Geostrophic currents and water masses in the Drake Passage

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The Drake Passage is the most suitable region for studying the easterly Antarctic Circumpolar Current (ACC) because here it passes between two coasts. The data of two hydrographic sections, which were occupied across the Drake Passage during cruises of the Russian research vessels «Akademik Sergey Vavilov» and «Akademik Ioffe» in December 2003 and November 2005, are analyzed. Both sections were located along the same track from Terra del Fuego to Elephant Island. Temperature, salinity, and velocity profiles in the entire water column were measured by Sea-Bird 911 CTD profiler and Lowered Acoustic Doppler Profiler (LADCP) at each station. Satellite altimetry data (available at http://www.jason.oceanobs.com) and data of some other sections in the Drake Passages were also used in the investigation.

Absolute geostrophic currents across these sections were calculated by correcting the geostrophic calculations using altimetry data and LADCP measurements. The distributions of hydrographic properties over the sections show strong difference between synoptic situations in December 2003 and November 2005 resulting from ACC fronts splitting and subsequent eddy formation. Despite the differences in the structure, the integrated eastward flows calculated both by altimetry and LADCP corrections across both sections were found very similar and approximately equal to 155 Sv.

The boundaries between specific water masses were determined using the procedure, which was developed earlier by the author for the South Pacific. The procedure is based on the analysis of the vertical gradients of hydrographic properties. Mean properties and flows of water masses across the sections were assessed. It is shown that the

flow of bottom waters with neutral density $\gamma^n > 28.23$ ($\theta < 0.4°C$) over the Shackleton Ridge (both eastward and westward) propagates mainly in the South Shetland Trench.