ARM
Atmospheric Radiation Measurement Program

Goal:

Improve the performance of general crclaton moel e for clmate reearch an precton mprovng nertanng of the effect an nteracton of nlght raant energ an clo an aerool on gloal an regonal temperatre

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Atmospheric Radiation Measurement

Primary Objectives

- **Relate observations of radiative fluxes and radiances to the atmospheric composition**
- **Use these relations to develop and test parameterizations to accurately predict the atmospheric radiative properties**

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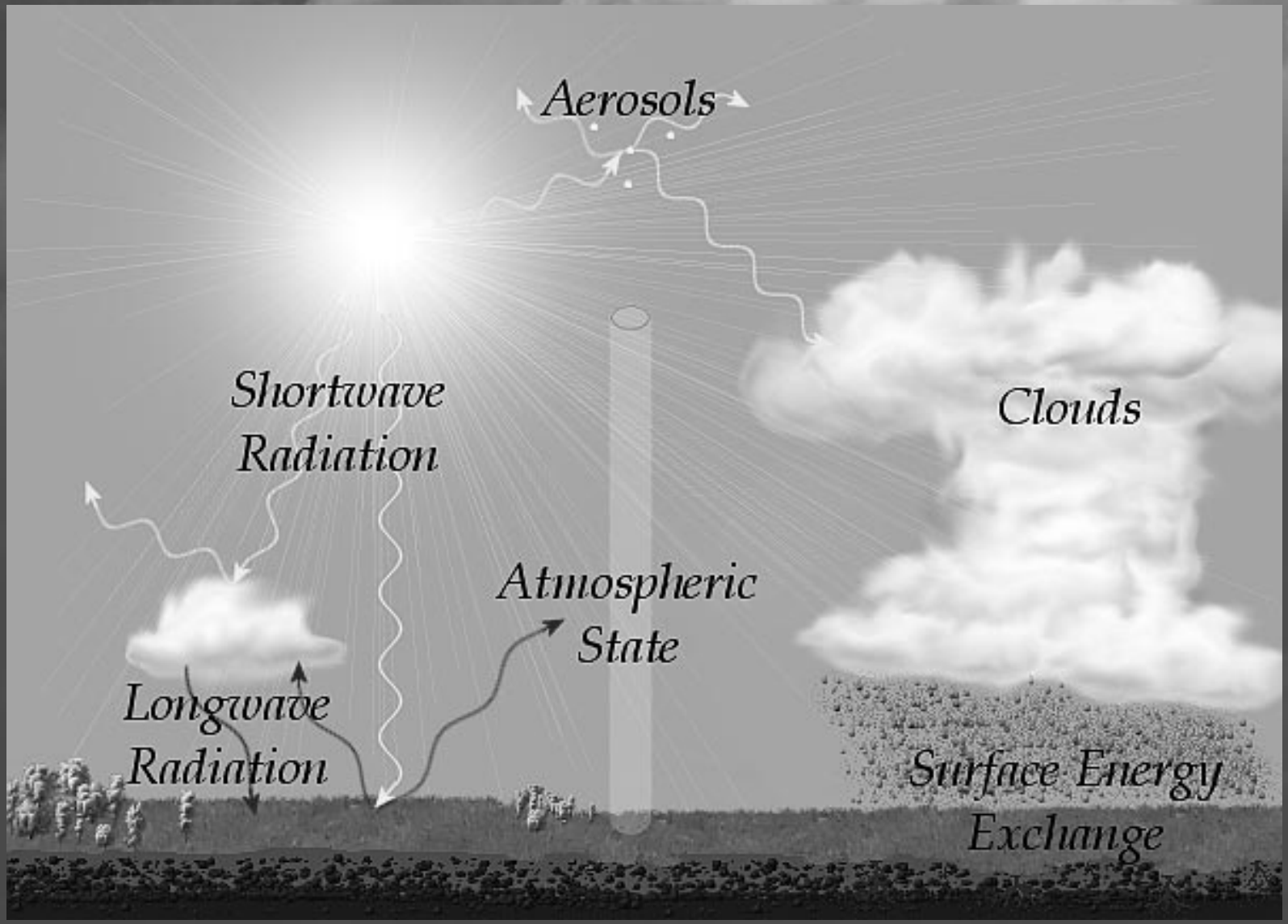
Atmospheric Radiation Measurement



