

Coupling hydrology, geochemistry and hydrodynamics towards rational management of discontinuous aquifers: application to the Ursuya massif (Basque Country, France)

J. JAUNAT^{1,2}, F. HUNEAU^{1,2}, A. DUPUY³, H. CELLE-JEANTON^{4,5,6} & P. LE COUSTOMER³

1 Université de Corse Pascal Paoli, Laboratoire d'Hydrogéologie, Corte, France
jaunat@univ-corse.fr

2 CNRS, UMR 6134, SPE, Corte, France

3 Université de Bordeaux, EA 4592 Géoressources & Environnement, ENSEGID, France

4 Clermont Université, Université Blaise Pascal, Laboratoire Magmas et Volcans, France

5 CNRS, UMR 6524, LMV, 63038 Clermont-Ferrand, France

6 IRD, R 163, LMV, 63038 Clermont-Ferrand, France

Abstract The metamorphic massif of Ursuya (French Basque Country) is a strategic aquifer for the water supply of southwestern France. A multidisciplinary approach, conducted between 2009 and 2013, has led to understanding of the behaviour of this system made of discontinuous media. Isotopic and geochemical characteristics of rainwater were studied together with groundwater geochemistry, to delineate the water–rock interactions along the underground flowpaths. The chemical characteristics of groundwater, the residence times (less than 10 years to more than 50 years) and the associated mixing processes allow the achievement of a conceptual model of the groundwater flow. It highlights the role of the weathering profile from the point of view of mineralization as well as flowpaths. Finally, a quantitative approach shows highly heterogeneous hydrodynamic properties related to the weathering profile development. These results are synthesized and validated by a numerical model which forms the basis for rational management of the Ursuya aquifer in a region subject to a constant increase in water needs.

Key words groundwater; hard-rock aquifer; weathered profile; major ions; residence time; numerical model; Basque Country, France