NOAA Global Systems Laboratory

Community Engagement

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Subject-Matter Experts: Dom Heinzeller, Evan Kalina, and Daniel Nietfeld
GSL Community Engagements

- Earth Prediction Innovation Center (EPIC)
- Developmental Testbed Center (DTC)
- Hazardous Weather, Hydrometeorology, and Aviation Testbeds
- Joint Center for Satellite Data Assimilation (JCSDA)
- UFS Community Governance
- Community Engagement via Social Science
- Leadership of Collaborative Programs (Dave Turner)
The Earth Prediction Innovation Center (EPIC)

**Hot off the press**
The EPIC contract was awarded to Raytheon Intelligence and Space on April 26

**Expected post-award**

- Launch of the EPIC website
- 3rd Annual Cloud Workshop
- 2nd Annual EPIC Community Workshop
- Release finalized EPIC Strategic Plan
- EPIC Symposium at AMS 102
- Assessment of UFS related activities
- Project management plan for the EPIC Contract
- Release community-based UFS Medium Range Weather application

2021 Global Systems Laboratory Science Review
NOAA Global Systems Laboratory

Developmental Testbed Center
The DTC Is...

- A NOAA Testbed whose mission is to connect the research and operational communities working on NWP
- Jointly sponsored by NOAA, the Air Force, NSF, and NCAR
- Comprised of staff at GSL and NCAR
- Well aligned with GSL in model improvement and evaluation
Overview of DTC Activities

Community Software Development and Support
UFS: SRW App, MRW App, HAFS, UPP, CCPP, METPlus
Legacy models and components: HWRF, GSI

Community Interactions
Workshops
Visitor Program
Newsletter

Testing and Evaluation

Addresses Review Recommendation C4.1: Identify core competencies within NOAA and the broader community and develop a strategy for how it can best utilize this expertise to improve the research and operational NWP suite.
A Cycle of R2O2R2O2R2O2

2020 HWRF implementation

DTC evaluation

Visitors Iacono/Henderson - AER
Further develop cloud overlap method

2018 HWRF implementation

DTC Evaluation

Visitors Iacono/Henderson - AER
Improve cloud overlap method

2015 HWRF implementation

Environmental Modeling Center Evaluation

DTC develops and T&E partial cloudiness scheme

DTC/EMC test RRTMG scheme

Visitors Fovell/Bu – UCLA
Identify shortcomings in HWRF radiation (GFDL)

Forecast degradation

Cooling due to radiation

GFDL radiation

RRTMG radiation

Shortwave at sfc

↓ Shortwave at sfc

RRTMG old

RRTMG + partial cloud

Track Skill Improvement

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DTC evaluations leveraged datasets from the Spring Experiment and helped inform future ensemble design.

2016 - Multi- and single-physics ensemble precipitation forecast performance within the Community-Leveraged Unified Ensemble (CLUE)
  • Single-physics has advantages but performance lagged from multi-physics

2018 - UFS ensemble compared against ensemble based on the WRF model
  • UFS ensemble performance was comparable or better than WRF ensemble
UFS Application Releases

UFS MRW App - v1.0 (March 2020) and v1.1 (October 2020)
UFS SRW App - v1.0 (March 2021)

DTC responsibilities for releases

- Co-lead the preparations
- Develop workflow (SRW only)
- Create test cases
- Port and test the code on various platforms
- Prepare documentation
- Provide user support via the UFS Forum

For more information, visit https://ufscommunity.org/science/code/ and dtcenter.org
Hazardous Weather, Hydromet, and Aviation Testbeds
Hazardous Weather Testbed (HWT)
2020 Spring Forecast Experiment

GSL demonstrating FV3 LAM convective forecast sensitivity to differences in initial/boundary conditions (GFS top and HRRR bottom) and use of different horizontal advection options (less diffusive left, more diffusive middle) at 22 UTC 27 May 2020

Hydrometeorology Testbed (HMT)
2020 Flash Flood and Intense Rainfall Experiment

GSL demonstrating FV3 LAM 24-hr precipitation forecast sensitivity to differences to use of different horizontal advection options on 7-8 July 2020
Aviation Weather Testbed

Aviation Weather Testbed (AWT)
2020 Probabilistic Convection Experiment

GSL demonstrating HRRRE forecast probabilities (color fill) for sparser coverage of convection (tops ≥ 25 kft and 40 dBZ) on 8 Aug 2020 compared with MRMS radar observations (polygons)

Statistical comparison of HREF (blue) and HRRRE (pink) forecasted probabilities of sparse (top) and medium (bottom) convective coverage
JEDI Development Contributions

- GSL 1-2 FTE in-kind contributions
- Assimilation of regional conventional observation
- Development of Unified Forward Operators (UFOs) i.e. H(x)

New JEDI UFO

Successfully Matched H(x)

Legacy GSI Observer

2m Temp

Successfully Matched H(x)

2m Specific Humidity
Earth System Prediction: Community Engagement
UFS Is a Community Effort

GSL role in the UFS governance

- **Steering Committee**: Ligia Bernardet (member)
- **SRW/CAM App Team**: Curtis Alexander (co-lead)
- **Physics WG**: Georg Grell, co-lead
- **System Architecture**: Dom Heinzeller (co-lead)
- **Atmospheric composition, physics, verification WGs**: GSL staff (members)

GSL role in the UFS-R2O Project governance

RRFS: Curtis Alexander, lead
A Role for Social Science in Weather Research!

Ensemble model development to generate probabilistic output / information:
- PDFs
- methods
- post processing

Forecasters receive this probabilistic information and provide Decision Support Services (DSS):
- Do they understand?
- Can they properly communicate probabilistic info?
- Confidence informed by verification

Core Partners receive this information from the forecasters:
- Do they understand?
- Does it help them make more informed and better decisions?

From Model Output to Improved Decision Making
Deriving Timing Uncertainty from Ensembles

Goal of 2 Projects: Help better assess and communicate hazardous weather risks for Impact-based Decision Support Services (IDSS) through 3 integrated, iterative R&D threads:

• Social science research (interviews & surveys) with NWS forecasters and core partners (EMs, Fire Officials, etc.) to identify their key informational needs
• Derivation of ensemble timing guidance for winter and fire weather parameters
• Development of forecaster-oriented verification of ensembles to quantify confidence
Hazard Services Development

- Forecaster involvement over the past 12 years:
  - Dozens of in-person, week-long, Forecaster Assessment Tests
  - Weekly calls/demos with Forecasters / focal points
  - Hazardous Weather Testbed experiments
Summary of Community Activities

**Performance**
- DTC management
- Participation in UFS Governance
- Tutorials and community workshops
- Engaged in the R2O process via testbed participation and DTC

**Quality**
- Improved models and decision support systems for the weather enterprise
- Release of NOAA models to the community, including UFS Apps
- Several multi-institutional papers authored

**Relevance**
- Cross-line office, cross-agency to improve NOAA R2O
- Engagement with community, forecasters, and end users
- Responding to national needs