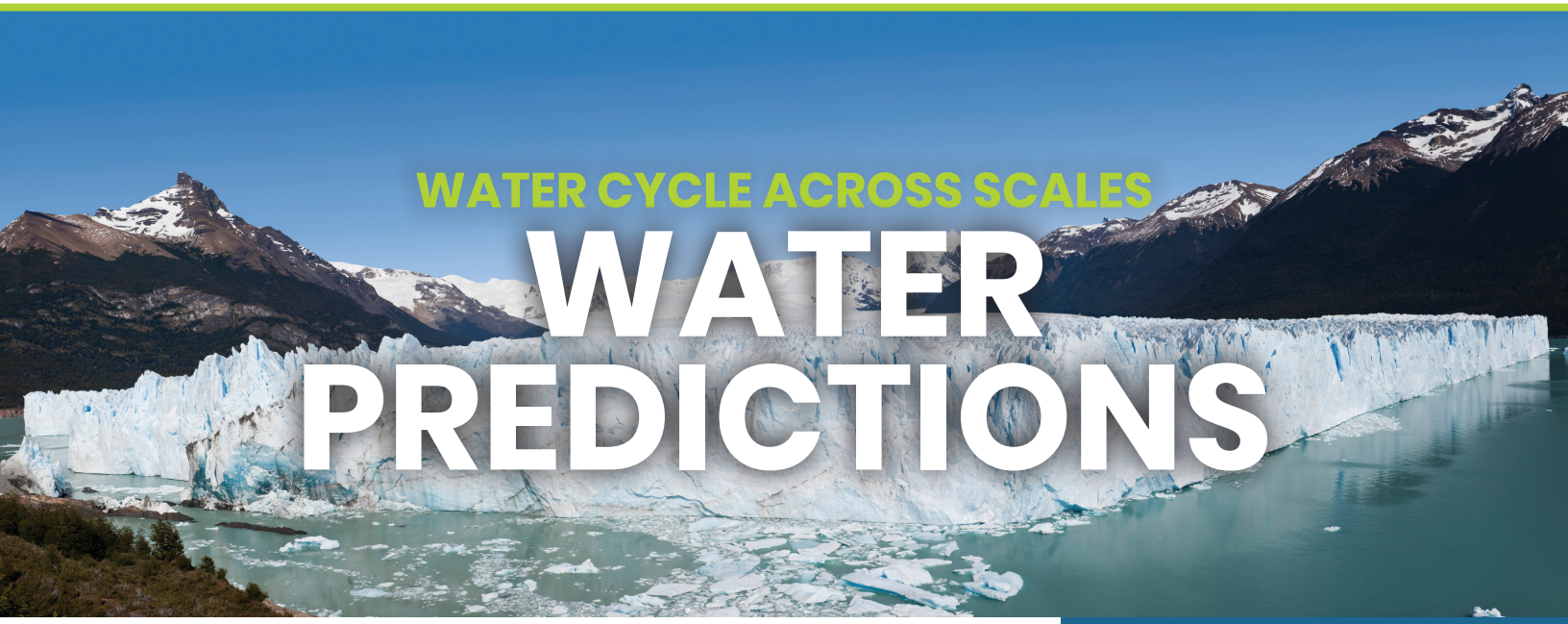
NCAR | RESEARCH APPLICATIONS LABORATORY



WATER CYCLE ACROSS SCALES

WATER PREDICTIONS

Our Water System

Water takes countless forms and touches our lives in infinite ways. The water cycle is a complex linkage of processes, reservoirs, and pathways that govern the movement and transformation of water on the Earth. While the uncertainties inherent in the water cycle are global problems, deepening our understanding of its behavior over continental areas will lead us toward a better understanding and prediction of key aspects of the water cycle.

MODELING OPPORTUNITIES

NCAR's Water Cycle Across Scales (WCAS) program aims to improve predictions of the water cycle within weather and climate models, on scales ranging from storm-scale to climatic fluctuations. Achieving this goal by studying processes within the water cycle will improve convective, land surface, and microphysical parameterizations within our models. These improvements have the potential to dramatically enhance the public's ability to plan for and react to significant weather events.

