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Parameter based solitary wave predictions in South China Sea.

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The Apel parameters that describe the presence of solitary waves are calculated in the South China Sea for the period of April and May 2001. The background for the calculations is obtained from 3D hydrostatic NCOM model predictions with tides. An energy analysis of NCOM predictions indicates the locations of tidally generated depressions propagating westwards. The location of these depressions corresponds to the location of solitary wave trains. At these locations solitary wave trains are constructed with the KdV based Apel dnoidal model. SAR data and the observations from the WISE experiment indicate solitary wave trains of large amplitude, 150 m and larger, propagating westwards with phase speeds of 3 m/s to 4 m/s.

Predictions with the fully nonlinear nonhydrostatic 2D Lamb model are undertaken along selected tracks. The predictions involve the generation of solitary waves in the Luzon Strait and their propagation towards the ASIAEX experimental site. A tuned set of parameters yields soliton amplitudes of 220 m , halfwidths of around 2000 m , and phase speeds near 3.5 m/s. These are in range of ASIAEX and WISE observations.

A sech2 representation of the solitons is, also, constructed (amenable to wavelength assimilation from SAR data), evolved by nonhydrostatic dynamics of Lamb model and used as ground truth. Ensembles of sech2 soliton representations are generated by varying the available potential energy around the tuned parameter case.

The Apel's dnoidal model encompasses cosine and cnoidal solutions. The cnoidal so-

lution is used to represent the large amplitude solitons in the South China Sea. Cnoidal solutions are constructed for a range of Apel model parameters. An uncertainty analysis of Apel model predictions is conducted, through model ensemble training, in relation to ground truth solutions consisting of predictions with the tuned Lamb non-hydrostatic model or sech2 representation.

Acoustical models are coupled to the predictions of the NCOM-Apel and Lamb models. Transmission loss calculations are performed in presence of large amplitude solitons and their impact on the acoustical field is illustrated.