Evidence of post-breakup tectonism on the Northeast Greenland shelf: Implications for “passive” margin conditions

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Abstract: Evidence of post-breakup tectonism on the Northeast Greenland shelf: Implications for “passive” margin conditions

The break-up between the Eurasian and North American plates during the Paleogene is well constrained by geophysical data. The structural history of Northeast Greenland following the breakup is on the other hand still very much an area of discussion. Here, analysis of seismic data offshore Northeast Greenland constrains the timing of the post-breakup tectonic events by correlation with the well-dated magmatic intrusions in the region and their associated thermal uplift and venting of gasses. Previous studies have mapped large-scale faulting along the western margin of the Thetys Basin where extensional faulting with an offset exceeding 1s TWT on the seismic profiles is observed (Petersen et al. 2015). This is often associated with dramatic failure of the uplifted footwall where vast quantities of sediment slid into the Thetys Basin, apparently instantly, which suggests relatively fast propagation of the fault system. The time of breakup is constrained in the seismic data by magmatic intrusions dated to peak in the earliest Eocene (Reynolds et al. 2017). Both a southwards deepening erosional incision, as well as several vents associated with the de-gassing of intruded magma coincides with the continental breakup. This seismic marker is clearly truncated by the failure of the footwall as well as offset by the fault, which shows that the faulting occurred in post-breakup times, during a tectonic phase where no faulting on the “passive” margin is expected. Significant progradation associated with tilting and erosion superseded the observed faulting. This indicates that active tectonism may explain the exhumation and progradation observed on the Northeast Greenland margin during the Neogene.

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