Geophysical Research Abstracts
Vol. 16, EGU2014-16837, 2014
EGU General Assembly 2014
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Tracking the multiple origins of salinity in three different karstic aquifers (southern France): Sr isotopes constraints.

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Groundwater resources of the Mediterranean area are submitted to a high anthropic pressure and face a set of major climatic and geological constraints. The potential exploitation of karst aquifers is still unclear and probably underestimated, but their vulnerability to pollution is high and potential for salinization in coastal aquifer increases with over exploitation and the rise of sea level.

In order to trace the origin of salinity in karst aquifers in a Mediterranean coastal environment, a multi-tracer approach coupling major, specific trace elements and stable (δ18O, δ2H) and radiogenic (87Sr/86Sr) isotopes was held. Three close sites in southern France have been studied to investigate a different origin of the salinity.

In the coastal karst aquifer of la Clape (Aude), salinity originated from deep salt water due to a paleoseawater intrusion followed by water-rock interaction with the carbonate host rock. On land and off-shore, powerful tertiary sedimentary deep deposits limit the karst network communications with the seawater. The presence of many faults could be a contributing factor to the mixing of salt water within the karst water. There it was shown that the paleoseawater proportions in the aquifer ranged from 0 to 16 %.

Slightly further inland, in another similar karstic aquifer, the source of Oeillal (Aude) displayed a high salinity. Salinity most surely originated from deep horizons that come to the surface by a major normal fault where it mixes with karst waters. Deep brines from ancient meteoric water evolved by water-rock interaction with evaporites in the underlying Keuper formation. There calculated proportions of salt water into the mixture with karst water varied between 30 and 40%.

In the third site located on the edge of the seawater shoreline, the simple limestone karst aquifer of Pliocene in Frontignan (Hérault) was under increasing salinity intrusion of seawater, which proportions of mixing between seawater and karst water varied from 2 to 4%.

These results highlight the variability of salinity origins in close coastal Mediterranean karst aquifers and the important contribution of evaporites, deep salty waters and seawater intrusion. Tools to investigate the origin of water salinity will be highlighted. Water management of these karstic aquifers must integrate the complex geological constraints.