FNMOC Ensemble Status and Plans

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Thanks to:

- Naval Research Lab scientists working on NOGAPS and the ensemble, especially Justin Mclay
- Steve Klotz, Department of Defense, High Performance Computer Modernization Program

Overview

- FNMOC EFS recent update history
- Current status
  - Current model description
  - Current file transfer status
- Current skill
- Planned updates

Recent Model Update History

- Feb 20, 2008 – FNMOC external server for NCEP receipt of EFS grids
- Apr 1, 2008 – Ensemble Transform initialization
- Mar 5, 2009 – FNMOC receiving NCEP WW3 ensemble
- Sep 23, 2009 – NAVDAS-AR 4D-Var data assimilation
- Sep 23, 2009 – Deterministic NOGAPS L42, top 0.04 mb
- Feb 10, 2010 – Banded Ensemble Transform
- Apr 2, 2010 – 20 members, 384 hr forecast
- May 19, 2010 – NOGAPS T319L42

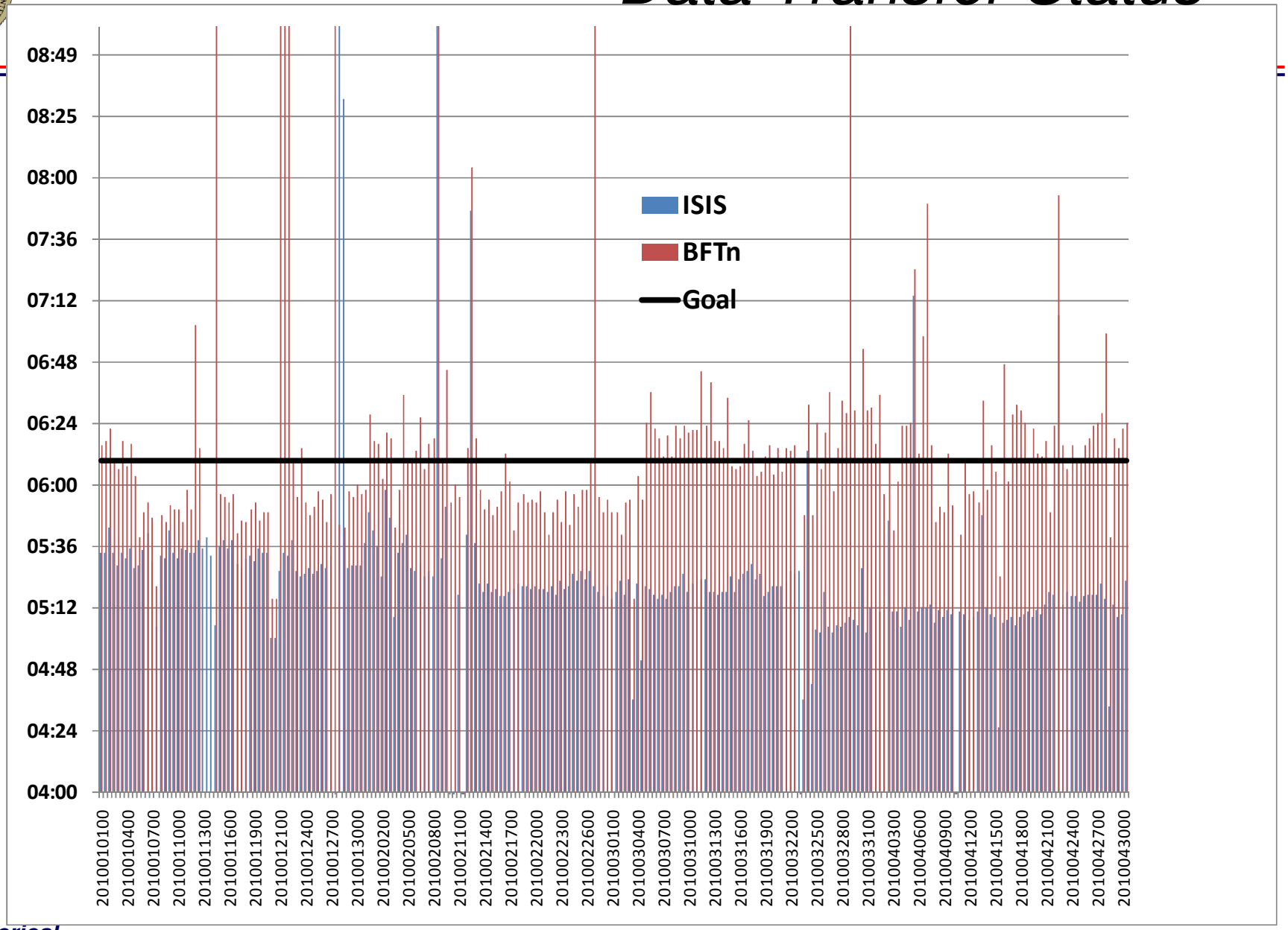
Current Status

- Navy Operational Global Atmospheric Prediction System (NOGAPS)
- Truncate deterministic model from T239L42
- T119 horizontal (~90 km), 30 levels vertical, top 1 mb
- 5 Latitude band ensemble transform initialization
- 6 hr update cycle (4 times per day)
- Forecasts at 00Z and 12Z
- Forecast length 384 hr
- 20 members
- WaveWatch 3 ensemble driven by surface winds from each NOGAPS ensemble member, 20 members, 240 hr forecast

Data Transfer Timing

- ET begins at +4:16
- First 10 NOGAPS members begin +4:22
- First grids written to ISIS +4:25
- First grids transferred to server for NCEP +4:30
- Second 10 NOGAPS members begin +4:51
- Last NOGAPS grids written to ISIS +5:26
- First 10 WW3 members begin +5:02
- Second 10 WW3 members begin +5:22
- Last grids transferred to server for NCEP +6:08
- Statistics and graphics completed by +6:27
- Last grid transferred to NWS gateway +6:30
- Last grid transferred to NCEP Operational system +7:20
- NCEP begins NAEFS product production +7:30

