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Parallelization and Performance of the NIM Weather Model Running on GPUs

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The Non-hydrostatic Icosahedral Model (NIM) is a global weather prediction model being developed to run on the GPU and MIC fine-grain architectures. The model dynamics, written in Fortran, was initially parallelized for GPUs in 2009 using the F2C-ACC compiler and demonstrated good results running on a single GPU. Subsequent efforts have focused on (1) running efficiently on multiple GPUs, (2) parallelization of NIM for Intel-MIC using openMP, (3) assessing commercial Fortran GPU compilers now available from Cray, PGI and CAPS, (4) keeping the model up to date with the latest scientific development while maintaining a single source performance portable code, and (5) parallelization of two physics packages used in the NIM: the operational Global Forecast System (GFS) used operationally, and the widely used Weather Research and Forecast (WRF) model physics. The presentation will touch on each of these efforts, but highlight improvements in parallel performance of the NIM running on the Titan GPU cluster at ORNL, the ongong parallelization of model physics, and a recent evaluation of commercial GPU compilers using the F2C-ACC compiler as the baseline.