



Deep earthquakes in the lithospheric structure of northern Germany

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One of the major challenges in seismology is to understand the distribution and controlling factors of intraplate earthquakes. Northern Germany is an area with both prehistoric and historic earthquakes of moderate magnitude that cluster along major reverse faults (Brandes et al., 2015), and therefore serves as natural laboratory for the study of low-strain intraplate regions.

The remarkable feature in this area are five deep earthquakes that have hypocentre depths between 16 and 30 km. They have been instrumentally recorded over the last 16 years. These earthquakes have magnitudes in a range of ML 1.3 to 3.1 and illuminate major structural elements in the lithosphere. The depth range of these earthquakes is manifested by the localization itself as well as particularly by the relatively small cross-over distance of the Pn phase versus the Pg phase, which is a strong indicator of their deep foci. One of the earthquakes can be attributed to the Elbe Line and another to the Thor Suture. This supports the idea that earthquakes in this intraplate regions concentrate on pre-existing zones of weakness. Three earthquakes group around the Moho and imply that the crust/mantle boundary in northern Germany acts as structural discontinuity at which deformation localizes. The location of one of the earthquakes indicates that the Thor Suture probably reaches deeper than previously expected and might sole out into the Moho.

References:

Brandes, C., Steffen, H., Steffen R. and Wu, P. (2015) Intraplate seismicity in northern Central Europe is induced by the last glaciation. *Geology*, 43, 611-614