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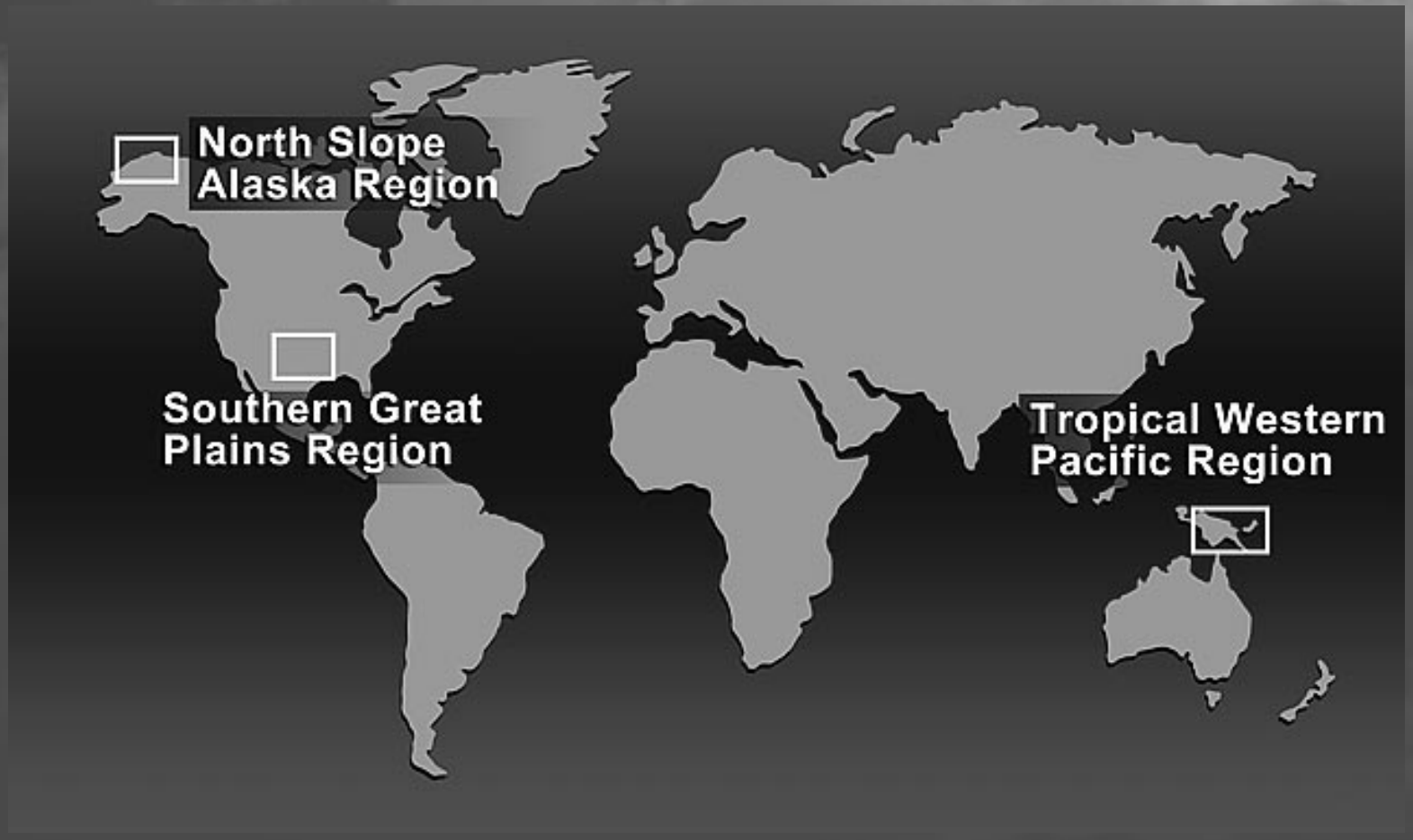
Atmospheric Radiation Measurement



