Numerical forecasting systems for geophysical fluids and for climate

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Résumé

The evolution of geophysical fluids (atmosphere, ocean, surface and ground water...) has important consequences, either in the short term (e.g. weather forecast), or in the longer term (e.g. climate change, water resource management). Forecasting this evolution is thus a major challenge from the scientific, economic, and human standpoints. Numerical and computational tools are omnipresent and play a fundamental role in these fields of research, in order to better understand the behaviour of these geophysical systems, and to design efficient numerical forecasting systems.

A number of specific features are shared by such applications: interaction of different scales, multi-component aspects, chaotic behaviour, heterogeneous sources of information (models, measurements, images), uniqueness of each event... The development of efficient forecasting systems for these applications therefore requires taking these features into account, a goal which covers several challenging aspects in terms of mathematical and numerical modelling, inverse modelling (data assimilation), quantification of uncertainties, and high performance computing.

In this talk, we will present a general survey of this field of computational sciences, with specific illustrations on some present research topics.

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