AERONET
Aerosol Robotic Network of Sun/Sky Radiometers

What we can and cannot do for AEROCOM

3d AEROCOM Workshop

December 1 - 3, 2004, New York, NY

Many thanks to contributors and collaborators

AERONET

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Sergei Sakerin,
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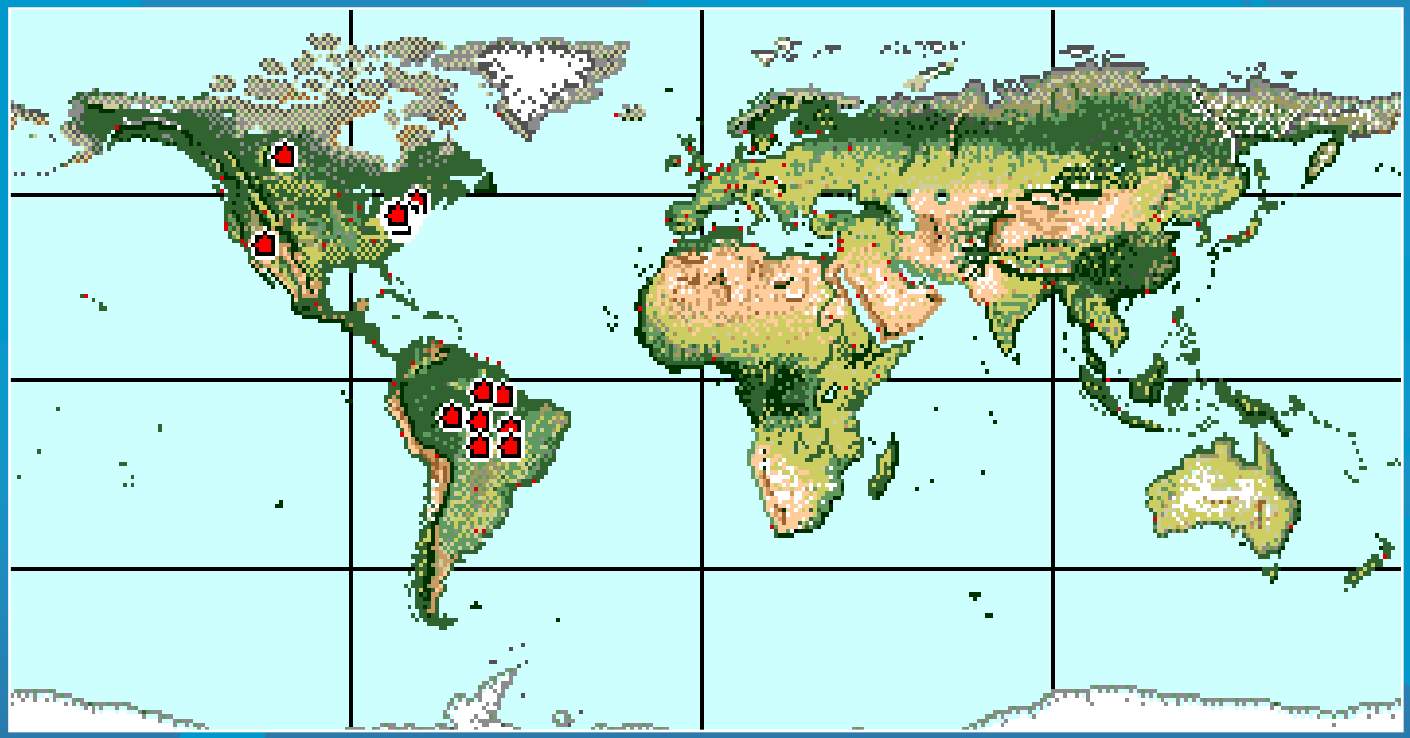
+

