The Next Generation Global Prediction System (NGGPS)

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Poster #15

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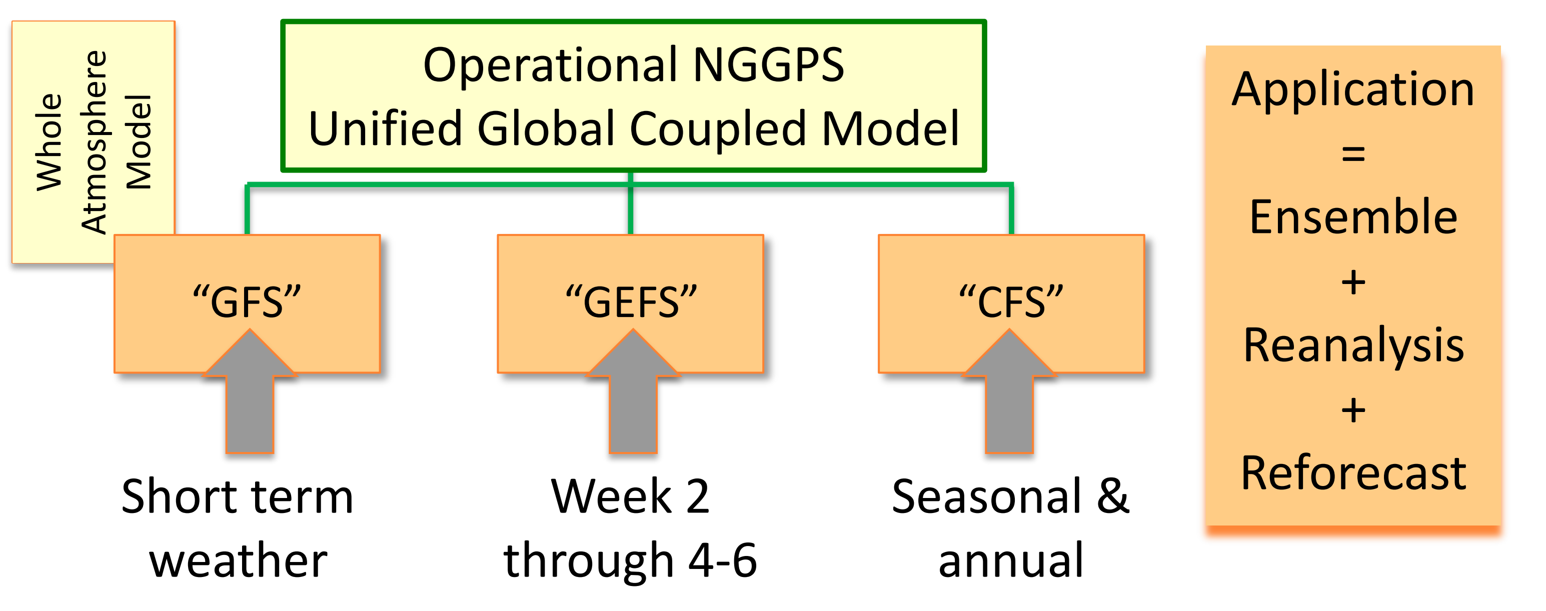
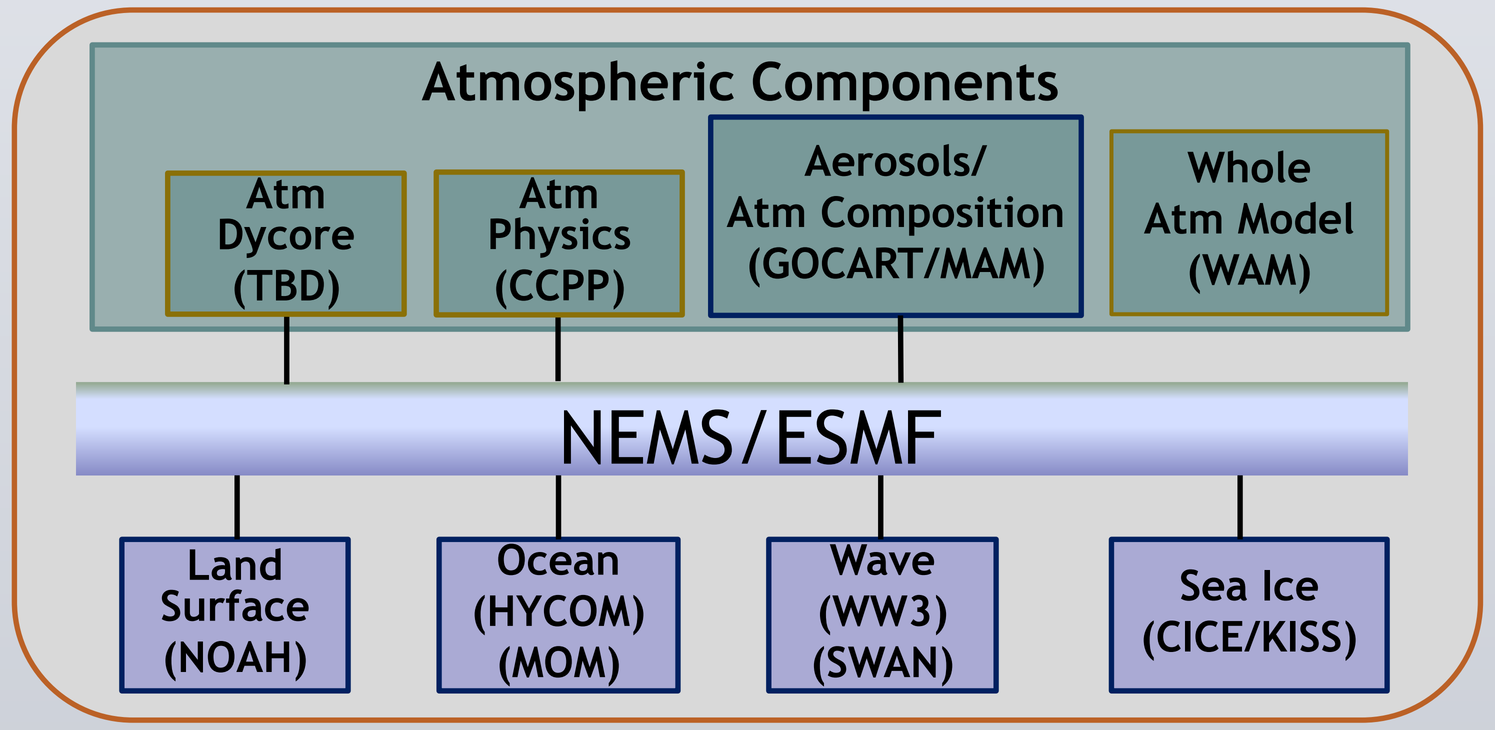
Unified Model Concept



