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Enigmatic Neogene magmatism NE of Iceland - major magmatic underplating off the Norwegian margin.

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The Northeast Atlantic Ocean was initiated during the earliest Eocene (∼54 Ma), and large volumes of magmatic rocks were emplaced at the margins during continental breakup. In 2003, an ocean bottom seismometer survey was acquired on the Norwegian margin to constrain continental breakup and early seafloor spreading processes. One target was a conspicuous bathymetric high of unclear origin off the Norwegian Vøring Margin. Modeling of the wide-angle seismic data revealed an up to 15 km thick crust of typical basic igneous velocity signature beneath the high. This is, however, not tied to the breakup magmatism: Conventional multichannel seismic surveys from 1999/2000 reveal that the high developed through basement uplift in the Late Miocene. The event also formed a prominent non-erosional unconformity in the sedimentary strata in the oceanic basin northeast of the high. The main uplift is located off the termination of the extinct seafloor spreading Aegir Ridge across the East Jan Mayen Fracture Zone (EJMFZ), suggesting that the ridge determined the location of the magmatic event. Renewed magmatism is also seen within the Norway Basin on the Aegir ridge on two locations, resulting in uplift of axial mountains or an incipient seamount within the ridge valley itself. The total magma volume is estimated to be ∼60000 km^3. The cause of this magmatic event is enigmatic: Distribution of magmatism does not form a time-transgressive track, and thus does not fit a classic mantle-plume model. Edge-driven small-scale convection at the EJMFZ would produce magmatism in the wrong location. While radial asthenospheric flow out from

Iceland could interact with bottom-lithosphere topography, magmatism occurs where the flow encounters thicker lithosphere, not thinner. We note similarities to the region northeast of the presently active seafloor spreading Kolbeinsey Ridge, where a volcanic ridge, a recent seamount, and unconformities in the sedimentary strata occurs northeast of the West Jan Mayen Fracture Zone. The seafloor here is $\sim$650 m shallower than the conjugate seafloor northeast of the Aegir Ridge, indicating that the active spreading ridge is able to channel the asthenospheric flow out from Iceland to some degree. We hypothesize that low-degree partially molten mantle from the lowest part of the melt column underneath the spreading ridge is captured by the astenospheric flow, to eventually surface northeast of the terminating fracture zone. This model requires that some of the melt is not extracted immediately, and that the asthenosphere can retain a molten component over significant time. If the model is applied to the magmatism northeast of the Aegir Ridge, a molten component will have to reside for 10-15 m.y. in the asthenospheric low-velocity zone before surfacing northeast of the EJMFZ. The model explains the spatial correlation, but the cause for the temporal delay in extracting the molten component remains unclear.