University Corporation for Atmospheric Research Community Advisory Committee for NCEP (UCACN):

2015 Request for Review of the NCEP Production Suite

Dr. William Lapenta, NCEP Director

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Background:
In November 2008, UCAR was requested by NCEP to conduct a thorough and thoughtful review of the nine Centers that comprise NCEP, as well as the NCEP Office of the Director (OD). An Executive Committee plus five panels conducted the reviews, which are collectively referred to as the 2009 Review. The reports were completed in early 2010 and are available at http://www.vsp.ucar.edu/UCACN/index.html. One of the major recommendations of the 2009 Review was that NCEP should establish a permanent external advisory committee to provide guidance on improvement of products and services based on the latest advances in science and technology. As a result, UCACN was established by UCAR in March 2011; its primary responsibilities are:

1. To conduct a comprehensive review of NCEP (the nine Centers and the Office of the Director) every five years, starting in the year 2015;

2. In the years between the comprehensive reviews, to:
   a. Monitor progress of the Centers in the context of the NCEP strategic plan and previous UCACN recommendations, and provide informal updates and advice to NCEP leadership through the UCAR President (or designate);
   b. Provide input to the strategic planning and long-range goals of the Centers and NCEP as a whole.

Given that NCEP is currently developing its strategic plan for 2015-2020, the NCEP Director and the UCACN co-chairs have targeted the next comprehensive center reviews to take place in 2016. That provides NCEP the opportunity to operate under the new budget, portfolio and NWSHQ structures for a year before being reviewed. However, the NCEP centers are encouraged to interact with the UCACN to address strategic priorities identified in the FY15 annual operating plan (AOP) and those under development in the FY16 AOP.

In the fall of 2014, the UCACN terms of reference was modified such that the NCEP Director may request that UCACN work on a particularly important strategic issue on which NCEP requires guidance. The purpose of this document is to charge the UCACN to perform a comprehensive review of the NCEP Production Suite (NPS) and associated strategic plans in 2015.
Requirement for NOAA Operational Environmental Modeling:

Numerical earth system prediction capabilities are critical to address evolving societal needs for natural disaster preparedness, ensuring food security for growing planetary population, national security and defense as well as future economic prosperity. The National Oceanic and Atmospheric Administration (NOAA) operational modeling suite at NCEP provides timely information on the future state of weather, land surface, ocean, sea ice, short-term climate, and ecosystems. The modeling suite provides input for the decision-making process for individuals and policy makers, and for sectors ranging from water resources to financial markets. The modeling systems directly support the National Weather Service (NWS) mission to provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.

There are numerous strategic and technical factors that must be taken into account when planning the evolution of the modeling suite. The NWS imperative of a Weather-Ready Nation (WRN) is about building community resiliency in the face of increasing vulnerability to extreme weather. Therefore, the foundational operational numerical guidance system must support the WRN initiative. Global modeling systems are now being run operationally at resolutions approaching 10km. Regional systems are running operationally at 3km and lower and are applied to convective predictability and severe weather. Advanced data assimilation techniques are being applied on global and regional scales. Demands are building for skillful outlooks in the week 3 and 4 time frame that will require coupled atmosphere and ocean global systems executed in ensemble mode.

Recent Infusion of Funding:

During the past several years the NOAA modeling enterprise has received national attention. The Disaster Relief Appropriations Act of 2012 provided $50M+ to advance the skill of NOAA operational numerical guidance systems for medium range weather prediction. Specific targeted areas include operational and research high performance computing, scientific development of data assimilation capabilities, model physics, dynamics and ensemble techniques. In FY14, the NWS introduced a new $14.3M initiative called “R2O” to improve the transition of research into NWS operations with an emphasis on operational global modeling and data assimilation. There are other programs within NOAA that have modeling components including the Warn on Forecast (WoF), National Multi-Model Ensemble (NMME), the National Earth System Prediction Capability (ESPC) and the NOAA Climate and Earth System Modeling Strategy.