CIMEL

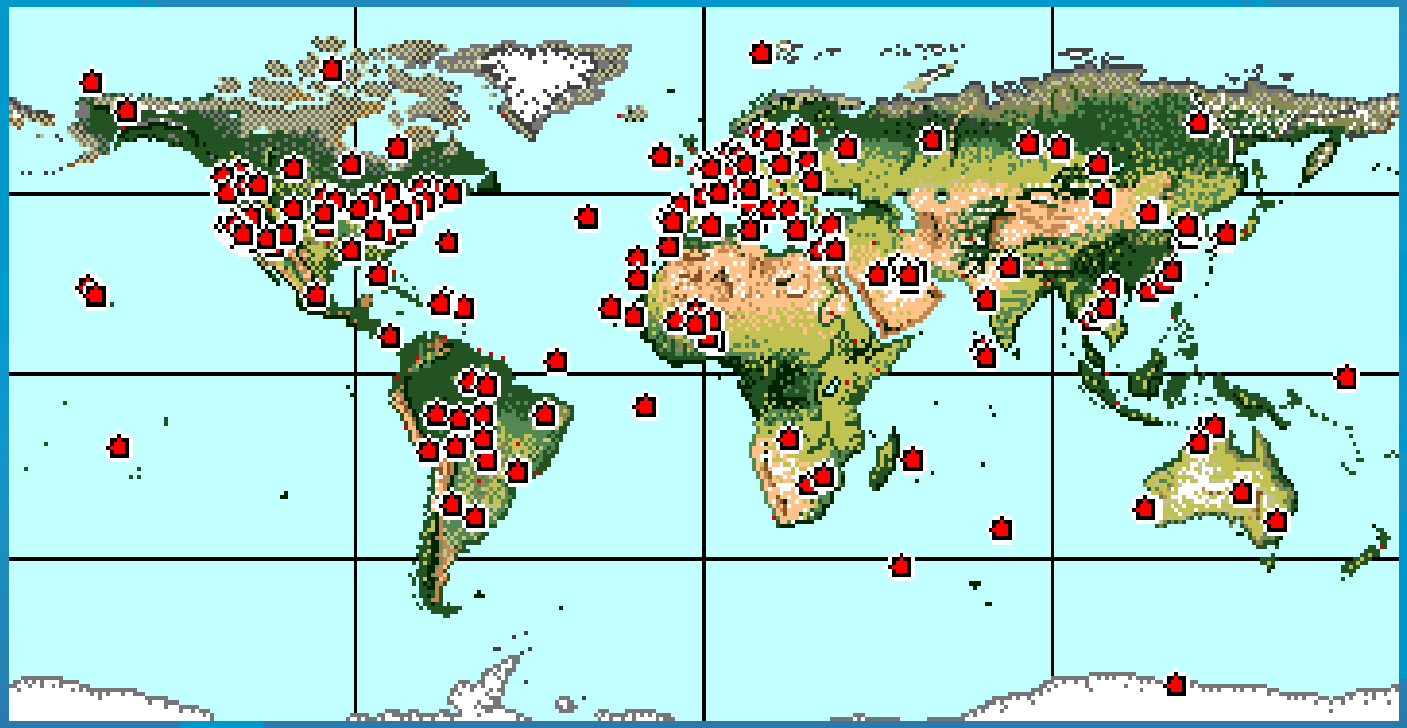
Jean-Pierre Buis,
Marius Canini

= AERONET

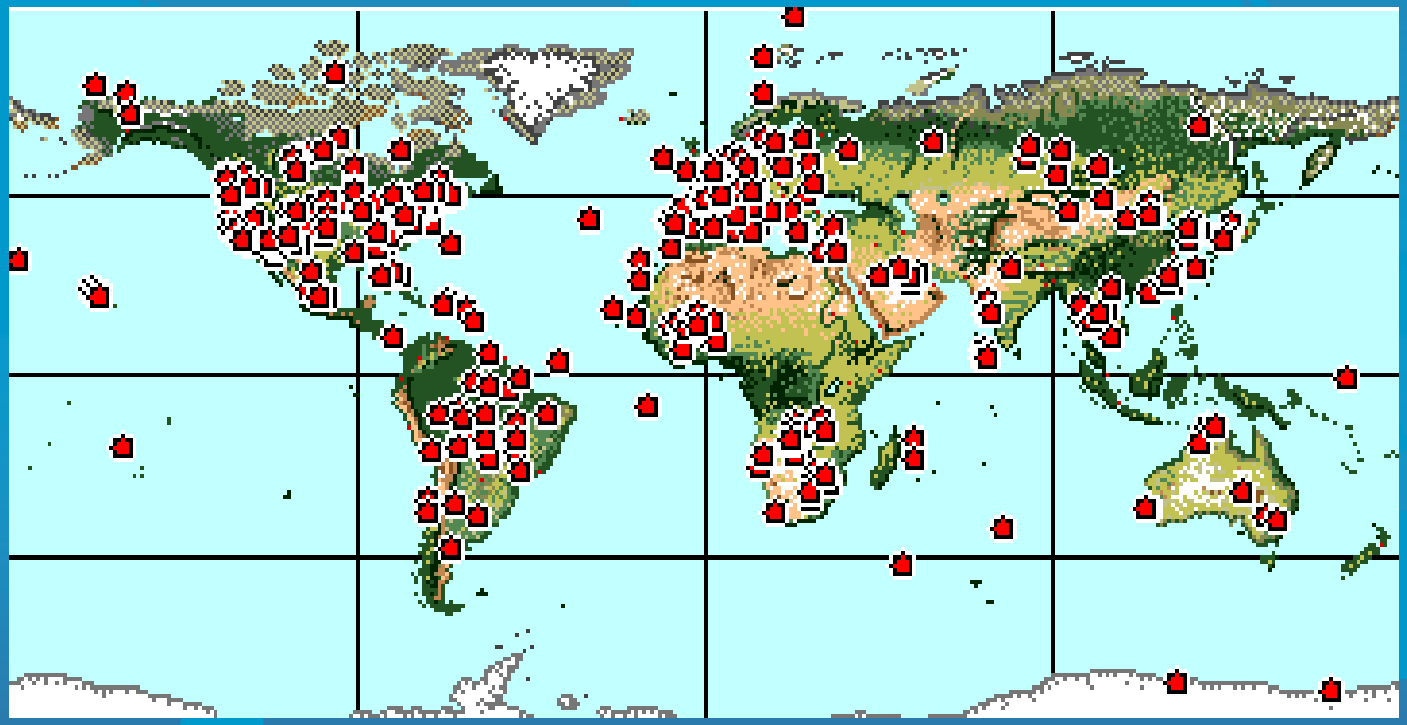
1993



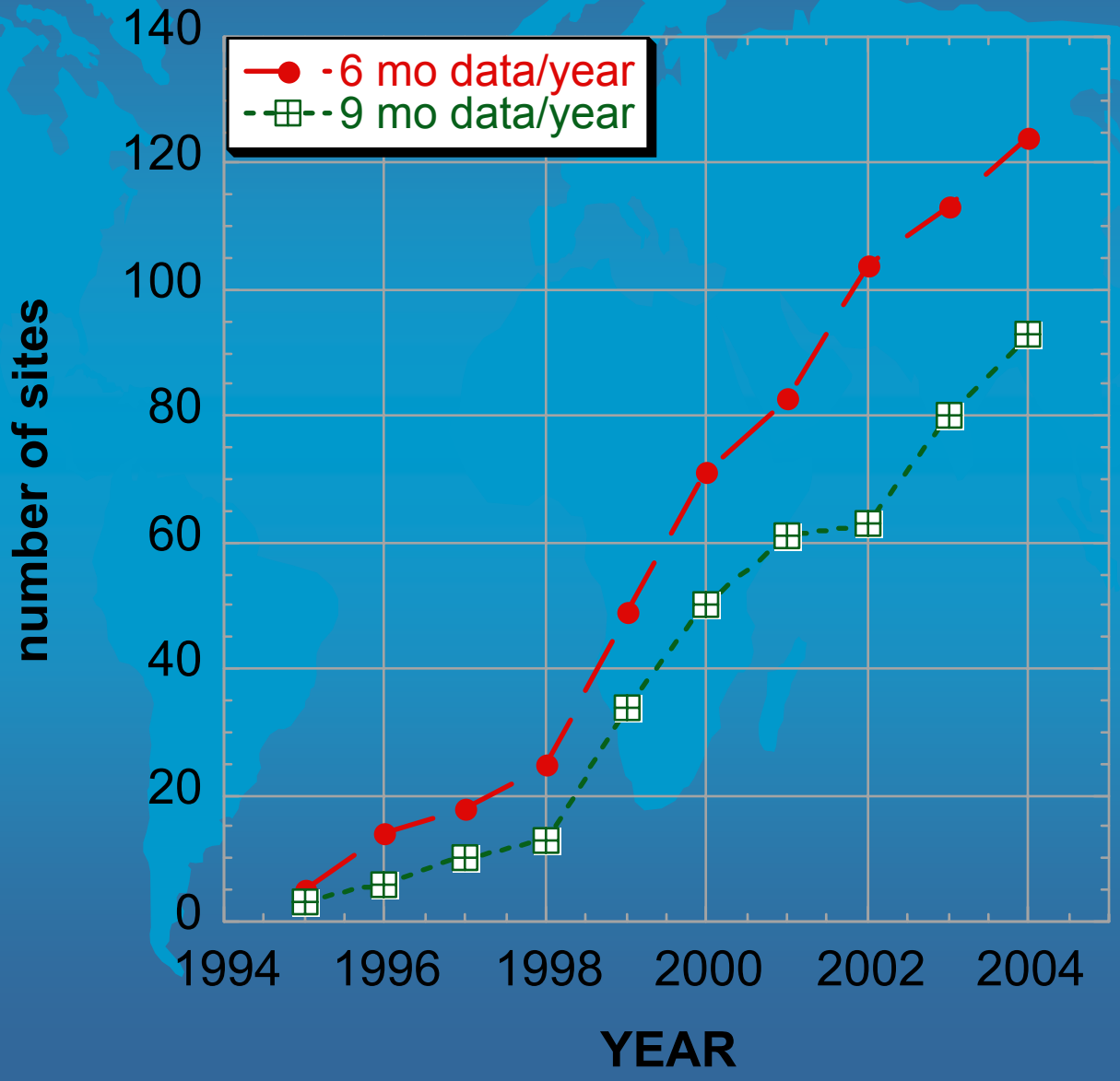
2004



1993-2004



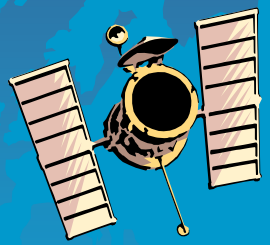
AERONET


6 mo data/year
9 mo data/year
number of sites
0
20
40
60
80
100
120
140
1994
1996
1998
2000
2002
2004
YEAR

Walker Branch, Tennessee

Data Acquisition

Measurements and Transmission



Relay Transmission to Receiving Station

AERONET Server

Download and Transfer Data via Internet

Transfer Data via Internet

Internal Server

Web Server

AERONET Data Flows

http://aeronet.gsfc.nasa.gov

368 Holben et al. *RSE*, 1998
112 Holben et al. *JGR*, 2001

Flux measurements

Direct - λ=340, 380, 440, 500, 670, 870, 940, 1020, 1640 nm
Diffuse - λ=340, 380, 440, 500, 670, 870, 1020, 1640 nm

Calibration and processing information

71 Eck et al. *JGR*, 1999

Aerosol optical depth and precipitable water computations

76 Smirnov et al. *RSE*, 2000

Cloud screening and quality control

113 Dubovik and King *JGR*, 2000
85 Dubovik et al. *JGR*, 2000

Inversion products

Volume size distribution (0.05<R<15 mm), refractive index, single scattering albedo (λ=440, 670, 870, 1020 nm)

Estimated uncertainties in aerosol optical depth, size distribution, complex refractive index, and single scattering albedo

- From Eck et al. JGR, 1999.

