

Glacial-interglacial oceanographic variations over the past 340,000 years at the mid-latitude of southwest Pacific based on a multi-proxy approach

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Our piston core KH04-5 SX16 (43° 11'S, 171° 10'W) is located north of the contemporary subtropical front (STF), east off New Zealand. Subtropical front is where the warm and saline subtropical water meets cold and relatively fresh subantarctic water. The front has been reported to be bathymetrically locked at the Chatham Rise over the glacial-interglacial (G-I) cycles [1].

In this study, 2 organic proxies, namely the latest paleothermometer TEX₈₆ and the more established unsaturation index of alkenone ($U_{37}^{K'}$) were used to reconstruct the sea surface temperature (SST) over the past 340,000 years. In addition to that, we also analyzed the $\delta^{18}\text{O}$ of foraminiferas, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of organic matter.

The trend of both TEX₈₆ and alkenone SST records over the G-I cycles are quite similar. However, TEX₈₆ record seems to be more synchronous with temperature variations at Antarctica, exhibiting a cold phase around 12ka which may correspond to the Antarctic cold reversal. In contrast, alkenone SST record shows a similar trend with $\delta^{18}\text{O}$ record of planktonic foram which indicates local forcing as the main controlling factor.

Based on the comparison of our SST record with that from a site underlying subantarctic water south of STF, in addition to TOC and $\delta^{15}\text{N}$ record of organic matter at the core site, it is suggested that STF might have migrated south during warm periods in MIS1 and MIS5e. This finding is in agreement with previous studies [2, 3]

[1] Heath (1981) *Deep Sea Res. Part A* **28**, 547-560.

[2] Schaefer *et al.* (2005) *Mar. Micropaleontol.* **54**, 191-212.

[3] Fenner & Di Stefano (2004) *Mar. Geol.* **205**, 59-86.

Nanominerals, mineral nanoparticles, and Earth systems

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Minerals are more complex than previously thought because of the discovery that their chemical properties vary as a function of particle size when smaller than a few to perhaps as much as several tens of nanometers in at least one dimension. These variations are most likely due, at least in part, to differences in surface and near-surface atomic structure, as well as crystal shape and surface topography as a function of size in this smallest of size regimes. It has now been established that these variations may make a difference in important geochemical and biogeochemical reactions and kinetics. This recognition is broadening and enriching our view of how minerals influence the hydrosphere, pedosphere, biosphere, and atmosphere on local, regional, and global scales.