Geochemical characterization of groundwater and saltwater intrusion processes along the Luy River, Binh Thuan, Vietnam

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ABSTRACT: With an average annual rainfall of 800-1150 mm/year, the Binh Thuan province is one of the driest places in Vietnam. The quantity and quality of groundwater play a significant role in the agriculture, aquaculture development and daily life of the local communities. In 2012, the national center for water resources (Nawapi, 2012) delineated the seawater intrusion extent in Binh Thuan based on the total dissolved solids (TDS) content of water samples taken from shallow boreholes. The threshold of 3g/L and 1.5g/L were exceeded in the estuaries of the Luy, Long Song and Ca Ty rivers. In recent years, the prolonged droughts combined with the sea level rise and the over-extraction of groundwater during the dry season increased dramatically the seawater intrusion process especially in the estuaries of the province.

The geochemistry of groundwater in the Luy River catchment was studied to investigate the contamination of the aquifers and identify the processes taking place. From 1991 to 2015, 98 water samples had been taken from the wells in the area in both dry and rainy seasons. 71% of the water samples were fresh while 21% and 5% were lightly saline and moderately saline respectively. In summer 2020, 110 new water samples from both shallow and deep wells were collected in the Luy river catchment in wells from 3m to 40m. The TDS values are ranging from 105 to 23080 mg/L and can be classified into 4 groups: freshwater (48%), slightly saline (40%), moderately saline (8%) and very saline (4%). The samples show that the seawater intrusion expands not only horizontally at shallow depth along the river but also deeper down the aquifer in most of the study area, what is also confirmed by geophysical data. Freshwater samples were mostly collected at a depth lower than 10m. The chemical composition of water samples were analyzed showing evidence of seawater intrusion, but also the occurrence of freshening processes within the study area. Together with the presence of saltwater at larger depths, this points towards a situation more complex than previously thought. Saltwater intrusions are likely not only related to interaction with the river estuary, but also to the presence of fossil saltwater in the aquifer, and to groundwater pumping and irrigation practices.

REFERENCES

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