Soil classification: from theory to application

Cornelius van Huyssteen

To cite this article: Cornelius van Huyssteen (2018) Soil classification: from theory to application, South African Journal of Plant and Soil, 35:4, iii-v, DOI: 10.1080/02571862.2018.1512728

To link to this article: https://doi.org/10.1080/02571862.2018.1512728

Published online: 20 Sep 2018.

Submit your article to this journal

Article views: 230

View related articles

View Crossmark data
INTRODUCTION

Soil classification: from theory to application

This special issue of the South African Journal of Plant and Soil collates selected reviewed papers, presented at the 5th International Soil Classification Congress that was hosted from 1 to 7 December 2016 in Bloemfontein, South Africa. The aim of the congress and field workshop was to exchange expertise on soil classification within the Soil Taxonomy, World Reference Base, and Universal Soil Classification systems. All three classification systems bear the official endorsement of the International Union of Soil Sciences (IUSS), either through official IUSS working groups and/or as the official classification systems of the IUSS.

A total of 54 delegates from 17 countries attended the congress and field workshop and presented 30 oral and 11 poster presentations. The first day of the conference, on 5 December 2016, coincided with the International World Soil Day. This day was celebrated with a presentation by Prof. Erika Micheli (Szent István University, Hungary) and the awarding of the Guy Smith Medal to Dr Juan Antonio Comerma (Centro Nacional de investigaciones agropecuarias, Venezuela), who is only the fourth recipient of this award.

The congress and field workshop was supported in various ways by the University of the Free State, TerraSoil Science (a consulting firm), Noordwes Koöperasie, North-West University, Omnia (a fertiliser company), the Soil Science Society of South Africa, and the IUSS.

Soil classification is often viewed as the pariah of the Soil Science disciplines, often accompanied by statements such as ‘they are always arguing’. The reality is, however, that humans classify their environment in a variety of ways, possibly due to the vast number of objects present and limited cognitive capacity to deal with this variation. Soil classification is no different. Soil is classified to organise knowledge, to deal with large numbers of objects and to enable the collection and retention of knowledge - both cognitively and in databases (Fanning and Fanning 1989).

Soil classification attempts to compartmentalise the natural soil landscape continuum into discrete classes (Ibáñez and Ruiz-Ramos 2006) and therefore involves uncertainty (Roth 2005). Miller’s Rule (Miller 1956) states that humans favour 7 ± 2 classes, with a maximum of 15, and has been proven true in diverse disciplines (Wong and Richmond 1993; Tichý et al. 1999; Devillers et al. 2007). See van Huyssteen et al. (2013) for a more detailed discussion.

Unfortunately, a myriad of soil classification systems exist internationally (Krasilnikov et al. 2009). The numerous soil classification systems is probably due to the relatively juvenile nature of the Soil Science discipline (being formalised in 1883 with the publication of Dokuchaev’s ‘The Russian Chernoziom’) and probably due to the geographic variability of soil that has led to the development of strong regional biases.

Only two soil classifications systems are formally recognised by the IUSS for international reference. These are the World Reference Base for Soil Resources (IUSS Working Group WRB 2015) and the United States Department of Agriculture’s Soil Taxonomy (Soil Survey Staff 2014). The process has been initiated to develop a unified ‘Universal Soil Classification’ through the establishment of a working group of the IUSS (Owens et al. 2014). International conferences and field workshops are therefore imperative: firstly, to ascertain the applicability of the two official soil classification systems to regional conditions; secondly, to relate the various diagnostics of these two systems with each other; and thirdly, to inform national soil classification systems on the advances in international rationale. The latter should be used in an attempt to better relate national soil classification systems with the international systems to improve international communication.

This special suite of papers is opened with ‘Spodosols in Brazil: distribution, characteristics and diagnostic attributes of spodic horizons (Menezes et al. 2018). Spodosols (podzols) form in specific environments, such as sandy materials, acidic vegetation and high rainfall. This study characterises Spodosols in Brazilian pedoenvironments. Selected extraction of aluminium (Al) and iron (Fe) indicates the importance of Al relative to Fe. This study provides important quantitative values for the Brazilian soil classification, but also for correlation with other national and international systems.
‘Where are we with whole regolith pedology? A comparative study from Brazil’ (Juilleret et al. 2018) deals with the classification of the deeper substratum, which is especially important for environmental issues and Critical Zone research. The authors compare Saprolite–Regolith Taxonomy and Subsolum Reference Groups. Saprolite–Regolith Taxonomy seems to require more specialist knowledge on lithology than Subsolum Reference Groups and is less flexible than the open Subsolum Reference Groups. The authors conclude that soil classification systems need to better integrate the concept of ‘whole regolith pedology’.

‘Impact of fundamental changes to Soil Taxonomy’ (Galbraith et al. 2018) discusses the guiding principles that were established to increase the use of Soil Taxonomy, to minimise the impact on the existing soil survey and soil science division programs, and to move toward harmonisation of definitions with other classification systems, such as the WRB and South African systems. Some examples are a simplified mollic epipedon and addition of several new soil orders. It is anticipated that this would result in easier collaboration between soil scientists in countries that use Soil Taxonomy and in better communication with other professionals.

‘Quantitative pedology to evaluate a soil profile collection from the Brazilian semi-arid region’ (Pinheiro et al. 2018) applies pedometric tools to analyse soil property information to compare soil profiles, transfer information and to model soil horizon distribution. The procedure defined soil property values for every one-centimetre layer of the soil profile, enabling similarity analysis between a large number of profiles using a dissimilarity matrix for each depth slice. Soil depth functions of diagnostic horizon soil properties were then developed, allowing qualitative comparison between the profiles.

‘An overview of pedogenesis in Technosols in South Africa (Daniell and van Deventer 2018) discusses the pedogenic processes observed in the three Technosols, i.e. soils from anthropogenic deposits or transported materials. Transformation processes, including pH changes, and changes in cation exchange capacity and base saturation have also been observed. Leaching, eluviation, illuviation, oxidation, salinisation, neo-formation, surface crusting and horizon differentiation were also observed. Horizonation also occurred due to compost addition and the establishment of vegetation.

‘Soil taxonomy proposals for acid sulfate soils and subaqueous soils raised by the 8th International Acid Sulfate Soils Conference’ (Wessel et al. 2018) discusses the classification of ‘acid sulfate soils’ and related issues for ‘subaqueous soils’. Sulfides react with oxygen to produce sulfuric acid when these soils are disturbed or exposed. These materials are recognised as ‘sulfidic materials’ in Soil Taxonomy. This paper presents several proposals to modify and add to existing definitions, such as adding new subgroups, defining sulfuric materials and editing the definition of the sulfuric horizon. These changes are centred on improving the interpretative value of taxa in Soil Taxonomy as well as use and management recommendations and their value in soil survey products.

References


Miller G. 1956. The magical number seven, plus or minus two: some limits on our capacity for processing information. Psychological Reviews 63: 81–97.


**Cornelius van Huyssteen**

*Department of Soil, Crop, and Climate Sciences, Faculty of Natural and Agricultural Sciences University of the Free State, Bloemfontein, South Africa*

*Email: vanHuyssteenCW@ufs.ac.za*

http://dx.doi.org/10.1080/02571862.2018.1512728

Copyright © NISC (Pty) Ltd