



## The high amplitude internal waves generated at San Esteban sill in the Gulf of California

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Results are discussed from a short survey in the Gulf of California (GC) to evaluate the parameters of internal tidal waves generated at San Esteban sill. Aboard a small oceanographic research vessel BIP XII, belonging to the CIBNOR (Centro de Investigaciones Biológicas del Noroeste) at Guaymas, different measurements of internal waves were performed using: a) a tow-yo CTD SBE-19plus; b) arrays of HOBO thermographs (distributed from surface down to 150 m depths) on three moorings, deployed at the north of a sill; and c) two temperature and pressure sensors arrays and an ADCP, towed one behind the other at a distance of 475 m. Data showed that the semidiurnal barotropic tide at San Esteban sill causes non linear internal tides, which propagates to the North, during ebb, and to the South, during flow, of the barotropic wave. These waves are dispersed in the surface layer formed of short strongly nonlinear waves of high amplitude, which together with long internal waves generates significant variations of temperature and salinity deeper as 150 m. The waves at the leading edge of these groups have maximum amplitudes 50-80 m, wavelengths of 1200 m, and phase speed about 1.2 m/s. Long internal waves with semidiurnal periodicity and short nonlinear waves disperse its energy generating turbulence, vertical and horizontal mixing. Such processes improve the removal nutrients to the surface and to maintain high biological productivity of waters in this area of the GC.