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Correlating the shallow and the deep 3D-structure of the Barents Sea/ Kara Sea

Peter Klitzke (1), Jan Inge Faleide (2), Judith Sippel (1), and Magdalena Scheck-Wenderoth (1)

(1) Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Potsdam, Germany (klitzke@gfz-potsdam.de), (2) Department of Geosciences, University of Oslo, Oslo, Norway

The Barents Sea and Kara Sea continental shelf region is located in the northern European Arctic. The crustal configuration of the Barents Sea/Kara Sea region exhibits a complex architecture of the sedimentary cover which implies the influence of diverse causative geological processes. The narrow and deep basins of the southwestern Barents Sea characterise rift basins which have been filled with thick sediments predominantly Mesozoic in age. In contrast, the eastern Barents Sea and the southern Kara Sea are marked by a wide and deep basin architecture which indicates basin formation mechanisms apart from rifting. There, the sedimentary succession yields Paleozoic and Mesozoic sediments. Cenozoic deposits are restricted to the southwesternmost parts of the Barents Sea and the oceanic domain. The lack of sediments on the shelf is attributed to strong Pleistocene uplift, subsequent erosion and recurring ice sheet coverage of the Barents Sea/Kara Sea region.
The modelled area covers about 5 million km^2 with a maximum longitudinal and latitudinal extent of 2180 and 2400 km, respectively, and comprises regions beyond the Barents Sea and Kara Sea such as parts of Greenland, Fennoscandia and western Siberia. This study presents the lithospheric density configuration below the greater Barents Sea/ Kara Sea region. Thereby, five sedimentary megasequences are differentiated across the entire study area. Each unit is modelled with matrix densities and depth dependent porosities to calculate the bulk densities. The respective compaction curves reflect that strong late Cenozoic erosion and ice sheet coverage removed particularly less dense sediments on Svalbard and Novaya Zemlya, while in the eastern Barents Sea and the southern Kara Sea erosion was less effective. Thus, the obtained sedimentary bulk densities vary laterally distinctively. The density setup of the subsedimentary lithosphere beneath the Barents shelf is defined by a high-resolution, velocity-converted density grid. This dataset is tested the first time against gravity to further constrain the 3D density model. Interestingly, region that experienced weaker Cenozoic erosion are underlain by a heavier mantle density composition.