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Southern Great Plains

North Slope of Alaska

Tropical Western Pacific

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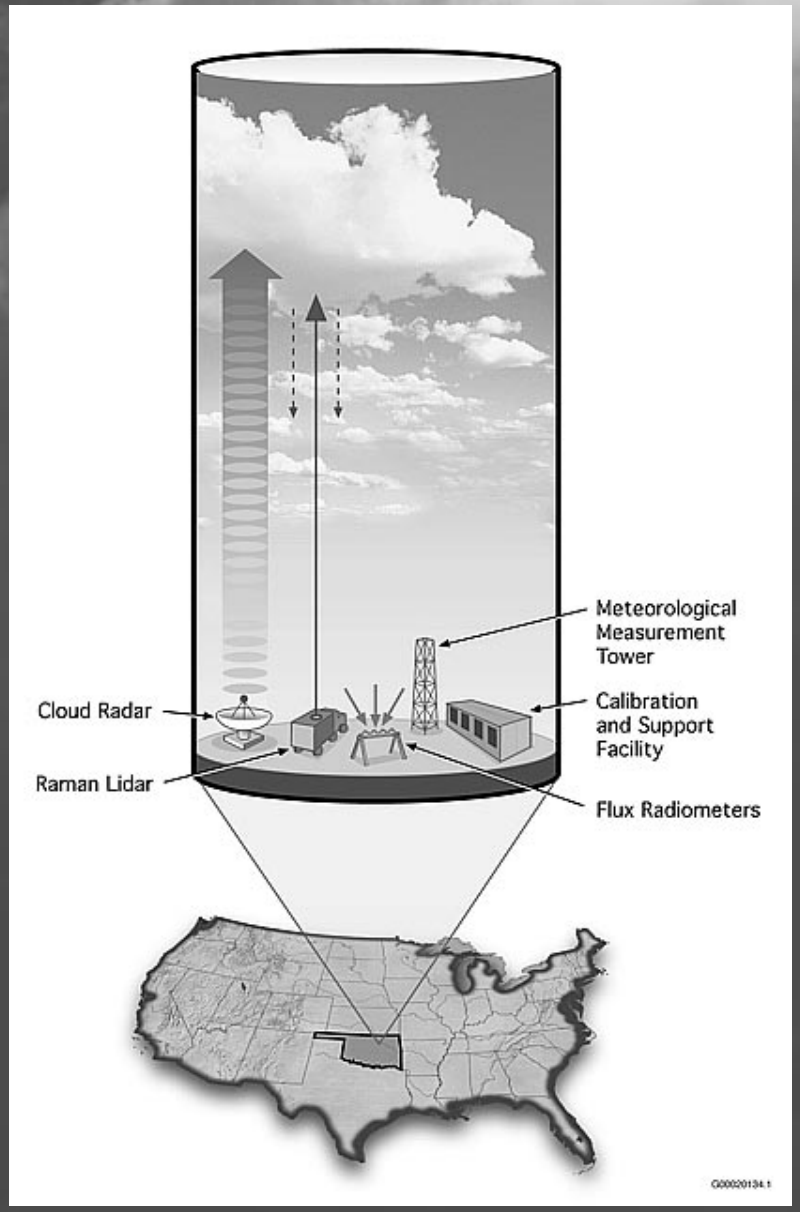

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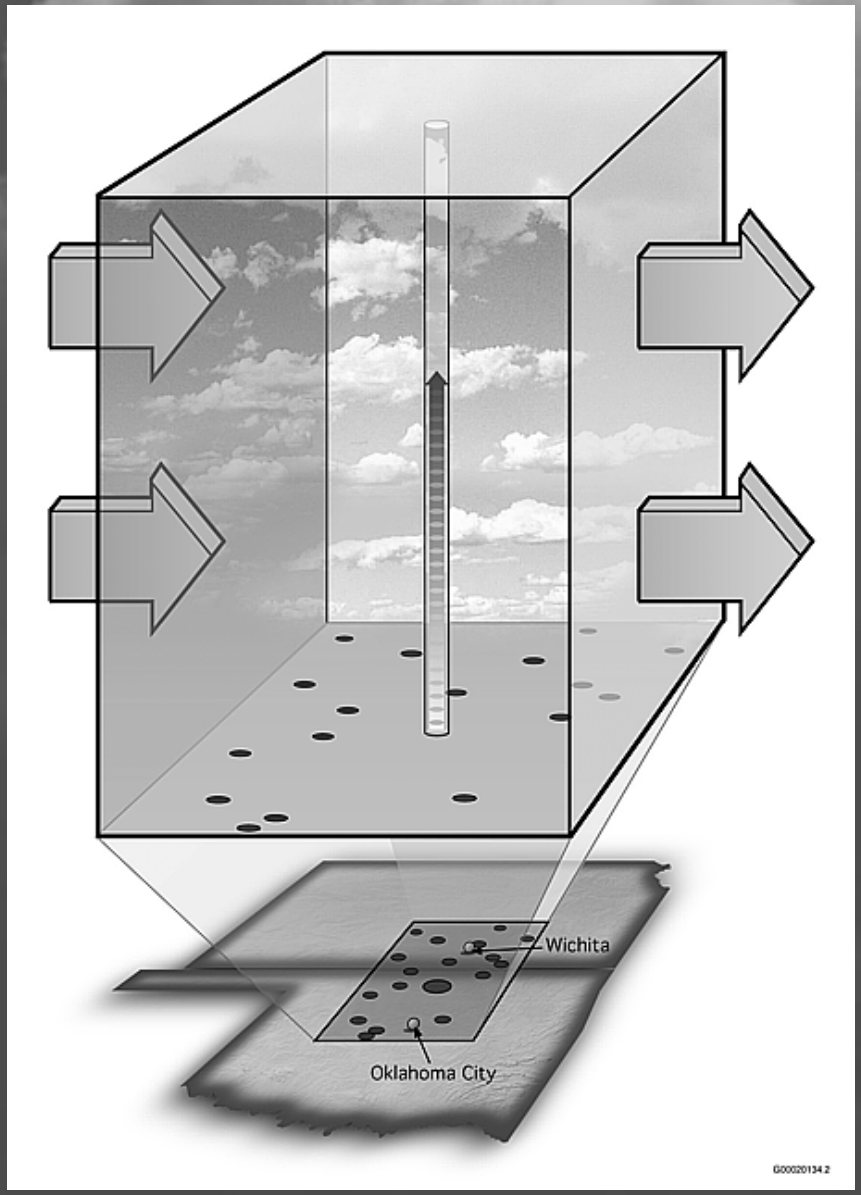

