydropedological characteristics of the Cathedral Peak Research Catchments. *Hydrology*, 9, 189. <https://doi.org/10.3390/hydrology9110189>.
- Julich S., Moorcroft M.A., Feiger K.H., **van Tol J.J.**, 2022. The impact of overgrazing on water fluxes in a semi-arid watershed – The suitability of watershed scale modeling in a data scarce area. *Journal of Hydrology: Regional Studies*. <https://doi.org/10.1016/j.ejrh.2022.101178>
- Bouma J., Bonfante A., Basile A., **van Tol J.**, Hack-ten Broeke M.J.D., Mulder M., Heinen M., Rossiter D.G., Poggio L., Hirmas D.R., 2022. How can pedology and soil classification contribute towards sustainable development as a data source and information carrier? *Geoderma*. <https://doi.org/10.1016/j.geoderma.2022.115988>.

- Smit I.E., van Tol J.J., 2022. Impacts of Soil Information on Process-Based Hydrological Modelling in the Upper Goukou Catchment, South Africa. *Water* 2022, 14, 407. <https://doi.org/10.3390/w14030407>
- Harrison R.L., van Tol J.J. & Toucher, M., 2022. Using hydrogeological characteristics to improve modelling accuracy in Afromontane catchments. *Journal of Hydrology: Regional Studies*. <https://doi.org/10.1016/j.ejrh.2021.100986>

### **Working Group – International Soil Modeling Consortium**

Chairs: **Martine van der Ploeg and Yijian Zeng**, the Netherlands

Vice Chair: **Lutz Weihermüller, Germany**

**Events** (in chronological order starting with the oldest)

- During the General Assembly of the European Geoscience Union 2022 (Vienna, Austria | 23–27 May; [www.egu22.eu/](http://www.egu22.eu/)), two sessions have been convened and chaired:
  - Vadose zone hydrology: advances and future perspectives in soil hydrologic processes
  - EGU Splinter meeting with intensive discussion about ISMC future activities
- Support the organization of 1<sup>st</sup> “International Summer school Advanced Soil Physics Modeling Water Fluxes in the Soil-Plant System” (2022)

### **Recent activities**

- Establishment of a new ISMC working groups “Mathematics of Soil Processes”, “Machine Learning for Soil Modeling” and “Dissemination and Teaching”
- Regular (monthly) ISMC Newsletter
- Discussion on a “Soil Digital Twin” started

### **Planned future activities**

- Joint organization of 1<sup>st</sup> International Summer school “Working with Dynamic Soil-Crop Models – an Intensive Course ” together with the Kassel University
- AGU Fall 2023 session Challenges and Opportunities in Representing Soil Processes in Earth System Models
- Organization of the 4<sup>th</sup> ISMC conference at Tianjin University, China, 6-11 May 2024.

### **Awards**

We are seeking for application for the ISMC awards 2023

- ✚ Rien van Genuchten Awards (Deadline October 2023)
- ✚ ISMC Early Career Awards (Deadline October 2023)
- ✚ ISMC Publication Awards (Deadline January 2024)

[https://soil-modeling.org/activities/copy\\_of\\_ismc-conference/rien-van-genuchten-award](https://soil-modeling.org/activities/copy_of_ismc-conference/rien-van-genuchten-award)

### **ISMC joint publications**

- Schnepf A., Black C.K., Couvreur V., Delory B.M., Doussan C., Heymans A., Javaux M., Khare D., Koch A., Koch T., Kuppe C.W., Landl M., Leitner D., Lobet G., Meunier F., Postma J.A., Schäfer E.D., Selzner T., Vanderborght J., Vereecken H., 2023. Collaborative benchmarking of functional-structural root architecture models: Quantitative comparison of simulated root water uptake. *in silico* Plants. doi: 10.1093/insilicoplants/diad005.
- Guillaume B., Aroui Boukbida H., Bakker G., Bieganski A., Brostaux Y., Cornelis W., Durner W., Hartmann C., V. Iversen B., Javaux M., Ingwersen J., Lamorski K., Lamparter A., Makó A., Mingot Soriano A.M., Messing I., Nemes A., Pomes-Bordedebat A., van der Ploeg M., David T.W.K., Weihermüller L., Wellens J., Degré A., 2023. Reproducibility of the wet part of the soil water retention curve: a European interlaboratory comparison. *Soil* 9(1), 365-379.

More 5 joint publications are in preparation or submitted.

## Report Division 4

### Division 4 – The Role of Soils in Sustaining Society and the Environment

*Division 4 takes the responsibility for making the connections, transfer and outreach of our soil knowledge to society where soil and soil science needs to be understood and appreciated. It takes the information generated in the other three Divisions and the developing new scientific information, addressing the public literacy in soil science, its education, international conventions, consequences of human activities on soil ecosystem services, policy issues, food security, and history of the discipline. As the capstone Division it integrates the science, scientists, policy makers, and the wider community to become more aware of soil as an essential natural resource.*

#### Structure and officers:

Chair: Claudio Zaccone, Italy

1st Vice Chairperson: Yongguan Zhu, China

2nd Vice Chairperson: Xin Song, China

*Vice Chairs are responsible mostly for the organization of the Centennial Celebration and Congress of the IUSS. The Chair is responsible for communication with the commissions, working groups and vice chairs.*

*IUSS Division 4. Commissions and Working Groups:*

- *Commission 4.1 – Soils and the Environment*
- *Commission 4.2 – Soils, Food Security, and Human Health*
- *Commission 4.3 – Soils and Land Use Change*
- *Commission 4.4 – Soil Education and Public Awareness*
- *Commission 4.5 – History, Philosophy, and Sociology of Soil Science*
- *Working Group - Cultural Patterns of Understanding*
- *Working Group - Young and Early Career Scientists*

#### Division Chair Report

Chair: Claudio Zaccone, Italy

All Division, Commission and Working Group Chairs and members actively contributed to the planning of the 22<sup>nd</sup> World Congress of Soil Science (31 July - 5 August, 2022, Glasgow, Scotland) (<https://22wcss.org/>) and are currently contributing to the organization of the Centennial Celebration and Congress of the IUSS (May 19-21, 2024, Florence, Italy) (<https://centennialiuuss2024.org/>). This is resulting in the submission of several scientific sessions and workshops (deadline: June 30<sup>th</sup>). Division IV members also contributed to the co-organization (EGU-IUSS) of sessions at the European Geosciences Union general Assembly 2023 (April 23-28, 2023, Vienna, Austria) (<https://www.egu23.eu/>).

#### Events

- Co-convenor and Chairperson of Interdivisional Session 8 “Sustainable land use”, 22nd World Congress of Soil Science, 31 July - 5 August, 2022, Glasgow, Scotland (<https://22wcss.org/>)
- During the General Assembly of the European Geoscience Union 2022 (Vienna, Austria & Online | 23–27 May; [www.egu22.eu/](http://www.egu22.eu/)), 3 sessions and 1 Symposium have been convened and chaired:
  - SSS5.2/BG3 “Dynamics and functions of SOM pools under new and traditional soil amendments” | Conveners: Claudio Zaccone, Stephen M. Bell, Sarah Duddigan, César Plaza

- SSS5.3/BG3/CL2 “Mechanisms of soil organic matter transformation, stabilization and storage” | Conveners: César Plaza, Beatrice Giannetta, Cristina Santin, Daniel Evans, José María De la Rosa, Carsten W. Mueller, Claudio Zaccone
- BG3.15 “Peatlands under pressure” | Conveners: Annalea Lohila, Jorge Hoyos-Santillan, Claudio Zaccone, Angela Gallego-Sala, Julien Arsenault, Gareth Clay, Maxim Dorodnikov, Frans-Jan W. Parmentier
- Union Symposium US2 “The role of the geosciences in preserving and restoring biodiversity” | Conveners: Chloe Hill, Claudio Zaccone, Maria-Helena Ramos, Noel Baker
- Two sessions co-sponsored by the IUSS have been submitted for the General Assembly of the European Geoscience Union 2023 (Vienna, Austria & Online | 24–28 April; [www.egu23.eu/](http://www.egu23.eu/)):
- SSS5.2 “Dynamics and functions of SOM pools under new and traditional soil amendments, with a special focus on pyrolytic carbon” | Conveners: César Plaza, Diego Marazza, Anna Gunina, Christhel Andrade Diaz, Claudio Zaccone
- SSS5.3/ BG3/CL3 “Mechanisms of soil organic matter transformation, stabilization and storage” | Conveners: Claudio Zaccone, Guido Wiesenberg, Boris Jansen, Karen Vancampenhout, Layla Márquez San Emeterio, Beatrice Giannetta, César Plaza

#### Recent activities

- Member of the Organising and Scientific Committees of the Centennial Celebration and Congress of the IUSS (May 19-21, 2024, Florence, Italy) (<https://centennialiuiss2024.org/>).

#### Publications

- Andreolli, M., Scerbacov, V., Frison, N., Zaccone, C., Lampis, S. (2022). Thauera sp. Sel9, a new bacterial strain for polyhydroxyalkanoates production from volatile fatty acids. *New Biotechnology*, 72, 71-79.
- Cavalli, E., Nardon, C., Willis, O.G., Zinna, F., Di Bari, L., Mizzoni, S., Ruggieri, S., Gaglio, S.C., Perduca, M., Zaccone, C., Romeo, A., Piccinelli, F. (2022). Near Infrared Circularly Polarized Luminescence from water stable organic nanoparticles containing a chiral Yb(III) complex. *Chemistry – A European Journal*, 28, e202200574.
- Giannetta, B., Plaza, C., Thompson, A., Plante, A.F., Zaccone, C. (2022). Iron speciation in soil size fractions under different land uses. *Geoderma*, 418, 115842.
- Giannetta, B., Cassetta, M., Oliveira de Souza, D., Mariotto, G., Aquilanti, G., Zaccone, C. (2022). Coupling X-ray absorption and Raman spectroscopies to characterize iron species in a karst pedosedimentary record. *Soil Systems*, 6, 24.
- Puglisi, E., Squartini, A., Terribile, F., Zaccone, C. (2022). Pedosedimentary and microbial investigation of a karst sequence record. *Science of the Total Environment*, 810, 151297.

#### Planned future activities

- To increase outreach and build on the experience of the Global Soil Security and other IUSS facebook sites we are planning to launch a Facebook site “Soil Connects” for Division 4. This will be moderated by Prof. Damien J Field. This Facebook site will replace the Division 4 newsletter Soil Connects that was launched and edited by Damien Field in 2014. This move towards online platform for Soil Connects responds to the increase in online sharing of information and extends to a community that is outside of the IUSS web presence.
- Contribute to the organization and to the definition of the session programme of the Centennial Celebration and Congress of the IUSS (May 19-21, 2024, Florence, Italy) (<https://centennialiuiss2024.org/>).

#### Link to Website:

**Facebook: *Global Soil Security*** – This site has over 8,200 members and shares posts focused on securing the world’s resources to support biodiversity and global health along with the need for ensuring food, water and energy security. We ask questions such as “what can our soils do?”, “can the soil continue to do this?”, “who cares and why?”, and “how is soil valued?”, and if not, “how is it regulated?”. Since 2018 this has grown substantially with global membership and averages at least 20 posts a week.

#### Commission 4.1 – Soils and the Environment

Chair: Miriam Muñoz Rojas, Spain

Vice Chair: Nobuhide Fujitake, Japan

*This Commission looks at the soil as part of the ecosystem. Human activities have a strong impact on the ecosystems and the soil and environment interactions in relation to humans are particularly important. Soils – a major component of the biosphere at the interface between the lithosphere, atmosphere, and biosphere – are investigated through several international programs such as IGBP; in the same way the soil plays a considerable role in the carbon sequestration (UN Convention on Climate Change) and is the habitat for a number of species covered by the Biodiversity Convention.*

#### **Awards**

- Talent Attraction Grant- High potential researchers. Awarded to Miriam Muñoz Rojas, University of Seville, Spain.

#### **Events** (in chronological order starting with the oldest)

- During the General Assembly of the European Geoscience Union 2022 (Vienna, Austria & Online | 23–27 May; [www.egu22.eu/](http://www.egu22.eu/)), 2 sessions have been convened and chaired:
  - SSS7.6 “Restoration, rehabilitation and management of degraded soils and ecosystems” | Conveners: Miriam Muñoz-Rojas, Thomas Baumgartl, Manuel Esteban Lucas-Borja, Nathali Machado de Lima, Paloma Hueso González, Claudia Meisina, Mihai Niculita, Jantienne Baartman
  - SSS8.5 “Soil functions and ecosystem services in a changing environment” | Conveners: Paulo Pereira, Miriam Muñoz-Rojas, Wenwu Zhao, Yang Yu, Paloma Hueso González
- Two sessions have been submitted for the General Assembly of the European Geoscience Union 2023 (Vienna, Austria & Online | 24–28 April; [www.egu23.eu/](http://www.egu23.eu/)):
  - SSS7.1 “Restoration, rehabilitation and management of degraded soils and ecosystems” | Conveners: Miriam Muñoz-Rojas, Carlos Sánchez-García, Marcos Francos, Demetrio Antonio Zema, Thomas Baumgartl, Layla Márquez San Emeterio, Manuel Esteban Lucas-Borja
  - SSS8.2 “Soil functions and ecosystem services in a changing environment” | Conveners: Paulo Pereira, Miriam Muñoz-Rojas, Wenwu Zhao, Yang Yu, Paloma Hueso González

#### **Recent activities**

- During the Training School ‘Forest ecosystem response to post-fire management strategies and restoration tools in wildfire affected forest- sponsored by the EGU - Division on Soil System Sciences (SSS) at ETSIAM (UCLM, Albacete, Spain) a seminar was presented by Miriam Muñoz-Rojas on ‘Soil microbial-based strategies in post-fire restoration’.

#### **Planned future activities**

- A session will be convened at the Ecological Association of Terrestrial Ecology Spanish Conference (AEET) 2023 on ‘Ecosystem Restoration’ (Miriam Muñoz Rojas as a committee member and session keynote speaker for the AEET ST.11.- La restauración de ecosistemas: lecciones aprendidas y criterios para el futuro)

#### **Publications**

- Dadzie, F.A., Moles, A.T., Erickson, T.E., Slavich, E., & Muñoz-Rojas, M. (2022). Native bacteria and cyanobacteria can influence seedling emergence and growth of native plants used in dryland restoration. *Journal of Applied Ecology*, 59(12), 2983-2992.
- Luster, J., Crockford, L., Keller, T., Muñoz-Rojas, M., Wollschläger, U. (2022). Editorial: Eurosoil 2021: Sustainable management of soil functions as a basis to avoid, halt, and reverse land degradation. *Front. Environ. Sci.*, 10, 1093226.
- Ondik, M.M., Bennell, M., Davies, R.J.P., Ooi, M.K., Muñoz-Rojas, M. (2022). Fire and land use impact soil properties in a Mediterranean dry sclerophyll woodland. *Journal of Environmental Management*, 324, 116245.
- Lembrechts, J.J., van den Hoogen, J., Aalto, J., Ashcroft, M.B., De Frenne, P., Kemppinen, J., et al. (2022). Global maps of soil temperature. *Global Change Biology*, 28(9), 3110-3144.

- Schultz, N.L., Sluiter, I.R.K., Allen, G.G., Machado-de-Lima, N.M., Muñoz-Rojas, M. (2022). Biocrust Amendments to Topsoils Facilitate Biocrust Restoration in a Post-mining Arid Environment. *Front Microbiol.*, 26, 13:882673.
- Jiménez-González, M.A., de Lima, N.M., Chilton, A.M., Almendros, G., Muñoz-Rojas, M. (2022). Biocrust cyanobacteria inoculants biomineralize gypsum and preserve indigenous bacterial communities in dryland topsoil. *Geoderma*, 406, 115527.
- Lucas-Borja, M.E., Jing, X., Candel-Perez, D., et al. (2022). Afforestation with *Pinus nigra* Arn ssp *salzmannii* along an elevation gradient: controlling factors and implications for climate change adaptation. *Trees*, 36, 93–102.
- Santini, N.S., Chamizo, S., Lucas-Borja, M.E., Muñoz-Rojas, M. (2022). Editorial: Restoration of Degraded Terrestrial Ecosystems. *Front. Ecol. Evol.*, 10, 863845.
- Getzin, S., Löns, C., Yizhaq, H., et al. (2022). High-resolution images and drone-based LiDAR reveal striking patterns of vegetation gaps in a wooded spinifex grassland of Western Australia. *Landsc. Ecol.*, 37, 829–845.
- Santangelo, J.S., Ness, R.W., Cohan, B., Fitzpatrick, C.R., Innes, S.G., Koch, S., et al. (2022). Global urban environmental change drives adaptation in white clover. *Science*, 375(6586), 1275-1281.

#### **Commission 4.2 – Soils, Food Security, and Human Health**

Chair: Taru Sanden, Austria

Vice Chair: Takuro Shinano, Japan

*In most countries soils are essential for food production. Consideration that one third of the land area is presently used for agriculture, and the world population is increasing, creating additional pressures on agricultural land, providing enough safe and nutritious food will be an ongoing challenge. Amount the conservation of agricultural land, the role of the soils in a changing world in relationship to human health.*

#### **Recent activities**

- Takuro Shinano (Commission 4.2 Vice Chair) participated and chaired one of the sessions of EU-Japan dialogues on Sustainable Food Systems: from production to consumption. The session was about Dialogue on soil health. The workshop was held in Tokyo 5 October 2022.
- Takuro Shinano (Commission 4.2. Vice Chair) has been selected as incoming vice president of Japanese Society of Soil Science and Plant Nutrition (from May 2023 to May 2025).
- A session has been submitted for the General Assembly of the European Geoscience Union 2023 (Vienna, Austria & Online | 24–28 April; [www.egu23.eu/](http://www.egu23.eu/)):
  - ITS4.1/SSS0.2 “Participatory Citizen Science, Critical Zone Science and Open Science as a new era of environmental knowledge for society” | Conveners: Taru Sandén, Daniel Dörler, Florian Heigl, Dilek Fraisl, Jannis Groh, Sylvain Kuppel and Tamer Abu-Alam.

