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Mesoscale variability of the absolute dynamic topography in the Drake Passage and Scotia Sea in 1993–2014

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Daily numerical maps of the absolute dynamics topography (ADT), which are published by the French CLS agency (www.aviso.oceanobs.com) were used for the investigation of synoptic (mesoscale) ocean eddies in the Drake Passage and Scotia Sea in 1993–2014. Parts of these maps with the closed ADT isopleths (isohypses) were detected by a precise numerical algorithm and were interpreted as places of the location of cyclonic and anticyclonic mesoscale eddies. In addition, curves of ζ^2(t), where t is time and ζ (t) is disturbance of ADT relative to the mean value in 1993–2014 at a given point, were plotted at a number of points within the studied ocean region. These curves show two well pronounced time scales ("periods") of ζ^2(t) fluctuations: a lesser scale of 100–500 days and a greater scale varying generally from 2 to 4.5 years manifesting as changes in the time intervals with low and high amplitudes of the lesser time scale ζ^2(t) fluctuations. Comparison of the ζ^2(t) curves with the ADT maps shows that these lesser scale fluctuations are related to the behavior of individual eddies: their propagation through a given point in the ocean, eddy generation or absorption of an eddy by an ACC jet.
The theory of the geostrophic ocean turbulence allows us to suppose that the above mentioned greater time scale of ζ^2(t) fluctuations is related to the energy exchange between the ACC jets and mesoscale eddies that appears in a given ocean region, as an alternation of the periods of intense generation of eddies by ACC jets and periods of increased reverse energy transfer from the eddies to jets. The fact revealed in this work that cyclonic (anticyclonic) eddies are adjacent from the north (south) to the ACC jets agrees with this supposition and opens the possibilities to analyze the dynamic influence of the eddy interaction with the individual ACC jets separately.