Mathematics, Statistics, and Computer Science **@ UIC**

Analysis and Applied Mathematics Seminar

New Integrals of Motion and Singularities in 2D Fluid Dynamics with Free Surface

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Abstract: We study the problem of 2D incompressible fluid dynamics with free surface, we assume the the fluid is ideal and the flow is potential. Following the conformal mapping technique we reformulate the problem to surface variables and demonstrate the existence of previously undiscovered constants of motion associated with singularities in the analytic continuation of conformal map and complex potential. In numerical simulations we recover the analytic structure of the surface shape and observe simple poles and branch point singularities of the square-root type. We use the Alpert-Greengard-Hagstrom method to recover the location, type and magnitude of the singularities. We show how the approach of square-root type singularities may be responsible for the breaking of waves in the ocean, following the nonlinear stage of modulational instability.

Monday, March 19 at 4:00 PM in SEO 636