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Barents Sea Paleozoic basement and basin configurations: Crustal structure from deep seismic and potential field data

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The Barents Sea is underlain by at least two different basement domains; the Caledonian in the west and the Timanian in the east. The transition between these two domains is not well constrained and contrasting interpretations have been published recently. Interpretations of new high-quality magnetic data covering most of the SW Barents Sea has challenged the Late Paleozoic basin configurations in the western and central Barents Sea as outlined in previous studies. Two regional ocean bottom seismic (OBS) profiles were acquired in 2014. This new dataset crosses the two major directions of Caledonian deformation proposed by different authors: N-S direction and SW-NE direction. Of particular importance are the high velocity anomalies related to Caledonian eclogites, revealing the location of Caledonian suture zones in the northern Barents Sea. One of the main objectives with this project is to locate the main Caledonian suture in the western Barents Sea, as well as the possible Barentsia-Baltica suture postulated further eastwards. The collapse of the Caledonian mountain range predominantly along these suture zones is expected to be tightly linked to the deposition of large thicknesses of Devonian erosional products, and later rifting is expected to be influenced by inheritance of Caledonian trends.

The P-wave travel-time modelling is done by use of a combined ray-tracing and inversion scheme, and gravity- and magnetic modelling will be used to augment the seismic model. The preliminary results indicate high P-wave velocities (mostly over 4 km/s) close to the seafloor as well as high velocity (around 6 km/s) zones at shallow depths which are interpreted as volcanic sills. The crustal transects reveal areas of complex geology and velocity inversions. A low seismic impedance contrast between the sedimentary section and top crystalline basement makes identification of this interface uncertain. Depth to Moho mostly lies around 30 km, except in an area of rapid change in Moho depth, from about 27 km to 32 km. This drop in Moho could indicate a relict subduction zone related to the Caledonian suture zone in the western Barents Sea