Atmospheric Radiation Measurement (ARM) Data Archive

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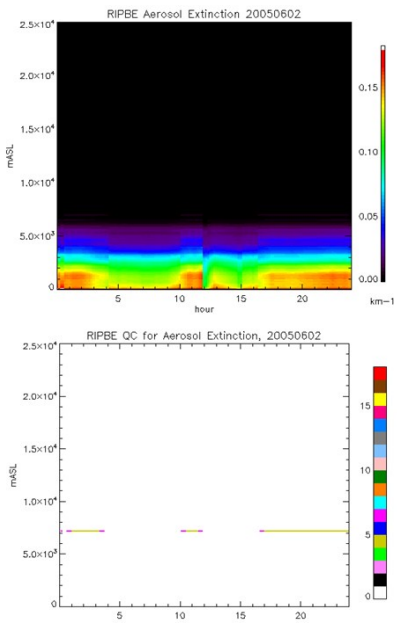
PROJECT START DATE: 1992

PROJECT END DATE: Ongoing

SPONSOR: US DOE, Office of Science, Office of Biological and Environmental Research (BER)

PARTNERS: Argonne National Laboratory, Brookhaven National Laboratory, Los Alamos National Laboratory, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, National Renewable Energy Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories

PROJECT WEBSITE: http://www.archive.arm.gov/



RIPBE for Southern Great Plains. The upper panel shows the output aerosol extinction field in Radiatively Important Parameters Best Estimate (RIPBE), and the bottom panel shows the quality control (qc) flags on aerosol extinction. Descriptions of the quality control flags are given in the netCDF file header. In this case, the gold and pink qc flags on the aerosol extinction indicate periods at the top of the aerosol profile where data were missing in the input file. These data points are marked as indeterminate, and RIPBE either interpolates over the missing data (gold) or uses the closest good value (pink).

PROJECT DESCRIPTION

The ARM Program was created to develop several highly instrumented ground stations to study cloud formation processes and their influence on radiative transfer. This scientific infrastructure includes two mobile facilities, an aerial facility, and data archive available for use by scientists worldwide through the ARM Climate Research Facility (ACRF). The primary objective of the ARM Project is improved scientific understanding of the fundamental physics related to interactions between clouds and radiative feedback processes in the atmosphere. The ARM Archive provides storage and access to all of the data generated or assembled by the ARM Program and the ACRF. The Archive provides access to data files by way of internet access to any researcher that submits data requests. The Archive supports hardware for data-intensive processing associated with reprocessing and processing of very large data sources, and also provides assistance with reprocessing and large data processing tasks (retrieving input, installing and supervising processing tools, storing results).

The Archive includes several integrated components that provide basic storage and retrieval services. The functional components include: a data reception and cataloging system, a database for metadata about the millions of stored files, a user interface and web server for data retrieval specification, and a mass storage system (automated tape libraries) for file storage. The storage processing component of the Archive records information about the data files (name, size, date received, etc.) and supervises the distribution of the data files to the permanent storage (mass storage system and backup copy). The database not only tracks the inventory of the Archive, it also supports searches for requested data based on sites, facilities, date range, instruments, and measurements. The database monitors incorrectly named data files and files with insufficient documentation, and also controls the retrieval of requested files and generates reports on data usage and user attributes. The web hosted user interfaces include query, catalog, and graphics based logic. The mass storage system includes a hierarchy of disk and tape storage media. It is capable of storing millions of data files and 100's of terabytesof data. It can also store or retrieve 100's of gigabytes of data per day. The Archive also includes an online storage structure and navigation interface for non-continuous and specialized measurements generated by the ARM Intensive Operational Periods.

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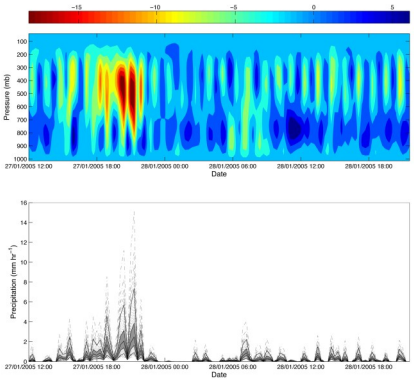

Long-Term, Large-Scale Ensemble Forcing Data Set for Darwin. The lower panel shows 100 precipitation time-series derived given potential errors in radar-retrieved rainfall estimate. These time-series are an important input to the variational analysis used to create the ensemble large-scale data set. The different precipitation time-series modify the large scale data, particularly the derived vertical velocity. The upper panel shows the profile of vertical velocity derived using a best-estimate precipitation time-series. Strong rainfall is clearly associated with strong vertical motion in the mid- and upper-levels.

SIGNIFICANCE

The ARM program conducts scientific field experiments studying atmospheric radiation balance, cloud feedback processes, and other atmospheric and environmental issues. Information gleaned from these field experiments is meant to improve scientific understanding of atmospheric radiative energy transfer, cloud formation, and the parameterization of these functions in general circulation models (GCM) for global climate change research. Measurements collected by the ACRF include numerous parameters about radiation, meteorology, water vapor, aerosols, and clouds. These measurements generate enormous amounts of data, which are made available to the scientific community through the World Wide Web. The Archive is the chief repository for these data and provides a gateway for access to them. The ARM Data Archive is intended to facilitate climate change research by providing climate related data about the Earth's atmosphere in standardized formats free of charge. New efforts are now included to add high value data sets from the ARM Archive and Carbon Dioxide Information and Analysis Center (CDIAC) data center into the Earth System Grid "data environment." This will further facilitate climate modeling researchers working with climate observations during the evaluation of model results.