



Soil Classification

Newsletter No. 5

Spring 2013



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Message from the Chair

I am pleased to introduce the 5th Soil Classification newsletter from IUSS Comm. 1.4. The newsletter continues through the efforts of Vice-Chair Pavel Krasilnikov. Several efforts are continuing to improve on soil classifications. In the United States, a simplified version of U.S. Soil Taxonomy is being written by several volunteer authors. In August, another meeting of the IUSS Universal Soil Classification System Working Group will be held in Brazil (see related article).

In reflection on the codices used by Aztec family leaders, it seems that our use of a soil classification system to convey simple but important information has gone through an evolution and possibly now a de-evolution or simplification. Soil classification evolved from simple descriptions of soil groups and properties, to the very complex systems of today that use expensive, sophisticated lab analysis and are understandable to a shrinking group of highly-trained scientists. Trending now are efforts to harmonize classifications and methods of analysis and to simplify terms and definitions. If adding complexity has resulted in a loss of ability to communicate functional soil properties to users of soil information, perhaps simplification will lead to true progress for use of soil classification.

Please visit our site <http://clie.cses.vt.edu/IUSS1.4/> for the latest news on soil classification

The cover shows Coatlicue (Earth Goddess) of Aztec culture in Mesoamerica. The Aztecs developed a complicated system of soil classification. In the Aztec culture it was common to show in a single document both land ownership relations and soil productivity and properties. Codices of Santa Maria Assunta and the Vergara has been studied thoroughly by Barbara J. Williams since the early 1970's to date (Williams and Jorge y Jorge 2008). These codices showed the plots of the family leaders, and each plot had in its central part a glyph indicating the type of soil; around 132 glyphs were used, built from 14 graphemes, including elements such as stone, points, backpack, thorn hill, eyes, teeth , manure, maiz, water, etc.

Recent meetings

2013 National Cooperative Soil Survey National Conference

Annapolis, Maryland

June 16-20, 2013

“Soil Survey — Planning for Soil Health in the Critical Zone”



[Agenda and Proceedings](#)

[Contacts](#)

[Committees](#)

About the Conference

The conference convenes every other year on the odd-numbered year to discuss and develop solutions to issues of national concern to the National Cooperative Soil Survey.

Audience Profile

Participants of the National Cooperative Soil Survey (NCSS) include representatives from the 1862 land-grant universities, experiment stations, NRCS, USFS, NPS, BLM, BIA, EPA, USFWS, National Association of State Conservation Agencies (NASCA), National Association of Consulting Soil Scientists, the 1890 land-grant universities, and western tribal colleges. Other interested foreign and domestic groups, such as lead scientists from Canada, Mexico, Asia, Africa, Europe, and Australia are invited to participate as users of soil surveys. We also welcome students and their contributions to the future of soil survey.

Postings:

Presentations will be posted at: <http://soils.usda.gov/partnerships/ncss/conferences/national.html> as soon as available. Past meeting presentations are available at that site as well.

Forthcoming meetings

UNIVERSITÄT HOHENHEIM



Soils in Space and Time

Ulm - Germany

Date: **September 30th - October 5th 2013**

Venue: **Ulm University**

"Soils in Space and Time" is one of the key issues documenting the variability of the pedosphere. Soils are so variable. But all of us have a limited experience. Therefore it is of utmost importance to exchange knowledge from time to time and from place to place.

Division I was established by IUSS pedologists working in related fields of soil morphology, micromorphology, soil genesis, soil geography and soil classification. Division I aims to bring these disciplines together to join their efforts in order to improve and communicate their knowledge. Especially the dynamic new paleopedology and pedometrics commissions can add substantial new methods and findings to improve our work. This particularly holds true also for the IUSS working groups feeling related to Division I like Acid Sulphate Soils, Cryosols, Digital Soil Mapping, Forest Soils, Land Degradation, Proximal soil sensors, Salt affected soils, Soil monitoring, Urban soils, Universal Soil Classification and WRB.

