Outline of Current Strategic Plan for HFIP
2015-2019

HFIP Overall Strategy
Near term: next 5 years

- Investigate increase in error growth rate beyond 4-5 days

- Use global models at as high a resolution as possible to forecast track out to 7 days

- Use regional models at 1-3 km resolution to predict inner core structure to meet intensity goals out to 5 days including rapid intensification

- Hybrid DA for both regional and global models using as much hurricane scale satellite and aircraft data as possible

- Both regional and global models run as ensembles

- Statistical post processing of model output to further increase forecast skill

- Eventually HWRF will evolve into a global model with multiple moving nests

Numerical Model Hurricane Forecast Guidance System for 2019

Component	Specifications
Global model ensemble with multiple interactive moving nests using hybrid data assimilation	• 20 member ensemble at 18 km, global model, 6 and 2 km for inner moving nests • Multi Model (at least two – FIM, GSF, Navy?) • Use all available aircraft and satellite data in core and near environment of hurricane • Run out to 7 days or more
Statistical Post Processing	**LGEM, SHIPS, SPICE, others**

FY 15 Milestones

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- Continued development of the HWRF/COAMPS-TC multi-model ensemble system. Real-time test in summer of 2015
- Operational implementation of high-resolution global GFS(15 km) using semi-implicit time differencing
- Development of new model products for forecasters (at least one per year)
- Test new high resolution physics package in HWRF Demo system
- Test assimilation of various new sources of satellite data into regional hurricane models
- HWRF operational model upgrade (June)
    - Increase horizontal resolution to 2km and vertical resolution to 64 levels
    - Replace POM with HyCOM
    - Coupling to wave model
    - Coupling to NOAH (for NCEP, Oregon State University, Air Force, Hydrologic Research Lab/NWS) land surface model (LSM)
    - Advanced Microphysics
    - Assimilation of microwave/infrared (IR) cloudy radiance and the Geostationary Operational Environmental Satellite Atmospheric Motion Vectors (GOES AMVs)
- Experimental downstream applications for Wave, Surge and Hydrological models
- Transition HWRF to NMMB/NEMS framework and conduct real-time testing (HFIP Stream 1.5/2.0)
- Improve physics and further improve HWRF data assimilation/initialization system—hybrid DA
- Retrospective testing of regional model components of multi-model ensemble for Stream 1.5
- Conduct demonstration experiment (Aug 1-Oct 30) routine operations such as regional and global ensembles at higher resolution
- Continued development of global models and regional models and their ensembles
- Continued development of physics packages for both global and regional models
- Experiment with coupled ocean-atmosphere models and new global data sets (such as COSMIC) to reduce rate of growth of track error growth after day 5 in global model to improve 7 day forecast

FY 16 Milestones

- Operational Implementation HWRF/COAMPS-TC multi-model ensemble system
- Operational Implementation of the hybrid GFS semi-implicit global high resolution ensemble (T574)
- Development of new model products for forecasters (at least one per year)
- Test new high resolution physics package in HWRF demonstration system
- Test assimilation of various new sources of satellite data into regional hurricane models
- HWRF operational model upgrade (June)
  - Implementation of basin-scale NMMB HWRF with multiple nests
  - Atmosphere-ocean-wave-surge-land-hydrology coupled modeling system in NMMB/NEMS framework
  - High-Resolution Physics upgrades
  - DA upgrades
- Experimental 7-day forecasts and tropical cyclogenesis
- Experimental HWRF ensembles in NEMS framework (HFIP Stream 1.5/2.0)
- Retrospective testing of regional model components of multi-model ensemble (HWRF/ COAMPS-TC) for Stream 1.5
- Conduct demonstration experiment (Aug 1-Oct 30) routine operations such as regional and global ensembles at higher resolution
- Continued development of global models and regional models and their ensembles
- Continued development of physics packages for both global and regional models
- Experiment with coupled ocean-atmosphere models and new global data sets to reduce rate of growth of track error growth after day 5 in global models to improve 7 day forecast

FY 17 Milestones

- Development of new model products for forecasters (at least one per year)
- Initial retrospective testing of 10 km FIM
- HWRF operational model upgrade (June),
  - Improved physics, and advanced data assimilation system
  - Testing of global-scale NMMB HWRF with multiple nests
- Testing of new aircraft observation strategies for improved model initialization
- Retro testing of regional model components of multi-model ensemble system (HWRF/COAMPS-TC) Stream 1.5
- Conduct demonstration experiment (Aug 1-Oct 30)
  - 15 km real-time global ensemble (20 member)
  - 6-10 member multi-member regional ensemble some with bias correction
  - High-resolution experimental HWRF with EnKF DA using inner core observations and radar data when available and improved use of satellite data at other times
  - Stream 1.5 components (multi-model ensemble, high-resolution global ensemble (20 km))
  - Testing of new products from regional multi-model ensemble and global ensemble for forecasters.
- Focus development of global models on one or two (to be determined) selected models and regional models (WRF, COAMPS-TC, Wisconsin model) and their ensembles
- Continued development of physics packages for both global and regional models
- Pre-implementation testing of new DA in operations (EnKF, 4D-VAR, hybrid)
- Pre-implementation testing of inner core data assimilation based vortex initialization

FY 18 Milestones

- HWRF Upgrades
  - Global NMMB/NEMS with multiple high-resolution nests
  - Dynamic and adaptive nesting for genesis cases
  - High-resolution ensembles of nests within the global framework
  - Fully cycled EnKF/3D- 4D-VAR DA with advanced satellite DA
  - Continuous advancement of physics for multi-scale interactions
  - Warn-on-forecast capability for land-falling TCs within a global model framework
  - Forecasts for tropical cyclones of all ocean basins

FY 19 Milestones

- Full Operational implementation of the system described in the first slide by the hurricane season of 2019