On the Generation and Evolution of Internal Solitary Waves in the Northwest of South China Sea

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Recently some internal solitary waves(ISWs) are observed from remotely sensed images in the northwest of South China Sea. Scrutinising the crest of these ISWs, it is supposed that they are generated locally as a result of tidal-topography interaction.To confirm this assumption, a 2-D fully nonlinear non-hydrostatic model MITgcm is applied to investigate generation process and mechanism of the ISWs in the northwest of South China Sea. A series of numerical simulations exploring the influence of bottom topography, strength of tidal forcing,stratification and different tidal hormonisc on ISWs generation are also carried out. The model results confirm that the ISWs on the left side of the sills are generated when the tidal flow on the sills top changes from ebb to flood tides,while those on the right side of the sills are associated with the beginning of ebb tides at generation. Analysis of Froude number and slope parameter that govern generation regimes indicates that the generation of internal waves in this area are subject to mixed lee wave rather than baroclinic tide regime or unsteady lee wave regime. Scrutiny of the ISWs reveals that the superposition of different internal wave modes exists near the sills and the well-developed firsr and second ISWs are prounced further from the sills. There are three sills in the model domain,which are sills a,b, and c from west to east respectively. It is found in a series of sensitivity experiments that the ISWs on the left side of these sills are generated from both sills b and c,while the sill a acts as the role of intensifying nonlinearity of the internal waves and facilitating the generation of higher internal wave modes.However the ISWs on the right side of these sills are only generated from sill c.