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Asymmetry of the Norwegian and East Greenland conjugate rifted continental margins

J. G. Watson (1), N. J. Kusznir (1), F. Tsikalas (2,3), J. Faleide (2)

(1) Department of Earth and Ocean Sciences, University of Liverpool, Liverpool, L69 BX, UK

(2) Department of Geosciences, University of Oslo, Oslo, P.O. Box 1047, Blindern N-0316, Norway

(3) ENI Norge AS, P.O. Box 101 Forus, NO-4064 Stavanger, Norway

The conjugate Norwegian and East Greenland rifted continental margins, formed by North Atlantic break-up at 54Ma, display a large asymmetry. This study examines the Lofoten, Vøring and Møre segments of the Norwegian margin and their East Greenland and Jan Mayen conjugates in order to better understand the form and origin of this asymmetry. Conjugate margin asymmetry is evident in differences in the width of the region of thinned continental crust, sediment thickness, the distribution of lower crustal magmatic bodies (LCB) and the sharpness of the ocean-continent transition. It is important to understand the origins of this asymmetry and the partitioning of breakup stretching and thinning of continental margin lithosphere in order to predict subsidence and heat flow histories. Conjugate margin profiles have been analysed to determine (i) continental lithosphere thinning using flexural backstripping and reverse thermal subsidence modelling, (ii) crustal thinning using gravity inversion and seismic refraction results, and (iii) upper crustal faulting from fault analysis. The rifted margins examined show breakup depth-dependent lithosphere stretching and thinning where whole lithosphere stretching and thinning exceeds that of the upper crust. The degree and form of breakup depth-dependent lithosphere stretching and thinning changes along strike. Both the Norwegian and Greenland continental margins show earlier pre-breakup lithosphere deformation related to earlier Jurassic and Cretaceous depth-uniform lithosphere stretching leading to intra-continental rift basin

formation. The non-coaxial superposition of lithosphere thinning from these earlier intra-continental rift events with Early Tertiary breakup thinning has led to a complex and laterally varying distribution of thinning of the continental lithosphere. Modelling of the Jurassic-Cretaceous intra-continental rifting and Early Tertiary lithosphere thinning leading to continental breakup has been carried out in order to investigate whether the asymmetry of the Norwegian and Greenland rifted margins arises from fundamental asymmetry within the continental lithosphere breakup process itself, or from the superposition of earlier Jurassic-Cretaceous intra-continental rift events with the Early Tertiary continental breakup thinning.