Chemical and multi-isotope fingerprinting to constrain groundwater salinization of a coastal Mediterranean multilayer aquifer (the Roussillon Basin, France)

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Aquifers salinization represents one of the major threats to groundwater resources. The sedimentary aquifer of the Roussillon Basin (S France) is a complex coastal aquifer, close to the Mediterranean Sea, and facing salinization problem and seasonally increase of water abstraction. We report here geochemical and isotopic vertical variability in this Quaternary and Pliocene aquifer.

Aquifer layers are not equally impacted by salinization with electrical conductivity ranging from 459 to 43000 μS.cm^{-1}. Groundwater chemical composition highlights binary mixing between fresh groundwater and salty water plus cation exchanges processes. The multi-isotope approach consists in the use of complementary tracers evidencing water-rock interaction processes or adsorption onto the clay matrix. In a δ^{2}H-δ^{18}O diagram, most of the samples plot along the global meteoric water line with signatures consistent with a recharge from the western part of the basin. Some samples plot along a mixing line between the recharge and seawater. The vertical profile of ^{87}Sr/^{86}Sr presents high variation, up to 60m the ^{87}Sr/^{86}Sr is close to the seawater ratio and then it increases with depth, reflecting water-rock interaction with argillaceous formations. Boron isotopes can trace secondary processes such as adsorption/desorption processes through fractionnation. δ^{11}B presents high variation from 20.3 to 45.4‰, suggesting isotopic fractionation due to preferential adsorption of ^{10}B onto clays.

This study is part of the GRAIN D'SEL project supported by the ANR ECOTECH N°09-ECOT-008-01.