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Geochemical, multi-isotopic and hydrogeological characterization of the mineralized groundwater body of the Entre-deux-Mers area, Gironde (South-West of France).

Malcuit E.[a,b], Négrel Ph.[a], Petelet-Giraud E.[a], Atteia O.[b], Franceschi M.[b], Dupuy A.[b], Larroque F.[b], Schmidt S.[c], Marchet P.[d]

[a] BRGM - 3 av. C. Guillemin BP 6009 ORLEANS CEDEX 2 - France
e.malcuit@brgm.fr; p.negrel@brgm.fr; e.petelet@brgm.fr

[b] Institut EGID - Bordeaux 3 - 1, allée F. DAGUIN - 33607 PESSAC CEDEX - France
Olivier.ATTEIA@egid.u-bordeaux3.fr; Michel.FRANCESCHI@egid.u-bordeaux3.fr; Alain.DUPUY@egid.u-bordeaux3.fr; Francois.LARROQUE@egid.u-bordeaux3.fr

[c] EPOC - CNRS - Université Bordeaux 1 - 33405 Talence Cedex - France
s.schmidt@epoc.u-bordeaux1.fr

[d] Agence de l'Eau Adour-Garonne - 90, rue du Férétra - 31078 TOULOUSE CEDEX -France
pierre.marchet@eau-adour-garonne.fr

Category: Groundwater quality sustainability

In the south-west of France, the Eocene aquifer is one of the main resources for irrigation, thermo-mineral water, and in particular for drinking water to the Bordeaux region.

This aquifer is characterized by the presence of a large mineralized area, centered on the Entre-deux-Mers region, between the Garonne and the Dordogne rivers, where the groundwaters show strong mineralization and anomalous levels of critical elements, such as sulfates and fluoride, leading to difficulties of resource exploitation for drinking water supply.

Initiated early 2009, the CARISMEAU 2 project (BRGM, Institut EGID and the French Water Agency Adour-Garonne) focuses on the geochemical, multi-isotopic and hydrogeological characterization of this mineralized groundwater sector of the Entre-deux-Mers area. The main objectives of this project are to improve the understanding of the origin of the salinity of this mineralized area and to investigate how these mineralized waters circulate in the Eocene aquifer and/or in this multi-layer aquifer system.

For that purpose, combined geochemical analysis (major and trace elements) and classical isotopic methods using $\delta^{18}O_{H20}$ and $\delta^{2}H_{H20}$, $\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$ is carried out. In addition, an innovative isotopic method using strontium isotopes ($^{87}Sr/^{86}Sr$) and more exploratory isotopic methods using boron ($\delta^{11}B$) and lithium ($\delta^{7}Li$), uranium ($^{234}U/^{238}U$) and radium ($^{228}Ra/^{226}Ra$) isotopes will be applied on the mineralized area.

The deposit sequences characterizing the Eocene aquifer system are progradational westward, from detrital deposits to carbonates. The Eocene sands and the Eocene limestones are hydraulically connected, the extension limit is located below Bordeaux city. The groundwater recharge may occur through the Eocene outcrops located in the north and north-east of this mineralized area of the Entre-deux-Mers, and also by vertical leakage from the Oligocene aquifer.

The first investigation has been carried out during low water stage in September and October 2009. The characterization of 50 groundwater sampling points in the mineralized area shows electrical conductivities ranging from 130 to 1630 µS/cm. On going analysis of major elements confirm the salinity variation in the system and the multi-isotopes results will be presented at the conference, in order to decipher the origin of this salinity.