Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06967, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06967
EGU General Assembly 2008

Intrinsic and integrated aquifer vulnerability of a karstic aquifer (Murgia, Southern Italy)

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Karstic aquifers are highly vulnerable to contamination. Karstic aquifers are well known for their specific vulnerability to contamination, due to particular characteristics such as thin soils, point recharge in dolines or shafts and swallow holes. The residence time of karstic groundwater is generally shorter; contamination tends to be faster and simpler than for non-karstic groundwater. In many European countries, 50 % of the drinking water supply comes from karstic groundwater and in many areas it is the only available source of fresh water as in the case of the Apulian region (South-Eastern Italy). The complex assessment of aquifer vulnerability of a karstic aquifer encourages testing the application of more methods to define the intrinsic vulnerability and to validate the vulnerability results considering the existing potential sources of contamination and the effects of these on the groundwater quality. The paper is based on the use of DRASTIC, SINTACS and of the 'European Approach', based on the COP and VULK methods. In the Murgia area, located in the Apulian region, local surface water resources are completely absent due the discontinuous nature of drainage network and the high permeability of outcropping limestone rocks. Murgia groundwater for domestic, irrigation and industrial use has been withdrawn in large and increasing quantities over the years; it still allows the development of local population. Murgia aquifer is a large and deep carbonate aquifer, the predominant rock material of which is either limestone or limestone-dolomite. The aquifer is affected by karstic and fracturing phenomena, also well below the sea level, whereas intruded seawater underlies fresh groundwater owing to a difference in density. The groundwater flow is confined except in a restricted coastline strip. The intrinsic vulnerability maps, produced using a GIS approach, report a wide range of vulnerability degrees, mostly

low, medium, high and very high vulnerability. Most of the selected area is classified as highly vulnerable. Very high risk is reported where karst features are present on the terrain (dolines) or the hydrodynamic characteristics of the aquifer make it particularly vulnerable. The validation approach based on the use of data layers of contamination sources and of anthropogenic groundwater quality degradation shows the advantages of assessment methods which consider karstic features.