

IDENTIFICATION OF A PALAEO-OIL MIGRATION ROUTE IN THE GEMINI WELL 16/1-24, NORWEGIAN NORTH SEA

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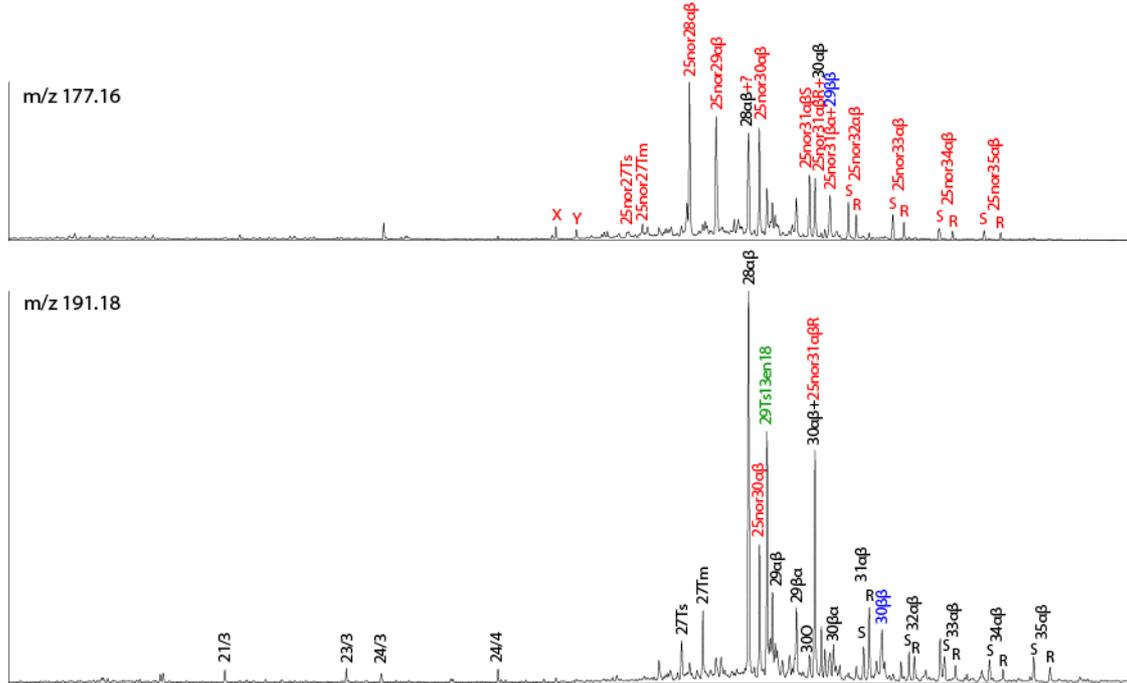
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Exploration well 16/1-24, drilled in the Southern Viking Graben, Norway, proved to be dry with minor oil shows in the Paleocene Ty Formation. However, geochemical analysis indicated the possibility of oil staining at a slightly shallower depth than the target reservoir, at the base of the Hordaland Gp (Eocene to Early Miocene) sediments. Claystone extracts from 1940 and 1954 m in the Hordaland Gp exhibit maturities consistent with immature indigenous bitumen for most molecular maturity parameters. However, indications of migrated oil are provided by an increase in the 22S/R ratio for 17 α -hopanes from low values for C₃₁ up to the equilibrium value by C₃₄. The ratio of migrated oil to immature bitumen appears greater in the 1954 m than the 1940 m extract, on the basis of lower abundances of hop-17(21)-enes, noehop-13(18)-enes, diaster-13(17)-enes, stigmast-5-ene and 4 β -methylsterenes relative to their regular saturated counterparts.

Both claystones contain abundant 28,30-dinorhopane and 25,28,30-trinorhopane, which appear to originate from the immature indigenous bitumen. The migrated oil present is heavily biodegraded, characterized by profound depletion of regular hopanes and steranes, leaving the immature signal of the indigenous bitumen dominant. A complete series of C₂₆–C₃₄ 25-norhopanes is present in both extracts, but at slightly lower relative abundance in the 1954 m sample. Despite the extent of biodegradation, other resistant compound classes, such as 8,14-secohopanes and diamondoids, were not obviously enriched.

The deeper oil staining, in the Ty Fm, does not appear biodegraded to any great extent, although concentrations are low and so contributions from oil-based drilling mud hamper correlation with the overlying Hordaland Gp stain.

Hordaland Gp show – 1940 m clst dc



Ty Fm show – 2121.50 m sst swc

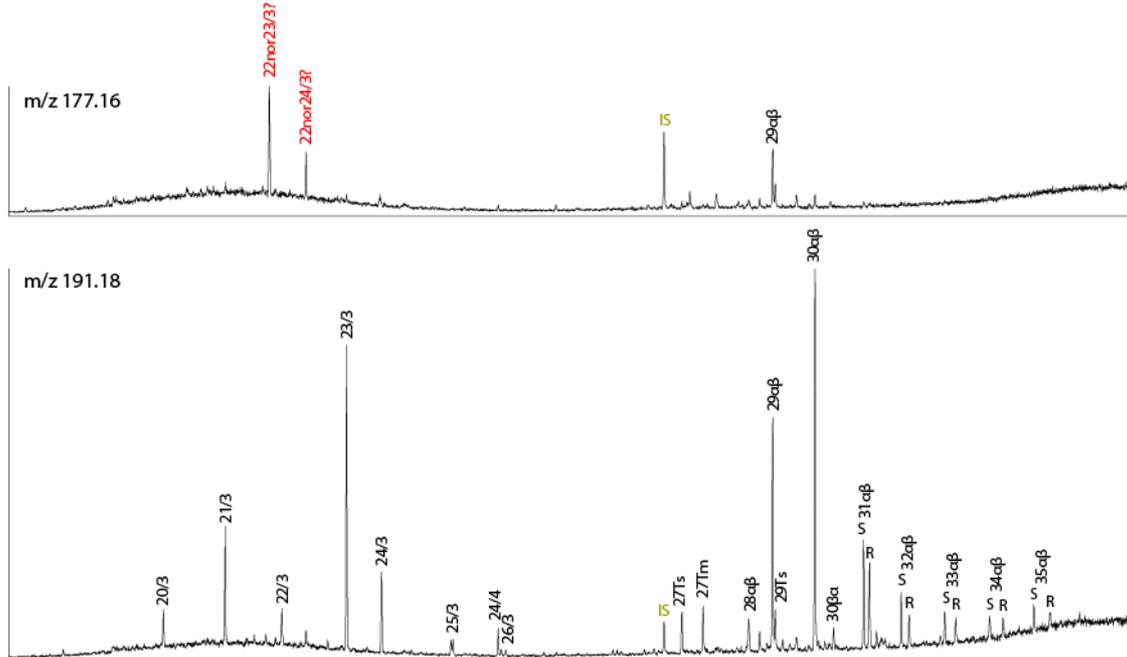


Figure 1 25-Norhopane and regular hopane distributions in oil stains from Hordaland Gp and Ty Fm, well 16/1-24 (intensity scales normalized).