Cretaceous depositional systems in the Norwegian Sea: heavy mineral constraints

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ABSTRACT

Deep water Cretaceous sandstones in the Norwegian Sea were deposited by a number of distinct sediment transport systems tapping different sediment source terrains. Three distinct sandstone types (K1, K2 and K3) have been identified, distinguished and mapped on the basis of a combination of heavy mineral parameters. Sandstone type K1 occurs on the Trøndelag Platform, Halten Terrace and Nordland Ridge, but does not appear to be present in the deeper water Vøring Basin. It was ultimately derived from the Scandinavian landmass, with detritus sourced from metasediments of the Caledonian fold belt, intrusives of the Trans-Scandinavian Igneous Belt, and, to a smaller extent, Svecofennian basement. K1 sandstones were deposited on an unstable slope by debris flows and slumps, with minor reworking by bottom currents. Sandstone type K3 was derived from the Western Gneiss Region, farther south on the Scandinavian landmass. Sandstone type K2 occurs in more basinal locations in the Norwegian Sea, and was not supplied by the systems operating along the Scandinavian margin because its mineralogy contrasts with that of K1 and K3. Its mineralogy is not consistent with a source in the Lofoten area or East Greenland, and it is therefore believed to represent the deposits of a separate axial transport system fed by a source that lay in Northeast Greenland. K2 zircon ages indicate involvement of Paleoproterozoic (c. 2000 Ma) and Archaean basement, together with metasediments of the Caledonian fold belt.

Previous sedimentological models for the Cretaceous of the Norwegian Sea suggest that sand deposition occurred as slumps and debris flows along the continental slope, resulting in discontinuous and unpredictable sandstone units, unless they become amalgamated into thick reservoir sequences. The mineralogical evidence indicates that this model can be applied only to sandstone types K1 and K3. By contrast, sandstone type K2 represents sediment introduced from the conjugate margin of the basin and occurs up to 200 km from its detrital source region. It is therefore likely to occur as more predictable, sheet-like bodies on the basin floor.