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Hydraulic conductivity and entrapped air in heterogeneous soil: laboratory experiment

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A discontinuous air phase, commonly referred as the entrapped air, affects significantly the near-saturated water flow in soils. Some authors have shown that the relationship between hydraulic conductivity and the entrapped air volume can be described by power law function. Hydraulic conductivity of soil at zero suction pressure head often decreases by two orders of magnitude, compared to the saturated hydraulic conductivity, when entrapped air is present. However, little is known about the mechanisms, causing the entrapped air to develop. We will present the results of infiltration outflow experiments done in laboratory to elucidate the effect of the initial water content and wetting dynamics on the entrapped air content. Experiments were conducted on undisturbed soil cores of heterogeneous coarse sandy loam. Newly proposed experimental set-up designed to measure the effective hydraulic properties of soils under varying entrapped air content was used to conduct the experiments. The key parts of the set-up are the infiltration disc and water collection assembly, which allow separation and quantification of air and water inflow and outflow. Preliminary results show the magnitude of influence of selected initial wetting scenarios on the near saturated hydraulic conductivities and entrapped air content. This research has been supported by MSMT 1K05024.