



ICTS Fluid Weekly Seminar (Online)

Title : Simulating turbulent mixing caused by local instability of internal gravity waves

Speaker : Yohei Onuki (COAR, Kyushu University, Japan)

Date : Friday, 14th October 2022

Time : 02:00 PM (IST)

Abstract : With the aim of assessing internal wave-driven mixing in the ocean, we develop a new technique for direct numerical simulations of stratified turbulence. Since the spatial scale of oceanic internal gravity waves is typically much larger than that of turbulence, fully incorporating both in a model would require a high computational cost, and is therefore out of our scope. Alternatively, we cut out a small domain periodically distorted by an unresolved large-scale internal wave and locally simulate the energy cascade to the smallest scales. In this model, even though the Froude number of the outer wave, Fr , is small such that density overturn or shear instability does not occur, a striped pattern of disturbance is exponentially amplified through a parametric subharmonic instability. When the disturbance amplitude grows sufficiently large, secondary instabilities arise and produce much smaller-scale fluctuations. Passing through these two stages, wave energy is transferred into turbulence energy and will be eventually dissipated. Different from the conventional scenarios of vertical shear-induced instabilities, a large part of turbulent potential energy is supplied from the outer wave and directly used for mixing. The mixing coefficient is always greater than 0.5 and tends to increase with Fr . Although our results are mostly consistent with the recently proposed scaling relationship between Γ and the turbulent Froude number, Fr_t , the values of Γ obtained here are larger by a factor of about two than previously reported.

Venue : Please click on the below link to join the meeting

<https://icts-res-in.zoom.us/j/87967130912?pwd=c3Z0bmg3d0lJRmw0WFc4Rm5WUnd4OT09>

Meeting ID: 879 6713 0912

Passcode: 473688