

# Hydrogeological modelling of mineral groundwater of Castrocaro (Northern Italy): insights from aqueous geochemistry and isotopic composition of sulphate and sulphide M. Pennisi<sup>a</sup>, G. Cortecci<sup>a</sup>, G. Magro<sup>a</sup>, F. Gherardi<sup>a</sup>, A. Antoniazzi<sup>b</sup>,

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Brines and salty waters associated to gas reservoirs in an attempt to understand the relationship between deep circulation of salty groundwaters, gas and oil genesis (1, 2, 3 and ref. therein). The Castrocaro area was selected in this study as a snapshot to investigate the origin of sulphur in local saline water, togheter with other geochemical and isotopic tracers (ref.4). sulphur isotopes ( $\delta^{34}$ S and  $\delta^{18}$ O of SO<sub>4</sub> and  $\delta^{34}$ S of H<sub>2</sub>S) appear crucial to highlight different hydrological circuits, i.e. water flowing through flysch and/or evaporite rocks





environment according to:  $SO_4^{2-} + 2(CH_2O) = H_2S + 2HCO_3^{-}$ . The basic factor controlling the bacterial activity is organic matter, which undergoes oxidation

In contrast with chemistry and with O, H, (and Sr) isotopic tracers, the  $\delta^{34}$ S values of the SO<sub>4</sub>- H<sub>2</sub>S system, when plotted against sulphate, clearly identify two

Sulphate produced from both sources underwent microbial reduction under closed conditions, thus producing H<sub>2</sub>S with the sulphur isotopic signature



Oxidation of reduced sulphur (pyrite) in the *Marnoso* Arenacea Fm. by meteoric water and dissolution of gypsum in the *Gessoso-Solfifera Fm.,* followed by deposits, are responsible for the production of  $H_2S$ 

## These results found application in the substainable exploitation of the resource for therapeutic purpose