# 852 - HYDROGEOCHEMISTRY OF CASTROCARO MINERAL GROUNDWATER (NORTHERN APENNINES, ITALY): INSIGHTS FROM AQUEOUS GEOCHEMISTRY AND ISOTOPIC COMPOSITION OF SULPHATE AND SULPHIDE

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Hydrogen sulphide in low to moderate temperature waters typically derives from anaerobic bacterial reduction of sulphate. The process may occurs in fresh to hypersaline waters, using both heavy and light organic molecules.

The sulphur isotope analysis of sulphide-sulphate pairs can support such a biogenic origin of sulphide, in the meanwhile providing evidence about the sulphate source. These indications can be crucial to define the hydrogeology of groundwater systems, thus allowing a more aware management and development of the resource.

Northern Apennines provide an interesting setting for studying the origin of sulphurous (and methane-bearing) anoxic saline groundwater, coupling chemical and isotopic data ($\delta^{34}S_{SO4}$, $\delta^{18}O_{SO4}$, $\delta^{34}S_{H2S}$) on the sulphide-sulphate system in solution. Groundwater from the *Castrocaro* area was selected, given its use in the local spa and the several wells available for sampling. Groundwater is characterized by Na-Cl facies, temperature of 13.2 to 17.7 °C, pH of 6.8 to 7.4, Eh between -130 and +30 mV, and sulphide and sulphate concentrations of 2 to 118 mg/L and 0.9 to 76.8 mg/L, respectively. The $\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$ values cover respectively a range of 59.1‰ and 16.5‰; $\delta^{34}S_{H2S}$ values span over a range of 57.7‰.

The inferred hydrogeological conceptual model is basically the following: 1) recharge meteoric water mixes with fossil seawater trapped in organic matter-bearing sediments of the *Marnoso-Arenacea* formation (Tortonian). Bacterial reduction in the groundwater mainly deals with soil sulphate leached by the recharge component ( *Castrocaro* and *Cozzi* wells); 2) the *Gessoso-Solfifera* formation (Messinian) is likely involved in some studied groundwater (*La Bolga* wells), where the bacterial reduction is enhanced given the abundant organic matter associated to the evaporite.