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ARM and Aerosols

- **Direct Effects**
  - **How do aerosols affect the calculation of clear-sky radiation fields?**
- **Indirect Effects**
  - **What is the influence of aerosols on cloud radiative and microphysical properties?**

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Strategic Plan for Climate Change Science Research Program (draft)

ILLUSTRATIVE RESEARCH QUESTIONS

- What are the sources of atmospheric aerosols, and what are their magnitudes and variability?
- What are the global distributions and radiative characteristics of aerosols?
- What are the processes that control the spatial and temporal distributions and variability of aerosols and that modify their chemical and radiative properties during transport, and how well can these processes and resulting spatial distributions currently be simulated?
- How do aerosols affect a cloud's radiative properties and ability to generate precipitation?

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Why are OC/EC measurements important for understanding climate?

- Important for deriving aerosol optical properties (e.g. scattering, absorption, extinction) used to represent aerosol forcing in climate models
  - Also, derived optical properties depend upon whether the aerosol are internally or externally mixed

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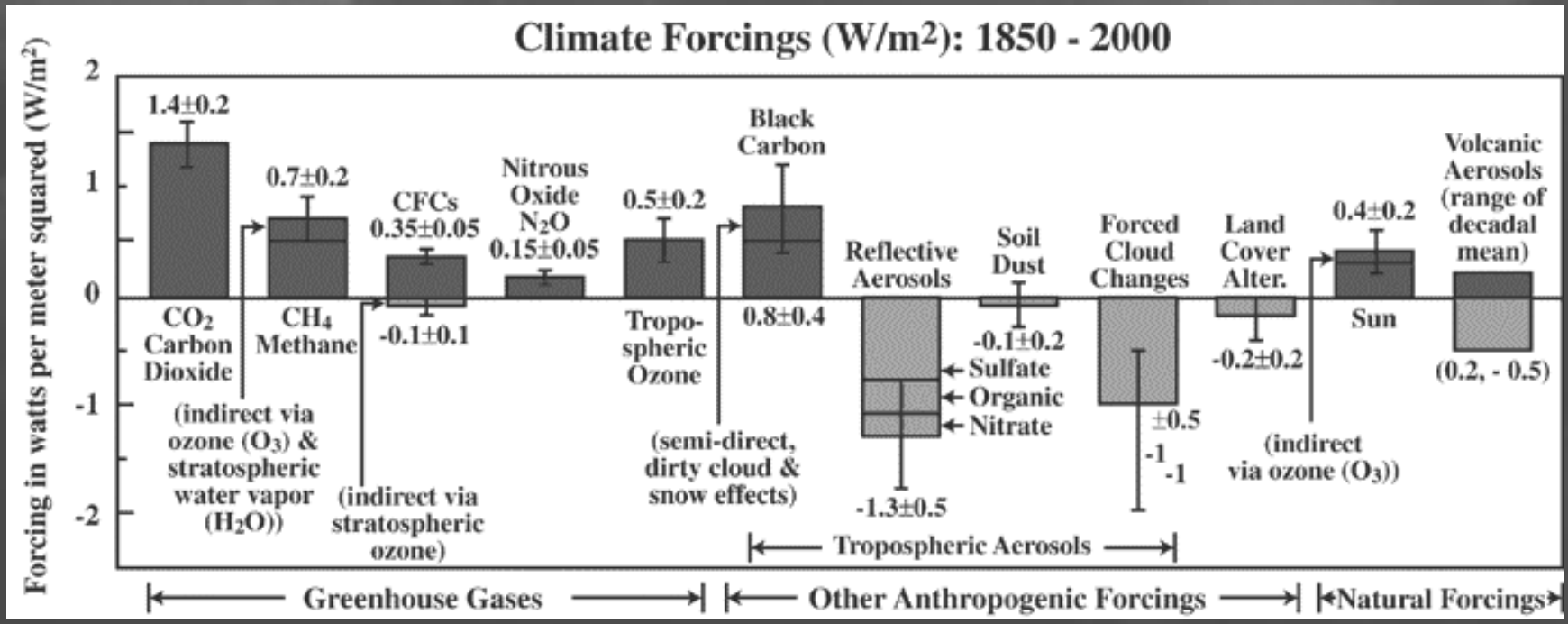

