Geophysical Research Abstracts
Vol. 19, EGU2017-4286, 2017
EGU General Assembly 2017

Refining plate reconstructions of the North Atlantic and Ellesmerian domains

Grace E. Shephard (1), Mansour M Abdelmalak (1), Susanne Buiter (2,1), Karsten Piepjohn (3), Morgan Jones (1), Trond Torsvik (1), Jan Inge Faleide (1), and Carmen Gaina (1)

(1) Centre for Earth Evolution and Dynamics (CEED), University of Oslo, Norway (g.e.shephard@geo.uio.no), (2) Geological Survey of Norway (NGU), Trondheim, Norway, (3) Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Germany

Located at the intersection of major tectonic plates, the North Atlantic and western Arctic domains have experienced both widespread and localized deformation since the Paleozoic. In conventional tectonic reconstructions, the plates of Greenland, Eurasia and North America are assumed to be rigid. However, prior to the onset of seafloor spreading, rifting lithosphere experiences significant thinning that is usually not accounted for. This leads to significant (in excess of 300 km in places) over- and under-laps between conjugate continent-ocean boundaries, an incomplete history of basin evolution, and loose correlations between climatic, volcanic, oceanographic and, geologic events. Furthermore, a handful of alternative regional reconstructions now exist, which predict different timings, rates and locations of relative motion and associated deformation. Assumptions of reference crustal thicknesses and the nature of lower crustal bodies, as well as the location of basin hinge lines have to-date not yet been incorporated into a consistent regional kinematic model. Notably, the alternative models predict varying episodes of compression or quiescence, not just orthogonal or oblique rifting. Here, we present new temporal and spatial-dependent results related to (1) the dominant rifting episodes across the North Atlantic (Carboniferous, Late Permian, Late Jurassic-Early Cenozoic and Late Cretaceous-Paleogene), and (2) restoration of compression and strike-slip motion between northern Greenland, Ellesmere Island (North America) and Spitsbergen (Eurasia) related to the Eurekan Orogeny. We achieve this by integrating a series of conjugate seismic profiles, calculated stretching factors, dated volcanic events, structural mapping and mass-balanced restorations into a global plate motion model via GPlates software. We also test alternative models of rift velocities (as kinematic boundary conditions) with 2-D lithosphere and mantle numerical models, and explore the importance of rheology and initial model setup.