



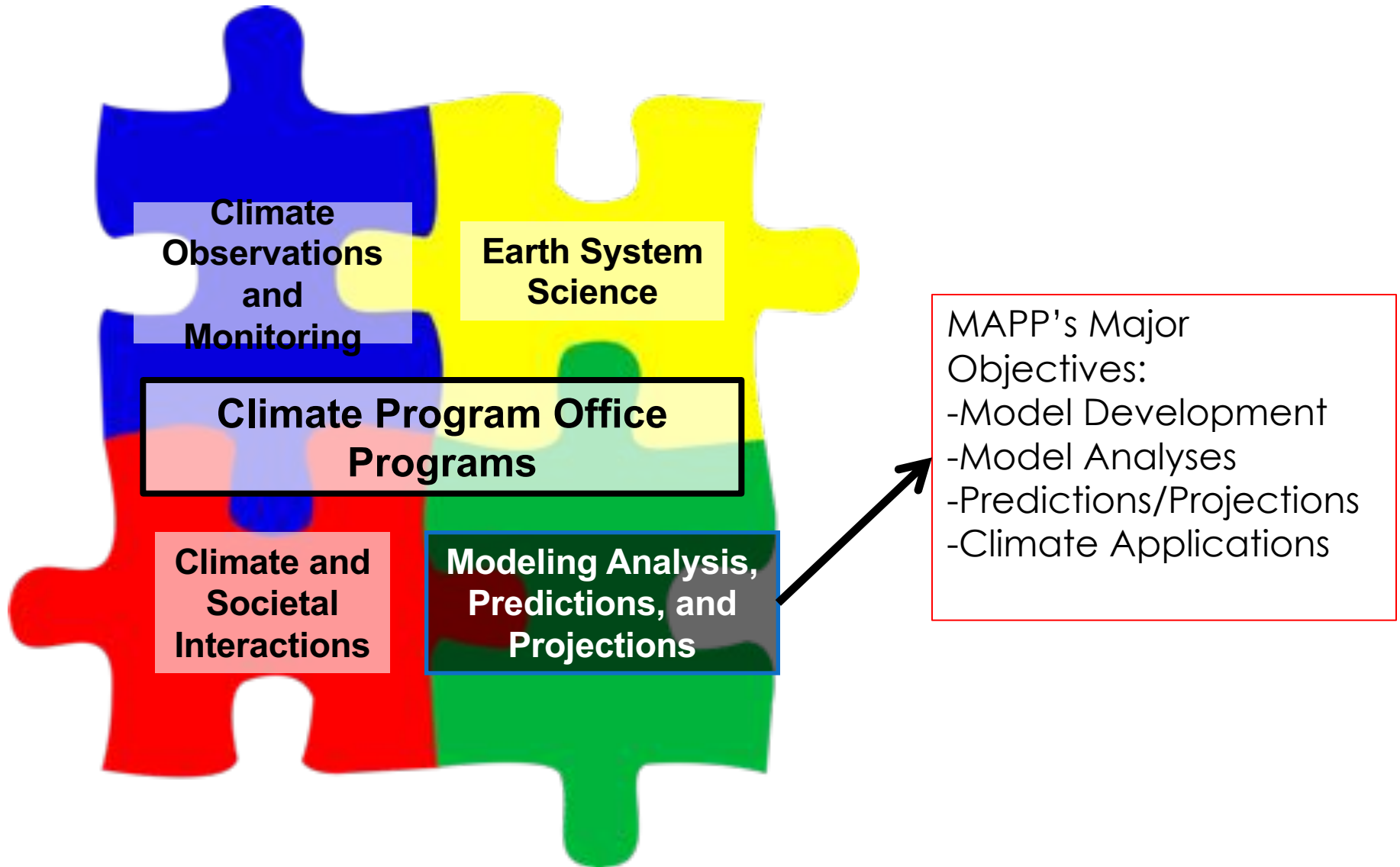
NOAA's Climate Program Office

***Modeling, Analysis, Predictions,
and Projections Program***

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Overview: Climate Program Office



Overview: MAPP Program Activities

“ To understand and predict natural variability and changes in Earth's climate system”

Long-Term Climate Outlooks
(CMIP5 Task Force)

Drought and Extremes
(Drought Task Force)

