Family of Service Meeting

NCEP Update

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WHERE AMERICA'S CLIMATE AND WEATHER SERVICES BEGIN

Agenda

- **NOAA Center for Weather and Climate Prediction**

- **Central Computer System**

- **Review of 2008 implementations**

- **Proposed 2009 implementations**

- **Proposed National Environmental Modeling System**

NOAA Center for Weather and Climate Prediction

Occupant space >268,000 RSF

Work space for >800 Federal employees, contractors, and visiting scientists

- 5 NCEP Centers
- NESDIS research and satellite services
- OAR Air Resources Laboratory

Schedule

Start	May 2007
Move Start	Sep 2009
Move Complete	Jan 2010

NCWCP – June 2007

MAY 29 2007

NCWCP – Dec 2008

CCS - Research &Development

- ## Gaithersburg, MD (NCEP)
  - ### IBM Supercomputer Systems (Power 5+/Power 6)
    - 8.7/20 TFlops Linpack sustained
    - 1392 P5+/1248 P6 processors, 2.7/4.8 TB of memory, 160/160 TB disk space, 5.5/9.7/13.2 PB Nearline tape storage in 2007/2008/2009

- ## Princeton, NJ (GFDL)
  - ### SGI Supercomputer System
    - 5248 Itanium processors, 10.3 TB of memory, 516 TB of disk space, 6.8 PB of Nearline tape storage

- ## Boulder, CO (GSD)
  - ### Appro Supercomputer System
    - 1440 Woodcrest Xeon processors, 1.5 TB of memory, 168 TB of disk space, 0.5 PB of Nearline tape storage

CCS - Production Systems

- # Gaithersburg, MD (primary) and Fairmont, WV (backup) (**Last upgrade Jan 07**)
  - 15.5 Tflops Linpack sustained per system
  - 156 Power 5+ Nodes
  - 2,496 processors (16 per node), 1.9 gigahertz speed)
  - 4,736 gigabytes of shared memory
  - 160 terabytes of disk space
  - 13 PB tape archive

CCS Upgrade

- **Gaithersburg (primary) and Fairmont (backup) Operations** (**Operational July 09**)
  - 69.7 Tflops Linpack sustained per system[*] (15.5 Tflops Linpack)
  - 156 Power 6 Nodes (148 Power 5+ Nodes)
  - 4,992 4.7 GHz processors (2,368 1.9 GHz)
  - 19,722 GB shared memory (4,736 GB)
  - 160 TB of disk space (150 TB)
  - 13 PB tape archive (unchanged)

  *Ranked #36 worldwide as of Nov 2008 (http://www.top500.org/list/2008/11/100)

