

Behavior analysis of offshore floating structures on ocean using smoothed particle hydrodynamics method

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ABSTRACT

The floating/fixed ocean structures such as offshore wind power plants and other structures have to be taken account of safety in rough sea and tsunami. It is necessary to predict behaviours for both structures and fluid. The structures in the ocean are subjected to forces from the fluid. Particle methods of fluid dynamics have advantages for safe analyses to defend from natural disasters which are tsunami etc. than other numerical methods.

Particle methods are recently developed to the applications of the fluid dynamics and the fluid structure interaction. The smoothed particle hydrodynamics (SPH) method [1] and the moving particle semi-implicit (MPS) [2] method are recently applied to fluid dynamics analyses for predictions of damage under natural disasters such as Tsunami.

The SPH method including stable terms are proposed by M.Antuono et al.[3] and D.Molteni et al.[4] that is the δ -SPH method. Artificial viscosity coefficient and artificial density diffusion coefficient such as the numerical correction terms are added to the momentum conservation equation and mass conservation equation in the δ -SPH method respectively. The 2-dimensional and the 3-dimensional δ -SPH method analyses are performed in the present paper. The results are compared with those of other researchers in several cases. The good agreements are obtained in the wave energy attenuator which is a floating device in the present analyses. Furthermore, the δ -SPH method is applied not only 2-dimensional analysis but also 3-dimensional analysis.

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