

Precipitation Prediction Grand Challenge (NOAA Response to SAB Review)

A Presentation to the
NOAA Science Advisory Board

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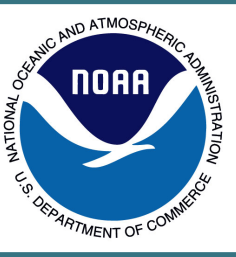
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Outline



- Background
- NOAA's general response
- NOAA's response to SAB recommendations
- NOAA coordination and views



Background

The SAB review of the Precipitation Prediction Grand Challenge (PPGC) Strategy document provided one grand recommendation, and 5 more specific recommendations.

These have all been addressed by NOAA, as shown in the following slides.



NOAA's General Response



NOAA is grateful for, and agrees with, the recommendations.

Moreover, with appreciation for the CWG's thorough and timely review, and the collaboration with the EISWG, the recommendations were incorporated in full into the next version of the Strategic Plan and immediately informed the Implementation Plan.

Here is the [link](#) to the latest version of the PPGC Strategic Plan.



Grand Recommendation



Grand Recommendation: Emphasize the grand in the plan: What is the biggest push that will make the biggest difference?

Six large pushes:

- 1) Improve end-user products through user engagement and social science .*
- 2) Assimilate and integrate data, then regularly produce supporting datasets*
- 3) Address model systematic errors*
- 4) Establish traceability of error sources*
- 5) Change the paradigm and target regions that host sources of precipitation predictability*
- 6) Improve water vapor and boundary layer observations and analyses.*

Response: NOAA agrees and has already identified the large pushes which are listed in the Introduction section of the Precipitation Prediction Grand Challenge Strategy document.



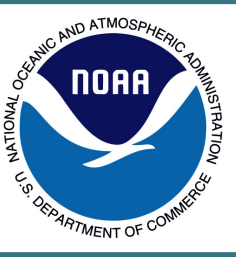
Recommendation #1

Recommendation #1: Structure the strategic plan for R2O2R, from the identification of needs in science of prediction and predictability, to the co-development of products to service.

Objective 1. Enhance and sustain user engagement

Acknowledging the necessary emphasis on science to improve prediction, a deep and continuous connection to the end user is key to building products and services that are useful, usable, and actually used (see also NWS Strategic Plan, Goal 1, sections 1.1-1.6; NESDIS Reimagined User Engagement Pillar 4 of 5; and NOAA Model for Service Delivery).

Response: NOAA agrees with the Review Team and the SAB, but retained the order of sections recommended by the SAB. A phrase was added to the introduction of Objective 1, which provides a nod to the SAB's Recommendation #1.



Recommendation #2

Recommendation #2: Explain the specific sources (decisions, observations, processes, etc.) of the substantial improvement (or the lack thereof) in precipitation prediction from the last 20 years, especially lessons learned from observations, modeling, and prediction.

Response: Accepted. Appendix A /Table A1 details the specific sources of improvement over the past 20 years as recommended.

Highlights of specific sources of the improvements (from hourly to seasonal forecasts) in the last 20 years

Observations: NEXRAD and Dual-Polarization Radar; TRMM and GPM satellite; surface and upper air observations

Data assimilation: improved initial condition

Process-level understanding: improved process understanding and physical parameterization

Understanding of predictability:

Model improvements: improved physics; improved coupling

Post Processing: reanalysis, reforecasts; ensemble forecasts



Recommendation #3

Recommendation #3: Explain the specific sources that will lead to substantial improvement in precipitation prediction over the next 20 years.

Response: Accepted. Appendix A /Table A2 details the specific sources that will lead to improvements in precipitation prediction in the next 20 years as recommended.

Highlights of specific sources that will lead to improvements in the next 20 years

Observations: Fill in the gaps; Increase observations of identified sources of predictability

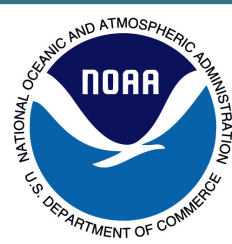
Data assimilation: Better utilize existing observations; Improved rapid refresh capabilities

Improved **process understanding** and parameterization of the key processes

Model improvements: Increase model resolution to convection-allowing scales; improved physics;

Improved **post-processing** including ML; Services based on user thresholds and generated based on ensemble post-processing

Making substantial improvements require a portfolio of integrated efforts across the value chain from understanding to observations, to modeling, to services, with user engagement throughout.



Recommendation #4

Recommendation #4: Highlight clear, quantitative goals and connect those to the improvements distinguished in Recommendation #3.

Response: Accepted. Section 3: The Future includes clear, quantitative goals for the next two, five, and ten years.

Highlights of 2 year Goals

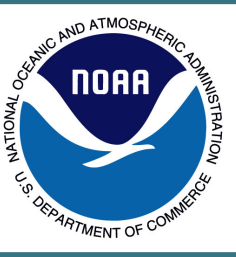
- Develop coherent, testable hypotheses for major precipitation systematic errors.
- Support partnerships with the decision-making community to establish precipitation predictability metrics that are of relevance to users and applications.
- Synthesize existing field observations for model development and improvement.
- New investments are driven by stakeholder needs for information and applications.
- Complete 25% of the proposed actions.
- Work with the broad community to implement multi-disciplinary, multi-agency process studies targeting key deficiencies in forecast systems that limit precipitation prediction skill the most.

Highlights of 5 year Goals

- Improved products (visualization and product design) to address forecaster's and partners needs, including information on confidence
- Leverage robust communities of practice to guide the production and application of precipitation products and research results.
- Reduce major systematic biases in UFS models by margins that are statistically significant.

Highlights of 10 year Goals

- Further increase the rate of improvement of the skill of precipitation forecasts from 30% per decade to 50% per decade.
- Completed 80% of the proposed actions.



Recommendation #5

Recommendation #5: Consider delineating the role of the community (different NOAA line offices, NOAA Cooperative Institutes, academia, private sector, states, and other federal agencies) and how NOAA and partners will work together to achieve these outcomes.

Response: Accepted. Appendix B delineates the roles and actions for everyone in the community.

Appendix B: Worksheet for the Role of the Community

Continuous engagement within the entire community is critical to the success of this grand challenge. The delineated roles in the table in the PPGC Strategy document are presumed to be part of an agile process for continuous integration and continuous deployment.



NOAA Coordination & Views



- **Coordination:**
 - Across NOAA LOs
 - ***GPEX (Global Precipitation Experiment)***
 - U.S. Coordination with USGCRP and USCLIVAR
 - WCRP is considering GPEX as a new WCRP Lighthouse Activity
- **What are NOAA's views on the subject?**
 - Coordination is critical to the Grand Challenge; NOAA cannot do it alone.
 - Sustained resources are important for implementation