

# International Union of Soil Science Societies Commission on Paleopedology

<< R E R U M C O G N O S C E R E C A U S A S >>

## N e w s l e t t e r N o . 2 1

M a y 2 0 1 0

### Commission officers:

**President:** Dr. Edoardo A.C. Costantini  
Research centre for agrobiological and pedology  
Piazza M. D'Azeglio 30, 50121 Firenze, Italy  
[www.soilmaps.it](http://www.soilmaps.it)  
Phone: +39-055-24912  
Fax: +39-055-241485  
e-mail [edoardo.costantini@entecra.it](mailto:edoardo.costantini@entecra.it)

**Vice-President:** Dr. Alexander O. Makeev  
MSU-RAS Soil Institute, Science Park of Moscow University, building 1, Vorobyovy Goru, 119899,  
Moscow, Russia  
Phone: +7 095 930 8952  
Fax: +7 095 930 8963  
e-mail: [makeev@fadr.msu.ru](mailto:makeev@fadr.msu.ru)

**Secretary:** Dr. Francesco Malucelli  
Geological Seismic and Soil Survey - Emilia-Romagna Region Italy  
Viale Silvani, 4/3  
40122 Bologna  
Italy  
Phone: +39-051 284724  
Fax: +39-051 284208  
E-mail: [fmalucelli@regione.emilia-romagna.it](mailto:fmalucelli@regione.emilia-romagna.it)

**Paleopedology Commission liaison with IUSS, INQUA and EGU**

### Contents

- Note from the President
- Commission meetings
- Commission publications
- Forthcoming activities

## **Note from the President**

Dear paleopedologists,  
this newsletter is intended to inform you about the most recent activities of the Commission on Paleopedology, in particular those related to our last events, which took place in November 2009 in Mexico, as well as to provide a summary of the most significant activities carried out during the current inter congress time, that is, between the World Soil Congresses in Philadelphia 2006 and Brisbane 2010.

It may be relevant to bring the rationale and current position of Paleopedology in the scientific community in mind again. The objectives of Paleopedology include the recognition, study and interpretation of paleosols, defined as soils which have formed in landscapes of the past. Both buried and non-buried (relict) paleosols are recognized. The group of people dealing with Paleopedology has the status of a Commission in IUSS, within Division 1 (Soil in Space and Time). In INQUA, they are part of the TERPRO Commission (terrestrial processes), but they must carry on an international project financed by INQUA to be recognized as a focus area. Current officers of the commission, Edoardo Costantini, president, and Alexander Makeev, vice president, will be substituted this year, at the end of their term, which will be in August in Brisbane, by Daniela Sauer and Sergey Sedov, respectively.

The vision of the commission on Paleopedology is pinpointed by three pillars: Interdisciplinarity, Projects, and Dissemination.

As for interdisciplinarity, we have many relationships with other commissions in IUSS, EGU and INQUA. In particular, we had many joint conferences with IUSS commissions of Division 1, like, for instance with:

- 1.1 Soil morphology and micromorphology (conference in Chengdu, China 2008: Session 6),
- 1.2 Soil geography (Mexico 2009: Session 5, micromorphology workshop and fieldtrip),
- 1.3 Soil genesis (Mexico 2005),
- 1.4 Soil classification (Florence 2004 and fieldtrip),
- 1.5 Pedometrics (joint symposium in Brisbane 2010).

Every four years we participate in the Conferences of a Cryosol working group of IUSS with a special session on paleosols (Archangelsk, 2005, Ulan-Ude, 2009). Our commitment in being interdisciplinary as well as transdisciplinary will continue in the future activities of the group, in terms of inter- and transdisciplinary scientific meetings as well as project activities.

Although the efforts made by the Commission to initiate international paleopedological and interdisciplinary projects (EU projects, EU cost actions, INQUA projects) were not successful so far, it is envisaged to make other attempts in the next term of the Commission. Our web site can be also used as a forum to disseminate pertinent information and proposals.

One major effort with regard to international projects was the elaboration of a large scale EU project proposal, "TERRA-REACT", which was unfortunately rejected. The idea was to launch an interdisciplinary project, in which results obtained from different archives (lake sediments, speleothems, paleosols etc.) are combined. Future attempts will go in the same direction. One aim of these efforts will be to raise the awareness of the value of paleosols as palaeo-environmental archives in communities outside paleopedology. Hence, all paleopedologists are encouraged to collaborate in interdisciplinary projects. Good opportunities to find partners for such ideas are particularly the EGU and INQUA congresses, where colleagues from different disciplines come together.