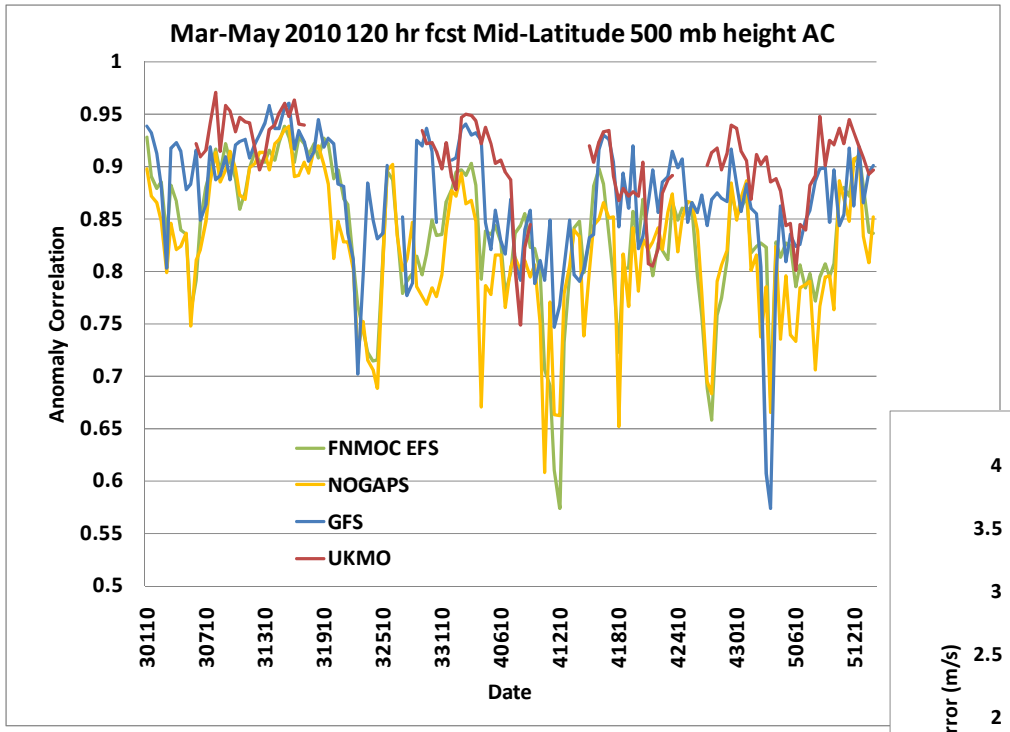
Data Transfer Status

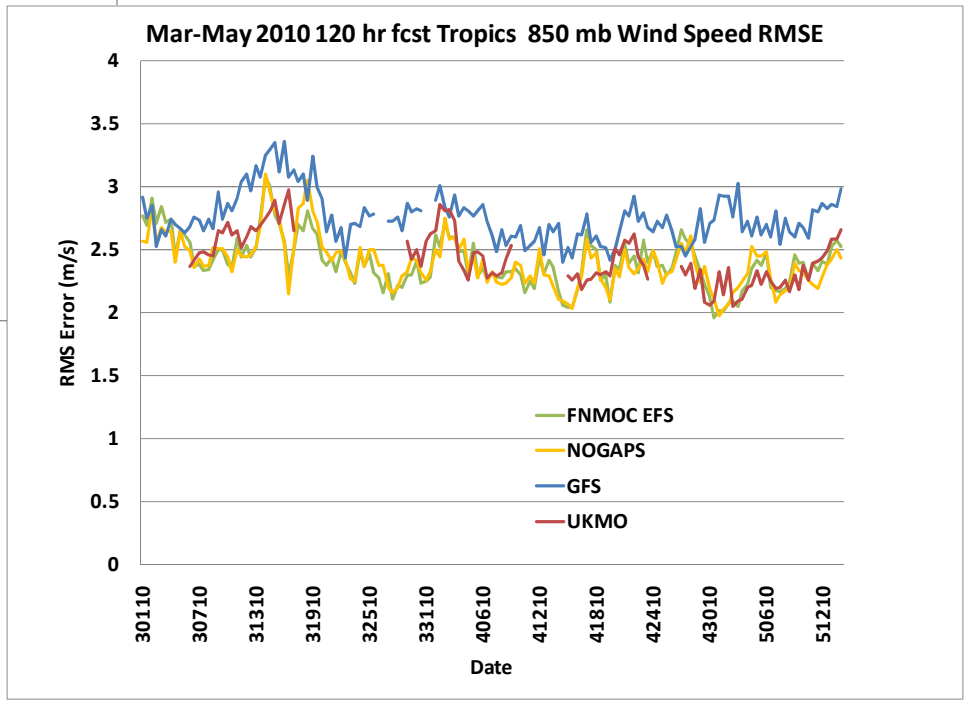


Current FNMOC EFS Skill

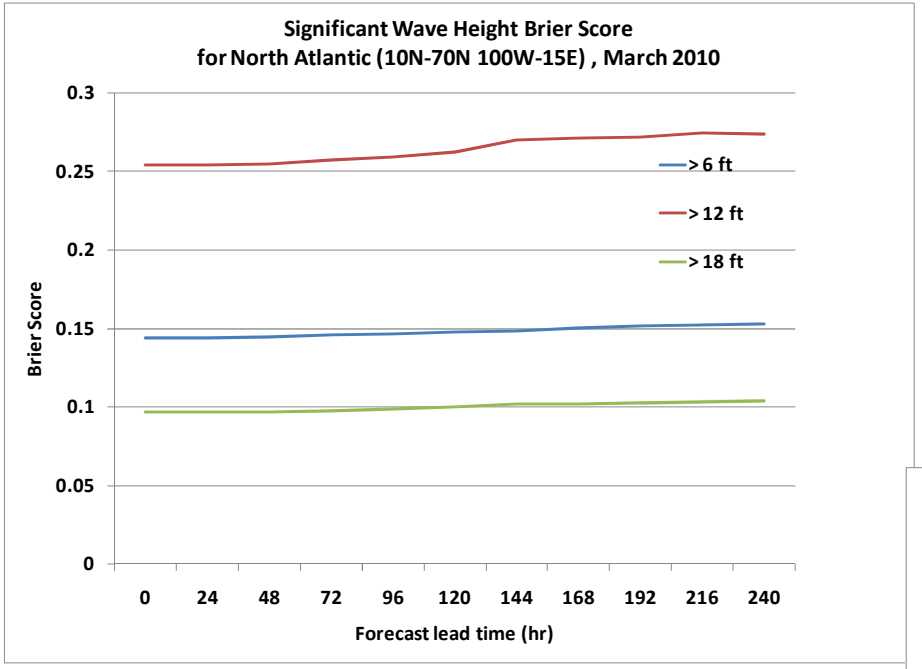
