[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-OS Ocean Sciences & Ocean Environment

[A-OS11]What we have learned about ocean mixing in the last decade

convener:Toshiyuki Hibiya(Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo), Louis St Laurent (Woods Hole Oceanographic Institution), Ren-Chieh Lien(None, 共同), Robin Ann Robertson (China-ASEAN College of Marine Science Xiamen University Malaysia)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The study of ocean mixing processes has made great strides in development of observation technology over the last decade. This includes the improvement of micro-scale and multi-scale profilers, innovation of ocean gliders, as well as identifying internal waves and turbulence through echo sounding from an underway research vessel. These new technologies enable field observations of ocean mixing processes to extend much deeper and wider than ever before. The accumulated knowledge of the observed features has stimulated theoretical and modeling studies related to ocean mixing processes such as internal wave-wave interactions, internal wave interactions with background shear, and associated energy cascade down to dissipation scales as well as assessment and reformulation of existing turbulent mixing parameterizations to be incorporated into the global circulation and climate models.

This session encompasses a wide variety of coastal and open ocean mixing processes; from the surface through the interior to the near boundary benthic mixing, including the roles of mixing in the biological processes and productivity of the ocean. Through detailed discussions, we would like to confirm how far our understanding of the ocean mixing processes has advanced over the last decade, defining the new frontier of ocean mixing research to be tackled in the next decade.

[AOS11-P06]Decay rates of internal tides estimated by an improved wave-wave interaction analysis

*Yohei Onuki[1], Toshiyuki Hibiya[2] (1.Ocean Modeling Group, Center for Oceanic and Atmospheric Research, Research Institute for Applied Mechanics, Kyushu University, 2.Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo)

Keywords:Internal tides, wave dynamics, parametric subharmonic instability

Recent numerical and observational studies have reported that resonant wave-wave interaction may be a crucial process for the energy loss of internal tides and the associated vertical water mixing in the mid-latitude deep ocean. Special attention has been directed to the remarkable latitudinal dependence of the resonant interaction intensity; semi-diurnal internal tides promptly lose their energy to near-inertial motions through parametric subharmonic instability equatorward of the *critical latitudes* 29°N/S, where half the tidal frequency coincides with the local inertial frequency. This feature contradicts the classical theoretical prediction that resonant wave-wave interaction does not play a major role in the tidal energy loss in the open ocean.

In this study, by reformulating the kinetic equation for long internal waves and developing its calculation method, we estimate the energy decay rates of the low-vertical-mode semi-diurnal internal tides interacting with the "ubiquitous" oceanic internal wave field. The result shows rapid energy decay of the internal tides, typically within O(10) days for the lowest-mode component, near their critical latitudes. Energy lost from the internal tides is then transferred to high-mode near-inertial components in the upper ocean. The decay time of internal tides obtained here is several-fold shorter than those in the classical studies and, additionally, varies by a factor of two depending on the local depth and density structure.

We suggest from this study that the numerical integration of the kinetic equation is a more effective approach than recognized to determine the decay parameter of wave energy, which is indispensable for the global ocean models.