EGU2020-10178
https://doi.org/10.5194/egusphere-egu2020-10178
EGU General Assembly 2020

Numerical Analysis of Floating Offshore Structures Using Overset Method

Sing-Ya Li and Shih-Chun Hsiao
National Cheng-Kung University, Department of Hydraulic and Ocean Engineering, Taiwan (jacoblizzsh@gmail.com)

The consciousness of global warming gradually transforms the energy dependency from fossil fuels to renewable energy resources such as waves, wind, solar, and geothermal heat. The flexible deployment range of floating offshore wind turbines makes this technology more popular in the offshore wind energy sector recently. However, this technique is still under development and the fluid-structure interaction (FSI) needs to be further investigated to improve the design of the floating wind turbine platform. Due to the significant evolvement of computer and numerical methods in recent years, computational fluid dynamics (CFD) has been widely applied to solve FSI problems. Grid morphing technique is commonly used to solve FSI problems, however, using this technique to deal with large body displacement problems will lead to large grid deformation and consequently induce numerical instabilities. In this study, overset grid was used to understand the interaction between fluid and floating structures to avoid calculation divergence due to excessive grid deformation. The open-source CFD solver was developed using OpenFOAM for offshore floating structures and the numerical wave tank was developed by integrating the overset grid Navier-Stokes solver, $overInterDyMFoam$, with a wave generation library in OpenFOAM. The accuracy of the developed model was validated using a series of benchmark tests including heave decay test, roll decay test, and a floating structure subject to different wave conditions. The influences of the overlapping zone properties on the model accuracy were discussed and the results obtained by the current study and those computed by dynamic grid solver were compared. Overall, the computed results presented in this study show good agreement with the results of the benchmark tests.