**Southern Ocean Hydrography and Circulation: Antarctic Intermediate Water and Subantarctic Mode Water formation in the southeast Pacific**

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We highlight results from the 2005-2006 austral winter survey of Subantarctic Intermediate Water and Antarctic Intermediate Water formation in the southeastern Pacific. The salinity minimum of the Antarctic Intermediate Water (AAIW) is formed in the southeastern Pacific, as the densest, coldest, and freshest, but not necessarily thickest, Subantarctic Mode Water (SAMW). A wintertime hydrographic survey with follow-on summer survey in 2005-2006 explored the late winter mixed layers and subsequent restratified water column in the southeastern Pacific.

A large region of mixed layers greater than 400 m depth was bounded to the south by the Subantarctic Front (SAF), and bounded to the north by a secondary "subduction front" north of which SAMW and AAIW were subducted into the subtropical gyre. During the cruises, the SAF jet velocity amplitude was 40 cm/sec, decaying rapidly with depth but with an equivalent barotropic structure; meanders had wavelengths of 250-300 km and a vorticity structure indicative of a quasi-stationary Rossby wave (Chereskin et al., 2010).

The late winter mixed layers within the study region were colder, fresher and denser downstream to the east; the greatest mixed layer depths and hence most well-developed SAMW coincided with higher surface salinity some distance north of the SAF while the freshest deep mixed layers adjacent to the SAF coincide with the new AAIW salinity minimum. Within the region of new SAMW, surface oxygen and chlorofluorocarbon saturations were reduced to ~95%, indicating active entrainment of older waters from below the mixed layer, but also not indicating extraordinarily deep penetration of mixing which would result in even lower saturations (Holte et al., 2011; Hartin et al., 2011; Carter et al., 2011).

Air-sea fluxes are capable of creating the deep winter mixed layers with no other direct forcing, starting with restratified summer SAMW, but cross-SAF fluxes of fresher, colder waters are essential for the downstream evolution in SAMW properties. These can be associated with major intrusions around meanders of the SAF (Holte et al., 2011; Holte et al., submitted).

Diapycnal diffusivities were enhanced, up to 10-4 to 10-3 m2/sec, near the SAF, north of the subduction front, within the capped SAMW in summer, and below the deep winter mixed layers (proto-SAMW) in winter; the diffusivities decayed rapidly with depth. Associated high rates of mixing within the summer SAMW suggests that the low stratification is partially actively maintained outside the winter (Sloyan et al., 2010).

Southeast Pacific SAMW and AAIW formation rates estimated from chlorofluorocarbon inventories from the 2005-2006 cruises and from WOCE data are 11.7 Sv and at least 5.8 Sv, respectively (Hartin et al., 2011).

References in order of publication Chereskin, Talley, & Sloyan, JGR 2010 Sloyan, Talley, Chereskin, Fine, & Holte, JPO 2010 Hartin, Fine, Sloyan, Talley, Chereskin, & Happell, DSR 2011 Holte, Talley, Sloyan, & Chereskin, JGR 2011 (in revision), JGR in preparation Carter, Dickson, & Talley, GBC in preparation