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Nonlinearity, Viscosity and Air-Compressibility Effects on the Helmholtz Resonant Wave Motion Generated by an Oscillating Twin Body in a Free Surface[1] PALANISWAMY ANANTHAKRISHNAN, Florida Atlantic University — The problem is of practical relevance in determining the motion response of multi-hull and air-cushion vehicles in high seas and in littoral waters. The linear inviscid problem without surface pressure has been well studied in the past. In the present work, the nonlinear wave-body interaction problem is solved using finite-difference methods based on boundary-fitted coordinates. The inviscid nonlinear problem is tackled using the mixed Eulerian-Lagrangian formulation and the solution of the incompressible Navier-Stokes equations governing the viscous problem using a fractional-step method. The pressure variation in the air cushion is modeled using the isentropic gas equation pV^{γ} = Constant. Results show that viscosity and free-surface nonlinearity significantly affect the hydrodynamic force and the wave motion at the resonant Helmholtz frequency (at which the primary wave motion is the vertical oscillation of the mean surface in between the bodies). Air compressibility suppresses the Helmholtz oscillation and enhances the wave radiation.

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