Paleopedology

newsletter

IUSS Commission 1.6–Paleopedology
INQUA Paleopedology Working Group

Issue 33, December 2023

Paleopedology Newsletter is a joint initiative of the International Union of Soil Sciences (IUSS) Commission 1.6–Paleopedology and INQUA Paleopedology Working Group.

IUSS Commission 1.6–Paleopedology

Chair: Maria Bronnikova, mabro@nmsu.edu

Vice Chair: Elizabeth Solleiro Rebolledo, solleiro@geologia.unam.mx

Secretary: Fatima Kurbanova, fatima.kurbanova@igras.ru

INQUA Paleopedology Working Group leaders:

Maria Bronnikova

Elizabeth Solleiro Rebolledo

Tobias Sprafke

Editor: Lilit Pogosyan, lilit.pogosyan@inecol.mx

Cover photo: an episode from a field excursion of the XIV International symposium and field workshop on paleopedology Soil Memory of Contemporary and paleo environments, October 7th-15th 2023. (For more details about the event see pages 5-7). Photo courtesy: Curtis Monger.

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Preface

Dear Friend of Paleopedology,

Welcome to the December 2023 Newsletter!

It was ment to be issued in November, hovewer, we recieved a number of important contriburions and announmsments that we wanted to include in this edition. It is great to be a part of such an active community and we always welcome your contibutions and suggestions.

I hope you will enjoy the reading and I am looking forwad to hearing from you next year.

Merry Christmas!

Best wishes,

Lilit Pogosyan

Recent activities

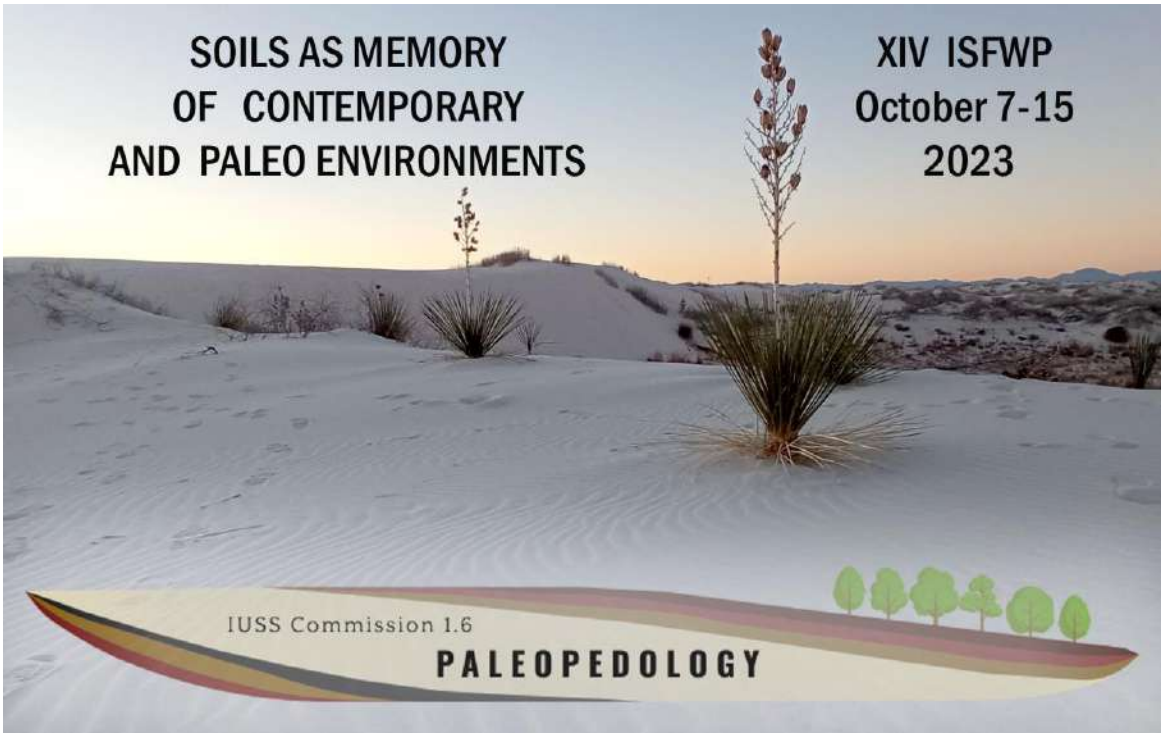
The Mexican Paleopedology Group together with the Commission 1.6 Paleopedology of the IUSS and the Paleopedology Working Group of the INQUA organized the **first online International Course on Paleopedology,** from March 6 to 10th 2023. The course took place under the zoom platform, hosted by the Institute of Geology (UNAM), completely free. International known specialists offered, during the five-days, basic concepts of soil genesis, soil development in time and space, soil as a recording system and a memory of landscape, and soil approaches in geoarchaeology were. The specialist group included Alexander Makeev, Maria Bronnikova, Alexandra Golyeva, Marie Agnes Courty, Fabio Scarciglia, Curtis Monger, Daniela Sauer, Sergey Sedov and Elizabeth Solleiro. The coordination of the event was held by Daisy Valera.

165 participants attended the course from 33 countries: Algeria: 13, Argentina: 5, Bangladesh: 7, Belgium: 1, Botwana: 1, Canada: 1, Chile: 1, China: 1, Colombia: 1, Croatia: 2, Ecuador: 1, France: 1, Germany: 1, Greece: 1, India: 12, Indonesia: 1, Ireland: 1, Israel: 3, Italy: 3, Ivory Coast: 1, Kuwait: 1, Mexico: 33, Nigeria: 1, Pakistan: 27, Philippines: 1, Poland: 5, Russia: 19, Spain: 1, Tebessa: 1, Thailand: 1, Tunisia: 3, Turkey: 2, USA: 12

75 PhD students, 49 masters 'students, 32 bachelor, and 9 participants with a technical career.

In this way, we consider the course has a wide impact in the international community.

Photo courtesy: J. Díaz-Ortega



XIV International symposium and field workshop on paleopedology Soil Memory of Contemporary and paleo environments, October 7th-15th 2023, Las Cruces, New Mexico State University, USA. Responsible organizers: Maria Bronnikova, Curtis Monger.

The XIV International symposium and field workshop on paleopedology "Soils as memory of contemporary and paleo environments" was a joint event of IUSS Commissions 1.6 Paleopedology, Commission 1.2 Soil Geography, and INQUA Paleopedology Working Group and New Mexico State University as a host institution. The event included October 7th – 9th academic sessions and round tables, and October 10 – 14th Field Workshop.

The symposium was opened by IUSS President Edoardo Costantini, who greeted the participants with a short presentation containing the latest updates on the forthcoming IUSS activities.

The sections of the symposium covered the following topics:

- Soil sedimentary sequences as environmental memory: pedostratigraphy, dating, soil genesis and paleoenvironmental reconstructions

- Surface soils and time factor: clues of contemporary and paleoenvironments, analogues of paleosols

- Organic and inorganic carbon as a part of soil memory

The third day of the symposium included the following round tables:

- Paleosols and paleolandscapes as cultural heritage (moderated by Edoardo A.C. Costantini and Elizabeth Solleiro Rebolledo)

- Understanding soils in time and space: concepts and challenges (moderated by Curtis Monger and Sergey Goryachkin)

- Contemporary methods of paleosol studies: profits of genetic approach, attraction and danger of geochemical coefficients (moderated by Sergey Sedov, and Maria Bronnikova, contributed by Nathan Sheldon)

Photo courtesy C. Monger

We also had a short In Memoriam session devoted to Victor O. Targulian, Peter W. Birkeland, Georges Stoops, Igor V. Ivanov, and Olga A. Chichagova.

The program included 39 oral presentations; 13 of those were delivered in person and 17 were presented online. About 60 participants from 16 countries has been registered. The highest number of participants was affiliated to Russia, Mexico and USA. Commission 1.6 officers are concerned about the low number of in person participants and even more about underrepresentation of European countries among the presentees. We hope that this situation is temporary and doesn't mean the lost of interest to paleopedology among European researchers.

Officers of Commissions 1.6 and 1.2 reached a preliminary agreement to make a call to publish the symposium proceedings in a special issue of one of the high-impact journals, such as Catena or Geoderma Regional.

The five-day Field Workshop was a highly enjoyable event that provided an opportunity to showcase significant achievements in the understanding of desert soils and their variability over time and space. This was made possible by the Desert Project, which has been running at New Mexico State University for over half a century. The workshop facilitated discussions on numerous contradictory problems and explored future perspectives in the study of soil memory. A field tour was conducted with the participation of specialists from the U.S. Department of Agriculture and the U.S. Forest Service. This enhanced the establishment and further enforcement of scientific contacts between basic and applied science, and the practical management of soil resources.

More information can be found here: https://sites.google.com/view/paleopedology/events/past-events?authuser=0

Photo courtesy M. Korkka

European Geosciences Union (EGU) General Assembly (23–28 April 2023, in Vienna and online)

Commission 1.6 annually participates in organizing paleosol–related sessions within the program block SSS3 – Soils as Records in Time and Space. This year we had a session Soils, sediments and buried structures as the memory of past environmental conditions and human impacts co-organized by CL1.2/GM11.

Conveners: Anna Schneider, Anna Andreetta, Rui Jorge Oliveira, Oren Ackermann, Pedro Trapero Fernández, Bento Caldeira, Maria Bronnikova.

The session included 9 oral presentations and 11 posters. Please, find more information here: https://meetingorganizer.copernicus.org/EGU23/session/45019

INQUA Congress 2023, 14-20 July 2023, Sapienza University of Rome, Italy.

