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# 1 Quantitative Comparison of ERT and Photographic Images of a Dye Tracer in a large Lysimeter

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Numerous studies have confirmed that dye tracer experiments provide spatially highly resolved information on solute transport through the unsaturated zone. Here, the food dye Brilliant Blue FCF is preferably used due to its low toxicity, good visibility and relatively high mobility. Recent studies show that detailed quantitative distribution of the dye concentration from Brilliant Blue FCF images is possible. In terms of spatial resolution, dye concentrations obtained from images provide better information on solute distributions in soils at that scale than any other current method. However, due to the requirement of the dye staining method to take photos of soil surfaces, dye tracer studies are normally either lacking information on the temporal evolution of the tracer plume/front or are constrained to two dimensions. Yet, in order to fully understand solute displacement through unsaturated soils, spatio-temporal monitoring of the solute plume/front evolution is required.

Brilliant Blue FCF is negatively charged for pH values higher than 5.84. Hence, for slightly acid or for basic soils, Brilliant Blue FCF provides an electrical contrast which should be detectable by time domain reflectometry (TDR) probes and electrical resis-

tivity tomography (ERT). The combination of ERT and TDR can supply quantitative information on the spatio-temporal evolution of the dye tracer plume/front until it reaches its final position which is then captured by photography.

In this study, we investigate a dye tracer displacement in a large undisturbed lysimeter by means of TDR, ERT and photography. The use of a lysimeter made possible to collect data of excellent quality due to overall accessibility and the high degree of control on the boundary conditions during the experiments. The aim of this study is a) to show that the temporal evolution of a Brilliant Blue FCF tracer front progression through an undisturbed and unsaturated soil can be captured by TDR and ERT and b) to investigate if the ERT data are quantitatively consistent with the corresponding Brilliant Blue concentrations that are derived from images of dye stained soil cross-sections.