High concentration of 28,30-bisnorhopane and 25,28,30-trisnorhopane at the PETM in the Faroe-Shetland basin

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HIGH CONCENTRATION OF 28,30-BISNORHOPANE AND 25,28,30-TRISNORHOPANE AT THE PETM IN THE FAROE-SHETLAND BASIN

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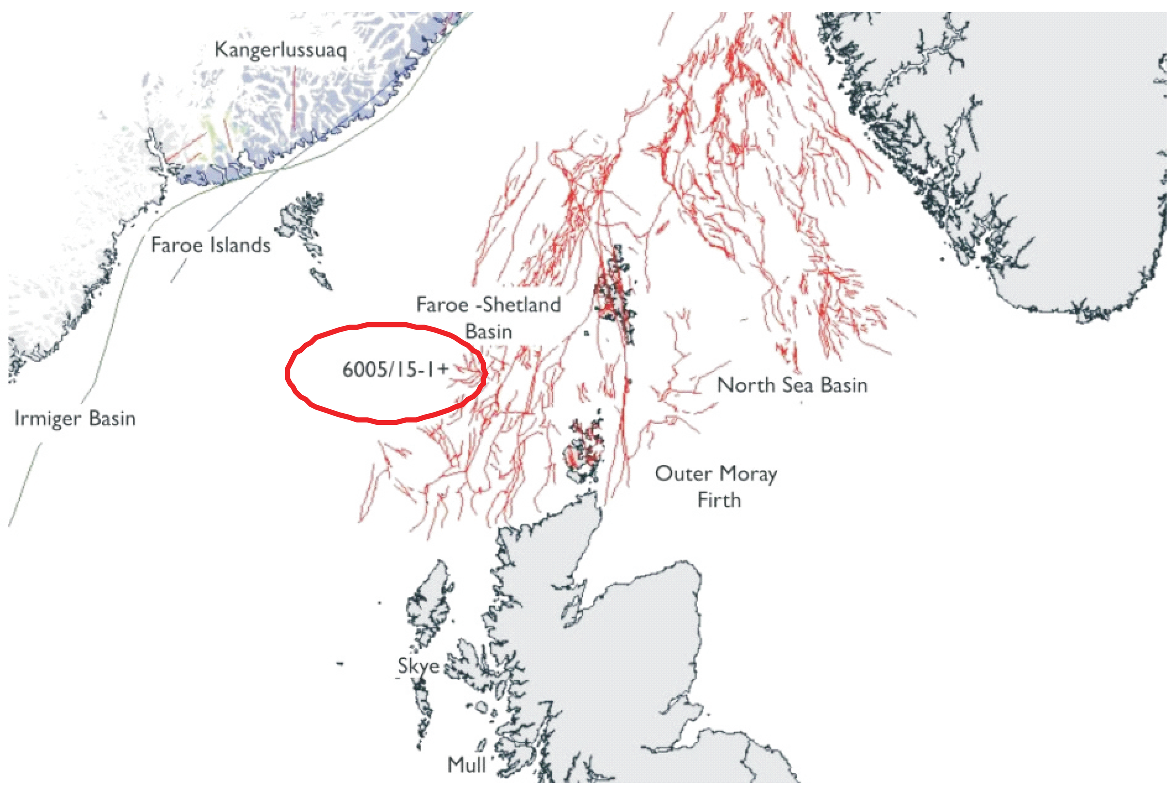

Figure 1: Location of analysed core

INTRODUCTION

Petroleum exploration in the Faroe-Shetland basin has resulted in the drilling of wells some of which contain expanded sections across the Palaeocene Eocene thermal maximum event (PETM). Here we present data from a Faroe – Shetland Basin well (Figure 1).

