Geophysical Research Abstracts,
Vol. 11, EGU2009-3358, 2009
EGU General Assembly 2009

Fresh Soil Sensing using Visible and Near Infrared Spectroscopy

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Fast, precise and affordable soil analytical techniques are needed for the determination of soil fertility of each zone of a field in site specific land management. The objective of this poster is to demonstrate how nutrients can be estimated from fresh soil using visible (VIS) and near infrared (NIR) spectroscopy method. This could be carried out by summarizing the methodology to develop a calibration model for soil phosphorus with the VIS-NIR spectroscopy method. Obviously, it can be simply extended for other nutrients with the same methodology. A large samples set should be collected from different fields with a wide range of soil type and texture. The samples in this set should be represented a wide range of moisture content and soil nutrient which is desired to be calibrated by the spectroscopy technique. Immediately after sampling, the samples should be kept in a cold room ($\pm$ 1 °C) until the time of the spectral measurement and the chemical analysis. The samples should be taken from the cold room one hour before the spectral measurement to ensure that the samples were at room temperature and no condensation occurs on the optical instruments. Each soil sample was thoroughly mixed and debris such as plant material and stones were removed. The soil sample was divided into three parts, one part for spectral measurement, another part for chemical analysis and the rest was archived. The part for chemical analysis should be examined for their soil nutrients. A small amount of soil (about 30 g) should be placed in a small plastic petridish (e.g. 7.5 mm depth and 30 mm diameter). The soil in the petridish should be first pressed and then carefully levelled in order to obtain a smooth surface for a maximum light reflectance. Soil samples should be put under the spectrophotometer. Three reflectance spectra should be measured on each soil specimen by rotating the plastic cups over 120°. Having finished measuring, the reflectance data should be put against the chemical analysis values to establish a calibration data set. Out of the data set one third should be divided and kept for validation and the rest for calibration. Using different type of multivariate techniques, the calibration model can be developed. To validate the calibration, the model should be used to predict those samples kept as validation data set. Having validated the calibration model, it can be used for prediction of soil nutrient of new samples.