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Soil classification using different spectroscopic data and chemometric methods

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Soil samples representative of a variability panel in forest soils in the Czech Republic were collected in different locations and depths (down to 80 cm) to identify and to quantify different mineral phases within the soil profile. The objective was to account for weathering processes within different soil horizons and depths, to reach a better description of the weathering processes, and ultimately to elaborate a better numerical model of weathering at the catchment scale.
To go over expensive and time consuming conventional analytical techniques dedicated to soil composition, such as X-ray diffraction, chromatography, or silicate analysis, a specific focus was put on Raman spectroscopy and laboratory reflectance/emissivity through a joint research effort between the Czech Republic and France. The spectroscopic platform of LMOPS was applied to soils samples (785-nm laser wavelength), along to aqueous solutions (532-nm laser wavelength) generated mixing given amounts of soils and distilled water. Soil reflectance was collected using a Spectral Evolution spectrometer (SR 2500, 0.4-2.5 μm), the emissivity spectra for selected soil samples were acquired using a Fourier transform infrared (FTIR, 8-14 μm) spectrometer. For both Raman spectroscopy and laboratory reflectance/emissivity the chemometric analysis was employed to identify to what extent similarities as well as differences between the soils could be detected. Results indicated that such spectroscopic data when combined with chemometric analysis contributed to identify groups in soils samples.
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