Product On-Time Percentage

Model Delivery to AWIPS/NOAAPort

Yearly Average (2006-2008): 270s 80s 65s

Legend:
- AWIPS Decoded Lag
- TOC Lag
- NCEP Delay

Y-axis: Average Monthly Lag (Minutes)
X-axis: Month

New NCF Uplink Server

Replacement Gateway Operational

12 Minute Goal
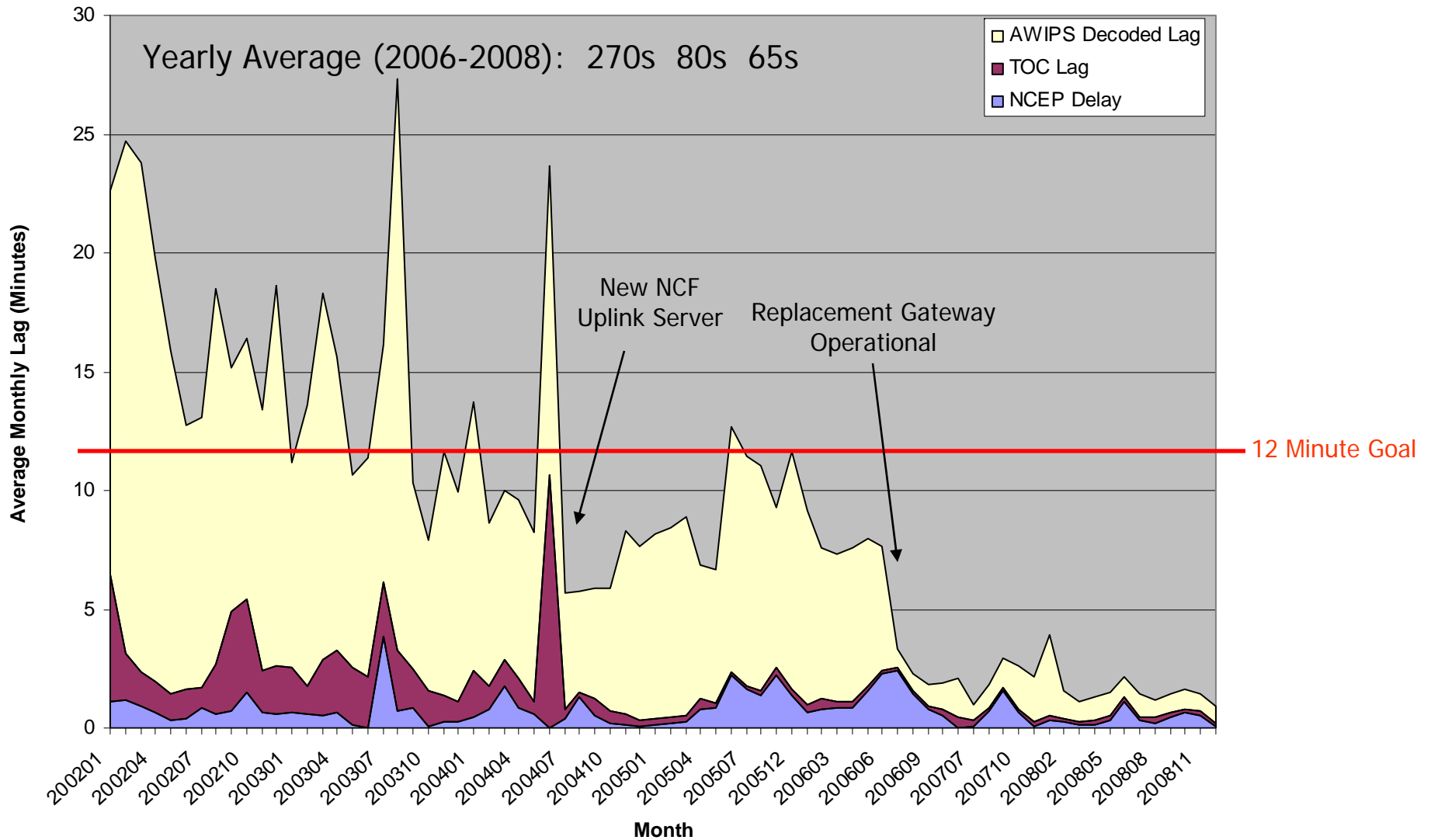
Notification of Upcoming Implementations

NCO WEB Site

http://www.nco.ncep.noaa.gov/pmb/changes/

Model Evaluation Mailing List

Notification of availability of test data for major model upgrades:

https://lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.modelevalinfo

Weekly Change Memo

List of every module, script, or data flow change:

https://lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.jifmemo

2008 Implementations

Change	Planned	Actual
Global Forecast System (GFS) Add new observational data sources Windsat, NOAA18 SBUV Upgrade GSI Analysis	3rd Qtr FY08	12 Dec 08 2nd Qtr 09
NAM - Expand Domain by 18%, upgrade GSI, WRF Model upgrades (Gravity wave drag, et al) - Upgrade GSI (improve CRTM, add TAMDAR, partial cycling to retain large scales), WRF Model upgrades	2nd Qtr FY08 4th Qtr FY08	21 Mar 08 12 Dec 08

2008 Implementations

Change	Planned	Actual
Ocean Modeling Great Lakes Wave Wave Ensemble	 2nd Qtr FY08 3rd Qtr FY08	 21 Mar 08 20 Jun 08
Climate Forecast System	2nd Qtr FY08	18 Jan 08
Hurricane Modeling HWRF upgrade GFDL	3rd Qtr FY08	 06 Jun 08 08 Aug 08

