Geophysical Research Abstracts
Vol. 15, EGU2013-6171, 2013
EGU General Assembly 2013

Reduction of Near-Inertial Energy by Ocean-Surface-Velocity-Dependent Wind Stress

Willi Rath (1), Richard Greatbatch (1), and Xiaoming Zhai ()

(1) GEOMAR | Helmholtz-Zentrum für Ozeanforschung, FB-1 / TM, Kiel, Germany (wrath@geomar.de), (2) School of Environmental Sciences, University of East Anglia, Norwich, UK

This study aims at understanding the effect of including or neglecting the surface velocity of the ocean into the wind stress parameterization for the strength and distribution of near-inertial oscillations. Wind-generated near-inertial oscillations are an important source of energy for surface mixed layer deepening as well as for internal wave breaking and the associated diapycnal mixing at depth which, in turn, is thought to be important for driving the meridional overturning circulation.

By using a realistic primitive equation model of the Southern Ocean at eddying resolution, we find that including ocean surface velocities into the wind stress leads to a large reduction of both wind power input into near-inertial oscillations (WPI) and near-inertial energy (NIE) in the surface mixed layer. The relative reduction of WPI can be as large as 30 percent and the relative reduction of NIE can be as large as 50 percent.

Using both, the primitive equation model and a simple linear local slab-ocean model for illustration, we find that a large part of this reduction can be explained by the leading order modification to the wind stress if ocean surface velocities are included. We also find that the strength of the reduction is modulated by the inverse of the ocean surface mixed layer depth.