PALEOCEANOGRAPHIC CONSTRAINTS ON GLACIAL-INTERGLACIAL CARBON CYCLING ON THE SUBANTARCTIC SOUTH TASMAN RISE

W. Howard (1), A. Moy (2), C. Samson (3), E. Sikes (4)
(1) Antarctic CRC, University of Tasmania (2) IASOS, University of Tasmania, (3) IASOS, University of Tasmania, (4) ICMS, Rutgers University
(Will.Howard@utas.edu.au/+61-3-62262973)

We have measured paleoceanographic variables that allow us to estimate changes in carbonate chemistry and $p$CO$_2$ over the last glacial-interglacial transition south of the Subtropical Front at South Tasman Rise south of Australia. Gravity core RS147-GC7 (45.2 S, 146.3 E, 3300 m) preserves a record of the last deglaciation at a sedimentation rate of about 4 cm/kyr, with chronology controlled by 11 AMS radiocarbon dates covering the last 27,000 $^{14}$C years.

Changes in carbonate system variables can be estimated by the time histories of geochemical and biotic proxies. Sea-surface temperature ($CO_2$ solubility) is estimated by alkenone unsaturation ratios and foraminiferal assemblages (via the modern analog technique). Dissolved inorganic carbon changes can be estimated by carbon isotopes in planktonic and benthic foraminifera. $[CO_3^{2-}]$ in deep water (assumed to be translated to subantarctic surface waters by upwelling of Circumpolar Deep Water and net equatorward Ekman transport across the Antarctic and Subantarctic Zones) are estimated by shell weights of the planktonic foraminifer *Globorotalia inflata* in 355-425 micron size fraction.

Our results are consistent with the northern subantarctic zone of the Southern Ocean south of Australia contributing to the deglacial atmospheric carbon dioxide rise. Our combined constraints suggest a $p$CO$_2$ history for the region that has the timing and amplitude to explain part of the atmospheric CO$_2$ change. Solubility history and $[CO_3^{2-}]$ change at the times predicted by models of oceanic control of the atmospheric carbon cycle. In addition, our estimates of $[CO_3^{2-}]$ show a trend toward lower values during
the past 8000 years, consistent with the hypothesis that the rise in atmospheric $p\text{CO}_2$ over that interval has been driven by the carbonate chemistry of the ocean rather than the terrestrial biosphere. This Holocene trend, if characteristic of the ocean as a whole, implies that the pre-anthropogenic carbon cycle may not have been in steady-state, a possibility that needs to be taken into account in carbon cycle models.