Geophysical Research Abstracts
Vol. 20, EGU2018-6212, 2018
EGU General Assembly 2018

Neotectonic analysis of the Harz boundary fault (northern Germany)

Katharina Müller (1), Christian Brandes (1), Ulrich Polom (2), Sumiko Tsukamoto (2), Thomas Spies (3), Thomas Lege (3), Manfred Frechen (2), and Jutta Winsemann (1)

(1) Leibniz Universität Hannover, Institut für Geologie, Germany , (2) Leibniz-Institut für Angewandte Geophysik (LIAG), Stilleweg 2, 30655 Hannover, Germany, (3) Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Stilleweg 2, 30655 Hannover, Germany

Northern Germany is commonly regarded as a low seismicity area, but there are a number of historic earthquakes with intensities of up to VII that occurred during the last 1200 years (Leydecker, 2011). Many of these earthquakes concentrate along major Cretaceous reverse faults and possible trigger mechanisms are lithospheric stress changes due to post-glacial isostatic adjustment (Brandes et al., 2015). Evidence for ongoing seismicity in northern Germany is rare, but recent earthquakes in the deep continental crust were recorded e.g., east of Hamburg and in the Halle/Leipzig area.

The approximately 90 km long Harz boundary fault is one of these Cretaceous reverse faults and represents a key structure in northern Germany. A recent sinkhole at the Harz boundary fault exposes a NNE-ward dipping planar fault plane that cuts through unconsolidated debris-flow deposits thus pointing to young tectonic activity (Franzke et al. 2015).

In this study, the timing of fault movement was estimated by means of luminescence dating (OSL and IRSL) of the faulted debris-flow deposits. The ages range from 14.4 $\pm$ 0.9 ka (polymineral feldspar IRSL pIRIR225) to 15.2 $\pm$ 0.8 ka (quartz OSL). Similar feldspar and quartz ages indicate a good bleaching of the sediment. These results imply fault movements post-dating 16-13.5 ka. In addition, shear wave seismic profiles were measured to analyse the geometry of the Harz boundary fault. The sections show that the Harz boundary fault is steeply dipping and probably has a branch in the northern foreland. The outcrop data in combination with the seismic data give evidence for a splay fault system with a back-thrust. The back-thrust is the NNE-ward dipping fault that is exposed in the sinkhole. With respect to the timing of fault movement, we assume that the Harz boundary fault was reactivated during the Late Glacial due to stress changes induced by the decay of the Late Pleistocene ice-sheet.

References

Brandes, C., Steffen, H., Steffen, R., & Wu, P. (2015). Intraplate seismicity in northern Central Europe is induced by the last glaciation. Geology, 43(7), 611-614.

Franzke, H. J., Hauschke, N., Hellmund, M. (2015). Spätpleistozäne bis frühholozäne Tektonik in einem Karsttrichter im Bereich der Störungszone des Harznordrandes nahe Benzingerode (Sachsen-Anhalt). Hallesches Jahrbuch für Geowissenschaften, 37, 1-10.

Leydecker, G. (2011). Erdbebenkatalog für Deutschland mit Randgebieten für die Jahre 800 bis 2008. Geologisches Jahrbuch, Reihe E, Geophysik, Heft 59, Hannover, p.198.