Abstract

Groundwater provides an important source of drinking water for many people around the world and it is the only source of drinking water for many rural and urban communities. In Switzerland, groundwater is the most important source of drinking water providing about 80 % of the drinking water for the country. Contamination of groundwater can result in poor drinking water quality, potential health problems, reduction of the water supply or high costs of treatment or searching for alternative water supplies. Thus, the protection of groundwater supplies from contamination is crucial.

In recent years, nitrate concentrations have often increased due to intensive industrial and agricultural activities, disposal of animal waste, or onsite septic systems. Despite increasing efforts to reduce nitrogen inputs into groundwater, nitrate remains one of the major pollutants of drinking water resources. The management and reduction of groundwater nitrate levels require an understanding of the different nitrogen sources and the contamination mechanisms. For this reason, identifying the nitrate sources in the groundwater is crucial for the development of agri-environmental policies and monitoring systems to improve the groundwater quality.

In this study, the groundwater quality of the Montricher watershed (canton Vaud) is assessed, as it is the source of drinking-water of the city of Morges, and the sources of nitrate and the factors influencing the groundwater nitrate contamination are investigated. With this aim, groundwater samples were collected from 12 existing piezometers in Montricher area during three different seasons.

The physico-chemical properties of the groundwater samples were analyzed. Stable isotopes of oxygen and hydrogen of the groundwater samples were studied to identify the origin of water and the recharge processes. Nitrate isotopes were used to identify sources of nitrate and to understand the contamination sources in order to effectively manage the groundwater quality.

The result of the water chemical compositions showed that the groundwater samples are of the Ca^{2+}- HCO_3^- type. Nitrate levels in some piezometers exceed the recommended limit of 25 mg/L and in a few cases, exceed the tolerance value of 40 mg/L. High nitrate concentrations were often associated with high concentrations of chloride and sodium. A comparison of the isotopic composition of the groundwater with the Local Meteoric Water Line (LMWL) indicates that the

groundwater in the study area is mainly meteoric but with evidence of evaporation. The $\delta^{18}O$ and δD variations of the groundwater showed a heterogeneous flow regime throughout the region. The enriched $\delta^{15}N$ values of the groundwater nitrate are characteristic of organic fertilizers and/or waste waters. $\delta^{15}N$ and $\delta^{18}O$ of nitrate showed that denitrification is not important in the aquifer. The high values of nitrate, chloride, sodium, and $\delta^{15}N$ in wells along the Malagne river suggests that there may be some contribution of the effluents of WWTP to the groundwater.

06 - 2018