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Interference patterns of internal tidal depressions in South China Sea.

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The formation of arc type structures in surface elevation and temperature fields are studied in South China Sea (SCS) and Luzon Strait region. Predictions of Internal Baroclinic Bores (IBBs) are performed for April 2007, with a regional version of the Ocean Nowcast/Forecast System (ONFS) of the Naval Research Laboratory. The system uses the hydrostatic approximation. The location of IBBs in SCS correspond to locations of internal solitary waves (ISWs) in SCS as the IBBs undergo frequency and amplitude dispersion. The predicted arc type structures are demonstrated to result from interference of the superposition of spreading baroclinic cylindrical waves associated with IBBs propagating from Babuyan and Batan Islands. The superposition is conducted with a knife-edge model. M2 and K1 tidal waves are considered. Superposition of both K1 diurnal and M2 semidiurnal components is required for the formation of arc segments. The formed arcs are similar to what is seen in SAR observations, Liu et al., (2004). Superposition of M2 with M2 or K1 with K1 yields, circular patterns, no arc segments.

The neap-spring tidal variations are considered. The effects of neap-spring modulation on the tidal signal for generation of A and B waves, Ramp et al., (2004) are analyzed and related to arc segment structure in SCS. A waves are large waves with amplitudes of 150 m and higher. B waves are of amplitudes 40 m or lower. This classification agrees with model predictions and mooring observations, Vlasenko et al., (2012), Ramp et al., (2004) and Warn-Varnas et al., (2010). It is shown that K1 and M2 tidal waves originating from Babuyan and Batan islands combine to form A and B waves, with an arc signature in sea surface elevation and warm segments in South China Sea (SCS). This agrees with SAR and in situ observations, Liu et al., (2004), and Chao et al., (2007).