Geophysical Research Abstracts
Vol. 18, EGU2016-11953, 2016
EGU General Assembly 2016

HYDRAULIC BINDING BETWEEN STRUCTURAL ELEMENTS AND GROUNDWATER CIRCULATION IN A VOLCANIC AQUIFER : INSIGHTS FROM RIANO QUARRIES DISTRICT (Rome Italy)

David Rossi (1), Elisabetta Preziosi (1), Stefano Ghergo (1), Daniele Parrone (2), Stefano Amalfitano (1), Anna Bruna Petrangeli (1), and Annamaria Zoppini (1)

(1) Water Research Institute - CNR, Monterotondo, Italy (david.rossi@irsa.cnr.it), (2) Department of Science, University of RomaTre

A field survey and laboratory analysis of fracture systems crosscutting volcanic rocks was performed in the North-East of Rome urban area (Central Italy) to assess the hydraulic binding between structural elements, groundwater circulation and geochemistry. Fracture features (orientation, density, apertures, length and spacing) as well as groundwater heads and geochemical characteristics of rock and groundwater were analysed. We present and discuss the macro and mesostructural deformation pattern of the Riano quarries district (Central Italy) to highlight the close relationships between geological heterogeneity and water circulation. Laboratory analyses were carried out on rock samples: using XRF, microwave acid digestion and diffractometer to identify the chemical and mineralogical characters of the outcropping rock samples with a special focus on altered bands of fractures. On water samples using ICP-OES for major cations, ICP-MS for trace elements, IC for major anions and Spectrophotometry for NO_2, PO4, NH4 .

A total of 26 quarries with different dimension, shape and depth were examined by both remote and field analyses. Despite all the quarries were realized within the same tuff formation interval, a different fracture spatial distribution was recognized. From North to South a progressively increment of fracture density was observed. It was possible to observe a close relationship between orientation, spatial distribution and length. For each single fractured set, a 5° max orientation variation was observed, suggesting that fracture genesis was likely related to an extensional/transtensional tectonic process. Most of the fractures directly examined show an alteration band with different colors and thickness around the whole fracture shape.

A preliminary overview of the laboratory results highlights that altered and unaltered tuffs (belonging to the same formation) show different chemical compositions. In particular, an enrichment of Mn, accompanied by a depletion of Na, Mg, Al and Ca, seems to be related to the occurrence of the fractures. We found a close relationship between fracture length/density and tuff chemistry in the altered bands. The groundwater circulation is likely responsible of the enrichment/depletion processes that may significantly modify the chemical composition of both tuff and groundwater. Furthermore, the role of the fracture network in the interaction between shallow and deep aquifer circulation is also discussed, considering the groundwater geochemical features.