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Northeast Atlantic Igneous Province volcanic margin development

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Early Eocene continental breakup in the NE Atlantic Volcanic Province (NAIP) was associated with voluminous extrusive and intrusive magmatism, and initial seafloor spreading produced anomalously thick oceanic crust. Recent publications based on crustal-scale wide-angle
seismic data show that there is a positive correlation between igneous crustal thickness (H) and average P-wave velocity (Vp) on all investigated margins in the NAIP. Vp can be used as a proxy for crustal composition, which can be related to the mode of mantle melting. A positive H-Vp correlation indicates that excessive mantle melting the first few million years after breakup was driven by an initial increased temperature that cools off as seafloor spreading develops, consistent with a mantle plume model. Variations in mantle composition can explain excess magmatism, but will generate a negative H-Vp correlation. Active mantle convection may increase the flux of mantle rocks through the melting zone above the rate of passive corner flow, which can also produce excessive magmatism. This would produce little H-Vp correlation, and place the curve lower than the passive flow melting curve in the diagram. We have compiled earlier published results with our own analyses of published and unpublished data from different groups to look for systematic variations in the mantle melting mode along the NAIP margins. Earlier studies (Holbrook et al., 2002, White et al, 2008) on the southeast Greenland conjugate system, indicate that the thick igneous crust of the southern NAIP (SE Greenland ? Hatton Bank) was dominated by increased mantle temperature only, while magmatism closer to the southern side of and including the Greenland-Iceland-Færøy Ridge (GIFR) was created by combined
temperature increase and active mantle convection. Recent publications (Breivik et al., 2008, White et al, 2008) north of the GIFR for the Norway Basin segment, indicate temperature dominated magmatism between the Jan Mayen Fracture Zone (JMFZ) system and the Færøy archipelago. Our unpublished data on the conjugate margin of the eastern Jan Mayen ridge confirm this. North of the JMFZ, early magmatism appears to be caused by the combined effect of elevated temperature and convection, while there is a rapid transition to predominantly temperature dominated melting $\tilde{2}$ M.y. after breakup. This is similar to the northern conjugate East Greenland profiles we examined (Voss and Jokat, 2007), while the southern of their two profiles indicates that convection is not turned off at that side. Conjugate differences in igneous crustal thickness further indicate asymmetric conjugate magmatic development. For comparison, we applied the same analysis to data from the Vøring Spur located off the Vøring Margin, and the igneous crust beneath the Jan Mayen Island. Both show little H-Vp correlation with generally lowVp, indicating that these igneous features were created through low-degree mantle melting created by some kind of mantle convection without an elevated temperature component.