

The hydrogeological function of the karst poljes on some islands of the Adriatic Sea

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Abstract: Detailed hydrogeological function of karst poljes will be explained on three islands: Hvar, Vis and Molat. These poljes are covered with fine-grained sediments, caused the filling of caverns and joint spaces. The consequence was the decrease of permeability in karsted carbonate rocks. Therefore, their hydrogeological function on the islands adopts the characteristics of hydrogeological barriers.

Key words: karst hydrogeology, islands, Adriatic Sea

INTRODUCTION

During the last few years, the needs for fresh water on the most Adriatic islands rapidly increase especially on some distant islands. The main aims of performed hydrogeological research activity were focused on evaluation of present water-supply state and investigation of new groundwater reserves suitable for direct water supply or quantity of water suitable for desalinisation on following islands: Hvar, Vis and Molat.

HYDROGEOLOGICAL FEATURES OF STUDY AREAS

The mentioned investigations were directed to various goals. In the case of pumping site Libora in Jelsa on the island of Hvar, the works were done to move over the pumping site because the water quality was getting worse due to human activity. In the case of island of Vis, the problem was concerned with defining the catchment area and with protection of the existing pumping sites. In the case of Zapuntelsko polje on the island of Molat the works were directed to finding the new groundwater quantities (KAPELJ ET AL., 2000, 2001, 2002). Special common feature of these islands is marked carbonate ridges made of limestone and dolomites between which there are usually small karst poljes covered with clastic sediments of Quaternary age. These sediments have different origin and characteristics, alluvial on the island of Hvar, while on Vis and Molat Island poljes are covered with fine grain aeolian silts (CREMASCHI, 1990) with all characteristics of terra rossa. As the result of a previous hydrogeological study some of these poljes were chosen as potentially perspective area for groundwater exploitation (GOATTI, 1999). Recent core samples and pumping analyses were not very promising. Besides the fact that groundwater chemical quality on many

locations is adequate for water supply, the obtained quantity of water is insufficient for further use. This is the consequence of geologic and morphologic evolution combined with sedimentation of fine-grained particles during the Quaternary period. It caused degradation of primary cavernous and fractures porosity of carbonate rocks. In number of cases fracture systems below the poljes are filled with silt and clay. That fact makes these areas function as hydrogeological barrier, and not very promising for water supply. On Figure 1, the detailed position of the mentioned localities is presented.

