Contribution ID: **52** Type: **30 minute oral presentation**

Towards a new dynamical kernel in GEM

Thursday, 27 September 2018 10:00 (30 minutes)

The increasing resolution of operational models leads to scalability concerns for most operational NWP centres in the world. Moreover, massively parallel systems with hundreds of thousands cores along with new computing architectures (such as GPUs) are strong incentives for improving our current fully-implicit semi-Lagrangian (FISL) methods. Those two schemes have the characteristics of being non-local algorithms and they are inherently communication intensive, and therefore difficult to optimize. This is currently driving the search for alternative numerical techniques that would allow for a large time step, local computing properties, high arithmetic intensity and minimal parallel communication footprint. In searching for an exponential time integrator to replace the traditional FISL schemes, our colleague esteemed Stéphane Gaudreault has developed a parallel implementation (MPI/OpenMP) of the exponential propagation iterative (EPI) method in the Global Environmental Multiscale (GEM) model with the Yin-Yang overset grid. Initial results with the shallow water equations and idealized test cases with the non-hydrostatic Euler equations look very promising. The next steps are to assemble a complete 3D model with results comparable to GEM-FISL and to port the resulting code on GPUs.

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Track Classification: 18th Workshop on high performance computing in meteorology