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What is reactivated when at rifted margins? comparing the Northwest Svalbard and Møre segments of the NE Atlantic margin.

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The opening of oceans along ancient mountain belts was stated as fundamental in the Wilson cycle and appears to be justified in the case of the North Atlantic. The question of what is actually inherited appears as much more difficult. We consider 3 aspects of inheritance as pertinent to the evolution of the Svalbard and Mid-Norwegian rifted margins: 1) inheritance of the post-orogenic rheological and structural template into later stages of rifting, 2) inheritance of the early rift configuration, including variations in crustal thickness and rheology, into the stage of crustal necking and 3) inheritance of the post-rift crustal template into the 'passive′ margin phase dominated by vertical movements. The Northwest Svalbard and Møre margins share some fundamental similarities in the arrangement of onshore and offshore structures. Both areas host inherited extensional complexes of detachment faults, strongly aligned extension-parallel fabrics including mineral lineations, doubly plunging extension-parallell folds and fold-parallel brittle faults. These fabrics developed during phases of orogenic 'collapse′, suggested to be characterized by constrictional strains and regional transtension in the Norwegian case, but that have only recently been identified in Svalbard. In both areas, faults incised into the flanks of extension-parallel folds display a long history of reactivation.

The necking domain of the Møre margin developed on a template of NE-SW-trending, warped detachment fabrics and sinistral strike-slip faults, which were reactivated from the Jurassic into the Cretaceous to define the inner boundary for the distal margin. Onshore these structures were reactivated in the Late Cretaceous and/or in the Cenozoic. Considerable topographic and geomorphic contrasts developed across reactivated fault strands since the Latest Cretaceous, demonstrating relationships between inherited structure and Scandinavian topography and landscape. In Svalbard, the N-S trending, Devonian fold-parallel Billefjorden Fault Zone was reactivated in a normal sense to control deposition in the Carboniferous Billefjorden Trough. Following Early Cenozoic transpression and formation of the western Svalbard fold and thrust belt, normal faulting was resumed along the N-S trending west Svalbard margin as transpression was overtaken by transtension in Oligocene-Miocene time. The establishment of the Knipovitch Ridge left the west Svalbard Margin with a very sharply tapered crystalline crust, a feature it shares with the Møre margin.

On the first order, landscape contrasts in Svalbard resemble those in Scandinavia with an elevated, deeply incised escarpment with alpine ranges adjacent to the sharply tapered rifted margin and gently E- or SE-dipping relict surfaces increasingly preserved to the south and east. The relict surfaces are poorly dated in the case of Norway, but are demonstrably Early- to Mid Cenozoic in Svalbard, where large-scale erosional incision indicates tilting towards the south and east and erosion into this template prior to extrusion of lavas in the Miocene. In summary, at both at the Møre and west Svalbard margins, fabrics related to 'orogenic collapse′ became reactivated in later rift phases to eventually produce sharply tapered margin segments that subsequently became uplifted, deformed and eroded along the same structural trends.