# Dust-induced changes in phytoplankton composition in the Tasman Sea during the last four glacial cycles.

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An increase in iron supply associated with enhanced dust inputs could be responsible for higher marine phytoplankton production leading to the typically lower glacial atmospheric $CO_2$ concentrations, as suggested by the ''iron hypothesis.'' The enhanced dust supply may also have provided the oceans with significant amounts of silica, which would have favored the growth of diatoms over coccolithophores, as suggested by the ''silica hypothesis.'' Here we present new data on molecular biomarkers in a sediment core from the mid latitudes of the Southern Hemisphere (Fr94-GC3, 44º15'S, 149º59'E, 2667m water depth), which reveal dust-induced changes in the relative contribution of the phytoplankton to total productivity. Our results illustrate a shift in the relative abundance of siliceous (see brassicasterol curve in Fig. 1 related to diatoms productivity) over calcareous (see long-chain alkenones curve in Fig. 1, related to Haptophyte algae productivity) organisms during glacial times, when terrestrial aeolian input (see long-chain alkanes curve in Figure 1, related to terrestrial higher plants input) was enhanced. Although we did not detect a significant glacial decrease in coccolithophorid productivity, the decrease in the $CaCO_3/C_{org}$ rain ratio could still have contributed to some extent in lowering atmospheric $CO_2$ levels. More details of this study can be found in Calvo et al (2004).

## References

Calvo, E., Pelejero, C., Logan, G. and De Deckker, P. (2004) Dust-induced changes in phytoplankton composition in the Tasman Sea during the last four glacial cycles. *Paleoceanography* 19, PA2020, doi:10.1029/2003PA000992.

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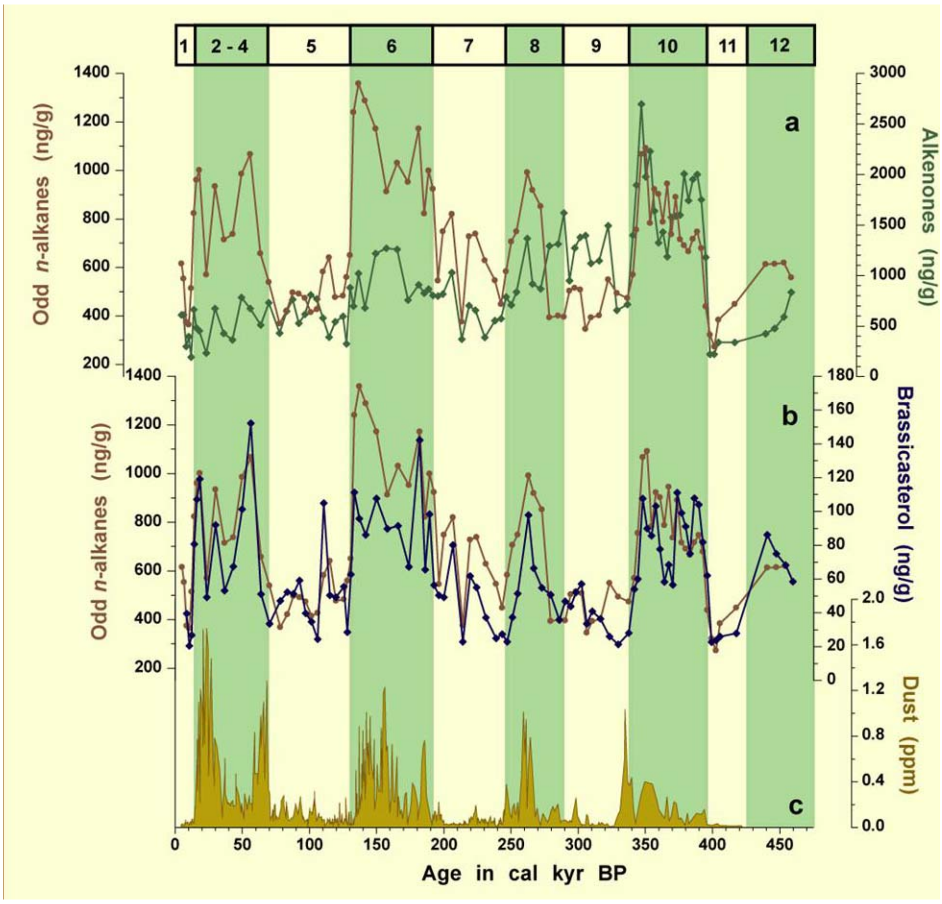


*Figure 1. Total odd* n*-alkane (brown curve) abundances compared with a) alkenones (green curve) and b) brassicasterol (blue curve). While brassicasterol and total odd* n*-alkanes follow a clear glacial/interglacial pattern, alkenone concentrations show no response to the main orbital parameters. c) Dust concentration as recorded in the Vostok ice core.*

# Interdecadal variability in climate and seawater chemistry from a 280-year coral record from Flinders Reef, western Coral Sea.

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Parallel Sr/Ca, $\delta^{18}O$, $\delta^{13}C$ and $\delta^{11}B$ measurements in a *Porites* coral from Flinders Reef (17.5ºS, 148.3ºE) in the western Coral Sea, indicate a close connection between climate variability and ocean chemistry. Low resolution (5-year intervals) Sr/Ca and $\delta^{18}O$ analyses, going back to 1710 AD, show a good correlation with the Interdecadal Pacific Oscillation (IPO). The IPO represents a recurrent pattern of surface temperature variability over the Pacific Ocean, with the most recent and best documented change occurring in 1976. In the Southwest Pacific, the IPO is known to modulate Australian climate, in particular the impact of ENSO events on decadal timescales. When the IPO is negative (tropical Pacific cooler than average), teleconnections between ENSO events and Australia's rainfall and temperature are strong, whereas this relationship barely exists during the positive phase of IPO (Power et al., 1999). In the Flinders coral, negative IPO values correspond with low salinities, due to increased precipitation at these times (enhanced and more frequent La Niña events). The decadal variability observed in our salinity record is closely followed by changes in SST, with cooler temperatures recorded during wet periods. This corresponds to a negative IPO phase when enhanced and more La Niña events bring more precipitation and cooler temperatures to Australia. Using $\delta^{11}B$, we have found surprisingly large variations in pH (~0.3 delta units) in 55-yr cycles that are also well correlated with IPO, probably related to changes in the ventilation of reef waters.

**References**

Power S, Casey T, Folland CK, Colman A, and Mehta V (1999) Inter-decadal modulation of the impact of ENSO on Australia. *Climate Dynamics* 15, 319-324.

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