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Hamiltonian aspects of multilayer flows

Tuesday, June 29, 2021 11:30 AM (40 minutes)

The theory of Hamiltonian PDEs will be applied to study evolution equations deduced from the Euler equations in the incompressibility regime by means of suitable vertical-averaging and asymptotic expansion processes. We shall consider two and three layers sharply stratified flows in an infinite 2D channel. A Hamiltonian structure introduced by T.-B. Benjamin will be reviewed and specialised to the models. We shall show how to reduce the full 2D Hamiltonian picture to 1D averaged equations and discuss conservation laws in the long wave dispersionless limit, with a view towards the inclusion of dispersive terms. The Boussinesq approximation of neglecting density differences in the fluids' inertia will be then applied to the leading order equations, showing the equivalence of the two-layer system with the shallow-water Airy system (a/k/a dispersionless NLS). Time permitting, we shall finally discuss time evolutions from a class of suitable initial data.

This is a report of joint ongoing works with R.A. Camassa (UNC - Chapel Hill), G. Ortenzi (Milano-Bicocca), M. Pedroni (Bergamo) and others.

Primary author: Prof. FALQUI, Gregorio (Dipartimento di Matematica e Applicazioni Universita' di Milano-Bicocca)

Co-authors: G., Ortenzi (Milano-Bicocca); M., Pedroni (Bergamo); CAMASSA, R. A. (UNC - Chapel Hill)

Presenter: Prof. FALQUI, Gregorio (Dipartimento di Matematica e Applicazioni Universita' di Milano-Bicocca)