



## Groundwater hydrogeochemistry of major ions in the Radovna River valley (NW Slovenia)

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Chemical analysis of major elements was used to investigate the characteristics of various springs and surface water in the Radovna River valley. The valley is situated in the north-western part of Slovenia. It is 17-kilometre long Alpine river flowing between karstic plateaus of Pokljuka and Mežakla confluencing with Sava Dolinka River. Wider area of the valley is built up by Triassic limestone and dolomite. Quaternary alluvial and glacial sediments occur in the bottom of the valley and on the slopes of the plateaus.

Water was sampled monthly from May 2005 till March 2007 at 10 locations along the valley. Locations are divided into: 5 springs, 3 surface water locations, 1 small lake and 1 artesian borehole. On site conductivity, pH and water temperature was measured and samples for chemical analyses were collected. Groundwater, spring water and surface water are related to carbonate rocks; therefore the pH of the samples is in range between 7.1 and 8.4. In most cases pH of river water is higher than that of groundwater and spring water. Conductivity of the water varied in the interval between 188  $\mu\text{S}/\text{cm}$  and 374  $\mu\text{S}/\text{cm}$ .

Results of chemical analyses show that concentration of  $\text{Ca}^{2+}$  exceeds that of  $\text{Mg}^{2+}$  in all of the samples and  $\text{Ca}/\text{Mg}$  ratio varies between 2.6 and 16.8. The concentration of  $\text{Na}^+$  is lower than  $\text{Mg}^{2+}$ , but always higher than that of  $\text{K}^+$ . Predominant anion is the  $\text{HCO}_3^-$  and varies between 100 mg/l and 211 mg/l. Concentration of anions  $\text{Cl}^-$ ,  $\text{NO}_3^-$  and  $\text{SO}_4^{2-}$  are low and range from 0.1 mg/l to 7.47 mg/l and between 0.62 mg/l and 12 mg/l for  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ , respectively.  $\text{NO}_3^-$  is in almost all of the samples below 1 mg/l. Water data shows that waters are alkaline and the dominant facies is  $\text{Ca}-\text{Mg}-\text{HCO}_3^-$ .

Ion concentrations fluctuate seasonally and are related to changes in discharge. In winter and early spring, when the discharge is low, the ion concentrations are higher and in late spring and summer during snowmelt, when the discharge is higher, the ion concentration are lower. Generally, ion concentrations in the water are also increasing downstream from the main spring. Chemical analyses of the water samples reflect typical karst spring dynamics and dynamics of groundwater fluctuations in the alluvium. Along the course of the river, water flow is increasing due to great amount of groundwater drainage in to the stream, therefore the chemical concentrations are increasing downstream.