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Identification of a fault zone beneath Moxa observatory (Central Germany): evidence from combining logging, rock physical measurements, and geophysical profiling

Valentin Kasburg[1], Todor Valchev[2], Andreas Goepel[3], Cornelius Octavian Schwarze[4], and Nina Kukowski[5]

[1]IGW, FSU, Jena, Germany (valentin.kasburg@uni-jena.de)
[2]IGW, FSU, Jena, Germany (todor.valchev@uni-jena.de)
[3]IGW, FSU, Jena, Germany (andreas.goepel@uni-jena.de)
[4]IGW, FSU, Jena, Germany (cornelius.schwarze@uni-jena.de)
[5]IGW, FSU, Jena, Germany (nina.kukowski@uni-jena.de)

Geophysical observatories aim to decipher natural processes taking place in very different parts of the Earth's interior by recording long time series of various signals related to these processes. As such signals, e.g. fluctuations of deformation or temperature, may be very small, complementary information e.g. from climate stations and very good knowledge of geological structures in the vicinity of an observatory is indispensable. Moxa Geodynamic Observatory, belonging to Jena university is located in a remote area in the Palaeozoic Thuringian Slate Mountains, which however, is characterized by complex subsurface structures with regard to fluid transport and hydrology, including a suspected fault beneath the observatory.

Information about the subsurface beneath the observatory and its geological structures is available from various near-surface geophysical surveys including numerous geo-electrical profiles. These were used to undertake 3D resistivity tomography.

Here we use rock physical measurements, including thermal conductivity, permeability and seismic velocities, on core material from the research drill hole next to the observatory building to characterise the silty greywackes. This data set is complemented by the evaluation of logging data and inspection of long-term temperature data obtained from records of an optical fibre deployed in the borehole to characterize the drilled rocks and identify sections which may favour ground water transport. We also identified fissures from the acoustic televiewer and thus found several depth intervals which could represent a fault zone. Finally we used this information and the results of the resistivity tomography to propose a structural model for the subsurface including the position and type of the suspected fault zone.