The symposia related to soil classification include:

Organized by the Commission:

- Soil classification and soil assessment: turning the theory into practice
- Man-made, deeply transformed and marginal soils

Organized by the USC Working Group:

- Diagnostics and soil profile harmonization

Also the WRB Working Group is planning to present the advances of the 3rd edition of the World Reference Base.

The registration is open, for details please see the web site:

<https://iuss-division1.uni-hohenheim.de/>



7th International Conference of the Urban Soils Working Group, SUITMA, IUSS

Toruń, Poland, 16-19 of September 2013

Nicolaus Copernicus University of Torun and Polish Soil Science Society would like to invite you to join us for the **7th International Conference of the Urban Soils Working Group, SUITMA, of the International Union of Soil Sciences.**

Share in the latest information and ideas from around the world in this exciting and important field.

Urbanization indicator had raised from 25% in 1950 to over 50% at present, and probably by 2030 60 percent of world's population would live in cities. It means that area of urban soils, is constantly growing. Passenger and cargo traffic growth result in construction of new roads, railroads and airports and thus the soils of traffic areas are also expanding.

SUITMAs (Soils in Urban, Industrial, Traffic, Mining and Military Areas) are one of main components of urban ecosystem. They are very diverse and heterogeneous, and fulfill primary functions of utmost importance. However, knowledge related to SUITMAs is still insufficient, which impairs the management of urban areas and limit the role of soil science in the decision making process for urban land management.

After successful events in Germany, France, Egypt, China, United States and Morocco, the 2013 conference in Poland will offer a further step forward in the knowledge of urban soils, **focusing on the functions of SUITMAs in global change issues.** It will feature current research from around the world, and panel discussions on topical issues. Not only are soil scientists invited, but members of other scientific communities (e.g. economists, lawyers, policy-makers, land planners) are most welcome to SUITMA 7.

Traditionally, SUITMA puts emphasis on local features of urban soils. In this objective, beside a **three-day conference (16, 17 & 20 September 2013)** held at Faculty of Earth Sciences of Nicolaus Copernicus University, located in UNESCO World Heritage city of Torun, **two-day mid-conference field tours (18 & 19 September 2013)** will be offered in the Kuyavian-Pomeranian Province focusing on Technosols and one field tour would be dedicated to Northern Poland red brick gothic castles. A **post-conference tour (20 - 24 September 2013)** will be organized in Poland and Czech Republic focusing not only on urban and industrial soils of Central Europe but also with interesting social part (breweries visiting) included in the program and ending in *Golden Prague*, Czech capital.

We will be very pleased to invite you to participate in SUITMA 7 to share your ideas and experience for the benefit of urban communities and SUITMAs.

You are also welcomed to join [SUITMA 7 group on Facebook](#) to be instantly informed on news and updates concerning the Conference.

Jean-Louis MOREL Chairman of SUITMA
Ganlin ZHANG, Vice-Chairman of SUITMA
Przemyslaw CHARZYNSKI, Chairman of SUITMA 7

Organizing Committee

CHARZYNSKI Przemyslaw, *Copernicus University, Toruń* (Chairman of SUITMA 7)

DĄBROWSKI Michał, *Nicolaus Copernicus University, Toruń*

HLADÍK Jiří, *Research Institute for Soil and Water Conservation, Prague*

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SEWERNIAK Piotr, *Nicolaus Copernicus University, Toruń*

ŚWITONIAK Marcin, *Nicolaus Copernicus University, Toruń*

VACHA Radim, *Research Institute for Soil and Water Conservation, Prague*

Please visit the web site for details <http://www.suitma7.umk.pl/>

Universal Soil Classification System Working Group Meeting and Brazilian Congress of Soil Science

The Universal Soil Classification System is a Working Group under Commission 1.4 (Soil Classification) which is part of Division 1 (Soil in Space and Time) of the International Union of Soil Sciences (IUSS). This IUSS Working Group will meet August 1-4, 2013 in Florianópolis, Brazil following the Brazilian Soil Science Society Meetings. The 34th Brazilian Congress of Soil Science is organized by the Epagri (State of Santa Catarina agency for rural extension and agricultural research) and will include the USC meeting and a field trip to examine highly weathered soil profiles in the South region of Brazil <http://tinyurl.com/ox8nks9>.

