American Meteorological Society

Forecast Improvement Group

April 4, 2014

DRAFT Meeting Summary

Location: NOAA's Weather and Climate Prediction Center (River Road and Glenview 201, College Park, MD)

The Forecast Improvement Group (FIG) met for the first all-day meeting since April 1, 2013. The meeting, held at NOAA's Weather and Climate Prediction Center (NWCPC) was open to all FIG members and was announced to the members by email a month in advance. The meeting opened with a review of the FIG goal of identifying as a community a path towards significant improvements and continually improving weather forecasts to the end users. The three newly defined foci of the FIG were reviewed and offered the basic outline for the day: continue to consider alternative business models; clarify the seven FIG recommendations; and shed light on areas of possible confusion or misunderstanding within the community. The primary result of the conversations was a strong interest in continued collaboration and the identification of a need for community strategic plan, as opposed to ad hoc response to problems or individual opportunities.

In attendance:

Don Berchoff, Unisys
Bill Callahan, EarthNetworks
Dave DeWitt, NOAA/NWS
David Green, NOAA/NWS
Neil Jacobs, Panasonic
Ming Ji, NOAA
Jack Hayes, Harris Corp.
Jay Ladd, Panasonic
Bill Lapenta, NOAA/NWS
Sandy MacDonald, NOAA/OAR
Anne Miglarese, PlanetiQ
Peter Neilley, The Weather Company
Nikki Prive, NASA
Tim Schneider, NOAA
Marc Schwartz, NREL
Bashwar Sen, Northrup Gruman
Jen Sprague, NOAA/NWS
Michael Steinberg, AccuWeather
Fred Toepfer, NOAA
Betsy Weatherhead, U. Colorado

There was an effort to allow for webinar capability and call-in capability which resulted in inadequate connectivity for those trying to participate remotely. Cliff Mass, Conrad Lautenbacher and others were able to listen, and partially contribute via telecom throughout the day.

The actual agenda for the day, which by chair's prerogative deviated from the planned agenda between 10:30 and 2:30, was as follows:

9:00 Alternative Business Models:
- Aligning research with operations Discussion Lead: Jack Hayes
- Update on Reston: Peter Neilley
- Update on Real Time Research (HIWPP): Tim Schneider

10:20 Update on complementary social science advancements: Jen Sprague

10:30 FIG-7 Recommendations
- Alternative Observational Needs Discussion Lead: Bill Callahan
  - Phone call-in: (712) 432-1212 ID: 534 456 762
- Prioritization of Observations Discussion Lead: Nikki Prive
  - Phone call-in: (712) 432-1212 ID: 501 209 897
- Real-Time Research Discussion Lead: Fred Toepfer / Tim Schneider
  - Phone call-in: (712) 432 0360 ID: 176 335 #
- Regional Modeling - Discussion Lead: Don Berchoff
  - Phone call-in: (712) 432-1212 ID: 534 456 762
- Global Modeling - Discussion Lead: Neil Jacobs
  - Phone call-in: (712) 432-1212 ID: 501 209 897

2:30 Presentation on operational computational allocations - Bill Lapenta

3:00 Discussion of computational needs – Neil Jacobs

3:30 Collaborative Efforts – Discussion

4:00 Conclusions for the day

4:15 Next steps for FIG – Betsy Weatherhead

4:30 Adjourn of general Meeting

4:30 Meeting of the ad hoc Executive Committee
- Phone call-in sent to members of ad hoc Executive Committee

Alternative Business Plans

Three alternative business plans were discussed. Within the FIG, alternative business plans refers to changes in how the different components of the weather enterprise address specific issues (e.g. purchases of satellite data or strengthening of collaboration between the public, private and academic sectors). Jack Hayes offered a presentation on ways to align research in operations to work more effectively, which was followed by a discussion. Two experiments in alternative business plans were discussed: the Reston Project and HIWPP which is an example of "Real Time Research." The powerpoints from each of these three presentations which introduced these topics will be available on line, however AMS's website is under construction and not directly usable. The discussions are briefly summarized here.

