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Seismic analyses of the Triassic in Northern Germany for hydrogeothermal exploitation

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Hydrothermal resources provide a large potential for the energy supply in Germany. However, the risk in reservoir detection is a major obstacle for its commercial utilization. Deep drillholes for a geothermal plant demand financial investments of several ten million Euros, without a comprehensive guarantee that the delivery and temperature of the required energy supply are met. A risk reduction is offered through the application of seismic techniques that have been developed in the oil and gas industry. Yet, in the geothermic business the topic of exploration cost reduction often has a higher priority.

This is the reason why the necessity of 3D seismic is being repeatedly questioned. However, a seismic dataset from northern Germany currently being studied reveals a complicated fault zone network that has been partly generated by salt tectonics. It would be unrepresentable without the aid of 3D seismic. For fault detection in particular, time slices of the signal variance with a short time window and few traces have proven their suitability.

In northern Germany some strata of the middle and lower Triassic are being regarded as hydrogeothermal reservoirs because of their temperature and permeability. Typically, areal amplitude distributions are being analyzed for anomalies. In the referred dataset, such areal analyses are however degraded by the intercalated complicated fault zone structures. In particular, in large sections of the lower Triassic the fault zone detection with signal variance calculation is also poor because of small seismic reflection amplitudes.

It can be concluded that in some cases, 3D seismic offers the only way to recognize the subsurface structures. On the other hand, there are cases where even 3D seismic data needs carefully guided analysis instead of automatic algorithms.