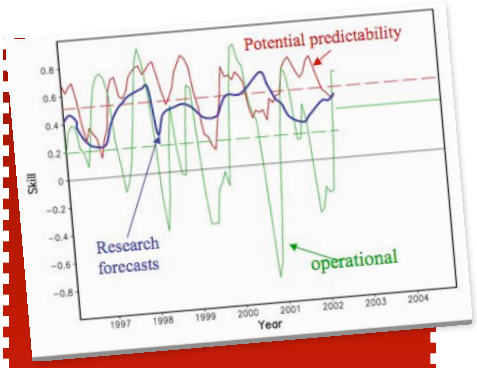
Climate Prediction & Predictability

U.S. CLIVAR - CLIMATE VARIABILITY AND PREDICTABILITY

U.S. CLIVAR has identified improved predictive capability to leave as its legacy. In order to accomplish this, scientists must foster improved practices in the provision, validation and uses of climate information and forecasts through coordinated participation in the U.S. and international climate science and applications communities. The aim of these efforts includes furthering fundamental understanding of climate predictability at seasonal to centennial time scales; improving provision of climate forecast information, particularly with respect to drought and other extreme events; fostering research and development of prediction systems for climate impacts on ecosystems; enabling the use of CLIVAR science for improved decision support. Drought and extreme events will be a central focus of predictability within U.S. CLIVAR.



Climate Predictability

The above shows potential gains in seasonal forecast skill that might be realized by transitioning research forecasts' methodologies into operational forecasts. Also shown is potential predictability, approximating an upper limit to skill.

Seasonal to Interannual Prediction

Seasonal to interannual forecasting is essentially predicting the climate signal due to external forcings such as anomalous sea surface temperature (SSTA), soil moisture, sea ice, and chemical constituents. ENSO SSTA is the primary source of forecast skill related to ocean influences. Further research is required to better understand the role of non-ENSO ocean states and the signals related to the other forcings on US climate variability. Current practices of using uncoupled models in forecast systems are slowly giving way to coupled models and multi-model ensemble approaches, but removing biases in these coupled models remains a key challenge.

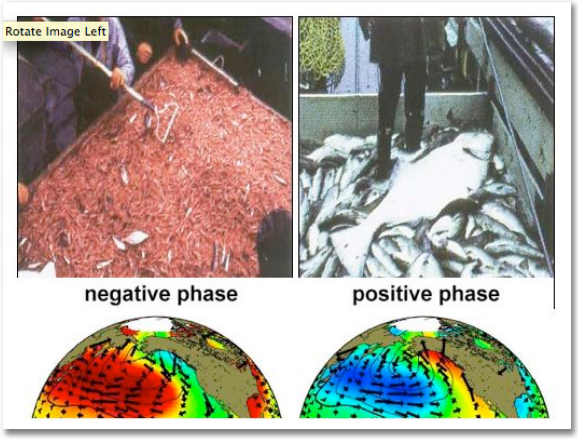
U.S. CLIVAR is working closely on these challenges with NOAA's Climate Test Bed activity and through the international World Climate Research Programme (WCRP) Task Force on Seasonal Prediction.

Prediction vs. Predictability

Quantifying potential predictability over all time scales is an important aspect to (1) understanding what the limit of predictability would be if, for example, the external forcing were known perfectly, (2) identifying conditional predictability (e.g. state of ENSO or Indian Ocean), (3) setting a baseline for improving prediction tools, such as dynamical models, or multi-model ensembling approaches, and (4) a target for real-time predictions. The Prediction, Predictability and Applications Interface Panel (PPAI) is coordinating development of three papers, covering predictability and prediction issues on the seasonal-to-interannual, decadal, and climate change timescales.

Opportunities

The phase of the Pacific Decadal Oscillation (PDO) is associated with changes in regional species composition in the North Pacific (small fish - negative PDO; large fish - positive PDO). Throughout the North Pacific numerous biological indicators suggest a regional ecosystem shift associated with the large-scale climate shift of mid-1970s. Thus, further research is required on decadal climate variability. Some predictability of low frequency variability may be possible for the North Pacific region, however, due to its link to ENSO. But, more research is required on the links between climate variability and ecosystems for all time scales.



Leadership

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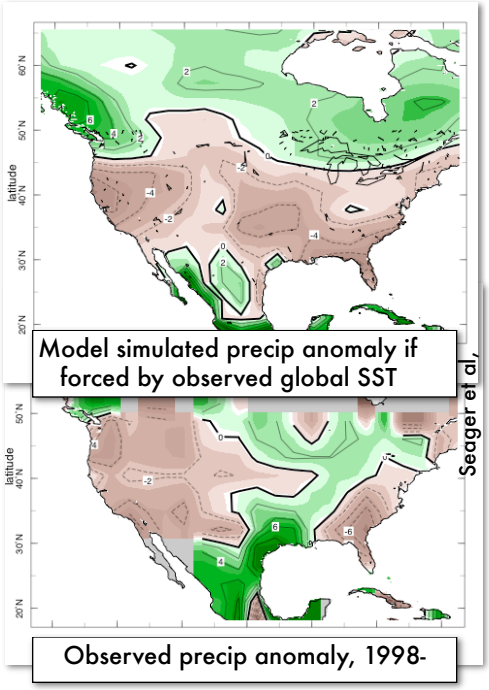
For additional information:
www.usclivar.org

Future Payoffs and Relevance

Much of the western US has been experiencing persistent drought since 1998. If we force a dynamical model of the atmosphere with the observed SSTs over the same period, we can recover a very similar pattern of below-normal rainfall. Those rainfall anomalies appear to be associated with La Nina-like conditions in the tropical Pacific. On the other hand, the extent and severity of drought over tropical land areas is highly correlated with El Niño events. For a given severity of drought, the spatial extent increases linearly with the strength of El Niño.



Funding Opportunity

The predictability of drought is a key challenge for CLIVAR. As such, mechanisms crucial to long-term drought need to be identified - how well do current models simulate observed droughts? To provide some answers, U.S. CLIVAR sponsoring agency programs will be soliciting short proposals for small supplemental grants to analyze and evaluate the simulation of drought in current models (e.g. unforced control runs archived as part of the WCRP CMIP3 multi-model data set at the PCMDI, multi-model simulations of 20th-century climate, long stabilized simulations with forcing held fixed at future climate conditions, paleo-climate simulations of the last glacial maximum, or downscaled high resolution model data sets). *Watch the US CLIVAR web site for an announcement about this opportunity.*