		Master	Field
UV	$\Delta\tau_a$	0.009	0.02
VIS-NIR	$\Delta\tau_a$	0.005	0.01

From Dubovik et al. JGR, 2000.

Table 4. Errors in the Size Distribution, Complex Refractive Index, and Single-Scattering Albedo

	Water-Soluble	Dust	Biomass Burning
$dV/d\ \ln r(r_i)$, %			
0.1 μm < r < 7 μm	15	35	25
r < 0.1 μm and r > 7 μm	15–100	35–100	25–100
$n(\lambda)$			
$\tau_a(440) \le 0.2$	0.05		
$\tau_a(440) > 0.2$	0.025		
$\tau_a(440) \ge 0.5$		0.04	0.04
$k(\lambda)$			
$\tau_a(440) \le 0.2$	80–100%		
$\tau_a(440) > 0.2$	50%		
$\tau_a(440) \ge 0.5$		50%	30%
$\omega_0(\lambda)$			
$\tau_a(440) \le 0.2$	0.05–0.07		
$\tau_a(440) > 0.2$	0.03		
$\tau_a(440) \ge 0.5$		0.03	0.03

Errors should be expected in the retrievals from the combination of spectral optical depth (440, 670, 870, and 1020 nm) and angular distribution of sky radiance in the solar almucantar (440, 670, 870, and 1020 nm; solar zenith angle of 60°) in the presence of the following instrumental offsets: in optical thickness, $\Delta\tau(\lambda) = \pm 0.01$; in sky radiances $I(\Theta;\lambda)$, $[\Delta_I(\Theta;\lambda)/I(\Theta;\lambda)]\ 100\% = \pm 5\%$; in azimuth angle pointing, $\Delta\phi = 0.5°$; and in the a priori estimates of ground reflectance $A(\lambda)$, $[\Delta A(\lambda)/A(\lambda)]\ 100\% = \pm 50\%$.

AERONET Data Flows

Current additions

Flux measurements

Sun - λ=340, 380, 440, 500, 670, 870, 940, 1020 nm **+1640 nm (412, 532, 555 nm)**

Sky - λ=440, 670, 870, 1020 nm **+ 500, 1640 nm** + **340, 380 nm**

Calibration and processing information H_2O, CO_2, CH_4

Aerosol optical depth and precipitable water computations **(1020, 1640, 940 nm) + extra** τ_a**(1020 nm)**

Cloud screening and quality control

Inversion products

Almucantar retrievals - spherical and spheroid models (4 wavelengths), level 2

Almucantar retrievals - **6 wavelengths + 340, 380 nm**

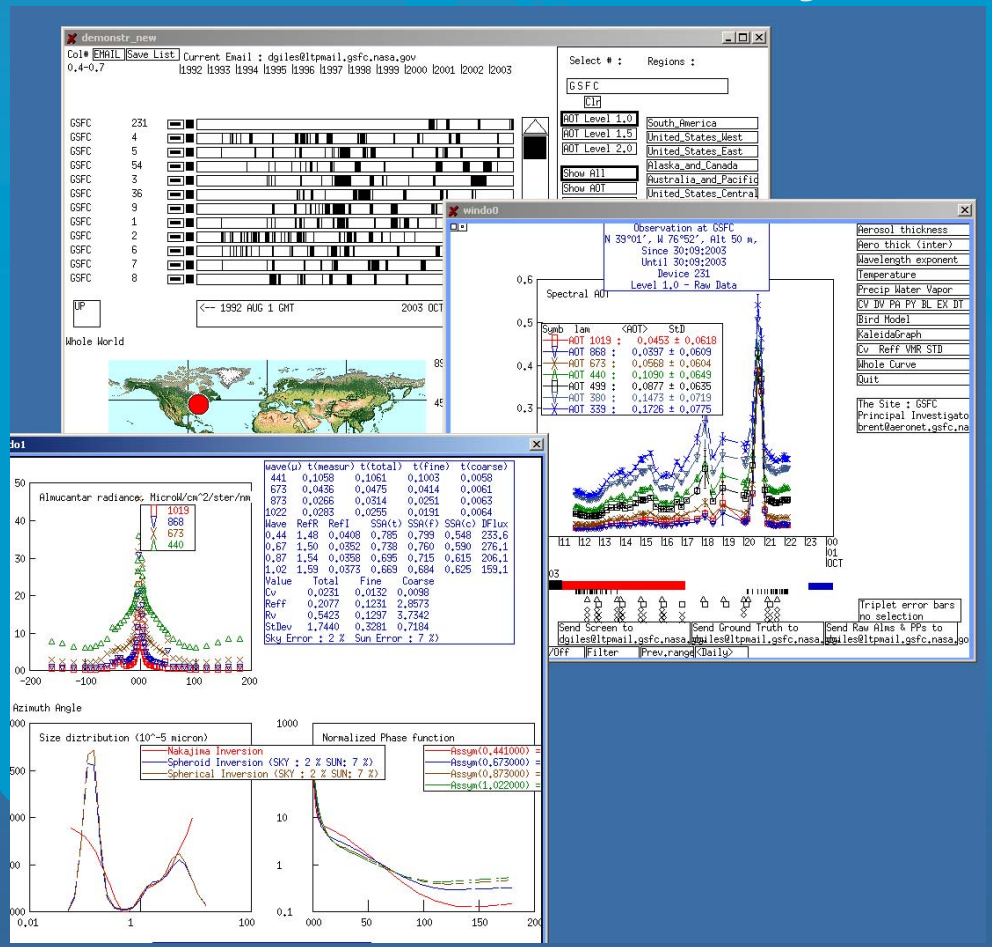
Principal plane retrievals - **4 wavelengths, level 2; 6 wavelengths**

? Combined retrievals (almucantar and principal plane)

Internal Data Interface

"Demonstrat"

- Provides interactive data browsing and analysis
- Accesses all AERONET and experimental products
- Functions as a intercalibration utility



AERONET Web Site

http://aeronet.gsfc.nasa.gov

QUICK LINKS

+ **AERONET Collaborators**
+ Aerosol/Flux Networks
+ Contacts
+ Installation/Shipping
+ Other NASA Projects
+ Site/Photos Information
+ Site Outline
+ System Description

DATA

Data Display
+ Level 1.0 AOT
+ Level 1.5 AOT
+ Level 2.0 AOT

Data Download Tool
+ All AERONET Data

Level 2.0 Climatology
+ AOT Tables

Climatology Map Animation
+ 500nm AOT
+ 870-440nm Angstrom Parameter

MISSION

The **AERONET (AE**rosol **RO**botic **NET**work**)** program is an inclusive federation of ground-based remote sensing aerosol networks established by AERONET and **PHOTONS** and greatly expanded by **AEROCAN** and other agency, institute, and university partners. The goal is to assess aerosol optical properties and validate satellite retrievals of aerosol optical properties. The network imposes standardization of **instruments**, **calibration**, and **processing**. Data from this collaboration provides globally distributed observations of spectral aerosol optical depths, **inversion products**, and precipitable water in geographically diverse aerosol regimes. Three levels of data are available from this website: Level 1.0 (unscreened), Level 1.5 (**cloud-screened**), and Level 2.0 (Cloud-screened and quality-assured). Descriptions may be found of program objectives, affiliations, the instrumentation, operational issues, data products, database browser "demonstrat", research activities, links to similar data sets, NASA EOS links and personnel involved in AERONET.

+ Read More

CAUTION: Data presented in the real time data version are unscreened and may not have final calibration reprocessing.

NOTICE TO NON-AERONET INVESTIGATORS: To maintain the integrity of the database and fairness to the individuals who have contributed, use of these data for publication requires an offer of authorship to the AERONET PI (s).

NEWS

2004 AERONET/PHOTONS Workshop in Spain

- **UPDATES (4/29/2004)**
- **Overview**
- **Rationale**
- **Preliminary agenda** (PDF)
- **Logistics** (PDF) - **Updated 4/28/2004**
- **Additional lodging and logistical information - Updated 4/28/2004**
- **Tourism**

+ Read More

- Current list of **participants** presenting **posters**.

