



# Cimel Sunphotometers at ACRF Sites History and Current Status



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ARM SGP CSPHOT Cimel Sun Photometer

## ARM Cimel Sunphotometers

As of August 2007, the ARM External Data Center took on a limited form of mentorship for the Cimel Sunphotometers (CSPHOTs) to coordinate the National Aeronautics and Space Administration Aeronet's and ARM Climate Research Facility (ACRF) site operations' activities to ascertain proper functioning, calibration, and data delivery of the CSPHOTs located at ACRF sites. Here is a brief overview of their history and status.

### Processing

1. Data collected at each site is sent to Aeronet for initial processing.
2. Aeronet processes level 1.0 AOT, level 1.5 cloud screened data daily.
3. After the instrument is returned to Aeronet for post-deployment calibration, level 2 data are processed including almucantar and Dubovik retrievals (deployments are for ca. 1 year).
4. XDC collects and converts these data to netcdf including the following measurements.

Cimel Sunphotometer Measurements	
Direct Sun and Sky Radiances	
<b>AOT Level 1.0</b>	Unscreened Aerosol Optical Thickness (csphotoaot)
<b>AOT level 1.5 (Cloud Screened):</b>	Cloud Screened Aerosol Optical Thickness (csphotoaotfilt) (Not Q/A'ed)
<b>AOT level 2 (Quality Assured):</b>	Pre- and post-field calibration applied, automatically cloud cleared and manually inspected (csphotoaotfiltqa)
<b>Principle Plane</b>	Calibrated Principal Plane radiance data (csphotpp)
<b>Almucantar</b>	Calibrated Almucantar radiance data (csphotalm)
Almucantar Retrievals	
<b>Dubovik</b>	Size distribution and optical properties derived by optimized retrieval from Sun and sky radiances (csphotalm1dubo)
<b>Size distribution</b>	Volume particle size distribution is retrieved in logarithmically equidistant bins from 0.5um to 15um. (csphotsize)
<b>Phase function</b>	Derived from almucantar sky radiance data (csphotpfn)

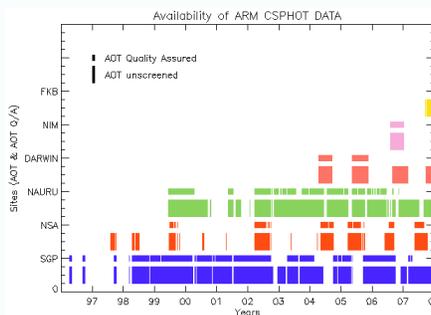
## Locations and Availability

The CSPHOT datastream officially started in 1996 with SGP. Since then additional instruments were added to cover NSA, TWP C2, and AMF sites. ACRF owns a 5<sup>th</sup> CSPHOT that rotates to the SGP, TWP, and AMF sites to swap out instruments that need to go back for post-deployment calibration at Aeronet. The NSA CSPHOT gets calibrated during the winter months Nov through Feb. This year, the AMF CSPHOT will be deployed in the China supplementary site at Taihu. The CSPHOT at Darwin is owned and operated by CSIRO.

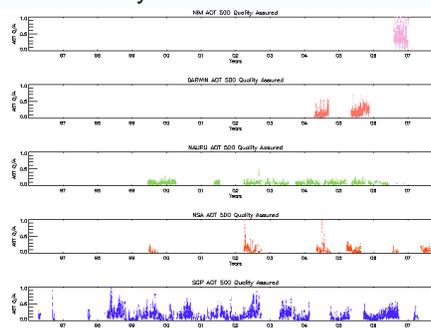
- SGP-C1 – Cart\_Site
- NSA-C1 – Barrow
- TWP-C2 – Nauru
- TWP-C3 – Darwin(CSIRO)
- AMF-M1 – Niamey
- AMF-M1 – Black Forest
- AMF-S1 – Taihu



## Availability of ARM CSPHOT DATA



## ARM CSPHOT AOT Quality Assured 1996-2008



## Recent Hardware Changes

The CSPHOT was originally conceived as a standalone instrument, with its own power source (solar panel and battery) and communication channel (GOES satellite transponder). ARM had encountered operational problems with both of these systems and in the past 2 years, we have made changes to more fully integrate the CSPHOTs into the ACRF hardware infrastructure.

- Moved SGP CSPHOT next to SWS on top of optical trailer in 2006
- Added serial line data collection on local instrument PC and internet transfer
- Site power supply instead of solar panel and battery
- Added zenith-pointing cloud mode (new PROMs)
- Added 1640 nm channel in 2007

## Upcoming Software Changes

With the removal of the satellite transponder, we lost a means to get real-time diagnostic messages. Currently the data are transmitted directly from the instrument PC to Aeronet, bypassing the site data system. In order to reestablish a data-status monitoring capability for site operations, we will add a collection of the raw data and status information.

The calibrated and quality assured data from Aeronet will continue to be converted to netCDF and archived in the ACRF Archive. The 3 separate datastreams for fine, coarse, and total phase-functions will be consolidated into one.

## Recent Applications

In ARM, the Aeronet derived column integrated aerosol parameters are most often used as a baseline measurement for comparison against other independent aerosol measurements. The most recent such direct comparison field campaign was:

2007-06/08 SGP: **Connor Flynn**: Prede Cimel Comparison

Other recent uses of CSPHOT data are highlighted in the following posters here at the 2008 ARM STM (On average there are 4 posters every year since 2001 that directly mention the Cimel Sunphotometer in the abstract):

"4STAR Spectrometer for Sky-scanning Sun-tracking Atmospheric Research: Airborne Concepts, Ground Prototype Measurements, and Aeronet-style Retrievals" **Connor Flynn** et al. (2-C)

"Integrated Cloud Optical Properties from Zenith Radiance Measurements Collected During the ARM COPS Experiment", **Christine Chiu**, et al. (7-H)

"Atmospheric Aerosol and Water Vapor Retrievals from SGP's MFRSR Network Data", **Mikhail Alexandrov**, et al. (11-C)

"GCM Aerosol Diagnostic Constrains from Satellite, AERONET, and SGP Observational Data" **Li Liu**, et al. (11-M)

"Sun and Aureole Measurement (SAM) Measurements During CLASIC and CHAPS, June 2007" **John DeVore**, et al. (13-H)

## More Information

### Cimel (CSPHOT) Instrument Page:

<http://www.arm.gov/instruments/instrument.php?id=cspshot>

### Aeronet

<http://aeronet.gsfc.nasa.gov/>

### ARM eXternal Data Center (XDC):

<http://www.xdc.arm.gov/>, [xdc\\_oper@arm.gov](mailto:xdc_oper@arm.gov).

### ARM Google:

<http://google.arm.gov/> search for "Cimel OR CSPHOT OR CSPOT"