#### **Planned future activities**

- Taru Sandén (Commission 4.2 Chair) will lead the development of the SoilPlastic App from the MINAGRIS Horizon 2020 project which will be launched on 1<sup>st</sup> of April 2023. The SoilPlastic App will be available in 9 languages, for Android (<https://play.google.com/store/apps/details?id=com.spotteron.soilplastic&pli=1>), Apple (<https://apps.apple.com/cz/app/soilplastic/id1622415639>) and as a web-based browser (<https://www.spotteron.com/soilplastic/>). More info is available at <https://www.minagris.eu/index.php/resources/soilplastic-app>
- A session on “Soil health implications of adapting to the Planetary Health Diet” will be submitted to the IUSS Centennial Conference by end of June 2023.

#### **Publications**

- Shinano, T., Maruyama, H., Watanabe, T., Fujimoto, H., Suzuki, M. (2022). The role of potassium on the remediation for the radiocesium contaminated soil. *Eurasian Journal of Forest Research*, 22, 5-7.

- Hendricks, S., Zechmeister-Boltenstern, S., Kandeler, E., Sandén, T., Diaz-Pines, E., Schneckner, J., Alber, O., Miloczki, J., Spiegel, H. (2022). Agricultural management affects the active carbon and nitrogen mineralisation potential in soils. *Journal of Plant Nutrition and Soil Science*, 185, 513-528.
- Daebeler, A., Petrová, E., Kinz, E., Grausenburger, S., Berthold, H., Sandén, T., et al. (2022). Pairing litter decomposition with microbial community structures using the Tea Bag Index (TBI). *SOIL*, 8(1), 163-176.

### **Commission 4.3 – Soils and Land Use Change**

Chair: Gary Feng, USA

Vice Chair: Felipe Andrés Zúñiga Ugalde, Chile

*Soils play a large role as source and sinks of greenhouse gases. In a context of global sustainability. This Commission will investigate how the source/sink functions of the soils can be managed and controlled to mitigate the impact of climate change. Of interest to all are significant changes in land use, including the effect of urbanisation, forest conversion and productive land being allocated to other uses. Such changes fall under the auspices of this Commission.*

#### **Awards**

- Prof. Yong Sik Ok became a highly cited researcher (HCR) in 3 fields in 2022. Among the 3,981 researchers named as Highly Cited in the 21 ESI fields, 219, or 5.5%, appear in two ESI fields, and only 32, or 0.8%, appear in three or more fields. Among HCR researchers, Prof. Ok became the top 0.8% of researchers by being HCR in the following fields, Biology and Biochemistry, Environment and Ecology, and Engineering. Prof. Ok has made history by being the only HCR in these three ESI fields to date.
- Dr. Gary Feng (Commission 4.3 Chair) was named as the Fellow of Soil Science Society of America, 2022.

#### **Events** (in chronological order starting with the oldest)

- The 2022 Global ESG Forum was held from 29th - 31st of August at KCCI, Seoul, Korea. The forum was organized by International ESG Association, where Prof. Yong Sik Ok is a co-president. This was co-hosted together with the nature journal. The sessions were held under the themes of the natural environment (soil-water), climate change, biodiversity, carbon neutrality, energy, green hydrogen economy, and building energy/indoor environment (<https://globalesgforum.org/en/>).
- The 6th Asia Pacific Biochar Conference (APBC 2022) was held from October 24th to 26th, 2022, in Seoul Tourism Plaza, Seoul, Korea. The Korea Biochar Research Centre and Korea University co-hosted this conference, and Prof. Yong Sik Ok from Korea University co-chaired the APBC 2022 (<http://www.esgapbc.com/>).
- 2022 'XIV Chilean Conference in Soil Science. Soils for Supporting Social Welfare and Environmental Protection' was held on the 22nd and 25th of November 2022, in Valdivia (Chile). Felipe Zúñiga (Commission 4.3 Vice Chair) was member of the organising committee (<https://congresoschcs.cl/>).
- 2022 'Soils and it's functions' was held on 13th of December 2022 in Máfil, Valdivia (Chile). Event developed in the context of World Soil Day celebration. Felipe Zúñiga (Commission 4.3 Vice Chair) was invited as speaker.
- 2022 Annual Academic Meeting of the Saline-Alkali Soil Professional Committee of the Soil Society of China and the "Comprehensive Utilization of Saline-Alkali Land" academic seminar were held virtually from 25th to 26th November, 2022. The content included the comprehensive utilization of saline-alkali land and global change, the formation and regulation of saline-alkali land barriers, the utilization of multiple water sources in saline-alkali land and water-saving improvement, etc.
- 2022 World Soil Day Event - "Soil Health and Food Safety" expert lecture was held online by the organization of Soil Science Society of China (5th of December 2022). The meeting mainly shared the connotation, challenges and cultivation of healthy soil, the close relationship between soil and human health, and the importance of understanding soil health from the perspective of plant nutrition.

### Recent activities

- Felipe Zúñiga (Commission 4.3 Vice Chair) participated in one of the most complete soil samplings in Western Patagonia (Aysén Region). The field campaign covered 266 points with contrasting soil types and land uses across all climatic conditions in the region. The activity was developed in the framework of FONDEF ID22I10014 project.

### Planned future activities

- Prepare the proposal for the IUSS Centennial which will be conducted in a session format.
- Organize the 3rd Meeting of Young Researchers in Soil Sciences (EJICS in Spanish). This activity will be held in Coyhaique, Chilean Patagonia in April 2024.

### Publications

- Vera Peters, V., Zúñiga, F., Valle, S.R., Dec, D., Clunes, J., Dörner, J. (2022). Shrinkage Behavior of Aquands Along a Longitudinal Climatic Gradient in Southern Chile. *Journal of Soil Science and Plant Nutrition*, 52, 50–57.
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- Bank, M.S., Mitrano, D.M., Rillig, M.C., Sze Ki Lin, C., Ok, Y.S. (2022). Embrace complexity to understand microplastic pollution. *Nature Reviews Earth & Environment*, 3(11), 736-737.
- Palansooriya, K.N., Li, J., Dissanayake, P.D., Suvarna, M., Li, L., Yuan, X., Sarkar, B., Tsang, D.C., Rin-  
klebe, J., Wang, X., Ok, Y.S. (2022). Prediction of Soil Heavy Metal Immobilization by Biochar Using Ma-  
chine Learning. *Environmental Science & Technology* 56(7), 4187–4198.
- Yuan, X., Wang, J., Deng, S., Suvarna, M., Wang, X., Zhang, W., Hamilton, S.T., Alahmed, A., Jamal, A.,  
Park, A.H.A., Bi, X. (2022). Recent advancements in sustainable upcycling of solid waste into porous car-  
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- He, M., Xu, Z., Hou, D., Gao, B., Cao, X., Ok, Y.S., et al. (2022). Waste-derived biochar for water pollu-  
tion control and sustainable development. *Nature Reviews Earth & Environment*, 3(7), 444-460.
- Xiang, L., Harindintwali, J.D., Wang, F., Redmile-Gordon, M., Chang, S.X., Fu, Y., Ok, Y.S., Xing, B.  
(2022). Integrating biochar, bacteria, and plants for sustainable remediation of soils contaminated with  
organic pollutants. *Environmental Science & Technology*, 56(23), 16546-16566.



Susana Valle and Felipe Zúñiga measurement volumetric water content and penetration resistance in a wet pasture in Western Patagonia. The Mountains in the back are part of the Patagonia National Park, sector Jeinimeni (© Rodrigo Vergara, Universidad Austral de Chile).

Prof. Yong Sik Ok giving the welcoming address at the 6<sup>th</sup> Asia Pacific Biochar conference in Seoul, Korea, in October 2022 (© Top Planners).



Prof. Yong Sik Ok welcomes the gathering at the 2022 Global ESG Forum in Seoul, Korea, in August 2022 (© Top Planners).

#### Commission 4.4 – Soil Education and Public Awareness

Chair: Martha M. Bolanos-Benavides, Colombia

Vice Chair: Juan C. Rey, Venezuela

*This commission deals with teaching methods and the development of soil scientists – but also how soil-related knowledge is presented to other interested parties, as well as the information provided to the public and related general public awareness. A well-informed public is needed so that the importance of soils is understood by all.*

##### Awards

- The work entitled "Participatory experiences with plantain producers under peasant and family agriculture in Colombia", developed by the Colombian Agricultural Research Corporation - AGROSAVIA, a product of projects led by Martha M. Bolaños B. (Commission 4.4 Chair), was awarded by the Food and Agriculture Organization of the United Nations (FAO) during the "Latin American and Caribbean Meeting of the United Nations Decade for Family Farming" on December 6 and 7, 2022.

##### Events (in chronological order starting with the oldest)

- XX Colombian Congress of Soil Science. The "XX Colombian Congress of Soil Science", organized by the Colombian Society of Soil Science - SCCS, was held in the city of Neiva (Colombia) from October 19 to 22, 2022. This event focused on sustainable soil management and its functionality in ecosystem services and food security and addressed the processes of sustainable soil management that include the integrity of aspects related to the identification, recognition, and balanced use of this natural resource with its potentialities and limitations for the permanent supply of ecosystem services, as its proper intervention for the use with a view to providing the food demands of populations. The event was attended by 300 people, including members, researchers, academics and various professionals in the agricultural sciences and related fields, who learned about 156 scientific advances framed in keynote lectures, special lectures, papers and posters presented in each of the thematic commissions established at the event.
- Celebration of World Soil Day 2022. As part of the celebration of World Soil Day, the event "Soils: origin of food, playfulness at the service of education" was held at the Faculty of Agricultural Sciences of the National University of Colombia, Bogota. The event was attended by representatives of the Ministry of Environment and Sustainable Development, the Colombian Agricultural Research Corporation - AGROSAVIA, the Colombian Society of Soil Science - SCCS, the Agustin Codazzi Geographic Institute - IGAC, the Rural Agricultural Planning Unit - UPRA, the Botanical Garden of Bogota José Celestino Mutis - JBB, the University of La Guajira and the National University of Colombia - UNAL. The objective of the event was to

raise awareness about the importance of soils for food production, nutrition and optimal diets, while claiming for sustainable management to ensure soil health. Emphasis was placed on the need to contribute to the proper management of soil resources, a non-renewable resource on the scale of human life, since this will determine whether we will have safe food in the future, a responsibility of all citizens. He also stressed the importance of contributing to the country's food and nutritional security, bearing in mind that nearly 80% of the food produced in the country is consumed in the country, and of this, 80% is produced by family farmers and peasants (small producers).

#### **Recent activities**

- Mexico: 46th National Congress of Soil Science, October 3-7, 2022, in the city of Saltillo, Coahuila de Zaragoza, Mexico. Organizers: The Mexican Society of Soil Science, A.C. (SMCS).
- Inter-American Congress on Water, Soil and Agrobiodiversity, November 23-25, 2022, in the city of Obregón, Sonora, Mexico. Organizers: IICA, Government of Mexico, INIFAP.
- Argentina: XXVIII Argentine Congress of Soil Science Buenos Aires 2022 (CACS): Healthy soils, sustenance of society and the environment, from 15 to 17 November 2022, in the Autonomous City of Buenos Aires, Argentina. Organizers: Argentine Association of Soil Science, Faculty of Agronomy of the University of Buenos Aires, INTA.
- Brazil: XIV Soil Science Meeting of Southern Brazil: Soil and water management and conservation in family agriculture, November 16-18, 2022, in the city of Florianópolis, Brazil. Organizers: Southern Regional Center of the Brazilian Society of Soil Science (SBCS).
- Chile: XIV National Congress of Soil Science, November 22-25, 2022, in the city of Valdivia, Chile. Organizers: Universidad Austral de Chile, Universidad de la Frontera, The Chilean Society of Soil Science.
- Costa Rica: "Hands to the soil: Soils, origin of food". Event, on December 06, 2022, in the city of San José.

#### **Planned future activities**

- To prepare a bibliographic material to train teachers about soils, with the objective that they can educate children between 8 and 17 years of age. The material will have standard information for all Countries and, in alliance with soil science societies, will be complemented with local information.

#### **Publications**

- Rombolá, A.D. (2022). Development, management and dissemination of agroecological strategies and systems. *Acta Horticulturae*, 1355, 7-19.
- Liu, H., Alharthi, M., Atil, A., Zafar, M.W., Khan, I. (2022). A non-linear analysis of the impacts of natural resources and education on environmental quality: Green energy and its role in the future. *Resources Policy*, 79, 102940.
- Rawtani, D., Gupta, G., Khatri, N., Rao, P.K., Hussain, C.M. (2022). Environmental damages due to war in Ukraine: A perspective. *Science of the Total Environment*, 850, 157932.
- Charzyński, P., Urbańska, M., Franco Capra, G., et al. (2022). A global perspective on soil science education at third educational level; knowledge, practice, skills and challenges. *Geoderma*, 425, 116053.
- Majoro, F., Wali, U.G. (2022). Analyzing Various Factors Affecting Farmers' Willingness to Adopt Soil Erosion Control Measures in the Sebeya Catchment, Rwanda. *Sustainability*, 14 (19), 12895.
- Son, J., Kong, M., Nam, H. (2022). Design Model and Management Plan of a Rice–Fish Mixed Farming Paddy for Urban Agriculture and Ecological Education. *Land*, 11(8), 1218.
- Meunier, C., Casagrande, M., Rosiès, B., Bedoussac, L., Topp, C.F.E., Walker, R.L., Watson, C.A., Martin, G. (2022). Interplay: A game for the participatory design of locally adapted cereal–legume intercroppings. *Agricultural Systems*, 201, 103438.
- Lin, M., Begho, T. (2022). Crop residue burning in South Asia: A review of the scale, effect, and solutions with a focus on reducing reactive nitrogen losses. *Journal of Environmental Management*, 314, 115104.

- O'Connell, C., Osmond, D.L. (2022). Why soil testing is not enough: A mixed methods study of farmer nutrient management decision-making among U.S. producers. *Journal of Environmental Management*, 314, 115027.
- Guo, H., Zhao, W., Pan, C., Qiu, G., Xu, S., Liu, S. (2022). Study on the Influencing Factors of Farmers' Adoption of Conservation Tillage Technology in Black Soil Region in China: A Logistic-ISM Model Approach. *International Journal of Environmental Research and Public Health*, 19(13), 7762.
- Balks, M.R., Grealish, G., Almond, P.C. (2022). Priorities for soil science in Aotearoa New Zealand. *Geoderma Regional*, 29, e00515.
- Löbmann, M.T., Maring, L., Prokop, G., Brils, J., Bender, J., Bispo, A., Helming, K. (2022). Systems knowledge for sustainable soil and land management. *Science of the Total Environment*, 822, 153389.
- Chinasho, A., Bedadi, B., Lemma, T., Tana, T., Hordofa, T., Elias, B. (2022). Farmers' Perceptions about Irrigation Roles in Climate Change Adaptation and Determinants of the Choices to WUE-Improving Practices in Southern Ethiopia. *Air, Soil and Water Research*, 15.

#### **Commission 4.5 – History, Philosophy, and Sociology of Soil Science**

Chair: Alexandra Toland, Germany

Vice Chair: Anna Krzywoszynska, Finland

*This Commission deals with our past. It links the study of what has happened in history and how soils can be used to help explain the past changes. This Commission is not just a record of history but the use and understanding of soil information and its relationship to human development and history.*

##### **Recent activities**

- Gaia Glossary. Installation of reference works and composing sculpture as contribution to the co-curated exhibition.
- We are Compost / Composting the We, on occasion of the 22nd World Congress of Soil Science. Centre for Contemporary Art Glasgow, Scotland UK. <https://www.cca-glasgow.com/programme/we-are-compost-composting-the-we>.
- Can we Compost that? Dialogue Event with IUSS members and Glasgow-based growers and artists as part of the We are Compost / Composting the We, on occasion of the 22nd World Congress of Soil Science. Centre for Contemporary Art Glasgow, Scotland UK. <https://www.cca-glasgow.com/programme/we-are-compost-composting-the-we>.
- Public Lecture Series in occasion of the 22nd World Congress of Soil Sciences.
- Support for the organization of the Gender Equity Workshop in occasion of the 22nd World Congress of Soil Sciences.
- Duy Bui, Karmen Franinović, and Roman Kirschner (8 September 2022) Interfaces and Interactions. [https://cca-annex.net/live\\_event/soil-interfaces-and-interactions/](https://cca-annex.net/live_event/soil-interfaces-and-interactions/)
- Claire Ratinon (1 September 2022) Unearthed. [https://cca-annex.net/live\\_event/unearthed/](https://cca-annex.net/live_event/unearthed/)
- Reuben Jentink and Mathew Arthur (25 August 2022) Composting Settler Nationalisms. [https://cca-annex.net/live\\_event/composting-settler-nationalisms/](https://cca-annex.net/live_event/composting-settler-nationalisms/)
- Our Living Soil: a two-year art/science programme to inspire a deeper public understanding of the importance of soils. Our Living Soil at the World Congress of Soil Science, led by the British Society of Soil Science (BSSS) in August 2022. Individual events found here: <https://www.ourlivingsoil.art>.
- Soil Talks, guest lectures by Alexandra Toland and Anna Krzywoszynska, September 16, 2022, at Zone2Source, Amstelpark, Amsterdam, Netherlands.