IMPORTANT: Workshop Notice

All attendees must send the following information to Ms. Pilar Sanz Cabeza:

1. **Name**
2. **Institution**
3. **Nationality**
4. **Passport Number**

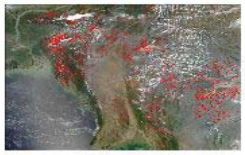
Please submit responses as soon as possible.

+ Read More

Important Announcements

- **18 February 2004** - The AERONET/PHOTONS workshop will be held on the south coast of Spain from May 10 to May 14, 2004. The workshop will be located at the facilities of the experimentation range "**El Arenosillo**" which is operated by **INTA's Department of Earth Observation, Remote Sensing and Atmosphere (Spain)**.
- **12 January 2004** - Please read the January 2004 **AERONET quarterly** report for an update on the upcoming project workshop, activities, and new products.
- **Former Announcements**

Features



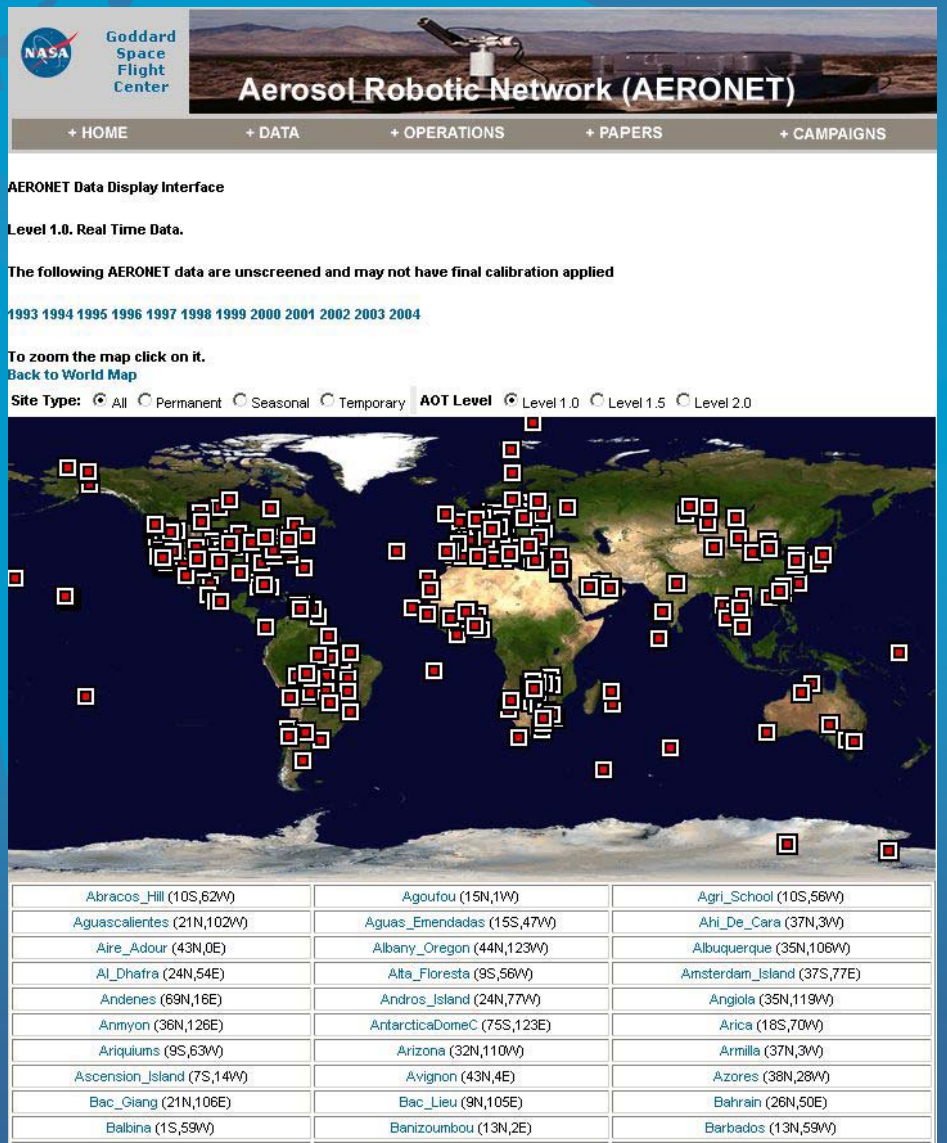
Aerosol Optical Properties in Southeast Asia
+ Read More (PDF)

Campaign

2004 United Arab Emirates

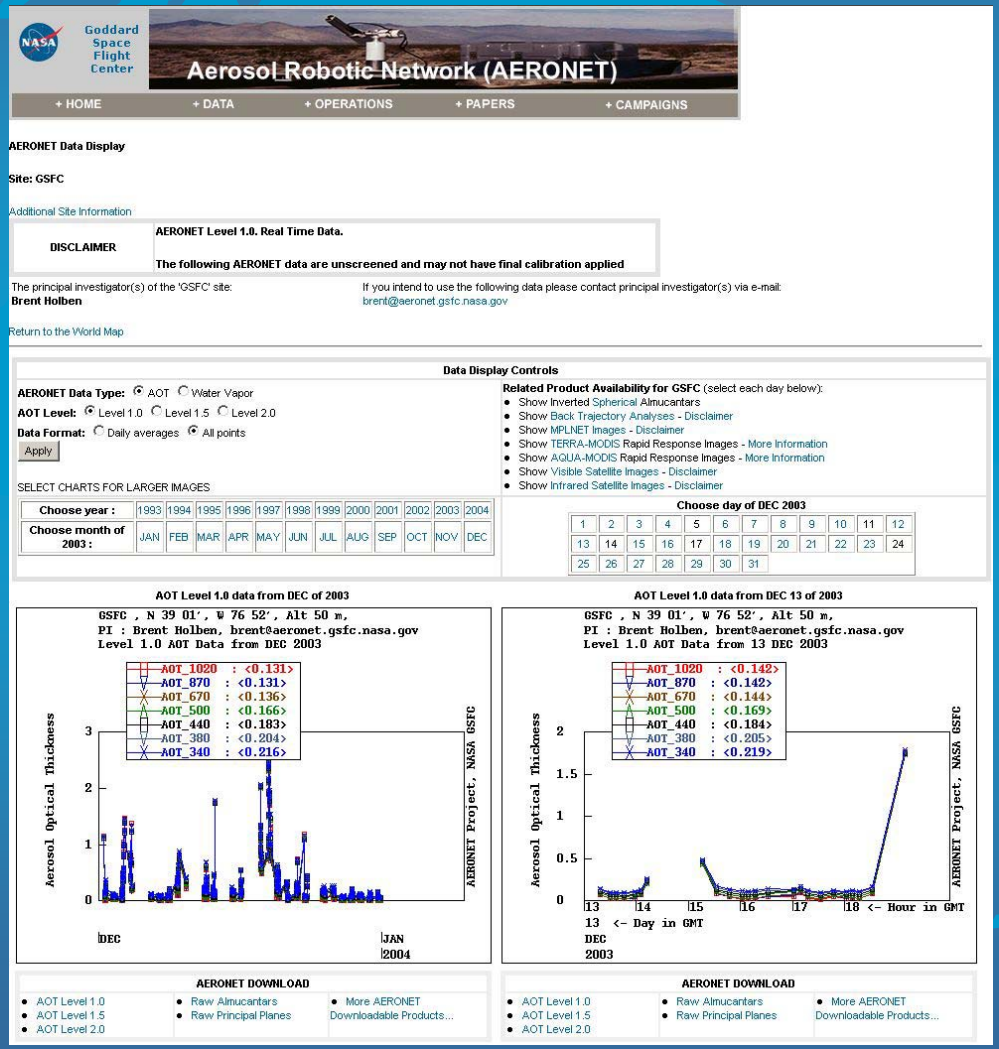
Display Interface

- Time Selection
- Site Selection
  - Map Interface
  - Text Interface
- Additional Options
  - Site Type
  - AOT Level



