

**Mathematical and computational problems related to  
the equations of the atmosphere and the oceans**

Abstract: In this series of lectures we will present the so-called Primitive Equations (PEs) of the oceans and the atmosphere and discuss a number of computational and theoretical questions regarding these equations. A particular emphasis will be on the issue of the boundary conditions in the nonviscous case in relation with limited areas models.

**Lecture 1 (graduate)**

**The zeroth mode of the Primitive Equations**

This lecture will deal with the zero-order mode for the PEs, in relation with a certain expansion of the PEs in the vertical direction. In the linearized case we obtain a system similar to the incompressible Euler equations of fluid mechanics, but different in many respects. It will be a chalk and blackboard lecture with all details given.

**Lecture 2 (colloquium)**

**The atmosphere - ices - oceans system: Its complexity, its modelling**

This lecture prepared in collaboration with physicist Robert Dautray, will be the preview of a lecture to be given at the French Academy of Sciences. After some brief historical remarks, we will describe, in general terms, some of the computational, mathematical and physical challenges related to the modelling and the numerical simulations of the atmosphere - ices - oceans system.

**Lecture 3 (colloquium)**

**The inviscid primitive equations of the atmosphere and the oceans  
in a limited domain**

In this lecture we will present the inviscid primitive equations of the atmosphere and of the oceans, and describe some mathematical and numerical issues related to these equations: existence and uniqueness of solutions for the linearized equations, numerical simulations for the linearized and the full non linear equations; the issue of the boundary conditions for limited areas simulations.