EMC FY15 Upgrade Review

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GEFS Upgrade

Yuejian Zhu

Update: 05/15/2014

Next GEFS (V11.0.0) configuration

- Model
  - Current: GFS Euler model (V9.0.1)
  - Plan: GFS Semi-Lagrangian model (V10.0.0)
- Horizontal resolution
  - Current: T254 (55km) for 0-192 hours, T190 (73km) for 192-384 hours
  - Plan: T_L574 (34km) for 0-192 hours, T_L382(55km) for 192-384 hours
- Vertical resolution
  - Current: L42 hybrid levels
  - Plan: L64 hybrid levels to match with GFS and DA
- Computation cost:
  - Current: 84 nodes (+ post process) for 55 minutes
  - Plan: 300 nodes (first 35 minutes), 250 nodes (2^{nd} 30 minutes)
- Output:
  - Current: every 6-hr for 1*1 degree pgrb files
  - Plan: every 3-hr for 0.5*0.5 degree pgrb files
- Challenges:
  - $T_L574L64$ configuration will cost 250-300 nodes for one hour (plus 5 minutes)
  - Option: $T_L574L42$ configuration will use less resources, but the forecast quality will be degraded.

Evolution of NCEP GEFS configuration (versions)

Version	Implem entation	Initial uncertainty	TS relocation	Model uncertainty	Resolution	Forecast length	Ensemble members	Daily frequency
V1.0	1992.12	BV	None	None	T62L18	12	2	00UTC
V2.0	1994.3				T62L18	16	10(00UTC) 4(12UTC)	00,12UTC
V3.0	2000.6				T126L28(0-2.5) T62L28(2.5-16)		10	
V4.0	2001.1				T126(0-3.5) T62L28(3.5-16)			
V5.0	2004.3				T126L28(0-7.5) T62L28(7.5-16)			00,06,12, 18UTC
V6.0	2005.8		TSR		T126L28			
V7.0	2006.5	BV- ETR					14	
V8.0	2007.3						20	
V9.0	2010.2			STTP	T190L28			
V10.0	2012.2				T254L42 (0-8) T190L42 (8-16)			
V11.0	2014.12	EnKF (f06)			T_L574L64 (0-8) T_L382L64 (8-16)			

Next GEFS Sciences

- Initial perturbations
  - Base: EnKF 6hr forecast
    - TS relocation
    - Centralization
    - Ensemble transform - un-necessary if there is no significant difference
    - Rescaling – un-necessary if we confirm EnKF parallels have the similar characteristics for different seasons
- Stochastic perturbations
  - Tune STTP for model change and initial perturbation changes
  - Turn off stochastic perturbations for surface pressure in STTP
- Expectations
  - Improve hurricane track forecast
  - Improve probabilistic forecast guidance
  - Improve predictability of HIW and extreme weather event

GEFS Upgrade (Q4FY14/Q1FY15)

Project Status as of 03/19/2014

G Project Information and Highlights

Lead: Yuejian Zhu, EMC, Chris Magee, NCO

Scope:

- Latest GFS model (SLG version with improved physics).
- Configurations: $T_L574L64$ and T382L64 out to 384 hours
  - 0-192hr - T_L574 – 33-35km
  - 192-384hr – T_L382 – 51-54km
  - L64 – the same vertical resolution as EnKF, GFS
- Initial perturbations
  - EnkF 6h forecast with improved TS relocation and centralization
- Stochastic physics
  - Tuning parameters for STTP to upgrade GFS model
  - Turn off stochastic perturbation of log surface pressure
- Forecast data output
  - All GRIB II format
  - 0.5degree data for pgb files
  - 3 hourly output frequency

Expected Benefits:

- Improve TS trick forecast
- Increase probabilistic forecast skill
- Improve predictability of HIW and extreme weather event

G Scheduling

Milestone (NCEP)	Date	Status
EMC testing complete/ EMC CCB approval	08/15/2014	
Initial Code Delivery to NCO	08/31/2014	
Technical Information Notice Issued	09/30/2014	
Initial Test Complete		
CCB approve parallel data feed		
IT testing begins		
IT testing ends		
Parallel testing begun in NCO (Code Frozen)	10/20/2014	
Real-Time Evaluation Ends	11/20/2014	
Management Briefing		
Implementation		

G Issues/Risks

Issues: N/A

Risks:

Mitigation:

G Finances

Associated Costs:

Funding Sources: EMC Base: NCO Base:

R	Management Attention Required	Y	Potential Management Attention Needed	G	On Target