INQUA 2023 "Time for change", July 14 to 20, 2023, Rome, Italy. Session, Paleosol memory of environmental change and man-landscape interactions: from soil profile to geosystem. Convenors: Elizabeth Solleiro-Rebolledo, Fabio Scarciglia

We received 24 abstracts to be considered for the session. 8 oral presentations were given and 5 posters were presented, dealing to paleoenvironmental reconstructions and geoarchaeological problems in different sites around the world.

Photo courtesy E. Solleiro Rebolledo

The paleopedology commission of the Brazilian Soil Science Society.

The first meeting of the Commission took place on August 1, 2023, as a part of two major events: the XXIII Latin American Congress of Soil Science (CLACS) and the XXXVIII Brazilian Congress of Soil Science (CBCS), which were held from July 30 to August 4, 2023, at the Costão do Santinho Resort in Florianópolis, Santa Catarina, Brazil.

The commission vice president, Marcia Regina Calegari (State University of West Parana, Brazil), moderated the session "Soil as a Memory of Climate and Environmental Changes."

Scientific presentations were made by Alexander Makeev (Moscow State University, Russia, "Soils and Climate: Past, Present, and Future") and Francisco Sergio Bernardes Ladeira (Campinas State University, Brazil, "Paleosols in Brazil: What is their (paleo)environmental significance?").

Alexander Makeev,
Chairman of the Paleopedology Commission,
V.V. Dokuchaev Soil Society,
Moscow State University, Russia.

Photo 1. Panel discussion on soils as a memory of climate and environmental changes. Francisco Ladeira (left), Marcia Regina Calegari (center), and Alexander Makeev (right). Photo 2. Discussion on the first meeting of the Brazilian paleopedology commission. ttps://solosfloripa2023.com.br/

Valdai Periglacial Conference And Field Symposium

August 25th–30th 2023

The conference was organized by the Institute of Geography, Russian Academy of Science (Moscow) with the support of the Soil Science Faculty, Lomonosov Moscow State University (Moscow), the Institute of Earth Sciences, Saint Petersburg State University (Saint Petersburg), the Faculty of Geography, Herzen State Pedagogical University of Russia (Saint Petersburg), Rostov Kremlin State Museum-Reserve (Rostov Veliky) and Russian Science Foundation.

The conference, focused on periglacial area of the Valdai glaciation (MIS 5d – MIS 2) of the East European Plain, covered a wide range of issues in Quaternary geology, geomorphology, paleoclimatology, soil science, cryolithology, and other related fields of knowledge in the. Particular attention was paid to the specific Late Valdai buried soil horizons, scattered pedogenetic features, and relict soilscapes, which largely determined the structure and properties of modern soils in the periglacial areas. The conference brought together more than fifty participants from various regions of Russia, including senior scientists and a large number of students and young scholars.

The conference included a two-day academic session that was held on the premises of the State Museum-Reserve "Rostov Kremlin", and a four-day field symposium. The field tour started at Rostov Veliky (Yaroslav Region, 200 km NE of Moscow) and ended at Suzdal (Vladimir Region, 200 km east of Moscow), presenting glacial uplands and end-moraine ridges, glaciofluvial plains, and lacustrine basins, typical for periglacial areas.

On the first day, the fluvial history of the Rostov Lowland was discussed. The glacial morphosculpture of the Borisoglebskaya Upland and lacustrine sedimentation as a factor in its post-glacial transformation were also discussed. The constitution of the mantle sediments, including buried soil horizons and pedosediments, was demonstrated (photo 1).

On the second and third days, the structure of the basement terraces of the Volga River valley and adjacent moraine ridges in the altitude range from 117 to 180 m above sea level was examined. Relict glacial relief of Moscow (Late Saalian) age and soils in bipartite sediments (cover layer on top of glacial till) were demonstrated. The absence of river terraces in the Upper Volga valley was shown, and aeolian reworking of the cover layer of bipartite sediments on basement terraces during the Late Glacial was demonstrated.

On the third and fourth days, participants in the field tour got familiar with the landscapes, soilscapes, and relict cryogenic polygonal microtopography of the Vladimir Opolye (high pre-Quaternary upland, exposed to intensive periglacial impact). Soils of the characteristic forms of paleocryogenic microtopography (main surfaces and closed depressions) were thoroughly examined (photo 2). The human development of Vladimir Opolie was also discussed based on geoarchaeological data.

The field tour followed the Golden Ring route with famous ancient Russian historical monuments that ensured a rich cultural program.

An extended conference English guidebook together with related scientific papers available at: http://eg.igras.ru/en/quarternea2023en/

Alexander Makeev,
Chairman of the paleopedology commission,
V.V. Dokuchaev Soil Society,
Moscow State University, Russia.

Photo courtesy A. Makeev

Future events and activities

THE PLACE AND DATE FOR THE NEXT PALEOPEDOLOGY SYMPOSIUM AND FIELD WORKSHOP HAVEN'T BEEN DEFINED YET.

IF YOU ARE EAGER TO HOST IT

PLEASE CONTACT MARIA BRONNIKOVA:

maria.bronnikova@ttu.edu

This picture of Santa Claus is here to draw your attention on this important call

Photo courtesy: M. Bronnikova

100 years of SOIL SCIENCE past achievements and future challenges

International Union of Soil Sciences

Centennial of the IUSS

Florence, Italy

May 19th - 21st, 2024

Centennial Celebration and Congress of the International Union of Soil Sciences
May 19-21, 2024 https://centennialiuss2024.org/

Please, find a short video-announce of the event. Abstracts submission deadline: 15 January 2024.

We would like to draw your special attention to all the sessions submitted on behalf of IUSS Division 1 (Soils in Space and Time).

+ 133836 - PREPARING THE NEXT GENERATION OF PEDOLOGISTS - NEEDS AND OPPORTUNITIES
+ 125400 - APPLICATIONS OF PROXIMAL SOIL SENSING TECHNOLOGIES AND BEYOND
+ 129252 - QUANTIFYING AND MAPPING SOIL FUNCTIONS
+ 129517 - DIGITAL SOIL MAPPING AND ASSESSMENT AT DIFFERENT SCALES – WHERE TO GO NEXT?
+ 131572 - ADVANCING QUANTITATIVE SOIL CLASSIFICATION: FROM SOIL PROFILES TO A DYNAMIC AND COMPREHENSIVE CLASSIFICATION SYSTEM
+ 133437 - NOVEL APPROACHES TO PROCESS-BASED MODELLING IN AGRICULTURAL SOILS
+ 133592 - DIGITAL SOIL MAPPING, DECISION SUPPORT TOOLS AND SOIL MONITORING SYSTEMS IN THE EU
+ 133601 - SOIL INFORMATION STANDARDS AND SYSTEMS - CURRENT INITIATIVES AND ADVANCES
+ 130893 - SOIL CLASSIFICATION: PAST AND PRESENT CONCEPTS AND SOLUTIONS
+ 133540 - THE BRIGHT FUTURE OF PEDOLOGY
+ 133768 - SOILS OF THE PAST FOR PRESENT AND FUTURE: MARKING THE 100TH BIRTHDAY OF DAN H. YAALON
+ 133613 - ADVANCES IN SOIL HEALTH MONITORING

Commission 1.6 Paleopedology invites you to contribute our session ID133768 Soils of the Past for Present and Future: Marking the 100th Birthday of Dan H. Yaalon. Conveners: Maria Bronnikova, Elizabeth Solleiro Rebolledo, Fabio Scarciglia

The motto of the section is "The past creates the present, the present creates the future". Soil development is dictated by soil forming factors and their changes in time which are usually triggered by climatic change and/or human impacts. Contemporary soils and soil cover cannot be wholly understood without comprehending the history of soils: their heritage based on former developments of environment and soil forming processes. At the same time, the knowledge of the past and understanding of the present of the soils and their environmental backgrounds can contribute to understanding the future of soil systems and their environment both in local and global contexts.

European Geosciences Union (EGU) General Assembly (14–19 April 2024, in Vienna & online)

SSS1.4 Soils as the memory of past environmental conditions and human impacts

https://meetingorganizer.copernicus.org/EGU24/session/50086

Conveners: Oren Ackermann, Maria Bronnikova, Martin Janovský, Anna Andreetta, Brad Sion

Session description:

Soils are the expression of complex relationships among soil-forming factors, a notion commonly referred to as the functional-factorial model of soil development. This basic principle of soil genesis drives the concept of soil memory: the capability of soil systems to retain information about environmental conditions and other intrinsic features (i.e., environmental indicators). As such, soils are valuable records of current and past environmental conditions that enable us to study their relevance as environmental archives among more common and extensively studied examples (e.g., sediments, glaciers and underground ice, speleothems, tree rings, etc.). Contemporary polygenetic surface soils (those that have endured one or more environmental changes), along with paleosols, offer valuable insights into the reconstruction of environmental factors present during their formation. These materials also help us unravel the relative influences of various environmental conditions, both local and regional, on soil formation. Despite the increasing consideration of palaeosols in sedimentary successions, studies of soils as part of soil-sedimentary record/memory are still underrepresented. This session is open to all contributions focused on the studies of palaeosols and contemporary polygenetic soils, including anthropogenic and anthropogenically affected ones, with a particular focus on their environmental history. We also encourage research related to soils, pedosediments, and soil materials from archaeological sites, and consider paleoenvironmental soil studies that blend novel methods of analysis, such as a variety biomarkers and isotopes, high-resolution visual recording in micromorphology, high-resolution X-ray tomography, micro-XRF for high-resolution chemical mapping, SIMS and NanoSIMS high-resolution secondary ion mass spectrometry), Raman Microspectroscopy, etc.

