

Tropical Warm Pool International Cloud Experiment

General Description

The Tropical Warm Pool – International Cloud Experiment (TWP-ICE) was a collaborative effort led by the U.S. Department of Energy’s Atmospheric Radiation Measurement (ARM) Program and the Australian Bureau of Meteorology. Beginning January 21 and ending February 14, 2006, the experiment was conducted in the region near the ARM Climate Research Facility in Darwin, Northern Australia. This permanent facility is fully equipped with sophisticated instruments for measuring cloud and other atmospheric properties to provide a long-term record of continuous observational data. Measurements obtained from the other experiment components (explained below) will complement this dataset to provide a detailed description of the tropical atmosphere.

Science Objective

This experiment focused on cirrus clouds associated with tropical convection and their impact on the environment. The experiment was timed to coincide with maximum rainfall and convective activity during the summer monsoon season across northern Australia. At the same time, a European collaboration sponsored by the Natural Environment Research Council conducted the second phase of an experiment focused on obtaining chemical and aerosol cloud property measurements in the upper troposphere. Cirrus are ubiquitous in the tropics, but the properties of these clouds are poorly understood. Therefore, a crucial product from this experiment will be a dataset that produces the necessary link between tropical cirrus cloud properties and the computer models used to simulate them.



Tropical clouds, like this anvil cloud, were the focus of the month-long Tropical Warm Pool-International Cloud Experiment (TWP-ICE), which took place during January and February 2006.

Research Instrumentation

- Aircraft – a fleet of five instrumented research aircraft flew at different altitudes to measure cloud properties.
- ARM Climate Research Facility, Darwin – fully equipped with instruments for measuring cloud and other atmospheric properties, this permanent site provides a long-term record of continuous observational data. Measurements obtained from the other experiment components will complement this dataset to provide a detailed description of the tropical atmosphere.
- Radiosondes (weather balloons) – radiosondes were launched every three hours from five surface sites arranged in a 200-km ring around the central experiment location in Darwin.

- Surface-based Instruments – additional ground sites equipped with passive instrumentation and lightning detection systems measured turbulent and radiant energy exchange between land and the atmosphere. In addition, radars were used to return profiles of cloud properties and wind speed, and provide 3-dimensional distributions of precipitation for daily mission planning and analysis.
- Ship – the Southern Surveyor research vessel was equipped with a full complement of surface-based instrumentation for measuring atmospheric properties. The ship also served as one of the locations for launching radiosondes (weather balloons), as well as a surface site for measuring energy fluxes.

Experiment Map



TWP-ICE Website

<http://science.arm.gov/twpice>

Participants

Key sponsors for TWP-ICE included the U.S. Department of Energy's ARM Program and ARM Unmanned Aerospace Vehicle Program; the Australian Bureau of Meteorology; the Commonwealth Scientific Industrial Research Organisation; the Royal Australian Air Force; the University of Manchester; and the U.S. National Aeronautics and Space Administration. Other key participants included:

- Australia – Airborne Research Australia; Monash University; University of Adelaide
- Canada – York University
- Japan – Osaka University; Kyoto University
- United States – National Oceanic and Atmospheric Administration; University of Utah; University of Illinois at Urbana-Champaign; Colorado State University; Pennsylvania State University; University of Washington; Texas A&M; University of Miami; and selected private institutions.

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