Geophysical Research Abstracts
Vol. 13, EGU2011-10458, 2011
EGU General Assembly 2011
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Stress field and plate break up over a thermal anomaly: the West Greenland and the Blosseville Kyst (East Greenland) case examples

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We characterize and map the stress fields along the West Greenland and the Blosseville Kyst (East Greenland) volcanic margins, which are respectively associated with continental breakup in Baffin Bay and NE-Atlantic. Interpolated stress fields are based on an inversion of fault-slip data sets and magma-driven fractures, crosscutting mainly an exposed inner seaward-dipping basaltic wedge (i.e. SDRi). In the two case examples, the SDRi is segmented along-strike, with differently oriented segments. In both cases, we identify two distinct deformations and associated stress fields (P1 and P2) which are both syn-magmatic and thus coeval with the huge mantle melting accompanying breakup. P1 is coeval with the development of the SDRi whereas P2 post-date the flexure in both cases. In W-Greenland, the P1-P2 transition occurred at $\sim$54 Ma, i.e. during magnetic chron C24R. P1 is syn-magmatic and purely extensional. It is associated with the major crustal stretching event affecting the margin. P1 probably acted as early as the Late Palaeocene. This stress field was first homogeneous with the minimum principal stress $\sigma 3$ trending $\sim$N060E, defining a P1A stage. During development of the SDRi, $\sigma 3$ locally reoriented to become orthogonal to each margin segment and, thus, to the continentward-dipping detachment faults bounding the SDRi (P1B). P1 is coeval with lithosphere breakup and is associated with an extension orthogonal to the Labrador-Baffin axis, which is inherited from the Mesozoic. A regional and radical change of $\sigma 3$ to a $\sim$NS trend took place during P2, which follows on immediately from P1. In both margins, we compare these results to the relative and absolute kinematic vectors of Greenland during the Paleogene, taking into account the local orientation and structure of the margins.