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Crustal structure of the Nordland region, northern Norway

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To understand the major structural features of the sedimentary cover and crystalline crust within the Nordland County area of Norway, a data-based 3D structural model has been constructed in the framework of the Neonor2 project, "Neotectonics in Nordland - implications for petroleum exploration". The 3D structural model covers the Lofoten Ridge, the Ribban and Vestfjorden basins and adjacent areas of the Norwegian mainland. The model also covers the northern part of the adjacent Vøring Basin. At the regional scale, the 3D model includes the rifted margin which is located at the transition from the exposed crystalline rocks of the Fennoscandian Shield in the east to the Cenozoic oceanic domain of the Norwegian-Greenland Sea in the west.
During the construction of the 3D structural model, all recently published and/or released data have been compiled in order to set the initial model. This initial 3D model has been validated by a 3D density modelling in order to obtain a gravity-consistent 3D structural model of the entire study area. The 3D density modelling has been carried out by using the IGMAS plus software (the Interactive Gravity and Magnetic Application System). During the 3D density modelling, densities have been assigned as constant values for the crystalline rocks. In contrast, densities of sedimentary rocks have been set to be depth-dependent in order to reflect the compaction of sedimentary rocks with depth.
According to the results of the 3D density modeling, the crystalline crust of the investigated region consists of several layers with different densities. The deepest crustal layer is the high-density lower crust which corresponds to the high-velocity lower crustal layer. The regional-scale gravity response associated with the positions of the Moho and lithosphere-asthenosphere boundary is one of the key factors for performing a proper 3D density model of the study area. At the regional scale, the Moho and lithosphere-asthenosphere boundary are relatively shallow beneath the oceanic domain and the relatively deep location of these interfaces beneath the Fennoscandian Shield. On the other hand, the detailed configuration of these interfaces is currently only poorly constrained. According to some recent studies, significant variations of the Moho and lithosphere-asthenosphere boundary are present at the local scale. Therefore, our new integrated model can shed new light onto the deep structure and hence the understanding of the tectonics history of the Nordland area.