Geophysical Research Abstracts
Vol. 13, EGU2011-12612, 2011
EGU General Assembly 2011

Diversity of sulfate-reducing bacteria in a plant using deep geothermal energy

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Enhanced process understanding of engineered geothermal systems is a prerequisite to optimize plant reliability and economy. In the scope of the research projects “AquiScreen” and “MiProTherm” we investigated geothermally used groundwater systems under microbial, geochemical, mineralogical and petrological aspects. In this study we focused on a groundwater system located in the Molasse Basin. Fluids are characterized by temperatures from 61°C to 103°C, salinities of 600 to 900 mg/L and a dissolved organic carbon content (DOC) of 6.4 to 19.3 mg C/L [1]. As it is known that -in addition to abiotic factors- microbes like sulfate-reducing bacteria (SRB) are involved in the processes of corrosion and scaling in plant components we identified SRB by specific analyses. The microbial population was analyzed by genetic fingerprinting techniques based on PCR-amplified 16S rRNA- and dissimilatory sulfite reductase genes. Despite of the high temperatures, microbes were detected in all investigated fluids. Fingerprinting and DNA sequencing enabled a correlation to metabolic classes and biogeochemical processes. The analysis revealed a broad diversity of sulfate-reducing bacteria. Overall, the detection of microbes known to be involved in biocorrosion and mineral precipitation indicates that microorganisms could play an important role for the understanding of processes in engineered geothermal systems. The further identification of crucial process parameters that are influencing microbial activities will help developing appropriate counter measures against microbial induced clogging and corrosion.

[1] data from A. Vetter and A. Vieth, GFZ Potsdam