Alignment of research and operations:

There has been some discussion within the community about how to make sure operations accepts the best research efforts and that research efforts are targeted to support useful operations. Jack Hayes offered his vision which included a distinction between "research" and "Research" where "research" was directly aimed at feeding into operational capabilities and "Research" supported fundamental, potentially innovative ideas which may or may not have a clear path to operations. The view was for both to be supported, because of the long-run value of both to the community. His vision primarily called for a structured coordination between operations and "research" at levels above the operations and research leadership. The presentation focused primarily on NOAA, with less involvement of academia and private sector research. The discussion led to the general agreement that both NOAA and the wider weather enterprise needed strategic planning as opposed to responding to problems and possible opportunities. This idea was discussed often throughout the day and was the primary outcome of the meeting.

The Reston Project

The Reston Project, was presented by Peter Neilley, is an experiment to allow private sector computing to sit in direct connectivity with NOAA's operational computing, to allow full access to forecast model output—a structure which is necessary if large amounts of data are to be shared. The concept is in complete alignment and has its origins in the Open Weather and Climate Services concepts presented by NOAA's Scientific Advisory Board. The actually project was formulated at last year's Forecast Improvement Group meeting. As an experiment, several issues have already been identified—with most offering the potential of significant improved forecasting capabilities to the end user. A few issues were identified as possibly requiring attention in the future including identifying which private sector users could have physical access (not an issue in this experiment as all interested parties have thus far been accommodated); cost sharing; data outages; and the possibility that NOAA could take on development and free dissemination of products developed by the private sector through this type of experiment. The general sense was that the potential benefits far outweighed the possible challenges, but that the community would keep open dialogue about potential issues as they proceeded with this experiment.

Real Time Research

The High Impact Weather Prediction Project (HIWPP) which is a two year experiment of "Real Time Research" was presented by Tim Schneider. Real Time Research is a concept which developed within the Forecast Improvement Group to allow for highly advanced research models to be run somewhat regularly (over 90% reliability) with output released to trusted partners for use and for feedback in identifying possible problems. Real Time Research is somewhat controversial within the weather enterprise with some members strongly in favor of the effort, and others somewhat against the concept. Some of the pros and cons of the general concept were discussed. In favor of the concept is the idea that advanced research models can be highly skilled and potentially useful, but the up-to-six-year delay due to Research to Operations (R2O) can be so lengthy that users of model output will always be six years behind stat of the art. Additional pro's for this approach include a closer relationship between the research community and trusted users of the output, including academic and private sector colleagues, allowing leveraging of these private sectors in the evaluation and debugging process. Real Time Research may offer information that would be useful for deciding which models to be transitioned into operations. Those not in favor of Real Time Research point to the ineffective use of researchers' time and research computing—both of which are limited resources. Some considered Real Time Research approaches with models that were not being considered for transition to operations to be an inefficient use of human and computational resources. Also against this approach is the idea that end users could become used to the output, which is not being supplied in a supported, reliable manner. Some pointed out that this approach is not new and has been around for quite a while, although the HIWPP experiment offers a significant increase in the effort. The experimentwill likely offer insights into the

relative merits of these pros and cons as well as possibly reveal additional aspects not yet discussed. Logistically, identifying trusted partners and evaluating the experiment are still somewhat challenging, although not insurmountable. The issue of real time research remains a somewhat controversial change in business model for the community.

Forecast Improvement Group's Recommendations

Bill Callahan led a discussion of alternative observational needs. The discussion underscored the multiple users of weather output and their different priorities for key observations: the key observational needs for renewable energy may be considerably different from those of the severe storm community. The group agreed that an abbreviated consolidation of existing efforts to priorities observations would be created in a tabular form to help summarize existing efforts.

