

Impact of CO₂ injection on groundwater chemistry and trace elements behavior: results from a field experiment.

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As a part of water-rock interaction study, the Carbon Capture and Storage (CCS) technology is a large field of fundamental and applied researches. Since many years, several works highlight the potential environmental impact of CCS for a long term prospective. Special focus is based on the risk of remobilisation and transfer of metals species into groundwater induced by CO₂ hydrogeochemical perturbation. We performed a field experiment based on single well injection of small volume of water-CO₂ saturated in an aquifer having a relatively low metal concentration in groundwater to estimate the environmental perturbation in the aquifer.

Following the evolution of the fluids as function of time, we found a several orders of magnitude increases of Dissolved Inorganic Carbon, Fe, Mn, U, As and Zn. We propose that the source of metals result from the mineral dissolution in acidic conditions resulting from CO₂ dissolution and pyrite alteration. Thermodynamic calculations reveal the presence of carbonate metal complexes responsible for the high level of the dissolved heavy metals. A field kinetic model allows estimation the active surface area of minerals participating to the process.