

Moored and Towed Measurements of Lee Waves at West Mariana Ridge

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LONG-TERM GOALS

We are interested in the general problems of internal waves and ocean mixing. Breaking of internal waves is the main cause for ocean mixing away from surface forcing. Knowledge of processes that lead to generation and breaking of internal waves is important for advancing the performance of operational and climate models. A special type of internal waves are lee waves, generated as low frequency currents interact with the bottom topography. The research described here will advance the understanding of how internal lee waves are generated, their radiation and breaking and the associated turbulent mixing.

OBJECTIVES

Low frequency flows encountering rough topography lose both momentum and energy to a variety of poorly understood small-scale dynamical processes, including quasi-linear and strongly non-linear (hydraulic) internal lee wave generation. Our measurements will

- characterize the near- ridge flows both upstream and downstream and their turbulence on timescales of hours to months
- improve parameterizations of drag and mixing (and therefore model representation) of eddies and currents over topography
- support nearby studies with complementary scientific foci.

APPROACH

We plan on deploying profiling moorings upstream and downstream of a ridge with the goal of coordinating the array with other FLEAT PIs. This will allow to characterize phenomena as form drag, internal lee wave generation, propagation and dissipation, boundary layer turbulence and eddy shedding and island wakes.

Lowered and towed LADCP/CTD measurements in the vicinity of the moored array will provide measurements with high lateral resolution. Figure 1 shows an example of combined moored and towed measurements of a mean flow interacting with topography. The towed measurements will significantly help interpret the mooring time series and vice versa.

Both the design of the mooring array and the shipboard observations will be based on initial model results from other FLEAT PIs and results from the Johnston cruise around Palau in October 2015.

WORK COMPLETED

A planning meeting with other FLEAT PIs was held in June 2015. The northern edge of Palau was determined as tentative location for the mooring array. Other possible locations are situated along ridges south of Yap.

RESULTS

IMPACT/APPLICATIONS

RELATED PROJECTS

NONE

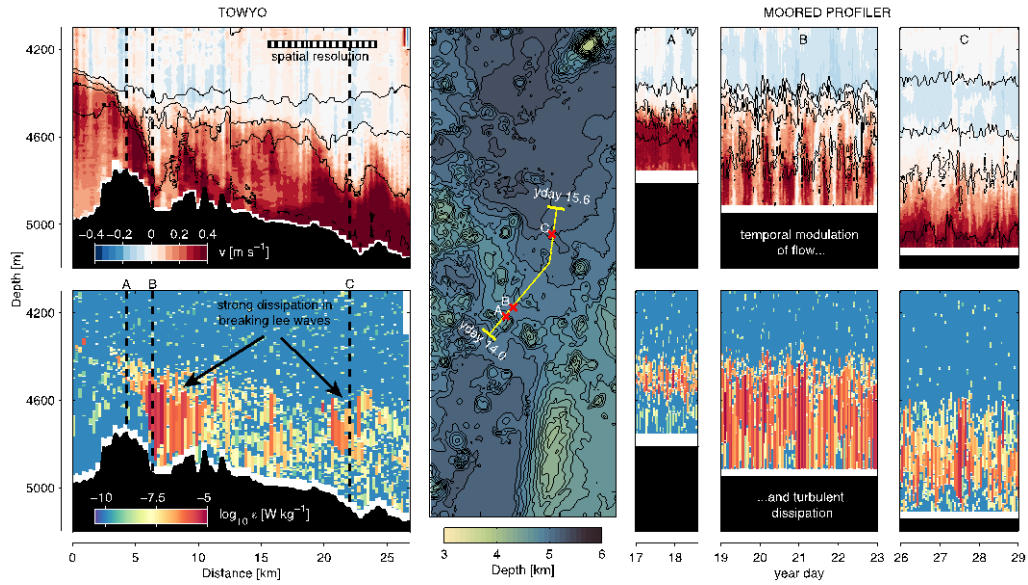


Figure 1: Moored Profiler and towed LADCP/CTD measurements of flow encountering rough topography in the Samoan Passage. The flow of dense water across a sill in the Samoan Passage accelerates downstream of the sill (upper panels). Breaking lee waves and hydraulic jumps are associated with increased levels of turbulent mixing (lower panels). Moored observations show the temporal variability of these processes.