

# On the Question of Global Regularity for Three-dimensional Navier-Stokes Equations and Relevant Geophysical Models

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## Abstract

The basic problem faced in geophysical fluid dynamics is that a mathematical description based only on fundamental physical principles, the so-called the “Primitive Equations”, is often prohibitively expensive computationally, and hard to study analytically. In this talk I will survey the main obstacles in proving the global regularity for the three-dimensional Navier-Stokes equations and their geophysical counterparts. Even though the Primitive Equations look as if they are more difficult to study analytically than the three-dimensional Navier-Stokes equations I will show in this talk that they have a unique global (in time) regular solution for all initial data.

Inspired by this work I will also provide a new global regularity criterion for the three-dimensional Navier-Stokes equations involving the pressure.

This is a joint work with Chongsheng Cao.