The first step in broadening the knowledge base of the water cycle is to explore how water vapor, precipitation, and land-surface hydrology interact across scales to define the dynamic hydrological cycle. Key research for these pursuits begins with observing and measuring the components of the water cycle, and how they work within the coupled land-atmosphere system.

Benefits & Impacts

- Improved parameterizations in our models
- More accurate predictions of severe weather
- More timely & pertinent data to decision makers
- Quantify runoff, soil moisture, & recycling of moisture

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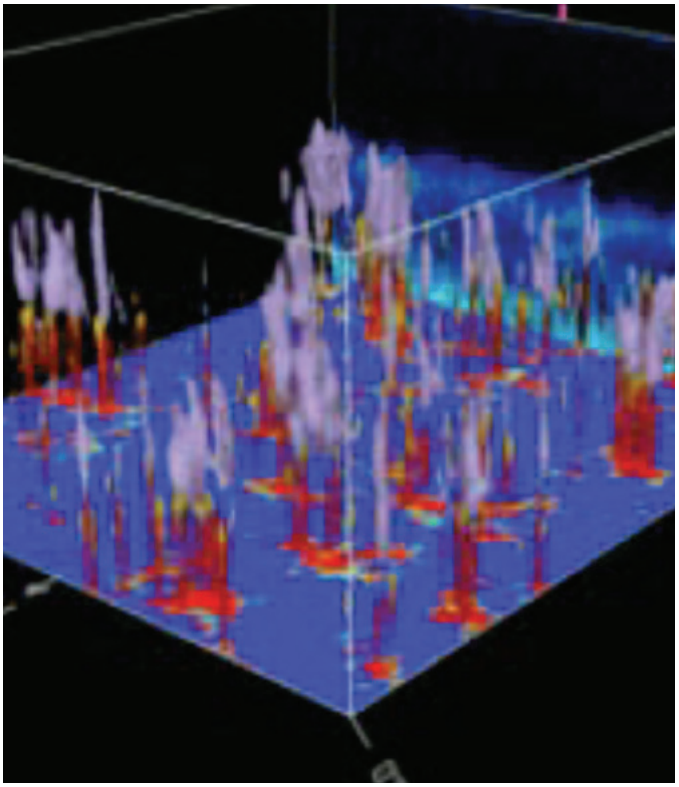
WATER-CYCLE RESEARCH

NCAR scientists are:

- extending our expertise on small-scale processes into effective representations of these processes at large scales;
- broadening our knowledge of the space and time distribution of water vapor across scales and its role in the initiation, growth, and dissipation of cloud and precipitation systems;
- conducting systematic analyses of precipitation processes using observations and models;
- deepening our foundational knowledge and modeling capability of the hydrological cycle and quantifying runoff, soil moisture, and recycling of moisture for various time and space scales;
- Improving the implementation of the water cycle in models across scales, from cloud-resolving to global.



Simulation of a cloud systems model

Better water resource management

CONTINENTAL NORTH AMERICA DURING THE WARM SEASON

The summer water cycle over the Continental U.S. is under study using data from the International H20 Program's (IHOP) 2002 field campaign, model reanalysis data, and numerous modeling studies. One area of concentration will study the diurnal cycle of water-cycle processes, specifically precipitation over the continent because it provides a means to systematically examine, test, and improve model predictions. The focus of Phase I is on warm-season convection in the North American continent. Four primary work areas are:

1. Diagnostic Analysis of Precipitation on a Continental Scale
2. Cloud-Systems Simulation
3. Water vapor and warm-season convection
4. Land-surface Hydrology

A GLOBAL SCALE

Future studies will focus on the water cycle over continental regions on a global scale. The knowledge gained from these research endeavors will inform the body of science as well as water managers and localmanagers local governments to better plan their supplies and communicate hazards to the public.

This material is based upon work supported by the National Center for Atmospheric Research, a major facility sponsored by the National Science Foundation and managed by the University Corporation for Atmospheric Research. Any opinions, findings and conclusions or recommendations expressed in this material do not necessarily reflect the views of the National Science Foundation.