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Hydrodispersive characterization of a sandy porous medium by tracer tests carried out in laboratory on undisturbed soil samples

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The contamination of large areas and correspondent aquifers often imposes to implement some recovery operations which are generally complex and very expensive. Anyway, these interventions necessarily require the preventive characterization of the aquifers to be reclaimed and in particular the knowledge of the relevant hydrodispersive parameters. The determination of these parameters requires the implementation tracer tests for the specific site (Sauty JP, 1978). To reduce cost and time that such test requires tracer tests on undisturbed soil samples, representative of the whole aquifer, can be performed. These laboratory tests are much less expensive and require less time, but the results are certainly less reliable than those obtained by field tests for several reasons, including the particular scale of investigation. In any case the hydrodispersive parameters values, obtained by tests carried out in laboratory, can provide useful information on the considered aquifer, allowing to carry out initial verifications on the transmission and propagation of the pollutants in the aquifer considered. For this purpose, tracer tests with inlet of short time were carried out in the Soil Physics Laboratory of the Department of Soil Protection (University of Calabria), on a series of sandy soil samples with six different lengths, repeating each test with three different water flow velocities (5 m/d; 10 m/s and 15 m/d) (J. Feyen et al., 1998). The lengths of the samples taken into account are respectively 15 cm, 24 cm, 30 cm, 45 cm, 60 cm and 75 cm, while the solution used for each test was made of 100 ml of water and NaCl with a concentration of this substance corresponding to 10 g/L. For the porous medium taken into consideration a particle size analysis was carried out, resulting primarily made of sand, with total porosity equal to 0.33. Each soil sample was placed in a flow cell in which was inlet the tracer from the bottom upwards, measuring by a conductivimeter the variation of the outgoing concentration over time and obtaining the respective breakthrough curve. The flow was induced and regulated by a peristaltic pump. The results obtained are consistent together with those obtained by other researchers for analogues soil types; moreover the existence of a scaling law for the hydrodispersive parameters considered, ie the longitudinal dispersivity ([U+F061]L) and the longitudinal dispersion coefficient (DL), was also verified (Neuman S.P., 1990), (Schulze-Makuch D., 2005).
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