An efficient domain decomposition strategy for wave loads on surface piercing circular cylinders

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A fully nonlinear domain decomposed solver is proposed for efficient computations of wave loads on surface piercing structures in the time domain. A fully nonlinear potential flow solver was combined with a fully nonlinear Navier–Stokes/VOF solver via generalized coupling zones of arbitrary shape. Sensitivity tests of the extent of the inner Navier–Stokes/VOF domain were carried out. Numerical computations of wave loads on surface piercing circular cylinders at intermediate water depths are presented. Four different test cases of increasing complexity were considered; 1) weakly nonlinear regular waves on a sloping bed, 2) phase-focused irregular waves on a flat bed, 3) irregular waves on a sloping bed and 4) multidirectional irregular waves on a sloping bed. For all cases, the free surface elevation and the inline force were successfully compared against experimental measurements.