Ensemble Forecasting Meeting
OHD, April 21st, 2004
Meeting Report

Objectives of the Meeting

1. Status on the ensemble projects at the RFCs and at OHD
2. Presentation and discussion of the OHD ensemble project plan and the next steps
3. Future communication
4. Data archiving
5. Ensemble verification

Agenda

Introduction and Objectives (George Smith, Julie Demargne)

Probabilistic Verification (Edwin Welles)

CBRFC Ensemble Project (Dave Brandon, Martyn Clark, Kevin Werner)

NERFC Ensemble Project (Rob Shedd)

CNRFC Ensemble Project (Rob Hartman)

MARFC Ensemble Project (Ned Pryor, Joe Ostrowski)

ABRFC Ensemble Project (Bill Lawrence)

OHD Ensemble Projects (Mary Mullusky, Julie Demargne)

Discussion to meet the objectives

Discussion Summary

1. The discussion generated three themes: verification, pre-processor enhancements, and hydrologic uncertainty. Regarding verification, there was unanimous agreement that everyone needed to conduct objective verification of their output. Concerning the ensemble pre-processor, although the OHD pre-processor appeared to be running effectively in many situations, ABRFC and CNRFC pointed out two circumstances in which it did not perform well. Regarding the hydrologic uncertainty, the success of the pre-processor has now allowed us to see the need for effective post processing more clearly. If the stream flow ensembles have large errors in them due to the hydrology, they are not useful. Therefore the ensemble post-processor needs to be implemented complementarily to the ensemble pre-processor. Also was emphasized the need for a unified ESP system to complete the process of ensemble forecasting.

Action Items

OHD ensemble project plan and next steps (Goal #2)

2. **Short-Term Ensemble Pre-Processor**

   Rob H. outlined a problem with the precipitation ensembles on day 5. The ensembles on day 5 don't reflect the QPF values at 6-hour time step because the skill of the QPF is rather low. A solution would be to use the 24-hour QPF values to get a higher skill for the QPF for days 3 to 5, and therefore to get ensembles closer the QPF.

   Bill L. pointed out a problem on day 5 when the smoothed climatology is used; for one test case with a high event, it led to a peak of streamflow. This problem needs to be further investigated.

   2.1. Commitment for OHD (Lead: John S.): calibrate the short-term pre-processor at 24-hour time step and then disaggregate the values to 6-hour time step. The CNRFC and ABRFC test cases need to be run to assess the impact of this new process.

   2.2. Commitment for Bill L.: evaluate the availability of the HPC archive for the 24-hour QPF.

   2.3. Commitment for OHD (Lead: John S. and Martyn C.): after the 24-hour calibration of the short-term pre-processor, disaggregate the ensemble members at 6-hour time step. It deals with space-time aggregation-disaggregation issues.

3. **Hydrologic Uncertainty**

   3.1. Bill L pointed out the importance of addressing the hydrologic uncertainty because of the poor results obtained for streamflow ensembles relative to high events. OHD might want to investigate the problem and its cause, and to propose a work plan to deal with it.

   3.2. Commitment for OHD (Edwin W., Hank H.): provide advice to MARFC and ABRFC in setting up the post processor and develop a plan for assessing the success of the post-processor.

4. Future communication (Goal #3)

4.1. **Meetings**: every 6 months (potentially at the RFC place)

4.2. Commitment for Julie D.: organize the future meetings (in mid-October 2004 and mid-April 2005). She will ask about funding at that time (see item 8.4).

4.3. **Status reports**: every 3 months to describe on-going activities and obtained results

4.4. Commitment for Julie D.: send an email to the 5 RFCs to ask for status reports (June 2004, January 2005, and June 2005).

4.5. **Results and papers**:

4.6. Commitment for All: send results and papers to everyone as often as possible.

5. Data archiving (Goal #4)

Archiving for the ensemble pre-processor calibration: Rob S. underlined that OHD needs to specify what data need to be archived to set up the ensemble pre-processor; these data requirements are needed by all the RFCs to enable them to set up the pre-processor.

