Field determination of unsaturated hydraulic conductivity of forest soils

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Journal of Forest Research, 1998,Volume 3, Number 1, Pages 11-17

Abstract

This study introduces a field method to determine unsaturated hydraulic conductivity which is applicable to sloping terrain with a limited water supply. A single steel ring infiltrometer and an artificial rainfall simulator are used in this method to reduce the amount of water required to attain a steady-state flux condition. Six tensiometers and a time domain reflectometry (TDR) are employed as the soil capillary pressure head and the volumetric soil water content measurement devices, respectively. Water contents measured by the TDR are corrected using a simple calibration method suggested by Hook and Livingston (1996). Unsaturated hydraulic conductivities are computed based on the instantaneous profile method using capillary pressure head and water content changes measured during a drainage process. The proposed method was applied to a forest soil profile in Rokko Mountain range. Results showed that the relationships between the unsaturated hydraulic conductivity and capillary pressure head developed by the proposed method coincide well with those measured by the conventional steady-state laboratory experiment. The proposed*in-situ* method is the effective simple means to determine unsaturated hydraulic conductivities of forest soils, since this method is enough accurate and consuming less amount of water and time.

Key words forest soil - rainfall simulator - time domain reflectometry (TDR) - unsaturated hydraulic conductivity - water retention curve

This research was partly supported by a Grant-in-Aid for Scientific Research (No. 08760149) from the Ministry of Education, Science, Sports, and Culture, Japan.