

Soil Classification Based on Spectral and Environmental Variables

ANDRE CARNIELETTO DOTTO¹, RAPHAEL A. VISCARRA ROSSEL¹, JOSE A. M. DEMATTÊ², RODNEI RIZZO²

¹School of Molecular and Life Sciences, Curtin University, Kent Street, Bentley, WA, Australia 6102, Australia

²Department of Soil Science, College of Agriculture Luiz de Queiroz, University of São Paulo, Ave. Padua Dias, Piracicaba, SP, 13418-900, Brazil

In the last decades, the volume of soil data collection has increased significantly. Because of that it is now possible to obtain a soil classification using spectral, climate and terrain attributes. The idea was to develop a soil series system, which intends to discriminate soil types according to soil, climate and terrain variables. This new system was called Soil-Environmental Classification. The spectra data from the visible to near infrared (350 – 2500 nm) was applied to obtain information about the soil, and climate and terrain variables to simulate the pedologist knowledge in soil-environment interactions. The most appropriate numbers of classes were achieved by the lowest value of AIC applying the clusters analysis, which was defined with 8 classes. A relationship between the Soil-Environmental Classification and WRB-FAO classes was found. Soil classes like Ferralsols and Nitisols share many soil and environmental characteristics and are difficult to distinguish, however other soil classes, such as Histosols, are relatively distinctive from the others and, consequently, it was possible to categorize them in a particular Soil-Environmental Class. This innovative soil system facilitated the identification and grouping of soils with similar characteristics due to the use of not only soil but environmental variables for the distinction of the classes. The conceptual characteristics of the 8 Soil-Environmental Classes were described. The development of Soil-Environmental Classification was conducted to incorporate applicable soil data for agricultural management, with less interference of personal, subjective, empirical knowledge (such as traditional taxonomic systems), and more reliance on automated measurements by sensors. The development of this soil classification system can assist in the distinction of soil types and serve as a new source of soil information.