The goal of this working group is to develop a Universal Soil Classification system by working with all sectors of the Soil Science community to improve the consistency of soil classification tools and too use the most up to date information, data and technology to enhance Soil Classification by developing a common language to describe soils that can be used internationally. The working group is comprised of members from around the world with expertise in Soil Taxonomy from different areas of expertise and knowledge in different taxonomic systems. Support for the working group meeting comes in part from USDA and Purdue University in the US, and UFRRJ (Federal Rural University of Rio de Janeiro) and Embrapa Soils in Brazil. The focus of the Universal Soil Taxonomy Working Group in Brazil will be on taxonomic issues of soils, with special attention on morphology and taxonomy of tropical soils. Other issues that will be discussed are 1) progress in the horizon nomenclature harmonization, 2) progress in the diagnostic horizon studies, 3) progress in the development of a horizon classification system, 4) taxonomic relationships of mollic soils, 5) the calculated centroids of the US Soil Taxonomy Great Groups and 6) soil moisture and temperature. Additionally, there will be reports from the task groups on current state of the knowledge regarding the charge of the task group. More information about the Working Group and the task groups can be found at http://soils.usda.gov/technical/classification/Univ_Soil_Classification_System/

2013 Soil Science Society of America



The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America will host more than 4,000 scientists, professionals, educators, and students at the 2013 International Annual Meetings, "Water, Food, Energy & Innovation for a Sustainable World," **Nov. 3-6, 2013, in Tampa, FL.** The program can be viewed at:

<http://scisoc.confex.com/scisoc/2013am/webprogram/start.html> and Pedology at: <http://scisoc.confex.com/scisoc/2013am/webprogram/S5.html>

May 14	Early Registration begins
May 14	Housing Opens
September 18	Standard Registration Rates Begin

Soil Classification at the 20th World Congress of Soil Science

Jeju, Korea, June 8-13, 2014

The 20th WCSS will be an opportunity to get on top of the changes in soil science and to envision new perspectives for basic and applied soil research. The local Organizing Committee is planning to set up the various programs to encourage the participation of many soil scientists from every corner of the world.

The year 2014 seem to be far ahead, but the time runs quickly, and we encourage everybody to think over the topics proposed for the World Congress.

The soil classification-related topics include the following (the conveners are provisional ones):

- **The progress in the development and harmonization of soil classifications** (convener *Sergey Goryachkin*)
- **Marginal soils: the classification of technogenic, subaqueous, and extraterrestrial soil-like bodies** (convener *John M. Galbraith*)
- **Folk soil knowledge for soil taxonomy, soil assessment (Div. 1 and Div. 3)** (convener *Francisco Bautista-Zuñiga*)
- **WRB - lessons learned during the development of the third edition 2014** (convener *Cornie van Huyssteen*)

For more details please see the web site of the Congress: <http://www.20wcss.org/>

Universal Soil Classification System Report from the International Union of Soil Sciences Working Group

Jonathan Hempel,* Erika Micheli, Phillip Owens, and Alex McBratney

In September 2009, in Budapest, Hungary, several events were organized to celebrate the 100th anniversary of the first International Conference of Agrogeology. A symposium to review the 100 years of advances in soil sciences and a seminar entitled "From the Dokuchaev School to Numerical Soil Classifications" were organized. As result of these discussions, a resolution (known as the "Godollo Resolution") was prepared and forwarded to the International Union of Soil Science (IUSS) Council for discussion at the 2010 World Congress of Soil Sciences in Brisbane, Australia. The resolution stated that there is a need (i) to develop common standards, methods, and terminology in soil observations and investigations and a universal soil classification (USC) system and (ii) for a new working group to coordinate the efforts of this global undertaking. There was a general agreement that there is a need for evaluation of current spatial soil definition and classification systems and new innovative approaches should be investigated to develop a common universally accepted system. During the 2010 World Congress of Soil Sciences in Brisbane, Australia, the IUSS Council unanimously accepted the Godollo Resolution and formally accepted the proposal for a new working group to carry out the proposed investigations and development of common standards, methods, and terminology in soil observations and investigations and a USC system.

