



Deep structure of hyperextended basins offshore Norway

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The 3D architecture of rifted margins is controlled by lateral variations in the location of domain boundaries and displacement gradients along the structures that define them. The deep structure of the Mid-Norway rifted margin is characterized by a fault-controlled necking domain, a hyperextended block-faulted area of variable width and an array of distal detachment breakaways that border areas that resemble exhumation domains. From Jurassic to Late Cretaceous times, the suite of extensional faults and basins appear to show a temporal migration towards the future location of breakup, but parts of the deep margin provide evidence for a complex evolution with more than one phase of extensional faulting in the deep basin areas, and with 'out of sequence' faults that cut and deactivated earlier detachments. A number of distinct extensional basin types evolved that can be identified and classified according to their structural setting and location in the margin system. In the necking domain, supradetachment basins became perched on rider blocks on gently dipping detachment faults that were abandoned in shallow structural positions as they were incised by a second generation of detachments. The taper break or coupling basin is the innermost basin in the distal margin and occupies a position at the base of a tens of kilometres wide crustal slope, defined by the faults associated with construction of the necking domain. Arrays of very deep half-graben basins are associated with hyperextended crust outboard of the necking domain. Outboard of the distal detachment breakaway, or the exhumation limit in the case of mantle windows, supradetachment basins are associated with extensional allochthon and multiply extended ridges. The necking and distal domains present variable contact relationships to the overlying sag basin in terms of downlap, onlap and erosional unconformities. The combined stratal architecture reflects the position with respect to the various margin domains.