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Large-scale geoelectrical survey in the Eger Rift region (Czech Republic/Europe) at an ICDP fluid monitoring drill site to image fluid-related structures

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The sedimentary Cheb basin, located in the Eger Rift region (Czech Republic/Europe), attracts much scientific interest due to its recent geodynamic activity (recurrent earthquake swarms and continuous emission of geogenic carbon dioxide).
The pathways for the ascending CO_2 of mantle origin are subject of an ongoing International Continental Scientific Drilling Program (ICDP) projects in which several geophysical surveys are currently carried out to image the near-surface geologic/tectonic situation, as existing boreholes are not sufficiently deep to characterize the structures.
As electric resistivity is sensitive to both lithology, its pore space properties, and pore fluid mineralization, a large-scale dipole-dipole experiment using a special type of electric resistivity tomography (ERT) was carried out in June 2017 in order to image possible fluid-relevant structures.
We used static remote-controlled data loggers in conjunction with high-power current sources for generating sufficiently strong signals that could be detected all along the 6.5 km long profile with 100m and 150m dipole spacing.
Extensive processing of time series and apparent resistivity data lead to a full pseudosection and allowing interpretation depths of more than 1000m.
The subsurface resistivity image reveals the deposition and transition of the overlying Neogene Vildstejn and Cypris formations, but also shows a very conductive basement of alterated phyllites or granites that can be attributed to high salinization and/or rock alteration by these fluids in the tectonically stressed basement.
Distinct, narrow pathways for CO_2 ascent are not observed with this kind of setup which hints at wide degassing structures over several kilometers within the crust instead.
We propose a conceptual model in which certain lithological layers act as caps for the ascending fluids, based on stratigraphic records and our results from this experiment, providing a basis for future drills in the area aimed at studying and monitoring fluids.