

International H₂O Project (IHOP_2002)

Weather forecasters are usually unable to predict accurately the amount of rainfall during summer months. This limitation has important consequences for our society. As an example, flash floods, which may result from heavy rainfall in a very localized area, are responsible for more deaths than either hurricanes, tornadoes, windstorms or lightning. The property damage from flash floods alone exceeds \$5 billion annually.



The main goal of the IHOP_2002 weather field project is to obtain more accurate and reliable measurements of moisture in the air. Humidity, a very important meteorological parameter, is measured inadequately and its distribution is poorly understood. We hope that the IHOP_2002 measurements will ultimately help us in understanding when, where and how storms form and will allow us to better predict actual rainfall amounts associated with these storms. IHOP_2002 is scheduled to take place over the Southern Great Plains (SGP) from 13 May to 25 June 2002. Over 80 scientists from the U.S., France, Germany, the Netherlands and Canada are planning to participate. Scientists will closely collaborate with various Oklahoma and Kansas-based laboratories and programs, including the Department of Energy/Atmospheric Radiation Measurement (DOE/ARM) program, the National Severe Storms Lab (NSSL), the National Weather Service (NWS), the Hydrometeorological Prediction Center (HPC), the Storm Prediction Center (SPC), the National Environmental Satellite, Data and Information Service (NESDIS), the University of Oklahoma and the Atmospheric Boundary Layer Experiment (ABLE).

Already existing weather instruments located in this region will be extensively used during IHOP_2002. The National Weather Service NEXRAD radars, scattered throughout the U.S., provide information about wind direction and speed before storms form and even within the storms themselves. The radars also provide estimates of rainfall amounts. The NOAA wind profiler network allows us to look at how wind speed and direction varies with height, while sondes, released from the surface, provide similar information about air temperature. Even though the twice-daily balloon soundings also measure humidity, we know that moisture distribution can change substantially within just a few miles and certainly within a few hours. In addition to the already existing facilities, IHOP_2002 plans to temporarily bring numerous wind and humidity-measuring instruments to the SGP, including radars, lidars and radiometers. These instruments will be either installed on one of the six participating research aircraft or they will be ground-based, with some deployed at a fixed site and some mounted onto cars and trucks.

IHOP_2002 is comprised of four main research components:

- **Quantitative Precipitation Forecasting (QPF):** This effort will use a variety of weather forecasting models to determine if better humidity measurements will improve the models' ability to forecast rainfall.
- **Convection Initiation (CI):** This effort will utilize mobile instruments that can drive to or fly to areas where storms are expected to form. Humidity measurements will be made before storms form and scientists and modelers will assess if those measurements can help in forecasting the timing and location of new storms.
- **Atmospheric Boundary Layer (ABL):** This effort will study the relationship between land surface variations and air moisture variations.
- **Instrumentation:** Since humidity is such a difficult measurement to obtain, it is probable that a combination of instruments is needed to obtain a useful set of measurements. Thus, this effort will determine the best combination of humidity-measuring instruments to better predict rainfall amounts.

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