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Biogeochemical monitoring of geological CO_2 storage in saline aquifers

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The geological storage of CO_2 in the subsurface is one possible option to reduce the overall emission of this greenhouse gas and with this having an effect on global warming. For future realization of geological CO_2 storage in saline aquifers it is necessary to improve our process understanding of the interactions between injected CO_2, reservoir fluid and rock with respect to the possible mobilisation and extraction of the natural organic matter.
It is known that supercritical CO_2 is a good solvent for organic compounds. The injection of CO_2 in saline aquifers will influence the natural chemical and physical equilibrium between reservoir and cap rock and the natural formation fluids leading to adaptation of the physico-chemical conditions. The interactions between CO_2, formation fluid and rock that will be induced by the injection of CO_2 will possibly lead to significant changes in the properties and composition of the surrounding rock and to mobilisation of the natural organic matter in reservoir and cap rock. Mobilisation of additional organic compounds with natural formation fluids will also provide substrates for microbial organisms present in the deep saline aquifer.
Here, we present results on the biogeochemical monitoring of the geological CO_2 storage at the pilot site Ketzin, 40 km west of Berlin, Germany. As part of ongoing research activities we investigate the composition as well as possible changes of the organic carbon pools within the saline aquifer (Stuttgart Formation) prior and during CO_2 injection. Since injection and monitoring wells are in operation at
the Ketzin site, formation fluids have been sampled and analyzed using organic geochemical techniques, to characterize natural DOC (dissolved organic carbon) as well as the changes occurring due to the CO_2 injection. In addition, the natural organic matter inventory from pristine rock samples from the wells Ktzi 200 to 202 has been characterized. Besides monitoring of the field site, lab experiments using supercritical CO_2 as solvent were performed to extract the reservoir rocks under reservoir conditions to give insight into the processes occurring down there. The integration of results from lab experiments and the field site will help to evaluate the efficiency and reliability of the long-term storage of CO_2 in such a geological system.