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Improving spectral techniques to determine soil organic carbon by accounting for soil moisture effects.

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The demand for up-to-date soil information has driven the development of rapid techniques to determine soil properties such as soil organic carbon (SOC) in situ. Both hand held and airborne spectral techniques have produced promising results, even if soil conditions such as moisture content and roughness cannot be controlled. Soil moisture dramatically alters soil albedo and, thus, organic carbon spectral signature. This study aims to develop a SOC prediction model, corrected for soil moisture, through the combination of soil spectroscopy and multiple linear regression analyses. 115 Soil samples were collected along a transect, located in the Grand-Duchy of Luxembourg. Soil samples were air-dried for 7 days, humified in steps of 5% until saturation, to obtain five levels of moisture content, and then spectrally analyzed. The soil moisture Gaussian model (SMGM) is used to estimate soil moisture by the declining reflectance in the near-infrared (NIR) and short-wave infrared (SWIR) regions, 1.2-2.5 μm, due to the spreading of the fundamental water absorption at 2.8 μm. SOC is predicted combining soil spectra and multiple regression model, corrected with the factor produced by the SMGM, at every level of moisture content. The quantification of the effect of water on the laboratory spectroscopy assessment of SOC might find application in the hyperspectral images domain, where the varying soil moisture still determines an accuracy decrease for the estimation of soil characteristics