Quantifying ocean acidification during the Palaeogene hyperthermals

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Palaeogene hyperthermals are associated with rapid negative Carbon Isotope Excursions (CIE) and global warming and hence may provide an analogue for future ocean acidification. We present $\delta^{11}B$ (pH), Mg/Ca (temperature), B/Ca (carbonate ion concentration) and wall thickness data from the benthic foraminifer *Oridorsalis umbonatus* to study the extent of the change in the carbonate system and the calcification response. In addition, we present Electron Backscatter data to assess preservation and diagenetic alteration.

Our study examines both the temporal and geographical response of ocean acidification during Palaeogene hyperthermals. For the former we present data from Walvis Ridge (1262, paleodepth 3500 m) for three proposed paleo-ocean acidification events: Early Late Palaeocene Event (ELPE), Paleocene-Eocene Thermal Maximum (PETM) and ELMO (59- 53 Ma). These events differ in the extent of carbonate dissolution and thus allow us to study the relative changes in ocean carbonate chemistry. We also present a detailed study of the PETM across a range of sites on Exmouth Plateau (762), Kerguelen Plateau (1135) and a shallower site on Walvis Ridge (1263, paleodepth 1500 m) to determine the global response.

Spatial and temporal tritium variability at Vostok station

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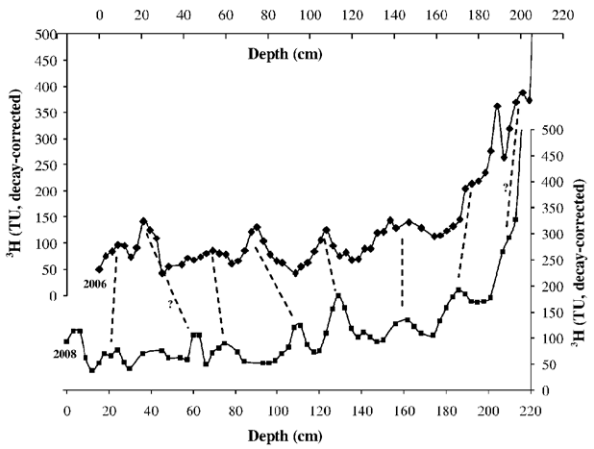
Tritium (^3H) concentration was measured in snow deposited at the Vostok station (East Antarctica) from two snow pits covering the period mid-50s to 2006 and 2008 respectively. At Vostok, ^3H concentrations are relatively high: low vapour pressure and almost no snowfall make this site specially sensitive to stratospheric inputs highly enriched in tritium. In the upper part of both pits, the post-bomb tritium record shows interannual variability.

As shown in the figure below, the records versus depth are affected by spatial distorsion, although the two pits are only distant of a few hundreds of meters. This can be attributed to redistribution of snow by wind, formation of dunes at different scales, locally different densification processes, etc..., as reported for instance by Ekaykin *et al*. (2002) for δD and $\delta^{18}O$.

However, despite this stratigraphic noise, a similar cyclic interannual pattern can be identified on both pits. This suggests that tritium can be used as a tracer of the relative contribution of stratospheric and tropospheric moisture to the snow deposition.



[1] Ekaykin *et al*. (2002) *Ann of Glaciology* **35** 181-186