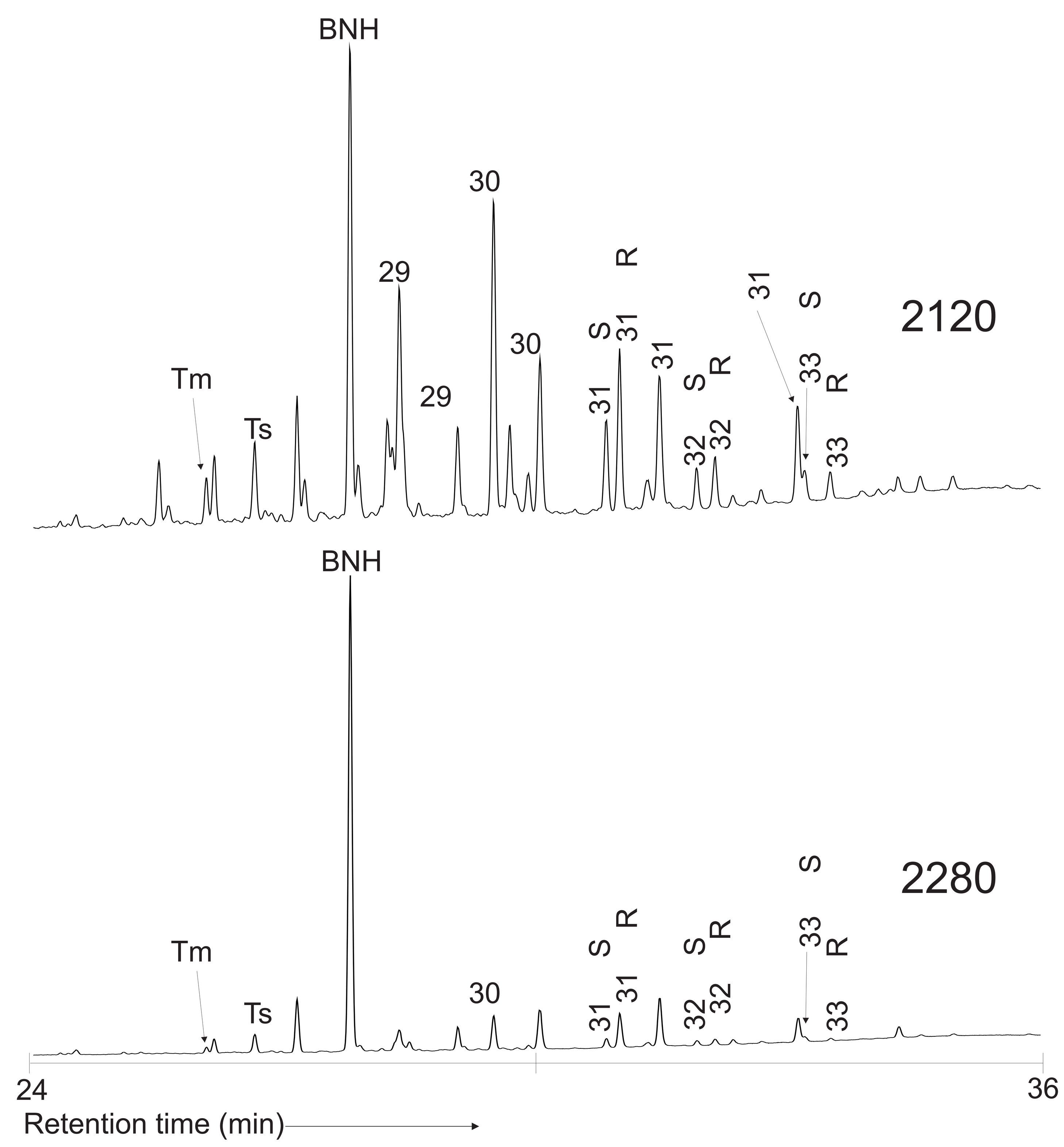

Figure 3: Partial mass chromatogram (m/z 191) at the PETM carbon isotope excursion and above (2280 and 2120 respectively).

RESULTS AND DISCUSSION

We have been able to identify variation in a range of compounds present in the core, their variation reassuringly follow associated palynological changes and indicate a mixture of marine and terrestrial inputs, which include abundant plant derived diterpenoids (Figure 2). PETM events, are recorded in both bulk and compound specific carbon isotope excursions of -2 to -3‰ (Figure 3) and by a change in palynology which is consistant with other reports.

Demethylated hopanes 28,30-bisnorhopane (BNH) and 25,28,30-trisnorhopane (TNH), are present in relatively low concentrations throughout the core but are at high concentrations at the PETM (Figure 3 &4). The actual bacteria responsible for TNH and BNH in geological samples has so far not been determined [1]. However, BNH and TNH are thought to be produced by chemoautotrophic bacteria, their presence in rocks which formed in inner neritic environments may indicate strong upwelling or perhaps ocean overturn.

