Geophysical Research Abstracts
Vol. 20, EGU2018-11390, 2018
EGU General Assembly 2018

Study of internal solitary waves shoaling by seismic oceanography method

Haibin Song (1), Minghui Geng (1), Yongxian Guan (2), Yewei Chen (1), Xitong Huang (1), and Yang Bai (1)

(1) State Key laboratory of Marine Geology, School of Ocean and Earth Science,Tongji University, China (hbsong@tongji.edu.cn), (2) Marine Geological Survey, China Geological Survey, China

Shoaling internal solitary waves (ISWs) are very important for ocean mixing, sediment resuspension, sediment transport, and seafloor geomorphology shaping, etc. We study the ISW shoaling process in the Dongsha region of South China Sea with multi-beam bathymetry data, multi-channel reflection seismic data, remote sensing images and numerical simulation results, and we focus on the relationship between ISW shoaling and local topography. We discuss the following scientific problems: (1) waveform change, (2) sediment resuspension, (3) upper slope dunes, during the ISWs shoaling process.

The obvious waveform change phenomenon is the ISW's polarity conversion. Through the analysis of seismic oceanography sections and previous studies, we find that the ISWs in the northeastern SCS generally begin to convert their polarities from depression to elevation waves at the seafloor depth of about 200 m, and turn into eleva-tion waves at water depth of about 100 m. The ISWs between depression and elevation waves are newly defined as transition waves, which are distributed between the seafloor depth of 130 m and 220 m, while elevation waves are distributed between 80 m and 120 m. The analysis suggests that the polarity conversion process is amplitude-dependent. The larger the ISW amplitude is, the easier it is for ISW polarity conversion to occur.

On the seismic sections, we totally identify 15 nepheloid layers on the shelf and upper continental slope by seismic oceanography method in the northern South China Sea. These nepheloid layers range in length from several kilometers to tens of kilometers, in thickness between more than ten meters and one hundred meters, and the top boundaries of which occur from 135 m to 752 m deep. These nepheloid layers are indicated by enhanced reflections on the seismic sections. It is the propagation and shoaling of the ISWs which bring about quite large wave-induced current, erode the seafloor and resuspend sediment particles to generate and maintain these nepheloid layers.

The genesis of reticular sand dunes distributed on the upper continental slope is also related to the ISWs propagation. The multi-channel bathymetry data show that these reticular sand dunes occur at depths of 352-420 m in the northeastern area to the Dongsha Atoll and their ridges extend in three directions: N-S, NE-SW and E-W. The former two directions are caused by the northwestward propagating ISWs, while the last one is likely to be formed by northward diffracted ISWs occurred when they encounter the Dongsha Atoll. The northward propagating ISWs induce the southward current, which erodes the seafloor, and forms the subaqueous sand dunes with E-W extending ridges. It is worth mentioning that, above the polygonal reticular dunes, the seismic sections reveal that the trough-to-trough wavelength is consistent between the high-frequency oscillating internal waves and sand dunes. It is the high-frequency oscillation caused by the ISWs interference that forms the reticular dunes field. The relevant diffraction and ISWs interference regions can be identified on the remote sensing images.