2008 Implementations

Change	Planned	Actual
Air Quality Forecast Aerosol chemistry included with gas-phase run. Improved planetary boundary layer coupling with NAM turb profiles. Improved convective mixing of pollutants from NAM precip forecasts. Initial developmental global dust forecasts. Testing of gas-phase AQ forecasts over Alaska and Hawaii.	4th Qtr FY08	13 May 08
Smoke Improved source term speciation from USFS fire smoke emission system. Experimental testing of smoke forecasts over Alaska and Hawaii.		15 Sep 08

2008 Implementations

Change	Planned	Actual
Real-Time Mesoscale Analysis		
-RTMA upgrade, 5 km CONUS Grids, 6 km Alaska grids	2nd Qtr FY08	11 Apr 08
- Hawaii and Puerto Rico	4th Qtr FY08	03 Oct 08
- Unify and upgrade CONUS and AK with HI and PR	4th Qtr FY08	09 Dec 08
RUC Assimilation of additional data sources (Level II Radar, TAMDAR), upgrade radiation, convection, and land-sea parameterization	3rd Qtr FY08	06 Nov 08

2008 Implementations

Change	Planned	Actual
SREF	1st Qtr FY09	Delayed to 3rd Qtr FY09

2009 Implementations

Change	Planned	Actual
Moratorium for CCS Upgrade	18 Dec 08 – Jun 09	
GSI - Add IASI long wave brightness temperatures; improve computational efficiency; new version of CRTM_GFSGSI for radiative transfer; change background error variances and standard deviations; variational QC - Add NOAA 18 SBUV (ozone only)	*2nd Qtr FY09* 3rd Qtr FY09	
SREF - Increase resolution of WRF-NMM, WRF-ARW and RSM to 32 km - Expand bias correction from CONUS to North America; statistical downscaling using 12 km NAM and using 5km RTMA	3rd Qtr FY09 4th Qtr FY09	

2009 Implementations

Change	Planned	Actual
GFS - Physics changes - Add ability to downscale GFS output (out to 8 days) to NDFD resolution; produce NDFD guidance grids for GU; add weather type parameter	3rd Qtr FY09 4th Qtr FY09	
HWRF - Include gravity drag and wind-driven sea spray	3rd Qtr FY09	
GEFS - Increase horizontal resolution T126->T190 for 4 daily cycles out to 384H; use 8th horizontal diffusion for all horizontal resolutions; introduce stochastic perturbation scheme	3rd Qtr FY09	
RUC - Extend forecast 18H; provide output every hour of forecast period	4th Qtr FY09	

