

PROCEEDINGS

Dynamic Behaviors of a Moored Floating Production System in Actions of Internal Solitary Waves

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ABSTRACT

Internal solitary waves (ISWs) are a serious threat to moored floating structures in deep water, especially in the South China Sea. On predicting the dynamic response of a moored structure subjected to ISWs, previous researchers directly apply the pre-calculated ISW loading to the structure, which ignores the coupling effects between the structure and the ISW. To address this issue, this paper develops a coupled dynamic analysis model for moored structures, where the determination of ISW loading considers the effects of dynamic responses of floating structures. This model can simulate the action of various loading components on the floating structures, such as the first and second order wave forces, mooring and riser force, ISW loading. In terms of calculating the dynamic response of the platform subject to water wave or ISW, the present model is in good agreement with the numerical results in published literatures. Using this model, dynamic responses of a semi-submersible platform subject to ISWs are studied. Studies demonstrated the coupling effect between the structure and ISW depends on the platform's velocity. One interesting finding is presented and explained, that a significant pitch will be induced by the phase difference of ISW loads on left and right slender structures. In addition, the main factor for the significant setdown is the increased mooring loads caused by the large offset, rather than the vertical ISW loads on the hull and slender structures.

KEYWORDS

Internal solitary wave; floating production system; coupled model; mooring system; deep-water riser

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