

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

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Response to reviewers comments

Reviewer 1:

Thanks for the positive comments! Point 3: Indeed, the reviewer is right and we were wrong with respect to the wick lysimeter data. We changed the corresponding sentence (Page 4639, Lines 22-26). *Gee et al., 2009 simulated the performance of wick lysimeters with 20 cm diameter in homogeneous soils, and came to quite favorable results. Field installations of the lysimeters, however, showed a large variation in sampling efficiency. They attributed this to heterogeneity, preferential flow and wick lengths*

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of the fluxmeters.

Reviewer 2:

Also thanks for the very positive and constructive comments, we appreciate. The critical points raised by the reviewer shows us where we need to clarify points in the manuscript.

I. Limitations of the installation technique

According to our experience, small holes in the soil, such like that at the left most end of the depicted lysimeter in Fig. 2, occurred only close to the wall of the access pit were the soil is relatively unstable. However, in cohesionless soils, as e.g. the simulated coarse uniform sand, limitations of the installation technique occur. This is now addressed in the paper by the statement “...*Note, that for dry single grained sands a disturbance of the overlying soil might be unavoidable, so that this insertion technique has its limitations with respect to the soil material.*”(Page 4642, Lines 5ff).

II. Disconnection between field study and simulation study

We are fully aware that in the homogeneous cases our numerical study was carried out for a wide range of soil materials, including rather coarse soil materials. The study with homogeneous soils was meant to show the effects of infiltration intensities and soil properties on collection efficiency with special consideration of the interaction of air entry pressure and hydraulic conductivity close to saturation. If the results are extrapolated towards finer materials, the lysimeter performance will be better in all cases, as seen in Fig 6. The field experiments was intended to show the general feasibility of the system, its general benefit in heterogeneous soils and the general disadvantage in homogenous soils, in particular for situations where hydraulic conductivities are relatively high close to saturation and infiltration intensities are relatively small. However, it was not meant to directly validate the numerical simulations. To achieve that direct validation in a strongly heterogeneous soil, a very intense and highly resolved local mapping of hydraulic properties would be necessary that cannot be obtained without

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destroying the system under investigation. This was simply beyond the scope of the study.

II. Disconnection between field study and simulation study

The gravel surface was not explicitly modelled because the interface soil-gravel is regarded as the lysimeter surface. This is reasonable since the air entry pressure of the gravel will be below 1 mm, so that water will infiltrate only if the matric head at the gravel surface is > -1 mm (i.e. if the soil is practically saturated). This is also the reason why the gravel will not serve as a capillary break: We try to make this point clear by inserting one sentence in Page 4643, Lines 21ff. "... *The seepage face boundary in the simulations represents the upper gravel surface of the installed lysimeters.*"

IV. Modelling the installation effects on the integrity of the soil

Modelling the installation effects on the integrity of the soil will be of such high complexity (especially if different soil material properties are investigated) that it would go far beyond the scope of this study. We believe, however, that in the typical application where the bore hole ceiling does not collapse, all soil disturbance is very local and close to the seepage face, so that the transport properties in the overlaying soil body will not be altered.

We hope that we addressed all concerns of the two reviews.

Kind regards, Andre Peters and Wolfgang Durner

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4637, 2009.

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