

Interactive comment on “Experimental and theoretical memory diffusion of water in sand” by G. Iaffaldano et al.

G. Iaffaldano et al.

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Thank you very much for the useful comments. Let me reply point by point:

1. As the experiments here described were a first trial to make flux measurements, the quality of the experimental set up was not so high. Nevertheless it served well the purpose to be able to resolve flux variations of the order of gramm/second. Based on the encouraging results here presented, Di Giuseppe, Caputo and other co-authors performed further experiments with a much more sophisticated automatic device. They confirm our results and a paper from them is in preparation and will soon be submitted. Because of the mathematical nature of the system to solve, the flux was forced to the first data point. The memory formalism has been included in the Darcy's law in order to describe the initial transient part, where the compaction occurs. It modifies the theoretic equation in such a way that the flux converges to zero at an infinite time. It is so expectable a lower quality of the fit in the last hours of the experiment. We tried

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to bypass this by subtracting an average flux over the last hours from the minimized function. This is explained in 3.1.

2. Flux reductions are due to the packing of the sand, which depends on the flux, which in turn depends on the pressure. Although not direct, it is logical to modify the pressure term in the equations. It also makes the solution easier to find in the Laplace domain and, once it has been transformed back in the time domain, the initial condition is physically observable. As we wanted to model the compaction of the sample, we preferred not to equilibrate it before the experiment.

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