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# GeoEn –Research on Geo-Energy

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One of the pressing challenges for the 21st century is a secure, sustainable and economical energy supply at simultaneous mitigation of its climate impact. Besides a switch to renewable energy resources, the exploration and exploitation of new, unconventional energy resources will play a major role as will the further use of fossil fuels. With the switch to renewable energies the question of geological energy storage will become an important topic whereas further use of fossil fuels requires strategies like CCS to reduce its negative climate impacts. These different aspects of geo-energy make complementary or competitive demands on the subsurface and its use. It is therefore essential to treat the subsurface as a geo-resource of its own right. So far, geo-resource related research has often focused on specific resource systems, e.g. ore forming systems, hydrocarbon systems or geothermal systems, providing results largely applicable only to the restricted range of physicochemical properties of the respective geo-resource systems. However, with the increasing use of the subsurface as important geo-resource, the different geo-resource systems tend to overlap and interact and also become much more complex due to the additional use or presence of artificial and technical matter, as is the case in geological $CO_2$ storage. On the other hand, the combined use of the subsurface for different purposes may also create synergetic effects.
GeoEn is a joint research project explicitly addressing the fundamental questions related to the sustainable and holistic use of the geo-resource subsurface with a special focus on geo-energy. Project partners are the German Research Centre for Geosciences (GFZ), the University of Potsdam (UP) and the Brandenburg University of Technology (BTU). GeoEn research addresses $CO_2$ capture, transport and utilization, $CO_2$ storage, the unconventional energy resource shale gas and geothermal technologies. These four core topics are studied in an integrated approach using the synergy of cross-cutting themes. The latter encompass new exploration and reservoir technologies as well as innovative monitoring methods, both complemented by numerical simulations of the relevant processes including flow dynamics or heat transfer in the subsurface and along the technological process chains. Accordingly, synergies derived from the cross-cutting topics improve both methodological development applicable in equal measure to the utilization of geothermal energy and of shale gas as well as to the use and monitoring of $CO_2$ storage. Complementary, new modelling approaches are developed that allow the simulation of involved processes to predict the occurrence and physical properties of potential reservoirs and the changes that may be induced by their utilization. We present first results with respect to exploration strategies, monitoring technologies and modeling approaches for the pilot storage site for $CO_2$ in Ketzin and the geothermal research platform Groß-Schönebeck, where the respective technologies are tested and monitored.