Geophysical Research Abstracts, Vol. 7, 09235, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09235

SGD as a source of N and P to a coastal marine ecosystem: a case study, south-eastern Sicily (Italy).

S. Hauser (1), and **M.A. Schiavo** (1,2)

(1) CFTA, Università di Palermo, Palermo, Italy

(2) INGV, Sezione di Palermo, Palermo, Italy

m.schiavo@pa.ingv.it / Fax : 39 091 6809449

This note is an overview of the main results of an hydrogeochemical survey carried out during 2002 - 2003 along the coast of the South-eastern Sicily, aimed at the geochemical characterisation of both groundwater chemistry and SGD manifestations in the area. In the area, SGD are the main pathways for the transport of nitrogen and phosphorous to the coastal marine ecosystem.

The abundance of nitrogen species in the studied groundwaters (nitrate and its reduced form precursors nitrite and ammonia) is far to high to be explained by a derivation from N-poor host carbonates: nitrate concentrations in un-polluted carbonate aquifers from the nearby carbonate massif rarely exceed 10 mg·l^{-1}, which is 4 to 20 times lower than typical contents in groundwaters from south-western Sicily, and the same is true for ammonia ($<$5-20 μg·l^{-1}should be the typical range of un-polluted carbonate groundwaters, whereas significant enrichments are observed here). In the search for the identity of this nitrogen source, we note that (a) the highest nitrate concentrations are recovered in the coastal area, which is the most densely populated; (b) nitrate is positively correlated with δ^{18}O, an evidence of the fact that shallow depth water levels with recharge areas on the lower Hyblean plateau or in the coastal plain are the most affected by nitrate pollution; (c) nitrate display striking positive dependence on sulphate. These observations are suggestive indication of an anthropogenic N origin, and most specifically from leaching of N-bearing fertilizer from infiltrating water in densely cultivated coastal areas. In these hypothesis, reduced N compounds would be the markers of the preliminary (non-equilibrium) irreversible stages of oxidation of a reduced nitrogen precursor. Sources of phosphate, in turn, are not so easy to

assess, because both anthropogenic (via wastewaters oxidation, organic matter burning or fertilizers) or geogenic sources (phosphate rich carbonates are indeed commonly outcropping in the area) are possible. Whatever the origin, the significant phosphate excess with respect to un-polluted carbonate groundwaters (PO_4^{3-} $\sim$10 μg/l) further demonstrate the "low quality" of the groundwater resource in the area, and claims for its potential environmental impact on the local marine ecosystems upon its discharge into the sea (SGD). This is also consistent with the very high concentrations of many toxic metals, some of them (Cd, Pb, Zn) being at concentration levels higher than those compatible with an exclusive crustal derivation.