Universal Soil Classification Background

Professional soil scientists have been coordinating internationally for many decades to structure systems for soil classification. Ideas have been shared in the development of national systems across the world and have made great progress from before 1900 to the present time. For example, Gennadiyev and Olson (1998) documented pedological cooperation between the United States and Russia for the development of soil classification concepts throughout the 20th century.

Recently, there has been a renewed interest within the soil science community for the development of a system of soil classification that can be applied universally across the world.

At the World Congress of Soil Science in Brisbane, Australia, the Working Group for Universal Soil Classification was officially established by an IUSS Council decision in August of 2010. The charge for the working group includes development of common

Jonathan Hempel, USDA-NRCS, 100 Centennial Dr., Lincoln, NE; Erika Micheli, Szent Istvan Univ., Godollo, Hungary; Phillip Owens, Purdue Univ., 915 W. State St., West Lafayette, IN; Alex McBratney, Univ. of Sydney, Sydney, Australia. *Corresponding author (jon.hempel@lin.usda.gov).

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5585 Guilford Rd., Madison, WI 53711 USA.

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standards for methods and terminology in soil observations and investigations and the development of a USC system. The following is a timeline of events and important milestones that provided the basis for the establishment of the "concept" of a USC system and the working group.

During the IUSS Inter-Congress Council Meeting in the summer of 2008, Paul Bertsch, on behalf of the U.S. National Committee, raised the issue that IUSS on behalf of soil science needs to address the problem of our lack of a common language within the soil science community, particularly in relation to the taxonomy of soils. There followed some discussion of the background and structure of U.S. Soil Taxonomy and the World Reference Base for Soil Resources (WRB), in particular stressing that WRB was originally designed to act as an "umbrella" for National Soil Classification Systems, rather than as a specific soil classification system. The council at this time recommended that IUSS through its WRB Working Group should make steps toward the establishment of uniform definitional observations and criteria and appropriate quantification within the various soil classification systems.

In September 2009, several events were organized to celebrate the 100th anniversary of the first International Conference of Agrogeology held in 1909 in Budapest, Hungary. The purpose of the conference in 1909 was to discuss the different approaches in field and laboratory methods for soil descriptions, soil

Abbreviations: IUSS, International Union of Soil Science; USC, Universal Soil Classification; WRB, World Reference Base for Soil Resources.

classification, and soil mapping. An additional objective was to gain a common understanding in methods and language and to develop common classification and mapping schemes. The two events in 2009, “Bridging the Centuries: 1909–2009” and “From the Dokuchaev School to Numerical Soil Classifications,” provided an overview of advances in the soil sciences over the past 100 years, including advances in soil classification. Interestingly, the participants of the 2009 conference came to the same conclusion, that, 100 years later, the soil science community is still lacking commonly accepted and used standards in soil characterization (field and laboratory) and classification, making communication and data exchange difficult within the soil science community and with other disciplines.

Therefore, the participants of the conference declared that there is a need to develop common standards, methods, and terminology in soil observations and investigations and a “universal soil classification system.” It was recommended that a proposal be presented to the IUSS Council at the 2010 World Congress of Soil Sciences in Brisbane, Australia. A resolution was developed that addresses the need for common standards and a USC for the international soil science community. It was further recommended that the universal system should be based on the experiences of broadly used classification systems, including the U.S. Soil Taxonomy, the Chinese, the Russian, the French, and other national systems, and the experiences of the WRB, the endorsed correlation system of IUSS, as well as on accumulated soil information and state-of-the-art observation and data processing tools. It was also recommended that a working group be organized and composed of representatives from countries from all continents with currently applied classifications systems, along with representatives from relevant organizations.

During the IUSS “Digital Soil Mapping 2010” meeting in Rome, Italy, many of the scientists who participated in the wording of the Godollo Resolution had a formal meeting and further discussed the issue. There was a general agreement that there is a need for evaluation of current spatial soil definition and classification systems and that new innovative approaches should be investigated to develop a common universally accepted system. It was also agreed that a new working group should be set up to coordinate the work and that the development of a USC may require several years, so national systems and the official correlation system of IUSS, the WRB, should be maintained.

