Poster Session:
Climate Products and Services

Climate Prediction Application Science Priorities and Issues - Contributions from 2010 CPAS Workshop

"Managing Water Resources and Drought in a Changing Climate"

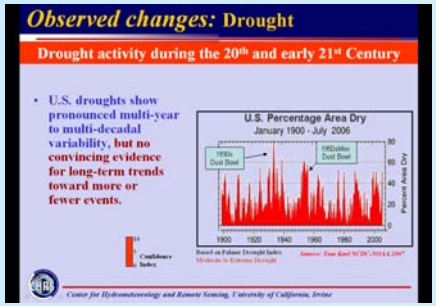
Jiayu Zhou, S&TI Climate Mission, Office of Science and Technology
Marina Timofeyeva and Michelle D. Hawkins, Climate Service Division/OCWWS
NOAA's National Weather Service

Introduction

The 8th NOAA Climate Prediction Applications Science (CPAS) Workshop, a sister workshop parallel to the NOAA Climate Diagnostics and Prediction Workshop but focusing on 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, service, and user communities, was held in San Diego, CA, from 2 to 4 March 2010, co-hosted by the National Weather Service Climate Services Division, the California Department of Water Resources, the National Integrated Drought Information System, and the Water Education Foundation. The special theme for this workshop was Managing Water Resources and Drought in a Changing Climate. A diverse group of 75 people from a variety of sectors including federal and local government, academia, and the private sector gathered to exchange ideas, build mutually beneficial collaborations, and share best practices within this specific climate sensitive sector. Aside from recurring issues, *e.g.* communication and outreach, engagement, decision support, *etc.*, discussions gave prominence to application science priorities and related issues to improve climate service products.

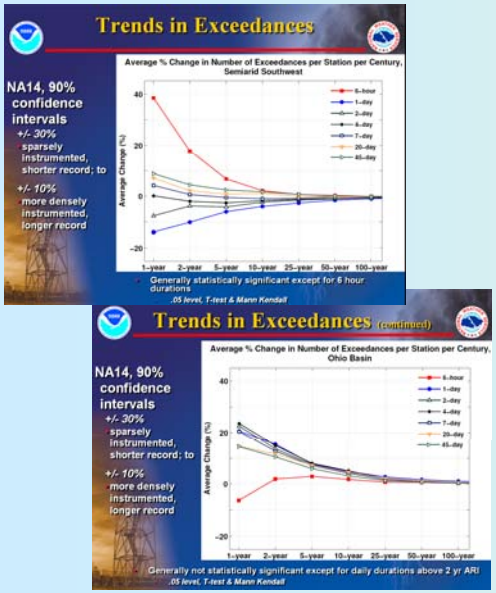
1. Improving forecast skill and reliability is crucial to increase users' confidence in climate prediction products.

- For IPCC prediction of more arid climate toward a warmer environment in the future, hydrometeorology expert participants looked at historical records (1900-2006) and showed pronounced multi-year to multi-decadal U.S. drought variability, but no convincing evidence of long-term trends toward more or few events from the observation (see figure below).



(From Sorooshian)

- Non-stationarity of design rainfalls, in the ranges used by civil engineers, was also examined. It was shown that historical trends in the number of rainfall exceedances over key areas of the U.S. were small compared to the uncertainty of intensity, frequency, duration (IFD) values used by civil engineers (see figure below).

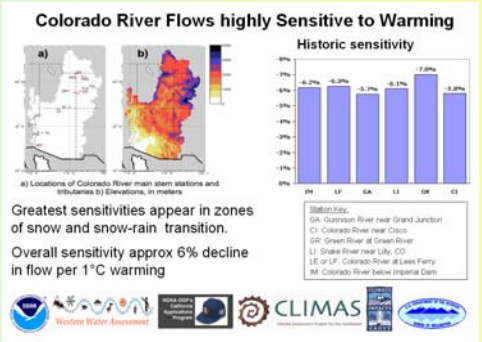


(From Bonnin)

In discussions, there was a general consensus that more research needed to be done to address non-stationarity because of climate change and assess the added value of downscaling over traditional stochastic hydrology methods.

