



Progress of Marine Geological Survey in Caofeidian, Bohai

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Abstract

Based on geophysical survey and Marine geological data, the characteristics of seabed topography, stratum structure and geological structure in the Caofeidian deep trough area are studied, and the formation reasons and influencing factors of topography and geomorphology in the caofeidian deep trough area are analyzed. Based on H6 borehole data, it is determined that the regional stratigraphic age is from Holocene to Late Pleistocene, and three transgressions occurred. Geo-slope analysis software is used to calculate the stability of submarine SLOPE quantitatively, and the stability of SLOPE under extreme conditions such as large wind wave and earthquake is simulated and analyzed. It is concluded that if the intensity of the tangshan earthquake occurs, the seabed slope will have a large deformation and the overall instability may occur. Engineering measures can be used to restrain the deformation of the seabed slope and structures and prevent the seabed geological disasters caused by the earthquake. The results of the project can be applied to other areas of the ocean and coastal zone.

Keywords: Caofeidian; Geomorphology; Earthquake; Submarine Slope; Structure; Newmark

Text

The Caofeidian sea area is located in the north of Bohai Bay in China, and the shore is the Caofeidian Port area. Chu Hongxian et al. studied the seabed topography and geomorphology characteristics of the Caofeidian deep trough area by using the multi-stage bathymetric topography, side scan sonar, Marine geophysics and Marine geology data obtained. The detailed interpretation of shallow seismic profile, single-channel seismic profile and multi-channel seismic profile with high resolution and high signal-to-noise ratio is carried out, and some new understandings are obtained:

- a) The development of topography and geomorphology in the Caofeidian deep trough is controlled by geological structure, paleo-Luanhe river delta evolution, Marine hydrodynamic force and human activities. The subsidence of the deep submarine structure is the basis of the formation of the topography and landform of the Caofeidian deep trough area, and the evolution of the abandoned delta of the ancient Luanhe River formed the landform of the Caofeidian headland under the action of Marine hydrodynamic force. The caofeidian project had obvious siltation effect on the tidal flat and made the deep trough area in the scouring environment.
- b) By testing and analyzing the grain size, carbon-14, palynology, geochemistry, clay minerals and heavy minerals content

characteristics of H6 borehole cores in the depth range of 120 meters, the strata, sedimentary facies and sedimentary environment of H6 borehole can be divided into six alternating layers from top to bottom: shallow sea facies-continental facies-shallow sea facies-continental facies-coastal facies - continental facies. The regional stratigraphic age is from Holocene to Late Pleistocene, when the climatic environment was in a warmer period and three transgressions occurred.

- c) Taking the typical sea area of Caofeidian deep trough as the research target, the calculation model [1] of typical SLOPE of Caofeidian deep trough was established, and the seabed topographic parameters, stratigraphic structure parameters, soil physical and mechanical parameters and other indicators calculated by the model were determined. Geo-slope SLOPE analysis software was used to perform quantitative calculation of the stability of seabed SLOPE. The stability of submarine slope under natural condition before construction and after large-scale construction is analyzed, and the stability of slope under extreme conditions such as large wind wave and earthquake is simulated.
- d) According to the research results of Newmark dynamic analysis method [2-4], if the intensity of tangshan earthquake occurs, the seabed slope deformation is large, the slope cannot remain stable, and the overall instability may occur [5].

Therefore, engineering measures should be taken to restrain the deformation of submarine slopes and structures, which is conducive to the prevention of seabed geological disasters caused by earthquakes.

- e) The project team has carried out the research and development of sounding data processing methods (surge filter application and correction method) and the application practice of technical methods. The results of this project provide the benchmark data for the follow-up evaluation of Marine environment in the later stage of engineering and can be applied to other areas of ocean and coastal zone.

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