

Relationship between GPS signal and soil volume moisture content / electrical conductivity

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In the field of agriculture, we focused on the development of measurement methods to determine the appropriate irrigation water and fertilizer rates. Since 1980, the TDR water sensor, TDT water sensor and capacitance water sensor have been the mainstream of measurement methods because they enable nondestructive and continuous measurement of soil moisture and electrical conductivity. However, these methods have poor spatial representation. Therefore, we tried to estimate the soil moisture content using electromagnetic waves from a GPS satellite in the same 1GHz frequency band as the TDR water sensor. The purpose of this study was to clarify the relationship between the reflected signal received by an inexpensive GPS receiver and the soil water content and soil electrical conductivity.

We experimented at Kurokawa Farm in Meiji University in Kawasaki City, Kanagawa Prefecture. The experimental period is from November 22, 2018 to December 31, 2019. We calculated amplitude B and the phase of the complex reflection coefficient from the reflected signal and compared with the volumetric water content and soil electrical conductivity.

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