



Hydrogeological Conditions of Coastal Carbonate Aquifer in Lucija - Portorož (Gulf of Trieste, N Adriatic Sea, Slovenia)

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In the 1994 801 m deep borehole Lu 1/94 very close to the sea in Lucija near Portorož (Piranski zaliv - Gulf of Trieste) was drilled through the 257 m deep sequence of flysh rocks after which it enters the limestone of Palaeogene and Cretaceous age. The aquifer where borehole is constructed is classified as high yield and highly permeable confined carbonate aquifer with fissured porosity.

During drilling and final pumping test after the borehole completion groundwater samples were taken. The results of these analyses were compared with groundwater samples from the wider Portorož environs. It was established that groundwater in the well Lu-1/94 is result of seawater freshwater mixing and due to the presence of high organic content in the aquifer subject to highly redox conditions. Groundwater from the carbonate aquifer is highly over saturated with respect to calcite, dolomite, iron sulphides and carbonate, with the presence of H₂S and NH₄⁺. In the carbonate aquifer seawater is represented with 33% and in the flysh part with 6%.

In the shallower part Ca²⁺ - Na⁺ - Cl⁻ - SO₄²⁻ - HCO₃⁻ hydrogeochemical facies is present followed by Na⁺ - Ca²⁺ - Cl⁻ - SO₄²⁻ - HCO₃⁻ facies in the other part of the borehole. In the carbonate part of the borehole Na⁺ - Ca²⁺ - Cl⁻ - SO₄²⁻ facies is present. Based on the comparison with other boreholes similar stratification is interpreted in the whole coastal aquifer around Portorož. Seawater is not distinctly separated from the freshwater flowing on it as it can be deduced from the hydrodynamical theory. Transition from freshwater to seawater is gradual and hydrogeochemically stratified. Hydrogeochemical stratification is very much related with the geological structure where big differences in physical and chemical properties among flysh and limestone rocks are present.

Delta-18O values show that fresh groundwater is recharged from the hinterland and this can be supported also with structural interpretations. Based on these results we can conclude that in the area of southwestern Slovenia deep and extensive groundwater flow in the direction from the northeast to the southeast exist and discharges as submarine seepage into the eastern part of Gulf of Trieste. Above this regional groundwater flow many local perched aquifers exists with different hydrogeochemistry that is mainly controlled with simple Ca²⁺ - Mg²⁺ - CO₂ - H₂O open system.