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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "Large zero-tension plate lysimeters for soil water and solute collection in undisturbed soils" *by* A. Peters and W. Durner

**Anonymous Referee #2**

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The paper is an impressive piece of work, and deserves publication once the issue detailed below is dealt with. It provides excellent insight into the issue of unsaturated flow and quantifies the importance of heterogeneities and preferential flow in a way that has not, to my knowledge, been done before.

The numerical modelling described in the paper makes for extremely interesting reading and provides valuable quantification of the effect of macropore flow. The discussion on the difference between first arrival of a tracer and the cumulative collection in a lysimeter and in a soil with no lysimeter is particularly valuable. My main concern is the apparent disconnect between the numerical modelling and the field experimentation.

The parameters chosen for the parametric study (Table 1) indicate a soil similar to

an Aeolian sand (e.g. a very low air entry value). Is this suggestion correct? If so, the proposed methodology for insertion of the large plate lysimeter is likely to still be destructive. The authors recognise the importance of not disturbing soil during the installation process and their experimental technique is intended to address this issue. However, the auger hole is very unlikely to remain open in soil of the type assumed in the modelling. In fact, it is likely that unless the soil has a reasonable clay content, disturbance during plate installation is unavoidable. This will cause loosening of the 'roof' of the horizontal hole, effectively producing a soil with different retention and permeability characteristics than the soil mass. Figure 2 in the paper illustrates this problem, with voids visible above the lysimeter channels (e.g. see the left-most end of the lysimeter). Furthermore, the channels are filled with gravel, which was not modelled in the numerical study. This disturbance and loosening of the soil, together with the use of gravel, is likely to produce a capillary break effect above the lysimeter, which is counterproductive, as recognised by the authors.

It may be that guidelines will have to be developed explaining the range of soil types for which the proposed lysimeter installation technique is likely to be problematical, such as the cohesionless sand discussed above. The authors may also find it useful to discuss the issue with their geotechnical engineering colleagues, who may be able to assist with modelling the installation effects on the integrity of the soil above the lysimeter.

The figures are excellent, the tables necessary and the references relevant. I have no suggested typographical corrections.

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Interactive Comment