Geophysical Research Abstracts
Vol. 20, EGU2018-17616, 2018
EGU General Assembly 2018

Simulations of barotropic and baroclinic tides under realistic conditions in the Southern Ocean.

Maria Luneva (1), James Harle (1), and Dave Munday (2)
(1) National Oceanography Centre, Liverpool, Liverpool, United Kingdom (mane1@noc.ac.uk), (2) British Antarctic Survey

At high latitudes semidiurnal tides have a strong impact on the bottom boundary layers and ice-ocean interface. At critical latitudes, where the inertial frequency is close to the tidal one, the depth of the Ekman layer generated by the clockwise (counterclockwise) component of the currents in the northern (southern) hemispheres respectively tends to occupy the entire column and increases mixing. These effects will impact on dense water formation in the Southern Ocean and by association the Meridional Overturning Circulation. The tidal rectification currents are capable of generating intensive quasi-steady vertical motions, which in turn affect the supply of warm water to the ice shelf interface and subsequent ice melting.
We present first results from a fine resolution Southern Ocean NEMO-shelf model, coupled with sea ice LIM3, which explicitly resolve tides. The model has a horizontal resolution of 1/12o. The vertical discretization is described by novel hybrid s-z coordinates that follow the bathymetry in the upper 1500 m and use z-partial steps below. The model applies realistic surface heat and momentum fluxes. Lateral boundary conditions are prescribed using output from a global NEMO simulation and tidal harmonics from OTPS7.2 inverse Oregon University Tidal Model.
We use 3d harmonic analysis to examine tidal currents, vertical motions and internal tide fields, showing that the model realistically reproduces barotropic tides. We evaluate energy of internal tides, their spatial characteristics and relative contribution of the different harmonics. We discuss effects of tides on the depth of bottom and ice-shelf boundary layers, sea ice and deep mixing. We compare results with simulations, that do not resolve tides explicitly, but parameterize tidal effects over rough topography.