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Southeast Pacific high resolution multi proxy study from ODP site 1233 during the Antarctic Isotope Maximum AIM 12

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Southern Ocean circumpolar dynamics are hypothesized to play an active role in the climate system through their influence on atmospheric carbon dioxide levels, the global thermocline, and the ocean overturning circulation. It is increasingly clear that Southern Ocean millennial scale sea surface temperatures show a pattern similar to what is observed in Antarctic ice cores, suggesting southern dynamics are involved in these climate events. Resolving the role of circumpolar ocean-atmospheric dynamics in regional and global climate events ultimately requires high resolution records constraining the nature of Southern Westerly Wind (SWW) and Antarctic Intermediate Water (AAIW) variability. Here we present multi proxy records from ODP Site 1233 monitoring AAIW and surface ocean hydrography—providing high resolution subpolar marine counterparts to the EPICA ice-core from Dronning Maud Land, Antarctica.

Our multi-decadally resolved foraminiferal multiproxy reconstruction spans the interval (ca 44-48kyr BP, MIS3) of Antarctic Isotope Maximum AIM 12, previously called Antarctic warm event 2, in Antarctic ice cores. ODP Site 1233 (41˚00'S, 74˚27'W, 838m, sedimentation rate ∼1.5-2.2 m/kyr) was recovered from the Chilean slope in the southeast Pacific where the SWW and the Antarctic Circumpolar Current (ACC) intersect with the South American continent and is bathed by newly formed AAIW at depth. We analyzed oxygen isotopes in planktic (*G. bulloides* and *N. pachyderma dextral)* and benthic foraminifera (*U. peregrina)*. In addition we analyzed Mg/Ca in

the planktic species *G. bulloides*. This allows us to: 1) establish a clear SST temperature signal derived from foraminifera, 2) reconstruct the $\delta^{18}O_{water}$ by removing the temperature component of the $\delta^{18}O_{foram}$ record, 3) assess the scale and rate of the high frequency variability in the sea surface temperature. The oxygen isotopic records of both the benthic foraminifera, monitoring AAIW properties, and the deeper dwelling planktic species decrease during AIM 12 suggesting a warming or freshening while the Mg/Ca temperature reconstruction indicates warmer subpolar temperatures accompany the Antarctic warming. The coherence of the signal in the multiple proxy records recording different water masses and climate components suggests the signal is robust and broadly representative of the Southern Hemisphere. It is interesting to note that the marine records show more fine scale (high frequency) features which, although present, are not as pronounced in the ice record. We examine the reasons for which these high resolution features may be more evident in our subpolar records than in the ice core records and discuss their implications for the bi-polar seasaw hypothesis.