NASA News Archive

December 07, 2001

STUDY OF CIRRUS CLOUDS MAY IMPROVE CLIMATE CHANGE FORECASTS

Studies of cirrus clouds by some 150 scientists may lead to improved forecasts of future climate change.

Beginning next summer, scientists from NASA, other government agencies, academia and industry will investigate cirrus clouds in Florida with the objective of reducing uncertainties in forecasts of the Earth's future climate. The project focuses on studies of high, tropical cirrus clouds. These clouds are composed of tiny ice crystals that float at altitudes from 20,000 feet (6,067 meters) to 55,000 feet (16,683 meters). Scientists will take measurements from a variety of aircraft and ground instruments for four to six weeks beginning in July. Analysis and reporting of the data are expected to take about two years.

"Our objective is to find out how ice clouds affect global warming," said Eric Jensen, project mission scientist based at NASA Ames Research Center in the heart of California's Silicon Valley. "The combination of measurements and computer modeling studies will improve our understanding of how cirrus may change in response to climate change," he said. "For example, as the surface heats up and thunderstorms become more intense, will larger, thicker cirrus clouds be formed?"

"Clouds are the largest source of uncertainty in computerized global climate models," Jensen said. "We want to measure the ice crystal sizes, cloud optical depths and the heating or cooling of the Earth's surface caused by tropical cirrus clouds, particularly those generated by intense storms." Optical depth is a measure of the visual or optical thickness of a cloud.

The effort is called the Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL-FACE). Participants include researchers from various NASA centers including Ames; Goddard Space Flight Center, Greenbelt, Md.; Langley Research Center, Hampton, Va.; and Jet Propulsion Laboratory, Pasadena, Calif. Other participating researchers are from the National Oceanic and Atmospheric Administration, the National Center for Atmospheric Research, Boulder, Colo.; and various universities and companies. For

a complete list of participants, please consult the project website at http://cloud1.arc.nasa.gov/crystalface/

A major scientific goal is to use cloud measurements from aircraft to calibrate cloud readings from satellites so characteristics of clouds can be observed more accurately from the higher altitudes of orbiting spacecraft. Better-calibrated satellite observations of clouds will result in better large-scale measurements of clouds because satellites can see huge areas of the globe at once. These satellite cloud readings will enable scientists to make more accurate regional and global cirrus cloud computer models that should reduce the uncertainty of climate change predictions, Jensen said.

"We anticipate flights will mostly be over southern Florida, and occasionally we will sample clouds over the ocean," Jensen said.

Six aircraft types will carry instruments to measure cirrus clouds. The high-flying ER-2 (similar to a U-2), based at NASA Dryden Flight Research Center, Edwards, Calif., will conduct remote sensing of cirrus clouds and environmental conditions. Scientists will compare the ER-2 instrument readings with similar satellite measurements.

The Proteus aircraft from NASA Goddard's Wallops Flight Facility, Wallops Island, Va., also will be making remote-sensing observations of cirrus clouds and environmental conditions.

The WB-57 aircraft based at NASA Johnson Space Center, Houston, will be making in situ measurements of cirrus clouds and environmental conditions. A Citation aircraft from the University of North Dakota will make in situ measurements in the lower parts of cirrus 'anvils.' An anvil is an extensive ice cloud that forms at the tops of deep thunderstorm clouds.

In addition, P-3 aircraft will use airborne radar to measure cloud structure and intensity. A Twin Otter airplane from the Center for Interdisciplinary Remotely Piloted Aircraft Studies, which is part of the Naval Postgraduate School and is based at the Navy Airport near Fort Ord, Calif., will make in situ measurements of aerosols and take other readings. Ground-based instruments in the study include radar and other instruments.

Satellites included in the study will be GOES, Terra, Tropical Rainfall Measuring Mission and the Aqua satellite currently scheduled for launch next year.

In addition to Jensen, other scientists from NASA Ames will take part in the CRYSTAL-FACE project. They include Andrew Ackerman and Katja Drdla, Jensen's co-investigators who are working on cirrus cloud computer modeling. Peter Pilewskie of Ames and his colleagues will use instruments on the ER-2 and Twin Otter aircraft to measure trapping of heat and reflection of sunlight by clouds.

Max Loewenstein's experiment includes measurements of carbon monoxide and methane. Paul Bui and others from Ames are responsible for measurements from the WB-57 and ER-2 aircraft of temperature, pressure and winds. Henry Selkirk and Leonhard Pfister are studying development and movement of cirrus clouds. Selkirk and Pfister also are helping with meteorological support.

Project manager Michael Craig of the Ames Earth Science Project Office is in charge of the field campaign for NASA.

##

Contact:
John Bluck
NASA Ames Research Center, Moffett Field, Calif.
650-604-5026 or 604-9000
jbluck@mail.arc.nasa.gov

This text derived from http://amesnews.arc.nasa.gov/

Recommend this Article to a Friend

Back to: News

Subscribe to the Earth Observatory
About the Earth Observatory
Please send comments or questions to: eo-contact@eodomo.gsfc.nasa.gov
Program Manager: David Herring
Responsible NASA official: Yoram Kaufman
NASA/GSFC Security and Privacy Statement