CLIMATE CHANGE SIGNAL IN OCEANIC EDDIES

Martínez-Moreno, Josué[1], Hogg, Andrew[1], Morrison, Adele.[1], and Kiss, Andrew[1]

[1]Australian National University, ACT, Australia

Transient processes in the ocean include eddies, jets and waves. These processes dominate the kinetic energy (KE) in many areas of the ocean, where the magnitude of the transient kinetic energy (TKE) is larger than the time-mean kinetic energy (MKE). However, the lack of a TKE process-based definition limits our understanding of the contribution and changes of the energy contained by eddies and the those due to other processes such as jets and waves.

Prior studies reported an increase of TKE in all western boundary currents (Stammer et al. 2006) and also the possibility of reaching an "eddy-saturated regime" in the Southern Ocean (Meredith and Hogg 2006). Hogg et al. (2015) also described an increase of TKE at different basins of the Antarctic Circumpolar Current(ACC) which was attributed to the intensification of the Southern Hemisphere westerlies. Further investigation is required to understand the response of the transient field to climate change.

The present study decomposes TKE into transient eddy kinetic energy ($TEKE$) and its residual ($TRKE$) based on assumptions about the shape and characteristics of eddies this decomposition is attributed to a spatial reconstruction of the Sea Surface Height anomaly (SSHa) from a $1/10^o$ degree ocean model (ACCESS-OM2) and satellite altimetry (Aviso +). We will present the temporal evolution of TKE for each eddy polarity, the eddy field and the residual.

Current results attribute the increase in TKE to the TEKE. In the some basins of the Southern Ocean, the TEKE trends are greater than the TKE, which suggests that the energy in the eddy field is increasing faster than the transient field. These results would provide a deeper understanding of the variability of TKE based on each process.

This decomposition will enhance our understanding of the eddy field response to climate change, which has implications in the heat exchange, carbon cycle, changes in potential energy and climate. The focus on individual processes allows better understanding of energy reservoirs in the ocean and improve eddy parameterizations.