Dissemination of Paleopedology is lively maintained by means of our WEB site:  
<http://paleopedology.msu.ru> and open Forum at Google groups:

<http://groups.google.com/group/Paleopedology>

The Forum is well attended by 378 members with the number increasing and is a base for posting news on events and publications, related to paleopedology and also for questions and discussions. We hope that the use of the Forum will intensify in the future and invite our members to post their messages and news. Another way of dissemination is the organization of the conferences, workshops and sessions on Paleopedology, and by the publication of our conference papers in peer-reviewed journals.

### **Commission meetings.**

**The most important event in 2007** was the participation at the XVII INQUA Congress held at Cairns, Australia, 20 July – 3 August 2007.

The commission collaborated in the preparation of three oral and as many poster sessions:

1. "Pedogenesis Analysis of Aeolian Deposits",  
Conveners: Martin Iriondo and Birgit Terhorst.
2. "Pedogenic carbonate as paleoenvironmental and chronological proxy in Quaternary research: potential and limitations",  
Conveners: Konstantin Pustovoytov and Marie-Agnes Courty.
3. "Timescales of soil formation", Conveners: Daniela Sauer and Edoardo Costantini

All sessions have seen a wide participation and a good attendance. Some papers related to Paleopedology were also presented in three other sessions: Aeolian dust and environmental change, Quaternary circum alpine stratigraphy, and Dynamics of terrestrial systems: geology, biogeochemistry, climate.

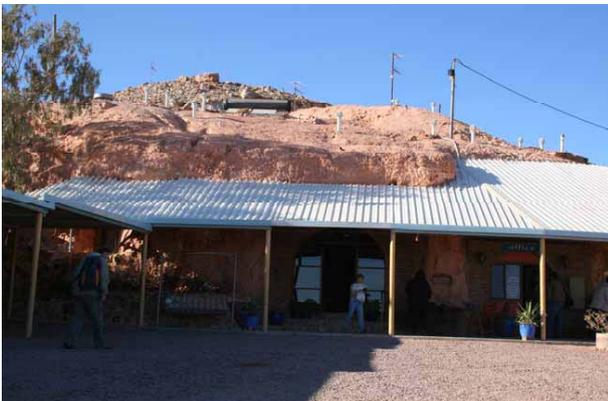


Figure 1 – Hotel entrance, leading to rooms excavated in a relict paleosol of the Australian outback (due to opal mining, Cober Pedy).



Figure 2 – Australian paleosols of about 25 M years ago.

**In the year 2008**, the Paleopedology commission organized the international conference & field workshop on Paleopedology “Palaeosols, Geomorphic Evolution of Landscape and Paleoclimate Change” at Chennai, India, January 10-14, 2008.

([http://groups.google.com/group/Paleopedology/browse\\_thread/thread/9698c94addfe892c](http://groups.google.com/group/Paleopedology/browse_thread/thread/9698c94addfe892c))

A paleopedological session was moreover held within the EGU (European Geosciences Union) General Assembly in Vienna, April 13-18, 2008:

Soils and pedosediments as environmental archives of the last 130 000 years

Convener: P. Kühn, Co-Convener: B. Terhorst



Figure 3 – Opening ceremony of the international conference & field workshop on Paleopedology at Chennai - India



Figure 4 – Petroplinthic landscape near Chennai-India



Figure 5 – Sunset on traditional production of bricks from fine alluvial soils

**During the year 2009** Paleopedology Commission members participated and/or co-organized four international Conferences, as described below:

At the EGU (European Geosciences Union) General Assembly in Vienna, April, 19-24, 2009, a paleopedological session similar to the successful session of 2008 was held:

Soils and pedosediments as environmental archives

Convener: P. Kühn, Co-Convener: B. Terhorst

**V International Conference on Cryopedology**, September 14-20, 2009, Ulan-Ude, Buryatia, Russia.

The Conference was held by Cryosol Working Group of the IUSS and International Permafrost Association (IPA). The Commission on Paleopedology was active in the organization of the

conference. The meeting was hosted by the Institute of General and Experimental Biology, Siberian Branch of Russian Academy of Sciences, Ulan-Ude. The focus of the meeting was DIVERSITY OF FROST-AFFECTED SOILS AND THEIR ROLE IN ECOSYSTEMS. More than 110 participants from six different countries representing many different areas of soil science but all with an active interest in Cryopedology attended the meeting. The first 4 days in Ulan-Ude were formal sessions, where 74 papers were presented as well as 25 posters dealing with all aspects of Cryosols. There was a very active discussion of the different papers, and recommendations were made for mitigation of consequences of global climate change for permafrost-affected soils. A special session “Paleocryosols as indicators of the past environments and climate change” was held during the Conference with more than 10 presentations. The paper presented by Stanislav Gubin et al., on paleosols of ice-loess (yedoma) complexes of the Russian Far-East was among the most interesting and complete, providing an answer to the mystery of a high productivity of Beringia landscapes in extreme climates during the LGM, based on paleosol features. The Conference was followed by a three days field trip to the Vitim Plateau in Central Buryatia and Lake Baikal area that left very good impressions among all participants. A full version of the report, prepared by Marek Drewnik and Sergey Goryachkin, is available in IUSS Bulletin #115.

([http://iuss.org/Bulletins/IUSS\\_Bulletin\\_115\\_hires.pdf](http://iuss.org/Bulletins/IUSS_Bulletin_115_hires.pdf)).

### **Report on the international Conference “Soil geography; new horizons”, Huatulco, Mexico, November 2009**

The international congress “Soil geography; new horizons” was held in Huatulco (Oaxaca, Mexico) from the 16<sup>th</sup> to the 20<sup>th</sup> November 2009, organized by UNAM (Universidad Nacional Autonoma del Mexico) and INEGI (Instituto Nacional de Estadística y Geografía del Mexico), sponsored by IUSS (International Union of Soil Science), SLCS (Latin American Society of Soil Science), SMCS (Mexican Society of Soil Science), ECSSS (European Confederation of Soil Science Societies), and IES (Institute for Environment and Sustainability of the Joint Research Center of the European Union).

The scientific program considered the following sections:

1. theory and methods of soil geography;
2. pedometrics, digital soil mapping, and soil geography;
3. landscape dynamics, soil geomorphology, and hydrogeology;
4. soil classification and soil mapping units: theory and application;
5. driving forces of soil diversity: lithogenic versus climatic factors;
6. paleosols in the present and past soilscapes;
7. pedodiversity and soil geography;
8. mountainous tropical soilscapes.

More than 200 scientists from 50 countries attended the congress and presented various research works.

Prof. Blum’s key presentation regarded an innovative theory, expressing the pedogenetic processes in terms of energy, which was found very provoking. This could be the subject of many research works in the near future.

Many works in the following three sections stressed the importance of geomorphological analysis in the soil cartography process, as the pedogenetic factor relief was among the most important in explaining the model of soil distribution in a region. The integration of geodatabases of soils and other natural resources was acknowledged as a fundamental step to improve soil cartography. Standardization and harmonization of data were also recognised in the digital storage process. The definition of a common ontology, including common rules and definitions in soil science, was also

recognised, so more exchange between soil scientists is needed in the future. The final aim of this work should be to progressively reduce tacit knowledge, and to make pedology a science more user friendly and understandable to the overall public. The general use of the WRB classification in soil cartography at national and regional levels (1:250,000 and smaller scales) was one of the recommended standardization systems. In the long run, efforts are undertaken to develop a Universal Soil Classification as a world-wide accepted common language for soil classification and mapping.

During the 4<sup>th</sup> session Dr. Schad presented the “Guidelines for constructing small-scale map legends using the World Reference Base for Soil Resources”. The reference WRB classification was the second version, published in 2006. In this version two new reference groups were created and a larger number of qualifiers for each reference group was added. Qualifiers were organized in prefixes and suffixes. For their use, rules and a fixed order were defined. The new concept presented by Dr. Schad during the congress included the possibility to give a different order to the qualifiers when using the WRB classification for profile classification or for creating mapping units, according to the cartographic necessities. The presented document was defined as an “in fieri” publication and everybody was invited to participate to its improvement, taking advantage of local experiences. During the discussion, which continued even in a special round table in the following day, the majority of the attending colleagues suggested not to classify profiles and types of map units in different ways, but they welcomed the possibility of using WRB flexibly to create cartographic units. (In April 2010 Dr. Schad informed the WRB community that the "Guidelines for constructing small-scale map legends using the WRB" have been electronically published as an amendment to WRB 2006/07 and are available on the WRB homepage at FAO: <http://www.fao.org/nr/land/soils/soil/wrb-documents/en/>. He pointed out that comments to these guidelines are welcome.)