Proposed Model Components



NGGPS is accelerating development efforts both inside and outside NWS. Developers are identifying and refining model components for the new coupled modeling system, coupling them through NEMS, and improving data assimilation and post-processing.

Global Modeling Test Bed (GMTB)

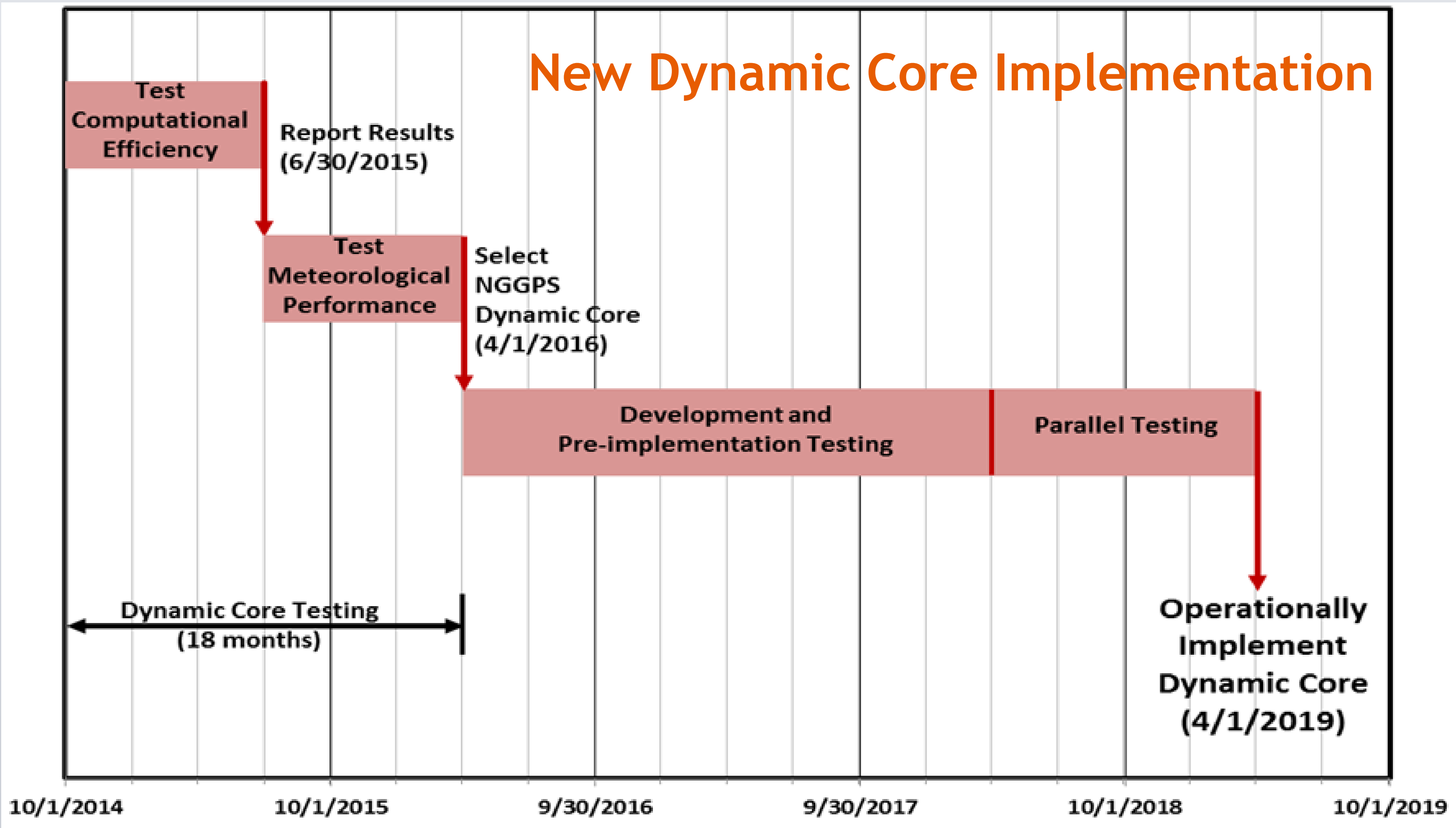
An extension of the Developmental Testbed Center (DTC) to foster community involvement in ongoing development of NGGPS model components, provide a pre-implementation and independent testing platform, and facilitate code access by the community. Initial GMTB tasking includes:

- Code management, testing, and user support for a common community physics package
- Code management and user support for interoperable physics driver
- Integration, testing and improvement of a sea ice model for NGGPS

Strategy and Goals

The NWS Research to Operations (R2O) initiative's five year plan is to upgrade the current operational Global Forecast System (GFS) to run as a unified, fully-coupled Next Generation Global Prediction System (NGGPS) within NEMS (NOAA Environmental Modeling System) infrastructure. Using advanced high performance computing architectures, the system will incorporate the most recent advances in weather prediction modeling from NOAA and the research community.

- Implement a weather-scale, fully-coupled NWP System
- Extend forecast skill beyond 8 to 10 days
- Improve hurricane track and intensity forecast
- Extend weather forecasting to 30 days



Community Participation

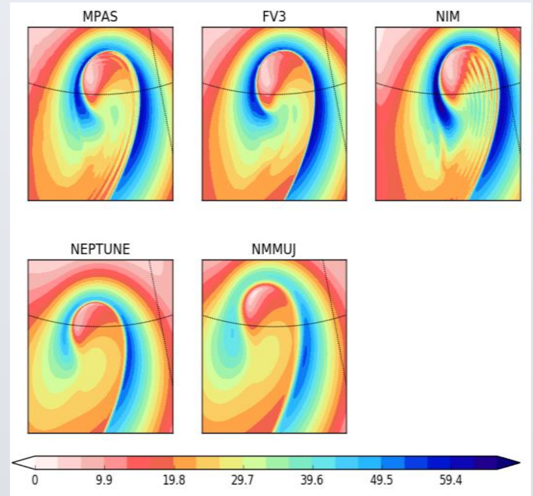
As a community modeling effort, over $6.3M has been awarded to university and Federal PIs, fostering collaboration between universities, internal weather test beds and Federal laboratories.

