Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11135, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11135
EGU General Assembly 2008

Pretreatment of Soil Samples for Reduced Vis-NIR Prediction Error of Soil Organic Matter and Clay Content

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Over the last few decades an increasing number of reports put forward the potential of diffuse reflectance spectroscopy in the near infrared (NIR), alone or combined with the visible range (vis), in soil analysis. Soil organic matter (SOM) or organic carbon and clay content are probably the most commonly and successfully predicted parameters. Nevertheless, prediction statistics published are relatively variable. A large part of the variation relates to the range of soil types covered by the calibrations, but especially organic matter is reported to be influenced by other factors. Analysis of field moist soil and the inclusion of the visible part of spectral range are two such factors. In this study a subset 400 samples from a data set of 2600 samples collected to represent Swedish agricultural soils and analyzed previously in the NIR only. The subset was selected to cover the spectral variation and was reanalyzed for vis-NIR on air dry samples in a Petri dish both carefully distributed to avoid stratification of particle size classes and shaken to enhance the separation resulting in predominantly larger particles being analyzed. Unshaken samples were also analyzed after standardized additional drying in 35˚C for 12 hours immediately before vis-NIR analysis and after stepwise remoistening up to 30 vol-%. Preliminary results show that the variance of the water peaks near 1400 and 1900 nm of 1: st derivative spectra decreased after additional drying with approximately 15 % and increased after remoistening with up to several hundred %. In air dried soil vis-NIR resulted in slightly better predictions of SOM than NIR only. The Vis-NIR prediction of SOM was slightly improved by shaking (R^2 = 0.73 compared to 0,70) while, as expected, that of clay was slightly worse (R^2= 0,88 compared to 0,90). Additional drying had no effect. The effects were

very small and suggest that vis-NIR spectroscopy is fairly robust to small changes in moisture content due to for example storage and care during preparation and handling of samples do not explain variable results and need not to be exaggerated. Effects of remoistening on prediction performance are not analyzed yet but will be shown as well.