2009 Implementations

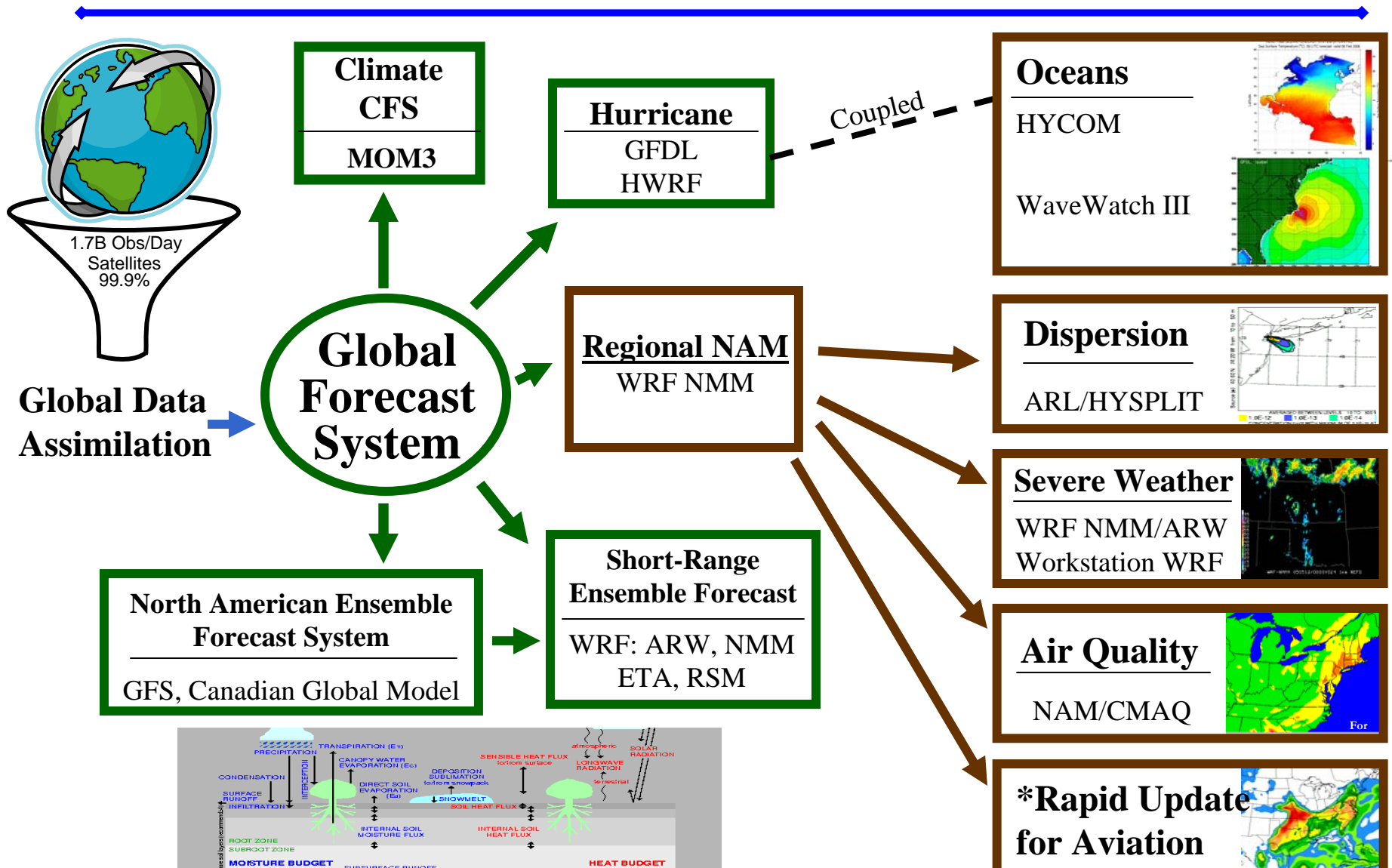| Change	Planned	Actual
RTMA - Add Guam 2.5 km NDFD grid; reduce RTMA grid spacing: CONUS from 5 km to 2.5 km, AK from 6 km to 3 km	4th Qtr FY09	
AQM - Add Ozone for AK; ozone and smoke for HI; add HYSPLIT smoke run for Hawaii; add CMAQ (sfc ozone) runs for AK and HI	4th Qtr FY09	
HYSPLIT - Upgrade dispersion model; include advanced physics, transport mechanisms, capability to deal with dust	4th Qtr FY09	

