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Vladimir E Zakharov* (zakharov@math.arizona.edu), Department of Mathematics,
University of Arizona, 617 N. Santa Rita Ave., P.O. Box 210089, Tucson, AZ 85721-0089, and
Alexander I Dyachenko. *Hydrodynamics with free surface in conformal coordinates.*

Mathematical aspects of hydrodynamics of ideal fluid with free surface are still sufficiently enigmatic. The coupling coefficient for four-wave interaction in 1-D geometry is identically zero. For some classes of initial data the evolution equation describing the fluid dynamics have extra constants of motion. Strongly nonlinear traveling waves in a pure capillary case (the Crapper waves) are expressed explicitly in elementary functions. Why it happens? Maybe, these equations are integrable, at least partly? We studied free-surface hydrodynamics, performing at any moment of time the conformal mapping of filled by fluid area to the lower half-plane. The analytic study of obtained equations made it possible to answer some questions and formulate the new ones. Equations in conformal variables are very much suitable for numeric modeling. During this simulation we observed many interesting phenomena like collision of envelope solitons or formation of freak waves due to modulational instability of Stokes waves. (Received February 06, 2006)