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STUDY ON SPECTRAL FEATURES OF EUROPEAN VOLCANIC SOIL USING Bi-DIRECTIONAL REFLECTANCE SPECTROSCOPY (BDRS)

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The study on soil spectral reflectance features is the physical basis for proximal soil sensing (PSS). Soil organic matter (SOM) and Iron oxides minerals content influences the soil spectral reflectance considerably. Spectral curves of the soil, showing that, in general, SOM attenuated the absorption bands of many minerals. The aim of this research is to analyze the relationship between soil reflectance data and chemical characteristics (organic matter, iron and aluminium forms) of 61 volcanic soil, accordingly extracting iron and organic matter content. Bi-directional reflectance was measured in the laboratory under artificial light, using an ASD FieldSpec Pro spectroradiometer. Spectral curves between 400-2500 nm were collected with from 19 different European sites, in Italy, Portugal, Iceland, Spain, Greece, France and Hungary. Derivative spectrum technology were applied to study the relationship between these soil spectral features and soil organic matter content and iron mineralogy. The second-derivative (SD) curve of the Kubelka Munk reflectance showed a minimum at the point of maximum curvature in the original spectrum . A relationship between spectra feature and iron oxides were observed specifically in the down horizons (brown soils < 7,5 YR, with high amorphous iron content) which caused a wider concavity with a band centred at 460 nm. This confirm the presence of goethite in the volcanic soils with color < 7.5 YR with a concave shape and a higher spectral reflectance. The second-derivative (SD) curve showed a second band at 950 nm that was significatively correlate with soil characterized by low SOM content. In particular regression model whose coefficient of determination reaches 0.86 in the down soil while in the top soil (very rich in SOM) decrease to 0.51. This results shows that second-derivative order of the Kubelka Munk reflectance curve is the most sensitive to SOM and goethite content among the various transform types of reflectance in consideration. A significant correlation was observed between soil Fe (oxalate extractable) and second-derivative band, indicating that both poorly ordered Fe oxides and goethite are especially abundant component in volcanic soils. Information from reflectance data were applied in order to evaluate the application potential of hyperspectral remote sensing technique in soil chemical properties prediction in the visible and near infrared spectrum. In the volcanic soils detecting spectral characteristics are very sensitive to organic matter content and could be establishing by which organic matter is preserved in these soils and may contribute to management techniques to sequester carbon as soil organic matter.