Another very interesting talk given by Dr. Wiesmeier and coll. about “Digital mapping of soil organic carbon in a semi-arid grassland of Northern China”. The research work concerned an innovative spatialization method which used random forest modelling and CART classification, in term of accuracy, better than those obtained by linear regression models.

During the following sessions the soil distribution of many environments and relative soil-landscape models were presented, such as of the karstic peninsula of Yucatan (Mexico), the pingo-islands in Russia, the Cape region of South Africa, the tropical environments of Sierra Madre del Sur (Mexico), and other Mexican, Russian and African environments. Among the presentations, the one of Søren Torp titled “Soil mapping and N-leaching modelling of intensively managed farmland in the Norsminde fiord catchment (Denmark)” was particularly interesting. It dealt with an application of geo-electrical scanning with electromagnetic induction technology (EM38), aimed at large scale cartography of soil characteristics related to the N-leaching managing. Other examples of pedological cartography with deterministic approach were presented during the 4<sup>th</sup>, 5<sup>th</sup> and 8<sup>th</sup> sections.

The relevance of the anthropogenic factor on pedogenesis was many times indicated as a disturbing agent in the natural evolution of soils, and thus it was suggested to properly consider this factor in the mapping process. A considerable success was the work of Prof. Carmelo Dazzi and colleagues "Soilscape order and disorder: is land use change a cause of loss of pedodiversity?", in which a model of soil and landscape evolution for a whole Municipality in Sicily was proposed, which indicated for the coming years, the almost complete loss of natural soils and their replacement by anthropogenic soils, only suitable for viticulture.

In the Paleopedology session, titled “Paleosols in the present and past soilscales” two interesting reports on the soils of the Mayan archaeological sites were presented, one of Dr. Timothy Beach "Ancient Maya wetland fields: two models based on multiple proxies" and the other by R. Terry

and R. Burnett "Stable carbon isotope evidence of ancient Maya agriculture at Tikal, Guatemala. These talks were followed by a methodological report of Edoardo Costantini and Simone Priori on "The pedostratigraphic study of the soil cover for the geomorphological, tectonic-stratigraphic, and paleoclimatic reconstructions", the work of Daniela Sauer and collaborators about pedogenesis on marine terraces in southern Italy, and a series of case studies, including those by Cabadas –Báez and co-workers on "Pedosediments Karstic of sinkholes in the eolianites of the NE of Quintana Roo, Mexico", where a model of the genesis of soils and forms in karst environment was described. The model predicts a small but variable contribution of the insoluble residue of limestone to the soil genesis during the Holocene, while the soil mass is by far constituted of aeolian and colluvial sediments. Other oral and poster presentations dealt with case studies covering a wide range of topics: reconstruction of Triassic (Arefiev and Kuznetsova) and MIS3 (Rusakov) soils, soil-archaeological research in the Palaeolithic (Sedov), Medieval Russian (Egovatova and Golyeva) and Classic Mesoamerican (Rivera et al.) archaeological sites.

The session on pedodiversity attracted a large audience, a sign of the growing interest in this emerging subject. Of particular value was the paper by Viktor Targulian and Maria.Gerasimova "Soil geography: Geography of soil systems and soil bodies", where a distinction was made between the concepts of soil as a functional system and a natural (or artificial) body. It was shown how the two concepts may differ, and how this has profound implications for mapping and monitoring soil properties. In the case of soil as functional system, a much closer scanning time and space is required, that includes the multiple phases of soil, like moisture and temperature regimes, biomass production, biogeochemical cycles, the aeolian, fluvial, colluvial contributions etc.



Figure 6 – Snapshot of the participants at Mexico 2009

The award for the best poster presented during the congress went to the work "Soil organic carbon stocks variations in Italy during the last three decades," in which Fantappiè M. et al. documented losses of carbon in the '90s in Italy and the subsequent slight recovery.