Submit your EGU24 abstract by 10 January!

Submit your regular abstract to the session of your choice by 10 January 2024, 13:00 CET.

Registration fee information is now available on the EGU24 website, registration will open mid-December.

If you have any questions, please do not hesitate to contact organizers: egu24@copernicus.org.

Other future events related to paleopedology

7th International Soil Classification Congress (ISCC) – June 3-9, 2024, Hokkaido, Japan

All details are available here: https://iscc2024.org/index.html

Registration deadline: January 19, 2024.

Due to this conference and field session focused on Andosols, the Working Group WRB will not host another field workshop in 2024. Thus, we highly recommend participation in this conference and associated discussions.

The next International Conference on Soil Micromorphology (ICSM) was not announced yet officially. We will share any news as they will appear. In the meantime, the preliminary announce says it was proposed to be held in Puno, Peru.

It is to be held in 02 – 05 December 2024 at the auditorium of Facultad de Ciencias Agrarias of Universidad Nacional del Altiplano in Puno and is meant "as a posthumous tribute to the Prof. Georges Stoops, who was repeatedly invited to the soil micromorphology courses offered in Latin America, and who was unable to attend due to the health reasons. This congress proposes to the micromorphologists community share in a unique natural environment rich in history as a community of friends enthusiastic about the study of micropedology. Professor Stoops, whom many of us knew, always imprinted his micromorphology work of human quality, making possible through his work a bridge of friendship, it is for this reason that the proposed special theme is "making Friends". This proposed conference seeks in addition to the exchange of knowledge, to strengthen the interaction and joint work of people with similar interested in different places of the world having than as axis the use of soil micromorphology."

We all are looking forward to receive any news about this event.

Archaeological Soil Micromorphology short intensive course at UCL (London)

The course is jointly run by Dr Manuel Arroyo-Kalin and Dr Richard I Macphail. Training days (10,12-17 February 2024) will comprise lectures followed by the study of specific thin sections. Reference collection self directed study, for more advanced practitioners, will run in parallel. Attendees with no prior experience should plan on attending the entire lecture programme. Experienced micromorphologists may attend lectures they are interested in, consult on their own research materials, and/or study the reference collections

Extra Practice Days: Given that many course attendees travel from different corners of the globe to London, reference collections will be made available for self-study between 20-23 February 2024 by special arrangement. If you wish to do so, please contact m.arroyo-kalin@ucl.ac.uk

Further details:

https://onlinestore.ucl.ac.uk/conferences-and-events/faculty-of-social-historical-sciences-c03/institute-of-archaeology-f31/f31-archaeological-soil-micromorphology-training-course-2024

The fifth Virtual Micromorphology Meeting (ViMi5) will take place the afternoons of Wednesday and Thursday the 24th and 25th of April, 2024 (UCT+1) as a joint venture of the University of Innsbruck, the Austrian Academy of Sciences and the University of Vienna.

To register, simply follow this Zoom link and fill out the form. You will be asked to add information about your interests and what you could/would like to show at the meeting, so that we can plan the event in the best possible way. Please feel free to share your micromorphological tastes and wishes with us. We count on your voices!

The ViMi5 workshop will have a mix of sessions: break-out rooms, live microscopy and methodological presentations. We are open to non-English sessions by/for students as well.

If you are interested in chairing any of these, do not hesitate to contact us at vimi.micromorph@gmail.com by 29th February, 2024.

Another tradition should be kept alive: the ViMi Student Prize for best microphotograph. The winner of this year's contest will receive an engraved sampling knife and a print copy of a selected micromorphology handbook. If you want to participate, send your microphotographs along with a description to vimi.micromorph@gmail.com.

A platform for discussion of micromorphology-related topics is available under this link (sign in to your google account and press the join button).

And if we forgot someone, or you know someone who would be interested in spending a few afternoons viewing, discussing, and sharing micromorphology, please feel free to circulate this information 😉

The organising team of ViMi5:

Susanna Cereda,

Mareike Stahlschmidt,

Lyndelle Webster,

Doris Jetzinger

Thomas Beard.

ARCHAEOLOGY, ENVIRONMENTAL CHANGES & GEO-CHEMISTRY RESEARCH GROUP

urban .brussels

International Workshop on Archaeological Soil Micromorphology and Phytoliths

The organizing committee is happy to announce that the next annual International Workshop on Archaeological Soil Micromorphology will be held at the Vrije Universiteit Brussel from the 6th to the 8th May 2024. The workshop is organised by the geoarchaeological team of the Archaeology, Environmental Changes & Geo-Chemistry Research Group (AMGC-VUB), with support from the Brussels Capital Region (Urban.Brussels).

The workshop will follow the tradition of the previous workshops: an informal meeting where participants are invited to bring their thin sections and where microscopy time and the exchange of ideas and experience prevail. 15 petrographic microscopes, two of which are equipped with fluorescence will be available. To assure sufficient microscopy time, there will be no oral presentation sessions, except for one or two key-note speeches. Instead, we will organize a poster session.

Registration and Expression of Interest:

If you are interested in attending the workshop, please submit an expression of interest using the registration form before the 15th of January 2024.

If you have any specific questions, do not hesitate to contact at yannick.george.devos@vub.be

The organizing committee:

Yannick Devos,

Luc Vrydaghs,

Mónica Alonso-Eguiluz,

Meihui Li

Axel Cerón González.

Publication activities

Journal of Plant Nutrition and Soil is still accepting the contributions for the special issue titled **"From parent rocks to soil: Co-evolution of structure and function during pedogenesis".** This issue is focused on fundamental understanding of the linkage of structure and function. Substantial progress has been achieved by experimental pedogenesis and the joint application of advanced spectroscopic, microscopic, and tomographic techniques and this knowledge is directly connected to soil functioning and therefore is important for understanding of soil health and sustainable land use development.

Further information on article types can be found at the following link: https://onlinelibrary.wiley.com/journal/15222624/homepage/sipedogenesis?=

Guest Editors Kai Uwe Totsche, Ingrid Kögel-Knabner, Nadja Ray.

Here we would like to announce some recent publications prepared by the authors who affiliated with Commission 1.6 activities:

E. Solleiro-Rebolledo, P. García-Ramírez, S. Sedov a, H. Cabadas-Báez c, Y. Rivera-Uria a, G. Ibarra-Arzave, T. Pi-Puig Interaction of geomorphic processes and long-term human impact in the soil evolution: A study case in the tropical area at Veracruz, Mexico // CATENA28 March 2023, https://doi.org/10.1016/j.catena.2023.107072

Anastasiia Kurgaeva, Sergey Sedov, Sol Moreno-Roso, Hermenegildo Barceinas Cruz, Beatriz Ortega Guerrero, Elizabeth Solleiro-Rebolledo, Andrei Sinitsyn Magnetic properties as indicators of pedogenic and pyrogenic processes at the Upper Paleolithic site of Kostenki 14. November 2023 Geoarchaeology6 DOI: 10.1002/gea.21985

Vladimir Sheinkman, Anastasiia Kurgaeva, Elena Bezrukova Multiphase cryogenesis and incipient paleosol development during MIS 2 in North-Western Siberia: Detailed chronostratigraphy, paleoenvironmental significance, and comparison with the global and European records // Quaternary International Available online 1 May 2023, https://doi.org/10.1016/j.quaint.2023.04.011

Sahar Maleki, Farhad Khormali, Manfred Frechen A loess-paleosol record of climate and vegetation change during the past 27,000 years from South-East of the Caspian Sea, Iran // Quaternary International, Volume 652, 10 April 2023, Pages 1-16, https://doi.org/10.1016/j.quaint.2022.12.011

Alexander Makeev, Alexey Rusakov, Pavel Kust, Marina Lebedeva, Olga Khokhlova Loess-paleosol sequence and environmental trends during the MIS5 at the southern margin of the Middle Russian Upland // Quaternary Science Reviews Available online 3 November 2023, https://doi.org/10.1016/j.quascirev.2023.108372

Terrazas-Mata, A., Pérez-Martínez, P, Cabadas-Báez H.V., Cruz-y-Cruz T., Menéndez-Iglesias B., Rodríguez-Rivas J., Pogosyan L, Fero M. 2023 Middle Stone Age at Equatorial Guinea: Technical and use-wear analysis of lithic bifacial points, L'Anthropologie, 127-5, 103213, https://doi.org/10.1016/j.anthro.2023.103213.

Anjali Kumari Reconstructing Paleolandscape and Soil Catena of the Dinosaur-Bearing Lameta Formation, Central India // November 2023, Eurasian Soil Science, DOI: 10.1134/S106422932360197X

We further introduce one selected paper recently published by Anjali Kumari , a member of our Paleopedology Community.

Anjali Kumari is an early career paleopedologist at the Department of Geology, Panjab University, Chandigarh (INDIA). She recently submitted her doctoral thesis and is actively seeking a postdoctoral position. Her primary research interests include Late Cretaceous sediments, micromorphology, and paleoclimate reconstruction, among other related themes. Actively contributing to paleopedology research, she communicates her findings through articles in journals and presentations at conferences. Her important and impactful contributions to the Catena, Cretaceous Research and Eurasian Soil Science are noteworthy. Her potential can be gauged from the fact that she has already garnered numerous award and fellowship at very onset of her research career.

