

## The Evolution of internal wave from mode-one to mode-two

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Internal waves (IWs) are observed in the ocean all over the world. In the northern South China Sea, internal waves are frequently monitored between the Luzon Strait and Hainan Island by several satellites, such as optical or radar satellites. The wave crest can be as long as 200 km. Its amplitude is larger than 170 m. The huge amplitude maybe the largest than that ever observed in the world's oceans. The huge IW is usually observed in the deep sea area between the Luzon Strait and Hainan Island. Then a small mode-two wave was observed following a huge mode-one IW on the shelf near Dong-Sha Atoll. Due to the different wave speeds, mode-one and mode-two waves would separate into two waves after decomposition on the shelf. Thus we thought the huge mode-one IW in deep sea area could be deposited into more modes of IW on the shelf.

In this study, the objective is to observe the generation and evolution of mode-one IWs in the deep sea area, and then the mode-one IW deposit into more modes of IWs on the shelf break. The generation of mode-two waves on the shelf by disintegration of mode-one IWs in the deep ocean is proposed and analyzed based on the theory of modal-decomposition. In this study, some historical measurement data and satellite image are used to detect IWs. Then, the environmental condition is from a mooring near Dong-Sha Island. For comparison, the characteristics of mode-one and mode-two waves from environmental parameters have been estimated. For the test case, water depth increases to 450 m the mode-two wave energy is decreasing to 14%, while it is increasing to 25% when water depth decreases to 350 m. So, the mode-two waves can be generated under favorable condition, especially for multiple layer stratification in the shallow water on shelf.

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