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VNIRS calibrations: ideas to enhance their stability and applicability

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During the last decade, Visible and Near Infrared Spectroscopy (VNIRS) has gained more and more acceptance as analytical tool among soil scientists. VNIRS is a non-destructive method allowing measuring a big number of soil samples at reasonable time and effort. Many soil characteristics are reflected in the soil spectral data collected by VNIRS. Statistical methods – amongst others partial least squares regression (PLSR) and regression based on wavelet coefficients – are needed to quantify soil properties like organic carbon, nitrogen, clay content from VNIRS data. Usually, the derived calibrations are restricted to the ensemble of soils where the samples come from. In most of the cases this also implies the restriction to a geographical area. Very often calibrations cover local to regional areas, although continental or even global calibrations exist. Therefore, soil scientists using VNIRS face the question if an existing VNIRS calibration is adequate for an unknown ensemble of soil samples and if a calibration may be transferred from one region to another or from regional scale to national scale, etc. The availability of mechanisms providing answers to these questions is a prerequisite to establish VNIRS as accepted analysis technique in soil science. It seems that soil scientists have neglected these aspects, so far. In this contribution, some – possibly preliminary – ideas are presented (i) how an optimal VNIRS calibration may be found for a specific set of soil samples, (ii) how calibrations can be derived that are more robust, more stable and easier to adapt to new ensembles of samples, and (iii) helping decide whether a calibration is adequate for unknown soil samples. The aim of the contribution is rather to enhance discussions about the topics mentioned above than providing complete solutions.