During the field trip after the conference it was remarkable to observe the environmental unsustainability of many urban developments and farming systems that, just likewise in richer countries, cause soil degradation. In the case of Mexico, they have historically led to the

abandonment of areas heavily populated, and now to a desertification that increasingly devastates large areas.



Figure 7 – Unsustainable use and soil degradation in the Oaxaca region



Figure 8 – Well preserved cactus forest. Traditional salt extraction in the background.

**Report on the International Workshop: “Micromorphology for paleopedological and geoarchaeological research” November 25-28, UNAM, Mexico City, Mexico. (Sergey Sedov)**

The International Workshop: “Micromorphology for paleopedological and geoarchaeological research” was organized by and held in the Institute of Geology and Institute of Anthropological Research National University of Mexico (UNAM), being sponsored by the International Comm. on Paleopedology and approved by the IUSS Commission 1.1 - Soil morphology and micromorphology and International Archaeological Soil Micromorphology Working Group. It was linked to the International Conference “Soil Geography – New Horizons” and took place immediately after its finish – so that a number of the international participants of the Conference could attend also the Workshop. The motivation of the organizers was to arrange a meeting that would be:

- interdisciplinary, bringing together pedologists and archaeologists interested in application of microscopic methods to a wide spectrum of ancient soil and soil-related objects
- inter-generational, involving experienced scientists together with the beginners, especially students of the UNAM Postgraduate programs in Anthropology and Earth Sciences.

The first day was reserved for oral and poster presentations. The oral session included 4 invited lectures: V. Targulian spoke about the diversity, “memory” and dynamics of the mountainous soils, demonstrating inherited nature of major part of fine earth in these soil bodies and warning about irreversible character of its loss in case of accelerated erosion. D. Sauer and K. Pustovoirov considered the paleoenvironmental implications of pedogenic silica and carbonates, proving that the latter could provide records with high temporal resolution, applicable also to the archaeological contexts. T. Beach and S. Sedov presented soil-archaeological studies in 2 key areas of the pre-Hispanic cultures in Mesoamerica: Maya Lowlands and Teotihuacan. The poster session included 23 papers (most of them by postgraduate students) covering a very wide spectrum of paleopedological and geoarchaeological topics, from pre-Quaternary paleosols to deterioration and conservation of historical heritage. All authors had a chance to present their posters giving a 5-minutes talk and then discuss it with all interested participants.

The second day was completely dedicated to the microscopy session, during which the participants, who brought their thin sections, could exchange their observations and interpretations. Some of the participants found this experience fruitful and interesting, whereas others considered it to be too chaotic and disordered. In future, this activity should be modified to make it more efficient and useful for everybody.

During the last 2 days (Nov. 27-28) the field excursion was held, which included the Quaternary volcanic and alluvial paleosol sequences of Mexico and Tlaxcala Basins and the world-famous archaeological sites of Teotihuacan and Cacaxtla. The excursion had an improvised continuation: most participants decided to take part in the field work of the German Research Foundation (DFG) project “Pedogenic Carbonates as a proxy of past climatic change in Mexico” and, together with the project team, studied calcic paleosols in the Pleistocene alluvial sequences of Puebla state. In general the Workshop gave a positive experience of small, flexible, accessible and productive meeting, linked to a large-scale international event.

## **Commission publications**

**In the year 2007**, the papers on Paleopedology presented at the International Conference of Mexico city 2005 “Global Soil Change” were published in *Catena*, 71, 3 (2007), editors E. Solleiro, and in *Revista Mexicana de Geologia*, 24, 2 (2007), editors C. Siebe, P.M. Jacobs and D.D. Richter.

All abstracts of the INQUA Congress 2007 in Cairns were published in *Quaternary International*, volume 167-168, Supplement.

**In the year 2008**, six papers presented at the symposium “Imprint of Environmental Change on Paleosols” held during the 18<sup>th</sup> World Congress of Soil Science (WCSS), July 9–15, 2006 in Philadelphia (Pennsylvania, USA) have been published in August 2008 in the *Journal of Plant Nutrition and Soil Science*, 171 (4), editors: D. Sauer, R. Jahn.

