The Inviscid Primitive Equations and the Effect of Fast Rotation

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Abstract

Large scale dynamics of the oceans and the atmosphere are governed by the primitive equation (PE). It is well-known that the three-dimensional viscous PE is globally well-posed in Sobolev spaces. In this talk, I will discuss the ill-posedness in Sobolev spaces, the local well-posedness in the space of analytic functions, and the finite-time blowup of solutions to the three-dimensional inviscid PE (also known as the hydrostatic Euler equations) with rotation (Coriolis force). Eventually, I will also show, in the case of "well-prepared" analytic initial data, the regularizing effect of the Coriolis force by providing a lower bound for the life-span of the solutions which grows toward infinity with the rotation rate. The latter is achieved by a delicate analysis of a simple limit resonant system whose solution approximates the corresponding solution of the 3D inviscid PE with the same initial data. In addition, and if time allows I will discuss Onsager's conjecture in the context of the inviscid primitive equations.