

Geochemical exploration and temperature-dependent reactivity of Berlin's deep aquifers Implications for potential High-Temperature ATES reservoirs

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While the share of renewable energy in the electricity sector is steadily increasing, it has stagnated in the heat supply, despite the fact that in Berlin, for example, almost half of the CO₂ emissions are caused by the heating sector. Due to its ability to store large volumes in the underground while at the same time taking up little space on the surface, High-Temperature Aquifer Thermal Energy Storage (HT-ATES) is particularly well suited as a storage technology for use in urban areas and can therefore contribute to the reduction of CO₂ emissions. However, clogging of aquifer pores thus reducing the permeability, corrosion and mobilization of trace elements may be undesirable effects of a HT-ATES.

Here, the Triassic limestones and the Jurassic sandstones were investigated as part of two Berlin ATES studies with the aim of (a) simulating the effect of HT-ATES operation on the carbonate aquifer by geochemical modelling, (b) identifying reactive mineral phases of the freshly drilled exploration well at Berlin-Adlershof by systematic elemental analysis using a handheld XRF, and (c) estimating the mobilisation processes by batch experiments at elevated temperatures.

Early career researcher Lioba Virchow is pursuing her PhD in the field of Aquifer Thermal Energy Storage (ATES) at the GFZ Helmholtz Centre for Geosciences and FU Berlin, focusing on the reactivity of potential ATES reservoirs in the Berlin area, in particular the Muschelkalk limestone and Hettangian (Jurassic) sandstone. Her research investigates how an ATES system, in specific the increase in temperature, affects the geochemical equilibrium of the aquifer, the associated environmental impacts and the implications for the operation of the ATES.



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