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FIRST IN CHANGE

Analysis and PDE Seminar

Professor Slim Ibrahim
Department of Mathematics & Statistics, University of Victoria

TITLE: Stable singularity formation for the inviscid Primitive equations

Date : May 14th, 2025 (Wednesday)
Time : 12noon-1pm (Hong Kong time)
1pm-2pm (Korea time)

Link to ZOOM : https://cuhk.zoom.us/j/99008163597
Meeting ID : 990 0816 3597
Password : 219834

Abstract. The primitive equations (PEs) model the large-scale dynamics of the oceans and the atmosphere. While it is by now well known that the three-dimensional viscous PEs are globally well posed in Sobolev spaces, and that there are solutions to the inviscid PEs (also called the hydrostatic Euler equations) that develop singularities in finite time, the qualitative description of the blowup remains undiscovered. In this talk, we provide a full description of two blow-up mechanisms, for a reduced PDE that is satisfied by a class of particular solutions to the PEs. In the first one a shock forms, and pressure effects are subleading, but in a critical way: they localize the singularity closer and closer to the boundary near the blow-up time (with a logarithmic-in-time law). This first mechanism involves a smooth blow-up profile and is stable among smooth enough solutions. In the second one the pressure effects are fully negligible; this dynamics involves a two-parameter family of non-smooth profiles, and is stable only by smoother perturbations. At the end, I will briefly discuss how the results extend when the system is coupled with a density equation. These are joint works with C. Collot, Q. Lin, Titi and Qian.

All are welcome

This is a joint activity organized by Department of Mathematics, The Chinese University of Hong Kong, Hong Kong; Department of Mathematics, Institute of Mathematical Research, Research Division of Mathematical and Statistical Science, The University of Hong Kong, Hong Kong; and Department of Mathematical Sciences, Ulsan National Institute of Science and Technology, Korea. More details can be found in https://hkumath.hku.hk/~imr/event/CUHK_HKU_UNIST_Analysis_and_PDE/index.php.