Display Interface

- Time Selection Menu
- Display Aerosol Optical Depth Plots
- Direct Data Download Links
- Additional Data Products
  - Almucantar Retrieval Products (AERONET)
  - Satellite Images (AQUA/TERRA-MODIS, GOES)
  - MPLNET
  - Back Trajectory Analyses

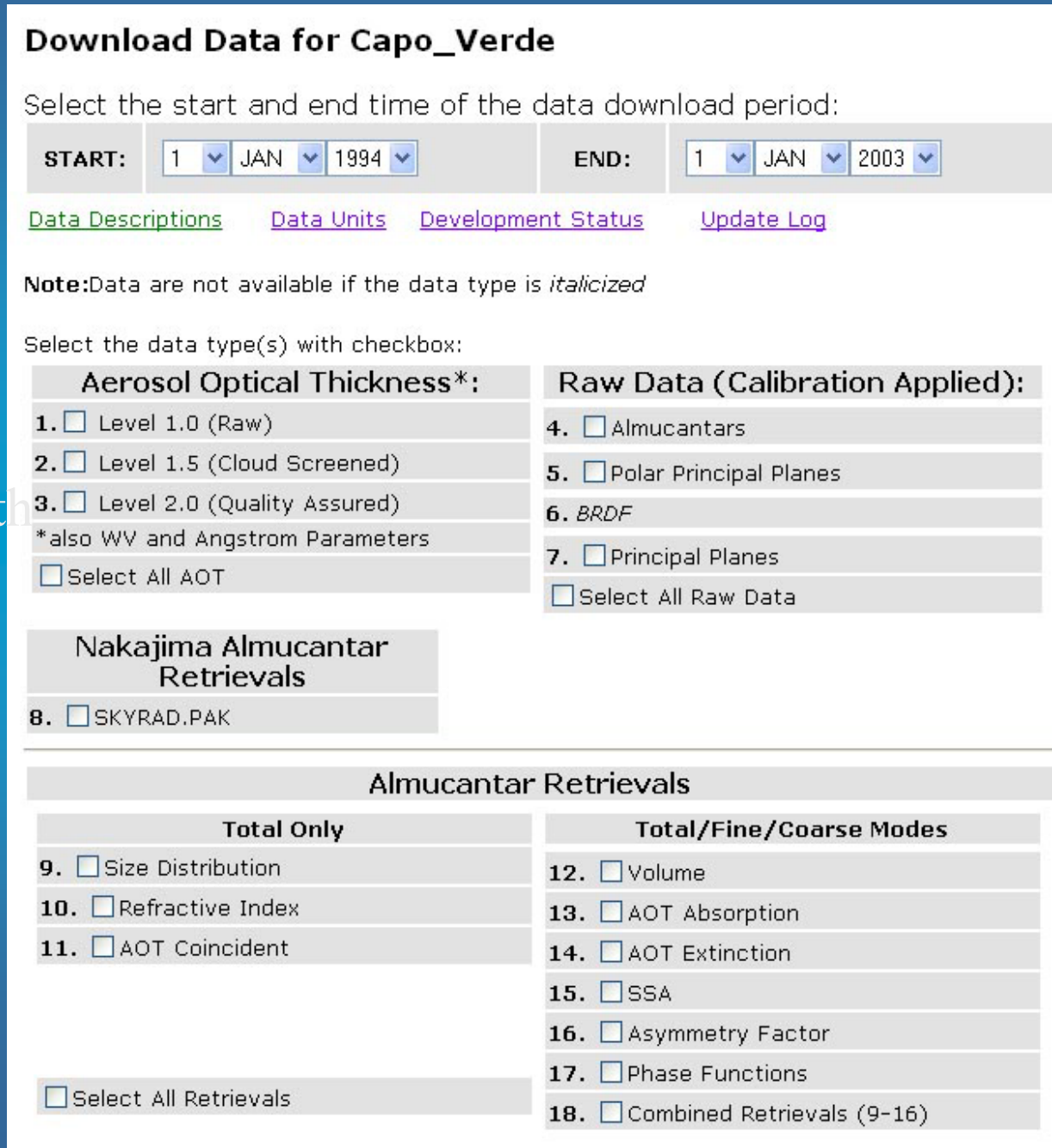


Download Tool

- Geographical Site Selection
  - Map
  - Region, Country/State, and AERONET Site

Download Tool

- Time Selection
- AOT Products
  - –Levels 1.0, 1.5, 2.0
  - –Instrument number and wavelength information
- Raw Radiance Data with calibration applied
  - –Almucantar, Principal Plane (Polar), BRDF
- Nakajima Almucantar Retrievals



Download Data for Capo_Verde

Select the start and end time of the data download period:

START:	1 JAN 1994	END:	1 JAN 2003

Data Descriptions | Data Units | Development Status | Update Log

Note: Data are not available if the data type is *italicized*

Select the data type(s) with checkbox:

Aerosol Optical Thickness*:

1. ☐ Level 1.0 (Raw)
2. ☐ Level 1.5 (Cloud Screened)
3. ☐ Level 2.0 (Quality Assured)

*also WV and Angstrom Parameters

☐ Select All AOT

Raw Data (Calibration Applied):

