



On the penetration depth of the Antarctic Circumpolar Current

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The Antarctic Circumpolar Current (ACC) is a geostrophic current which encircles Antarctica from west to east. Thus this current is a buffer zone hindering the water exchange (by geostrophic currents) between high and mid-latitudes of the World Ocean in the Southern Hemisphere. The series of the transverse barriers (Phoenix Rift, Hero Ridge, and Shackleton and North Scotia ridges in the region of the Drake Passage and Scotia Sea, Mid-Atlantic Ridge in the Atlantic, Kerguelen Rise in the Indian Ocean, Macquarie Ridge south of New Zealand, and East Pacific Rise) limits the penetration depth of the ACC. The expedition studies of IO RAS in 2003–2011 were concentrated in the Drake Passage. Seven hydrographic sections across the passage and one survey in the central part of the passage were executed during this period. Velocity measurements (by LADCP) on these sections revealed the near-zero transport through the Drake Passage in the water layer $28.26 > \sigma_t > 28.16$ which is considered very low layer of circumpolar water and occupied near the bottom. This result, considering quasi-isopycnal spreading of water masses, leads to exclusion of this layer from the circumpolar flow. This conclusion is confirmed by analysis of the data of Russian sections, historical hydrographic database (WODB2009) in the Drake Passage and the Scotia Sea in combination with the satellite altimetry data and taking into account the bottom relief. It shows that the circulation in the aforesaid layer in the Drake Passage and the Scotia Sea is essentially across the ACC jets due to the presence of the Shackleton and North Scotia ridges although both of these ridges are permeable for this layer.