Séminaire **Mardi** 25 mars 2014 **11:00h** / Seminar **Tuesday** March 25th 2014 **11:00h**

Sujet/Subject: Time integration schemes for numerical weather prediction

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Résumé/Abstract:

Recent work on time integration methods will be presented. The aim of this research has been to explore suitable time-stepping techniques for use in new atmospheric models being developed at RPN. As is the case with any numerical discretisation, the balancing of accuracy, stability and efficiency is crucial. The proposed methods have been analysed both theoretically and with numerical simulations in a number of experimental frameworks.

Two different approaches are considered. The first is a family of semi-implicit predictor-corrector methods. Similar to the traditional semi-implicit schemes widely used in forecasting models, fast linear terms in the governing equations are treated implicitly to allow for stable simulations with long time-steps. The remaining terms are then treated with a predictor-corrector technique instead of the standard leapfrog approach. This largely removes the problems associated with spurious computational modes and leads to more robust and stable integrations.

In addition, an emerging class of time schemes known as exponential integration methods will be discussed. These have been applied in a number of diverse fields as they offer very high accuracy and stability, while recent progress in computational linear algebra has led to great improvements in their efficiency. Preliminary work on their application to numerical weather prediction will be presented.