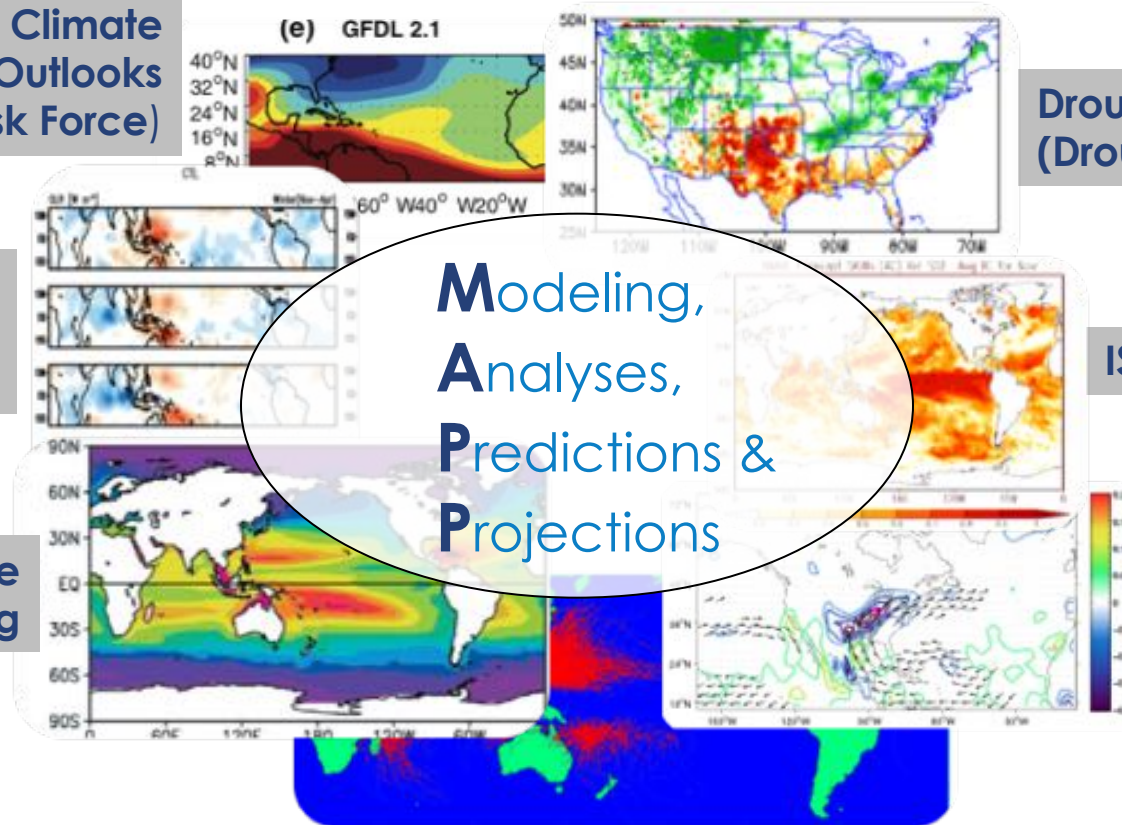
Climate and Earth System Model improvement

Regional-scale modeling

ISI climate prediction

Climate Re-analyses

Modeling,
Analyses,
Predictions &
Projections



Extending NOAA's research capability via competitive funding opportunities, Task Forces and a webinar series that connect NOAA with the broader community



A Network of Research Task Forces

Strategically connecting scientists at NOAA labs, NOAA's operational centers and in the external community.

Drought Task Force
Advancing Drought Monitoring
and Prediction

CMIP5 Task Force
Developing Projections for
North America

MAPP Webinars
Facilitating communication

Prediction Task Force
Advancing ISI climate prediction

- Each, 30-plus plus investigators; multi-institution/multi-agency participation
- Each includes PIs from ESRL, GFDL, AOML and NCEP; facilitates collaborative work.