Photo courtesy: A. Kumari

She can be contacted on ResearchGate and via email

Anjali Kumari **Reconstructing Paleolandscape and Soil Catena of the Dinosaur-Bearing Lameta Formation, Central India** 2023, Eurasian Soil Science, https://doi.org/10.1134/S106422932360197X

The present publication focuses on the dinosaur-bearing Lameta Formation in Central India, dating back to the Maastrichtian age and modified by soil processes. These sediments are closely linked to the Deccan Volcanics, enhancing their significance. The primary method employed in this study involves a thorough morphological and micromorphological analysis of Paleosol profiles. The study successfully identified and characterized eleven paleosol profiles within the Lower Limestone and Mottled Nodular Bed lithounits of the Lameta Formation in the Jabalpur subregion. Using pedogenic features, the study categorized these profiles into five pedotypes. These observed pedotypes consist of compound and composite paleosol profiles, including entisols, hydromorphic calcic-inceptisols, gleyed alfisols, and well-developed alfisols.The various soil types uncovered in this study helped us piece together the puzzle of the ancient landscape that indicates a Soil Catena. We discovered that the Lameta sediments, home to these buried stories, were laid down in a climate resembling a mix of seasonal wetlands and dry lands. The findings also suggest that the region experienced tropical warmth and humidity during this time.

In essence, this research transforms seemingly mundane sediment layers into a vibrant account of an ancient environment, where dinosaurs roamed amidst changing landscapes and fluctuating climates.

To read the article and see the illustrations please use this link: https://doi.org/10.1134/S106422932360197X

We have updated the **website of IUSS 1.6 Paleopedology commission**

https://sites.google.com/view/paleopedology/home

What was done:

- new interface, new logo, easy access to all information
- updated commission history
- updated information about conferences
- all newsletters are uploaded to the site
- new YouTube channel https://www.youtube.com/@paleosols with videos from conferences

Site includes next sections:

- Home page
- Commission history
- Meetings
- Newsletters
- Activities within INQUA

We would appreciate any ideas to improve our site and...

... we are excited to announce our plan to create a paleosol photo gallery on our site. If you have pictures of paleosols that you'd like to share with the paleosol community, please send them, along with a brief description, to our webmaster, Fatima Kurbanova fatima.kurbanova@igras.ru

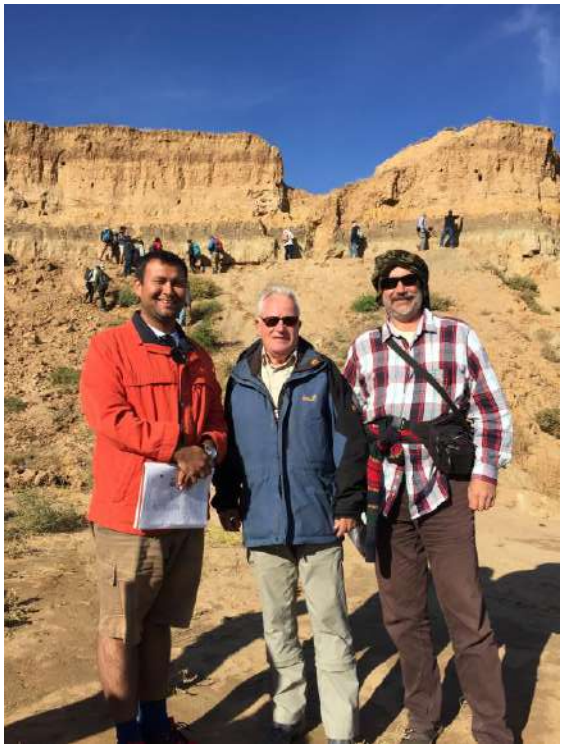


Photo: R. Kurbanov, A. Bronger, and S.Sedov
LoessFest 2018, Volgograd
photo courtesy S.Sedov

Loess as an Initial Stage of Soil Formation

Examples from Central Europe, China and Central Asia

A homage to Leo Semjonowisch BERG and his idea of "loess as a product of weathering and soil formation", 1916-1964

by Arnt Bronger

Department of Geography, University of Kiel, Germany

*edited by A. Makeev, S. Sedov and A. Kurgaeva

Preface

The efforts of Prof. Arnt Bronger had decisive impact on the re-vitalization of the INQUA Commission on Paleopedology when he was elected as its President at the XIVth INQUA Congress (Berlin, 1995). Starting from the meeting in Rauischholzhausen (Germany) in 1997, the Commission events were organized every year – being linked to the world congresses of INQUA and IUSS or independently. At the same time several fundamental publications by Arnt Bronger and John Catt (Commission Vice President) strengthened the theoretical and methodological background of paleosol research. On this basis a core group of enthusiastic Commission members was formed that maintained the high level of its activity during next decades.

Since early 1960-ies Prof. Arnt Bronger studied recent soils and paleosols of loess sequences. Starting with the sections in Baden he later worked in the Danubian basin and afterwards extended his research to the loess-paleosol sequences of China, Kashmir and Tajikistan. His detailed mineralogical investigations of all granulometric fractions permitted quantitative evaluation of weathering in paleosols and Holocene soils – until now unique in loess research. Prof. Bronger was also a persistent promoter of micromorphology as a key instrument for diagnostics of pedogenetic processes and their discrimination from diagenetic phenomena in the paleosol horizons. Arnt Bronger was one of the pioneers in using paleosols as a base for inter-regional correlation of the loess-paleosol sequences, recently summarised in Bol.Soc.Geol.Mex.2019.

In this year Prof Arnt Bronger turned 85, keeping on his scientific activities and interests. Below we publish his discussive contribution in which the impact of pedogenesis on loess properties is discussed – the viewpoint developed already in the early period of loess research and sustained on extensive experience accumulated by the author, especially on his detailed micromorphological observations.

Sergey Sedov

A valuable summary of various aspects of loess genesis with an extended bibliography was presented recently (Sprafke and Obreht, 2016). The summary, however, lacks analytical data or micromorphological observations regarding its genesis. It is generally accepted that a predominance of silt is a characteristic feature of loess, especially in its coarser fraction of 20-50 µm. This is valid for loesses in various parts of Europe and also e.g. in the Central Lowlands, especially in the Mississippi Area and the Great Plains of the U.S.A. (Follmer, 1979; Pécsi & Richter, 1996). The loesses in these areas contain various amounts of sand, especially fine sand (63-200 µm); if larger amounts of this fraction are present, the term sandy loess is used. In comparison, in the Loess Plateau of China or in Tajikistan loess contains only silt and clay with a maximum often in the Luochuan section (China) or in most cases in the Central Asian Kashmir Valley or in Tajikistan in the medium silt size (6-20 µm) for the entire Quaternary (Brunhes and Matuyama) period (Bronger & Heinkele, 1989; Bronger el al., 1993). This favours the theory that loess is in the first stage an accumulation of windblown silt. This was postulated for the loess in China especially e.g. by v. Richthofen (1882), Obruchev (1945, 1964), and Liu T.S. (1988), recently discussed e.g. by Makeev (2009) for the upper loess mantles of the Russian Plain.

The idea that loess is specific soil was expressed by Richthofen (1882); Obruchev (1964), Sibirtsev (1897), Kossovich (1911), Gerasimov (1962), Pécsi (1990), Makeev (2009), Astakhov (2022). L.S. Berg was the first to postulate that loess is a product of weathering and soil formation under dry climates (Berg, 1916, 1958, 1964). The processes are, however, not explained in detail. Based on the abcense of visible soil horizons, I.P. Gerasimov compared loess layers between well-defined layers of paleosols with Syrozems (Gerasimov (1962). Syrozems are soils of foothill areas in desert, semi-desert and dry-steppe areas in Middle Asia formed in loess (Soil classification of the USSR, 1977). The equivalent of Syrozem is Regosol (Siltic), in most cases Calcic or Protocalcic, Protic, and sometimes Yermic (in the case of vesicular pores) (IUSS Working Group WRB, 2022). However, we use the term Syrozem here to discuss pedogenetic impact on loess layers resulted in the initial soil formation.

The carbonate content is one of the most prominent characteristic features of loess. Calcium carbonate occurs in various forms: as primary calcites, irregularly distributed in the matrix, and as secondary calcites, e.g. calcite microlites, as calcite needles (sometimes called lublinites) and secondary calcites in root channels - as signs of (high) bicarbonate metabolism. The primary calcite grains clearly indicate that they were windblown with dust together with other mineral particles (Fig. 1). The secondary carbonates often are present as calcite needles ("lublinites") in voids (Fig. 2). Similar picture was described in the loess profile in Heitesheim, South Baden, Germany (Bronger 1966), or in the Dilpur loess profile, Kashmir Basin, India (Bronger et al., 1987) or in Karamaydan, Tajikistan (Bronger et al., 1998). The secondary carbonates of silt size often completely fill root channels, as a form of macroscopically visible pseudomycelium (Figs. 3, 4). Similar picture was described in the transitional horizon between PKXI and the overlying loess in Karamaydan, Tajikistan (Bronger et al., 1998) or the Dilpur loess profile, Kashmir Basin, India (Bronger et al., 1987). They may also fill excrements of roots or enchytraea in the partly fine spongy fabric including microlites and calcite needles in the A(Ca) horizon of the modern Chernozem near Novi Sad, Vojvodina, Serbia (Fig. 5, Bronger, 1976).

