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Observed acoustic arrival structure and intensity variability
induced by transbasin nonlinear internal waves in the South China
Sea basin

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During the 2005-2006 Windy Island Nonlinear Soliton Experiment (WISE), large-amplitude internal waves were observed by in situ oceanographic sensors to propagate eastward from the Luzon Strait, through the deep basin, onto the shelf and Dongsha Plateau of the South China Sea year round except winter. In a parallel effort to measure the effects of these transbasin internal waves on long-range, low-frequency sound propagation, an acoustic source with a center frequency of 400-Hz and bandwidth of 100-Hz was moored on the west side of the deep basin transmitting a phase-modulated m-sequence signal every 15 min from February to October 2006. These periodic transmissions were recorded by a receiver moored ~166 km to the east of the source. The recording was processed to give the arrival structure of a pulse and its temporal changes over the eight-month period. The observed temporal variability in the arrival structure and in the acoustic intensity were analyzed using time-series techniques and models with emphasis to elucidate the connection to the observed sound speed variability induced by the nonlinear transbasin internal waves. Results from the analysis are presented and discussed. [The research is sponsored by the US ONR and the Taiwan NSC.]