##### **Planned future activities**

- Co-convended Session at the 2023 Nordic Environmental Humanities Conference in Oslo
- Open the Pit – Interdisciplinary Soil Judging event and public field intervention at the 2024 EGU
- Co-convended IUSS Centennial Sessions:
  - “Digging up Soil Science History”

- “Soil Arts Data Quilting”
- “Critical Soil Science”
- Exhibition on occasion of IUSS Centennial Sessions (planned collaboration with Max Planck Institute Kunsthistorisches Institut Florenz)
- An award for Critical Soil Studies and Public Engagement is currently being planned

#### **Publications**

- Toland, A., von Foreich, H., Körner, B. (2022) Signposting the Anthropocene – Air Care, Poleotolerance, and the Queering of Ecosystem Services. *Journal of Performance Research*, 26 (7), 127-135.

#### Working Group Cultural Patterns of Soil Understanding

Chair: Nikola Patzel, Austria

Vice Chair: Eric Brevik, USA

#### **Events** (in chronological order starting with the oldest)

- At the World Soil Conference in Glasgow in August 2022, more than a dozen of presentations were given, many of which presented research results from the WG project "Cultural Understanding of Soils": European (Nikola Patzel) and North American cultures as well as modern soil health concepts (Eric Brevik), different religiously or gender-biased influenced attitudes towards soil (Sabine Grunwald and others), or the cultural-psychological concept of “inner soil” (Nikola Patzel). There were contributions on issues of decolonisation of agriculture (Jim Scown), on cultural aspects of agroecology (Cristine Muggler) of scientific framing of soil at different universities globally (Eric Brevik and Dann Itkin), principles for soil education (Damien Field) or case studies for it (Ednalva Duarte) and regarding different farmers' attitudes towards soil (contributions by Anna Abramova, Emmeline Topp, Jean Haley).
- The working group co-sponsored at the Glasgow WCSS a workshop on Gender Equity in Soil Science: A View from Multiple Countries. Eric Brevik was an organizer along with Laura Bertha Reyes-Sanchez and Lorna Dawson.
- In September 2022, results from the WG were presented at the meeting of the German Soil Science Society.

#### **Recent activities**

- Work was done in Glasgow on a concept of how Division IV of the IUSS could be restructured according to the needs of the time (Damien Field, Anna Krzywoszynska, Alex Toland, Nikola Patzel and other actives). This includes the possibility of the WG Cultural Patterns of Soil Understanding being merged into a new Division IV Commission on Soil and Culture.

#### **Planned future activities**

- (-)

#### **Publications**

- The WG’s book on Cultural Understanding of Soils (about 550 pages, 26 chapters) is in final publication stages with Springer.

#### Working Group Young and Early Career Scientists

Chair: Bartłomiej Głina, Poland

Vice Chair: Axel Cerón González, Mexico

*The proposal to establish the Young and Early Career Scientists Working Group within the structure of the International Union of Soil Sciences was accepted by the IUSS Executive Committee on September 26th, 2022.*

#### **Awards**

- Axel Cerón González (Vice Chair of the Working Group Young and Early Career Scientists) was a co-winner of the King Bhumibol Medal awarded this year by the FAO and the Kingdom of Thailand on World Soil Day (December 5, 2022).

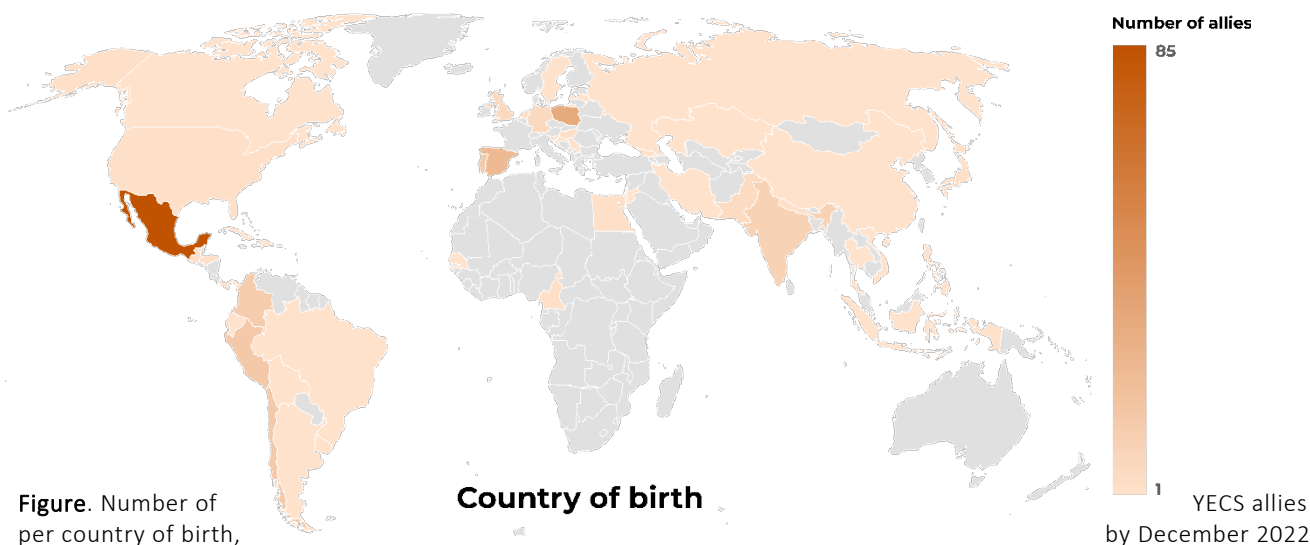
**Events** (in chronological order starting with the oldest)

- Members of the working group were engaged in several actions related to celebration of World Soil Day and promoting soil science (scientific conferences, meetings in primary schools and kindergartens). Moreover, members share the information about our working group during several events in the form of posters and oral presentations. Among others:
  - Jorge Ivelic Saez promoted the Working Group during the XIV Chilean Congress of Soil Science in Chile.
  - Daniela Bobadilla Ballesteros organized on December 5th the International Young Scientists Symposium in Mexico.
  - Axel Cerón González promoted the Working Group on December 5th during the World Soil Day 2022 Celebration in Thailand.

**Recent activities**

The official email ([iuss.youngss@gmail.com](mailto:iuss.youngss@gmail.com)) and Facebook fanpage (<https://www.facebook.com/yecs.iuss>) were created. The managers are Mariana Tovar and Axel Cerón from Mexico. So far, @yecs.iuss has 99 followers.

The registration form was developed and sent to worldwide scientific units to encourage new members to join the YECS working group. So far, we have 281 registered members from 46 countries. The sent registration forms allowed to create the database including the names, surnames, age, affiliation, nationality, and field of interest. The database is available upon the email request to the chair of the working group.



**Figure.** Number of per country of birth, (© ...xxx...).

The official logo of Young and Early Career Scientists Working Group was created by Marcin Sykuła from the Nicolaus Copernicus University in Toruń, Poland. The logo consists of full and abbreviated name versions.



**Figure.** Official logo of YECS (© Marcin Sykuła).

## Planned future activities

Co-convened organization of:

- a session at the 47<sup>th</sup> Mexican Congress of Soil Science in 2023:
  - “Round Table for Young and Early Career Scientist”
- sessions during the IUSS Centennial in Italy (in 2024):
  - “Mentor & Mentee Workshop – Challenges for Future Soil Science”
  - “Youth Digging – The Progress of Early Career Global Soil Research”
- 2024 International Conference of Young Scientists – Soil in the Environment in Warsaw (Poland)

YECS allies proposed to create other social media spaces as follows:

- @yec.s.iuss **Instagram** | Manager: Mariana Tovar Castañón (Mexico)
- YECS IUSS **Linkendln** | Manager: Jorge Ivelic Saez (Chile)
- @yec.s.iuss **Twitter** | Manager: Muhammad Danish Toor (Pakistan/Türkiye)

In the future, we would like to publish job opportunities, PhD/Master positions, scholarships, share infographics, videos, and promote national, regional, and international initiatives. These accounts will truly start at early 2023, after stablishing the working scheme.

The YECS working group members will continue working on social media (FB, Instagram, Twitter, LinkedIn), to make them more attractive and informative. We would like to prepare infographics/videos to encourage Youth in promoting soil science all over the World. Our main goal is to reach regions in the world where soil science is not that common.

We will share the information of planed national/international events and activity of YECS members in our social media. We strongly encourage members to monitor local/national activity and send to us information about scheduled conferences/meetings, as soon as possible. Moreover, we will promote the articles published by Youth soil scientists, as well as information about research projects.

The chair and vice-chair will organize online meetings (three per year) with members to share new ideas and discuss issues/difficulties arise during implementation of individual tasks. We plan to award the most active members by personal certificate, for their involvement in YECS working group development during the year.

We will promote the annual celebrations of World Soil Day from the youth spheres all around the globe. Furthermore, we will motivate YECS allies to perform discussion forums during soil events such as workshops and congresses.

In the year 2024 the 5th edition of the **International Conference of Young Scientists – Soil in the Environment** is planned to take place in Warsaw (Poland). The main organizers of this event are members of YECS working group. We want to establish this event as an excellent platform to show the research results of the projects leading by young scientists. Additionally, it will be an occasion for live meetings for YECS members and encourage new people to join our group.

## Other News from the IUSS

# International Decade of Soils (2015-2024)

## World Soil Day 2022... in a nutshell



The celebration of World Soil Day 2022 “Soils, where food begins” was

extraordinarily successful, followed by media throughout the week, reaching 3.8 billion people from all over the world.

### Just some figures...

- Over **2200 events** pinned on the official World Soil Day map;
- Over **700 news articles** featuring World Soil Day were read by nearly 4 billion people;
- The hashtag #WorldSoilDay trended on Twitter on 5 and 6 December **reaching 488 million users**;
- **400 FAO tweets** reached 145 million users;
- FAO’s World Soil Day (WSD) website, the UN observance website and FAO articles featuring soils on those days totalized over **200 000-page views**;
- Over **3000 people from 154 countries** attended the **official FAO ceremony** in person and virtually;
- **3 official contests** (*From the soil to plate contest, Poster drawing contest for kids, Book contest for children*) were launched with extremely high engagement rates, including an online public ballot that reached 25 695 votes in less than 48 hours.



More information at <https://www.fao.org/world-soil-day/en/>

## IUSS Centennial 2024



### Centennial Celebration and Congress of the IUSS 100 years of soil science - past achievements and future challenges

Invitation from the organizers: *Sara Marinari, Giuseppe Corti, Edoardo A.C. Costantini*

“The custodian of soil science will celebrate its centennial contribute to the nature and human wellbeing in 2024.

The event will also empower the linkages with different disciplines, policy makers, stakeholders, institutions, and associations to effectively address civil society needs within agriculture, forestry, environment, urban planning, energy, education, and other societal issues.

The celebration will occur on May 19<sup>th</sup> and will be followed by two intense days of congress, with plenary and parallel scientific sessions. Both soil scientists and specialists from other disciplines will participate to each session, focusing on past achievements and future challenges.

The congress will be followed by technical/scientific excursions that will range from short local to long trips, spanning from Alps to Sicily.

A pre-congress visit to Villa Lubin in Rome, the historical place where the IUSS was founded, is scheduled on May 18th.

We are looking forward to welcoming you to Italy”.

Sunday, 19 May 2024 to Tuesday, 21 May 2024

Florence, Italy

Website: <https://centennialius2024.org/>

Download: [media/iuss\\_2024\\_brochure.pdf](media/iuss_2024_brochure.pdf)

#### GENERAL THEMES

1. Soil health in achieving the Sustainable Development Goals
2. Soil governance
3. Soil in the circular economy
4. Soil sciences impact on basic knowledge
5. Soil in the digital era
6. Soil and humanity
7. Equity, diversity, and inclusivity in soil sciences
8. Other

The programme group chair and officers will build the session programme from the session proposals. The programme group chair may also suggest to merge proposed sessions that are similar <https://centennialius2024.org/submitted-sessions/#1685449512773-65c24928-1e65>

The call for session proposals at <https://centennialius2024.org/> was open until **30 June 2023**.

#### NEXT STEPS:

- **25 Sept 2023**      **Session Proposal: notification of acceptance/ rejection to conveners**
- **16 Oct 2023 – 15 Jan 2024**      **Call for abstracts**
- 26 Feb 2024      Abstract Submission: notification of acceptance/rejection to authors
- 11 Mar 2024      Letter of schedule
- 25 Mar 2024      Deadline for early registration
- 13 May 2024      Deadline for late registration – Online registration closing
- 19–21 May 2024      Centennial Celebration and Congress of the International Union of Soil Sciences

## IUSS Book

Based on the Vienna Declaration highlighting the closure of the FAO/IAEA/IUSS International Year of Soils 2015, the IUSS proclaimed the International Decade of Soils (2015-2024), with the aim to continue raising global awareness on soils, their functions and manifold interactions with human life and environment and to let soils enter the global Agendas, especially in view of the UN 2030 Agenda and its Sustainable Development Goals.

As one of the outreach activities during the International Decade of Soils the IUSS launched an open access book series not only addressed to soil scientists, but also to academic students of other sciences, with the intention to shed light on important soil issues related also to other disciplines and global challenges.

So far, seven books have been published under this series, providing insight into a wide range of scientifically, environmentally, economically and socially important soil-related issues. Readers are invited to deepen their understanding on a range of scientific aspects and perspectives in science related to soil biodiversity, ecosystem services and soil interactions with the different animated and non-animated environments that characterize the globe. The importance and necessity of soil sustainable management is addressed under different thematic aspects stretching from different ways of land use to soils in the urban environment.

As education and public awareness on soils is one of the declared priority areas of the International Decade of Soils, a specific publication addresses the educational sector by helping to assist schools and other extension institutions in integrating soil awareness in teaching programmes to people of all ages.

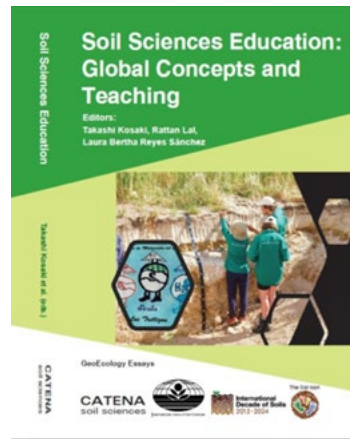
Last but not least, cultural aspects related to soils are reflected in one publication dedicated to soil-related proverbs, that, handed over from generation to generation in countries all over the globe, give an insight into the interactions between soils and humans and how soils teach people to perceive their surroundings and organize their lives around the year.

In 2022, celebrating the 98th anniversary of the IUSS, the first book of IUSS Book Series (*Sustainable soil management as a key to preserve soil biodiversity and stop its degradation*) was published as Open Access under a Creative Commons license.

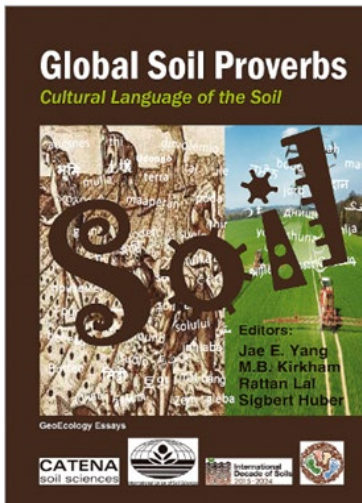
Further information on each book can be found below.



2022 - <https://www.iuss.org/international-decade-of-soils/iuss-book-series/>



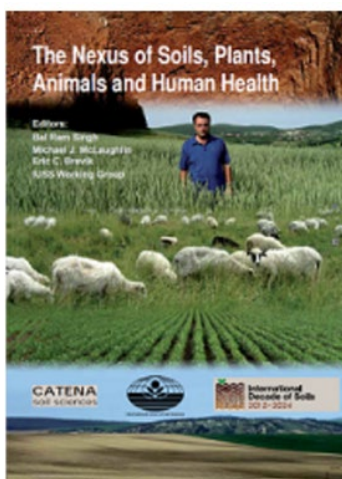
2020 - <https://www.iuss.org/publications/soil-publications/soil-sciences-education-global-concepts-and-teaching/>



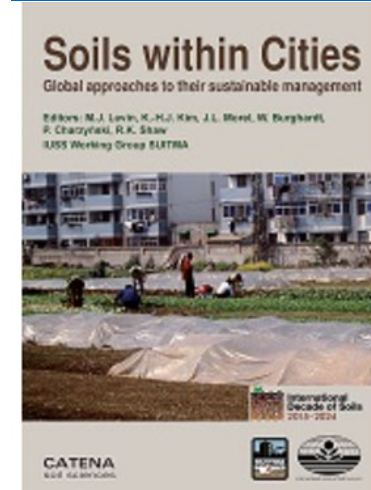
2018 - <https://www.iuss.org/publications/soil-publications/global-soil-proverbs-cultural-language-of-the-soil/>



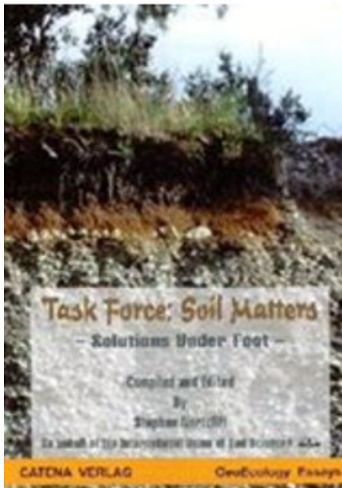
2018 - <https://www.iuss.org/publications/soil-publications/soil-and-sustainable-development-goals/>



2017 - <https://www.iuss.org/publications/soil-publications/the-nexus-of-soils-plants-animals-and-human-health/>



2017 - <https://www.iuss.org/publications/soil-publications/soils-within-cities/>



2015 - <https://www.iuss.org/publications/soil-publications/soils-within-cities/>

## IUSS GOES TO SCHOOL

### VIII Latin American symposium on educational innovations in the teaching of soil science

IUSS and the Latin American soil science society invite you to participate in the VIII Latin American symposium on educational innovations in the teaching of soil science to be held on August 1<sup>st</sup>, 2023, in Florianópolis, Brazil in the framework of “the IUSS goes to the school” educative project.