Nikki Prive led a discussion on evaluating observations in an objective manner. There was an interesting discussion of the benefits and limitations of OSSE experiments. It was acknowledged that OSSE's represented a developing field with some very primitive OSSE's used in a manner which may not be fully useful or robust. Carefully carried out OSSE's take many years to develop and international efforts are not well supported. Data denial experiments (OSE's) remain a strong, defensible approach for existing observations.

Community Strategic Planning

Discussions of global and regional model recommendations very quickly returned to the need for community based strategic planning, which would then allow the various entities (NOAA, UCAR, private companies) to develop and implement their own strategic plans. There was a clear recognition within the group present that the weather enterprise had already undergone a significant paradigm shift, with private sector and academic sectors playing much more important roles in collecting observations, developing and running models as well as delivering better forecasts to end users that the strategic planning needed to take place at the community level—not within or led by a single agency. The question soon turned to which group should lead this group for developing a community strategic plan. Characteristics that were considered important for leading this effort included: the ability to represent the broad community; the ability to have "teeth"—some level of authority; the ability act quickly—nearly everyone felt that the time to act was in the coming months not coming years. The Forecast Improvement Group was identified as having some of these characteristics but not all; some noted that the FIG already had a start of a community strategic plan and had most of the key players already engaged. The FIG ad hoc Executive Committee was charged with looking into options for where this community strategic planning and discuss options.

Operational Computing

Bill Lapenta presented information on how operational computing was allocated. The powerpoint he used will soon be available on the AMS website. Some of the discussion focused on requirements and the difficult in allocating space for new models. The NAM was noted to take considerable computational resources and may be less applicable to meeting 0-3 day meteorological requirements once the GFS transitions to 13km resolution. The High Resolution Rapid Refresh was identified as soon to take up considerable amounts of computing resources. One issue discussed was that it was difficult to decrease the footprint of a model once it became a part of the operational suite of models—even if a reasonable evaluation might indicate the appropriate removal of a model. Entitlement/historical running of models often was more deterministic of computer usage that strategic decisions. Bill discussed the complex nature of the operational suite of models and stressed, with apparent full agreement of those present, the need for a more strategic approach to developing and running the operational models. The

community offered assistance on any of these issues, particularly with respect to prioritizing the use of computational resources to meet stakeholder requirements.

Computational Needs

Don Berchoff led a discussion of the needs computing resources, which is the first of the seven FIG recommendations. Discussions focused on the Petaflops needed (possibly 20-40 petaflop machines), as well as the financial investment, because petaflops didn't fully express the need for personnel support for increased computational investment. The numbers discussed—with clear acknowledgement that these discussions did not present a careful study—were roughly $25M (up to $44M) per year additional resources for operational computing and anywhere from one to three times that much for research computing. These numbers were offered as a starting point discussion within the broader computing.

Future Plans for the FIG

Betsy W. reported that the FIG was becoming a more formalized group within AMS. An executive committee was being organized and terms of reference were being developed. Neil Jacobs has agreed to be the incoming chair of the FIG. Anyone who wants to see the current draft of the FIG could get it from Betsy; currently the ad hoc executive committee was reviewing it. There will be a chance for AMS members to participate in a hill visit May 6 & 7, with a second hill visit in September. The AMS Summer Community Meeting will focus on forecast improvement as well as forecast communication improvement at Penn State, August 11-13. Discussions continue on the value of a large, multi-day meeting for the FIG; immediate plans include continued discussion via telecoms and webinars.

Action Items

- David Green and Bashwar Sen will supply examples of community based strategic plans.
- Betsy W. and FIG ad hoc Executive Committee will explore options for where community based strategic planning could take place.
- Bill Callahan will begin a draft of a table indicating key observations by category of users.
- Don Berchoff is going to get Pam Taylor in touch with Bill Callahan because of her efforts on analysis of alternatives.
- Bashwar Sen is going to get a copy of the Air Force's analysis of alternatives on observations to Betsy W.
- Neil Jacobs is going to gather some of the existing work on observational evaluations.