

Timing and paleoceanographic implications of the North Sea 'base Cretaceous unconformity' event at its correlative conformity: a multi-disciplinary core study, North Jens-1 well, Danish Central Graben

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The so-called 'base Cretaceous unconformity' (BCU) in the North Sea was traditionally considered to be a widespread event with a hiatus at marginal areas, structural highs, and deeper parts of the North Sea Basin. Increased biostratigraphic resolution revealed the existence of complete, often condensed sections on the highs and conformable sequences in the basins. In the earliest Cretaceous basinal settings of the Danish Central Graben, borehole sections through the BCU 'correlative conformity' reveal a shift from dark grey, variably carbonaceous and calcareous, organic-rich claystones of the Farsund Formation to marlstones and chalky limestones of the lowermost Valhall Formation. Though rarely cored in the North Sea, the event was spanned by a 17m thick core in the North Jens-1 well that provided the opportunity for an integrated sedimentological, biostratigraphic, and paleoecological study.

Multidisciplinary biostratigraphic and palynofacies analyses that span the late Ryazanian-early Valanginian reveal a shift in fossil assemblages and palynofacies reflective of a transition from dysoxic bottom conditions and stratified water column, linked to the Farsund Formation,

to open-marine conditions and well oxygenated bottom waters associated with the Valhall Formation.

The Farsund Formation nannofossil assemblages included age indicative *Sollasites arcuatus*, *Kokia curvata*, abundant *Watznaueria barnesiae*, and common *Cyclagelosphaera margerelii*. The dinocyst assemblage was dominated by *Canningia compta*, *Sentusidinium* spp., and *Hystrichodinium voigtii* and in the uppermost part by the late Ryazanian marker *Oligosphaeridium diluculum*. Pyritised radiolaria, abundant amorphous organic matter, and common prasinophycean algae indicated a stratified water column in a restricted basin.

The Valhall Formation nannofossil assemblage is dominated by *Watznaueria barnesiae* and includes *Micrantholithus brevis*, *Stradnerlithus silvaradius*, and *Nannoconus kamptneri kamptneri*. The relatively high abundance dinocyst assemblage includes the basal Valanginian marker *Achomosphaera neptunii*. Reduced amorphous organic matter, rare prasinophycean algae, and a relatively rich calcareous benthic foraminifera fauna, dominated by *Lenticulina muensteri*, indicate oxygen-rich bottom waters and mixing of the water column.