The event addresses children and young people aged 10-18 from all countries that are part of the Latin American Soil Science Society.

The Symposium is organized in the context of the SOILS FLORIPA 2023 event (30 July to 4 August 2023), promoted by the Soil Science Societies of Latin America (SLCS) and Brazil (SBCS), with the support of the IUSS.

The organizers hope to receive more than 3,000 participants of different nationalities for six days, making it the largest soil science event in Latin America and the Caribbean.

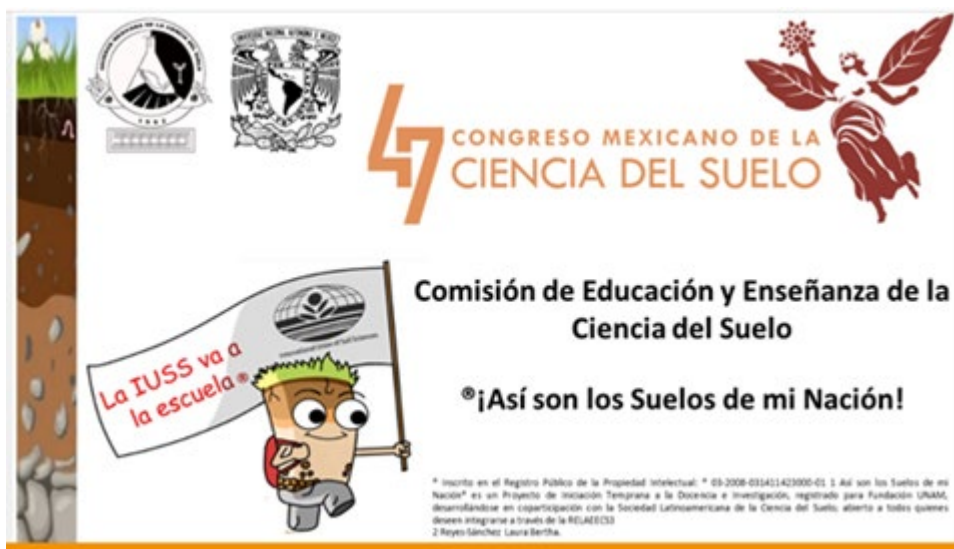
(<https://solosfloripa2023.com.br/site/solos2023/sobre-o-evento>)



### XVII Symposium on Educational Innovations in the Teaching of Soil Science

The National Autonomous University of Mexico and the Mexican Society of Soil Sciences organize the

XVII SYMPOSIUM ON EDUCATIONAL INNOVATIONS IN THE TEACHING OF SOIL SCIENCE, to be held on October 17, 2023, in the framework of the IUSS goes to School” project. The event will be hosted at the University city exhibition and congress center of the National Autonomous University of Mexico, Mexico City. The event is being organized under the 47 Mexican Congress on Soil Sciences.



For more information, please visit the Symposium website: <https://sitios.iztacala.unam.mx/47cnscs/>

### News from ESDAC Newsletter No 150 (February 2023)

#### Soil Health dashboard of the EU Soil Observatory

Life on earth depends on healthy soils. Yet the new Soil Health dashboard of the EU Soil Observatory (EUSO) estimates that 61.5% of EU soils are unhealthy, with strong implications for the supply of ecosystem services that keep us alive. With the EUSO Soil Health Dashboard, the JRC provides a spatial assessment of where unhealthy soils may be located in the EU – and which degradation processes affect them. The EUSO Soil Health Dashboard uses a convergence of evidence methodology, which spatially combines datasets to highlight the intensity and location of 15 soil degradation processes. The resulting map shows, for the first time, where current scientific evidence converges to indicate areas that are likely to be affected by soil degradation. The EUSO Dashboard also shows that the majority of unhealthy soils is in fact to be subject to more than one type of soil degradation, an important finding for the soil restoration agenda. The loss of soil organic carbon (48%), the loss of soil biodiversity (37.5%), and soil erosion by water (32%) are the most prevalent types of soil degradation. The EUSO Soil Health Dashboard will evolve as new scientific data become available (e.g., Horizon Europe’s Soil Mission projects) and with the implementation of EU and national soil policies, in particular the forthcoming EU Soil Health Law.

Read the report: <https://esdac.jrc.ec.europa.eu/esdacviewer/euso-dashboard>

### VACANCY NOTICE – 2023-IPR-D3-FGIV-022620 Project Officer - Quantifying and improving soil health in Africa - (AFSOH)

This 2-years project will address following research questions: (1) how healthy are agricultural soils in Africa? (2) which soil functions are at risk and what are the major threats? (3) which measures should be taken to improve soil health, taking into consideration the specific environmental and socio-economic context on the African

continent? We look for candidates with a PhD degree, modelling skills, a solid publications record, and experience in soil biodiversity, soil carbon and soil fertility. The contract agent position can be up to 6 years—**Deadline: 21.3.23**. More vacancies in JRC can be found here: <https://recruitment.jrc.ec.europa.eu/>. Visit also the 20 ESDAC announcements for soil-related posts: <https://esdac.jrc.ec.europa.eu/vacancies>

Further information: <https://esdac.jrc.ec.europa.eu/>

# Conference and Meeting Reports

Global Conference on Sandy Soils, 4-8 June 2023, University of Wisconsin-Madison, USA

Sandy soils are common throughout the world, and many are in arid and semiarid regions like the Saharan and Kalahari Desert, Gobi Desert, Middle East, Australia, Patagonia, and the northern parts of Central Europe. In the USA, Florida, Wisconsin, Nebraska, northern Michigan and Minnesota, and the deserts in the west have sandy soils. Most sandy soils have high water permeability, low water-holding capacity, low ability to retain and exchange nutrients, weakly developed soil structure and they may be prone to erosion by wind. As irrigation is required for obtaining crop yields there is an inherent risk of substantial leaching of nutrients and pesticides, and groundwater depletion.

In 2005, an International Symposium on Tropical Sandy Soils was held in Thailand. The symposium focused on the global extent of tropical sandy soils and their pedogenesis, socio-economic imperatives, physical and chemical properties, the role of organic matter and biological activity, and soil management. Due to global pressure on land resources, marginal soils such as sandy soils are taken into intensified agricultural production and managed for potential soil carbon sequestration. Sandy soils – as a group of soils with specific characteristics and ecological limitations – have received limited research attention.

As a follow up to the 2005 Symposium, we organized the Global Conference on Sandy Soils which was held in June 2023 in Madison, USA. The conference consisted of 2.5 days of presentations and discussions, and a 1-day field trip to the Wisconsin Central Sands Plain. There were 60 participants from 17 countries, including Dr Richard Heck, Chair of Division 1, and Dr Takashi Kosaki, past President of the International Union of Soil Sciences (IUSS). The conference focuses on the following six topics: Distribution and formation; Monitoring, mapping and sensors; Soil carbon; Nutrient management and soil health; Soil and water conservation, and Environmental issues.

Psammophiles of the fieldtrip of the Global Conference on Sandy Soils discussing a Udispammments and other sandy soils.

The proceedings of this conference will be published in a book entitled “Sandy Soils” which will be published by Springer Nature in 2023. The book will not be the ultimate review on what is known about sandy soils but it will present a global glimpse on what recent progress has been in the study of sandy soil and their properties and management.

Alfred E. Hartemink

Jingyi Huang

Department of Soil Science

University of Wisconsin—Madison USA

The International Joint Workshop of the IUSS Working Groups “Digital Soil Mapping” and “Global Soil Map” “Soil Mapping for a Sustainable future, 2023”

7<sup>th</sup> to 9<sup>th</sup> February 2023, Orléans, France



## Context

The STUDIUM Institute for Advanced Research Studies (Orléans, France) organized an international workshop on Digital Mapping of Soils from February 7 to 9, 2023, in Orléans. This conference, entitled “Soil mapping for a Sustainable Future” was co-organized by the INRAE Info&Sols Unit of Orléans, Centre Val de Loire, France.

It was the second international workshop bringing together the "Digital Soil Mapping" (DSM) and "GlobalSoilMap" (GSM) working groups of the Commission 1.5 Pedometrics of the International Union of Soil Sciences (IUSS), after a first conference organized in Santiago (Chile) in 2019. The main scientific coordinators of this conference were Dominique Arrouays, Anne Richer-de-Forges (INRAE) and Laura Poggio (ISRIC, The Netherlands), D. Arrouays and L. Poggio being respectively chairs of the working groups mentioned above.

The conference brought together around 150 representatives from 30 different countries. The objectives were to assess the advancement of the projects, advocate for the products and their utilization, converse about the technical and scientific aspects, and inspire new collaborators to come on board. The conference discussed the challenge to disseminate information to both soil science experts and user communities, thereby expanding participation to all organizations interested in employing these digital soil data for addressing global challenges across various scales.

## Scientific content and organization

The conference was held in the auditorium of the Musée des Beaux-Arts (1 Rue Fernand Rabier, Orléans) for the oral presentations and in the premises of the STUDIUM (7 rue Dupanloup, Orléans), for the poster sessions, breaks and lunches.

### Scientific Committee

A scientific committee of 12 prominent members from 8 organizations was formed as committee of the conference, each leading a theme.

#### Chairs

Dr. Ir. Dominique Arrouays, INRAE, Info&Sols, Orléans, France.

Dr. Laura Poggio, ISRIC-World Soil Information, Wageningen, The Netherlands.

#### Members

Dr. Kabindra Adhikari, United States Department of Agriculture-Agriculture Research Service - USA

Dr. Songchao Chen, ZJU-Hangzhou Global Scientific and Technological Innovation Center, Hangzhou - China.  
Dr. Subramanian Dharumarajan, ICAR-NBSS&LUP, Bangalore, - India.  
Prof. Dr. Gerard Heuvelink Wageningen University & ISRIC - World Soil Information - The Netherlands.  
Dr. Zamir Libohova, United States Department of Agriculture-Agriculture Research Service - USA.  
Prof. Dr. Budiman Minasny, University of Sydney - Everleigh, NSW, Australia.  
Prof. Dr. Vera Leatitia (Titia) Mulder, Wageningen University, Soil Geography and Landscape group - The Netherlands.  
Anne Richer-de-Forges, INRAE, Info&Sols, Orléans, France.  
Dr. Pierre Roudier, Manaaki Whenua - Landcare Research, Palmerston North - New Zealand  
Dr. Alexandre Wadoux, University of Sydney - Everleigh, NSW, Australia.

The presentations were grouped into several categories:

- Invited keynotes: 20 minutes;
- Long talks: 15 minutes;
- Talks: 10 minutes;
- Short talks: 5 minutes;
- Posters: displayed throughout the conference and benefiting from a dedicated 2-hour session.

All the sessions were moderated by world-renowned scientists bringing together research institutions responsible for soil mapping at local, national, continental and global scales.

Around 150 representatives from 30 countries gathered at the conference with the primary objectives of reviewing research progress, promoting digital map products and their applications, discussing technical and scientific aspects, and attracting new partners. An important challenge was increasing the awareness about digital soil data among soil science experts and user communities, to encourage broader participation of all interested entities in addressing global issues such as climate change, food security, water supply, biodiversity protection, soil resource conservation, human health, as well as local concerns like surface and groundwater protection, sustainable land development, urbanization, and zero land-take objectives.

#### **Integration with the history of the existing situation**

The INRAE Info&Sols Unit is the structure that sets up the national information system for the soils of France and the evolution of their qualities, under the patronage of the GIS Sol which brings together the ministries in charge of the environment and agriculture, Ademe, IGN, IRD, OFB and INRAE. The programs developed within the framework of the GIS Soil in metropolitan France and overseas are the subject of international recognition which has materialized in particular by the chair of the WG Global Soil Map of the commission 1.5 of the IUSS.

- The organization of the first “GlobalSoilMap” world conference in Orléans in 2013 and the publication of an associated book.
- The co-organization of the world symposium "Global Soil Security" in 2016 in Paris and the publication of an associated book.
- The co-organization of the second “GlobalSoilMap” world conference in 2017 in Moscow and the publication of an associated book.
- The co-organization of the global symposium “Digital soil mapping and GlobalSoilMap– Scientific advances and the operational use of digital soil mapping to address global environmental challenges” in Santiago de Chile in 2019 and the publication of a special issue of the journal “ Geoderma Regional” in 2021.
- Obtaining a funding from the STUDIUM for a research consortium on this topic, bringing together researchers from INRAE (FR), Wageningen Research University (NL), Univ. Sydney (AU), United-States Department of Agriculture (USA), LandCare Research (NZ) and ISRIC-World Soil Information (NL).

Despite facing challenges due to the ongoing pandemic, this consortium has produced a significant amount of knowledge and has greatly contributed to the expansion of numerous international collaborations. This was highlighted in one of the posters presented at the conference.



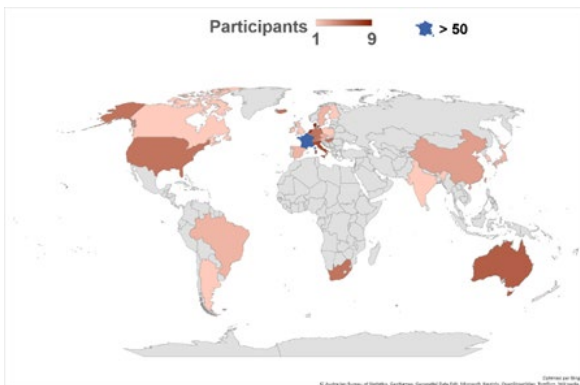
*Network of co-authors of the 100 publications produced by the consortium funded by LE STUDIUM*

© Anne Richer-de-Forges, INRAE. Source: GLADSOILMAP consortium publications (list available at <https://www6.inrae.fr/gladsoilmap-consortium/Deliverables/Publications>). Figure from the communication: Arrouays, D., Richer-de-Forges, A.C., Minasny, B., Poggio, L., Libohova Z., Mulder, V.-L., Roudier, P., Martin, M.P., Lagacherie, P., Martelet, G. Nehlig, P., Bourrennane H. 2023. An overview of the Consortium GLADSOILMAP supported by the LE STUDIUM Loire Valley Institute for advanced research studies (France). Joining efforts between sub-national, national, continental and global scale digital soil mapping of soils, soil properties and soil functions. Soil mapping for a Sustainable Future Conference, Orleans, France 7-9 Feb. 2023.

The challenging health situation has impacted the operations of this consortium, specifically with regards to cancelled funding for trips and stays. As a solution, LE STUDIUM proposed to allocate the remaining balance towards the simultaneous organization of an international symposium on the same topic. To balance the budget, funding was obtained from various sources including the French Ministries of Agriculture and Environment, INRAE, the city of Orléans, and the French Soil Science Society. Additionally, a request for a \$2,400 grant from the IUSS stimulus fund was made to support the participation of four low-income country (LIC) attendees, which was approved. However, some interested LIC participants were unable to secure their visa or the necessary funding from their respective laboratories.

**Main outcomes of the workshop \_Reaching a large and various audience**

Despite some difficulties due to visa problems, the participation of countries was numerous, with in particular the presence of large emerging countries such as India and Brazil. Thirty countries from different continents actively participated in this conference. About a third of the participants were of French origin, which corresponds to the average proportion observed in this type of conference. It should be noted that the participants were also from various backgrounds, mostly scientific, but that the audience also included private companies, representatives of public authorities at different territorial and national levels and NGOs.



*Geographical origin of the participants*

© Anne C. Richer-de-Forges (INRAE Info&Sols, France) using the file of registrations at the conference



*Group photo of the participants*

*© Sacha Desbourdes (INRAE Info&Sols, France) - In front of the hotel Dupanloup, Orléans, France*

### **Take stock of progress**

During the first two sessions, progress in geographical and thematic coverage of digital soil mapping worldwide was reviewed. Several countries have emerged as pioneers in this field, including Australia, the United

States, France, Hungary, Belgium, Denmark, the Netherlands, and South Korea. Furthermore, there are significant initiatives in progress in large nations like China, India, Brazil, and across continents such as Europe, Africa, and South America. Many other countries have also made substantial strides, such as Italy, Austria, Germany, Canada, South Africa, the Czech Republic, and Argentina. Digital soil maps at varying resolutions have been compared and occasionally utilized together to more effectively leverage soil evolution processes expressed at different scales.