ARM Atmospheric Radiation Measurement

ARM User Facility (SGP)

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Participants

DOE Laboratories

- Argonne National Laboratory, IL
- Brookhaven National Laboratory, NY
- Lawrence Berkeley National Laboratory, CA
- Lawrence Livermore National Laboratory, CA
- Los Alamos National Laboratory, NM
- National Renewable Energy Laboratory, CO
- Oak Ridge National Laboratory, TN
- Pacific Northwest National Laboratory, WA
- Sandia National Laboratories, CA/NM

Private

- Atmospheric and Environmental Research, Inc., MA
- General Atomics, CA
- Greenwood Aviation, OK
- Mission Research Corp., CA
- SeaSpace Corp., CA
- Vaisala, Finland

Universities

- Boston University, MA
- Clark Atlanta University, GA
- Colorado State University, CO
- Desert Research Institute, NV
- Florida State University, FL
- Georgia Institute of Technology, GA
- Harvard-Smithsonian Center for Astrophysics, MA
- Lamont-Doherty Earth Observatory, NY
- Pennsylvania State University, PA
- Rutgers University, NJ
- State University of New York at Albany, NY
- State University of New York at Stony Brook, NY
- Stevens Institute of Technology, NJ
- University of Alaska, Fairbanks, AK
- University of California, Los Angeles, CA
- University of California, San Diego, CA
- University of California, Santa Barbara, CA
- University of Colorado, CO
- University of Denver, CO
- University of Maryland, MD
- University of Massachusetts, MA
- University of Miami, FL
- University of Michigan, MI
- University of North Dakota, ND
- University of Oklahoma, OK
- University of Utah, UT
- University of Washington, WA
- University of Wisconsin, WI
- University of Wyoming, WY

International Collaborators

- Airborne Research Australia, Flinders University, Australia
- Bureau of Meteorology (BOM), Australia
- CSIRO, Division of Atmospheric Research, Australia
- Canada Centre for Remote Sensing (CCRS), Canada
- Dalhousie University, Canada
- McGill University, Canada
- Meteorological Service of Canada
- University of British Columbia, Canada
- Laboratoire de Meteorologie Dynamique, France
- Japan Marine Science Technology Center, Japan
- National Institute of Polar Research, Japan
- Tohoku University, Japan
- Meteorological Research Institute (MRI), Japan
- Nauru
- Clouds and Radiation (CLARA) Study, Netherlands
- Papua New Guinea
- Central Aerological Observatory, Russia
- Institute for Atmospheric Optics (IAO), Russia
- Institute of Atmospheric Physics (IAP), Russia
- European Center for Medium-Range Weather Forecasts (ECMWF), United Kingdom
- Hadley Center for Climate Prediction, United Kingdom

Other Government Offices and Laboratories

- Air Force Phillips Laboratory
- Illinois State Water Survey
- NASA Ames Research Center
- NASA Earth Observing System (EOS) Project Science Office
- NASA Goddard Institute for Space Studies
- NASA Goddard Space Flight Center
- NASA Jet Propulsion Laboratory
- NASA Langley Research Center
- National Centers for Atmospheric Research
- National Marine Fisheries Service
- National Science Foundation
- National Severe Storms Laboratory
- Naval Research Laboratory
- North Slope Borough government
- NOAA Aeronomy Laboratory
- NOAA Climate Monitoring and Diagnostics Laboratory
- NOAA Environmental Technology Laboratory
- NOAA Geophysical Fluid Dynamics Laboratory
- NOAA National Centers for Environmental Prediction
- NOAA National Environmental Satellite, Data, and Information
- NOAA Office of Global Programs
- NOAA Pacific Marine Environmental Laboratory
- NOAA Surface Radiation Research Branch

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