High-Resolution Climate Modeling

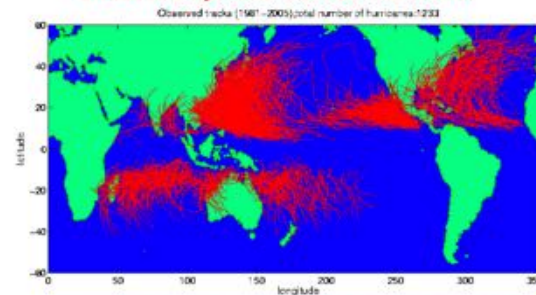
- A coordinated modeling experiment involving NCAR, GFDL, ESRL, and NASA to study the impact on MJO prediction of resolution and physics. [Involves hindcasts with GEOS-5, CAM5, HiRAM, and WRF]. (PI: Tulich)
- COLA's high-resolution modeling experiments (ATHENA) to explore the hypothesis that high spatial resolution and process-resolving models can dramatically alter simulation of climate. (PI: Kinter)

HiRAM at GFDL

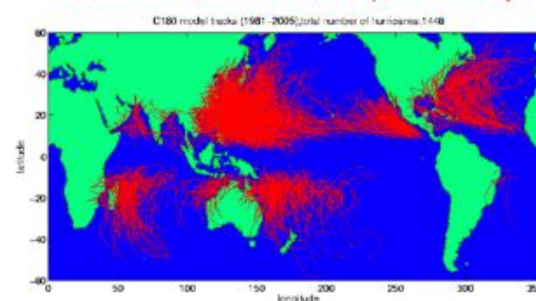


Courtesy of S Tulich, M Zhao

Observed cyclone tracks: 1981-2005



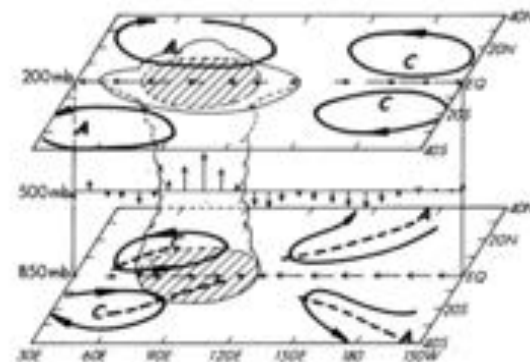
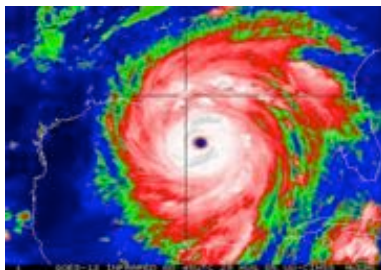
Simulated tracks: 1981-2005 (C180 model)



← One realization

High-Resolution Climate Modeling

- Several projects focusing on extremes contributing to WCRP MJO Task Force, and U.S. CLIVAR Hurricane WG.



Includes a project at GFDL (Vecchi et al.) using high-resolution models (CM2.x suite and HIRAM) to look at the connection between the IAS and extremes.

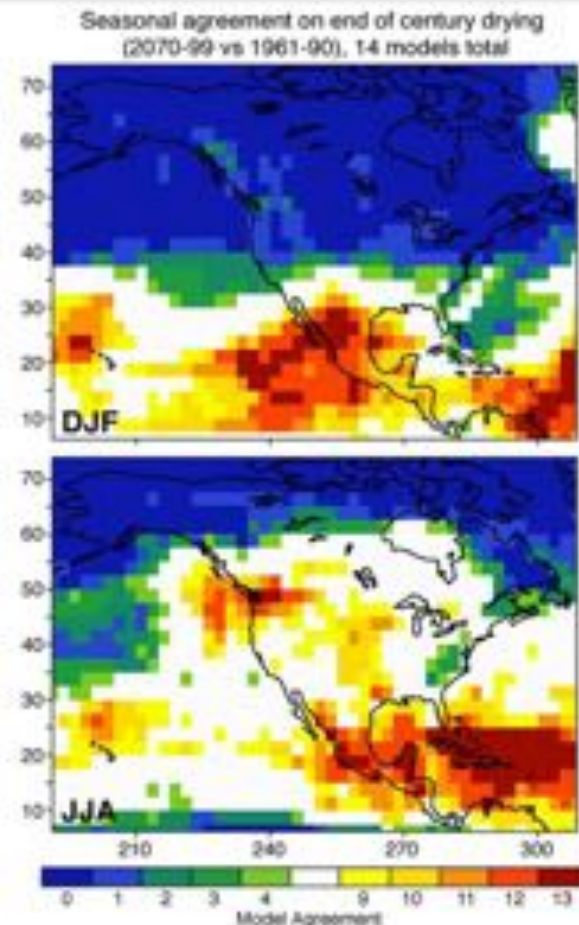
- Innovative approaches to high-resolution (FY12 call):
 - Test adaptive vertical grid approach in the Multiscale Modeling Framework, which has been embedded in CAM.(PI: Marchand)
 - Experiments with two-way nesting with WRF-CCSM (PI: Colle)

Uncertainties in regional-scale climate projections

A **MAPP CMIP5 Task Force** evaluating simulations of the 20th century climate and the uncertainties in long-term predictions and projection of twenty-first century climate over North America.