### **Unite scientific communities**

The significant turnout at the conference is indicative of the growing interest in the research themes. However, due to the current international security and health situation and certain strikes, we observed a slight reduction in the expected number of participants, which was around 180. Nevertheless, the discussions were highly productive, relaxed, and engaging, with a notable level of scientific expertise and vision displayed by world leaders in the field. The discussions were focused on substantive issues, without getting lost in purely technical aspects, which is noteworthy for a community where mathematical and statistical components are particularly significant. Additionally, the breaks and poster sessions provided an opportunity to expand the scientific community further and directly communicate with potential users. All participants commended the positive atmosphere of the event, and the quality of its organization.

### **Awards**

Awards were given to the best oral presentation, the best oral presentation by a student, the best poster, the best student poster, and the most innovative idea.



*Awards*

*© Maurine Villiers Le STUDIUM Institute for advanced research studies, Orléans, France*

### **Main advances and methodological issues**

The primary methodological advancements and challenges discussed were as follows:

- Novel modelling approaches and their ability to enhance predictive power and process explanation.
- Combination or fusion of different models.
- Emergence of new variables, especially those obtained from high-resolution remote sensing data (spatial, spectral, and temporal).
- Methodologies used for selecting and choosing co-variables.
- Incorporating uncertain data in machine learning models.
- Various strategies for handling data density and spatial structure during learning.
- Different validation strategies to consider.
- Integration of soil process knowledge in spatial modeling, and vice versa.
- Developing robust and low-data-intensive validation techniques.
- Risk of over-adjustment of models.

Estimation and propagation of uncertainties throughout the processing chain in models and decision support tools.

In general, the presentations demonstrated a shift from merely mapping soil and its properties to mapping ecosystem functions and services. This transition is vital to extend digital soil mapping beyond experts and generate input data for models used by other disciplines, such as hydrology, economics, agronomy, climatology, and more. Additionally, this shift can produce operational tools on various spatial scales and timescales, ranging from managing cultural interventions to extreme climate events, projections, and long-term forecasts related to global changes that affect the planet as a whole.

Improving the understanding of how to use DSM and effectively communicating the potential impact of uncertainties to end-users involved in sustainable soil management, conservation, service optimization, and risk assessment is critical. Additionally, the discussion highlighted the importance of utilizing diverse information dissemination channels, which should be tailored to meet the specific needs of end-users.

While it is feasible to generate maps consisting of highly detailed "pixels" (or "voxels"), these outputs may not always align with the expectations of most users. Moreover, attempting to make highly localized predictions using limited and sparse data may result in significant errors. Therefore, we need to adopt a different production approach, one that prioritizes user requirements. This means generating maps that best align with the specific spatial support, map extent, inquiry, and acceptable level of uncertainty of each user request.

It is also a question of not promising the "moon" but of agreeing to say if it is reasonable to produce such a prediction over a given area or if the state of our data or our knowledge does not yet allow us to do it.

Ultimately, gaining a deeper comprehension of the diverse origins of prediction uncertainties is crucial. This includes uncertainties related to initial soil measurements (which are often assumed to be accurate), co-variable measurements (e.g., remote sensing data), model parameterization, spatial and statistical coverage of relevant variables, as well as errors that may be intrinsic to the model structure itself.

This path should make it possible to make better progress on the priorities to be implemented to improve predictions.

#### **Other practical prospects discussed**

- Putting the presentations online, subject to the agreement of the authors.
- Posting of a selection of photographs of the event after agreement of the authors of the photographs and the right to the image of the person (if individual or small group).
- Public report in the Information Bulletin of the International Union of Soil Sciences (this text).
- Publication of a special issue of *Geoderma* open access with reduced fees (call ongoing).
- NBSSS-LUP proposal for a next conference in India, Bangalore, in 2024.
- Redesign and elections for the renewal of the IUSS working groups to be organized before the 2024 conference.

#### **Communication-related commitments towards the project funders**

All the partners who have supported or proposed to support the project are each described in one full page (after their approval) in the final booklet. Their logos appear on all documents, posters and on the website. They were acknowledged during the introductory and concluding sessions.

Anne C. Richer-de-Forges<sup>1</sup>, Dominique Arrouays<sup>1</sup>, Laura Poggio<sup>2</sup>, Budiman Minasny<sup>3</sup>

<sup>1</sup>- INRAE, *Info&Sols*, Orléans, France

<sup>2</sup>- ISRIC- *World Soil Information*, Wageningen, The Netherlands

<sup>3</sup> - *The University of Sydney*, Everleigh, NSW, Australia



## The 3rd Global Soil Biodiversity Conference

13<sup>th</sup> to 15<sup>th</sup> March 2023, Dublin, Ireland

The 3<sup>rd</sup> Global Soil Biodiversity Conference was held at University College Dublin, Ireland on 13<sup>th</sup>-15<sup>th</sup> March 2023. These conferences are considered to be the premier global conferences dealing with soil biodiversity and were set up to promote the exchange of expert knowledge on soil biodiversity into environmental policy and sustainable land management, in order to protect and enhance ecosystems services.

This is the 3<sup>rd</sup> conference of the Global Soil Biodiversity Initiative. It was hosted by University College Dublin & Teagasc and organized by Professor Emeritus Tom Bolger (UCD School of Biology and Environmental Science), and Professor Olaf Schmidt (UCD School of Agriculture and Food Science). It followed from the first two in Dijon, France (2013) and Nanjing, China (2017). The conference event focused on new research and techniques needed to expand soil biodiversity science and monitoring in light of the increasing effects of global climate change and its impact on the benefits to humans that biodiversity in general provides. It is estimated that at least 25 % of the world's biodiversity inhabits soils. The concerns and calls-to-action raised at the 15<sup>th</sup> Conference of Parties of the UN Convention on Biological Diversity in Montréal, Canada increased the awareness and urgency of this research area. Researchers and policymakers attending the conference were, therefore, on the frontlines of ascertaining the quantity and quality of services soil biodiversity provides and how to protect soil biodiversity.

Speakers at the Opening Session included representatives of the host organisations and speakers from the EU-JRC and UN-FAO who described how the EU Soil Strategy intends to address soil biodiversity issues and discussed how the International Network on Soil Biodiversity and the Global Soil Biodiversity Observatory aimed to mainstream soil biodiversity in order to halt biodiversity loss and ensure healthy soils for sustainable development.

Keynote addresses were delivered by Richard Bardget (University of Manchester, UK), Lydie-Stella Koutika (CRDPI, Republic of the Congo), Tom Crowther (ETH-Zurich), Edith Hammer (Lund University, Sweden), Yuting Liang (Chinese Academy of Sciences, China), Jennifer Pet-Ridge (Lawrence Livermore National Lab, USA) and Don Cowan (University of Pretoria).

During the conference 7 keynotes and 162 oral presentations were delivered. There were over 360 poster presentations and 12 workshops.

The conference attracted approximately 670 delegates and the feedback has been very positive. The university website report can be found at: <https://www.ucd.ie/research/news/2023/thirdglobalsoilbiodiversityconferenceco-hostedbyucdandteagasc/body,676400,en.html>.

The students who received the bursaries all delivered either oral or poster presentations. The role of Professor Ellen Kandeler in winning the awards from IUSS and in selecting the winners was acknowledged.

The university website report can be found at

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The students who received the bursaries all delivered either oral or poster presentations. The role of Professor Ellen Kandeler in winning the awards from IUSS and in selecting the winners was acknowledged.

The student Early Bird Registration fees of € 325 was waived for each of the following six students:

- Sean Darcy, Poster, Modelling connectivity of microhabitats: You can run, but can you hide? Centre Of Microbiology And Environmental System Science, University Of Vienna, Austria
- Nathan Howard, Oral, Functional significance of Mucoromycotina 'fine root endophyte' fungi in plant nitrogen nutrition, University Of Sheffield, UK

- Thomas Jeanne, Oral, Microbial diversity and soil quality across a range of cropping systems and soil textures, Institut de Recherche et de Développement en Agroenvironnement, Québec, Canada
  - Jesse Jorna, Poster, Facilitative Interactions in Soil Microbial Systems at the Polar Regions Brigham Young University, USA
  - Julia Königer, Oral, Shining light on the belowground eukaryotes: an EU-wide metabarcoding analysis on environmental drivers, Joint Research Centre, EU, Ispra, Italy
  - Judith Paetsch, Oral, Shotgun Metagenomics Reveals Decade-Scale Spatio-Temporal Dynamics of Entire Soil Communities: Microbes and Soil Invertebrates, University of Trier and Senckenberg Biodiversity and Climate Research Centre, Germany
- They each provided comments on the value of attending the conference and acknowledged the generosity of the bursaries.
- Julia Königer, European Commission - Joint Research Centre, Ispra, Italy, delivered an oral presentation in which she described the results of an EU-wide large-scale metabarcoding analysis of soil eukaryotes. Comparing their diversity across Europe, the team found the ecosystem type and the C:N ratio as the main driver. This study is the first in a series of standardized soil biodiversity monitoring protocols for eukaryotes and provides a first baseline of soil organisms which aims to contribute to quantitative conservation goals. Julia found that while a PhD zooms in so much on a topic, the conference embedded this specialized work in a wider picture. She related “It was great to meet, exchange and connect with researchers that work in the same field but also others that work on seemingly far-away spectrums of soil biodiversity. The conference gave me and my work new perspectives, inspiration and a long list of aspects that I did not come across before. I am very grateful that I was able to be part of it! “
  - Nathan Howard University of Sheffield, presented a talk at GSB detailing his PhD work on Mucoromycotina 'fine root endophyte' fungi and their role in N nutrition of vascular host plants. He found the GSB conference really motivating and thought provoking. Especially since it was the first conference where he had met and connected with so many young and early career scientists in similar research fields. He says that it has been really important for his development as a scientist in terms of community and networking for future collaborators.
  - Thomas Jeanne, Institut de Recherche et de Développement en Agroenvironnement, Québec, Canada, thanks the organizers and funding partners for giving him the opportunity to present at the GSB conference in Dublin. He was able to share his results on the variability of microbial diversity in different soil types and crop management in Quebec. During the GSB3 event, he had the chance to exchange research theme ideas with several groups from different countries. These exchanges were very stimulating and have allowed him to validate some technical and statistical approaches and also to have many new research questions to explore. This experience is a major asset in the pursuit of his graduate studies.
  - Judith Paetsch, University of Trier and Senckenberg Biodiversity and Climate Research Centre, delivered an oral presentation where she says she had a unique opportunity to present her master's thesis on shotgun metagenomics of German soil samples. She says that what is special about this dataset is the possible diversity analysis of a time series over the last 20 years. Her results show that, contrary to the global trend, there is no homogenisation in German soils. Julia says that the conference especially gave her the opportunity to connect with many scientists worldwide, to get a deeper insight into soil science and to present and discuss her work in front of a large audience. “It was super exciting to get a taste of the scientific world and how this path could look further. Thank you very much for this experience!”.
  - Sean Darcy, Centre of Microbiology And Environmental System Science, University Of Vienna, Austria presented a poster in which they simulate community assembly via environmental filtering, species interactions and dispersal for habitats in a spatially explicit model. He investigated how spatial structures (e.g. resource distribution or habitat connectivity) impact the possible inferences we can draw from simulated communities compared to our initial settings. Then, grouping habitats within certain sampling volumes, the authors defined how these inferences change with scales of observation and aim to link our findings to community data common to soil microbial studies. Sean expressed his gratitude to the GSBC3 and the IUSS for enabling his visit to Dublin. He says that his attendance at the conference was very enlightening. He heard some fascinating talks broadening

his understanding of his field and attendance gave him a great opportunity to connect with his peers. He was also delighted to discuss his work with other colleagues and got some great ideas that he thinks will influence his research for years to come.

- Jesse Jorna, Brigham Young University, presented a poster which outlined a study on the facilitative interactions microbes exhibit in natural systems and how these might vary along environmental stress gradients in similar ways as theory from plant community ecology predicts. For this, he collected samples in naturally heterogeneous environments to construct bacterial interaction networks along environmental gradients in both polar regions and infer network parameters and the prevalence of positive and negative interactions. Jesse says that the conference presented an awesome opportunity to introduce the experiment and his hypotheses to leading microbial ecologists from around the world and receive feedback on the experimental design and methodology applied. He further was able to meet and learn from scientists working on similar community analyses, ecological networks and soil biodiversity in general and have gained numerous ideas and contacts for potential future work.

Report: Prof Thomas Bolger  
Co-Chair of the 3rd Global Soil Biodiversity Conference  
Prof Diana Wall  
Co-Chair of the 3rd Global Soil Biodiversity Conference  
Prof. Dr. Ellen Kandeler  
IUSS, Chair of Commission 2.3.

### ISC Distinguished Lecture Series: Basic Sciences for Sustainable Development

21 March 2023, online event

In order to promote the International Year of Basic Sciences for Sustainable Development and to highlight the importance of basic sciences to the ISC community, ISC GeoUnions have initiated the "Distinguished Lecture Series on Basic Sciences for Sustainable Development". On March 21, the online event at 14:00 UTC was held: "Learning the duality between disaster risk and sustainable development". Irasema Alcántara-Ayala, former Director and current Professor and Researcher at the Institute of Geography of the National Autonomous University of Mexico (UNAM), and ISC Fellow (appointed in December 2022) in the conference he states that the objective of this Lecture is to give a powerful impetus to reflection and actions on disaster risk reduction and global sustainability in an era of unprecedented socio-environmental changes, in which the leading role of geography as a compass to support transdisciplinary approaches to strengthen policy formulation and practice is indispensable. – Conference's registration: <https://council.science/events/duality-disaster-risk-sustainable-development/>



**Working Group on Archaeological Soil Micromorphology (WASM) 2023 30-31 March 2023 and Workshop integrated-microscopy-approaches-in-archaeobotany (IMAA) 2023**

1<sup>st</sup> to 2<sup>nd</sup> April, University of Reading, UK

The themes for the 2023 workshop they were: Archaeo- and Paleobotanical Approaches to Tropical Agriculture, Innovation in microanalysis, taphonomy and identification, Rewilding and Conservation, Science Communication of Archaeo- and Palaeobotanical Data, Sustainable Uses of Plants, The Archaeobotany of the Islamic West.

The 2023 workshop he followed the format of oral presentations in the morning and microscopy sessions and round table discussions in the afternoon. A small meeting of WASM (Working Group of Archaeological Soil Micromorphology) was held before the IMAA on 30th and 31st March as a separate event.

<https://blogs.reading.ac.uk/integrated-microscopy-approaches-in-archaeobotany/wasm-2023/>  
media/workshops\_archaeological\_soil\_micromorphology\_2023.pdf

Downloads:

**International scientific and practical conference "Integrated management and reclamation of degraded soils to ensure food security: new approaches and innovative solutions"**

19<sup>th</sup> to 21<sup>st</sup> April 2023, National University of Uzbekistan, Tashkent city, Uzbekistan (Hybrid)

The international conference was held in languages Uzbek, Russian and English and the forms of participation was hybrid. Scientific conferences on soil and scientific field trips alternated. They were present scientists, teachers, university students, students at colleges and lyceums, farmers and specialists in the field of rational use of land and soil resources, in the field of digital economy, chemicalization of agriculture and environmental protection.



### **The European Geosciences Union (EGU) General Assembly 2023**

24<sup>th</sup> to 28<sup>th</sup> April 2023, Vien, Austria (Hybrid)

The European Geosciences Union (EGU) General Assembly 2023, which brought together geoscientists from all over the world to one meeting covering disciplines of the Earth, planetary, and space sciences, ended on April 28, 2023. Welcomed 18,831 registered attendees, 15,453 of which came to Vienna from 107 countries and 3,378 joined online from 105 countries. Researchers joined from all the world for a week of scientific discoveries, discussions, and new connections together with all the volunteers from the Programme Committee who put the meeting together and to the hundreds of EGU volunteers who made the meeting possible, EGU staff and conference partner, Copernicus. 16,357 oral, poster, and pico presentations on site and virtual, delivered across 938 sessions. Between Inter- and Transdisciplinary Sessions was present Sustainable energy, geo-resources, and land-use for the future. 22 Disciplinary sessions were presented. The 47 recipients of this year's prestigious Union Medals and Awards, Division Medals and Division Outstanding Early Career Scientist Awards, were celebrated with a special event on April 26, 2023.

<https://www.egu.eu/awards-medals/ga/2023/introduction/>. The IUSS attended with a booth together with the Chinese and the Italian Soil Science Societies (CSSS and SISS). Gadgets and info materials of the IUSS, those of the next IUSS Inter-Congress in China, and that of the Centennial in Italy were distributed. IUSS Officers and Colleagues attended at the stand to share info and ideas for the Union and the progress in Soil Sciences. EGU

informed that it is possible to have a say about who will give a Medal or Award Lecture in 2024 by nominating your colleagues for an EGU Award or Medal by 15 June 2023. <https://www.egu.eu/awards-medals/nominations/>, or to nominate an individual or team for the new Champion(s) for EDI Award, accepting nominations until 31 August 2023 <https://www.egu.eu/awards-medals/edi/>. The EGU General Assembly reconvenes at the ACV in Vienna & online as EGU24, 14–19 April 2024. Much of the scientific information from this year's General Assembly is still available online. All supplementary materials uploaded with open access permission will be available on EGUsphere. Over the next few months, they will be also uploading of EGU Union Symposia, Great Debates, and Union Medal Lectures onto EGU's YouTube channel, so that people from around the world can access these keynote livestreamed events, for free at any time. A list of all the livestreamed EGU23 Great Debates and Union Symposia that will be uploaded in the coming months is currently available on the EGU website <https://www.egu.eu/news/962/egu23-by-the-numbers/>



#### 4<sup>th</sup> Virtual Micromorphology Meeting (ViMi4)

26<sup>th</sup> to 27<sup>th</sup> April 2023, Virtual

The ViMi4 was held at the ICAREHB, University of the Algarve, in Faro, Portugal organized by geoarchaeologists Vera Aldeias, Carlos Simões, Chase Murphree, Miguel Soares, Alvis Barbieri, Pedro Coxito and Flora Schilt. As part of the workshop, as a ViMi-tradition: an informal meeting with live microscopy sessions and different breakout rooms where you can show photomicrographs, discuss features, and get feedback from other participants it was held. Also, a competition "ViMi4 Student Photomicrograph Prize" was organized for students (from undergraduate to PhD levels) to showcase their skills in capturing interesting and informative photomicrographs.



