

Seawater intrusion in coastal areas of arid and semi-arid regions

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The exploitation of groundwater resources is of high importance and has become very crucial in the last decades, especially in coastal areas of arid and semi-arid regions. The coastal aquifers in these regions are particularly at risk due to intrusion of salty marine water. One example is the case of Tripoli city at the Mediterranean coast of Jifarah Plain, North West Libya. Libya has experienced progressive seawater intrusion in the coastal aquifers since the 1930s because of its ever increasing water demand from underground water resources. Tripoli city is a typical area where the contamination of the aquifer in the form of saltwater intrusion is very developed. Sixty-four groundwater samples were collected from the study area and analyzed for certain parameters that indicate salinization and pollution of the aquifer. The results demonstrate high values of the parameters Electrical Conductivity, Na⁺, K⁺, Mg²⁺, Cl⁻ and SO₄²⁻, which can be attributed to seawater intrusion, where Cl⁻ is the major pollutant of the aquifer. The water types according to the Stuyfzand groundwater classification are mostly CaCl, NaCl and Ca/MgMix. These water types indicate that groundwater chemistry is changed by cation exchange reactions during the mixing process between freshwater and seawater. The intensive extraction of groundwater from the aquifer reduces freshwater outflow to the sea, creates drawdown cones and lowering of the water table to as much as 25 m below mean sea level. Irrigation with nitrogen fertilizers and domestic sewage and movement of contaminants in areas of high hydraulic gradients within the drawdown cones probably are responsible for the high NO₃⁻ concentration in the region.