Samoan Passage near-inertial waves

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The Samoan Passage Abyssal Mixing Experiment (2012 - 2014) was designed to study transport, mixing, hydraulic control, and internal waves in the Samoan Passage (168.5-170W, 7.5-10S) where the majority of the transport of water, below 4000m depth, into the North Pacific occurs. The current work focuses on a sill at the entrance to the western channel. Observations in this subregion included four simultaneous short-term (~7 days) moorings: one located 2 km upstream of the sill and three, spaced 1 km apart, 3 km downstream of the sill; and one longer term (~18 months) mooring located on the sill. While near-inertial waves were observed throughout the passage, this sill region provides an opportunity to study downward propagating, near-inertial waves interacting with topography. A coherent signal in time and space was observed, which shows the wave propagating equatorward (northward) over the sill. Plane wave solutions with a vertical wavelength of 238m and a frequency of .35 cpd (1.04f) match the signals observed at the four simultaneous moorings. Maximum near-inertial energy was centered around the 1 degree C isotherm in the interface between the Antarctic origin bottom water and the overlying water. The two western most moorings upstream of the sill, show a single depth band centered around 4100m of maximum high near-inertial energy. The down stream and eastern upstream moorings both had a secondary lower magnitude near-inertial energy peak, in addition to the peak around 4100m, centered at 4300m. These deeper waves are more rectilinear (90% of KE rotating anti-cyclonic in time) than the waves observed at 4100m (70% of KE rotating anti-cyclonic in time). Interactions with topography, including generation of local vorticity, shadowing and flow steering, are important.

Keywords: Near-inertial waves, ocean, mixing

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