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Ian T Tice* (ian.t.tice@gmail.com), Universite Paris-Est Creteil, LAMA, 61 Avenue du General de Gaulle, 94010 Creteil Cedex, France. *Global well-posedness and decay for the viscous surface wave problem without surface tension.*

We study the incompressible, gravity-driven Navier-Stokes equations in three dimensional domains with free upper boundaries and fixed lower boundaries, in both the horizontally periodic and non-periodic settings. The effect of surface tension is not included. We employ a novel two-tier nonlinear energy method that couples the boundedness of certain high-regularity norms to the algebraic decay of lower-regularity norms. The algebraic decay allows us to balance the growth of the highest order derivatives of the free surface function, which then allows us to derive a priori estimates for solutions. We then prove local well-posedness in our energy space, which yields global well-posedness and decay. The novel LWP theory is established through the study of the linear Stokes problem in moving domains. This is joint work with Yan Guo. (Received September 20, 2011)