Selecting a Dynamic Core

Phase 1: **Idealized testing, computational performance and scalability testing** on five atmospheric dynamic cores from existing research and operational models, leveraging High Impact Weather Prediction Project (HIWPP) non-hydrostatic dynamic core testing.

Baroclinic wave test with embedded fronts (DCMIP 4.1)

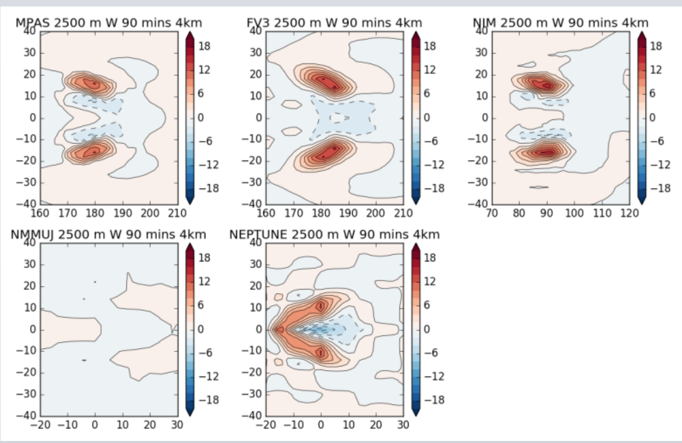
- Dynamics strongly forces solution to shortest resolvable scales
- Shows impact of truncation error near quasi-singular points on computational grid ("grid imprinting")
- 15/30/60/120 km horizontal resolutions with 30 and 60 vertical levels



Baroclinic Wave (Sfc Wind Speed at Day 9, 15-km resolution)

Idealized supercell thunderstorm on a reduced-radius sphere:

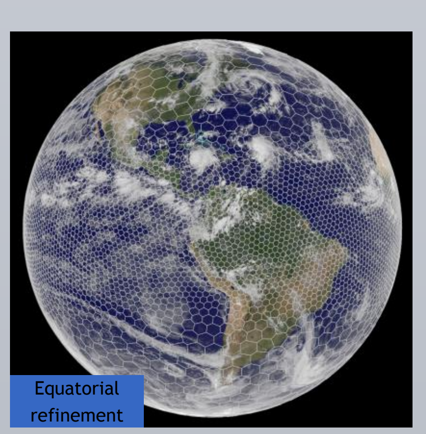
- Convection is initiated with a warm bubble in a convectively unstable sounding in vertical shear
- Simple Kessler warm-rain microphysics, free-slip lower boundary (no boundary layer)
- Splitting supercell storms result after 1-2 hours of integration
- 0.5/1/2/4 km horizontal resolutions



Supercell (2500-m w at 90 minutes, 4-km resolution) model output of a split system

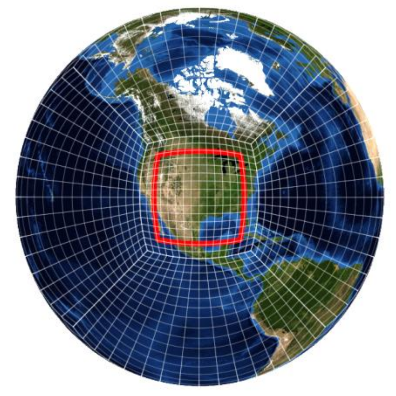
Phase 1 Results Summary: Evaluations demonstrated that two dynamic cores consistently produced solutions of higher quality and/or were more mature, providing a low technical risk for a down select. No unique dynamic core quality will be lost when the two candidate cores proceed to Phase 2 testing.

MPAS and FV3 provided the most consistent results and will continue to Phase 2.



MPAS (Model for Prediction Across Scales) from NCAR offers global meshes with local refinement

The FV3 (Finite Volume), from GFDL offers grid stretching and 2-way nesting



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