Dynamic response of semi-submersible supporting structure with three pontoons of offshore wind turbine

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Abstract: The stability of the supporting structure of an offshore wind turbine could be greatly influenced by the aerodynamic load during its normal working conditions. At present, most researches on the dynamic response of supporting structure of offshore floating wind turbine are mainly focused on the extreme sea conditions, while the influence of the aerodynamic load is rarely considered, so it is necessary to be studied. In the paper, the dynamic response of the supporting structure of the three pontoons offshore wind turbine under the wind, wave and current load are analyzed with the hydrodynamic theory and aerodynamic theory combined with the finite element method. Moreover, there are three cases of wind load, and that is the aerodynamic load considered, the aerodynamic load not to be considered and the aerodynamic load simplified as a fixed load. The results are as follows: (1) The dynamic response of the offshore wind turbine during the normal working conditions is mainly affected by the aerodynamic load. (2) The response of the supporting structure mainly show surge, heave and pitch. (3) Under the condition of the aerodynamic load simplified as a fixed load, the responses of surge, heave and pitch are greater than that of considering the aerodynamic load. Therefore, considering the aerodynamic load has more practical meaning in engineering practice, and it provides the theory foundation for the study of the stability of the supporting structure of offshore wind turbine.

Key Words: Dynamic response, supporting structure, offshore wind turbine; aerodynamic load