In-Field Calibration Checking and Use of a Dual-Function Soil Cone Penetrometer. (S01-topp141550-Oral)

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Abstract:

Our penetrometer measures cone resistance (PR) and water content on one shaft. A piezoelectric sensor coupled to a cone is followed by a helical wrapped TDT sensor for water content. Hourly in-field checks of TDT and piezo calibrations are made to assure the quality of data, which facilitated detailed analyses of the strength-water content interactions. The piezo-unit relied on dead weight loading for laboratory, and a calibrated spring in-field. The calibration of the TDT sensor had three stages: a series of fluids of known dielectric constant; soil columns at known water content; and field soils at a range of ambient conditions. The penetrometer has been used to study soil strength behaviour in time and space along 300 m plots. The treatments were conventional and no-till, each at two levels of 'trafficking'. The crop was corn, continuous and in rotation with soybean and wheat. In tilled soil, the PR was a function of water content and time. Under no-till the relationship between PR and water content was time invariant. The time varying PR-water content relationship implies an evolving soil structure in tilled soil,

complicating interpretations of soil structure/strength effects on crop development.

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