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Experimental evidences on the scaling behavior of a sandy porous media.

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Abstract
Various authors treated the scaling of the hydrodispersive parameters in porous media. Nevertheless several studies and reports finding in literature on this matter, specifically on the dispersivity increases with scale of measurement, are based on a statistical or experimental approach (Neuman, 1990; Wheatcraft & Tylor, 1988; Clauser, 1992; Schulze-Makuch, 2005).
Following this last approach, we analysed the scale behaviour of a sandy porous media, the grain size of which was characterized carefully in laboratory.
For this aim we carried out several tracer tests on three cylindrical samples of the considered sandy soil. The diameter of these samples was the same, equal to 0.0635 m, and the lengths respectively equal to 0.15 m, 0.30 m and 0.60 m. At the bottom and the top of the cylindrical sample two membrane were located to allow the water flow. The water arrived in the sample from the bottom by a plastic tube and came out from the top to exclude the presence of air in the soil sample.
The flow was produced by a peristaltic pump, able to develop different rates and therefore different flow velocities. For all tests the utilized tracer was NaCl, that was melted in 50 ml of solution with concentration of 5 g/l. The letting in of the solution was performed immediately up pump, by a connection of plastic tubes and a tap. The tests was carried out at first letting in the tracer in short times and after repeating it with continuous letting in.
In this way the tests was carried out, repeating them five times with different rates and, therefore, velocities. For each of test the breakthrough curves were obtained and successively the longitudinal dispersivity (αL) and the coefficient of longitudinal dispersion (DL) were calculated. These values, considering also the lengths of the samples, allowed to verify the scaling behaviour of the examined sandy porous media. In fact a specific law to describe the increase of αL with scale was determined. Analogously another law was determined to describe the increase of DL with the velocity.

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