

P1.9 AEROSOL, GASES, AND CLOUD DATA SETS AVAILABLE FOR RESEARCH
IN URBAN, REGIONAL, AND GLOBAL SCALE ENVIRONMENTS

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1. INTRODUCTION

The Atmospheric Sciences Data Center (ASDC), located at the NASA Langley Research Center in Hampton, Virginia is responsible for archiving and distributing science data in the areas of radiation budget, clouds, aerosols and tropospheric chemistry. Data in these areas are available for research in urban, regional and global scale environments. Sample measurements for the region surrounding Hong Kong will be used to illustrate some of the types of measurements that are available from several science data projects at the ASDC. Clouds and the Earth's Radiant Energy System (CERES) products contain aerosol and cloud measurements from regional and global scale environments. Multi-angle Imaging SpectroRadiometer (MISR) products contain aerosol and cloud measurements from regional and global scale environments. Measurements Of Pollution In The Troposphere (MOPITT) products contain profiles of carbon monoxide for a global scale environment. Global Tropospheric Experiment (GTE) products contain measurements of many gases from urban and regional environments. These data are available from the ASDC at <http://eosweb.larc.nasa.gov>.

2. GTE DATA SETS

The GTE is a major component of the NASA Tropospheric Chemistry Program. GTE consists of a series of airborne field experiments designed to evaluate the capability of instrument techniques to measure, under field conditions, the minute concentrations of key chemical species in the atmosphere and systematically address tropospheric chemistry issues relevant to global change, through airborne sampling expeditions, coupled with modeling and laboratory studies.

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2.1 GTE TRACE-P Data

The Transport And Chemical Evolution over the Pacific (TRACE-P) field experiment was conducted by the NASA Tropospheric Chemistry Program from 26 February to 9 April 2001 over the north Western Pacific Ocean. TRACE-P utilized the NASA DC-8 and P-3B aircraft, based from Hong Kong and Yokota Airbase near Tokyo, as platforms to measure a wide range of atmospheric trace gases and aerosols for the purpose of understanding the impact of the emissions from eastern Asia on the Pacific region. During TRACE-P the NASA Langley airborne UV DIAL (Differential Absorption Lidar) system was flown on the NASA DC-8 aircraft. The DIAL operated simultaneously in the nadir and zenith viewing modes to measure vertical profiles of O₃ and aerosols from near the surface to the upper troposphere along the flight track. In situ measurements of aerosol number density and composition were also obtained aboard the DC-8 and P-3B aircraft.

The UV DIAL and all in situ measurements from the TRACE-P mission are available from the ASDC. Sample measurements from this field campaign for the region surrounding Hong Kong will be shown. A complete list of GTE data products is available at: http://eosweb.larc.nasa.gov/PRODOCS/gte/table_gte.html

3. CERES DATA SETS

The CERES data products measure the Earth's radiation budget and atmospheric radiation from the top of the atmosphere to the surface, and cloud parameters in terms of measured areal coverage, altitude, liquid water content, and optical depth can be retrieved. The CERES instruments are improved models of the Earth Radiation Budget Experiment (ERBE) scanner instruments, which operated from 1984 through 1990 on NASA's Earth Radiation Budget Satellite (ERBS) and on NOAA's operational weather satellites

NOAA-9 and NOAA-10. The first CERES instrument was launched from Tanegashima, Japan, on November 27, 1997, as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments were launched into polar orbit on board the Earth Observing System (EOS) flagship Terra on December 18, 1999, and two additional CERES instruments were launched on board EOS Aqua on May 4, 2002. CERES data are available for December 1997 to the present.

3.1 CERES Cloud and Aerosol Data

CERES Single Scanner Footprint TOA/ Surface Fluxes and Clouds (SSF) data products contain one hour of instantaneous data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. SSF data include clear area parameters (clear amount, aerosol), cloud area parameters for up to two layers (cloud amount, height, temperature, pressure, optical depth, emissivity, and water path and particle size for both water phases), MODIS land aerosols, and MODIS ocean aerosols (starting with Terra). Sample measurements from this data product will be shown for the region surrounding Hong Kong during the TRACE-P field campaign.

Other CERES data products available for cloud and aerosol research are the Monthly Gridded Single Satellite Fluxes and Clouds (FSW), the Monthly Gridded TOA/Surface Fluxes and Clouds (SFC), the Monthly TOA/Surface Averages (SRB-AVG), and the Clouds and Radiative Swath (CRS). A complete list of CERES data products is available at: http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html.

4. MISR DATA SETS

The MISR instrument was successfully launched into sun-synchronous polar orbit aboard Terra, NASA's first EOS spacecraft, on December 18, 1999. MISR measurements are designed to improve our understanding of the Earth's environment and climate. Viewing the sunlit Earth simultaneously at nine widely-spaced angles, MISR provides radiometrically and geometrically calibrated images in four spectral bands (red, blue,

green, and near infrared) at each of the angles. Spatial sampling of 275 and 1100 meters is provided on a global basis. The MISR instrument orbits the Earth about 15 times each day. There are 233 distinct orbits which are repeated every 16 days. These 233 repeating orbits are called paths, and since the paths overlap, near global coverage is obtained in 9 days. MISR data are available for March 2000 to the present.

4.1 MISR Cloud and Aerosol Data

MISR has several cloud and aerosol data products. The Level 2 cloud stereo product contains a stereoscopically-derived cloud mask and cloud height on a 1.1 km grid, and reflecting level reference altitude on a 2.2 km grid, and cloud motion parameters are calculated on a 70.4 km grid. The Level 2 aerosol data product contains aerosol optical depth, aerosol compositional model, ancillary meteorological data, and related parameters on a 17.6 km grid. Sample measurements from these data products will be shown for the region surrounding Hong Kong during the TRACE-P field campaign.

Additional MISR aerosol and cloud products are available from the ASDC. Level 3 monthly, quarterly, and yearly aerosol data products are a summary of the Level 2 data products. Additional Level 2 cloud data products are cloud classifiers and cloud albedo. A complete list of MISR data products is available at: http://eosweb.larc.nasa.gov/PRODOCS/misr/table_misr.html.

5. MOPITT DATA SETS

The MOPITT instrument was successfully launched into sun-synchronous polar orbit aboard Terra, NASA's first EOS spacecraft on December 18, 1999. MOPITT generates atmospheric profiles of CO using thermal radiation at 4.7 μm . Column carbon monoxide is measured using a channel at 2.4 μm to sense solar radiation from the surface. The MOPITT Level 2 data product consists of the geolocated, retrieved carbon monoxide profiles and total column amounts for carbon monoxide. Ancillary data concerning surface properties and cloud conditions at the locations of the retrieved parameters are also included. MOPITT data are available for November 2000 to the present. Sample measurements from this global data product will be shown from the time period of the TRACE-P field campaign. A complete list of MOPITT data products is available at: http://eosweb.larc.nasa.gov/PRODOCS/mopitt/table_mopitt.html.

6. CONCLUSION

These data products are available for conducting aerosol, gases, and cloud research on urban, regional, and global scales. Sample measurements from CERES, MISR, MOPITT, and GTE for the region surrounding Hong Kong during the TRACE-P field experiment will be used to illustrate

the some of the types of data that are available for research on these various scales. The MISR, MOPITT, and CERES instruments are continually collecting data. Information about these data are available from the NASA Langley ASDC web site: <http://eosweb.larc.nasa.gov>.