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NOAA/NWS/OST Engaging Climate Prediction Science Community

— Challenges from NOAA 4th Climate Prediction Application Science Workshop

NOAA/NWS Office of Science and Technology

Building Climate Prediction Application Science (CPAS) Community

Strategic Setting of NOAA CPAS Workshop

The NOAA Climate Prediction Application Science (CPAS) Workshop has been set up as a sister workshop parallel to the NOAA Climate Diagnostics and Prediction Workshop (CDPW). Being distinguished from the CDPW's goal, which is to meet technical challenges to making climate prediction, the purpose of the CPAS workshop is to address applications of climate predictions by identifying new climate prediction application research, assessing the impact of climate forecast on environmental societal activities and promoting interactions between the climate sensitive integrated research and the service community. By setting up the CPAS workshop, it is also envisioned to build a broader climate product application community and create a bridge between the product production, dissemination and customer needs.

NOAA 4th CPAS Workshop Success

The NOAA 4th CPAS Workshop: Research and Applications on Use and Impacts, co-hosted by the Climate Service Division (CSD), Office of Climate, Water & Weather Services, National Weather Service and the Climate Assessment for the Southwest (CLIMAS), the University of Arizona, was held in Tucson, AZ, 21-24 March 2006. A diverse group of climate science producers and users from more than 40 institutes all over the country gathered to share and discuss developments in research and applications related to the user and impacts of climate predictions on societal decision-making and resource management. The meeting followed the agenda of seven sessions in the themes of stakeholder engagement, climate products, climate-health/air quality, climate science/services, climate forecasts and applications, water management, and economics/forecast value. It also conducted four panel discussions on the issues of NOAA Climate Prediction Services Team, drought, water resources management & climate science, and decision making, partnerships & stakeholders. In a concerted effort by all participants, the workshop successfully achieved its goals.

Broad Spectrum of Participating Applications

- Wildfire and land management
- Water resource management
- Health - air quality
- Health - malaria early warning
- Agriculture
  - Plant diseases
  - Livestock (heat stress)
- Drought planning
- Dam control
- Hydropower
- Canal operation
- Ski industry
- Crop insurance

NOAA/NWS/OST Summaries of 4th CPAS Workshop

http://www.nws.noaa.gov/ost/climate/STIP/CPASW06/

Announcement

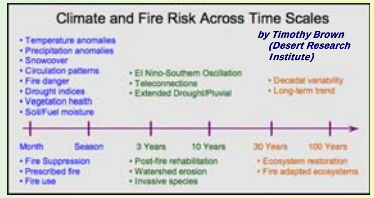
5th NOAA CPAS Workshop, Seattle, WA, 20-23 March 2007
http://www.nws.noaa.gov/ost/climate/STIP/ann_cpasw07.htm

Predictable information

All agents that can change climate are of matter.

- Changes in received solar radiation
- Changes in sea-surface temperature
- Changes in land use and surface vegetation
- Changes in sea-ice distributions
- Changes in atmosphere composition

Predictability of these forcing factors and their influence on climate pattern changes are critical to applications.



Uncertainties

Sources of uncertainties:

- Model biases
- Variability in predictable climate information (e.g. ENSO)
- Downscaling errors
- Errors in judgment (assumptions and Measurement)
- Scaling-up / aggregation with plot-scale models

Uncertainties affect decisions. Quantification of uncertainty is required as input to any decision systems. Uncertainty diagnostic analysis, which highlights factors whose uncertainty is pivotal in determining actions, should be an integral part of the forecast. The methodology development is desperately needed for routine applications to identify high impact areas for uncertainty. Currently, we have not put enough efforts to document impacts of uncertainty on decisions.

by Shrikant Jagtap (Univ. of Florida)

Models

Existing climate models cannot credibly produce future weather scenarios (the form, seasonality, and variance of the phenomenon that constitute the dominant controls on weather systems and their variability) of other than the gross geographic and seasonal distribution of mean surface temperature.

