



Strategic Implementation Plan (SIP) for a Community-based Unified Modeling System



Ensembles Working Group

Presented by

Tom Hamill, NOAA ESRL/PSD

Presented at NOAA Community Modeling Workshop

April 18-19, 2017; College Park, MD



Ensembles WG *Membership*



- *Tom Hamill (NOAA ESRL/PSD) ***
- *Yuejian Zhu (NWS NCEP/EMC) ***
- *Ryan Torn (SUNY Albany) ***
 - *Co-Chair ***
- Chris Reidel (Univ. of Oklahoma)
- Bill Gallus (Iowa St. Univ.)
- Robert Nystrom (Penn St. Univ.)
- Cliff Mass (Univ. of Washington)
- Vijay Tallapragada (NWS NCEP/EMC)

“No forecast is complete without a description of its uncertainty”
from National Research Council 2006, *“Completing the Forecast”*



Ensembles WG

Science Priorities



- NGGPS plan [here](#); we welcome feedback.
 - NWS wishes 3-tier global ensembles with unified system:
 - (a) hi-res. weather ensemble to ~10 days.
 - (b) medium-range sub-seasonal ensemble to 30 days.
 - (c) seasonal ensemble to 9-12 months. [Initial NGGPS focus on (a)-(b)]
- NGGPS high-level ensemble science priorities.
 - Ensemble state initialization (with NGGPS DA team)
 - Near term focus on land-surface ensemble initialization.
 - Coupled state initialization in longer term.
 - Improved, physically based treatments of model uncertainty.
 - Near-term focus on land-surface.
 - Moving toward focus on more general coupled state uncertainty (ocean-atm fluxes, ice, waves, etc.) in longer term
 - Extension of system so it properly models uncertainty at sub-seasonal time scales, e.g., ocean-state evolution.
 - Configuration: How to optimally use available CPU time
 - Which cycles for which tiers? Amount if any for real-time reforecasts?
 - Resolution vs. ensemble size



Ensembles WG

Wish list: Infrastructure to support global ensemble R&D



- Hardware: a large R&D computing pool, with:
 - Low barrier to access (< 1 month, not seasons to years to get on system, as is currently).
 - Consistent uptime.
 - Ready read access to operational, parallel ensemble IC's, land/ocean/ice BC's.
 - Readily available baselines for comparison (operational, development parallels).
 - Much greater disk storage (currently the rate-limiting factor for development, not CPU).
 - Cross-mounted disks between systems, unlike WCOSS.
 - Facilitating possible cloud computing (Amazon, IBM, Microsoft, etc.)
- Software characteristics:
 - Scripting that permits community ensemble software to compile, gather data, and run on multiple platforms with little intervention by scientist. Follow best practices learned w/HFIP.
 - Simple examples: canned, low-resolution cases that can be run out of the box.
 - Much friendlier DA software (support JEDI) to support cycled ensemble DA research.
 - Community verification code (e.g. MET) with extensive support for ensemble diagnostics.
 - Ideally, readily accessible via modern mechanisms, e.g. github.
 - Well documented, so easier to make modifications.
 - Well structured code following best practices.



Ensembles WG

Wish list: Funding and Community Vision



- **Funding:** Gap right now between NGGPS (near-term implementation) and NSF (basic).
 - Lab and university partners likely to address issues at middle of research funnel.
 - Need funding source to grow the community.
 - Support visiting scientists at NOAA labs, EMC.
- **Community vision:** eventually we'll need a whole governance structure to manage code contributions from various partners.
 - HFIP has wrestled with this; learn from what worked there.