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Characterisation of the bacterial populations in a saline heat storage aquifer in the North German Basin

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The colonization and the ecology of microorganisms in the deep biosphere arouse increasing interest of scientists because of utilizing the subsurface for e.g. energy storage and recovery. The research project AquiScreen investigates the operational reliability of eight geothermally used groundwater systems in Germany under microbial, geochemical, mineralogical, and petrological aspects. This study shows the results of the heat storage in Neubrandenburg (depth: 1250 m), a typical site for saline fluids in the North German Basin. The seasonal alternation in charge and discharge mode enabled sampling the warm (75˚C) and the cold (45˚C) side of the geothermal doublet.

The analyses focus on microbially induced corrosion on plant components and scaling resulting in filter and/or formation clogging. Microbiological analyses were carried out with fluid and solid phase samples by 16S rDNA based Single Strand Conformation Polymorphism (SSCP) fingerprinting. The analyses are utilized to evaluate the impact of microbial populations on such systems. The genetic fingerprinting revealed significant differences in the bacterial community structure between the warm and cold side of the heat storage. Since the geochemical analyses revealed no remarkable differences, the temperature might be crucial for the different community structures. At the warm side of the aquifer the identified bacteria are closely related to *Variovorax* and *Sphingomonas*. At the cold side of the heat storage sulphate reducing and fermentative bacteria were detected. These results correspond with locally observed iron sulphide precipitation and corrosion processes on plant components. Particularly the bacterial population of the cold side was studied over a period of two years. Thereby seasonal changes in the abundance of the identified bacteria, depending on the operational mode of the geothermal plant, were observed. After a malfunction in the pump system of the cold side of the heat storage changes in the bacterial population structure were recognized by SSCP fingerprinting techniques.