- Ensemble Mean Skill
- Ensemble Skill

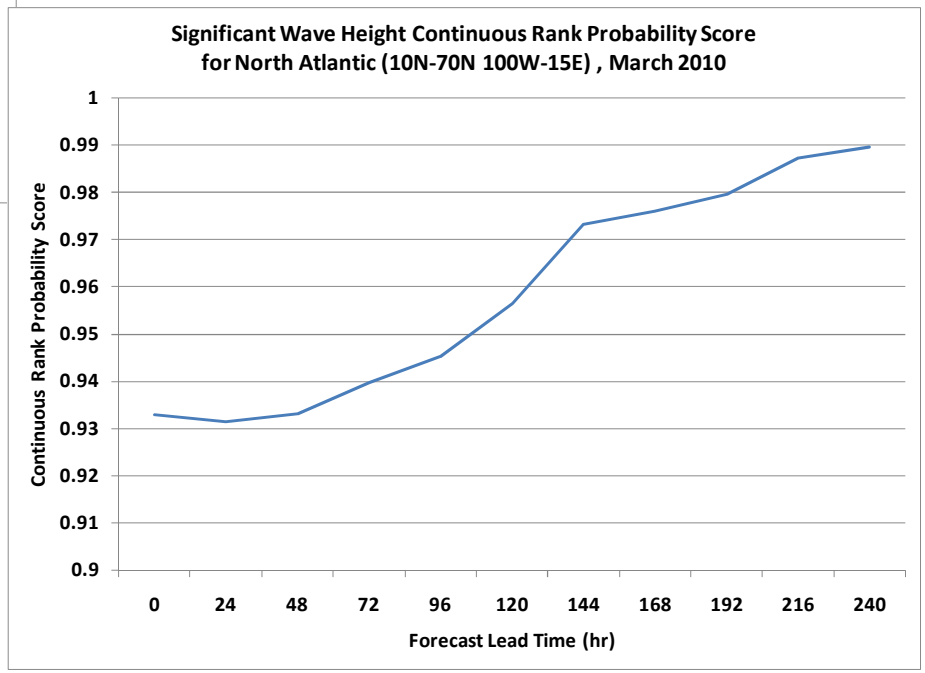
Recent Ensemble Mean Statistics vs Deterministic Models





