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Observations of fine structure changes in shoaling internal solitary waves based on seismic oceanography method

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In the study of shoaling internal solitary waves, the observation and research on the internal fine structure and the effect of the topography are still insufficient. We try to make up for such insufficiency by seismic oceanography method. A first-mode depression internal solitary wave was observed propagating on the continental slope in the northeast South China Sea near Dongsha Atoll. We used common offset gathers (COGs) to obtain a series of images of this internal solitary wave that evolved over time, and studied the changes in internal fine structure by analyzing the seismic events in COG migrated sections. We found that the seismic events were broken during the shoaling, which was caused by the instability induced by internal solitary wave. We picked six events which represent six waveform and analyzed their evolution. It was found that the change in shape of waveform at different depths is different. The waveform in deep water deforms before that in shallow water, and the waveform in shallow water deforms to a greater degree. In addition, we also counted four parameters of phase velocity, amplitude, wavelength, and slopes of front and rear during the shoaling. The results show that the phase velocity and amplitude of waveform in shallow water increases, the wavelength decreases, and the slope of rear gradually becomes larger than that of the front. We have compared the observed changes with previous study made by numerical simulation.