Integrated NOAA Modeling Strategy:

NOAA has an unprecedented opportunity to advance its end-to-end modeling capability to meet both operational and research requirements. In January 2015, the NOAA administrator has tasked the NOAA Chief Scientist to revise the integrated modeling strategy connecting individual projects and programs across all the NOAA Line Offices with a common thread. The
strategy is expected to be revised by the end of 2105. The results of the UMAC review will be used as input to the modeling strategy.

**Charge to UCACN in 2015: Review of the NCEP Production Suite**

NOAA is a science based agency with an operational mission to provide environmental predictions. Therefore, NOAA leadership is striving to align its research portfolio with delivery of operational products and services. As described above, there is a significant amount of NOAA research being devoted to numerical modeling that should advance the skill of the NPS components. In addition, a unified message from NCEP stakeholders obtained during the development of the strategic plan was the need to systematically obtain user requirements and incorporate them into the decision-making process that drives the NPS evolution.

The NCEP Director requests the formation of a UCACN Modeling Advisory Committee (UMAC) to provide a comprehensive, technical review of the NPS strategy for development. The proposed terms of reference of the UMAC are provided below:

**Structure:**

1. The UMAC will be established no later than March 2015 and will exist for a minimum of three years.

2. The first review of the NPS will occur between June and August 2015 in College Park MD.

3. The UMAC will consist of approximately 12-14 members who are established subject matter experts in numerical modeling, drawn from academia, non-governmental organizations, the private sector and Federal and state agencies.

4. The Chair(s) of the UCACN and the Director of NCEP will select the members of the UMAC.

5. Members of the UCACN may be asked to also serve on the UMAC.

6. The UMAC will meet at least annually and provide a written report of its findings and recommendations to the UCAR Authority, who will then transmit the report to the Director of NCEP.

**UMAC Scope:**

The NPS is operated by NCEP Central Operations and currently contains more than 20 end-to-end operational modeling systems ranging from on-demand dispersion, regional hurricane, continental ensembles, global ensembles and seasonal. It has systems for near shore coastal, global ocean, surge, space weather, and waves. Soon we will be adding on-demand tsunami and coupled terrestrial-ionosphere space weather capabilities. The future production suite will
become even more complicated as we move towards complex earth system modeling systems across a wide time and space paradigm.

This will be the first ever holistic technical review of the NPS. All major model developers will provide input to the review to ensure communication takes place across all scales and components. Participants will also include representatives of the stakeholder community from NOAA (i.e., SPC, WPC, the NWS regions, NWC, OAR, NOS), public, private and academia.

**Nowcasting and Short Range Systems (0-3 day):**
- High Resolution Rapid Refresh (HRRR)
- Rapid Refresh (RAP)
- North American Mesoscale (NAM) and associated nests
- High Resolution Windows (HiRESW)
- Short Range Ensemble Forecast System (SREF)
- Air Quality (CMAQ; HYSPLIT)
- Great Lakes waves
- Coastal Ocean/Bays (ESTOFS)
- Near Shore Wave Prediction System (NWPS)
- Hydrology (HEFS, AHIPS)
- Tropical and Extratropical Storm Surge (ETSS; PSURGE; SLOSH)
- Solar flare (ENLIL)
- Geomagnetic
- Coupled space weather model (WAM)

**Regional Hurricane (0-5 day):**
- Hurricane Weather Research and Forecast (HWRF)
- GFDL

**Medium Range Systems (0-16 day; global):**
- Global data assimilation and forecast system (GDAS/GFS)
- Real Time Ocean Forecast System (RTOFS)
- Global Ensemble Forecast System (GEFS)
- North American Multi-Model Ensemble (NMME)
- North American Ensemble Forecast System (NAEFS)

**Extended Range (0-45 days):**
- Global Ensemble Forecast System (GEFS)
- Climate Forecast System (CFS)

**Seasonal (0-9 months):**
- Climate Forecast System (CFS)
- North American Multi-Model Ensemble (NMME)
- North American Ensemble Forecast System (NAEFS)