Computation of Added Mass and Damping Coefficients of a Horizontal Circular Cylinder in Open Foam - DTU Orbit (28/06/2019)

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This paper presents numerical computation of added mass and damping coefficients of a slender horizontal cylinder in the free surface zone, which typically serves as a fish cage floater. A fully viscous two phase flow solver in OpenFOAM was employed in the numerical computation. The purpose was to validate the capability of this solver and dynamic mesh functionality. A two dimensional numerical wave tank was set up, and two wave relaxation zones were used to reduce the size of the computational domain. Harmonic forced oscillations of the cylinder were performed at different frequencies and amplitudes. The mesh at free surface zone was refined based on the radiated wave heights at different oscillation frequencies in order to properly resolve the radiated waves. The result shows that in most frequency ranges, the numerical computation agreed well with the experimental data and analytical solution. However at low frequency range for added mass coefficient in heave motion, deviations were observed, and it was due to the effect of finite water depth. In addition for sway motion at high frequency range, the damping coefficient was underestimated comparing with analytical solution. This was believed to be as a result of high steepness of the radiated waves.

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