In response to the resolution and the discussion in Rome, a proposal for a new working group within IUSS to research the potential of a USC system and other common standards was developed. The proposal was presented to Dr. Stephen Nortcliff, Secretary General of the IUSS on 15 July 2010. The significant parts of the proposal are paraphrased in the following.

“Based on the above mentioned documents and meetings, I would like formally propose a new Working Group of IUSS to

carry out the proposed investigations and development of a universal soil classification. I also propose Jon Hempel (USDA, NRCS) to chair the working group.” All participants of the Rome meeting supported this proposal and Jon Hempel accepted the nomination. “Dear Mr. Secretary General and addressed officers please put this proposal for discussion to the agenda of the Council meetings in Brisbane” (Micheli, 2010). During the World Congress of Soil Science in August of 2010 in Brisbane, Australia, the IUSS Council agreed to establish the Universal Soil Classification Working Group. The minutes relating to this particular discussion are as follows.

Meetings of the IUSS Council

Brisbane Conference and Exhibition Centre, 2–5 Aug. 2010

Universal Soil Classification Working Group

Council agreed to the following Working Group being established with the reporting requirements indicated.

1. The Working Group on Universal Soil Classification was agreed with a time limit of 8 yr (2018) and a review of progress toward an agreed soil classification system after 4 yr (2014), with an interim document report in 2012.
2. Jon Hempel, USDA-NRCS, Director, National Soil Survey Center, elected as Chair of the Working Group, Erika Micheli, Head Department of Soil Science and Agricultural Chemistry Szent Istvan University Gödöllő, Hungary, elected as Co-Chair.

Development of the Working Group

Following this approval, the development of the core working group for the USC system happened over a period of months in early 2011 (Table 1).

When the core working group was established, Jon Hempel, Erika Micheli, and Phillip Owens began planning for the initial meeting of the working group. A date of 6–11 May 2011 was established. The meeting was hosted by Dr. Phillip Owens, Soil Science Associate Professor at Purdue University in West Lafayette, IN. The working group is pictured in Fig. 1 during the field trip of the initial meeting.

Development of a Framework for Moving Forward

The agenda for the meeting included the following important discussion topics:

Discussion of USC Specifics

- Discussion of Oversight and Evaluation Group (providing feedback to the core working group).
- Dissemination of information regarding the core working group to IUSS community.
- Discussion of the development of common standards: correlation, methods, and terminology in soil observations and investigations (part of the IUSS Council tasks).

Table 1. The Universal Soil Classification Working Group.

Name	Institution
Alberto Hernandez Jimenez	Academy of Sciences of Cuba
Alex McBratney	University of Sydney, Sydney, Australia
Alfred Hartemink	University of Wisconsin, Madison, WI
Ben Harms	Department of Natural Resources, Indooroopilly, QLD, Australia
Curtis Monger	New Mexico State University, Las Cruces, NM
Erika Micheli	Head Department of Soil Science and Agricultural Chemistry Szent Istvan University Gödöllő, Hungary (Co-Chair)
Ganlin Zhang	Chinese Academy of Sciences, Nanjing, China
Humberto Santos	Embrapa Solos, Rio de Janeiro, Brazil
Jon Hempel	Director, National Soil Survey Center, Lincoln, NE (Chair)
John Galbraith	Virginia Tech University, Blacksburg, VA
Luca Montanarella	Action Leader, Joint Research Center, Ispra, Italy
Lucia Anjos	UFRRJ, Soils Department Rio de Janeiro, Brazil
Method Kilasara	Faculty of Agriculture, Department of Soil Science, Tanzania
Micheal Golden	Deputy Chief, Soil Science and Resource Assessment, Washington, DC
Pavel Krasilnikov	Institute of Biology, Karelia Research Center RAS, Petrozavodsk, Russia
Peter Schad	Department of Ecology and Ecosystem Sciences, Technische Universität, Munchen, Germany
Phillip Owens	Assistant Professor, Department of Agronomy, Purdue University, West Lafayette, IN
Sergey V. Goryachkin	Institute of Geography, Russian Academy of Sciences, Moscow, Russia



