

Soil Moisture Measurement by the Capacitance Probe

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Abstract

Capacitance probe is the soil moisture gauge which performs continuous measurement of soil water content in several depths without disturbance the soil surface. However, it has not been applied for the fine particle soil like Kanto Loam in previous studies. The objectives of this study are to calibrate the capacitance sensors against Kanto Loam and to clarify the factors which affect on the measurement.

The capacitance probe responds quickly to the rainfall event in the Kanto Loam soil, so it is possible to measure the change of soil moisture amount. The results indicate that the relationship between SF parameter, which indicates frequency of individual capacitance sensor, and soil water content was not linear. The SF parameter is influenced by dry bulk density. The capacitance probe depends on the principal of differences of the dielectric constant among materials. When a dry bulk density increase, bound water may also increase. This bound water has a physicochemical character like soil rather than water. Therefore, it can not be distinguished the bound water from the soil particle by the method using the dielectric constant. In the study, influence of a dry bulk density was corrected depending on the relationship between SF value and the dry bulk density of the soil. As the result, correlation coefficient of the calibration curve was improved from 0.6 to 0.8. The measurement error was found to be 10%, in full scale.

Capacitance probe will be able to measure the soil water content of Kanto Loam more accurately by removing influence factors. It is necessary to accumulate more research case for using capacitance probe to measure soil water content of Kanto Loam.