

Improved images of crustal structures in the Bergslagen, central Sweden, through seismic reprocessing of BABEL lines 1, 6 and 7

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In a joint effort through the BABEL project, geoscientists from five countries acquired marine seismic data in the Baltic Sea with a total length of 2268 km in the year 1989. These consisted of near-vertical reflection and wide-angle refraction seismic data, providing insights into the subsurface down to the Moho and suggesting the existence of plate tectonics already during the Paleoproterozoic.

The seismic data were acquired using a receiver group interval of 50 m and a total cable length of 3 km. In total, 60 groups of 64 hydrophones at 15 m depth were used. An airgun array consisting of six equal subarrays towed at 7.5 m depth was used to generate the seismic signal. The shot interval and the corresponding record lengths were different among the lines. A record length of 25 s and 75 m shot spacing for lines 1 and 7, respectively and 23 s and 62.5 m for line 6, respectively was used. The sampling rate was 4 ms for all three profiles.

Lines 1, 6 and 7 are located at the boundary to the world-class and historical Bergslagen mineral district, and are being revisited in this study. Improved images can be used to refine previous interpretations, particularly at shallower depths (< 5 km). About 27 years after the acquisition, these data have been processed again in our study. Aside from the original processing steps, like spherical divergence correction, deconvolution and NMO corrections, additional processing steps such as DMO corrections or pre- and post-stack deconvolutions and coherency enhancements were applied.

The reprocessing revealed reflections in the shallow part of the profiles, likely from major deformation (multi-phase) zones extending down to the lower crust, which were not present in the previous images. Also the images of the reflections in the deeper parts are remarkably improved. This also includes a few sub-Moho reflections. The three reprocessed profiles help constrain the nature of the northern boundary of Bergslagen and associated crustal structures. Furthermore they should assist in the planning of an onshore refraction and reflection profile, to be acquired in 2017, crossing the northern boundary of the Bergslagen district.

Acknowledgments: This work is supported by the Swedish Research Council (VR) grant number 2015–05177 for which we are grateful. S. Buntin's PhD work is supported by the grant.