# Downward lee wave radiation from Pacific tropical instability waves: A possible energy pathway to turbulent mixing

*Yuki Tanaka[1], Toshiyuki Hibiya[1], Hideharu Sasaki[2]

1.Graduate School of Science, The University of Tokyo, 2.Application Laboratory, Japan-Agency of Marine Science and Technology

Turbulent mixing in the equatorial Pacific Ocean is an important process that controls diapycnal heat transport and hence affects the intensity of air-sea interactions related to the global climate. It is recently shown that, in the eastern equatorial Pacific, strong mixing is induced in the thermocline by enhanced vertical shear associated with tropical instability waves (TIWs), which propagate westward along the equator at a speed of ~0.5 m $s^{-1}$ with a wavelength of ~1000 km.

In this study, using a high-resolution ocean general circulation model, we show that the TIWs can play an important role in inducing turbulent mixing in the thermocline also in the central equatorial Pacific, although the thermocline is too deep to be directly affected by the vertical shear of the TIWs. The front of the TIW is clearly manifested as a narrow strip of strong convergence of horizontal surface flow, from which area downward and westward propagating internal waves are intermittently emanated. These internal waves can be interpreted as lee waves generated by the surface-flow convergence zone, which acts like an inverted obstacle moving along the stratified ocean surface by inducing downward flow. The associated downward energy flux below the surface mixed layer increases as the TIW structure becomes deeper toward the central equatorial Pacific, so that the energy pathway to turbulent mixing in the thermocline can be created. The downward energy flux integrated over the entire equatorial Pacific and averaged during January 2011 amounts to ~8.1 GW, occupying a significant fraction of the energy input to the TIWs.

Keywords: Turbulent Mixing, Vertical Energy Flux, Internal Wave Radiation, Lee Wave, Tropical Instability Wave, Eddy-Resolving Ocean General Circulation Model

 