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Nonlinear hydroelastic waves in a compressed ice sheet

This study concerns the motion of nonlinear hydroelastic waves along a compressed ice sheet lying on top of a two-dimensional fluid of infinite depth. Applying techniques of Hamiltonian perturbation theory, a Hamiltonian Dysthe equation is derived for the slowly varying envelope of modulated wavetrains. The derivation is further complicated by the presence of cubic resonances. A Birkhoff normal form transformation is introduced to eliminate non-resonant triads while accommodating resonant ones. Numerical solutions constructed from the Dysthe equation are compared to direct simulations of the full Euler system, and very good agreement is observed.

This is a joint work with Philippe Guyenne and Adilbek Kairzhan.