2. Though regional climate services are highly demanded by users in all geographical locations, the predictability is not evenly distributed in space and time. There are gaps between what is known and the knowledge needed in regional applications

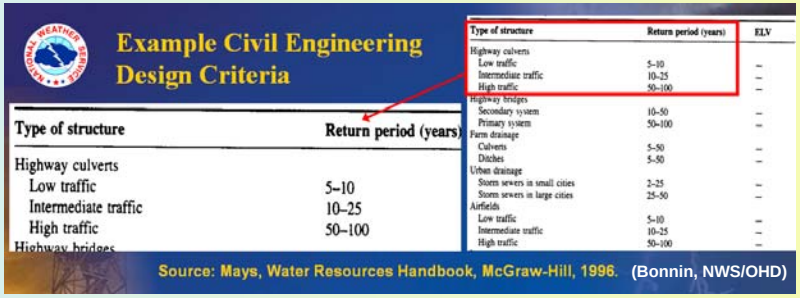
- By assessing current 'state of the art' of climate forecasting teleconnection research, no clear link was found between California multi-year droughts and either ENSO or PDO phase. The dominance of ENSO teleconnection research to improve ISI forecast should not dwarf other efforts (i.e. detecting the linkage between summer trends in SLP near Azores and runoff in Sacramento and San Joaquin basins, the impact of the Indian Ocean dipole etc.). A good fraction of annual precipitation from 'atmospheric river' events, which could be linked to MJO and ENSO, are still poorly understood and requires more research. Research needs were also identified for detecting sensitivities of regional impacts to the projected changes of temperature and precipitation.
- Studies showed high sensitivity of the Colorado River flows to the projection of warming (see figure right). It is important to know the underlying mechanisms for the flow changes in order to provide meaningful information that incorporates uncertainties in future climate change projections for water managers and policy makers.



(From Cayan)

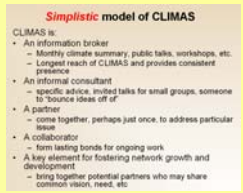
3. Coupling of climate science advancement with water resource practices has been shown as a key mechanism to develop needed tools and products for applications.

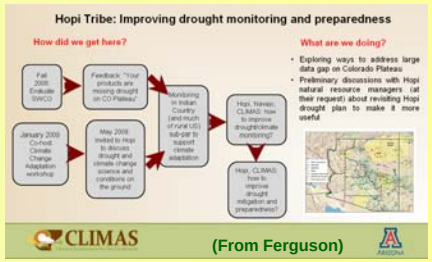
- For climate information products to be considered useful by the civil engineering community, products should address the frequencies and durations used for designing civil infrastructure (see figure below). Because of different cultures, values, languages, as well as the loading dock method used for information transfer with little interaction with practitioners during climate research, the climate community's statements on trends in rainfall frequency do not adequately address the concerns of civil engineers.



4. Enhancing partnerships with social scientists to maximize the benefits of climate information for users with statistically unsophisticated climate knowledge and providing training opportunities was another prominent S&T aspect of the workshop.

- Lessons learned from past and current practices emphasized the importance of sharing goals and resources, leveraging expertise and fostering extension networks to identify and understand specific information needs, relate these to the design and function of operational tools, and communicate information back to stakeholders.

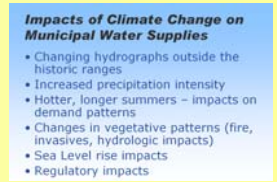




(From Ferguson)

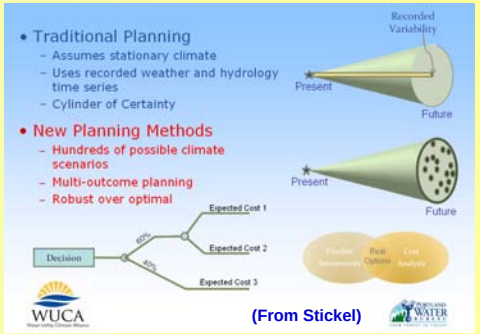
5. From the user perspective, water resource managers need actionable climate information.

- This community emphasized the importance of climate model agreement on change in key parameters, narrowing the uncertainty range of model output, increasing resolution at a spatial and temporal scale that matches water utility current systems, and improving projections within water utility planning horizons.



(From Stickel)

- It was also suggested that the development of priorities needs to be more focused on the enhancement of global and regional climate model ensembles, development of regional climate model components, improved use of observations to constrain climate model projections, improved modeling of the tropical Pacific, improved decadal prediction, and development of probabilistic downscaling for extremes and daily data.



(From Stickel)

Acknowledgements. This presentation is based on the workshop summary accessible at http://www.joss.ucar.edu/events/2010/cpasw/meeting_report.pdf