Fig. 1. Universal Soil Classification Working Group (May 2011). Front row, left to right: Ben Harms, Phillip Owens, John Galbraith. Middle row, left to right: Lucia Anjos, Humberto Santos, Dick Arnold (honorary member), Alex McBratney, Erika Micheli, Alfred Hartemink, Peter Schad, Jon Hempel, Curtis Monger. Back row, left to right: Luca Montanarella, Ganlin Zhang, Darrell Schultz (field trip guide), Yeon-Kyu Sonn, Micheal Golden, Mike Wigginton (field trip guide), Sergey V. Goryachkin, Pavel Krasilnikov.

Purpose of a USC system

- What are the new purposes/needs since most of the current systems were developed?
- Do current systems satisfy those purposes (specify purposes that are not satisfied)?
- Who are the users and who should understand the USC (soil scientists, farmers, politicians, students, scientists of other disciplines, etc.)? Can one system fulfill the needs of all users?

Discussion of Current and Needed Elements for a Unified Soil Classification System

- Do we agree on current master properties that differentiate soils on the highest level?
- What soil properties (characteristics) became more important as a result of new knowledge or global problems that are not included in current systems (e.g., cold regions/global warming, anthropogenic)?

Discussion of Currently Applied Standards

- Methods and terminology in traditional soil observations (plans for testing these on the field trip).
- Potential new observation techniques (alternative potentials).
- Laboratory standards.
- Correlation issues.

Expected Features of USC

- What are basic elements?
- Handling soil landscape continuity issues.
- Preserving legacy information from national systems.
- Build on accepted standards, specifications, and concepts.

From these discussion points a framework, task groups, and priorities were built for moving forward with the effort to provide harmonized criteria for describing, sampling, and analyzing soil and work needed to understand gaps in existing soil classification systems. The framework is built into three distinct categories:

- Soil classification issues.
- Diagnostic and soil profile information harmonization.
- Important information relating to soil classification.

Soil Classification Issues

1. Acid-Sulfate Soils.

Goal: Ensure that a USC properly accommodates the diversity of both acid sulfate soil profiles and acid sulfate soil materials. Liaise and collaborate with the IUSS working group on acid sulfate soils to achieve this goal.

Chair: Ben Harms, liaison with IUSS working group on Acid Sulfate Soils

2. Hydromorphic Soils.

Goal: Define diagnostics for soils affected by oxygen deficiency due to groundwater, stagnation water or reducing gases. Define great groups for soils affected by groundwater (including subaquatic and tidal soils), stagnating water, and reducing gases.

Chair: Cornie VanHuysteen; members: Phillip Owens, Tom Reinsch, Joe Chiaretti, and Peter Schad

3. Anthropogenic Soils (long-term land use).

Goal: Define diagnostics and major properties for soils derived from human activities that are needed for soil classification.

Chair: Ganlin Zhang; members: Sonn Yeon-Kyu, John Galbraith, Wolfgang Burghardt, and Andreas Lehmann

4. Cold Soil Group.

Goal: to elaborate the classification system for cold (not only permafrost-affected) soils; the classification system of hierarchical character embracing permafrost-affected soils, cold non-permafrost soils, soils of continental climates with deep permafrost, and soil and soil-like bodies of Antarctic with specific organic matter transformations.

Chair: Sergey Goryachkin; members: James Bockheim, Chien-Lu Ping, and Cezary Kabala

5. Tropical Soils.

Goal: Define diagnostics and major properties for soils that are developed in the tropical regions of the earth that are needed to accommodate soil classification needs.

Chair: Lucia Anjos; members: Humberto Santos, Ben Harms, Ganlin Zhang, Peter Schad, Thomas Reinsch, Method Kilasara, and Phillip Owens

6. Salt Affected Soils.

Goal: Define diagnostics and major properties for soils that are developed in salt affected regions of the earth that are needed to accommodate soil classification needs.

