Reappraisal of the Mid-Jurassic Central North Sea doming based on a compilation of the regional stratigraphy and denudation history.

The Mid-Jurassic Central North Sea is interpreted to be a regionally extensive, long-lived, multi-directional (plume) extensional tectonic setting. The Mid-Jurassic Central North Sea rift system is characterized by a combination of late stage intracontinental rifting and oceanic rifting. The mid-North Sea mid- to late Jurassic is dominantly controlled by plume activity to extension.

We used a combination of databases and onshore outcrops, supplemented with recently acquired regional seismic reflection data, to compile and review regional erosion/denudation data. Such data are of pedagogical interest and are easily accessible to students and researchers. The database includes a new compilation of Jurassic stratal geometries, denudation surfaces, unconformities, and fossil biohorizons.

We show that the maximum amount of the Mid-Late Jurassic erosion occurred along the Central Graben and decayed away with increased erosion on topographic highs far from the Central graben, such as the Brabant massif, could be linked to changes in boundary conditions during the Mid-Jurassic rather than to large-scale uplift. The geometry of the Caledonian suture between Baltica and Avalonia tectonic blocks and its reactivation could have controlled the locus and the asymmetry of the Mid-Jurassic doming. It suggests that the Mid-Jurassic thermal doming in the North Sea corresponds to a regional regression culminating during the Aalenian. The regression is concomitant to enhanced erosion on Palaeozoic highs. The thermal doming event started around 180Ma, preceding the localized rifting of the Central Graben that started around 160Ma. This Late Jurassic rift modified Permian/Triassic extensional structures. The rifting has been presented either as radial with a locus of extensionally Super Balanced Block, or with a single oblique extension. The present paper adds new data on Jurassic volcanism that is often associated with plume activity to extension.

Synthetic vertical sections of the North Sea rift system compiled from literature and data gathered from the new compilation. The sections show the relation between the grabens and the extensional horsts. The grabens are mostly bounded by faults. The extensional horsts are bounded by faults and the direction of extension generally varies between the grabens. The sections show that the Central Graben is the largest and most mature of the grabens. The North Sea rift system is characterized by a combination of late stage intracontinental rifting and oceanic rifting. The mid-North Sea mid- to late Jurassic is dominantly controlled by plume activity to extension.

There are strong similarities between the Atlas and the North Sea rift systems. Multi-directional extension over a plume head produces extensional and continental rifts downthrown. There are strong similarities between the Atlas and the North Sea rift systems. Multi-directional extension over a plume head produces extensional and continental rifts downthrown. Consequently, how and why the North Sea rift system failed. A future numerical modelling study will hopefully shed some light on the North Sea rift system.