## 2023 EU Agri Research Conference

May 31<sup>st</sup> to June 1<sup>st</sup>, 2023, Brussels, Belgium

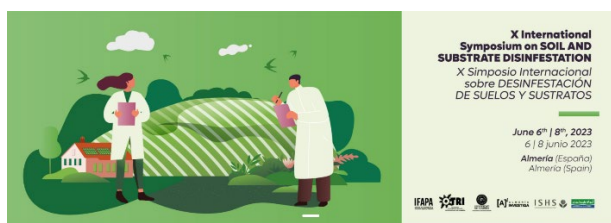
This year's edition gathered over 500 participants in Brussels, Belgium in Hybrid modality, engaging scientists, farmers, rural communities, industry, advisors, policymakers, citizens and NGO representatives. Many more followed online. The conference brought critical thinking on how research and innovation can tackle the challenges faced by agriculture, forestry and rural areas, and building on current activities and achievements, what new opportunities should be explored. Participants were engaged in identifying research and innovation priorities to shape the future EU agricultural research and innovation agenda. Field visits on 'Innovation in agriculture, forestry and rural areas in practice' organised by the EIP-AGRI took place on 2 June. On the site there are photos and recordings at [The 2023 EU AgriResearch Conference \(europa.eu\)](https://www.europa.eu) you can find out more about ongoing research in agriculture by consulting a series of factsheets.

## Global Conference on Sandy Soils

4<sup>th</sup> to 8<sup>th</sup> June 2023, University of Wisconsin, Wisconsin, USA

The conference was held at the Madison, in the University of Wisconsin brought together sandy soil experts from across the world. Sandy soils cover approximately 900 million ha worldwide, particularly in arid or semi-arid regions. There are extensive areas of sandy soils under cultivation, but the soil fertility is often low. Sandy soils – as a group of soils – have received limited research attention. With increasing global pressure on land resources, marginal soils such as sandy soils are taken into production or cultivated more intensely. There is a need to quantify and understand the properties of sandy soils.

The main topics have been addressed in symposiums several leaving plenty of room for discussion. The main topics interested: Sandy soils – distribution and formation • Monitoring, mapping, and sensors • Sandy soils and salinity • Soil water repellency, crust, and compaction • Sandy soils under forestry • Carbon & Nutrient management, soil health • Soil water conservation and groundwater • Environmental conservation. The papers from the conference will be published in the Progress of Soil Science Series (Springer).



## X ISHS International Symposium on Soil and Substrate Disinfestation

6<sup>th</sup> to 8<sup>th</sup> June 2023, Almería, Spain

X International Symposium on Soil and Substrate Disinfestation was held in Almería (Spain). The symposium involves the ISHS (International Society for Horticultural Science) Division Protected Cultivation and Soilless Culture,

the ISHS Division Vegetables, Roots and Tubers, and the ISHS Working Group Soil Borne Pathogens. A unique opportunity to exchange with the scientific and stakeholder communities, the latest advances on control of soil-borne diseases and nematodes without breaking the balance of the soil. It has passed four years since last symposium and many changes have arisen in relation to the topic.

The scientific sessions were attended by European speakers from the Universities of: Spain (Granada, Madrid, Seville, Almería), France, Belgium, Portugal and Italy (Turin) and international speakers from California, U.S.A., from Fars Agricultural Research, Iran; Agricultural Research Council, South Africa, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, China and United Arab Emirates University, UAE.

The scientific sessions included hot current topics based on research and application around the Globe as: Anaerobic soil disinfestation; Soil disinfestation and beneficial microorganisms; Disinfestation against nematodes; Soil solarization, biosolarization, biofumigation and nonfumigant soil disinfestation technologies; Soil disinfection technologies; Cultural practices and Combined Control Measures; and Resistant Cultivars and Grafting for Soil-Borne Disease Management.

Next year it will be possible a chance to know how to face these changes and how to cope with the challenges of the new production requirements in terms of sustainability and profitability.

[PROGRAM - SD2023 - ALMERÍA \(sdalmeria2023.com\)](https://sdalmeria2023.com)

### **International Workshop on “Soil and water health” hold in Imola (Italy) 4-6 July 2023**

It was a pleasure to have attended to the International Workshop on “Soil and water health” hold in Imola (Italy) on 4-6 July 2023.

I really appreciated the great friendliness, availability and professionalism of the staff that took part to the organization and execution of the event. The organizers carried out a very hard and successful work. The “soil and water health” is a hot topic at a global scale and therefore the focuses of the workshop were greatly topical.

The level of expertise and knowledge of the presenters were excellent. In addition, I appreciate their positive attitudes, willingness to explain concepts, clarity of the showed slides, and opportunities to ask questions during and after the presentation time. All the sessions were excellent and challenging. The topics taken in account clearly demonstrated the strong interconnection among soil, water, landscape, ecosystem services and also human health. The key speaker prof. Carmelo Dazzi engaged audience with new and interesting information which could inspire new research topics. From my side, the keynote speech allowed me to take home a world of new knowledge and insights.

The panel discussion that took place at the beginning of the workshop brought together multiple experts sharing their perspectives about nature, fostering a rich and informative experience. The panel discussion has encouraged audience participation through Q&A, making attendees feel more involved and gaining a deeper understanding of the topic.

Overall, the location together with the scientific communications made the congress atmosphere fascinating and exciting. The new knowledge and contacts gained from this congress will be helpful for me to further enhance the quality of my research, to increase my network and reinforced my passion for research.



# IUSS Alerts June – November 2022

## Wageningen Soil Conference 2023

August 28th – September 1st, 2023

Wageningen, the Netherlands

Website: <https://wageningensoilconference.eu/>

Twitter: <https://twitter.com/WageningenSoil>

Flyer: [https://www.iuss.org/media/wsc2023\\_first\\_circular.pdf](https://www.iuss.org/media/wsc2023_first_circular.pdf)

SAVE THE DATE

100 years of  
**SOIL SCIENCE**  
*past achievements  
and future challenges*

International Union of Soil Sciences

**Centennial  
of the IUSS**  
Florence - Italy  
May 19 - 21, 2024

**Registrations & Public Call  
for Proposals**  
**5 December 2022**  
Visit [www.centennialius2024.org](http://www.centennialius2024.org)

**ISMOM 2024 - 9<sup>th</sup> International Symposium of Interactions of Soil Minerals with Organic Components and Microorganisms**

10-14 October 2024

Tsukuba, Japan

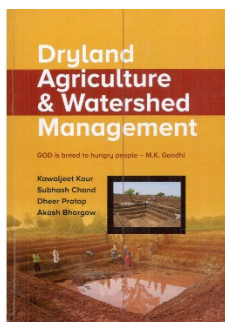
Following the spirit of ISMOM, we plan to put a focus on “aggregate” or “soil structure” as the physical constraints for the interactions among minerals, organic matter, and microbes in soil. Among regular topics of ISMOM, we also hope to cover topics associated with volcanic soil and paddy soil. You will have a chance to see these soils in the landscape at the post-conference field trip (October 15-17).

Read more: <http://web.agr.ehime-u.ac.jp/~soil/ISMOM2024.html>

**For the complete list of upcoming events, please see the event calendar on the IUSS website:**

<https://www.iuss.org/meetings-events/>

# New Publications



## **Dryland Agriculture & Watershed Management**

By Kawaljeet Kaur, Subh Chand, Dheer Pratap, Akash Bhargava.

ISBN: 9789395700085\_2023

The book "Dryland Agriculture and Watershed Management" is written in simple English for better understanding about Dryland agriculture, Dryland farming and watershed management practices to undergraduate and post-graduate students of agriculture sciences. The basic objective of the book is to clear doubts about dryland and dry farming agriculture. The book gives a summarised knowledge about his two history, development and various practices to control soil erosion and drought. The whole handy book is divided into 9 chapters. chapter 1. describes about primary introduction of dryland agriculture. chapter 2. describes soil and water conservation techniques, whereas chapter 3. describes drought. chapter 4. describes strategies for mitigation of drought. Chapter 5 & 6 written to understand water harvesting and management. chapter 7. describes about contingent crop planning for aberrant weather conditions. A special chapter on Land policy (chapter 8) reviews the present and future land policy and different programmes, measures taken by Government to combat drought. The book is handy and written to satisfy the competitive aspirant opinion for various competitive exams and theory aspects. Authors hope that book will be extremely important for agronomists, soil scientist, crop scientist, post-graduate, graduate students of agriculture and allied subjects. It is also important for colleges, universities, institutions/libraries.

Read more: <https://www.satishserial.com/book/9789395700085/dryland-agriculture-watershed-management>

## **Illustrated Handbook of WRB Soil Classification**



## **Illustrated Handbook of WRB Soil Classification**

By Marcin Świtoniak, Nicolaus Copernicus University; Cezary Kabala, Wrocław University of Environmental and Life Science; Przemysław Charzynski, Nicolaus Copernicus University in Toruń; Gian Franco Capra, Università degli Studi di Sassari; Szabolcs Czigány, University of Pécs; Manuel Pulido, Universidad de Extremadura; Antonio Ganga,

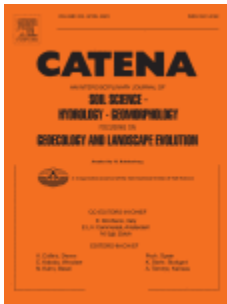
Università degli Studi di Sassari; Bartłomiej Glina, Poznań University of Life Sciences; Łukasz Mendyk, Poznań University of Life Sciences; Novák Tibor, University of Debrecen; Vit Penizek, Czech University of Life Sciences Prague; Endla Reintam, Estonian University of Life Sciences; Blaz Repe, University of Ljubljana; Ilze Vircava, University of Latvia, Latvia University of Agriculture; Marcin Sykuła, Nicolaus Copernicus University.

December 2022, Publisher: Wrocław University of Environmental and Life Sciences Publishing, ISBN: 078-83-7717-386-2

Soil classification is a difficult issue and requires many years of study under the guidance of experienced teachers. In the course of long-term studies and field research, soil scientists acquire the skills of recognizing and correctly naming many important features resulting from litho-, anthropo- or pedogenic processes. The problem with learning the secrets of this art is the lack of opportunity to see many examples of different soil features hidden beneath the earth's surface. Visiting many regions of the world for didactic or scientific purposes, we felt the need to share our photographic collections with other people involved in the study and interpretation of the soil environment. It is with great pleasure that we present to the reader a set of several hundred photographs showing the features, properties, soil horizons, as well as examples of interpretation of soil profiles – in accordance with the rules and nomenclature adopted in the international soil naming and classification system – the World Reference Base for Soil Resources (2022). The book has been divided into eight chapters with a total of 300 pages. The photos have been arranged in such a way as to reflect the process of creating a description of the soil profile - from environmental features, through morphological soil features, diagnostic horizons, properties, and materials, to specific examples of soil profile classification. In the section with soil profiles, we managed to collect 100 examples from all Reference Soil Groups found in all climatic zones of our planet. In the names of the soils, we have mainly emphasized those features (qualifiers) that are morphologically identifiable in the photos, consciously omitting those that can only be read from the results of laboratory analyses. The prepared textbook is a continuation and development of a simplified student WRB guide published by Świtoniak et al. (2018). In this previous book, nomenclature and examples of soil description and qualifiers were limited to the environments of Central and Eastern Europe. The "Illustrated Handbook of WRB Soil Classification" contains a collection of photos from different parts of the world, and their selection was intended to show as much as possible the diversity of the world's soil cover. The book opens with Chapter 1 which contains examples of environmental and soil surface features with their short descriptions in the context of use in describing the surroundings of a soil pit. In Chapters 2 through 6, the reader is guided through extensively inventoried examples of detailed soil features and horizons, properties, and diagnostic materials. It should be noted that full definitions of the soil features required in the WRB were not used, but only simplified descriptions aimed at drawing attention to the characteristic morphological features, that facilitate their recognition in the field. The core of the study is Chapter 7 - a list of 100 soil profiles, presented in order according to the Reference Soil Groups key in the WRB (2022). Each soil photo was accompanied by a thumbnail showing the depth of occurrence of individual features determining the classification position of the soil, both the RSG and the use of main qualifiers. The description of particular parts of the soil names (RSG and qualifiers) has been simplified in order to link the interpretation of a given names with recognizable morphological features of the soil. The book ends Chapter 8 with photos showing the general principles of using specifiers and additional examples of selected qualifiers with their general descriptions. Therefore, the handbook is not able to replace the formal key for soil determination in accordance with WRB, it is only a complementary, additional tool containing a database of photographic examples for wide use by people involved in soil classification.

Freely available: [https://www.researchgate.net/publication/368839948\\_Illustrated\\_Handbook\\_of\\_WRB\\_Soil\\_Classification](https://www.researchgate.net/publication/368839948_Illustrated_Handbook_of_WRB_Soil_Classification)

Read more: doi [10.30825/1.26.2022](https://doi.org/10.30825/1.26.2022)



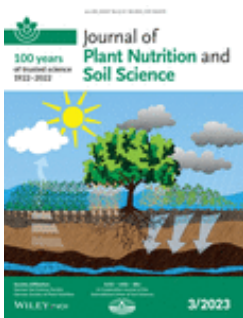
## Improvement of spatial prediction of soil depth via earth observation

By Gabriel Pimenta Barbosa de Sousa, Mahboobeh Tayebi, Lucas Rabelo Campos, Lucas T. Greschuk, Merilyn Taynara Accorsi Amorim, Jorge Tadeu Fim Rosas, Fellipe Alcantara de Oliveira Mello, Songchao Chen, Shamsollah Ayoubi, José A. M. Demattê.

Catena Vol. 223, 106915, Science Direct.com by Elsevier, April 2023

Soil depth is one of the most critical factors which impact on culture productivity and makes difficult appropriate management decisions. However, assessing this parameter is also the most challenging tasks in the agronomic field. The objective of this work was to predict the spatial distribution of soil depth from space techniques (remote sensing, RS) and machine learning. A total of 292 sites were allocated (based on the toposequence approach) and drilled (0–2 m depth) at three different locations in Brazil. Based on these, in-situ traditional depth maps (denominated field-map) were elaborated for validation. Afterwards, we created a strategy to achieve these different depths by RS (RS) approach. Landsat 8 OLI bands, Land Surface Temperature (LST), Normalized Difference Vegetation Index (NDVI) and emissivity in dry and rainy seasons as well as terrain attributes were applied to predict soil depth. For this purpose, the most important covariates were selected using Recursive Feature Selection (RFE) based on Random Forest (RF) and Support Vector Machine (SVM). Afterwards, the application of RF and SVM by selected covariates were compared based on tenfold cross validation for each location. The best model was selected based on R<sup>2</sup>, RMSE and MAE, accuracy and bootstrapping approach and uncertainties. Terrain attributes were important to discriminate soil depth. Although, LST and NDVI also presented important contribution to this task. Different seasons implies on water and plant dynamics in deep and shallow soils. This impacted on NDVI and LST as detected by RS. Thus, the method brings more variables to infer soil depth. The RF model performed better than SVM to predict soil depth with an average of 0.77 R<sup>2</sup>. The accuracy between a digital soil mapping and a field-map reached 0.58 to 0.81 indicating an important result considering the difficulty of the objective This may help pedologists and farmers as well as water and plants environmental monitoring.

Read more: <https://doi.org/10.1016/j.catena.2023.106915>



## World Reference Base for Soil Resources—Its fourth edition and its history

By Peter Schad.

J. Plant Nutr. Soil Science 2023; 186:151–163; published by Wiley-VCH GmbH.

The fourth edition of the international soil classification system World Reference Base for Soil Resources (WRB) was released in 2022. It maintains the 32 Reference Soil Groups at the first classification level. Most qualifiers (second level) and most diagnostic horizons, properties and materials were maintained but some were abolished, and new ones introduced. The main part of the fourth edition is followed by six annexes, most of them are new. For the first time, the WRB has a Field Guide (Annex 1) to facilitate field survey and to assure that all field characteristics required in the classification are reported. The fourth edition also provides designations for horizons and layers (Annex 3), which was not the case in the second and the third edition. The wordings of the definitions were harmonized, and the same features are worded in the same way throughout the text (including the annexes). Ambiguities have been corrected and many definitions written in a more concise and a more didactical way. The WRB has a long history. Four editions have been published: 1998, 2006 (with update 2007), 2014 (with update 2015) and 2022. Editor is the Working Group WRB of the International Union of Soil Sciences. The WRB followed the Legend and the Revised Legend of the Soil Map of the World. This map was edited by FAO (Food and Agriculture Organization of the United Nations) and UNESCO, and the system is known as the FAO Soil Classification System. In addition, WRB incorporated ideas from the former Working Group International Reference Base for Soil Classification that existed from 1982 to 1994.

