

## **Contrasting basin architecture and rifting style of the Vøring Basin, offshore mid-Norway and the Faroe-Shetland Basin, offshore United Kingdom**

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The Vøring and the Faroe-Shetland basins are offshore deep sedimentary basins which are situated on the outer continental margin of the northeast Atlantic Ocean. Both basins are underlain by thinned continental crust whose structure is still debated. In particular the nature of the lower continental crust and the origin of high velocity bodies located at the base of the lower crust are a subject of discussion in recent literature. Regional interpretation of 2D and 3D seismic reflection data, combined with well data, suggest that both basins share several common features: (i) Pre-Cretaceous faults that are distributed across the entire basin width. (ii) Geometries of pre-Jurassic strata reflecting at least two extensional phases. (iii) Three common rift phases, Late Jurassic, Campanian-Maastrichtian and Palaeocene. (iv) Large pre-Cretaceous fault blocks that are buried by several kilometres of Cretaceous and Cenozoic strata. (v) Latest Cretaceous/Palaeocene inversion. (vi) Occurrence of partial mantle serpentinization during Early Cretaceous times, as proposed by other studies, seems improbable.

The detailed analysis of the data, however, revealed significant differences between the two basins: (i) The Faroe-Shetland Basin was a fault-controlled basin during the Late Jurassic but also the Late Cretaceous extensional phase. In contrast, the Vøring Basin is dominated by the late Jurassic rifting and subsequent thermal subsidence. It exhibits only minor Late Cretaceous faults that are localised above intra-basinal and marginal highs. In addition, the Cretaceous strata in the Vøring Basin are folded. (ii) In the Vøring Basin, the locus of Late Cretaceous rifting shifted westwards, affecting mainly the western basin margin, whereas in the Faroe-Shetland Basin Late Cretaceous rifting was localised in the same area as the Late Jurassic phase, hence masking the original Jurassic geometries. (iii) Devonian-Carboniferous and Aptian/Albian to Cenomanian rift phases are present in the Faroe-Shetland Basin, but are not recognisable in the Vøring Basin. (iv) Based on seismic data only, a Permian/Triassic rift phase can be suggested for the Vøring Basin, but the evidence for an equivalent rift phase in the Faroe-Shetland Basin is inconclusive.

The present study demonstrates that basins developing above a complex mosaic of basement terrains accreted during orogenic phases can exhibit significant differences in their architecture. The origin of these differences may be considered to be a result of inherited pre-existing large-scale structures (e.g. pre-existing fault blocks) and/or a non-uniform crustal thickness prior to rifting.