- Involves people at GFDL, NCEP, ESRL, AOML, NCAR, NASA and many universities.
- Comparison of various modeling techniques (high res. time-slices, dynamical downscaling, statistical methodologies), in the development of regional projections.
- A process-based approach to assessing uncertainties

A J of Climate Special Collection in preparation focusing on projections for North America, including regional aspects.



Courtesy of D. Neelin

Regional-scale Climate Prediction

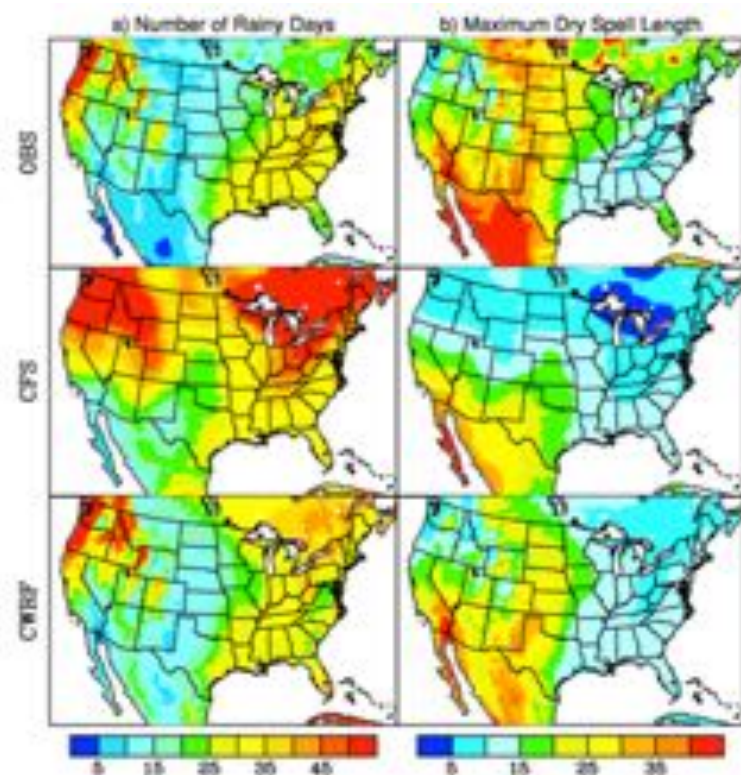
Does downscaling improve seasonal prediction skill?

-> Multi-RCM Ensemble Downscaling of NCEP CFS Seasonal Forecasts (MRED) Project (PI: Roads/Arritt)

- Research inspired by NCEP needs.
- Involved best and brightest from the RCM community and NCEP (ETA-UCLA, WRF, CWRF, MM5, RAMS..)
- Tested the impact of resolution and RCM model physics on winter prediction skill (based the period 1982-2008)

Mixed research results:

- Seasonal skill determined by the skill of the driving GCM; mostly ENSO related.
- Some improvements in the statistics of extremes with downscaling.



Downscaling of CFS predictions (center panels) with CWRF (bottom panels) shows some improvements in the statistics of extremes if compared to observed (top panels). (Courtesy of Liang).

Multi-Model Ensemble for Drought and ISI Climate Prediction (NMME)

An experimental U.S. multi-model ensemble to improve ISI climate and drought prediction

MAPP successfully established a broad multi-institutional interagency-funded collaboration, led by NOAA (MAPP-CTB)

