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STUDY OF MACROPORE FLOW USING ELECTRICAL RESISTIVITY TOMOGRAPHY?

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Water flow in unsaturated soil can relatively easily be observed using time lapse high resolution electrical resistivity tomography (ERT). However, in order to conclude from the inversion results the “true” process critical questions with regard to resolution, inversion bias and non unique relationships between water content and resistivity need to be answered. There can be no general answers because i.e. resolution depends on the resistivity, its absolute values, contrasts and heterogeneity. In order to study those critical questions in 2011 two different experiments were carried out on a Loess soil close to Hannover, Germany. Firstly, a ponded infiltration experiment and secondly an irrigation experiment both using water coloured with brilliant blue. Before, during, and after both experiments ERT array measurements were conducted. After the experiments the areas were excavated, undisturbed soil samples (soil cores) were taken, water content and matric potential was measured. From the ponded infiltration experiment where within 25 min 30 l water infiltrated in a circular area of 40cm diameter (716mm/h) it became clear that macropore flow is of major significance at this site. The ERT inversion revealed indeed hints for this rather quick process. Contrary to the irrigation experiment (4.2 mm h⁻¹ for 48h) and greatly different to the experiments in sand the inversion showed narrow infiltration paths for a short time. Three different time lapse inversion strategies were tested and showed significant differences. After the calculation of the time correction the process could be reconstructed with higher reliability.