4. ☐ Almucantars
5. ☐ Polar Principal Planes
6. *BRDF*
7. ☐ Principal Planes

☐ Select All Raw Data

Nakajima Almucantar Retrievals

8. ☐ SKYRAD.PAK

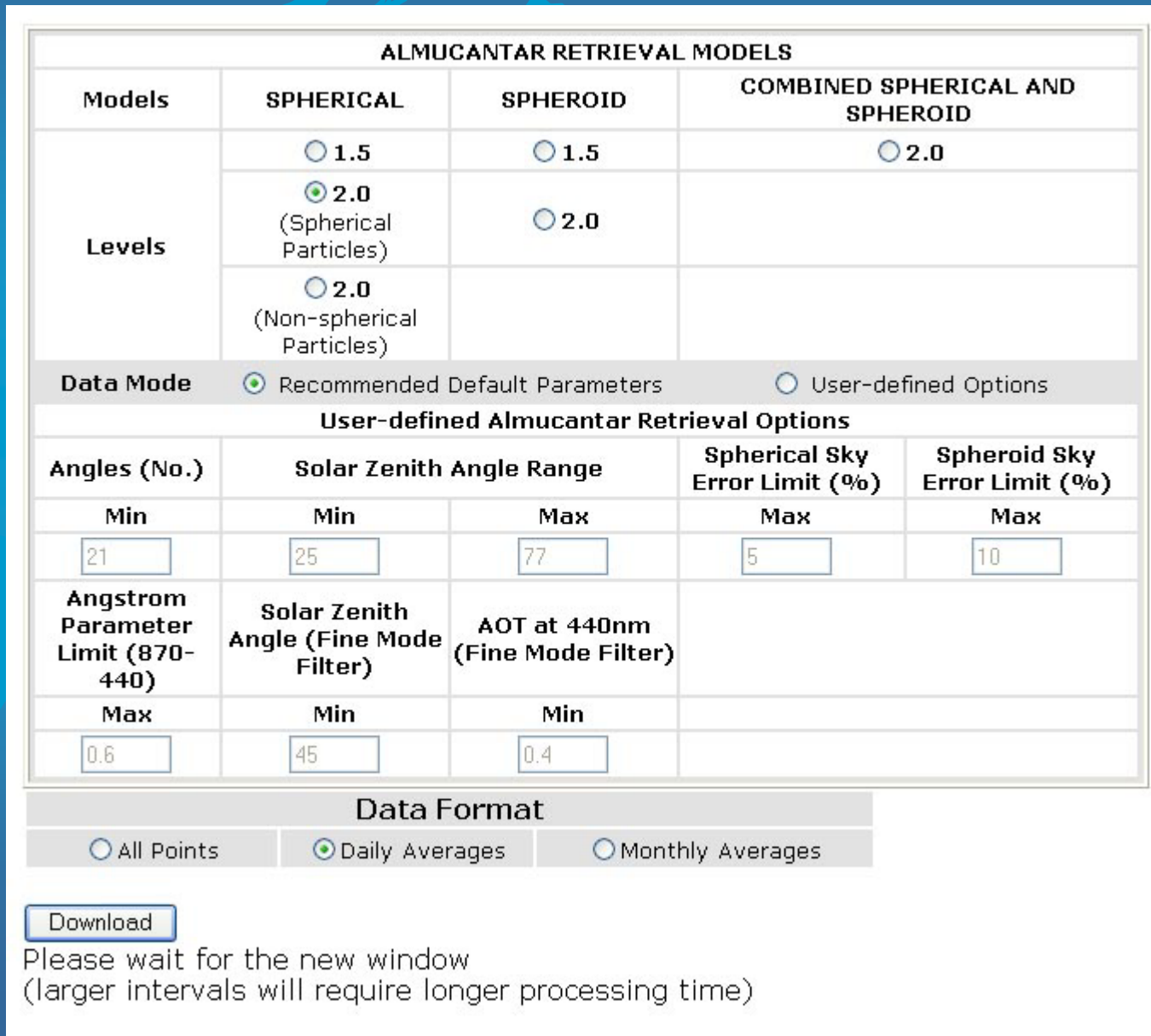
Almucantar Retrievals

Total Only	Total/Fine/Coarse Modes
9. ☐ Size Distribution	12. ☐ Volume
10. ☐ Refractive Index	13. ☐ AOT Absorption
11. ☐ AOT Coincident	14. ☐ AOT Extinction
	15. ☐ SSA
	16. ☐ Asymmetry Factor
	17. ☐ Phase Functions
	18. ☐ Combined Retrievals (9-16)

☐ Select All Retrievals

Download Tool

- Almucantar Retrievals (Dubovik)
  - Spherical, Spheroid
  - Default Option
  - Advanced Parameters
- Data Type Formats
  - All Points
  - Daily and Monthly Averages



ALMUCANTAR RETRIEVAL MODELS

Models	SPHERICAL	SPHEROID	COMBINED SPHERICAL AND SPHEROID
Levels	○ 1.5	○ 1.5	○ 2.0
	◉ 2.0 (Spherical Particles)	○ 2.0	
	○ 2.0 (Non-spherical Particles)		
Data Mode	◉ Recommended Default Parameters	○ User-defined Options	

User-defined Almucantar Retrieval Options

Angles (No.)	Solar Zenith Angle Range		Spherical Sky Error Limit (%)	Spheroid Sky Error Limit (%)
Min	Min	Max	Max	Max
21	25	77	5	10
Angstrom Parameter Limit (870-440)	Solar Zenith Angle (Fine Mode Filter)	AOT at 440nm (Fine Mode Filter)		
Max	Min	Min		
0.6	45	0.4		

Data Format

○ All Points ◉ Daily Averages ○ Monthly Averages

Download

Please wait for the new window
(larger intervals will require longer processing time)

Level 2.0 Climatology

- Averages:
  - Daily
  - Monthly
  - Multi-Year Monthly
  - Yearly

AERONET Climatology, Level 2.0 - Quality Assured Data

GSFC (N 39°01', W 76°52', Alt 50 m)

Site Index

Year: 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003

Channel (nm): 1020, 870, 670, **500**, 440, 380, 340, 500 (not interpolated)

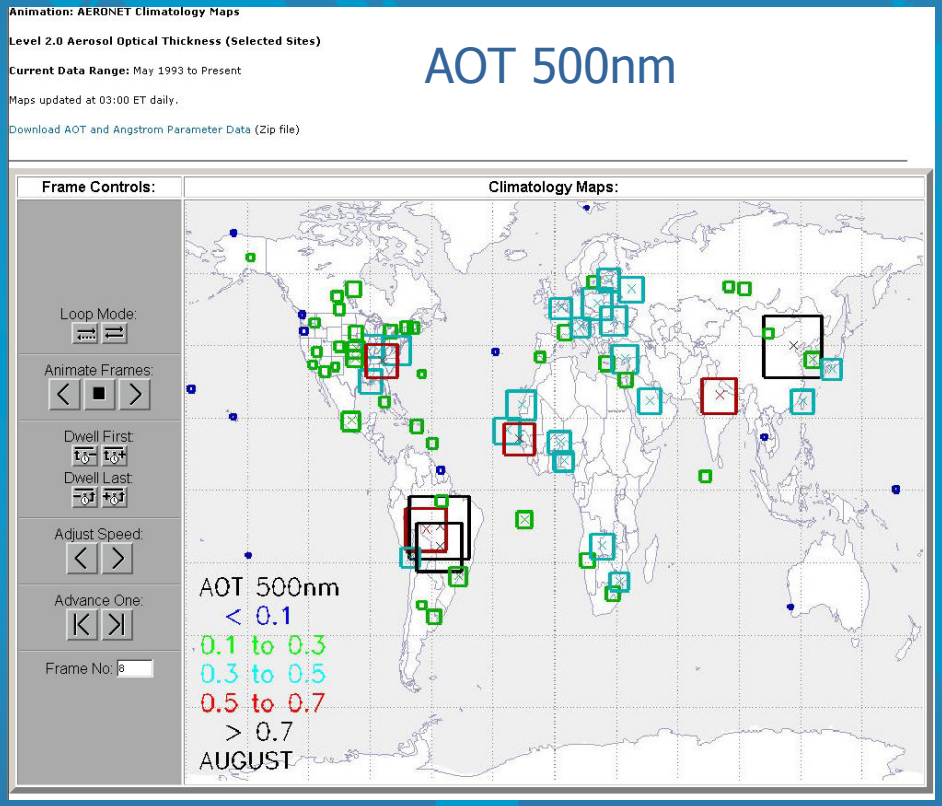
Explanation of Statistics

Aerosol optical depth at 500 nm (tau_{a500}), Angstrom exponent ($alpha_{440-870}$), precipitable water (PW), the associated standard deviations (sigma), the number of days (*N*) and months (Month) in the observation periods.

