



Continental sutures in the North Sea interpreted from integrated potential field modelling and seismic interpretation

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Integrated interpretation and modelling of gravity, magnetic and seismic data gives new insight into the spatial distribution of large-scale crustal domains and their boundaries in the North Sea area. The triple plate tectonic history of the North Sea has in decades been debated. The timing, dynamics and especially the location of the Palaeozoic triple plate collision sutures is poorly constrained despite the existing large deep seismic database. Filters and transformations applied to the potential field data, constrained by reflection seismic data and velocity models reveals intrinsic features of crustal/uppermost mantle transitions and their relation to later extensional structures. The integration of potential field data with deep reflection/wide-angle refraction seismic data shows fundamental differences between the lithosphere of Avalonia and Baltica. The location of the Mesozoic rift systems (the Central Graben and the Viking Graben) may in places have been determined by the location of the suture between these two plates. A significant lineament across the entire North Sea from Scotland to North Germany is revealed in the potential field transformations, indicating that lower crust of Baltica provenance may extend as far westward as to this new lineament. We hypothesize that lower crust of Baltica affinity extends across the North Sea as far westward as to Scotland, in contradiction with previous assumptions regarding the location of the sutures. We show, by spectral analysis of the gravity field, that much of the crystalline crust, in areas previously believed to be of Laurentia affinity, may instead be of Baltica affinity (at least the lower crust). This lineament could as such represent the crustal suture between lithosphere of Caledonian origin (Avalonia) versus lithosphere of Precambrian origin (Baltica) in the lower crust. We believe that this lineament may be the missing link in the reconstruction of the triple plate collision.