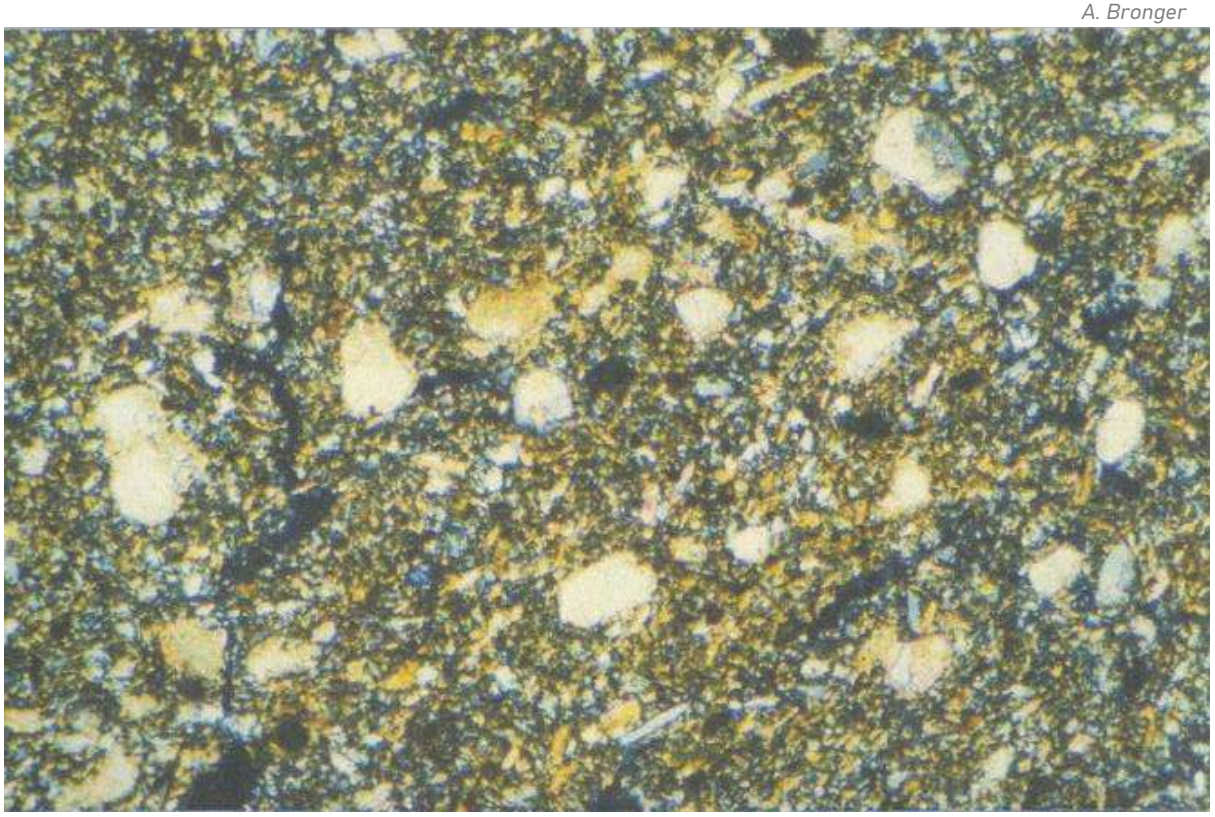


Fig. 1. Primary calcites, irregularly distributed in the matrix, in typical loess above the PK I in Karamaydan/Tajikistan. XPL. Width of view is 2 mm. Photo courtesy A. Bronger.

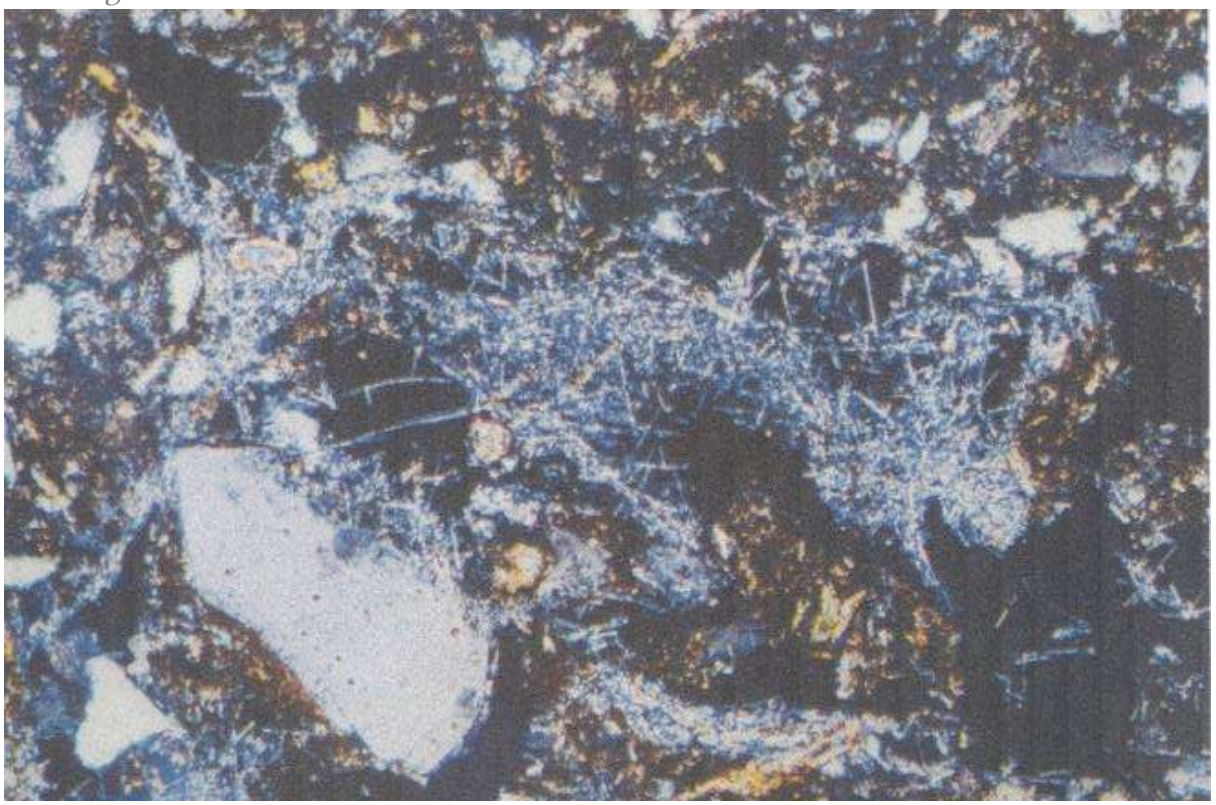


Fig. 2. Calcite needles ("lublinites") in voids. fA(Ca) horizon, Bácsalmás/Hungary. XPL. Width of view is 2 mm (Bronger, 1976).

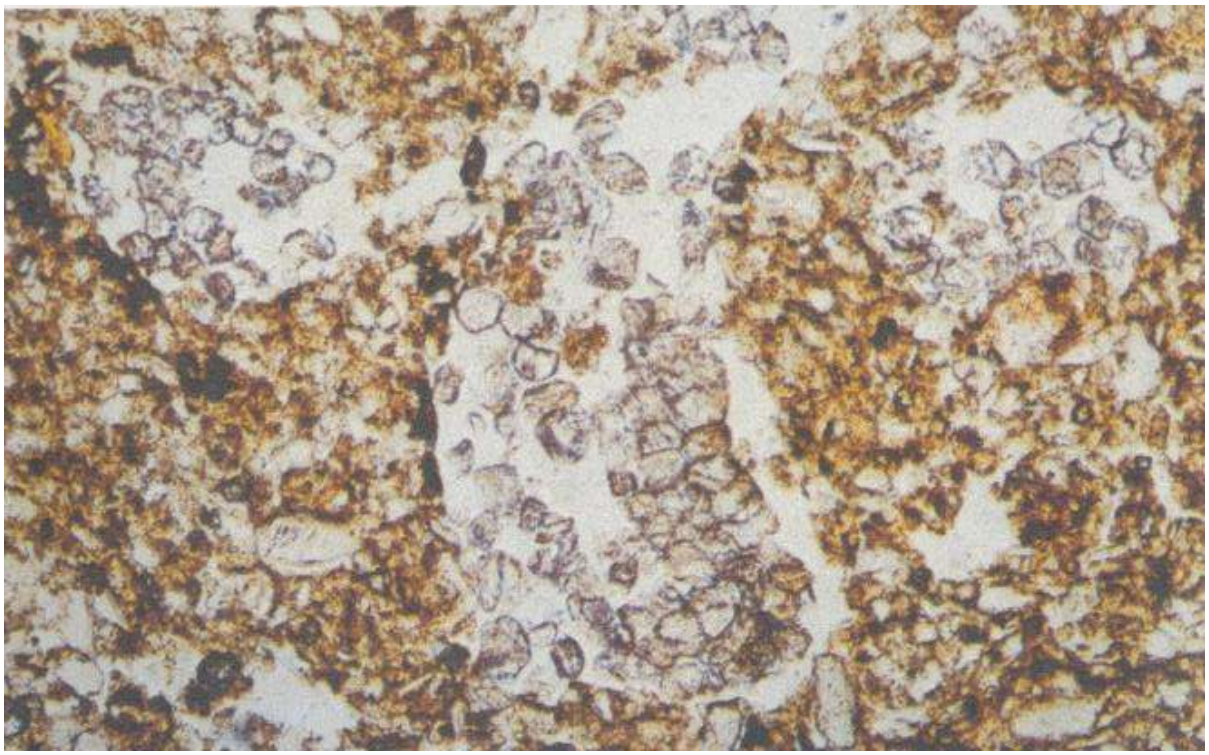


Fig. 3. Secondary carbonates of silt size in a root channel – as a form of macroscopically visible pseudomycelium. Lower part of the paleosol F2 in Basaharc, Hungary. PPL. Width of view is 3 mm. Photo courtesy A. Bronger.