2009 Implementations

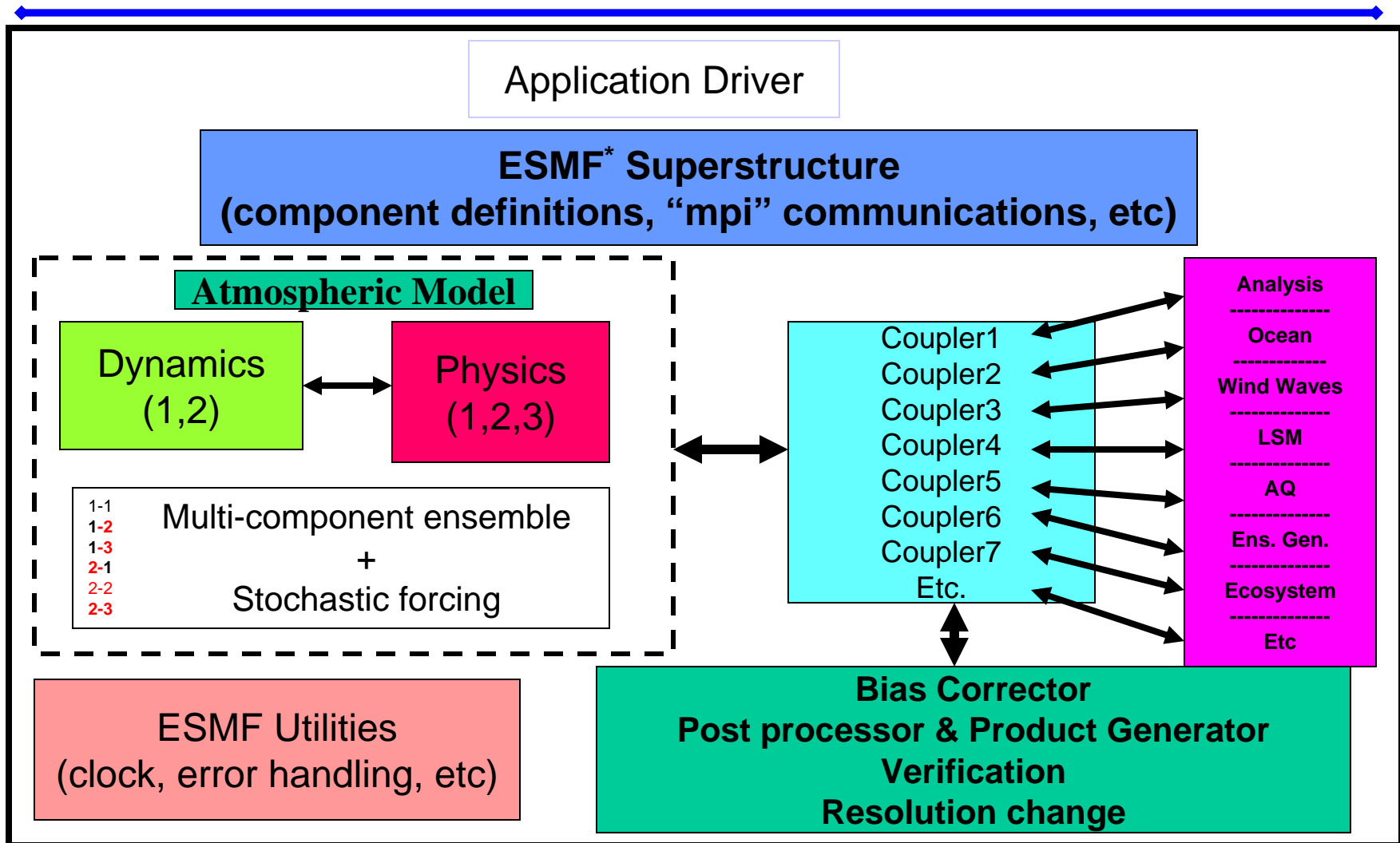| Change	Planned	Actual
Global Multi-Grid Wave Model - Generate GRIB2 output earlier in run; increase internal spectral model resolution; increase spectral resolution of point output	3rd Qtr FY09	
Hurricane Wave Model - Upgrade to new multi-grid model running global NAH and NPH grids as a single model	3rd Qtr FY09	
RTOFS - Add Jason-2 altimeter data; incremental upgrade of data assimilation schemes	3rd Qtr FY09	

NOAA's NWS Model Production Suite

1.7B Obs/Day Satellites 99.9%

Global Data Assimilation

Global Forecast System

Climate CFS

MOM3

Hurricane
GFDL
HWRF

Coupled

Oceans

HYCOM

WaveWatch III

Regional NAM
WRF NMM

Dispersion

ARL/HYSPLIT

Severe Weather

WRF NMM/ARW
Workstation WRF

North American Ensemble Forecast System

GFS, Canadian Global Model

Short-Range Ensemble Forecast

WRF: ARW, NMM
ETA, RSM

Air Quality

NAM/CMAQ

*Rapid Update for Aviation

NOAH Land Surface Model

* Will be ARW-based by 2009

National Environmental Modeling System (NEMS)
(uses standard ESMF compliant software)

Application Driver

**ESMF* Superstructure
(component definitions, "mpi" communications, etc)**

Atmospheric Model

Dynamics (1,2)

Physics (1,2,3)

1-1
1-2
1-3
2-1
2-2
2-3
Multi-component ensemble
+
Stochastic forcing

Coupler1
Coupler2
Coupler3
Coupler4
Coupler5
Coupler6
Coupler7
Etc.

Analysis

Ocean

Wind Waves

LSM

AQ

Ens. Gen.

