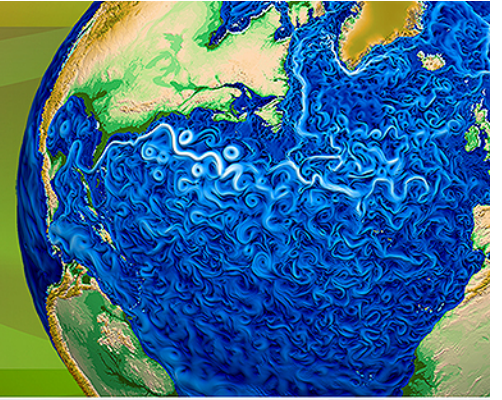




Accelerated Climate Modeling
for Energy



ACME Performance Group Progress and Plans

Phil Jones and Pat Worley

Accomplishments

- Nested threading in atmosphere
 - Exposes additional parallelism
 - 1.2-1.7x speedup for atm/Ind (F case on Mira)
 - Should have much larger impact on Cori, Aurora (KNL)
- GPU acceleration of atmosphere dynamics
 - Improvement of 2x (K20), 2.4x (Interlagos) for transport
 - Improvement of 1.9x (32 elements/node), 2.2x (64) for dynamics
 - More expected from PGI bug fix, improving data exchange overlap
- Threading in ocean
 - Combined ACME, SUPER, Multi-scale efforts
- I/O improvements
 - PIO2 implemented and in testing

Accomplishments

- Performance capture and monitoring
 - Useful in debugging
 - Integration with workflow
- Benchmarking and optimizing experimental configurations
 - Coarse resolution water cycle: throughput of 10 SYPD (Edison)
 - High-res water cycle in progress
- Much effort in debugging
- Proposals for additional resources
 - Compute cycles: INCITE, ALCC, ERCAP
 - LEAP (6 months), Exascale (in review): forward-looking, including new algorithms, programming models

Plans for year

- Continued benchmarking, configuration optimization
 - Document and improve throughput, esp. for high-res water cycle
 - Identify/eliminate bottlenecks when possible
 - Configuration: PE layouts, build/runtime parameters, compiler flags, etc.
- Prep for Corip2 and Summit
 - Nested threading in atm, harden threading for MPAS
 - Vectorization throughout
 - Harden OpenACC in atm, implement OpenACC in MPAS
- I/O
 - Complete testing, tune PIO2
- Inter-node
 - Messaging optimization in each component, coupler
 - Load balancing, esp. in MPAS components
- Coordinate with Exascale, LEAP projects
 - New algorithms (transport, MMF)
 - New programming models (Kokkos, Legion)