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Magma-starved seafloor accretion in the Norway Basin caused by the Iceland hotspot.

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The Norway Basin was initiated by continental breakup between northern Europe and Greenland/Jan Mayen in the earliest Eocene (∼54Ma). Being part of the North Atlantic Igneous Province, continental breakup and early seafloor spreading produced voluminous magmatism, which subsided as seafloor spreading progressed. An ocean bottom seismometer (OBS) profile acquired in the year 2000 from the Norwegian Møre margin to the extinct spreading axis of the Aegir Ridge was used to estimate variations in magma productivity as the oceanic basin evolved. Due to low magnetic data coverage, a satellite derived gravity map proved suitable to reinterpret the East Jan Mayen Fracture Zone (EJMFZ) system, but no other fracture zones could be identified within the Norway Basin. The revised EJMFZ trace was used to re-evaluate spreading in the Norway Basin, which appears more asymmetric than previously believed, being condensed mostly on the southwestern side. The magnetic track recorded along the OBS profile was used to identify magnetic seafloor spreading anomalies by forward modeling, and projected onto synthetic flow lines half spreading rates were derived along-profile. Maximum rate was above 3 cm/a between A24A and A24b, falling off to ∼0.7 cm/a (ultra-slow) by C20 (42.7 Ma) which lasted to the Late Oligocene (25-28 Ma) termination of seafloor spreading. Breakup magmatism created oceanic crust up to 10-11 km thick, tapering down to thin crust by C23 time (51.4 Ma); the increased melt potential was thus spent ∼2.5 Ma after continental breakup. While oceanic crust created during ultra-slow spreading is thin (3.9 km), crust created during slow spreading is also thinner than the world average (5.3 vs. 7.1 km), indicating a somewhat depleted mantle source. A V-shaped pattern seen in the gravity field only around the northern part of the Aegir Ridge corresponds to increased crustal thickness in the

OBS model, demonstrating Middle Eocene-Early Oligocene northeast migration of asthenosphere zones with slightly increased melt production at a speed of 0.3-0.6 cm/a. The thin crust and lack of fracture zones in the Norway Basin is typical for ultra-slow seafloor spreading, even if much of it was created during slow spreading ($\sim$1.5 cm/a half rate). This character may have developed not despite the closeness to the Iceland Hotspot, but because of it, as mantle partially depleted by high magma production during the construction of the aseismic Iceland-Faeroe Ridge to the south was transported to the northeast to feed oceanic accretion. The southern part of the Norway Basin lacks V-shaped ridges and the Aegir Ridge has a deeper axial valley, indicating a lower magma budget than in the north, consistent with this model.