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Stratigraphic response from Late Cretaceous rifting to Early Cenozoic drifting, Norwegian Sea

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The Late Cretaceous-Paleocene rift episode in the Norwegian Sea was a precursor to the final continental separation in the North Atlantic region at the Paleocene-Eocene transition. Extensional faulting in the western Vøring Basin was associated with this rift episode, demonstrated by marked thickening of Campanian-Maastrichtian sediments against normal faults as well as internal divergent reflections. Based on seismic data and available wells, rifting was initiated in the Early Campanian, around 82-80 Ma. Renewed fault activity recorded in the eastern part of the Norwegian Sea, appears to be coeval with deformation within the Vøring and Møre basins and indicate that crustal extension associated with the Campanian-Paleocene rift episode also affected areas to the east.

The stratigraphic response to the initial rift stage, main rift and post-break up stage varies dramatically, both in time and space. The Campanian succession in the Vøring Basin has very thick sand units deposited in deep basins during the initial rift stage. In contrast, the Cretaceous interval is much thinner and less sand prone on platforms and terraces to the east. The Campanian succession varies from more than 800 m thick deep-marine sandstone on the Nyk High, to less than 200 m of mudstone on the Halten Terrace.

The transition to the main rift stage in the Maastrichtian and Early Paleocene resulted in basin margin uplift, deepening of hanging wall basins, footwall erosion and sediment accumulation in hanging wall depocentres. Complete stratigraphy of the Late Maastrichtian and Paleocene in the Norwegian Sea is only present in the deeper parts of the basins, and wells penetrating the succession in the deep basins reveal classical turbidites deposited in submarine fans (i.e. the Ormen Lange fan). Accordingly, major stratigraphic breaks cover the Late Maastrichtian to Late Paleocene interval at both the eastern and western basin margins.

Fine-grained, sand-poor deposits dominate the post-break up sediments in the Norwegian Sea. The western margin was no longer an active sediment source related to break-up subsidence and sea-floor spreading, and the sediments derived from the eastern margin were dominated by silt and mud. The earliest post-break up sediments (Lower Eocene) were strongly influenced by active sea-floor spreading with abundant volcanic ash layers.