[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

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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-P11]The impacts of tidal mixing in the Indonesian Archipelago on the transformation of the Indonesian Throughflow waters

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Keywords:Tidal mixing, Indonesian Archipelago, Water-mass transformation

Tidal mixing in the Indonesian Archipelago is thought to be one of the essential factors regulating the transformation of the ITF waters. Most OGCMs are, however, incapable of reproducing the transformation of the ITF waters, since tidal forcing is neglected.

In the present study, in order to investigate the impacts of tidal mixing on the transformation of the ITF waters, the spatial distribution of vertical diffusivity obtained from the high-resolution baroclinic tide model which is forced with a single tidal constituent (M_2) is incorporated into an OGCM. It is shown that the SST is significantly reduced around the narrow straits where intensive vertical mixing takes place. As a result, the SST averaged within the Indonesian Archipelago is reduced by 0.15 °C compared with that predicted from the experiment without tidal mixing. In the thermocline, although the vertical mixing induced by breaking of M_2 baroclinic tides has a moderate impact on reducing the saline bias often found in the existing OGCMs, it is still not enough to completely resolve the model bias especially in the Halmahera/Banda Seas where saline waters are injected through the eastern route of the ITF. In order to explain this missing mixing in the Indonesian Archipelago, the impacts of other tidal constituents (S_2, K_1, O_1), tidal flow interaction with the ITF, and the horizontal mixing enhanced by the sub-mesoscale eddies should also be investigated in the future.