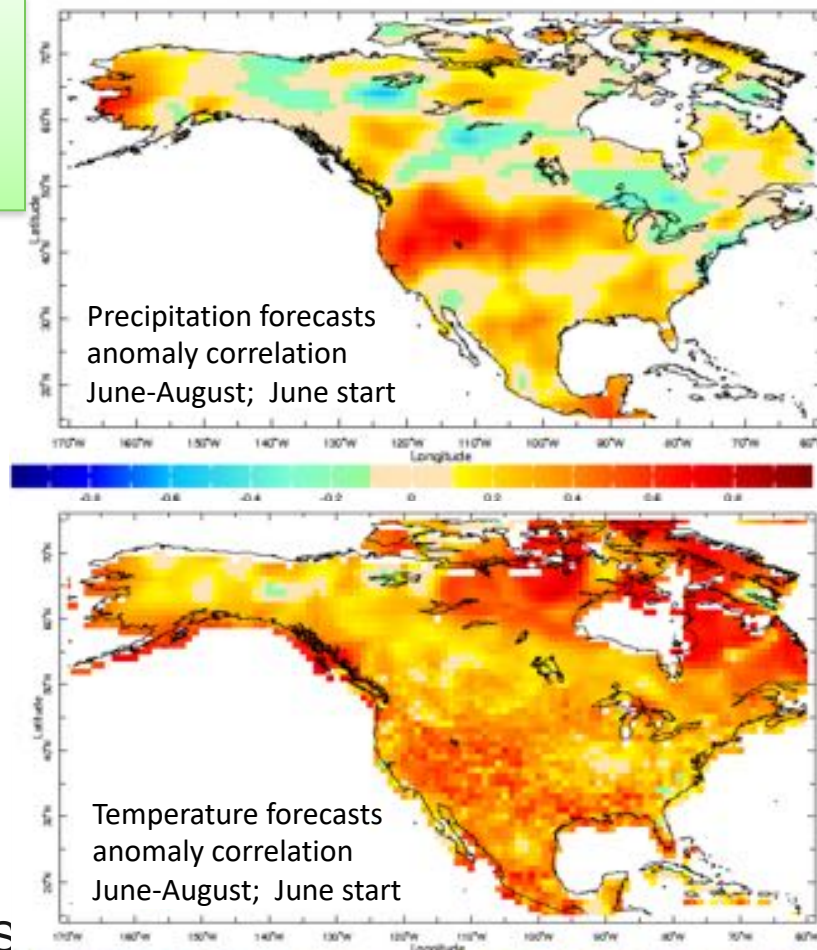
Supported activity:

- Involves U Miami, GFDL, NCEP, ESRL, NCAR, NASA, IRI, U of Princeton, COLA
- With NOAA/NSF/DOE/NASA support.
- Address modeling and prediction research questions
- Test specific metrics in a near-operational mode to help the design of an optimal system.

Potential Outcomes/Payoffs:

- An optimal design of a multi-model system
- Improvements in NOAA's operational climate forecasts.
- An unprecedented accessible set of coordinated U.S. model predictions for research

NMME Forecast Verification analyses



Courtesy of IRI

Drought Research

Funding the Best Science and Innovation; Providing Coordination and Leadership

A multi-agency/multi-institution group of 30-plus MAPP Investigators

Extending NOAA's Research Capability

Joint projects between scientists at GFDL, ESRL, NCEP and external investigators

Contributing to National Efforts

Drought Monitoring and forecasting research for NOAA-led National Integrated Drought Information System

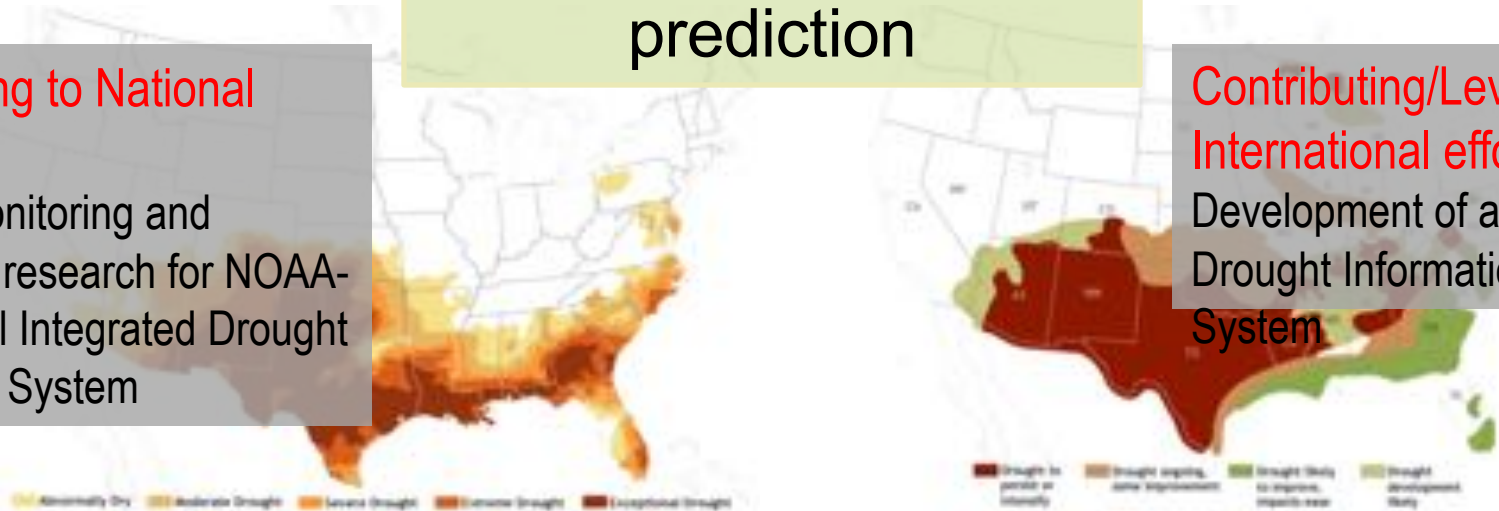
Drought Task Force
Advancing U.S. drought monitoring and prediction