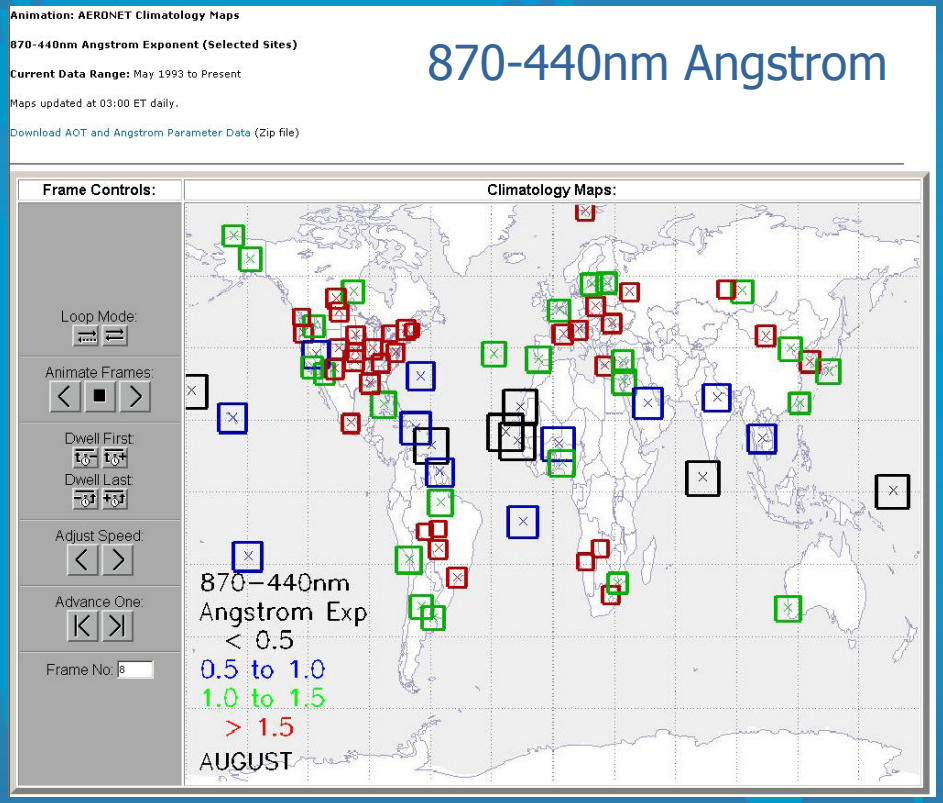
Overall Averages of	tau_{a500}	sigma	$alpha_{440-870}$	sigma	PW	sigma	*N*	Month
JAN	0.09	0.05	1.74	0.31	0.75	0.45	134	9
FEB	0.12	0.07	1.56	0.38	0.73	0.35	135	9
MAR	0.15	0.10	1.58	0.37	0.98	0.55	166	10
APR	0.20	0.11	1.38	0.33	1.37	0.78	189	10
MAY	0.26	0.18	1.49	0.32	1.94	0.85	183	11
JUN	0.40	0.27	1.72	0.29	2.96	1.01	207	11
JUL	0.45	0.31	1.76	0.30	3.39	0.97	229	11
AUG	0.47	0.29	1.74	0.28	3.35	0.98	223	11
SEP	0.26	0.23	1.76	0.28	2.47	0.96	200	11
OCT	0.15	0.12	1.68	0.36	1.58	0.69	199	11
NOV	0.11	0.07	1.75	0.28	1.12	0.65	187	11
DEC	0.09	0.06	1.80	0.34	0.83	0.50	188	11
YEAR	0.23	0.14	1.66	0.13	1.79	1.01	2240	126

Overall Download Years Combined Download

Level 2.0 Climatology



AOT 500nm



870-440nm Angstrom

Goddard Space Flight Center

Aerosol Robotic Network (AERONET)

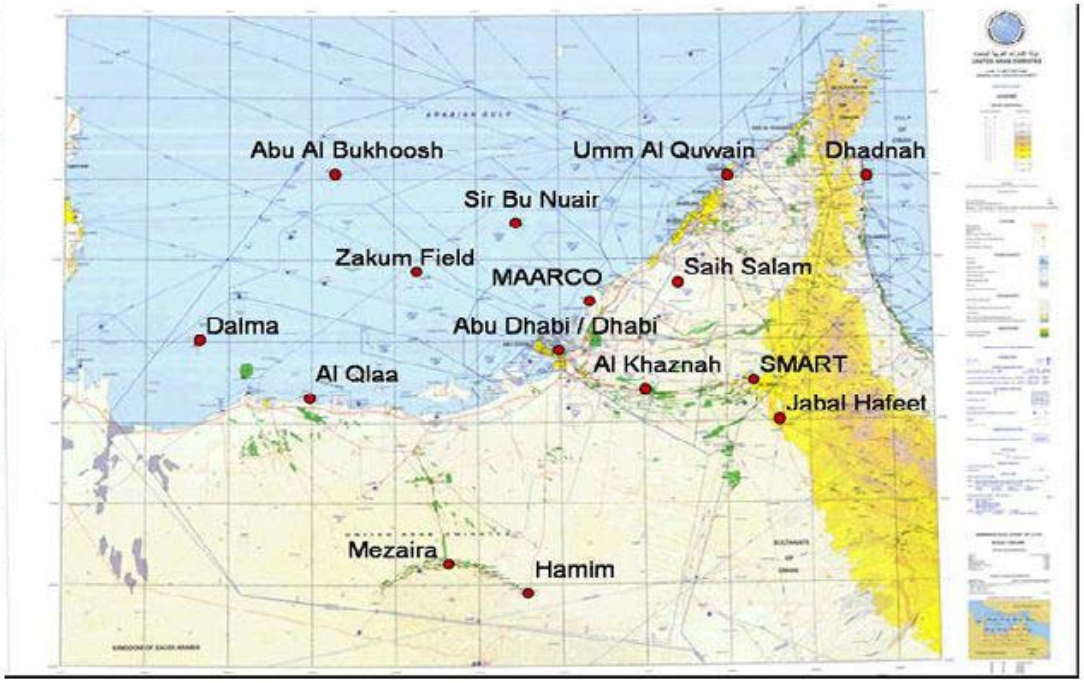
+ HOME | + DATA | + OPERATIONS | + PAPERS | + CAMPAIGNS

United Arab Emirates Summer Field Campaign (2004)

+ UAE^2 HOME
+ ABSTRACT
- DATA
+ MEETINGS
+ RATIONALE
+ OBJECTIVES
+ REFERENCES
+ LINKS
+ SCHEDULE
+ MAPS
+ PHOTOGRAPHS
+ SATELLITE
+ CONTACTS
+ INFORMATION FOR TRAVELERS
+ STATUS AND REPORTS
+ SCIENCE TEAM
+ WEATHER

AERONET UAE Data

Red circles indicate the data are available for the site.



- Abu Al Bukhoosh
- Al Qlaa
- Al Khaznah
- Dalma
- Dhabi
- Dhadnah
- Hamim
- Jabal Hafeet
- MAARCO
- Mezaira
- Saih Salam
- Sir Bu Nuair
- SMART
- Umm Al Quwain
- Zakum_Field

Send Us Your Comments

Curator: David Giles
NASA Official: Brent Holben

Last Updated: **24 September 2004**

2004 United Arab Emirates Unified Aerosol Experiment (UAE^2)

+ UAE^2 HOME
+ ABSTRACT
+ DATA
+ MEETINGS
+ RATIONALE
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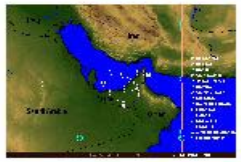
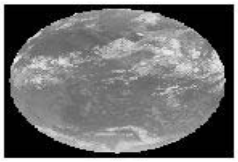
+ WEATHER

SATELLITE



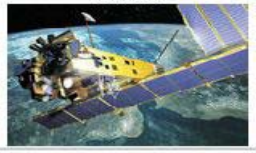
+ Satellite Overpass Predictor



+ EUMETSAT Images

+ TERRA/AQUA/SeaWiFS Orbit Track Plots - Navy Post Graduate School
+ NOAA Orbit Track Plots - Navy Post Graduate School
+ Global Rain Rate - NRL
+ Scatterometer Winds - NRL
+ MeteoSat 5 Cloud Tops - NRL

AATSR



+ UAE^2 Support Information
  - + AATSR Impression for UAE^2 (PDF)
  - + AATSR Coverage for UAE^2 (PDF)

MISR-TERRA

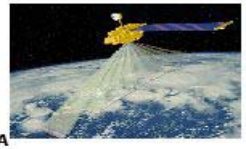
- + MISR Daily Imagery
- + MISR Regional Imagery
- + MISR Regional Archive Imagery (password protected)
- + MISR Regional Product Imagery overall access table
- + Overflight Schedule Table (PDF)
- + Imaging Site Maps (PDF)
- + MISR data detailed products and information table
- + UAE^2 MISR Goals and Products Presentation (PowerPoint)
- + UAE^2 Support Information
- + MISR UAE^2 campaign page

MODIS-AQUA

+ UAE^2 Rapid Response Images
  - + Granules (Cloud Top Pressure and Temperature; Water Vapor IR and near IR; Aerosol Depth Land/Ocean; Cloud Optical Thickness; Effective Particle Radius; Aerosol Depth Ratio Small)
  - + Average and Standard Deviation Statistics - 50km Box - Collocated with AERONET sites - Spectral AOT, Particle Size Information, and Reflectances from which the products are derived etc., separate for land and ocean.