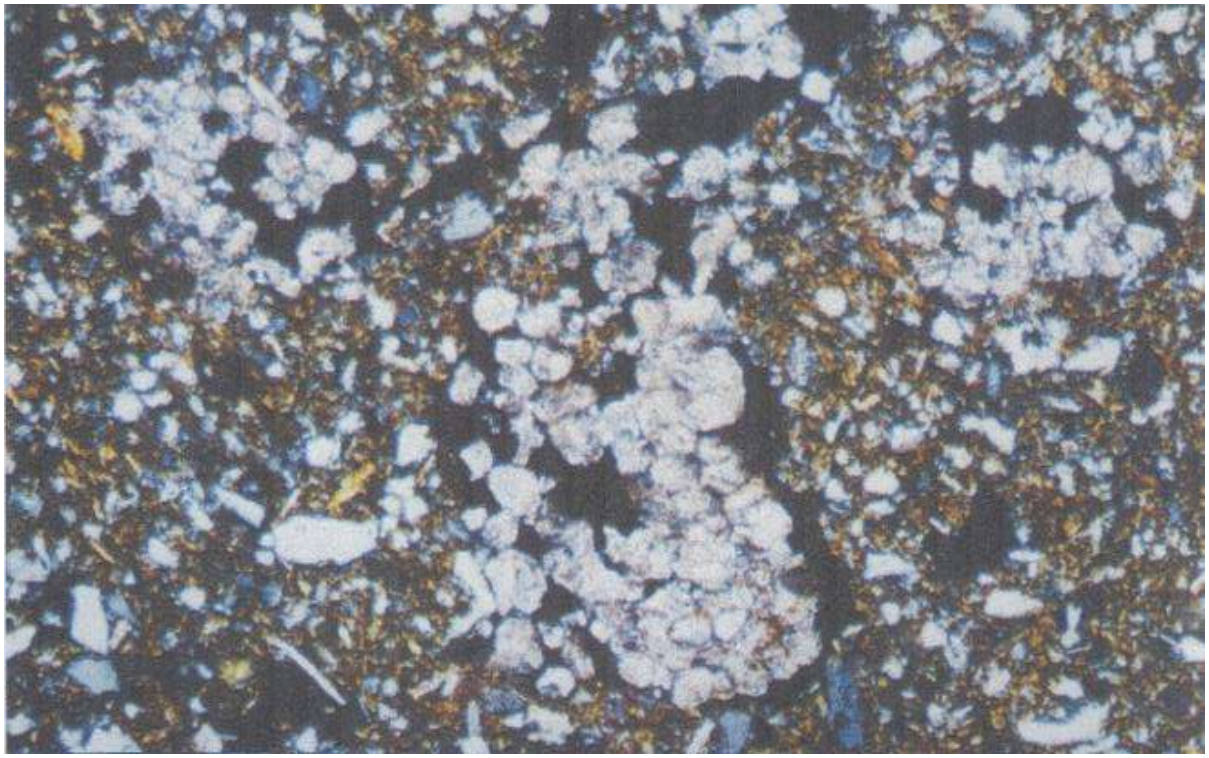


Fig. 4. Secondary carbonates of silt size in a root channel – as a form of macroscopically visible pseudomycelium. Lower part of the paleosol F2 in Basaharc, Hungary. XPL. Width of view is 3 mm. Photo courtesy A. Bronger.

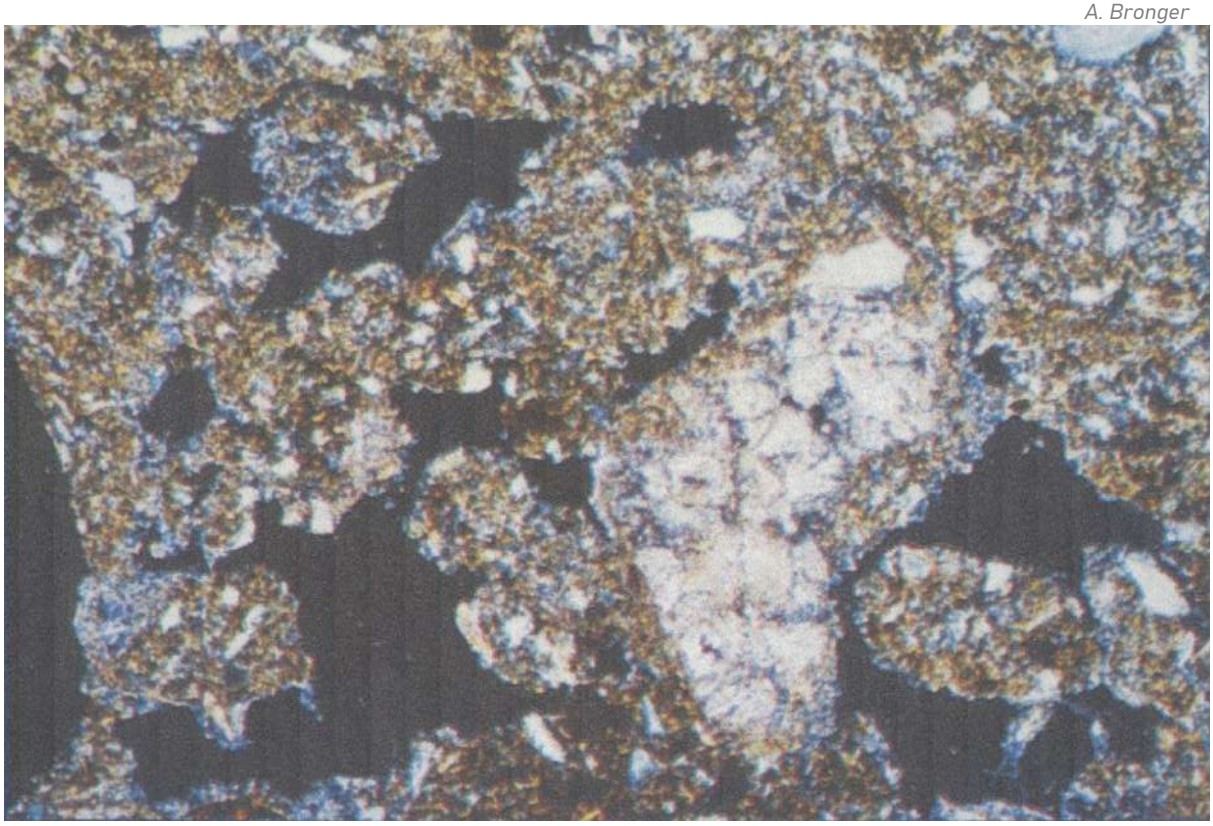


Fig. 5. Secondary calcites – excrement of roots or enchytraea (?) – in the partly fine spongy fabric including microlites and calcite needles in the A(Ca) horizon of the modern Chernozem near Novi Sad, Vojvodina, Serbia. XPL. Width of view is 3 mm (Bronger, 1976, 52).

Calcite microlites with primary calcites, partly dissolved were described in A(Ca) horizon of the lower part of PKIII in Dolnì Vestonice, Czech Republic (Fig. 6) (Bronger, 1976). A large calcite, approximately 1,2 mm in diameter, grown together of different calcite crystals, probably an excrement of Lumbricus terrestris L. shown in the modern Chernozem of Ruma, Vojvodina, Serbia, XPL (Fig. 7). The genesis of these large calcites was first discovered by Bräm (1956), and later confirmed by Mazenot et al. (1963) (see also Bronger 1966). Large calcite neoformation, probably also excrements of Lumbricus terrestris L. together with secondary calcites in a root channel are also shown in Fig. 8. The whole matrix is covered by calcite microlites. Recently carbonates in loess as biogenic forms (grass root rhizoliths, pseudomycelium, etc. were studied by Becze-Decke et al. (1997), and Gocke et al. (2011).

The pedofeatures in loess are not limited to carbonates. The often high porosity of loess is mainly caused by the fauna and flora, resulting in all transitions from initial stages of aggregate formation to a stable fine spongy fabric, rich in aggregates and pores. An example of the initial stage of a fine spongy fabric in a synsedimentarily formed Loess Syrosem "F1" in the loess exposure of Erdut/Croatia, dated between 45 ka and 29 ka is presented on Fig. 9 (Bronger, 1976; Singhvi et al., 1989).

The mineralogical composition of the silt and clay subfractions of the “F1” shows, however, (almost) no mineral weathering and clay mineral formation, whereas a recent primary carbonate chernozem of Stillfried/Lower Austria shows already a distinct decrease of feldspars and phyllosilicates in comparison with the underlying loess. Details are given in Bronger et al. (1976).