Improving NOAA Operations

Projects to test research advances for NCEP's operations

Contributing/Leveraging International efforts

Development of a Global Drought Information System



- Back Up Slides on NCPP



National Climate Predictions and Projections (NCP)

NCP applies experience and research to the successful application of climate models to the development of structured approaches to climate change problem solving. NCP is distinguished by:

- NCP uses and links together existing capabilities and communities.
- NCP is a governed community
- NCP emphasizes and integrates three paths of activity:
 - Cyberinfrastructure
 - Quantitative evaluation of climate predictions and projections
 - Translational narratives of direct use to practitioners
- NCP is committed to open communities and open source development.

The making of a flood

Large amounts of
snow on the ground

Rainfall
Snowfall

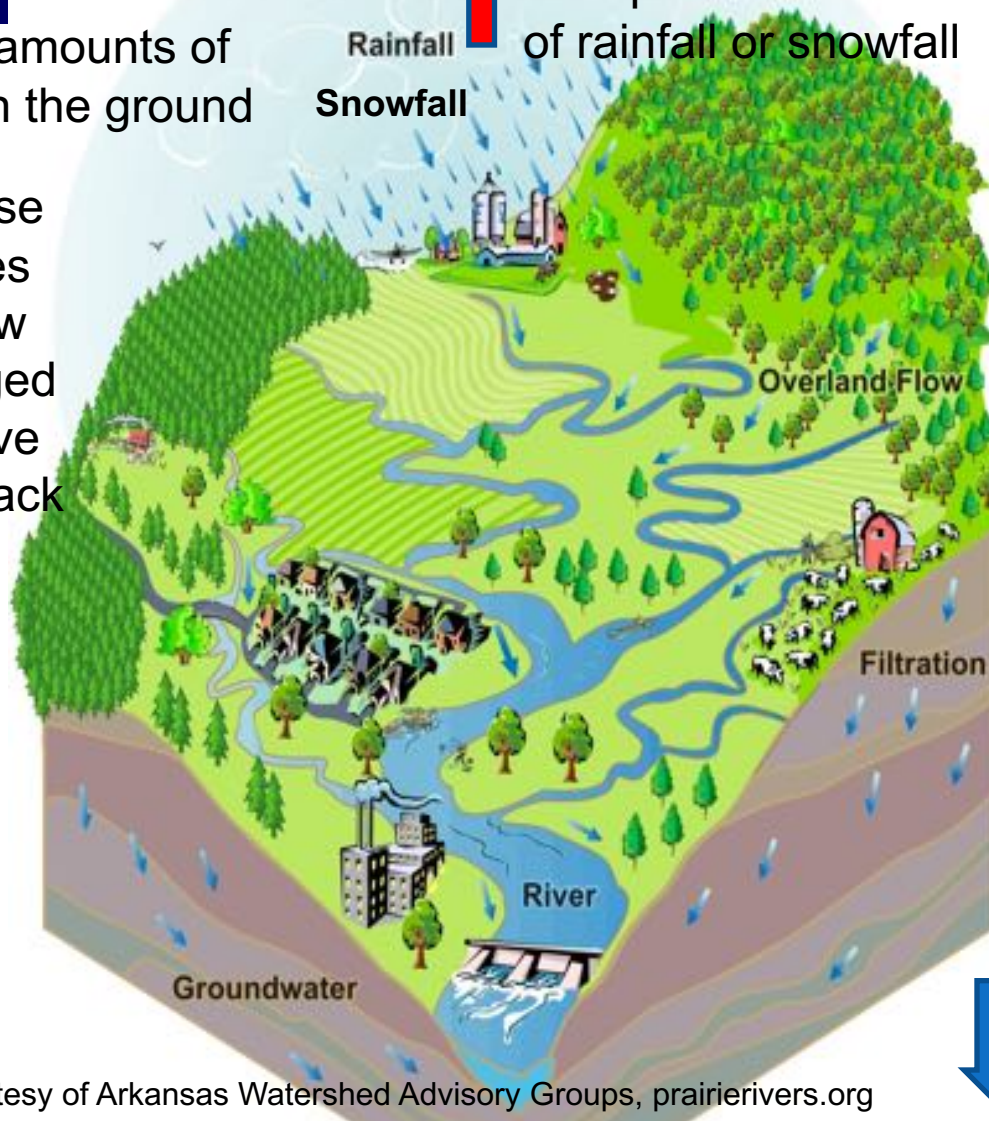
Exceptional amount
of rainfall or snowfall