Chair: Erika Micheli; members: Curtis Monger, Tibor Toth, and Craig Ditzler

7. Explore data and knowledge acquisition for soils (pedons) at depths greater than 2 m (e.g., Anthropogenic, Urban, Subaqueous, Paleosols).

Goal: Define potential diagnostics and major properties for soils at depths greater than 2 m and how these properties and their depths can be accommodated in soil classification.

Chair: John Galbraith; members: Daniela Sauer, Mark Stolt, Thomas Reinsch, Shawn McVey, and Eduardo Costantini

8. Determine the appropriate categorical level at which to start classification.

Chair: Pavel Krasilnikov; members: Alex McBratney, Mike Golden, Peter Schad, Curtis Monger, and Lucia Anjos

Diagnostic and Soil Profile Information Harmonization

1. Evaluation of diagnostic criteria from existing soil classification systems.

Goal: Prepare dataset of options for diagnostic criteria.

Chair: Erika Micheli; members: Phillip Owens, Joe Chiaretti, Peter Schad, Curtis Monger, and Lucia Anjos

2. Compare guidelines for field profile descriptions (e.g., redox, structure, color, consistency, texture).

Goal: Prepare a dataset of soil profile descriptive options.

Chair: Joe Chiaretti; members: Peter Schad, Reinhold Jahn, Phillip Owens, Sergey Goryachkin, Humberto Santos, Alberto Hernandez-Jimenez, and Doug Wysocki

3. Compare and compile horizon nomenclature, designations, definitions.

Goal: Compile global master horizon designations, suffixes, and their definitions from legacy soil classification systems and a concise side-by-side comparison of master horizons and subordinate distinctions.

Co-Chairs: Curtis Monger and Lucia Anjos; members: Ganlin Zhang, Yeon-Kyu Soon, Sergey Goryachkin, Alberto Hernandez-Jimenez, Ben Harms, Phil Schoeneberger, and Peter Schad

4. Development of a horizon classification system.

Goal: Research and develop a process that will provide categorization of soil characterization data into logical groupings that can be used and applied to better define existing diagnostic features especially relating to horizon classification and potentially develop new features. To begin, the NRCS soil characterization database for the surface horizons will be parsed into logical categories based on measured soil properties (Fig. 2).

Chair: Alex McBratney

Important Information Relating to Soil Classification

1. Moisture and Temperature Regimes.

Goal: Define potentials for the development of soil moisture and temperature regimes. Provide literature and data search for existing soil moisture and temperature information that exists for the earth that can be modeled into logical regimes for potential inclusion into soil classification. Test re-programmed Newhall model for application outside of the US, potentially begin with Mexico and Canada.

Chair: Phillip Owens; members: Cornie VanHuysteen, and Lucia Anjos

2. Define potential user groups interested in soil classification wider than the traditional users

Goal: Create a list of potential users that would need soil classification information or find this information useful in applying to their specific area of work or research.

Chair: Luca Montanarella

3. Recommend laboratory methods and correlation rules.

Goal: to liaise with other IUSS Divisions, Commissions and Working Groups to understand if there are current functions developed or under development that can be used to correlate different laboratory methods into one dataset.

Chair: Alfred Hartemink (IUSS Liaison and ISO)

4. Explore other diagnostics that could have significance to soil classification (e.g., soil biology).

Goal: to liaise with other IUSS Divisions, Commissions and Working Groups to understand if there are other diagnostic



Fig. 2. All of the surface horizons pictured above would qualify as Ochric epipedons. The Universal Soil Classification System will take into account the diversity of topsoils of the world.

criteria that could be useful to better define concepts in soil classification.

Chair: Alfred Hartemink; members: (IUSS and NCSS soil ecology) Liaison: Susan Andrews, Diane Stott, and Rachel Creamer

5. Explore other observation methods (e.g., spectroscopy, gamma radiometrics), ask IUSS committee on different techniques.

Goal: New field technologies have significant potential to quantify conventional and new diagnostic soil properties and to enhance the allocation process. The development of the technologies should be developed in lock step with the USC System and will help to enhance its uptake by the provision of efficient operational tools.

