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Late Cretaceous-Paleocene strike-slip faults along the East Greenland margin (63ºN to 75ºN): constraints for the North East Atlantic opening

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The East Greenland margin is a long stretch starting from 60ºN up to 81ºN in a distance of almost 3000 km. It represents the conjugate of the European margin now separated by the North East Atlantic (NEA). After a long period of E-W extension and almost N-S oriented rift basins since Early Cretaceous, separation between Greenland and Europe began at 55 Ma following a NE-SW oriented line of breakup and the emplacement of the North Atlantic Igneous Province (NAIP). Post-breakup thermal subsidence followed in the Eocene, and the Oligocene initiated a period of plate re-organization together with the initial separation of Jan Mayen microcontinent, a complex tectonic history with inversion structures and uplifts along both the East Greenland and European margins. The effect of this history is represented by exhumed sedimentary basins, dyke swarms, fault systems, intrusive centers, shield volcanoes and plateau lavas constituting highest mountain of Greenland with some peaks up to 3700 m (e.g. Watkins Bjerge).
During expeditions for fieldwork in East Greenland (2009 to 2011) to collect new geological and structural data related to the North East Atlantic tectonics, four areas were visited: Skjoldungen 63ºN, Kangerlussuaq 68ºN, Traill Ø 72ºN and Wollaston Forland 75ºN. More than 1000 measurement of fault-slip data for structural analysis along major faults were collected and helicopter flights to collect oblique pictures for 3D-photogeology and 3D-mapping were taken. Kinematic analysis of brittle deformation associated with Late Cretaceous-Paleocene rift shows strike-slip movements. Palaeo-stress tensors reconstructed from fault-slip data highlight a NE-SW maximum horizontal stress in a strike-slip tectonic setting along the entire East Greenland margin (Guarnieri 2011a; Guarnieri 2011b; Guarnieri et al. 2011). Structural data show clear evidence for oblique rifting that corresponds in time to the “volcanic rift” (61-55 Ma) with in some cases the magmatic segmentation of macro-dyke complexes or the activation of major shear zones with strike-slip movements.
Oblique rifting and strike-slip deformation along the East Greenland margin reflect the progressive clockwise shift, from W-E to NW-SE, of the separation trend between Greenland and Europe probably in response to the opening of the Labrador Sea.