Theme 3: Modeling the Physical System

Improving Model Processes - Summary

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Science Review
12-14 May 2015
Boulder, Colorado
Science Issues Addressed

• Use-inspired research addressing PSD science goals
  
  ▪ Rigorously characterize and predict weather, water, and climate extremes and their uncertainties to inform decision-making
  
  ▪ Develop new process understanding, observational and modeling capabilities to predict conditions associated with too much or too little water for improved early warnings, preparedness and resource management
Notable Successes

- PSD research is improving model predictions
  - Provide increased confidence in forecasts across time scales
  - Inform policy makers on regional to global variability and trends
What You Heard

• Addressing PSD goals to **understand** and **predict** extremes across the weather-climate continuum
  
  ▪ Accurate projections of future global climate require improved understanding of model uncertainty (R. Pincus)
  
  ▪ Increased complexity in model physics doesn’t necessarily translate to improved prediction (J.-W. Bao)
What You Heard

• Addressing PSD goals to understand and predict extremes across the weather-climate continuum
  ▪ Using models with sophisticated parameterizations to inform models with simpler parameterizations, targeted at key weather-climate phenomena (S. Tulich)
  ▪ High resolution modeling of extreme events to inform flood risk management (K. Mahoney)
Future Directions

• Apply lessons learned to produce “seamless water prediction”
  ▪ Support NOAA concept for an Integrated Water Information System
  ▪ PSD contributions are extensive
    • Characterization of forecast uncertainty from flash floods to global climate change
  ▪ Provide policy makers with actionable information over a range of time scales
    • Flood risk
    • Water supply

An integrated information system for decision support on water-related risks and impacts

Examples of potential PSD Contributions

Past to Present: Reanalyses, attribution, and assessments of past and ongoing conditions and their impacts. Improved real-time observations and monitoring.

Future: Seamless forecasts of water-related risks across time scales

Needs for observations, process understanding and user interactions extend across all time scales
Session Speakers

- Robert Pincus: *Radiative Forcing in CMIP6*
- Jian-Wen Bao: *Evaluation of Microphysics Schemes for Numerical Weather Prediction*
- Stefan Tulich: *Improving Weather and Climate Prediction Models Through the Super-Parameterization Approach*
- Kelly Mahoney: *High Resolution Modeling to Understand Flood Risk and Hail Impacts in Future Climates*