FNMOC Wave Model Ensemble Scores





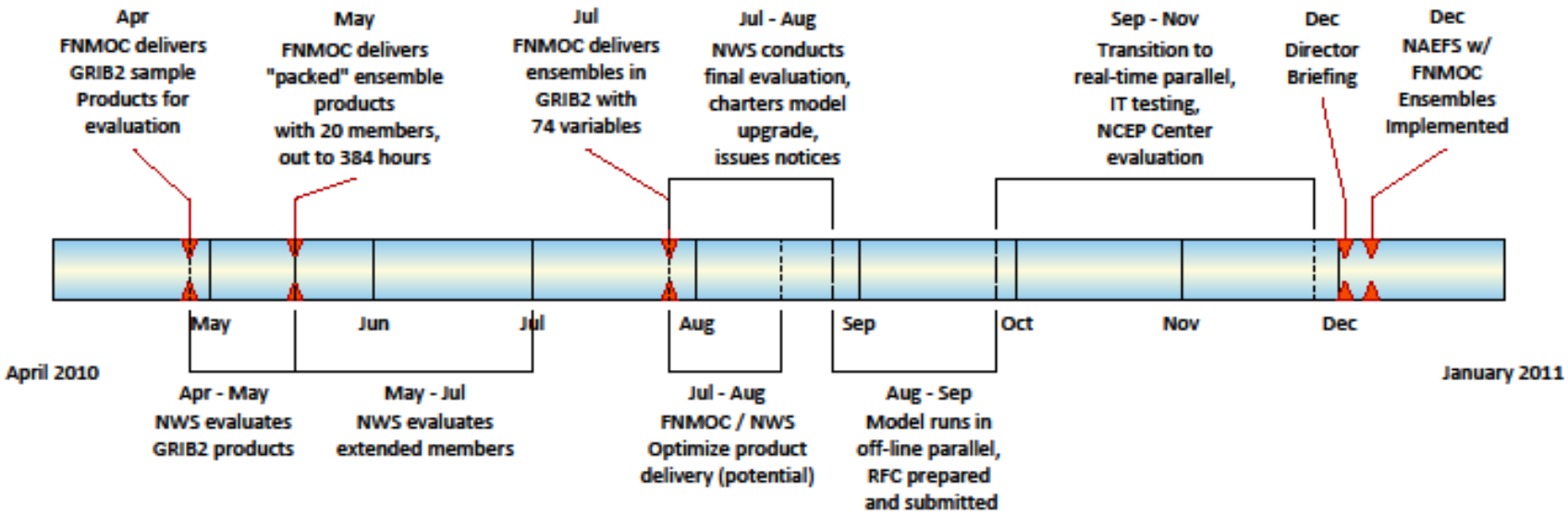
FNMOC Model Update Plans

- FNMOC Integration into NAEFS Timeline
- FNMOC NOGAPS and EFS Update Plans

North American Ensemble Forecast System
FNMOC Ensemble Integration Timeline

DRAFT – UNDER REVIEW

April 15, 2010



Risk:	Data transfer timeliness maintained after increasing members, variables, and hours
Mitigation:	COPC Network upgrade (complete), product "packing" transition to GRIB2 (May), FNMOC dissemination hardware upgrade (date TBD)
Risk:	Complete delivery of all GRIB2 fields
Mitigation:	NCEP-proposed packing scheme allows model to run with some missing data
Risk:	Data transfer reliability
Mitigation:	FNMOC dissemination hardware upgrade (date TBD)

Model Update Future

- May, 2010 – Deterministic NOGAPS T319L42
- May-June, 2010 – Improved data transfer technique, 20 members, 384 hr forecast
- June, 2010 – Tropical Storm Tracker for EFS
- July, 2010 – Begin transferring all variables (except fluxes), 20 members, 384 hour forecast, using GRIB2
- Sep, 2010 – 9 banded ET initialization and Stochastic Kinetic Energy Backscatter in EFS
- Oct, 2010 – Begin EFS Forecast vs obs verification
- Jan 2011 – EFS to T159L42 (may wait for SI/SL later in year)
- 2012 – T239L60 ensemble, T384L60 deterministic

Questions ?