The papers are:

- (1) D. Sauer et al.: Podzol development with time in sandy beach deposits in southern Norway;
- (2) I. V. Kovda et al.: PaleoVertisols of the northwest Caucasus: (Micro)morphological, physical, chemical, and isotopic constraints on early to late Pleistocene climate;
- (3) S. Priori et al.: Pedostratigraphy of Terra Rossa and Quaternary geological evolution of a lacustrine limestone plateau in central Italy;
- (4) A. Tsatskin: Near-surface paleosols in coastal sands at the outlet of Hadera stream (Israel) in the light of archeology and luminescence chronology;
- (5) M. Wieder et al.: Paleosols of the southern coastal plain of Israel;
- (6) X. F. Hu: Yellow-brown earth on Quaternary red clay in Langxi County, Anhui Province in subtropical China: Evidence for paleoclimatic change in late Quaternary period.

**In the year 2009**, papers presented during the International INQUA Congress 2007 in Cairns (Australia) and during the conference in Chennai were published in *Quaternary International* vol. 209 (2009) guest editors: E. Costantini, A. Makeev, D. Sauer.

The volume, titled “Recent Developments and New Frontiers in Palaeopedology“, included papers about:

### **Pedogenic Processes and Their Rates**

- Vertisols of India
- Chinese Loess Plateau
- Albeluvisol development with time in loamy marine sediments of southern Norway
- Holocene Mediterranean floodplain

### **Periglacial Sediments, Loess and Dust**

- Geomorphological processes in the eastern Prealps (Austria)
- Pedogenic alteration of aeolian sediments in the upper loess mantles of the Russian Plain
- Characteristics of eolian dust deposits across south-eastern Australia
- Middle Holocene eolian deposits of the Elsa River basin (central Italy)

### **New Concepts in Paleopedology and Soil Heritage Documentation, Use of Paleopedology in Interdisciplinary Studies**

- Multisol – a proposal
- The soil cultural heritage of Italy: Geodatabase, maps, and pedodiversity evaluation
- Local Holocene environmental indicators in Upper Mesopotamia
- Calcareous duricrust, Al Qasim Province, Saudi Arabia: Occurrence and origin
- Magnetic parameters reflecting pedogenesis in Pleistocene loess deposits of Argentina

### **Forthcoming activities for the year 2010.**

As for the forthcoming events of the year 2010, the Paleopedology Commission is organizing three sessions within the World Congress of IUSS in Brisbane, Australia. In particular, within Division 1- Soil in Space and Time, and in collaboration with the Commission on Pedometrics: session D1.2 Modelling direction and rates of soil formation in time; as IUSS Commission: 1.6.1 Impact of aeolian sediments on pedogenic processes and soil morphology, and 1.6.2 Genesis and functions of soils and paleosols in karst environments.

Paleopedology related sessions at the EGU (European Geosciences Union) General Assembly in Vienna (May, 2-7, 2010) are:

Archaeopedology and Archaeological Soil Micromorphology

Convener: Luca Trombino, Co-Conveners: Martine Gérard, Donald Davidson

From rock to soil and back to rock (including Philippe Duchaufour Medal Lecture)

Convener: Martine Gérard, Co-Conveners: Giuseppe Corti, Alberto Agnelli, Luca Trombino

Climatic and environmental magnetic (paleo-)signatures in waters, ice, soils, and sediments

Convener: Nicolas Thouveny

### **Future meeting and summer school.**

August 2-7 2010 Priobye loess plateau near Novosibirsk (Russia)

The Paleopedology Commission will take active role in a new Paleopedology summer school. The participants will get lectures on the major aspects of paleopedology and practice in field studies at the marvelous loess-paleosol sections at the bank of Ob river, covering the major part of Pleistocene.

For those who are interested in taking part in the summer school this year or next please contact prof. Maria Dergacheva ([mid555@yandex.ru](mailto:mid555@yandex.ru)).

5 September - 10 September 2010 Klosters, Switzerland,

The Paleopedology Commission will collaborate to the International Summer School on Geochronology that will be organized by the University of Zurich, Suisse.

<http://www.geo.uzh.ch/geochronology/>

Summer 2011 International conference & field workshop on Paleopedology in Germany.

It will be organized by Daniela Sauer and colleagues. Details will be announced in August at the World Congress in Brisbane and will at the same time be published on the paleopedology web site and google group.