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The Antarctic Slope Front: what happens to it at the tip of the Antarctic Peninsula?

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The tip of the Antarctic Peninsula is a fascinating place, where water from the southernmost part of the Weddell Sea is brought into confluence with the Antarctic Circumpolar Current system, and the topography of the shelf and slope plays a vital role. As it circumnavigates the Weddell Sea, much of the cyclonic flow is concentrated in a shelf-slope frontal system, the Antarctic Slope Front. At the tip of the Peninsula, however, we speculate that the associated flow splits into two components. The first flows west over the ridge, and may pass through or circumnavigate Bransfield Strait. The second continues east as the Weddell Front, also tied to the topography, marking the northern boundary of the waters of the Weddell Sea, and the southern boundary of the Weddell Scotia Confluence.

To test these hypotheses, in February 2007 we will conduct a hydrographic section across the continental shelf and slope at the tip of the Antarctic Peninsula, into the deep Weddell Sea. We will deploy 40 surface drifters drogued at 15 m. We present the transport associated with the Antarctic Slope Front, deduced from geostrophy referenced to de-tided Lowered Acoustic Doppler Current Profiler data. We show the paths to date of the satellite tracked drifters, and illustrate whether they remain as tightly tied to the topographic contours as we expect. We compare the obtained drifter paths with those predicted by altimetry-derived geostrophic currents using near-real-time maps which provide daily information combining all available satellites.

Eddy resolving numerical ocean-ice models have been used to predict the paths of the drifters by particle tracking in their velocity fields. Here we present the predicted

paths in three models, the OCCAM one twelfth degree version, TPAC (one-eighth degree resolution), and ORCA (one quarter degree resolution). We discuss the extent to which the numerical models agree with the observed drifter tracks. The virtual drifters in OCCAM take 7-10 months to reach South Georgia from the Antarctic Peninsula, whereas in TPAC they take 5-8 months, and in ORCA 7-11 months. This mimics the behaviour of krill spawned on the Antarctic shelf. Comparison is made with the historical drifter data set deployed to the north and west of the Antarctic Peninsula, and the new drifter results from the 2007 deployment south and east of the Peninsula.