Hydrology and Earth System Sciences
An Interactive Open Access Journal of the European Geosciences Union

Hydrol. Earth Syst. Sci., 13, 1809-1821, 2009
www.hydrol-earth-syst-sci.net/13/1809/2009/

Significance of tree roots for preferential infiltration in stagnic soils

B. Lange[1,2], P. Lüescher[1], and P. F. Germann[2]
[1]Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Zuercherstrasse 111, 8903 Birmensdorf, Switzerland
[2]Soil Science Section, Department of Geography, University of Bern, Hallerstrasse 12, 3012 Bern, Switzerland

Abstract. It is generally recognized that roots have an effect on infiltration. In this study we analysed the relation between root length distributions from Norway spruce (*Picea abies* (L.) Karst), silver fir (*Abies alba* Miller), European beech (*Fagus sylvatica* L.) and preferential infiltration in stagnic soils in the northern Pre-Alps in Switzerland. We conducted irrigation experiments (1 m^2) and recorded water content variations with time domain reflectometry (TDR). A rivulet approach was applied to characterise preferential infiltration. Roots were sampled down to a depth of 0.5 to 1 m at the same position where the TDR-probes had been inserted and digitally measured. The basic properties of preferential infiltration, film thickness of mobile water and the contact length between soil and mobile water in the horizontal plane are closely related to root densities. An increase in root density resulted in an increase in contact length, but a decrease in film thickness. We modelled water content waves based on root densities and identified a range of root densities that lead to a maximum volume flux density and infiltration capacity. These findings provide convincing evidence that tree roots in stagnic soils represent the pore system that carries preferential infiltration. Thus, the presence of roots should improve infiltration.

Final Revised Paper (PDF, 1604 KB) Discussion Paper (HESSD)

Citation: Lange, B., Lüescher, P., and Germann, P. F.: Significance of tree roots for preferential infiltration in stagnic soils, Hydrol. Earth Syst. Sci., 13, 1809-1821, 2009. Bibtex EndNote Reference Manager