A cyclonic eddy train and poleward heat transport in the Australian-Antarctic Basin

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We developed ice-free dynamic ocean topography data by using the altimeter measurements from four missions (CryoSat-2, Jason-2, Jason-3 and Sentinel-3A). Like previous study done by Armitage et al. (2018), the depth of the Weddell/Ross Gyre (strength of gyre circulation) and ERA-interim wind curl showed negative correlations (R=-0.6/-0.64). In the Australian-Antarctic Basin, our ice-free dynamic ocean topography revealed the existence of four cyclonic eddies off the Vincennes Bay (VB), off Cape Poinsett, and off Totten Ice shelf. We call them as a cyclonic eddy train. Our in-situ observation and satellite data show the core of warm Circumpolar Deep Water (CDW) identified at the eastern side of a cyclonic eddy of the VB. Our results indicate the oceanic poleward heat transport due to a cyclonic eddy, but the strength of the eddy circulation is only correlated with wind curl during winter (July to October). The Empirical orthogonal function analysis displayed the dominant variable signal extending from VB along the ridge where the pathway of the Antarctic Bottom Water (AABW) . Those results implied that the eddy circulation off the VB is not only controlled by surface stress field but also the ocean interior. At least, spatial structure of the eddy is defined by CDW and the AABW.

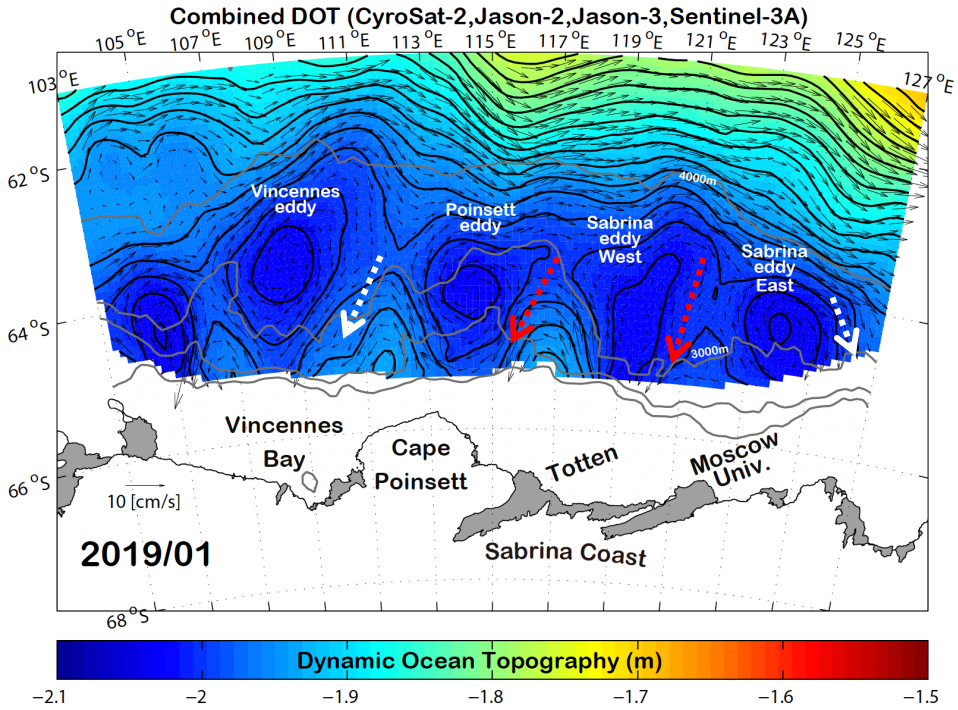

Figure 1. A cyclonic eddy train revealed by our ice-free dynamic ocean topography.

References

Armitage, T. W. K., R. Kwok, A. F. Thompson and G. Cunningham, Dynamic Topography and Sea level Anomalies of the Southern Ocean: Variability and Teleconnections, Journal of Geophysical Research: Oceans . 123, 613-630, 2018.