Ecosystem

Etc

ESMF Utilities
(clock, error handling, etc)

**Bias Corrector
Post processor & Product Generator
Verification
Resolution change**

*Earth System Modeling Framework (NCAR/CISL, NASA/GMAO, Navy (NRL), NCEP/EMC), NOAA/GFDL

NCEP Production Suite
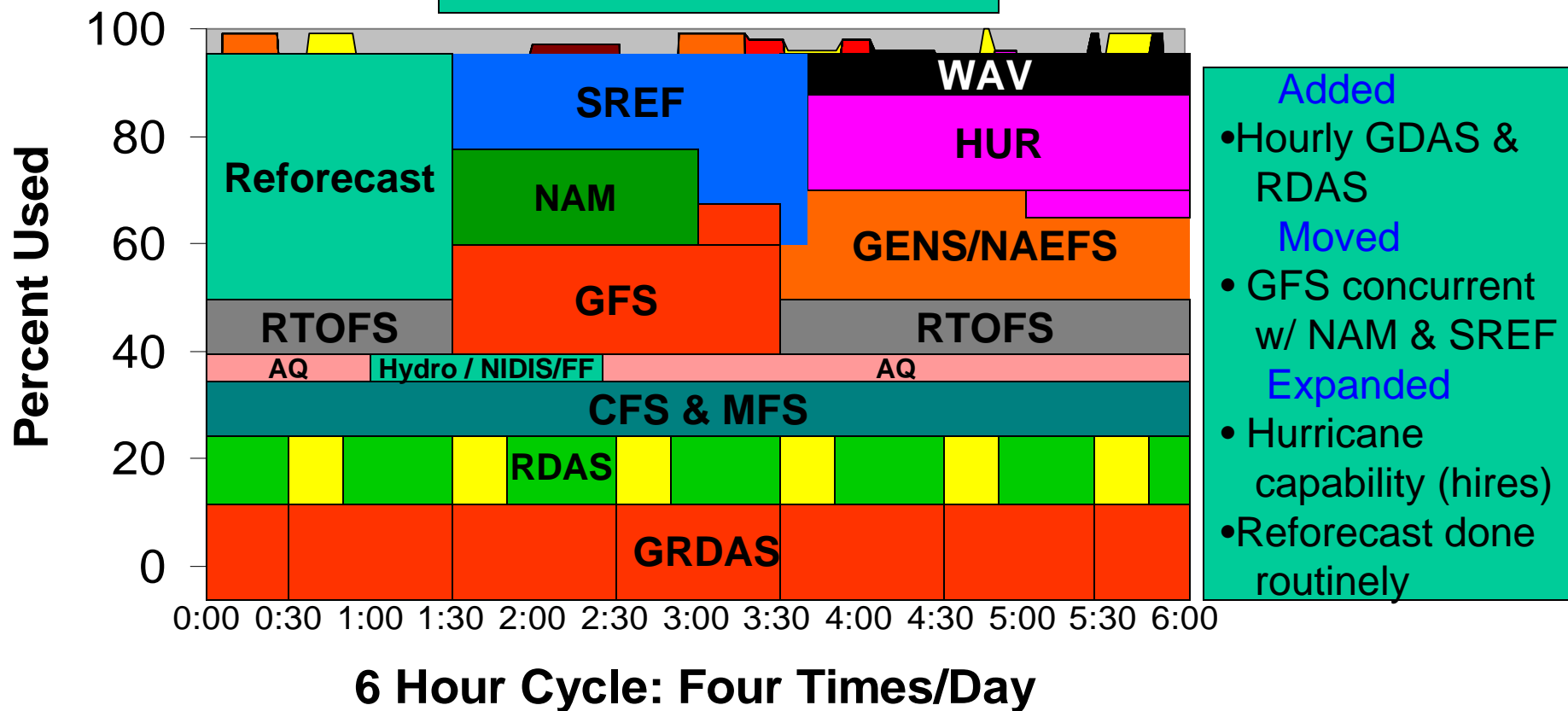Weather, Ocean, Land & Climate Forecast Systems