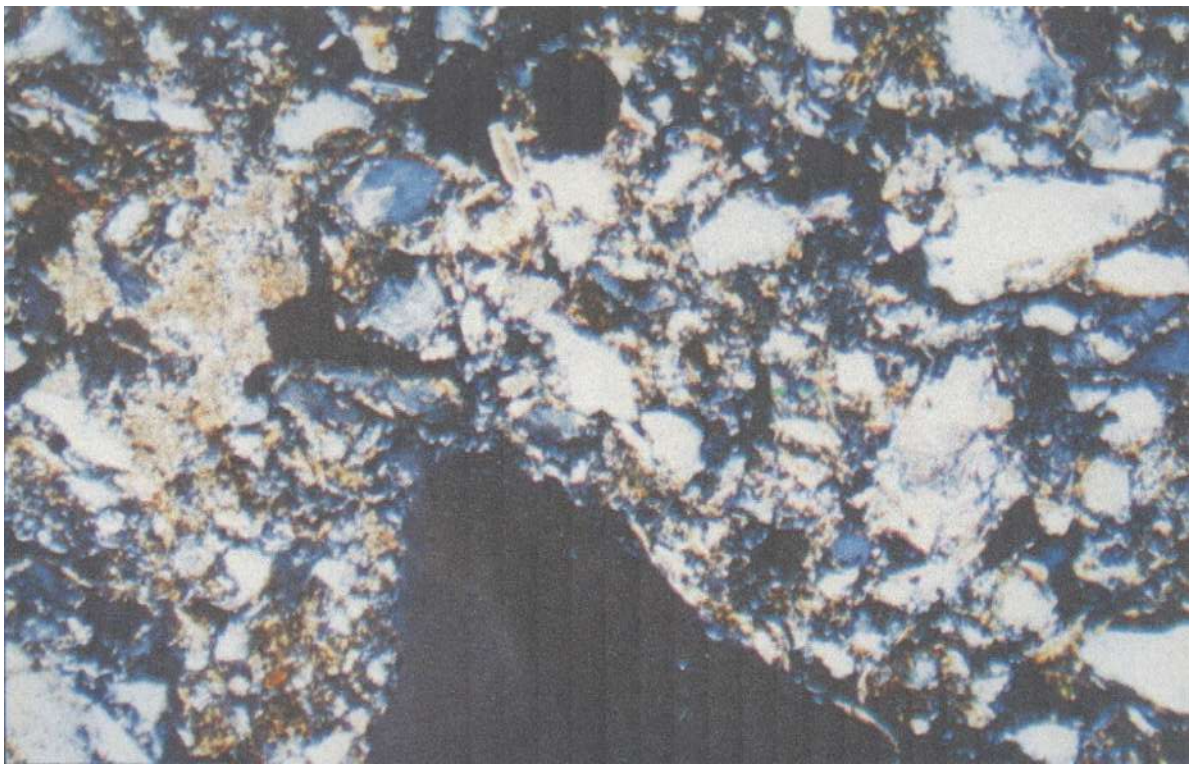


Fig. 6. Calcite microlites (left part) with primary calcites, partly dissolved. A(Ca) horizon of the lower part of PKIII in Dolnì Vestonice, Czech Republic. XPL. Width of view is 3mm (Bronger, 1976, 146).

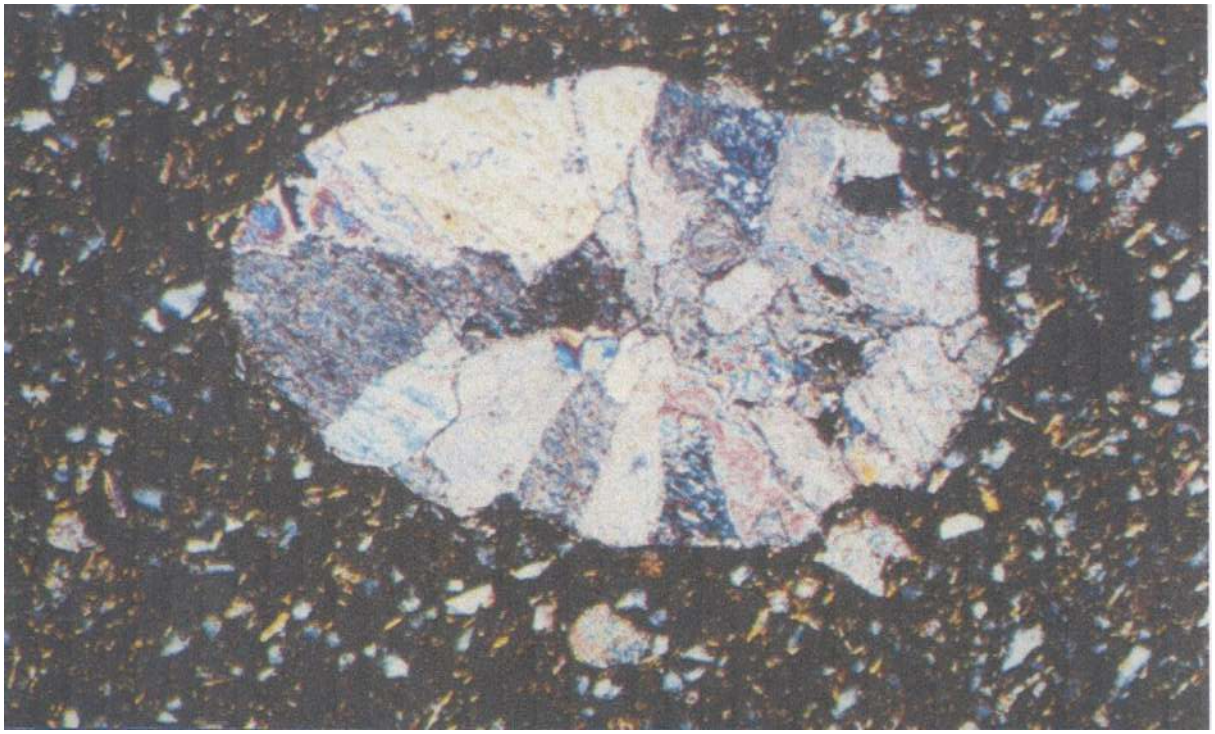


Fig. 7. A large calcite, approximately 1,2 mm in diameter, grown together of different calcite crystals, probably an excrement of Lumbricus terrestris L. in the modern Chernozem of Ruma, Vojvodina, Serbia. XPL. The genesis of these large calcites was first discovered by Bräm (1956), confirmed by Mazenot et al. (1963) (see also Bronger 1966, p.28ff).

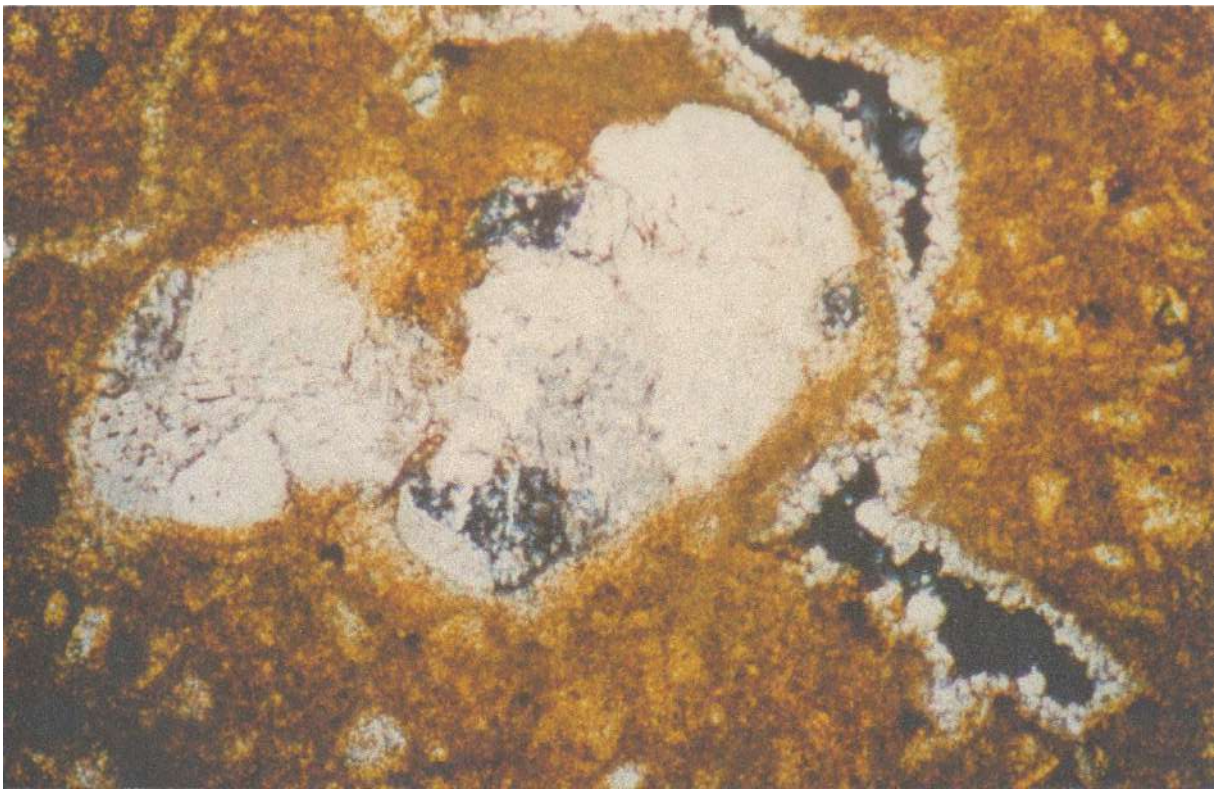


Fig. 8. Larger calcites, probably also excrements of Lumbricus terrestris L.; additionally secondary calcites in a root channel. Whole matrix covered by calcite microlites. (B)CCa horizon of the paleosol F9 in Stari Slankamen, Vojvodina, Serbia. XPL. Width of view is 2 mm. Photo courtesy A. Bronger.

