Séminaire vendredi le 6 avr 2018 11:00 / Seminar Friday Apr 6th 2018 11:00h

Sujet/Subjet: The New GEM Dynamical Core with Height-Based Vertical Coordinate

Langue/language : Anglais/English

Conférenciers/Lecturers: **Syed Husain (RPN-A)**
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Résumé/Abstract

At present, the dynamical core of the GEM model employs a log-hydrostatic-pressure-type vertical coordinate. Such a coordinate system permits the use of a direct solver for the discretized elliptic problem to resolve the dynamical component of the flow. However, for very high spatial resolution, e.g., for sub-kilometer horizontal grid spacing, the model is found to exhibit strong numerical instability – particularly over complex terrains where the mountain slopes can become substantially steep with increasing model resolution. With the growing demand for very high-resolution operational NWP systems, improving model stability over steep mountains has become an imperative for RPN.

Previous experience with the Mesoscale Compressible Community model at ECCC suggests that a dynamical core based on height-type vertical coordinate may be less susceptible to severe orography-induced instability. Furthermore, tests performed on the new high performance computing infrastructure shows that the existing direct solver approach in GEM loses its scalability for a very large number of processor cores. This implies that in order to take advantage of very large number of processor cores to integrate each model dynamical step, a highly optimized iterative solver will be essential in future. Such a requirement negates one of the most attractive aspects of the existing mass-based vertical coordinate system. All of these factors have motivated the development of a new dynamical core for the GEM model that utilizes a height-based vertical coordinate.

An overview of the newly-developed GEM dynamical core along with some results pertaining to a number of theoretical test cases as well as three-dimensional atmospheric flow will be presented at the seminar.