Read more: <http://dx.doi.org/10.1002/jpln.202200417>



## Digital soil mapping of Italy to map derived soil profiles with neural networks

By Maria Fantappiè, Giovanni L'Abate, Calogero Schillaci, Edoardo A.C. Costantini.

Geoderma Regional, Volume 32, March 2023, e00619

In recent years there has been an increased demand for digital soil mapping (DSM) products. DSM has become the ultimate soil spatial representation framework due to its quantitative results, replicability, and uncertainty analysis. The present study aimed to map the probability distribution of the derived soil profiles (DSPs) of soil typological units (STUs). DSPs are statistical representation of the properties of the soil profiles belonging to STUs. STUs aggregate individual profiles into a group. The criteria used for grouping were homogeneity for World Reference Base (WRB) reference soil group (WRB-RSG), qualifiers (WRB-qu), and Soil Taxonomy particle size for the family classification (USDA-PS), and the belonging to a specific Soil Region. The European Soil Regions have been suggested as the primary grouping criteria for soil mapping at the European continental scale since they define continental-scale soilscares, distinguished mainly by their climate and geology. To map DSPs, we firstly mapped STUs. The grouping criteria of STUs were mapped at 500 m spatial resolution, using a Neural Network trained on 18,707 georeferenced and analyzed soil profiles selected from the Italian national soil database. A 10% of the soil profiles were randomly sampled using a stratified sampling approach for validation. In particular, the procedure consisted of: i) mapping the grouping criteria WRB-RSG, WRB-qu, and USDA-PS, on a 500 m national grid, through Neural Network; ii) grouping soil profiles on the base of the combinations of grouping criteria (WRB-RSG, WRB-qu, USDA-PS, and Soil Regions) as mapped with the first step at each grid node, to produce a map of Soil Typological Units (STUs); iii) calculating statistics for the soil parameters of the groups of soil profiles created, to produce

a map of Derived Soil Profiles (DSPs). DSPs statistics (average, standard deviation, and sample numerosity) were elaborated for the following parameters: soil rooting depth, pH (in water), soil organic carbon, clay, silt, sand, coarse fragments, and cation exchange capacity. The maps obtained were validated against the test set. The same test set was used for the comparison with the National benchmark map (Soils Map of Italy 1:1,000,000) and with the global scale SoilGrids at 250 m spatial resolution. The overall accuracy was 45.98% for the WRB-RSG map compared with the 30.74% of WRB-RSG as mapped with the Soil Map of Italy, and 28.79% as mapped with SoilGrids; 33.07% for WRB-qu compared with the 15.69% of WRB-qu as mapped with the Soil Map of Italy, and 12.45% as mapped with SoilGrids, and 45.48% for USDA-PS, not comparable with the National and Global benchmarks. Tau statistics showed a higher accuracy Kappa of our approach than in others, due to the unbalanced classes numerosity. The predictive ability in the validation of DSPs parameters resulted in a R<sup>2</sup> of 0.35 for clay (0.16 with SoilGrids), 0.28 for sand (0.08 with SoilGrids), 0.18 for pH in water (0.21 with SoilGrids). The proposed approach produced harmonized soil type maps with higher accuracy than the previous generation of conventional field-based soil maps for the national benchmark and the calculation of the uncertainty. The STUs express variability of soil properties between groups so their knowledge might improve our understanding of the soil distribution, the planning of their management, monitoring, and the decisions for further surveys. A future challenge will be including more dynamic parameters in the criteria used to create STU, to help monitoring soil management effects.

Read more: <https://doi.org/10.1016/j.geodrs.2023.e00619>



### **Monitoring the concentrations of Cd, Cu, Pb, Ni, Cr, Zn, Mn and Fe in cultivated Haplic Luvisol soils using near-infrared reflectance spectroscopy and chemometrics**

By S. Krzebietke, M. Daszykowski, H. Czarnik-Matusiewicz, I. Stanimirova, L. Pieszczyk, S. Sienkiewicz, J. Wierzbowska.

Published by Elsevier B.V.; Talanta, Vol. 251, 1 January 2023, 123749

This study illustrates the successful application of near-infrared reflectance spectroscopy extended with chemometric modeling to profile Cd, Cu, Pb, Ni, Cr, Zn, Mn, and Fe in cultivated and fertilized Haplic Luvisol soils. The partial least-squares regression (PLSR) models were built to predict the elements present in the soil samples at very low contents. A total of 234 soil samples were investigated, and their reflectance spectra were recorded in the spectral range of 1100–2500 nm. The optimal spectral preprocessing was selected among 56 different scenarios considering the root mean squared error of prediction (RMSEP). The partial robust M-regression method (PRM) was used to handle the outlying samples. The most promising models were obtained for estimating the amount of Cu (using PRM) and Pb (using the classic PLS), leading to RMSEP expressed as a percentage of the response range, equal to 9.63% and 11.5%, respectively. The respective coefficients of determination for validation samples were equal to 0.86 and 0.58, respectively. Assuming similar variability of model residuals for the model and test set samples, coefficients of determination for validation samples were 0.94 and 0.89, respectively. Moreover, the favorable PLS models were also built for Zn, Mn, and Fe with coefficients of determinations equal to 0.87, 0.87, and 0.79.

Read more: <https://doi.org/10.1016/j.talanta.2022.123749>



### Scale-specific controls of soil water storage along a transect in a semiarid catchment

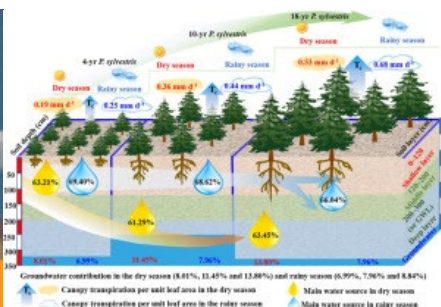
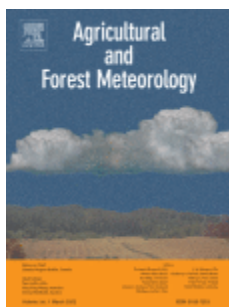
By Xue Zhang Li, Xianli Xu, Ming'an Shao, Kelin Wang.

Published by Elsevier, European Journal of Agronomy, Volume 145, April 2023, 126759

Spatiotemporal variability in soil water storage (SWS) is controlled by different factors operating at various intensities and scales. The traditional Pearson's correlation analysis can be used to identify the linear correlations at the measurement scale only. In this study, wavelet coherency analysis was used to investigate scale-specific relationships between SWS and selected controlling factors. SWS of 135 sampling locations were calculated along a 1,340-m long sampling transect established in a typical catchment on the Loess Plateau, China. The selected controlling factors were soil saturated hydraulic conductivity (Ks); clay, silt, sand, and soil organic carbon (SOC) contents; elevation; and aboveground biomass (AGB). The spatial pattern of SWS measured in growing and nongrowing seasons and at different soil depths was similar. At all the sampling points, except for some locations in the depression area, SWS in the growing season was relatively greater than that in the nongrowing season. The influence of factors on SWS varied with scale, with soil Ks, clay and sand contents significantly correlated with SWS at large scales. Season and soil depth had no significant effect on scale-specific relationships between SWS and the controlling factors. The wavelet coherency analysis identified the type of correlation at different scales and locations. The outcomes of this study offer meaningful insights into the hydrological processes that can be observed in the Loess Plateau region and could have significant implications for future hydrological systems and water resources management.

Read more: <https://doi.org/10.1016/j.eja.2023.126759>

<https://www.sciencedirect.com/getaccess/pii/S1161030123000278/purchase>



Water use pattern and transpiration of Mongolian pine plantations in relation to stand age on northern Loess Plateau of China

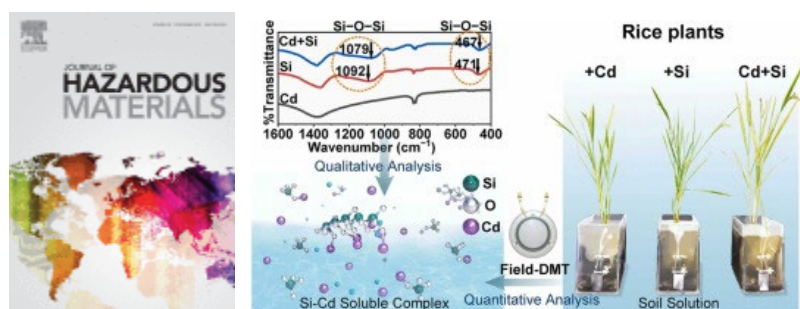
By Yanwu Pei, Laiming Huang, Ming'an Shao, Yinglong Zhang, Yanhui Pan.

Agricultural and Forest Meteorology, by Elsevier, Volume 330, 1 March 2023, 109320

Understanding the water use pattern and transpiration rate of revegetation species is crucial for efficient water management and sustainable vegetation restoration. Mongolian pine (*P. sylvestris*) plantation has been implemented for decades in desert regions of northwest China, achieving significant improvements in combating soil erosion and desertification. However, the characteristics of water use pattern and transpiration of *P. sylvestris* at different ages remain poorly understood. We investigated seasonal variations in water uptake pattern and transpiration of different-aged *P. sylvestris* (4-, 10-, and 18-yr) based on stable isotope and sap flow measurements over two growing seasons. The canopy transpiration of *P. sylvestris* and its discrepancy between the dry and rainy season increased with increasing stand age. The 4-yr *P. sylvestris* extracted water mainly from shallow soil layer (0–120 cm) across the growing season (63.21–69.40%). In contrast, the older *P. sylvestris* (10- and 18-yr) displayed a greater degree of ecological plasticity as they shifted water uptake to deeper soils and groundwater in times of drought. In the rainy season, 10- and 18-yr *P. sylvestris* extracted water predominantly from shallow soil layer (68.62%) and shallow plus middle soil layers (0–200 cm) (66.04%), respectively; in the dry season, however, they both shifted main water sources to the middle plus deep soil layers (120–300 cm) (61.29% and 63.45%). The older *P. sylvestris* also increased absorption of groundwater in the dry season, leading to more severe soil desiccation and faster groundwater decline. The changes in water use patterns of *P. sylvestris* were related to differences in root distribution and biomass, seasonal variations of plant transpiration, and changes in soil water condition. As a consequence, the variations and controls of age-dependent plant water uptake and transpiration should be considered to implement the corresponding management measures in future reforestation activities to achieve sustainable development goals.

Read more: <https://doi.org/10.1016/j.agrformet.2023>.

Download: [Download high-res image \(351KB\)](#)



### Solution chemistry mechanisms of exogenous silicon influencing the speciation and bioavailability of cadmium in alkaline paddy soil

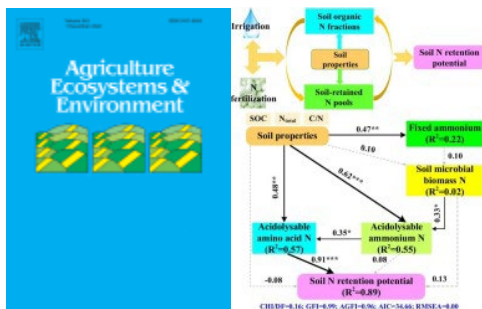
By Lei Guo, Aiting Chen, Cai Li, Yaojing Wang, Dan Yang, Na He, Mingda Liu.

Published by Elsevier Elsevier, Journal of Hazardous Materials Volume 438, 15 September 2022, 129526

The mechanism of silicon (Si) influencing cadmium (Cd) speciation and bioavailability in alkaline paddy soil solution remains unclear. Therefore, this study sought to elucidate the effect of Si on Cd by combining chemical analysis and rice pot experiments. In this work, the effects of Na<sub>2</sub>SiO<sub>3</sub> alkalinity and the differences in Na<sup>+</sup> were eliminated in all treatments, and the Cd speciation in soil solutions was determined in-situ using a Field-Donnan membrane technology (DMT) cell. Additionally, rice yields and the Cd content in various parts of the rice plant were studied. The results showed that Si application significantly increased rice biomass by 32% ( $P < 0.05$ ) while significantly reduced the Cd content in brown rice by 52% ( $P < 0.01$ ) and the free Cd<sup>2+</sup> concentration in the soil solution.

Further analysis of the interaction of Si and Cd using Fourier transform-infrared spectroscopy (FT-IR), Raman, and X-ray photoelectron spectroscopy (XPS) indicated that a Si-Cd complex was formed by Cd and Si-O groups. In summary, Si changed the chemical speciation of Cd in the alkaline soil solution and formed a water-soluble Si-Cd complex that the rice could not absorb, consequently reducing Cd bioavailability.

Read more: <https://doi.org/10.1016/j.ijhazmat.2022.129526>



### Optimization of irrigation and N fertilization management profoundly increases soil N retention potential in a greenhouse tomato production agroecosystem of Northeast China

By Hanqing Wu, Liyuan Zhang, Jindong Lv, Yuling Zhang, Yulong Zhang, Na Yu.

Agriculture, Ecosystems & Environment, Volume 340, 1 December 2022, 108185 Elsevier

Soil nitrogen (N) retention capacity can influence crop production, soil health, and environmental quality, especially in greenhouse agroecosystem with multiple cropping and high N application rate. However, the key N components and indices for predicting greenhouse soil N retention potential and the underlying driving mechanism of soil N retention under different agricultural management practices remain elusive. Here, a three-year tomato field experiment with mulch-film drip irrigation was conducted to investigate the effects of different irrigation and N fertilization regimes on soil organic N fractions and soil-retained N pools in a greenhouse agroecosystem of Northeast China. Three irrigation levels (W1, high, 25 kPa; W2, moderate, 35 kPa; W3, low, 45 kPa) and three N application rates (N1, low, 75 kg N ha<sup>-1</sup>; N2, moderate, 300 kg N ha<sup>-1</sup>; N3, high, 525 kg N ha<sup>-1</sup>) were considered. The results showed irrigation, N fertilization, and their interactions profoundly influenced soil properties, organic N fractions, and soil-retained N pools at 0–30 cm greenhouse vegetable soil layers. The dominant forms of greenhouse soil organic N fractions and soil-retained N pools were acidolysable amino acid N (AAN) and fixed ammonium (FA), respectively. Structural equation modeling and redundancy analysis indicated that there were significant direct effects of soil properties (SOC, Ntotal, and C/N) on FA, acidolysable ammonium N (AN), and AAN; additionally, soil microbial biomass N (SMBN) also exerted a significant direct effect on AN. Our results suggest that soil organic N fractions are closely correlated with soil-retained N pools and soil properties under different irrigation and N fertilization regimes. Furthermore, AAN and FA could be the appropriate indicators for predicting greenhouse soil N retention potential, and the optimization of irrigation and N fertilization application schedule (W3N2 treatment: 45 kPa – 300 kg N ha<sup>-1</sup>) is conducive to improve soil N retention potential in greenhouse tomato production of Northeast China.

Read more: <https://doi.org/10.1016/j.agee.2022.108185>



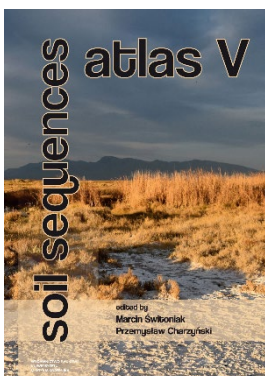
### **Loss of microbial diversity weakens specific soil functions, but increases soil ecosystem stability**

By Xueling Yang, Jie Cheng, Ashley E. Franks, Xiaowei Huang, Qi Yang, Zhongyi Cheng, Yuanhui Liu, Bin Ma, Jianming Xu, Yan He,

Elsevier, Soil Biology and Biochemistry, Volume 177, February 2023, 108916

The importance of microbial community diversity for soil functioning is still debated. Here, we used a dilution approach (undiluted, and 10–4, 10–8 and 10–12) and supplementation of N nutrient and electron donors to reveal the response of specialized soil functions (lindane removal, methanogenesis and Fe (III) reduction) and microbiome stability in an eutrophic environment. Contrasting to our previous findings in oligotrophic condition, the loss of diversity delayed lindane degradation (with residual concentration of 11.88 mg kg<sup>-1</sup> on an average in diluted vs 1.23 mg kg<sup>-1</sup> in undiluted), as well as significantly inhibited Fe (III) reduction and methanogenesis. Dilution under eutrophic conditions also weakened the coupling intensity between lindane degradation and methanogenesis, associating with the abundance reduction of specialized dechlorinators and methanogens. However, decline of microbial diversity significantly aggravated the microbial respiration. Microbial co-occurrence networks under diversity loss became more robust, with microbiome stability significantly correlated with abundant species and network complexity. Collectively, nutrient status determined the interaction strength among functional bacterial and archaeal groups, thereby driving contrast in the dependence of specialized and generalist soil functioning on microbial diversity. These findings provide new insights into improved evaluation of carbon loss and extended diversity-functioning relationships to a multi-factor context.

Read more: <https://doi.org/10.1016/j.soilbio.2022.108916>



### **Soil Sequence Atlas vol. V**

By Marcin Świtoniak, Przemysław Charzynski.

