



Evaluating the recharge area of a spring by means of isotopic analysis

A. Tazioli (1), G.S. Tazioli (1) and M. Mosca (2)

(1) Dep. of "Fisica e Ingegneria dei Materiali e del Territorio", Marche Technical University, Ancona +39 071 2204729 (2) Geologist

Isotope techniques have been used to investigate groundwater circulation in Marche Apennines (Central Italy) and to have information on the recharge area of an important spring which supplies drinking water to the entire Ancona Province. This spring has a discharge of about 1000 l/s. The water is picked up by several wells located near Serra S. Quirico (AN) at 172 m a.s.l., in which groundwater goes up until about 150 m a.s.l. The outcropping rocks are made of a limestone series, Mesozoic-Paleogenic in age, which can be estimated up to 1500 m in thickness. The structural framework displays folds oriented SE-NW and a series of faults NW-SE and NE-SW. Main tectonic events (Middle Pleistocene) have established the uplift of the area with consequent deepening of valleys. These rocks constitutes the main aquifer of the spring, and are strongly fixured. Above these rocks, a low permeability dam of marly clay -"Marne a fucoidi"- is found close to the surface. The wells perforate these layer and take the groundwater up to surface plain. This composition, from the top of mountain to the point of drawing, assures a constant, fast and continuous recharge to the spring. The rock permeability is conditioned by lithology and by a very complex tectonics. To investigate groundwater chemistry and its isotopic and tritium content, monthly sampling in several spring wells has been performed for over 4 years by 2001. The groundwater chemistry is generally of calcium bicarbonate type with TDS between 290 and 360 mg/l and the temperature is generally constant, equal to 12.2 °C. The isotope content in precipitations was controlled in two rain stations located at different altitudes. The environmental isotopes utilized (^{18}O , ^2H , ^3H) have allowed to localize the recharge area of infiltration of the spring. In fact, groundwater from spring is recharged only in highlands areas, between 1000 and about 1500 m a.s.l. From tritium content results (between 6-9 TU) it is possible to assert that a little amount of groundwater is recorded

in spring with a retardation of 5-6 months with respect to recharge water from rains.