

## **Near infrared index to assess the effect of soil tillage and fertilizer on soil water content.**

Ines Soltani, Youssef Fouad, Didier Michot, Pascale Breger, Remy Dubois, Pascal Pichelin, and Christophe Cudennec

UMR SAS AGROCAMPUS-OUEST-INRA, 35042, Rennes, France (ines.soltani@agrocampus-ouest.fr)

Characterization of soil hydraulic properties is important for assessing soil water regime in agricultural fields. In the laboratory, measurements of soil hydrodynamic properties are costly and time consuming. Numerous studies recently demonstrated that reflectance spectroscopy can give a rapid estimation of several soil properties including those related with soil water content. The main objective of this research study was to show that near infrared spectroscopy (NIRS) is a useful tool to study the combined effect of soil tillage and fertilizer input on soil hydrodynamic properties. The study was carried out on soil samples collected from an experimental station located in Brittany, France. In 2000, the field was designed in a split-plot combining three tillage practices and four sources of fertilizers (mineral and organic). Undisturbed soil blocks were sampled in 2012 from three different depths of topsoil (0-7 cm, 7-15 cm and 15-20 cm) at each treatment. From each soil block, four aggregates with 3-4 cm diameter by 5-6 cm height were collected. Soil aggregates were first saturated and were then drained through 10 matric potential, from saturation up to permanent wilting point ( $pF=4.2$ ), by successively using a suction table and a pressure chamber. Once the desired water pressure head was reached, soil samples were scanned to acquire reflectance spectra between 400-2500 nm using a handheld spectroradiometer equipped with a contact probe. Each spectrum was transformed into continuum removal, and an index based on the full width at half maximum (FWHM) of the absorption feature around 1920 nm was calculated. This index showed a linear relationship ( $R^2>0.9$ ) with volumetric water content. Moreover our results showed that the slope of the line was well correlated with the range of treatment. Overall, our findings indicate that the absorption feature of continuum removal spectra around 1900 nm can be useful to study the effect, particularly, of tillage on hydrodynamic properties of soils.