

INSTITUTUL DE MATEMATICA “SIMION STOILOW” AL ACADEMIEI ROMANE

Conferința lunară

*Some three-dimensional nonlinear
geophysical flows and their instabilities*

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la sediul **IMAR**, amfiteatrul “Miron Nicolescu”, parter

Abstract: This talk reviews some recent mathematical research activity in the field of nonlinear geophysical water waves. We survey a number of exact Gerstner-like solutions - nonlinear, three-dimensional solutions which are explicit in terms of Lagrangian variables - and some exact, steady solutions of the geophysical free boundary problem within the Eulerian framework, representing purely azimuthal flows that do not vary in the azimuthal direction but allow arbitrary variations with depth. The short-wavelength method appears to be an efficient and rigorous mathematical tool to study the stability of geophysical flows. To detect instabilities, it is sufficient to make a clever choice for the initial position and direction of the wave vector that is likely to give an exponentially growing amplitude vector. The method has been applied to geophysical Gerstner-type solutions which have been shown to be unstable when the wave profiles are steep enough. On the other hand, for certain physically realistic velocity profiles, steady flows moving only in the azimuthal direction are locally stable to the short-wavelength perturbations.