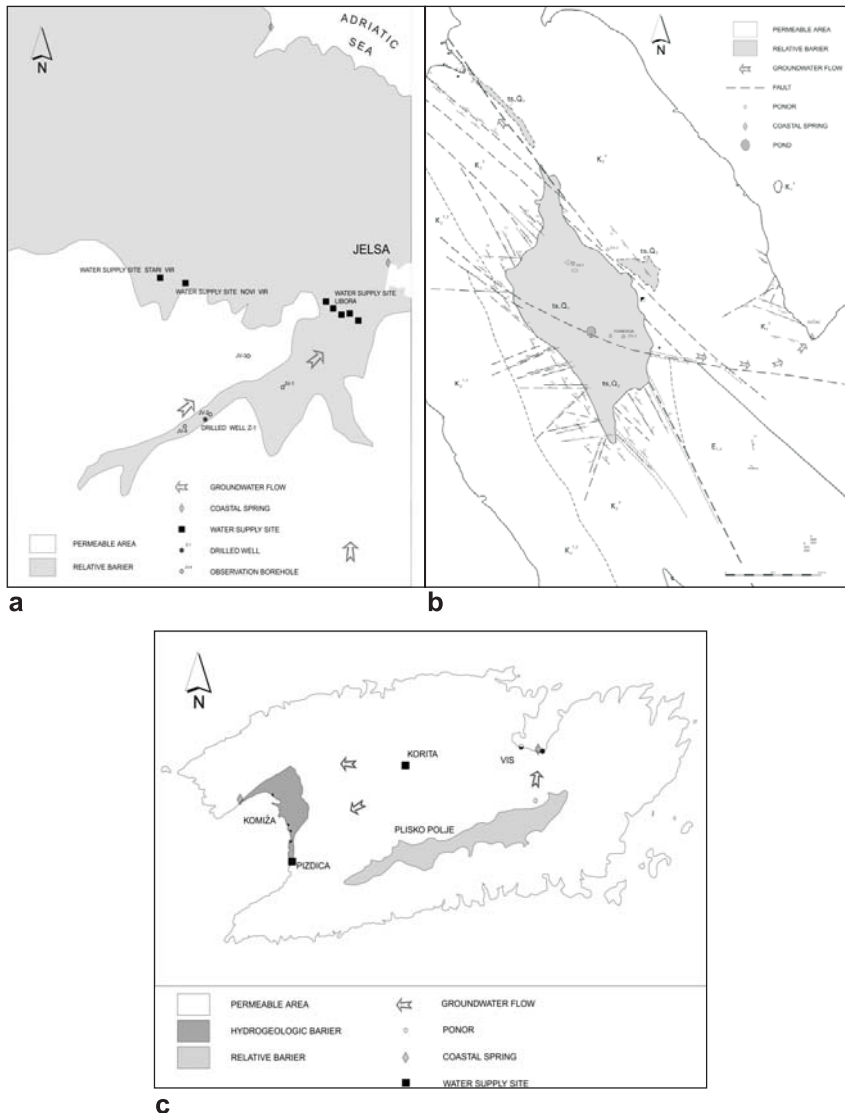


Figure 1. Schematic hydrogeological map of **a**-Libora - Hvar Island, **b**-Zapuntelsko polje – Molat Island and **c**- Vis Island case studies

HYDROGEOCHEMISTRY

According to hydrogeochemistry, the groundwaters of islands of Hvar, Vis and Molat belong to so-called mixed $\text{CaNa-HCO}_3\text{Cl}$, NaCa-ClHCO_3 up to Na-Cl type depending on hydrological conditions and the distance from the sea (Fig. 2).

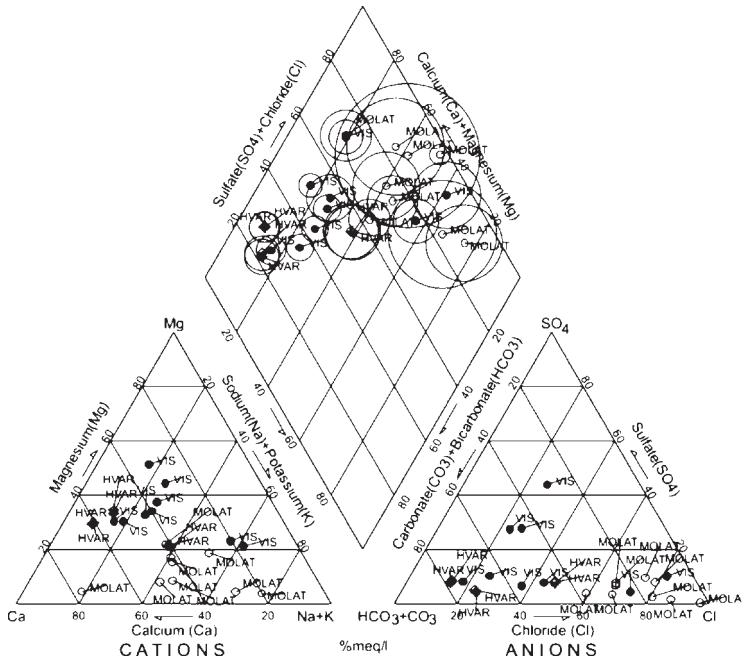


Figure 2. Piper diagram of groundwaters' main ionic composition

Mixed type of water is characteristic for the precipitation, surface and groundwaters under the so-called marine influence (APPELO & POSTMA, 1994). On the island of Vis, the presence of gypsum and anhydrite in the Komiža area cause the increase of sulphate content in waters that flow out at the coastal springs, and adopt partially sulphate character.

In the island groundwaters the values of totally dissolved mater are decreasing with the increase of distance from the sea, and the deviations during the year are smaller, depending on the hydrological conditions. Generally, the smallest salinity has the groundwaters from clastic deposits, because the possibility of communication with sea through the mixing zone is the lowest in them.

CONCLUSIONS

The results of former hydrogeological investigations have often marked the karst poljes on the islands of Molat, Vis and Hvar as the potentially perspective ones for the groundwater

exploitation. Unfortunately, the recent comprehensive hydrogeological investigations that included investigation drilling, borehole core determination, geophysical investigations and test pumping are not promising.

Geological and morphological evolution of the islands, through structural-tectonic processes accompanied by karstification during the glacial age, i.e. the period when the sea level was in average 100 m lower than the present one, created the conditions for the accumulation of fresh groundwater on the mentioned islands (ŠEGOTA, 1968). However, the sedimentation of fine-grained sediments of various origins in the created depressions during Quaternary age, caused the filling of caverns and joint spaces. At the end, the consequence was the decrease of permeability in karsted carbonate rocks - potential aquifers. Therefore, their hydrogeological function on the islands adopts the characteristics of hydrogeological barriers.

Because of that, although the groundwaters from clastic sediments that covers karst poljas and valleys on the islands of Vis, Hvar and Molat are in the most cases suitable for water supply considering the chloride content, the acquired groundwater quantities are very small or insufficient for future exploitation, which is the limiting factor for the development of the islands.

Acknowledgements

On this occasion the authors wishes to thank JVP "Croatian waters" for financing the investigations whose results were partially used in this paper.

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