High-resolution results of the GEM Model

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• Largest feasible GEM global on new HPC
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The global forecast is based on the two-way nesting method between 2-limited area models.

GEM Model

- Horizontal discretization: Finite differencing on Arakawa-C grid
- Vertical discretization: Charney Phillips grid with a log-like zeta-coordinate
- 2 time-level semi-Lagrangian fully implicit scheme
- The elliptic problem on the Yin-Yang grid is solved by using the Schwarz iterative method
- Full physics
- Explicit horizontal diffusion
GEM scalability on the new supercomputer

790 compute nodes

36 processors / node

Therefore:

**Max of 28440 cores available**
GEM Yin-Yang Setup for Scalability Tests

144 Timesteps

Grid Resolution: .047 degree

Using between:
3276 to 27594 cores
GEM Yin-Yang grid:
Each LAM core: 5999 x 2000 pts

<table>
<thead>
<tr>
<th>Processor Topology Npex X Npey</th>
<th>Total Nodes used</th>
<th>Total # of CPUs</th>
<th>Local tile size: Ni x Nj</th>
<th>Total CPU time (seconds)</th>
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Highest Resolution GEM Yin-Yang run to fit into the new HPC

Grid size of Yin/Yang:

Grd_{ni} = 10035, Grd_{nj}=3370

Resolution = 0.0282 degrees (3.1 kms)

- Alberta clipper : initialized at 1200 UTC 5 January 2015
- 5 day forecast , time step = 90 sec
- Total Wall clock run = 7hrs + 9min
- Processor Topology per LAM grid: (279 x 50 x 1)
- Total CPUS = 27900 (775 nodes)
Global Yin-Yang (3.1km) grid, 5 day forecast: 1200 UTC Jan. 5, 2015
(El) Out-going Infrared energy exiting the atmosphere, (UV) Wind speed

GY_EI+UV_Globe_4K.mp4
Highest Resolution GEM LAM run to fit into the new HPC

Grid size of LAM:

Grd_{ni} = 12022, Grd_{nj}=6162

Resolution = 0.00480 degrees (533.33 metres)

• Alberta Clipper low: initialized at 1200 UTC 26 Jan 2015
• 48 hour forecast, time step = 12 sec
• Wall clock = 16hrs
• Processor Topology : (188 x 151 x 1)
• Total CPUS = 28388 (789 nodes)
National LAM grid (533m), 48H forecast: 1200 UTC Jan. 26, 2015
(ZEC) Maximum Equivalent Radar Reflectivity, (PR) 15 min Accumulated Precipitation

LU_ZEC+PR_4K.mp4
Thank-you

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