



NOAA RESEARCH • ESRL • PHYSICAL SCIENCES DIVISION

## Theme 4: Research to Applications, Operations and Services

### *Serving NOAA - Summary*

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# Notable successes in R2X: uncertainty quantification

- Jeff Whitaker: R2O of ensemble-based data assimilation; hybrid EnKF operational in 2012.
- Chris Fairall: R2A of flux data sets to reduce process uncertainty and improve parameterizations.
- Phil Pegion: R2O of model uncertainty in ensemble prediction, implementations in 2014, 2016.
- Tom Hamill: R2O of reforecasts and statistical post-processing. Products used operationally at CPC, HPC, OHD, and more.
- A few others:
  - Maria Gehne, Gary Bates: land-surface uncertainty estimation in ensembles.
  - Gil Compo: ensemble data assimilation for climate reconstruction.
  - Kathy Pegion: seasonal climate uncertainty quantification with multi-model ensembles.
  - Matt Newman: linear inverse models.
  - Michael Scheuerer: verification of forecast uncertainty.

# A few of the science questions addressed

- *How can we improve forecasts, warnings, and decision support for high-impact weather events?*
- *How can we improve the way scientific information and its uncertainty are communicated?*

## Some PSD research goals addressed

- *Identify new sources of predictive skill and improve predictions of weather, water, and climate through observations, understanding and modeling of physical processes and phenomena of the coupled Earth system.*
- *Rigorously characterize and predict weather, water, and climate extremes and their uncertainties to inform decision-making.*

# Future directions

- Continue collaborations on all aspects of ensemble system design (data assimilation, forecast, post-processing) via NWS Next-Generation Global Prediction System project.
- Likely to be involved in development and production of next-generation weather reanalysis/reforecast.
- Challenge: **sustained** funding support to continue foundational lab R&D to feed into R2X
  - physically based stochastic parameterization
  - coupled data assimilation/reanalysis.

# Questions on what you've heard or on other uncertainty-related projects?

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