A CLUSTER OF REPEATING SEISMICITY AROUND MOHO-DEPTHS IN UPPER-AUSTRIA

GERNER, Andreas* (1); GRASEMANN, Bernhard (1); LENHARDT, Wolfgang (2)

1: Geodynamics & Sedimentology, University of Vienna, Austria; 2: Zentralanstalt für Meteorologie und Geodynamik (ZAMG Vienna), Austria

andreas.gerner@univie.ac.at

Austria, Lower-crustal seismicity, Earthquake clusters, Waveform correlation

In this work we investigate a previously unknown cluster of unusually deep earthquakes located in the vicinity of Arnberg, Upper Austria. The events were initially detected by seismological services/research institutions in Austria and adjacent countries in August, 2008. Depth estimates varied around 10-20 km, magnitudes published were in the range of 2.0-3.0 with only the strongest event above 3.5.

Geologically, the region is positioned in the Molasse Basin, between the NW-SE striking Bohemian Massif (approx. 80 km to the NE) and the mostly E-W striking Alps (approx. 80 km to the S), with until then little natural seismicity reported, but active geothermal production in place at the German border around Braunau/Ried (Austria).

We gathered available data from surrounding networks and relocated the events using a non-linear probabilistic approach for location determination (NonLinLoc), combined with a published 3D-velocity model of the region, which had been used in previous studies covering Austria.
Our results consistently show a dense cluster of events with depth at approx. 40 km, which within the max. observed errors of +/-8 km, is significantly deeper than expected. Further, these results are in the range of published estimates of local Moho-depth, putting the source of the events in the lower crustal region or below. Phase onset analysis supports event depth at or around the Moho. Lateral errors were about +/-2.5 km in NE-SW-direction, and +/-5 km along NW-SE.

For most of the events, complete waveforms show cross-correlation coefficients well above 0.8, which lead us to search available data for additional, previously undetected events using a master event. Two additional major periods of activity of the same cluster could be verified (2008 & later again in 2012).

While our results as to relative locations, and the near-identical wave-patterns indicate a source of highly similar physical origin and character at or around Moho-depths, possible mechanisms and conditions causing these events currently remain subject of investigation.