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Active microbial community in gas reservoirs in the North German Plain and the effects of high CO2 concentrations

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From the IPCC report on global warming, it is clear that large-scale solutions are needed immediately to reduce emissions of greenhouse gases. The CO_2 capture and storage offers one option for reducing the greenhouse gas emissions. Favourable CO_2 storage sites are depleted gas and oil fields and thus, are currently investigated by the BMBF-Geotechnologien RECOBIO-2 project. Our study is focussing on the direct influence of high CO_2 concentrations on the autochthonous microbial population and environmental parameters (e.g. availability of nutrients).

The gas fields Schneeren in the "North German Plain" is operated by Gaz de France SUEZ E&V Deutschland GmbH. The conditions in the reservoir formation waters of two bore wells differ in various geochemical parameters (pH, salinity and temperature). In previous studies the community of this gas field was described by Ehinger et al. 2009. Based on these results our study included cultivation and molecular biological approaches. Our results showed significant differences of the community structure in regional distinctions of the gas reservoir.

The activity profiles of two wells differed clearly in the inducible activity after substrate addition. The fluids of well A showed a high methane production rate after the addition of methanol or acetate. Well B showed a high sulphide production after the addition of sulphate and hydrogen. The molecular biological analysis of the original fluids supports the activity profile for both sites. The community analysis via real-time PCR showed for the production well head A a higher abundances for *Archaea* than for B. The community at site B in contrast was dominated by *Bacteria*.

Fluids of both wells were also incubated with high CO_2 concentrations in the headspace. These enrichments showed a significant decrease of methane and sulphide production with increasing CO_2 levels. Currently, the community composition is analysed to identify changes connected to increased CO_2 concentrations. This will provide information about possible biogeochemical and microbiological changes during and after the storage of CO_2, and effects on the storage capacity and injectivity of the reservoir formation.