

GEOCHEMICAL TRACERS IN COMPLEX HYDROGEOLOGICAL SETTINGS: THE ROCCAMONFINA VOLCANIC VS. MT. MASSICO SEDIMENTARY AQUIFERS (SOUTHERN ITALY)

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The Peri-Thyrrhenian margin of central-southern Apennine chain hosts complex geologic structures. The Quaternary explosive volcanism covered several sedimentary basins. This complex geologic setting drives groundwater circulation between sedimentary vs. volcanic aquifers, which host important water resources for human supply. Geochemical composition together with traditional hydrogeological investigation methods provide useful information in the exploration of productive aquifers, allowing a correct management of water resources. Geochemical traces, elemental Sr and its isotopic composition are an useful tool to trace groundwater evolution along its flow-path. In the present investigation we report the results of a study conducted to determine the hydrogeochemical and (⁸⁷Sr/⁸⁶Sr) isotopic compositions of the Roccamonfina volcano and Mt. Massico groundwater. Fifteen water samples were collected from wells (18-168 m a.s.l) spread over a wide area on the northeastern flank of Mt. Massico (Casanova di Carinola area) and on the southern slope of Roccamonfina volcano (Cascano area). This area acts as "natural laboratory" where the relationship among Sr isotopic signature, chemical composition of groundwater and hydrogeological dynamics can be investigated in order to correctly define the hydraulic relationship between the Roccamonfina volcano and the Mt. Massico hydrogeological basins. Furthermore, Sr isotope ratio together with the results obtained from traditional methods, allow us to discriminate a) the influence of different lithologies during water-rock interaction processes, b) the recharge areas and c) the maturity of the aquifer. Two endmember water compositions were recognized characterized by distinguished Na⁺/K⁺ and ⁸⁷Sr/⁸⁶Sr isotope ratios. Groundwater samples collected on the southern slope of Mt. Roccamonfina (Cascano area) are alkali type and characterized by ⁸⁷Sr/⁸⁶Sr isotope ratios ranging from ca. 0.7087 to ca. 0.7096, in agreement with the chemical and isotopic composition of host rocks. Groundwater from the northeastern slope of Mt. Massico (Casanova di Carinola area) are alkali earth type and have ⁸⁷Sr/⁸⁶Sr ranging from 0.7084 to ca. 0.7090. Intermediate compositions have been detected in groundwater sampled in wells located along the boundary between Roccamonfina volcanic units and Mt. Massico limestones and dolostones in the Cascano area. In conclusion, chemical and isotopic data on ground water sampled from the Mt. Roccamonfina - Mt. Massico hydrogeological basins allow to clearly detect different mineralization processes related to the specific hydrodynamics produced by interaction with volcanic or carbonate host rocks.

