Gravity and Seismic Reflection Constraints on the Crustal Structure of Southern Norwegian Sea

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The southernmost portion of the Norwegian Sea presents one of the most complex geodynamic processes of the globe. In this area, the Aegir Ridge (AR), an extinct axis, is limited southward by aseismic Iceland-Faeroe Ridge (IFR). The asymmetric fan-shaped AR became extinct about 32-26 Ma and the seafloor spreading jumped westward to the Kolbeinsey Ridge. However, the change of the spreading activity represents a gradual tectonic process, which can be recognize by a multidisciplinary geophysical study. The morphology of the crust-mantle interface could be estimated from a flexural model in response to volcanic loading. The isostatic response showed an anomalous 22 km thick oceanic crust beneath the IFR, which decreases rapidly to a more typical oceanic crust (10 km thick) beneath AR. The main extinct axis of the AR is clearly indicated by a linear gravity low, which is centered to the magnetic isochron 12 (34 Ma). Elongated grabenlike structures are observed in bathymetric maps as well as by satellite-derived gravity and seismic reflection data, where the southern branch of the AR meets the northern flank of the IFR. These basement depressions suggest westward migration of the spreading axis, which resulted from a complex combination between the motion of the tectonic plates at Norwegian-Greenland and Labrador Seas and the excessive volcanism of the Iceland Hot Spot. The elongated structures worked as the main pathway for the over 1,800 m thick sediment sequence transported from the source areas at the IFR and the Iceland Plateau to depocenters at the Norway Basin.