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TestUM-Aquifer – A test site for the development of geophysical methods to investigate and monitor reactive multi-phase transport processes in shallow aquifers

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Geotechnological applications in the context of energy transition, such as heat or synthetic gas storage in subsurface porous media, might have impacts on shallow aquifers due to temperature variations and gas leakages. In particular public acceptance and political valuation are crucial topics for the implementation of such applications. For this purpose proven monitoring methods as a basis for resilient impact analysis are essential. However, even on international level only few field sites exist for the (further) development and validation of exploration and monitoring approaches, numerical models and possible intervention mechanisms to decrease hazards on ground water.
Within the BMBF funded project “TestUM-Aquifer – A test site for investigation and monitoring of reactive multi-phase transport processes in shallow aquifers” we will establish a test site close to the town of Wittstock in Northeast Germany. This site enables us to answer the research question on how to detect, predict and control geophysical, hydrogeochemical, microbial and hydraulic interactions and effects caused by changes in temperature and injected gases (gas phase and solution) during controlled experiments in natural shallow aquifers? With regard to a long-term maintenance beyond this project the test site and its infrastructure as well will be opened for cooperation with and activities of other research groups.
We will present results on the detailed site investigation that is necessary to design the injection experiments and to set up the monitoring network. Firstly, geophysical surveys were performed. Areal measurement of electromagnetic induction and electrical resistivity tomography profiles provided initial information about the stratigraphic composition of the near subsurface. Based on these results, relevant locations for direct push (DP)-soundings were selected to obtain high resolution vertical profiles of various properties. Hydraulic profiling tool (HPT) profiles were used to derive estimates of hydraulic conductivity based on the ratio of injected water flow rate and the corresponding pressure response. Electrical conductivity loggings allow for a high resolution characterization of electrical properties of these sediments, which can be interpreted with respect to lithostratigraphy. In combination with soil cores, retrieved by Sonic drilling, we were able to identify potential locations for the implementation of in situ field scale experiments and the installation of monitoring equipment.