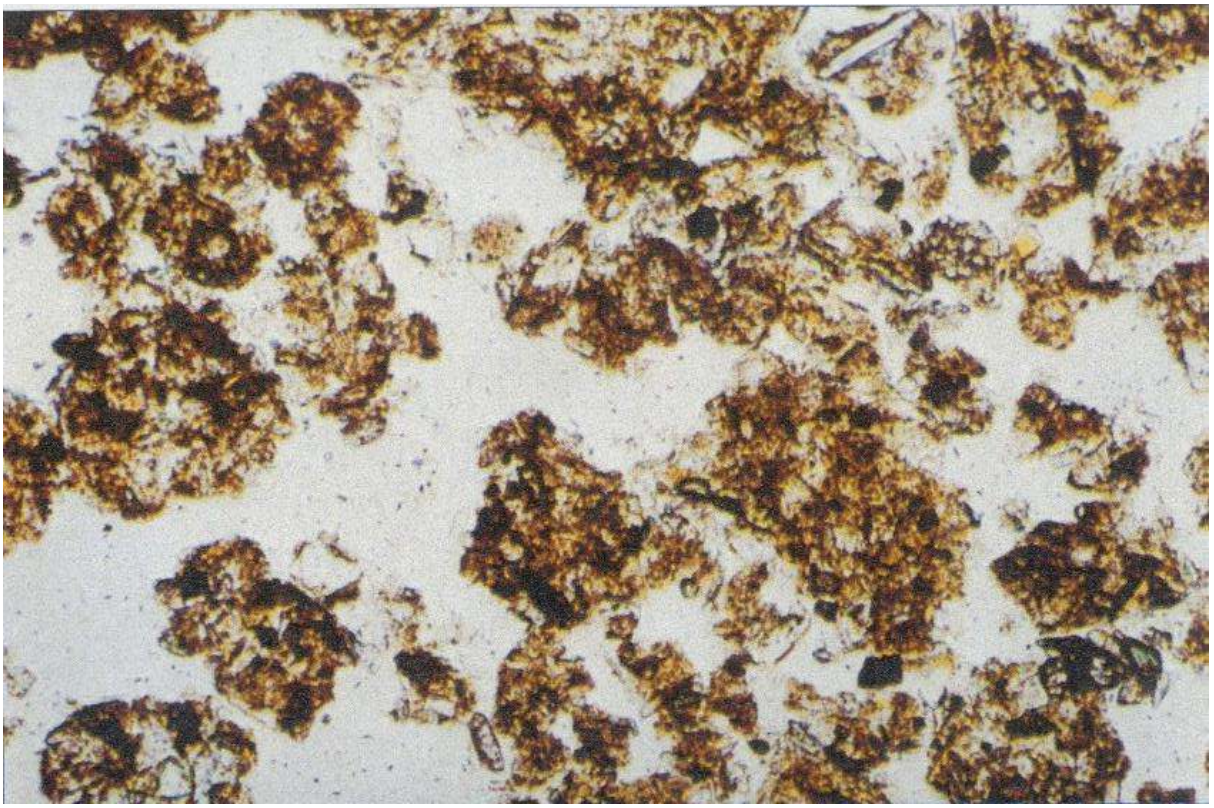


Fig. 9. Loess Syrosem "F1" in Erdut/Croatia. PPL. Width of view is 2 mm. Photo courtesy A. Bronger.

Finally, we would like to discuss the question on loess and environment: Most loesses generally are connected with a cold climate especially in the glacial stages. In the central Great Plains of the U.S.A, however, Holocene loess formation (Bignell Loess) is reported (e.g. Olson et al., 1997; Jacobs & Mason, 2004). It is underlain by the Brady Soil, which divided the late glacial Preoria Loess from Holocene Bignell Loess, which is up to 6 m thick, e.g. in the Wauneta exposure in SW Nebraska. The Brady Soil developed between about 12600 and 9500 (cal. yr. BP; according to Johnson & Willey, 2000), at least during "a minimum of 2000 calendar years" (P. Jacobs, pers. comm.). Recently the age of the Brady Soil – regarded as a cumulative soil, which grew upward in aggrading loess – was calculated between 15040 ± 900 (OSL) and 10310 ± 90 (14C) (Miao et al., 2016) .

Conclusion

Not only the soils included in the loess-paleosol series but also the loess horizons themselves are affected by pedogenesis, resulting in the formation and redistribution of secondaty carbonates (bicarbonate metabolism), structural organization (fine spongy fabric), organization of pore space and clay bridges between silt particles. The processes of bicarbonate metabolism and aggregate formation are regarded as initial stages of soil formation: all stages from virgin loess via a loess-syrosem to primary carbonate chernozem can be observed. The unclear term loessification, widely used in loess studies, should be avoided.

Acknowledgement

My sincere thanks go to A.O.Makeev, S.Sedov, T.Sprafke, and A.Kurgaeva for valuable improvements and help in preparing the manuscript.

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We also would like to include un this issue of Paleopedology Newsletter a

Paleopedology Glossary,

which was discussed at the 2nd International Symposium and Field Workshop on Paleopedology, Shampaign-Urbana, Illinois, USA, August 1993

PALEOPEDOLOGY GLOSSARY

(prepared by the WG on Definitions used in Paleopedology and approved at the business meeting during the Second Paleopedology Meeting and Field Workshop, July 1994)

Accretionary soil: a thick soil formed by simultaneous slow deposition of sediment and pedogenesis; it may possess an over-thickened A horizon which grades up into overlying unaltered sediment, or an "endless B horizon" formed as the basal A horizon is progressively transformed into B horizon material (synonym: cumulic soil).

Diagenesis: the chemical, physical and biological processes that charge sediments and soils after burial beneath younger deposits. They include compaction, formation of new minerals, redistribution, cementation, reduction and loss of (or changes in) organic matter, but exclude the pedogenetic processes involved in original development of a soil before burial. However, many diagenetic processes are similar to pedogenetic, and the two may be difficult to distinguish. Diagenesis includes all post-burial changes occurring at temperature (up to 200C) and pressures (up to 100 MPa) characteristic of the outer part of the earth's crust; processes at higher temperatures and pressures are metamorphic.

Duricrust: a soil horizon or sequence of consecutive horizons by precipitation of calcium carbonate (calcrete or caliche), magnesium-rich carbonate (dolocrete), calcium sulphate (gypcrete), iron/oxides (ferricrete), aluminium oxides/hydrated oxides (alucrete) or silica (silcrete); it should be at least 1 cm thick and laterally continuous, and may form at any depth in the soil profile.

Geosol: the fundamental unit in pedostratigraphy, consisting of a traceable, mappable three-dimensional body of soil material comprising one or more differentiated pedologic horizons; it has a consistent stratigraphic position, and is defined at a type locality where the horizons are buried be younger deposits, but may be traced to sites where it crops out on the present land surface. Geosols transgress lithostratigraphic or lithodemic units, and change laterally in response to differences in parent material, the original buried topography, drainage, vegetation and other factors, giving different pedifacies, Geosols may be monogenetic, polygenetic or compound (multistory). Compound geosols (sometimes termed pedocomplexes) comprise two or more soils, which are separated over large areas by thin unmodified deposits and are overlain and underlain by greater thicknesses of unmodified deposits or by unconformities; they often merge laterally into polygenetic geosols where the intrageosols deposits are very thin (modified by pedogenesis) or absent.

Lithified soil: soil material which has been hardened by pedogenetic cementation (duricrust) or by diagenetic compaction and/or cementation or by metamorphic processes and cannot be moulded by the fingers or fully dispersed in water.

Monogenetic soil: a soil formed in a period when the variation in environmental factors was too small to produce detectably different assemblages of soil features in different parts of that period (i.e. the direction of soil development was constant).

Paleosol: previously defined (Ruhe, R.V. 1956, Soil Science 82, 441) as "a soil formed on a landscape during the geologic past"; it began to form during the Pleistocene or an earlier geological period and (a) is partly or completely buried deposits that are at least 10,000 radiocarbon years old, or (b) contains distinct evidence that the direction of soil development was different from that of the present. Paleosols are therefore either buried or surface (non-buried or exhumed). Soils entirely formed in and buried during the Holocene period (since 10,000 B.P.) are termed buried soils, not buried paleosols, even if they show evidence of development in a direction different from that of the present. Paleosols and buried soils are often truncated by erosion. Buried paleosols and many buried soils are also subject to diagenetic changes, which may be difficult to distinguish from past or current pedogenetic changes.

Pedoderm: a mappable unit mantle of soil which has physical, chemical or biological characteristics and stratigraphic relationships that permit its consistent recognition and mapping; obsolete (see geosol).

Pedofacies: the different profile types (soil horizon sequences) of a geosol that result from lateral variation in parent material, climate, vegetation, topography or length of development period.

Pedolith: (a) lithified soil, such as laterite or silcrete; obsolete (see lithified soil). (b) transported (allochthonous) soil material; obsolete (see soil sediment).

Polygenetic soil: a soil formed in two or more periods when the environmental factors were sufficiently different to produce detectably different assemblages of soil features (i.e. the directions of soil development were different in the periods involved). Minor episodes of deposition may have occurred between or within the periods of soil development, but were not sufficient to leave layers of unaltered material.

Relict soil: (a) a surface (non-buried) soil containing features formed in an environment different from the present; its development began in a pre-existing landscape and continues today because it was never buried; obsolete (see paleosol, non-buried). (b) soil aggregates transported from their original site of formation; obsolete (see soil sediment).

Soil: a three-dimensional body on the surface of the earth composed of mineral and/or organic material, air and water, and formed by the impact of environmental factors acting on parent materials over a period of time to produce a sequence of horizons. The organic material includes both living and dead components and is at least partly autochthonous. 'Soil' is now obsolete as a stratigraphic term but informally is still widely used as such. It is also used in various slightly different senses by civil engineers, botanists, farmers etc. With slight modification this definition can also be applied to the surface materials of extra-terrestrial bodies such as other planets.

Soil sediment: soil material which has been transported a considerable distance from its original site of formation yet retains some recognizable soil fabric (i.e. was incompletely dispersed during transportation).

Vetusol: a surface soil formed over a very long period (105 - 107 years) during which the land surface remained fairly stable and the variation in environmental factors was too small to produce detectably different assemblages of soil features (i.e. the direction of soil development was constant). These old monogenetic soils occur mainly on peneplains and other old geomorphic surfaces in tropical and subtropical regions where Quaternary climatic changes were small.