



PARAMETERS OF FLOW IN POROUS ALLUVIAL AQUIFERS EVALUATED BY TRACERS

Alberto TAZIOLI ¹, Lucia AQUILANTI ², Francesca CLEMENTI ², Torquato NANNI ¹, Stefano PALPACELLI ³, Andrea RONCOLINI ², Paola VIVALDA ¹

¹ *Department of Scienze e Ingegneria della Materia, dell'Ambiente ed Urbanistica, Università Politecnica delle Marche, Via Brezze Bianche-Ancona, Italy, a.taziolit@staff.univpm.it*

² *Department of Scienze Agrarie, Alimentari e Ambientali, Università Politecnica delle Marche, Via Brezze Bianche-Ancona, Italy, laquilant@univpm.it*

³ *Geologist*

Dye tracer tests are a good technique useful to determine the hydrogeological parameters of aquifers, especially in alluvial plains, where the heterogeneity of the lithology is a key factor leading the groundwater circulation. In the last decade, new tracers have been developed and introduced in the hydrological and geological context, one of them is the DNA biotracer, a synthesized molecule composed by 72 nucleotides used in the same way as the traditional tracers (Tazioli et al., 2016).

In this study, some experiments in piezometers and wells (draining an alluvial plain in the Marche Region, Italy) were performed with the aim of comparing the behavior of different tracers (Uranine, NaCl) in the evaluation of an alluvial aquifer's parameters, and to test the suitability of the DNA-tracer in a geological context different respect to the one studied by Aquilanti et al. (2016).

Single well and multiwell tests have been performed during the winter and spring seasons of the present year, involving one piezometer (30 m depth) and 4 wells (tapped by the aqueduct, with depth varying between 12 to 20 m). The tracer test results highlight faster zones of flow in the alluvial plain, being located at different depths, which levels are characterised by gravel and sand layers. Average flow velocity of about 3 cm/day have been obtained by the single well tests, executed both in the piezometer and in the wells; the main direction of flow is along the watercourse axis, as resulted by the multi well tracer test (tracer injection in the piezometer and tracer recovery in the wells).

The obtained results confirm that the fluorescent tracers are a reliable tool very valuable in the determination of groundwater velocity, groundwater flow direction and dispersion parameters, even in cases of multi-layer aquifers. DNA tracer is very helpful in the determination of faster circuits and vertical flow even in multi-layered aquifers.

References

Tazioli A., Aquilanti L., Clementi F., Marcellini M., Nanni T., Palpacelli S., Vivalda P.M. (2016) The contribution of DNA and fluorescent tracer for the identification of connections in karst and fissured aquifers. Rend. Online Soc. Geol. It. Suppl. n. 1 a Vol. 39 (AQUA 42nd IAH Congress, Rome)

Aquilanti L., Clementi F., Nanni T., Palpacelli S., Tazioli a., Vivalda P.M. (2016) DNA and Fluorescein tracer tests to study the recharge, groundwater flowpath and hydraulic contact of aquifers in the Umbria-Marche limestone ridge (central Apennines, Italy). *Envir. Earth Sci.* 75(7):626

