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Short internal waves trailing strong internal solitary waves in the South China Sea

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Sea surface signatures of short internal waves trailing strong internal solitary waves (ISWs) have been detected on several synthetic aperture radar (SAR) images acquired by the Advanced Synthetic Aperture Radar (ASAR) onboard the European Envisat satellite over the northern South China Sea (SCS). Such configurations were found recently by Vlasenko et al. (2010) in numerical simulations carried out with the MIT general circulation model (MITgcm). They showed that the short internal waves, which have wavelengths of the order of 1.5 km and amplitudes of 20 m, ride on second mode ISWs. The existence of these short internal waves, which follow a first mode ISW, can be explained by the Taylor-Goldstein equation which includes a shear in the background current. The simulations predict that the short internal waves occur in two distinct areas, one close to the Luzon Strait (LS) and the other further west. In the first area, they are generated by the disintegration of a baroclinic bore, which is generated by the interaction of the tidal current with the steep topography in the LS. In the second area they are generated when the faster first mode ISW overtakes the frontal second mode ISW. We have screened the ASAR archive of the European Space Agency (ESA) and found many SAR images acquired over the northern SCS showing sea surface signatures of such short internal waves trailing a much longer first mode strong ISW. The detailed analysis of six of these SAR images shows good correlation between modeled and observed internal wave fields.