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A. David Trubatch* (david.trubatch@montclair.edu), NJ. *Developing a program for systematic investigation of asymptotic nonlinear wave equations by direct numerical simulation of full fluid equations.* Preliminary report.

We present an outline for a program of systematic investigation of nonlinear wave equations, obtained by asymptotic analysis of the Navier-Stokes (NS) equation, as governing equations for waves in the full NS system. The PARIS Simulator code, currently under development, provides a platform for direct numerical simulation of surface and internal wave motion in fluids, as solutions of NS in three dimensions, with sharp fluid-fluid interfaces or and/or free surfaces. In such simulations, initial conditions and system parameters can be set precisely, including experimentally unobtainable, but theoretically useful, configurations such as zero viscosity and periodic boundary conditions. Moreover, all elements of the simulation can be varied systematically so as to reveal the range of validity of reduced equations in distinct asymptotic regimes, as well as the emergence of new dynamics in transition regions. (Received January 29, 2019)