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NUMERICAL STUDY OF FLOWS AROUND A SHIP HULL INCLUDING ELASTIC DEFORMATION EFFECT USING A MODE FUNCTION

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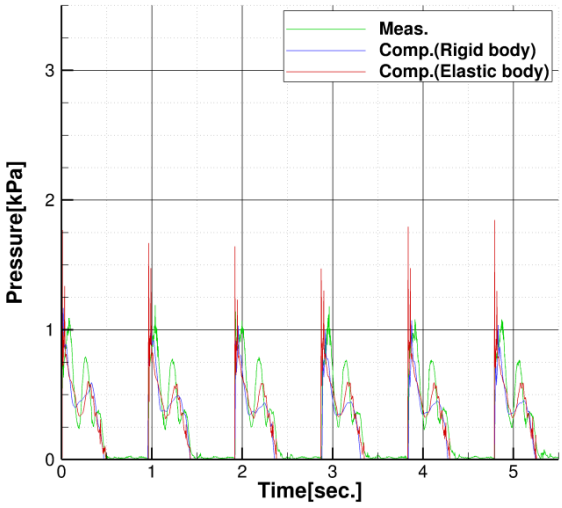
A numerical method to simulate flows with elastic deformation effects using a mode function has been developed. An in-house structured CFD solver which is capable of the overset-grid method is used. The governing equations are 3D RANS equations for the incompressible flow. The artificial compressibility approach is used for velocity-pressure coupling. Spatial discretization is based on the finite-volume method. An interface capturing method based on the single phase level-set approach is employed to capture free surfaces. Ship motions are obtained by solving motion equations, and the motions are strongly coupled with the governing equations. The weight values for the overset-grid interpolation is determined by the in-house system[1] which is based on the Ferguson spline interpolation. Elastic deformation is obtained by solving the equations based on the Bernulli-Euler beam theory, and deformations of 2nd and 3rd modes are accounted for by the grid deformation method with the strong coupling way. Present method is applied to a computation of flows around a container ship in the severe wave condition. Amplitude of the ship motions consistent with the measured data. Present method reproduce the impact pressure due to the interaction between the ship motions and incoming waves, and effect of the elastic deformations is examined.



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