Applications of Computational Hydrodynamics in Ocean Engineering

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In recent years, computational hydrodynamics has been widely applied in solving practical problems in interdisciplinary fields of ocean engineering. The hydrodynamic model can be coupled with other models such as structural dynamic models, aquatic ecological models, and ocean environmental models, etc., to study a wide range of ocean engineering problems. For example, in the design of a deep-sea oil platform, in order to calculate accurately the hydrodynamic forces exerted on the structure and the corresponding structural responses, the wave and current models at different scales must be coupled together to simulate a realistic ocean environment, which is important for the safety and reliability analysis of oil platform operations. In the extreme case of platform accidents and oil spills, the hydrodynamics model coupled with water quality and ecological models can provide predictions of potential impacts of the accident and possible restoration alternatives. In this presentation, the ocean hydrodynamic models at different scales will be introduced. Their characteristics, applications, and coupling with other models will be discussed in connection with a few real ocean engineering problems. Finally, the future research trend of computational hydrodynamics in ocean engineering will be discussed, with the emphases on further extension of the computational hydrodynamics into multi-disciplinary areas of ocean engineering.