Low or decreased
interception,
due to lack of
vegetation

Sudden increase
in temperatures
and rapid snow
melt; or prolonged
melting of above
average snowpack

Limited
evaporation

Increase in
baseflow



Increase in
overland flow

Water saturated
grounds

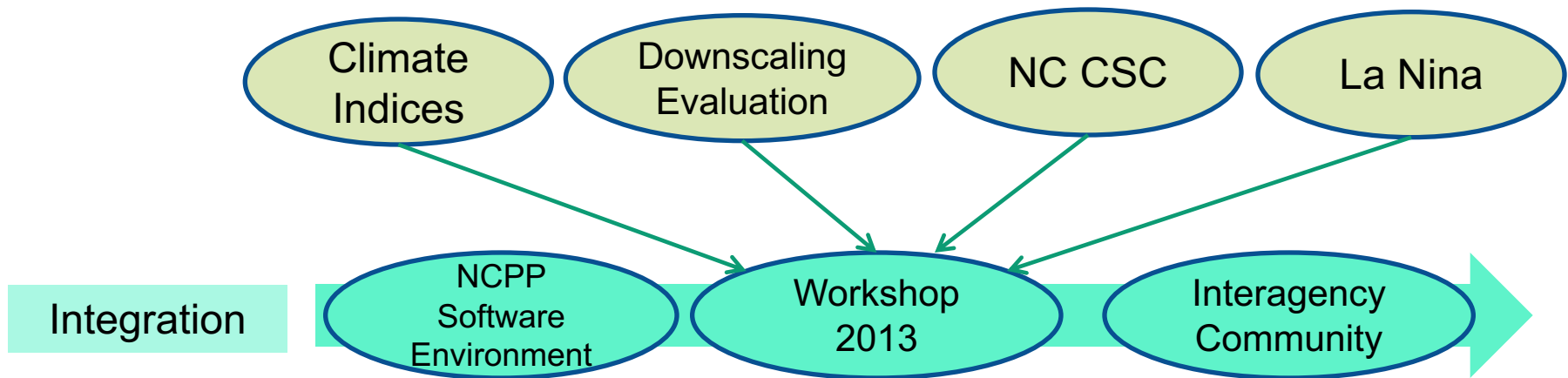
Large increase
in soil
moisture

Limited infiltration,
due to frozen
ground, soli type,
soil saturation

Watershed Diagram Courtesy of Arkansas Watershed Advisory Groups, prairierivers.org

$$\text{Runoff} = \text{Precipitation} - \text{Infiltration} - \text{Interception} - \text{Evaporation}$$

NCPP - Take Away Messages



NCPP is an effort focused on how to build organized, trusted, scientifically robust, usable climate information in a world of scattered resources, scattered capabilities, and in constant flux. We are focused on the organization as a whole and knowing how we solve problems - knowing what is available, building partnerships, decision making as an organization, science-based evaluation of products, application-specific guidance based on those products, and development of an infrastructure to organize and sustain the effort. Community is essential; it is the only way to extend across the complexity and it is essential for the emergence of standards and services.