Model Capabilities vs. Application Interests

Parameters and/or trend(s)	Level of practical interest to policy makers, adaptive planners, and resource managers	Ability of climate models to reproduce over the last 50 years
Mean annual global surface temperature	None	Exceptional
Regional and seasonal mean surface temperature and precipitation and their interannual variability	Considerable	Fair to poor for surface temperature and poor for precipitation
Regional and seasonal intraseasonal variability, especially risks of weather extremes and high-impact events	Intense	Poor or unknown

Dynamical downscaling

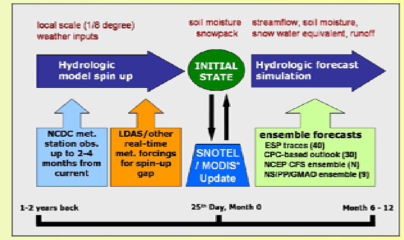
Challenges

- Models which don't represent the current climate well cannot be credibly downscaled statistically for even the current climate with methods based only on observations, or based on model corrections if either (a) the model is missing important variability or (b) observational data is limited.
- Models of future climate cannot be credibly downscaled statistically because climate change is inherently a non-stationary process
- Nested model downscaling implies major technical challenges as well as assumptions about scale interactions if attempted for future climates
- More attention needs to be paid to the development of credible meso-scale (to avoid downscaling compromises) global coupled models that correctly treat the full spectrum of variability.

by Robert Livezey (NWS Climate Service Division)

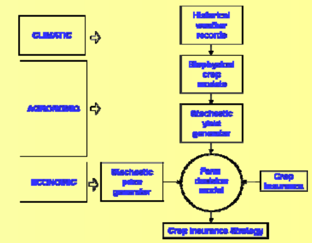
Examples of Applications

Experimental W. US Hydrologic Forecast System



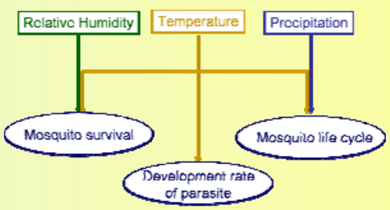
Alan Hamlet et al. (Univ. of Washington)

Optimal Climate Crop Insurance Strategy: Contrasting Insurer and Farmer Interests

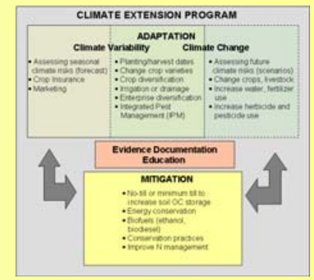


Victor E. Cabrera et al. (New Mexico State Univ.)

The Role of Climate for Malaria Control

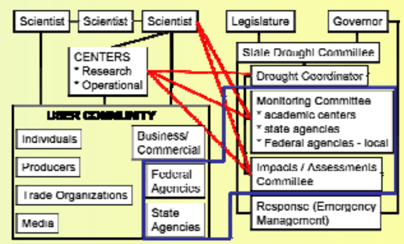


Emily Grover-Kopec (Columbia Univ. / IRI)



Clyde Fraisse (Univ. of Florida)

Communication Between Scientists and Policy-Makers



Mark Shafer (Oklahoma Climatological Survey)

Panama Canal Simulation System

Nicholas Graham et al. (Hydrologic Research Center, San Diego, CA)

To engage application community, ask what you are doing instead of what you need.

— *Eileen L. Shea* (East-West Center, Honolulu)

Products

Problems in translation and extension

- Misinterpreted forecast products
- Use of forecasts limited by lack of demonstrated forecast skill
- Some products are unappreciated by users because of lack of understanding
- No "forecast" language: No skill seems to work better than Not Available, Equal Chances or Climatological Probabilities

Recommendations for product improvement

- Simplified presentations
- Provide forecast evaluation
- Trained NOAA staff to educate customers
- Better information tools to explain product
- Consistency in forecast product information

by Holly Hartmann (Univ. of Arizona) & Marina Timofeyeva (NWS/CSD)