NCEP PROJECT CHARTER

01/06/2015

Increasing Resolution and Other Changes for Global Ensemble Forecast System (GEFS v11.0.0)

Description:

The Global Ensemble Forecast System (GEFS) runs in the NCEP production suite on the NOAA Central Computer System. This system is developed and supported by the Environmental Modeling Center (EMC) and operated and managed by NCEP Central Operations (NCO). The GEFS also serves as a subset of a larger global ensemble system called the North American Ensemble Forecast System (NAEFS). Currently, the NAEFS consists of the NCEP GEFS and the Canadian Meteorological Centre's global ensemble system.

The objective of this project is to improve the probabilistic forecast skill of the GEFS, to reduce tropical storm track mean forecast errors. This objective will be accomplished by increasing model vertical resolution (42 levels to 64 levels for 0-384 hours) and increasing horizontal resolution (T254 to T_L574 for 0-192 hours, T190 to T_L382 for 192-384 hours) within GEFS. This project will incrementally improve the NCEP GEFS by increasing the resolution, improving model physics, improving model dynamics (using semi-Lagrangian to replace Euler scheme for time integration), using EnKF 6-hour forecast as initial perturbations and tuned stochastic perturbations four cycle times daily. This project is an NCEP Annual Operating Plan (AOP) milestone for the 3rd quarter of fiscal year 2015. The milestone maps to NCEP's strategic goal to produce and deliver the best products and services.

Scope:

The scope of the project includes:

- Use latest GFS model with new physics (GFS V12.0.0) replacing GFS V9.0.1
- Increase horizontal resolution from T254 (about 50-55km) to T_L574 (about 32-35km) for 0-192 hour forecasts, from T190 (about 70km) to T_L382 (about 50-55km) for 192-384 hours forecasts.
    - Additional 100% CPU resources for this change
- Increase vertical resolution from 42 levels to 64 levels for 0-384 hour forecasts.
    - Additional 50% CPU resources for this change (this will multiple to an additional resource of changed horizontal resolution)
- Initial perturbations (uncertainties)
    - Use EnKF f06 as initial perturbations
    - With Tropical Storm relocation
    - And perturbation centralization.
- Model perturbations (uncertainties)
    - Tuned stochastic total tendency perturbation (STTP)
    - Turn off (or stop) stochastic perturbation for log surface pressure
- Update ensemble based TC track and genesis to GRIB2 version
    - NCEP global ensemble
    - ECMWF global ensemble (restricted)
    - CMC global ensemble
    - FNMOC global ensemble

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- Use current NCEP-post version (should be new version – GRIB2)
- Use current ESMF version for concurrent generation of all members.
- File changes
  - Add 3-hourly postprocessing for 0-192 hours
  - Include at 1 degree resolution all variables now produced by GFS (at 1 and 0.5 degree resolution)
  - Add 0.5 degree output for selected fields during hours 0-192
    - Include a subset of the 0.5 degree products in the NAEFS data exchange in pgrb2a_hr
    - Include a larger subset of the 0.5 degree products for public distribution in pgrb2a_hr and pgrb2b_hr
    - Include all variables now used for SREF initial/boundary conditions, all not included above will be for local use only in pgrb2d_hr
  - Need 75 days notification of this changes (working on TIN)
- Public data access (ftpprod, nomads)
  - N/A
- GEMPAK
- HPSS archives
  - Add 0.5 degree products (New):
    - pgrb2ap5 to be archived for 5 years (Q: do we have 5-year archive?)
    - pgrb2bp5 to be archived for 2 years
    - pgrb2dp5 to be archived for 1 year
  - For exist archives
    - init to be archived permanently
    - sfcsig to be archived for 1 year
    - sflux to be archived for 1 year
    - pgrb2a to be archived permanently
    - pgrb2b to be archived for 2 years
    - pgrb2d to be archived for 1 year
    - ensstat to be archived permanently
    - track to be archived permanently
    - How about TS genies

The scope of the project does not include:

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The following areas of scope are uncertain or have not been fully defined:

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Major Deliverables:

Planning

- Project charter
- Scope statement
- Project schedule
- Sign-off package for plan acceptance
- List of subjective assessment participants

Scientific Test and Evaluation

- Subjective assessment results from participants
- Objective verification results
- Computational resource analysis (estimations)

Technical Test and Evaluation

- Code available to NCO
- Network, service and storage capacity analysis
- Product format and content analysis
- Parallel production runs
- Analysis of production resource and schedule impact

Review

- Mid-term and final scientific implementation briefing
- Mid-term and final technical implementation briefing
- Signed implementation approval memorandum

Implementation

- TOC change notification
- Change requests in PMB JIF database
- Final code implemented in production

Justification:

This project will incrementally improve the overall probabilistic forecast skill of the NCEP GEFS by increasing the resolutions, improving initial perturbations, improving stochastic physical perturbation scheme of the four cycle times daily. This project is intended to improve overall ensemble mean forecast skill such as anomaly correlation and RMS error. To successfully complete this project, the changes to the NCEP GEFS must demonstrate improvement to the overall probabilistic forecast skill without degrading the forecast skill of the overall ensemble mean.

As part of a bilateral agreement with the CMC, in conjunction with the NAEFS project, NCEP has agreed to send parallel information to CMC at real time prior to the implementation.

Organizational Scope:

The organizational scope of the project includes all of the NCO Branches, the EMC Global Modeling Branch, all the NCEP Service Centers, the NWS Telecommunications Gateway (TOC), the NOAA Web Operations Center (WOC) and the NWS OS&T. EMC will be responsible for developing the code changes, running retrospective runs and validating the quality of the GEFS changes. The NCO will be responsible for the technical testing, evaluation and implementation of the GEFS changes. The NCO will

also be responsible for coordinating the product and volume changes with the TOC, WOC and NWS OS&T. The NCEP all Service Centers, mainly WPC, OPC, CPC and NHC, OST/MDL and OHD will be responsible for the subjective evaluation of the GEFS changes. The TOC and WOC will be responsible for allocating and approving the necessary resources needed for the GEFS changes on the downstream ftp servers. The NWS OS&T will be responsible for issuing and approving the change notification to the field.

Risk:

Project Authorization

Appointment of Project Manager:
To achieve the objectives of this project, I appoint Brent Gordon as Project Manager for this project. In this capacity, Brent Gordon has the authority to expend NCO human and financial resources to accomplish objectives of the project.

Project Budget Authority:
In support of this project, I authorize the use of staff time to meet the scope/objectives. A time estimate will be provided for review and approval during the project planning phase.

Project Reporting Frequency:
Status will be reported on a monthly basis or as required by Sponsor.

Project Expected Duration:
A roll-up duration estimate is four months. Actual effort will be determined from the project plan and submitted to the Sponsor for review and approval.

Project Sponsor(s):
Ben Kyger, Director NCEP Central Operations
Hendrik Tolman, Director NCEP Environmental Modeling Center

Signature(s) of the project Sponsor(s) indicates the project charter has been reviewed and approved by the Project Sponsor(s).

Project Sponsor Approval: _____ Date: _____
Ben Kyger, Director NCO

Project Sponsor Approval: _____ Date: _____
Hendrik Tolman, Director EMC

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NTOP Project Number: NCO*xx* *Look at the RMS project list to get the proper NTOP number (confirm with Sponsor/PMO)*

PMO Project Number: PMO*xxx* *PMO will assign this number once the project is signed by Sponsor (signed copy goes to PMO)*

Document Information and Revision History

Version	Date	Author(s)	Revision Notes
1.0	06/06/2014	Yuejian Zhu	New
2.0	01/06/2015	Yuejian Zhu	Revision