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Shallow groundwater from the far north of Cameroon (southern Lake Chad): revisiting a 20 years old survey of hydrochemistry and stable isotopes

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Two field hydrogeological investigation surveys were conducted in 1992 and 2013 using hydrochemistry and isotope techniques in the far north part of Cameroon which corresponds to the southern part of Lake Chad basin. All of these data relate to groundwater and surface water which were collected at the same places to potentially reveal any temporal variation in the chemical and isotopic characteristics of the water resources.
Groundwater show mainly a Ca-HCO_3 water type but CaMg-Cl and Na-HCO_3 water types can also be found. The groundwater chemistry is resulting from many processes including pure silicate weathering and cation exchange.
It is found that the nitrate content after 20 years has increased by an average factor of 6. These high concentrations in nitrate (up to 400 mg/l) are related to local anthropogenic activities and to the very bad conditions of maintaining of wells and boreholes. This pollution is also correlated to the population growth over the past two decades in the region.
The isotopic content of groundwater is ranging from -6.87‰ to -0.32‰ for δ18O in 2013 and from -6.03‰ to +0.25‰ in 1992 without noticeable evolution through time. The conventional δD–δ18O diagram indicates that the groundwater has a meteoric origin more or less influenced by evaporation processes. Different processes involving different water sources were highlighted: (i) groundwater which has been affected by evaporation or in communication with evaporated surface waters; (ii) groundwater which is very close to the Global Meteoric Water Line and corresponding to a recent and direct recharge from precipitation; (iii) groundwater which is more depleted corresponding to a mixing between shallow and deep groundwater.
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