

Using Statistical Views of Measurements to Guide ARM Data Discovery and Access



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Introduction

The Atmospheric Radiation Measurement (ARM) Program has been compiling a collection of cloud and radiation observations over the past 10-14 years. This DOE-sponsored program provides climate modelers information to improve the parameterization of the models. The ARM Archive has been providing data access and discovery through various user interfaces based on inventories of data availability (from 3.3 million data files and 100's of measurement types). A new interface is being developed so that users can discover and access data based on the observed results by viewing hierarchical statistical summaries. Statistical views are intended to give modelers a high-level overview of cloud and radiation measurements that should prove helpful in selecting data for closer examination. This approach provides the various modeling communities with products that are easily accessible and display insights needed for research on model parameterization and validation.

The prototype of statistical views currently consists of pre-computed products for nested time ranges (whole period of record; annual; seasonal; and monthly - as appropriate). For each time range and measurement, a variety of simple statistics are computed. Graphs of the statistical distribution of measurements (e.g., histograms) are also linked to the actual statistics displayed in the graphs. The graphs are available through a web-based interface. Users select a location and measurement and then drill down through times scales ranging from the full period of record to individual months. In addition to viewing graphs displayed by the user interface, users will be able to extract the data behind the statistical graphs, obtain the measurements that were used in calculating the statistics, and order the ARM data files from which the measurements were obtained.

The Purpose

- Encourage greater use of ARM data by the modeling community
- Create highly-polished datasets useful to modelers (e.g., Climate Modeling Best Estimate Product (CMBE) - <http://www.arm.gov/data/showcase.stm>)
- Possible future availability of statistical summaries for all standard ARM products (plots and/or datasets)
- Possible future 'on the fly' calculation of statistical quantities, integrated into ARM archive interface

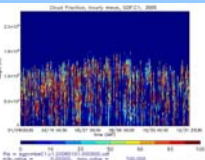
"We'd like to hear from you..."

- Are Statistical Summaries helpful for your research?
- What variables of interest should have Statistical Summaries?
- For those variables, which statistics should we use?
- Are you interested in multivariate Statistical Summaries?

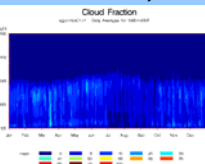
Statistical Summaries

Climate Modeling Best Estimate Product (CMBE)

CMBE Cloud Fraction Yearly Plot



CMBE Cloud Fraction Multiyear Plot



The CMBE product is a major focus of the statistical views interface. The plots on the left show examples of how cloud fraction, a key output from CMBE, can be summarized for the Southern Great Plains (SGP) site. The top plot shows one year of hourly mean cloud fraction; the bottom plot shows the annual climatology of daily cloud fraction based on the full period of record.

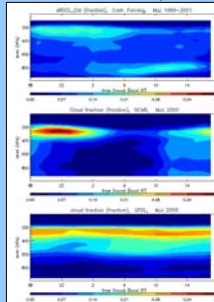
Diurnal Cycle of Cloud Fraction

The SGP site has a strong diurnal cycle, particularly in the months of May through July.

The cloud radar observations display the prominent maximum in upper tropospheric cloud fraction, as well as the occurrence of shallow cumulus clouds that grow atop the daytime boundary layer.

The NCAR model captures the timing of the upper tropospheric maximum, while the GFDL model does not. Neither model captures the daytime boundary layer maximum.

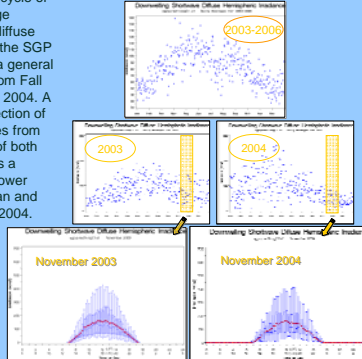
Long-Term Continuous Forcing Data from Variational Analysis



Annual Cycle of Diffuse Radiation

The annual cycle of daily average shortwave diffuse radiation at the SGP site shows a general decrease from Fall 2003 to Fall 2004. A closer inspection of hourly values from November of both years shows a somewhat lower midday mean and variance in 2004.

ARM Surface Radiation data (QCRAD)



Evolving Web Access

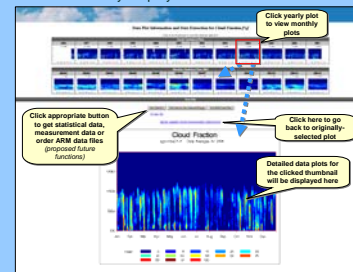
Prototype Design for ARM/Archive Web Site

Initial Summary Selection View

<http://www.archive.arm.gov/arm/statnb1.jsp>



More Detailed Summary Display and Access to Statistics and Data



User interface provides integrated access to Statistical Views and Data Extraction Features

