Long-range propagation and associated variability of internal tides in the South China Sea

*Zhenhua Xu¹

1. Institute of Oceanology, Chinese Academy of Sciences

The variability of internal tides during their generation and long-range propagation in the South China Sea (SCS) is investigated by driving a high-resolution numerical model. The present study clarifies the notably different processes of generation, propagation and dissipation between diurnal and semidiurnal internal tides. Internal tides in the SCS originate from multiple source sites, among which the Luzon Strait is dominant, and contributes approximately 90% and 74% of the baroclinic energy for M_2 and K_1 , respectively. The tidal beams from the Luzon Strait can travel across the deep basin and finally arrive at the Vietnam coast and Nansha Island more than 1000-1500 km away. During propagation, M_2 internal tides maintain a southwestward direction, whereas K_1 exhibit complicated wave fields because of the superposition of waves from local sources and island scattering effects. After significant dissipation within the Luzon Strait, the remaining energy travels into the SCS and reduces by more than 90% over a distance of ~1000 km. Inside the SCS, the K_1 internal tides with long crests and flat beam angles are more influenced by seafloor topographical features and thus undergo apparent dissipation along the entire path, whereas the prominent dissipation of M_2 internal tides only occurs after their arrival at Zhongsha Island.

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