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Jet Structure of the Antarctic Circumpolar Current in the Drake Passage in the Southern Hemisphere Spring 2011

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Fine jet structure of the Antarctic Circumpolar Current (ACC) in the Drake Passage is investigated on the basis of the daily satellite data of the absolute dynamic topography (ADT) provided by the French CLS Agency (DT-Global-MADT-Upd product, http://aviso.oceanobs.com) and sea surface temperature (SST) provided by the GAMSSA Project (Global Australian Multi-Sensor SST Analysis, http://data.nodc.noaa.gov/las/getUI.do?dsid=id-c80878d11f&varid=analysed_sst-id-c80878d11f&auto=true) of the Centre for Australian Weather and Climate Research. The investigation was executed on 01.09.2011–31.12.2011 using the methods of the probability-statistical analysis. Mesoscale eddies were eliminated from the analysis of fine jet structure of the ACC in the Drake Passage. As a result the amplitude of the ADT and SST gradients increased. This allowed us to distinguish more precisely the limits and cores of the jets. The jet limits were chosen as the isopleths of the ADT (isohypses) matching with the local minima of the ADT and SST gradients (averaged in time) along ADT axis in ADT-gradient–ADT and SST-gradient–ADT spaces, while the cores of the jets coincided with the local maxima of the SST and ADT gradients at the corresponding isohypses.

The main feature of the studied region is merging of the separated jets into a powerful “superjet” as the ACC passes through the passage. It is possible to separate and identify these separated jets if we have auxiliary (e.g. sub-satellite) information. With this in mind we used the CTD- and SADCP-measurements over the section carried out on 28.10.2011–04.11.2011 onboard R/V “Akademik Ioffe” across the Drake Passage. The analyses of the satellite data revealed 8–9 individual jets characterized by the local horizontal maxima of the ADT and SST gradients. These jets were actually various combinations of the twelve ACC jets, which we found earlier south of Africa. In September–October 2011, we found 6 jets of the Subantarctic Current, 4 jets of the South Polar Current, and 2 jets of the South Antarctic Current in the structure of the ACC in the Drake Passage.

Our probability-statistical analysis of the satellite ADT and SST data showed that the multi-jet structure of the ACC is characteristic of the entire Antarctic Circle even in the region of the strong narrowing of this current such as the Drake Passage. The revealed jets are steadily related to the specified ADT isopleths. This matching is stable in time for 3–4 months.