Archiving ensembles is also necessary for ensemble verification.

5.1. **RFC archive** only for short-term ensemble pre-processor: a standard format needs to be defined for the RFC archive, if possible using an existing format (basically the data to archive are pairs of observations and forecasts). Currently, files in bfpx or informix format are used at OHD.

5.2. Commitment to Mary M.: document the requirements for data archive (precipitation: QPF and corresponding observations; temperature: QTF and corresponding observations) and give the information to all the RFCs.

5.3. **National archive**: the ensemble pre-processor needs to be enhanced for longer lead times by ingesting other meteorological forecasts.

5.4. Commitment to John S. and Martyn C.: define data availability and data archive requirements for ensemble prediction for all lead times.

5.5. **Verification archive**: it is necessary to start archiving ensembles generated by the pre-processor and streamflow ensembles obtained from these ensembles to evaluate the quality of the probabilistic forecasts.

5.6. Commitment for Julie D.: document the data archive needed to verify ensembles from the ensemble pre-processor and the ESP system and give the information to the RFCs. The required data are: i) precipitation: PQPF data CARD files and corresponding observations; ii) temperature: PQTF data CARD files and corresponding observations; iii) streamflow: ESP .CS files and corresponding observations.

6. Ensemble verification (Goal #5)

Verification: the need for verifying the ensembles and therefore for a unified verification system (which includes retrospective verification) was emphasized by everyone because information on the quality of ensembles is essential to both forecasters and end-users.

6.1. **RTi verification prototype**: Commitment for CBRFC (Lead: Dave B.; Bill L. Ned P., Rob H., Shuzheng C., Edwin W.): to run and test the RTi prototype and to organize a conference call to discuss the future steps.

6.2. **Retrospective verification**: Commitment for John S., Rob H., and Kevin W.: develop a retrospective ensemble generation program, which integrates the ensemble pre-processor and potentially the ensemble post-processor, which is compatible with the RTi verification prototype.

Issues to be addressed

7. Short-Term Ensemble Pre-Processor

7.1. Request of Joe O. and Ned P.: OHD should develop the capability for the RFCs to compute the short-term calibration parameters in order for them to run the system on more basins.

7.2. Bill L. requested "live" calibration procedures that automatically update parameters as new data become available.

7.3. Request of Rob H., Ned P., and Bill L. about the relationships between the deterministic forecasts and the probabilistic forecasts: since the forecasters have experienced with the deterministic forecasts, the links between these forecasts and the new probabilistic forecasts need to be investigated.

8. **AHPS Program**

8.1. Ned P. pointed out that the RFCs do not get credit from the AHPS program for their work with the short term forecasts only with long term implementation.

8.2. Ned P. underlined that there is currently no place in the AHPS web for these short term products to be displayed

8.3. Strategic plan for the ensemble development: Rob H. asked for an overall plan for the ensemble system enhancements from near to long term, including the pre- and post-processors, and verification.

8.4. Rob S. asked about AHPS funding for the travel expenses (see item 4.2).

9. **Training and Documentation**

9.1. Training is needed for the RFCs and their forecasters (with the use of examples from the calibration step to the ensemble generation step); training is also needed for the end-users with specific information about the quality of the probabilistic forecast relative to their needs.

Participants

ABRFC: Bill Lawrence.

CBRFC: Dave Brandon, Ed Clark, Steve Shumate.

CIRES: Martyn Clark.

CNRFC: Rob Hartman.

MARFC: Joe Ostrowski, Ned Pryor.

NERFC: Rob Shedd.

HSD: Kevin Lynott.

OHD: Gary Carter, Shuzheng Cong, Julie Demargne, Xiaobiao Fan, Hank Herr, John Ingram, Mary Mullusky, Pedro Restrepo, Jon Roe, John Schaake, Dong-Jun Seo, George Smith, Edwin Welles, Limin Wu.

WRH/SSD: Kevin Werner