Current

NCEP Production Suite
Weather, Ocean, Land & Climate Forecast Systems

Next Generation Prototype
Phase 4 – 2015+

Computing factor: 81

Percent Used (y-axis: 0, 20, 40, 60, 80, 100)

Reforecast
RTOFS
AQ
SREF
NAM
GFS
Hydro / NIDIS/FF
WAV
HUR
GENS/NAEFS
RTOFS
AQ
CFS & MFS
RDAS
GRDAS
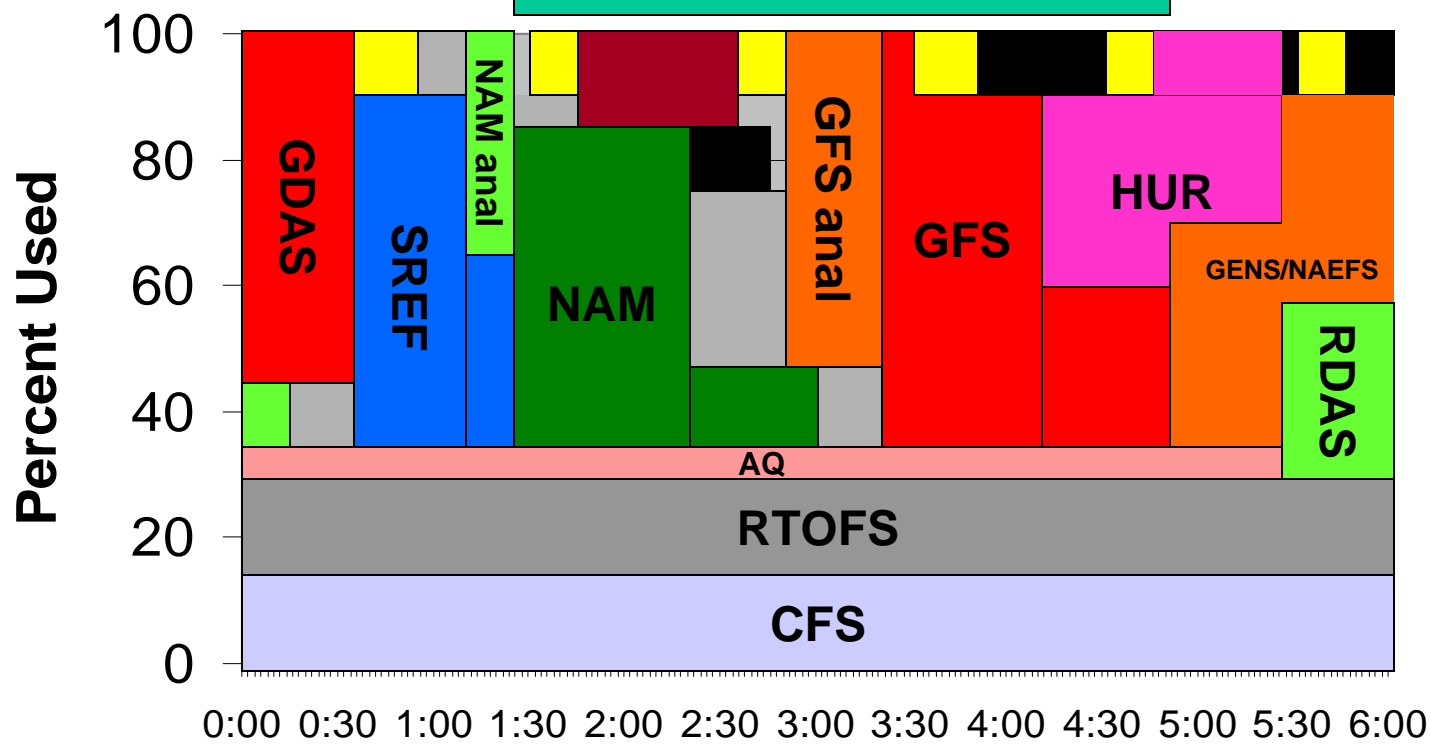
6 Hour Cycle: Four Times/Day

(x-axis: 0:00 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30 6:00)

Added
•Hourly GDAS & RDAS
Moved
• GFS concurrent w/ NAM & SREF
Expanded
• Hurricane capability (hires)
•Reforecast done routinely