Publisher: Nicolaus Copernicus University in Torun, December 2022, ISBN: 978-83-231-4960-6 eISBN 978-83-231-4961

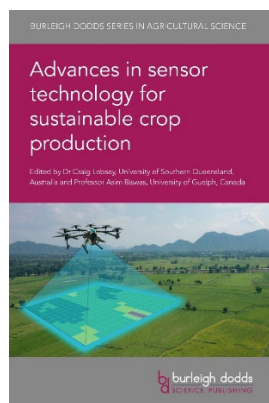
The significant spatial variability of soil cover results from the diverse impacts of different soil-forming factors. This book presents pedovariability in the form of a collection of soil sequences typical of particular landscape types. The fifth part of the Soil Sequences Atlas contains description of 73 pedons grouped into 15 chapters each representing a different environmental setting specific to very diverse regions from five continents – North and South America, Africa, Europe and Asia. The Atlas begins by presenting a pedo-landscapes from Americas – from Mexico to Peru. Next comes a group of chapters devoted to The Mediterranean Region – Spain, Italy, Slovenia and Tunisia. The next two chapters concern the soils of Central Europe – Hungary and Poland. At the end there are examples of steppe

(Russian chernozems), semi-arid (Iran) and subtropical soils of Southeast Asia (Thailand). Out of 32 reference groups, as many as 17 are represented in the fifth part of atlas Soil Sequences Atlas.

The collected data is intended as a useful educational tool in teaching soil science, and in supporting an understanding of the reasons behind the variability of soil cover, and also as a WRB classification guideline.

Free PDF version: [https://www.researchgate.net/publication/367334985\\_Soil\\_Sequences\\_Atlas\\_V](https://www.researchgate.net/publication/367334985_Soil_Sequences_Atlas_V)

Read more: <https://doi.org/10.12775/978-83-231-4961-3>



### **Advances in sensor technology for sustainable crop production**

Edited by Dr Craig Lobsey, University of Southern Queensland, Australia and Professor Asim Biswas, University of Guelph, Canada. Burleigh Dodds Science Publishing, 21 February 2023, Hardback ISBN-13: 9781786769770

#### **Description**

With the agricultural sector facing mounting pressure to reduce their carbon footprint, greater emphasis has been placed on improving existing components and practices, such as soil health and biodiversity, which have since emerged as key components to achieving regenerative agriculture.

Sensors provide the opportunity to measure crop and soil health at unparalleled scales and resolution. Key developments in sensor technology will help improve our current understanding and optimisation of the complex agricultural systems that make up our global ecosystem.

Advances in sensor technology for sustainable crop production provides a comprehensive review of the wealth of research on key developments in sensor technology to improve monitoring and management of crop health, soil health, weeds and diseases. This collection also reviews advances in proximal and remote sensing techniques to monitor soil health, such as spectroscopy and radiometrics, as well as how sensor technology can be optimised for more targeted irrigation, site-specific nutrient and weed management.

#### **Key features**

Assesses key developments in sensor technology to improve monitoring and management of complex agricultural systems.

Considers the growing influence of proximal crop sensors in assessing, monitoring and measuring the health of agricultural soils.

Explores the potential of remote and aerial sensing towards achieving sustainable crop production through more targeted irrigation management, site-specific nutrient management and weed management.

What others are saying...

“Much of future innovation in crop production will revolve around digital agriculture – the collection, management, interpretation and application of data. Sensor technology is a key component of this future. Thus, it is exciting to see this collection about the application of sensors in sustainable crop production from these highly knowledgeable authors. This will be an important reference for students, researchers and practitioners applying

sensors in crop production systems.” (Dr Richard B. Ferguson, Professor and International Soil Scientist, University of Nebraska-Lincoln, USA)

View/buy chapters

Part 1 Advances in remote sensing technologies

1. Advances in remote/aerial sensing of crop water status: Wenxuan Guo, Texas Tech University and Texas A&M AgriLife Research, USA; and Haibin Gu, Bishnu Ghimire and Oluwatola Adedeji, Texas Tech University, USA;

2. Advances in remote sensing technologies for assessing crop health: Michael Schirrmann, Leibniz Institute for Agricultural Engineering and Bioeconomy, Germany;

3. Advances in remote/aerial sensing techniques for monitoring soil health: Jeffrey P. Walker and Nan Ye, Monash University, Australia; and Liujun Zhu, Monash University, Australia and Yangtze Institute for Conservation and Development, Hohai University, China;

Part 2 Advances in proximal sensing technologies

4. Advances in using proximal spectroscopic sensors to assess soil health: Kenneth A. Sudduth and Kristen S. Veum, USDA-ARS, USA;

5. Advances in using proximal ground penetrating radar sensors to assess soil health: Katherine Grote, Missouri University of Science and Technology, USA;

6. Using proximal electromagnetic/electrical resistivity/electrical sensors to assess soil health: Alain Tabbagh, Sorbonne Université, EPHE, UMR7619, Métis, 4 place Jussieu 75252 Paris CEDEX 05, France; and Seger Maud and Cousin Isabelle, INRAE, Centre Val de Loire, UR0272 SOLS, 2163 Avenue de la Pomme de Pin, CS40001 Ardon, F-45075 Orléans Cedex 2, France;

7. Using ground-penetrating radar to map agricultural subsurface drainage systems for economic and environmental benefit: Barry Allred, USDA-ARS – Soil Drainage Research Unit, USA; and Triven Koganti, Aarhus University, Denmark;

Part 3 Advances in sensor data analytics

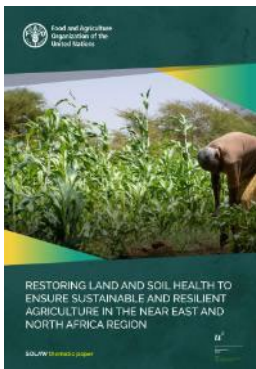
8. Advances in machine vision technologies for the measurement of soil texture, structure and topography: Jean-Marc Gilliot, AgroParisTech Paris Saclay University, France; and Ophélie Sauzet, University of Applied Sciences of Western Switzerland, The Geneva Institute of Technology, Architecture and Landscape (HEPIA), Soils and Substrates Group, Institute Land-Nature-Environment (inTNE Institute), Switzerland;

9. Using machine learning to identify and diagnose crop disease: Megan Long, John Innes Centre, UK;

10. Advances in proximal sensor fusion and multi-sensor platforms for improved crop management: David W. Franzen and Anne M. Denton, North Dakota State University, USA;

11. Using remote and proximal sensor data in precision agriculture applications: Luciano S. Shiratsuchi and Franciele M. Carneiro, Louisiana State University, USA; Francielle M. Ferreira, São Paulo State University (UNESP), Brazil; Phillip Lanza and Fagner A. Rontani, Louisiana State University, USA; Armando L. Brito Filho, São Paulo State University (UNESP), Brazil; Getúlio F. Seben Junior, State University of Mato Grosso (UNEMAT), Brazil; Ziany N. Brandao, Brazilian Agricultural Research Corporation (EMBRAPA), Brazil; Carlos A. Silva Junior, State University of Mato Grosso (UNEMAT), Brazil; Paulo E. Teodoro, Federal University of Mato Grosso do Sul (UFMS), Brazil; and Syam Dodla, Louisiana State University, USA;

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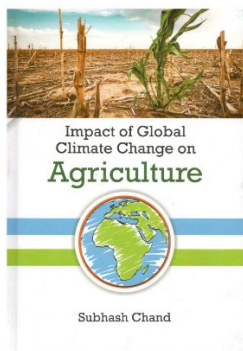
**Restoring land and soil health to ensure sustainable and resilient agriculture in the Near East and North Africa region – State of Land and Water Resources for Food and Agriculture thematic paper.**

By Zdruli, P. and Zucca, C., Cairo 2023, Egypt, Publisher FAO, 80 p., ISBN 978-92-5-136677-6

The report is part of a series of background papers prepared within the context of the development of the Near East and North Africa Region of the State of Land and Water Resources for Food and Agriculture (SOLAW) in the Near East and North Africa Region. The paper reflects on the status of soil degradation and fertility loss, the drivers that put pressure on soils and land in the region, the responses to address the pressing issues leveraging existing technical knowledge, as well as tools for assessment and monitoring.

Free PDF version: [https://www.researchgate.net/publication/368661543\\_Restoring\\_land\\_and\\_soil\\_health\\_to\\_ensure\\_sustainable\\_and\\_resilient\\_agriculture\\_in\\_the\\_Near\\_East\\_and\\_North\\_Africa\\_region\\_-\\_State\\_of\\_Land\\_and\\_Water\\_Resources\\_for\\_Food\\_and\\_Agriculture\\_thematic\\_paper\\_Cair#fullTextFileContent](https://www.researchgate.net/publication/368661543_Restoring_land_and_soil_health_to_ensure_sustainable_and_resilient_agriculture_in_the_Near_East_and_North_Africa_region_-_State_of_Land_and_Water_Resources_for_Food_and_Agriculture_thematic_paper_Cair#fullTextFileContent)

Read more: <https://doi.org/10.4060/cc1137en>



**Impact of Global Climate Change on Agriculture**

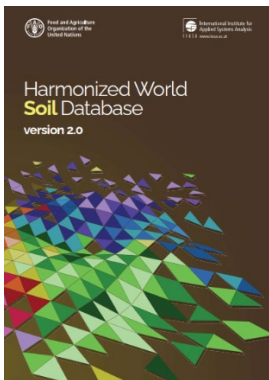
by Subhash Chand.

Satish Serial Publishing House, 2023. Hardcover ISBN: 9789394023185

The book “Impact of Global Climate Change on Agriculture” is a compilation of best soil, nutrient, crop and climate change mitigation vis-a-vis management strategies and carbon sequestration, resource conservation agriculture practices in changing world agriculture scenario due to pressure on land and water for sustainable food security and socio-economic development of ever-growing world population. The book has been divided into 10 chapters on various issues related to modern soil and crop science coupled with sustainable agriculture resource conserving technologies. Chapter 1 deals with global climate change, causes of climate change, impact of climate change on agriculture and systems, climate change and water, mitigation and adaptation strategies for combating global climate change including land use practices (LUPs), integrated soil fertility management (ISFM), biological management of soil fertility (BMSF), role of biodiversity and resource conservation technologies (RCTs). Chapter 2

highlights the soil health (Quality) vis-à-vis soil organic carbon in scenario of climate change and challenges of food Security. The enhancing soil organic carbon stock (SOC) looks an ultimate solution for sustainable soil health and food security. Chapter 3 focuses on soil carbon sequestration –as solution for mitigating global climate change along with soil carbon sequestration practices like adoption of recommended agricultural practices (RAPs) and land use practices (LUPs) for uses and benefits of research scholar, soil scientist, crop scientist, agronomist, extension worker and farm workers. Chapter 4 describes farming carbon and sequestration for enhancing soil organic carbon (SOC) in agricultural lands for sustainable crop production and productivity. Various carbon farming practice like low tillage /no tillage, crop rotations, fertilisations, land use management (LUM), biochar burial and composting technologies described with suitable examples. Chapter 5 is a classical collection and compilation of a to z information on resource conservation technologies (RCTs) for sustainable agriculture. It gives all the answers related to conservation agriculture in modern changing agriculture scenario like frequently ask questions mode e.g. goal of CA, characteristics of CA, what is not CA, is CA compatible with IPM, role of animal husbandry in CA, down sides of CA, benefits of CA, issues in CA, is conservation agriculture real, new machines in CA, RCTs-potential tools for attaining food, nutritional and livelihood security , RCTs in rice –wheat system and need for CA, laser land levelling, RCTs in wheat, zero tillage and energy and economics of CA. About the Book Chapter 6 deals with approaches in fertiliser recommendations for maximising yield and sustainable soil health with highlighting soil testing services in India, advantage of soil testing, approaches in formulations of fertilizer recommendations like, generalised recommendations, fertiliser recommendations based on soil fertility categories, soil test based fertiliser recommendations for a certain percentage of yield, fertiliser recommendations based on soil critical limits, soil test based recommendations (STCR) for target yield of crops, target yield concept and adjustment equation, STCR under IPNS for optimising doses, IPNS V/S fertiliser alone on crop response, site specific nutrient management (SSNM) for rice crop, diagnosis and recommendations integrated system(DRIS) for the uses of soil and crop experts vis-à-vis progressive farmers. Chapter 7 well describes concept, objectives, components and limitations of INM described with classical examples. Chapter suggest an appropriate and best INM options for important crops viz., rice, wheat, sorghum, maize, pearl millet, soybean, groundnut, sunflower, cotton, mustard, sugarcane, pulses, vegetables, spices, fruit crops and ornamental plants besides important cropping system in different agro-climatic zones for sustaining their productivity on one hand and maintaining soil quality for future generation on the other hand. Chapter 8 describes about opportunities for precision agriculture and remote sensing for sustainable agriculture highlighting variability in field, components of precision farming, techniques for identification of GIS problems, success of GIS, limitations of GIS, applications of GIS, global positioning system (GPS), system of GPS, operations, remote sensing (RS), precision land levelling, etc. It is a software and computer, satellite-based technology needs high expertise for operations. Chapter 9 is a collection of more than 100 reviews on the effect of deforestation on flora and soil properties like soil reaction (Ph), organic carbon (OC) and available nitrogen, phosphorus and potassium. Chapter 10 is a miscellaneous topics of interest (MTI) focus on resource management technologies (RMT) for rice-wheat cropping system, beneficial effect of SRI, salinity in vertisols, diversified farming technologies for lessor Himalayas, precision farming, organic farming and certification, maximising fertiliser use efficiency, soil pollution remedial measures are useful for readers, scientist, students and farmers. The book will be extremely important for soil scientists, agronomist, climate change scientist, agrometrologist, extensionist, environmentalist, plant scientist, soil microbiologist, economist, research institutes, colleges, universities, research scholars, students, and progressive farmers. Information given in appendices is also important for readers.

Read more: <https://www.satishserial.com/book/9789394023185/impact-of-global-climate-change-on-agriculture>



## **Harmonized World Soil Database Version 2.0**

FAO & IIASA. 2023 Rome and Laxenburg

<https://doi.org/10.4060/cc3823en>

Based on the work of Freddy Nachtergaele, Harrij van Velthuisen, Luc Verelst, Dave Wiberg, Matieu Henry, Federica Chiozza, Yusuf Yigini (Editors) And Ece Aksoy, Niels Batjes, Enoch Boateng, Günther Fischer, Arwyn Jones, Luca Montanarella, Xuezheng Shi, Sylvia Tramberend (Contributors).

The Harmonized World Soil Database version 2.0 (HWSD v2.0) is a unique global soil inventory providing information on the morphological, chemical and physical properties of soils at approximately 1 km resolution. Its main objective is to be useful for modelers and to serve as a basis for prospective studies on agroecological zoning, food security and the impacts of climate change. HWSD v2.0 also serves an educational function, illustrating the geographical distribution of soils as well as their properties globally. HWSD v2.0 is easily accessible and user-friendly.

# In Memoriam

In Memoriam  
VICTOR TARGULIAN  
1934-2023



An outstanding scientist, one of the leaders in world soil science, Doctor of Geography, Professor Victor Targulian passed away on April 1, 2023, after a long struggle with a deadly disease, at the age of 89.

V. Targulian was born on 10 August 1934 in Moscow, USSR. He graduated from Timiryazev Agricultural Academy. He got his first experience in soil science in the Dokuchaev Soil Science Institute, where he did extensive field work in very remote areas of the Arctic, East Siberia, Kamchatka, and the Far East to collect data on unexplored soils there for the State Soil Map of Russia, scale 1:1M.

Victor had two outstanding teachers – Prof. E. Ivanova and Academician I. Gerasimov, who proposed him to work in the new department of soil geography and geochemistry that he organized in the Institute of Geography, Academy of Sciences. In 1967 he got the degree of a full doctor (Doctor of Sciences, Geography), without the transitional Ph.D. stage, for his comprehensive monograph “Pedogenesis and weathering in cold humid areas” (published in Russian in 1971). This study made a revolution in understanding the soil genesis in the cold climates of Russia. His studies of northern soils were highly evaluated not only in Russia but also by many specialists in the arctic soils of North America. However, the worldwide recognition came to Prof. V.O. Targulian several years later, in 1974 during the X International Congress of Soil Science in Moscow. He organized and carried out the most detailed study of soil genesis ever in worldwide practice and prepared the brilliant field excursion. Two books ‘Arrangement, composition and genesis of sod-pale-podzolic soil derived from mantle loams’ (separately morphological and analytical studies) published in both English and Russian made him known as a deep and very skillful specialist in soil morphology and genesis.

In 1976 he took part in a long-term expedition to the tropical islands of the Pacific Ocean on board a scientific vessel. After this experience and following overseas trips, Victor Targulian entered the club of “global pedologists”. In 1989-90 he organized the team and prepared together with R. Arnold, I. Szabolc, R. Dudal, D. Yaalon and many other prominent specialists the book “Global Soil Change” (1990), which reflected the response of the world soil community to global changes.

Victor Targulian is also widely known for his theoretical papers on the pedogenesis on global scale, soil behavior in time, soil memory, characteristic time in soils and many other basic points.

As an IUSS officer (1990-2006) he has been very active – permanently organizing international meetings, expeditions and publications. He participated in nine World Congresses of soil science.

Prof. Dr. Victor Targulian also was an outstanding speaker, a bright lecturer and an admired teacher, a smart editor, rigorous and thorough reviewer. His last papers and books on the development of soils in time and soil memory of biosphere interactions, and very detailed and deep investigations of soil matter of recent and very old soils together with his students make him one of the most readable pedologist.

Awards - 2006, Prof. Targulian is the first winner of the Dokuchaev Award of the IUSS. In 2011 he was awarded by Dokuchaev Gold Medal of the Russian Academy of Sciences.