Poster title: *Approximate equations for the water wave problem in the shallow water limit on unbounded domains*

Poster abstract : A free boundary, water wave problem is studied for an irrotational, inviscid, and incompressible fluid. Specifically, we describe a derivation of approximate equations in the shallow water limit using a non-local formulation, introduced in [3] via a normal-to-tangential operator, in two related settings. One is the classical, whole line case, and another is a half line case, which physically is represented by putting up a tall and impenetrable barrier in the middle, so that all the fluid is flowing to one side. In both settings, non-local formulations yield expressions for the surface elevation, from which the appropriate wave and Boussinesq equations, as well as new approximations are obtained. We present a numerical algorithm using the non-local formulation, and the utility of a normal-to-tangential operator is examined via its numerical error, along with comparison to DNO [2] and AFM [1] formulations. Connections between the two settings are explored, and a number of interesting differences are noted.

References

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[2] W. Craig and C. Sulem, *Numerical simulation of gravity waves*, Journal of Computational Physics (1993).

[3] K. Oliveras and V. Vasan, *A new equation describing travelling water waves*, Journal of Fluid Mechanics (2013).