BACK-UP SLIDES

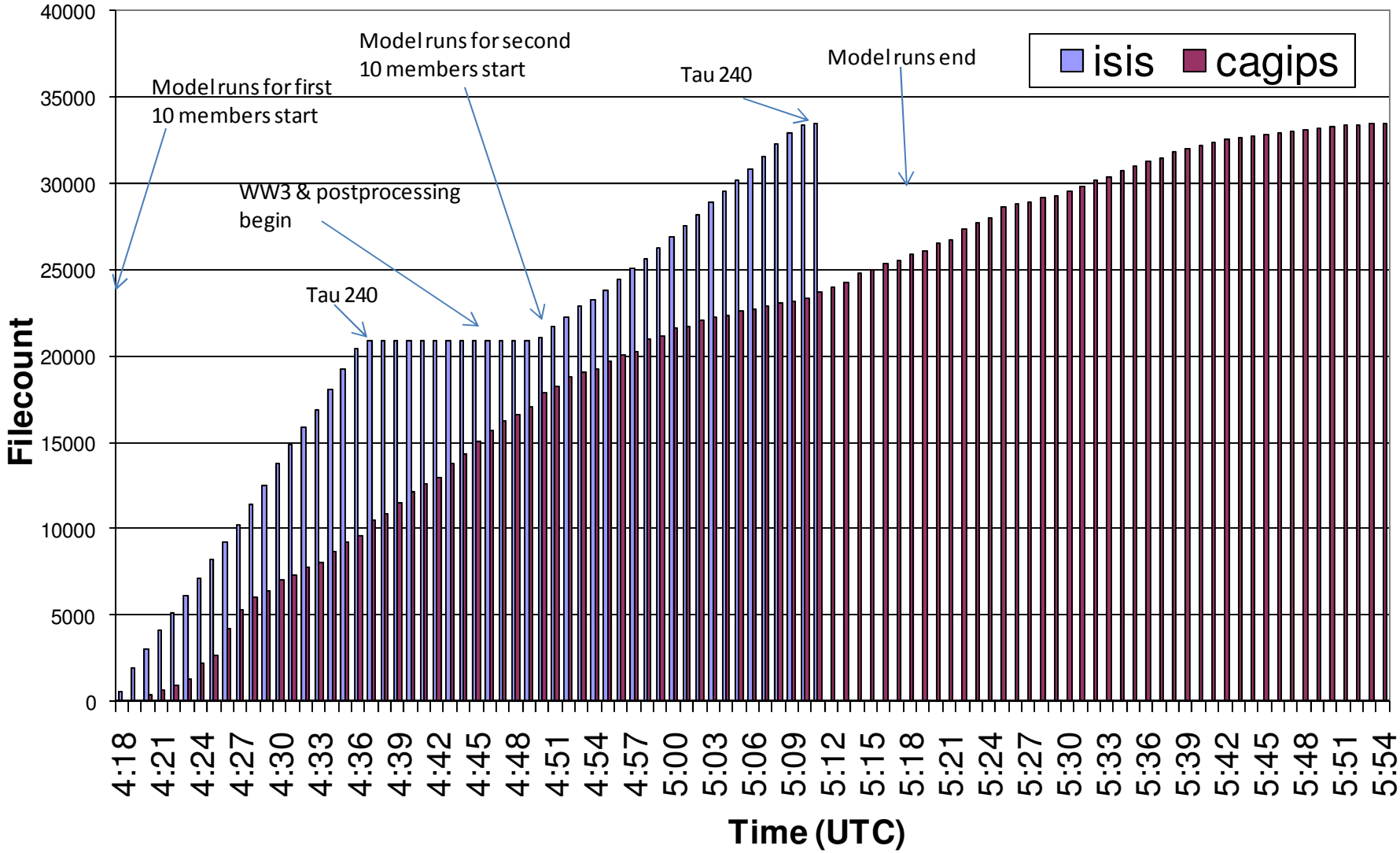
Banded Ensemble Transform

- Previously Ensemble Transform solved over entire globe
- Perturbations are actually different scale in different geographic regions
- Global ET results in initial perturbations (and early ensemble spread) too large in mid-latitudes, too small in tropics
- Currently solving ET separately over 5 latitude bands 90° to 60 ° south, 60 ° to 20 ° south, 20 ° south to 20 ° north, 20 ° to 60 ° north and 60 ° to 90 ° north
- Scale adjustment (0.3 multiplier) on perturbations in tropics applied to improve tropical storm track forecast
- 9 latitude bands or blocks in latitude and longitude are likely even better

FNMOC to NCEP NCO Data Transfer Route

- FNMOC EFS model to internal database (ISIS)
- ISIS to internal data server via CAGIPS
- Internal data server to external server via Bulk File Transfer (ftp)
- FNMOC external data server to NWS Telecommunications Operations Center (TOC) via wget over DATAMS-U
- TOC to NCEP NCO
- Improved FNMOC system will be direct from ISIS to external data server, controlled by operational run, not CAGIPS

NCEP ENSEMBLE: ISIS - CAGIPS Cumulative filecount comparison



Data Transfer Delay