1027-76-196 **V E Zakharov*** (zakharov@math.arizona.edu), Department of Mathematics, University of Arizona, 617 N Santa Rita Ave, Tucson, AZ. *Free-surface hydrodynamics in conformal variables.*

I study the Euler equations for potential flow of ideal incompressible fluid with free surface in 2D geometry. The fluid is infinitely deep, thus one can perform conformal mapping of the domain filled by fluid to the lower half-plane. The surface dynamics is formulated in terms of two equations imposed on two analytic functions — conformal map and complex potential. The equations have a Hamiltonian structure, which is non-canonical. Both functions can be continued to the upper half-plane. The surface dynamics is defined completely by evolution of the upper-plane singularities. The poles of both functions are persistent, and the residue in the poles are constants of motions. However, zeros of the function are not persistent. They are "seeds" for growing cuts. The dynamics can be described approximately until the cuts are narrow. The system of equations has a rich family of self-similar solutions describing formation of surface singularities in a finite time. For almost flat surface the equation could be essentially simplified. In absence of gravity and surface tension the dynamics of almost flat surface is described by the integrable Hopf's equation. The equation in conformal variables are good for numerical simulation and can be applied to study of freak wave formation. (Received February 27, 2007)