Chair: Alex McBratney (inquire from IUSS committees on potential techniques).

6. Dual (parallel) nomenclature that includes and accommodates both a scientific and non-technical language (i.e., lay terminology such as gumbotil or sugar sand).

Goal: Provide an analysis of the potential for the development of parallel non-technical language (common names) that correlate to well known soil concepts for soil classification diagnostic features.

Chair: John Galbraith; members: Peter Schad

7. Extra-terrestrial (other planets).

Chair: Alex McBratney; members: Victor Targulian and Ron Amundson

Each task group leader is responsible for developing the task membership, a work plan, and deliverables that will meet the goals of the task group. Many of the task groups are fully engaged and working on producing preliminary information.

Task groups that have compiled data and have developed preliminary information are as follows:

1. Evaluation of diagnostic criteria from existing soil classification systems.

Goal: Prepare dataset of options for diagnostic criteria.

2. Compare guidelines for field profile descriptions (redox, structure, color, consistency, texture, etc.).

Goal: Prepare a dataset of soil profile descriptive options.

3. Compare and compile horizon nomenclature, designations, definitions.

Goal: Compile global master horizon designations, suffixes, and their definitions from legacy soil classification systems and a concise side-by-side comparison of master horizons and subordinate distinctions.

4. Development of a horizon classification system.

Goal: Research and develop a process that will provide categorization of soil characterization data into logical groupings that can be used and applied to better define existing diagnostic features especially relating to horizon classification and potentially develop new features. To begin, the NRCS soil characterization database for the surface horizons will be parsed into logical categories based on measured soil properties.

5. Moisture and temperature regimes.

Goal: Define potentials for the development of soil moisture and temperature regimes. Provide literature and data search for existing soil moisture and temperature information that exists for the earth that can be modeled into logical regimes for potential inclusion into soil classification. Test re-programmed Newhall model for application outside of the US, potentially begin with Mexico and Canada

Within the information important to soil classification there are several task groups that are moving forward with meetings planned to discuss soil classification gaps within each of the specific topics.

Conclusions

Soil classification is decentralized within the international soil science community. There are many countries that have developed soil classification systems for national use, but there are only two that are used worldwide: U.S. Soil Taxonomy (Soil Survey Staff, 1999, 2010) and WRB (IUSS Working Group WRB, 2006; Krasilnikov et. al., 2009). Their worldwide usage includes activities in soil correlation, reports for technical documents, soil reports, soil mapping at a variety of scales, and scientific publications.

Although these systems are used extensively, there are some specific issues that would need to be resolved before acceptance as a USC System. For example, correlation with U.S. Soil Taxonomy is not always precise because of the lack of information on soil moisture regimes in many parts of the world. Additionally, the soil temperature regimes in U.S. Soil Taxonomy that define agroecological zones are not always applicable and acceptable in other parts of the world, making it difficult to correlate implicitly the range of values that define these within U.S. Soil Taxonomy. Krasilnikov et al. (2009) stated that the WRB was not designed as a full-fledged classification system, but rather is to serve as an “umbrella” system for correlating national classifications.

The Universal Soil Classification Working Group plans to continue the improvement of the WRB and U.S. Soil Taxonomy through the work of the task groups. We are aware that there are gaps in classification of the cold soil, hydromorphic, salt affected, anthropogenic, and tropical soil groups and will be working specifically within these areas to better define classification needs.

As the working group looks to the future of a USC system, a centroid-based approach is being considered. This would involve analyzing databases to make allocations into logical clouds of points designed to recognize “Great Soil Groups.” The great soil groups will be equivalent to the great group level from U.S. Soil Taxonomy, along with similar levels in the World Reference Base, Australian Soil Classification, and other defined soil classification systems. The Great Soil Groups will have taxa developed that will document more and less detail. Lower taxa in the system will potentially recognize anthropogenic features, family criteria, and other important use and management characteristics. Higher taxa in the system will be developed for meso- and macroscale applications. As more data are added to the system, taxonomic distance calculations can be used to determine if new categories are needed based on tolerances that are set. This system can then be more scalable based on the objective analyses of the data that are collected and entered into the system.

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