Extreme shallowing of the CCD is well documented at the PETM, but there has previously been no clear indicator for a potential ocean overturn, although this has previously been mentioned as a potential driver for the event. While this has been dismissed as a mechanism driving the PETM events because it was envisaged as a local basin overturn, and can not explain the global extent of the PETM [2], we propose that the presence of TNH and BNH indicates ocean overturn may have played a role in the PETM. While it may not explain the isotopically light carbon in its entirety, stratification and ocean overturn may be a consequence of high temperatures, since palynological evidence indicates very low salinity conditions in surface waters at the PETM in this core.

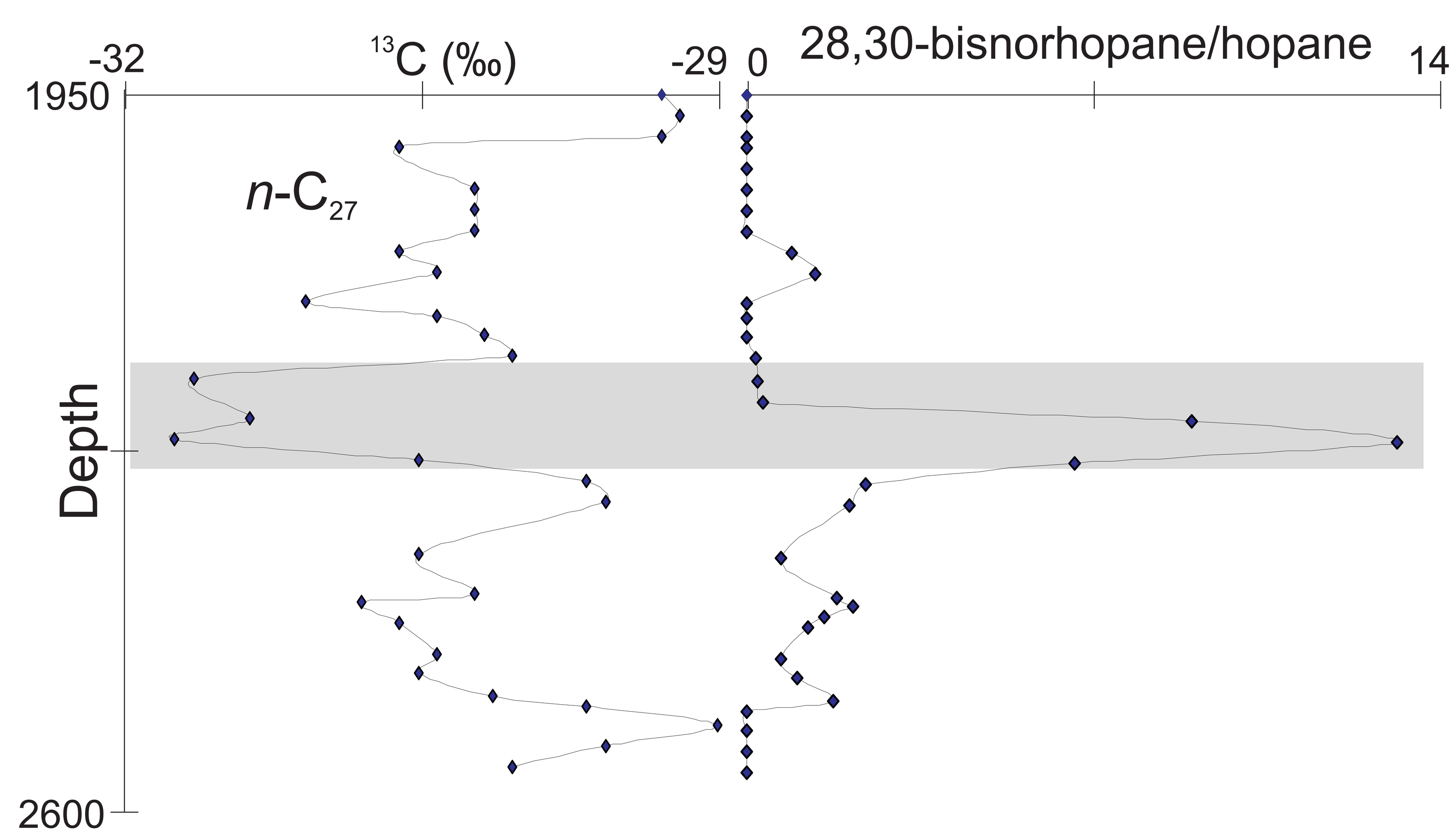

Figure 4: Plot of ^{13}C of n-C$_{27}$ and the ratio of 28,30-bisnorhopane/hopane against depth. PETM is highlighted by shaded area.

