Geophysical Research Abstracts
Vol. 16, EGU2014-1705, 2014
EGU General Assembly 2014

Heat fluxes across the Antarctic Circumpolar Current

Ramiro Ferrari (1), Christine Provost (1), Young Hyang Park (1), Nathalie Sennéchael (1), Gilles Garric (2), and Romain Bourdallé-Badie (2)

(1) LOCEAN,UPMC,CNRS Paris, France, (2) MERCATOR, Ramonville St Agne, France

Determining the processes responsible for the Southern Ocean heat balance is fundamental to our understanding of the weather and climate systems. Therefore, in the last decades, various studies aimed at analyzing the major mechanisms of the oceanic poleward heat flux in this region. Previous works stipulated that the cross-stream heat flux due to the mesoscale transient eddies was responsible for the total meridional heat transport across the Antarctic Circumpolar Current (ACC). Several numerical modelling and current meters data studies have recently challenged this idea. These showed that the heat flux due to the mean flow in the southern part of the Antarctic Circumpolar Current could be larger than the eddy heat flux contribution by two orders of magnitude.

Eddy heat flux and heat flux by the mean flow distributions of were examined in Drake Passage using in situ measurements collected during the DRAKE 2006-9 project (from January 2006 to March 2009), available observations from the historical DRAKE 79 experiment and high resolution model outputs (ORCA 12, MERCATOR).

The Drake Passage estimations provided a limited view of heat transport in the Southern Ocean. The small spatial scales shown by the model derived heat flux by the mean flow indicate that circumpolar extrapolations from a single point observation are perilous. The importance of the heat flux due by the mean flow should be further investigated using other in situ observations and numerical model outputs.

Similar situation has been observed, with important implication for heat flux due to the mean flow, in other topographically constricted regions with strong flow across prominent submarine ridges (choke points). We have estimated the heat flux due to the mean flow revisiting other ACC mooring sites where in situ time series are available, e.g. south of Australia (Tasmania) (Phillips and Rintoul, 2000), southeast of New Zealand (Campbell Plateau) (Bryden and Heath, 1985).

Heat fluxes due to the mean flow at those choke points were compared to model outputs and provided new circumpolar estimates indicating that the choke points are a potential overwhelming contribution for the heat flux needed to balance heat lost to the atmosphere in the Southern Ocean.