[20] REVIEW ON AVAILABLE DATA ABOUT NATURAL BACKGROUND LEVELS OF DISSOLVED ELEMENTS IN THE GROUNDWATER OF ROME (ITALY)

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Introduction

Natural background levels (NBL) of groundwater, are defined as the concentration of a given element, species or chemical substance present in solution of a groundwater body which is derived by natural processes from geological, biological or atmospheric sources. Substances need to be understood in the context of their geochemical setting. This may often be difficult where substances exhibit high NBL in relation to any presumed anthropogenic component (Hart and Müller 2006).

In this note a review about currently available data of NBL in groundwater of Rome (central Italy) is presented in order to plan further studies about all the municipality area.

Main Body

Establishment of natural background levels (NBL) for groundwater is commonly performed to serve as reference when assessing the contamination status of groundwater units (Griffioen et al. 2008).

Background levels in groundwater are the result of water–rock interaction, chemical and biological processes both in the vadose and saturated zone, relationships with other water bodies, atmosphere and rainfall composition. For this reason, spatial variation of background level of a substance present in solution in a specific groundwater body can be huge and a single value may be difficult to define (Preziosi et al. 2010).

Several studies have been carried out in Europe and in Italy (Molinari et al. 2012; Hynsby and Condesso De Melo, 2006) to evaluate thresholds of NBL in groundwater and soils and many of those were commissioned by government authorities in order to manage drinkable water supply and also the real pressure of contaminated sites and/or their identification.

In the Latium Region the only commissioned studies, right now, are related to specific evaluation of thesholds of NBL for water supply and for some important potentially contaminated sites (IRSA/ENEA 2010), and moreover there are several scientific published works by research institutes and universities (Vivona et al. 2007; Preziosi et al. 2010; 2014).

The area of Roma Capitale (Municipality of Rome) has a particular geological and hydrogeological setting. It is in fact strongly influenced by the coexistence of tectonic activity, volcanism of several volcanoes (the Vulsini, Cimini, Sabatini volcanic complex northward, the Colli Albani volcanic complex to the south) and eustasy. By a general hydrogeological point of view, the roman area is placed between three regional structures and the aquiclude of the Pliocene Clays (which can be considered the bedrock of this area, with more than 800 meters of thickness).

Going into details, main aquifers of Rome are located in the Colli Albani volcanic pozzolanaceous products and in the continental and alluvial prevolcanic and sinvolcanic sediments. Moreover Olocene valleys, filled by postvolcanic alluvial sediments, are interested by a confined aquifer into the gravels placed in the base of the alluvial sequence (Capelli e al. 2008).

Thus there are 6 hydrogeological units that can be indentified: the aquiclude of M. Vaticano clayey Pliocene formation, the volcanic aquifers of Sabatini Volcano (right of Tiber), the volcanic aquifer of Colli Albani Volcano (left of Tiber), the continental aquifers of Paleo-Tiber and of Ponte Galeria Formation, the alluvial aquifers of the Tiber basin and fan. Looking at hydraulic relationships between these units, the main groundwater circulations which can be identified are: the basal Tiber alluvial gravel body, the volcanic and prevolcanic aquifer's body in the orographic left of Tiber, the volcanic and prevolcanic aquifer's body in the orographic right of Tiber, and the alluvial fan aquifer's body.

In this complex geological and hydrogeological setting the presence of many natural elements (i.e. As, F, V, Mn, Fe) and compounds dissolved in groundwater is widely documented, sometimes and somewhere exceeding the law thresholds, due to the volcanic and mineral nature of soils and hydrothermal activity. It's important to consider that some elements, naturally contained in soils, may be mobilized by pollution phenomena by changing physic and chemical parameters like Eh, pH, etc. so that their concentrations in groundwater may have also significant, local, not natural increase.

The lack of a general NBL aquifer zonation is a real problem to manage the water supply and

the contaminated sites pressure.
Even if the best solution for the future NBL thresholds evaluation should be to plan a study regarding the whole territory and every existing aquifer, looking at the existing studies inside or close to the Municipality territory (Fig. 1) it can be shown which is the area with no data and which must be investigated in a first moment in order to obtain a first NBL diffusion in the Roma Capitale territory. Is important to underline that all these existing studies have not analyzed the same species. Many data about groundwater quality which could be easily used for these purposes are currently, for example, available at Regional Environment Protection Agency (ARPA Lazio) and other local administrations. These data could be a useful support to a scientific hydrogeological study which should be a good opportunity for government administrations to work together in order to apply the best groundwater management practices.

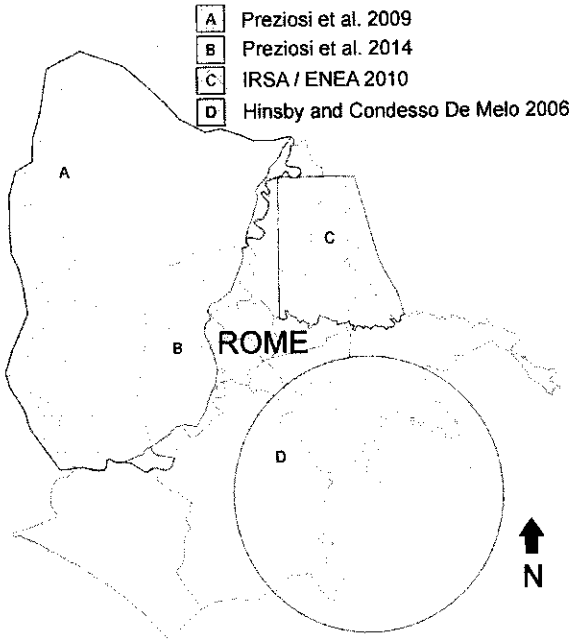

Fig. 1 – Location of the existing studies of NBL regarding the ROMA CAPITALE territory.

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