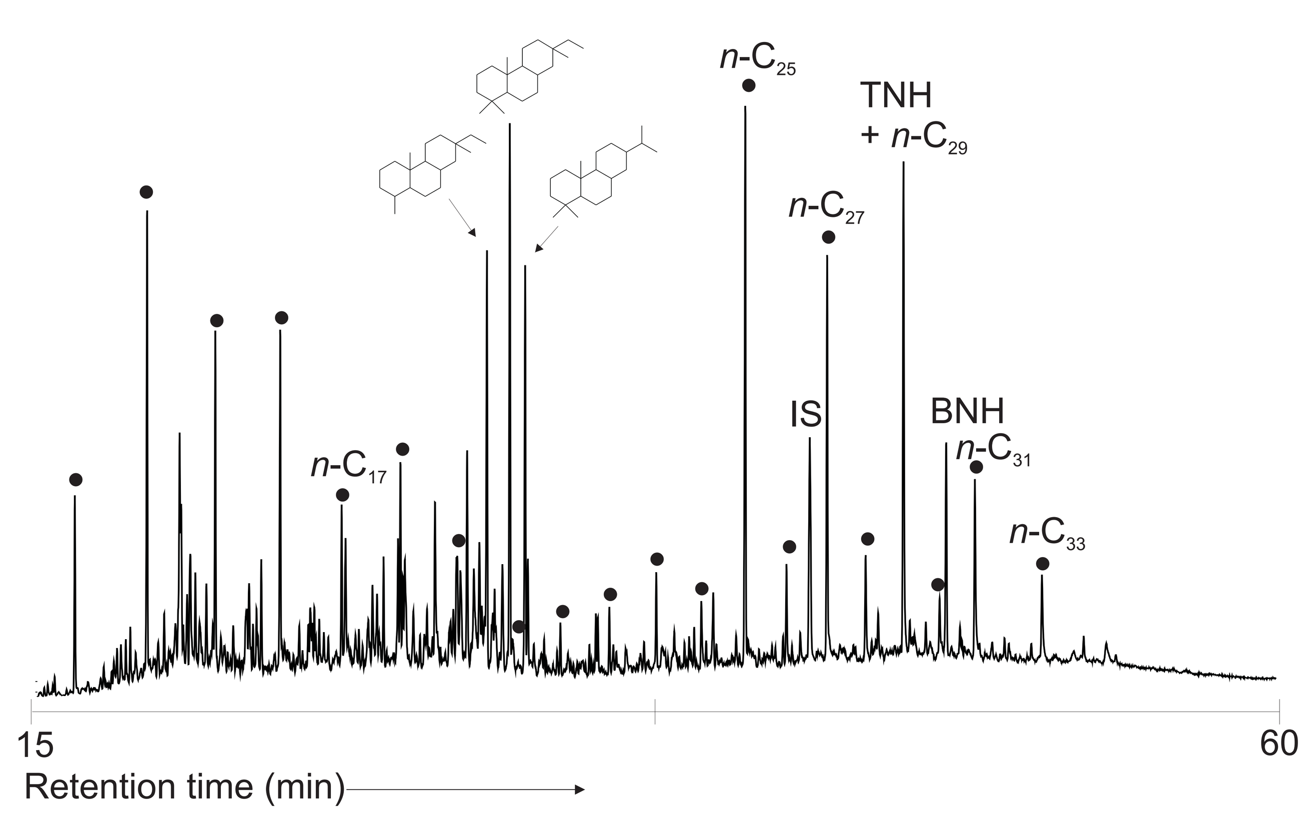

Figure 2: Total ion current for saturate fraction at the PETM carbon isotope excursion (sample 2280).

REFERENCES

[1]Peters et al. (2005) The Biomarker Guide, Cambridge University Press, UK

[2]Cohen, A.S. et al. (2007) J. Geol. Soc. 164, 1093-1108