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A Comparison of Semidiurnal Internal Tides from Different Bathymetric Locations on the Australia North West Shelf

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ABSTRACT

The vertical structure of the semidiurnal internal tide is calculated from current meter data, for three locations of varying bathymetry, on the southern part of the Australian North West Shelf. These results are compared to results from a previous study at a fourth location. Each site is characterized by the ratio α/c , where α is the slope of the bathymetry and $c = [(\sigma^2 - f^2)/(N^2 - \sigma^2)]^{1/2}$ is the slope of the internal Wave characteristics, where σ is the wave frequency, f the inertial frequency and N the buoyancy frequency. The observations then fall into three categories, subcritical ($\alpha/c < 1$), near-critical ($\alpha/c \sim 1$), and super-critical ($\alpha/c > 1$) bottom slopes. The results at near-critical bottom slope ($\alpha/c = 1.2$) show a strong intensification of the near-bottom baroclinic currents. Observations at the super-critical slope ($\alpha/c = 1.9$) show a weak bottom intensification, and at the subcritical slopes ($\alpha/c = 0.2$ and 0.5), no bottom intensification of currents is observed. The observations agree qualitatively with Wunsch's solutions for freely propagating internal waves in a wedge. except for the case $\alpha/c = 0.5$, where the weak intensification predicted is not observed.

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