+ TERRA/AQUA/SEAWIFS Orbits
Glint Angle Information

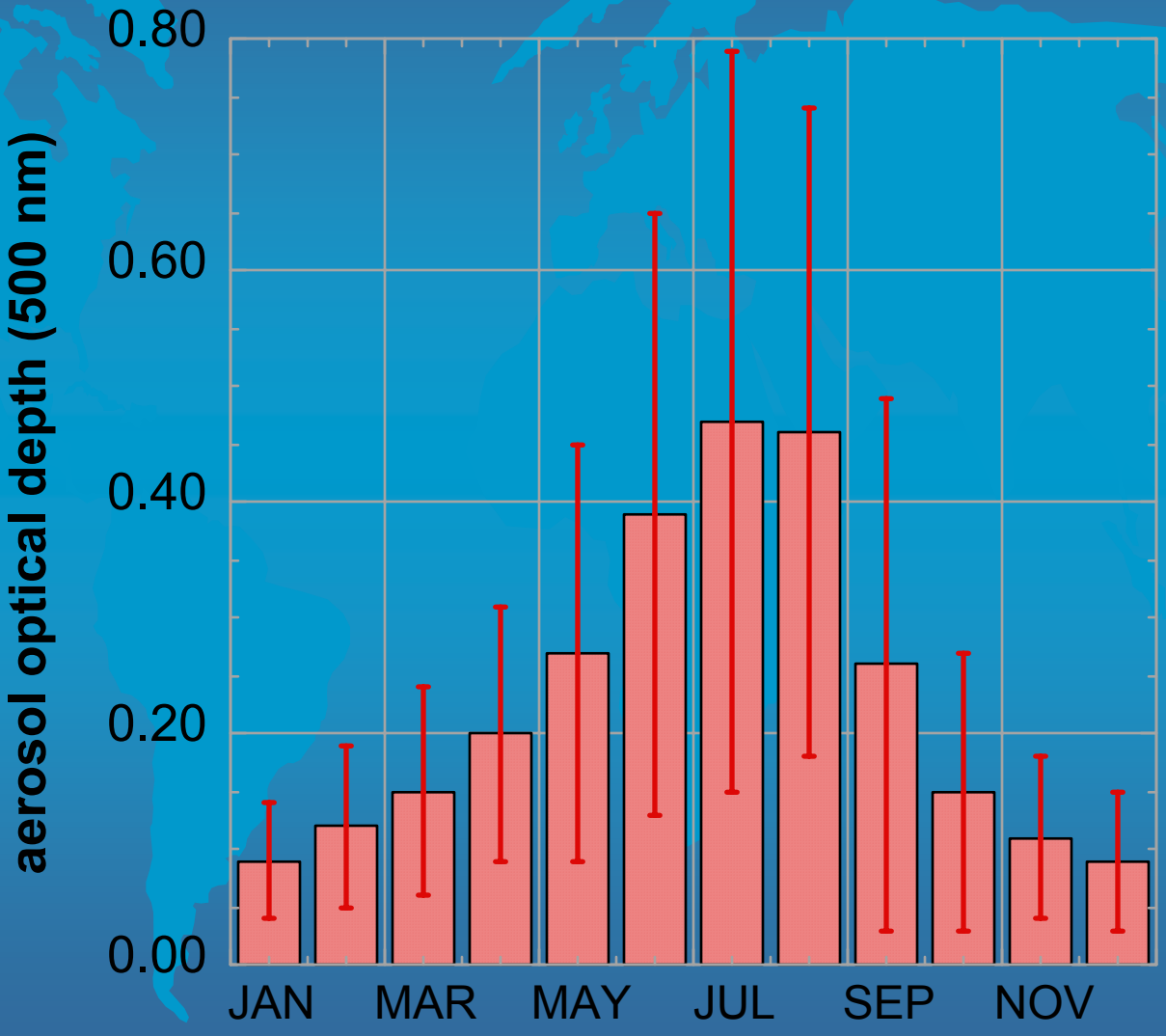
MODIS-TERRA



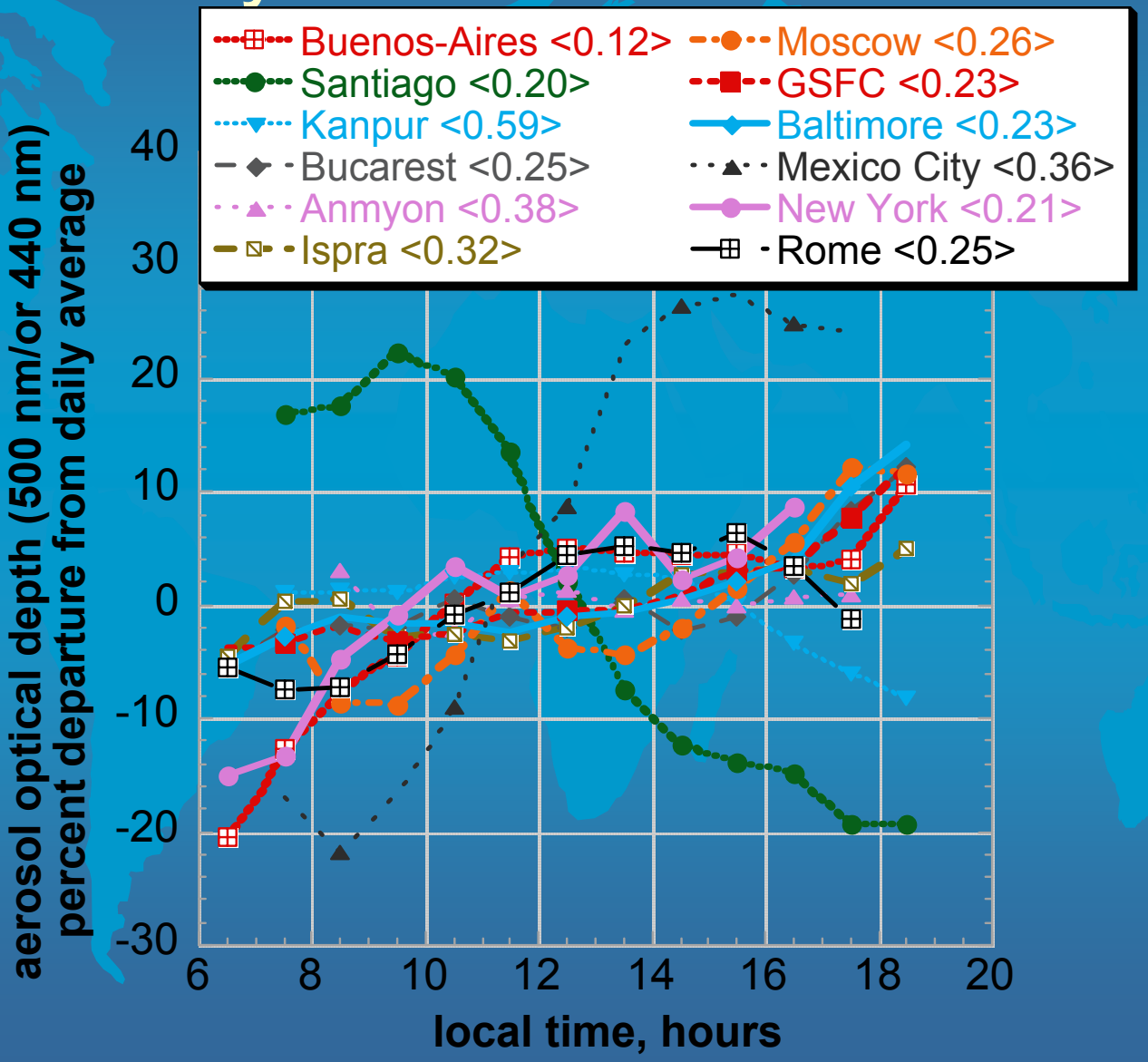
+ UAE^2 Rapid Response Images
  - + Granules (Cloud Top Pressure and Temperature; Water Vapor IR and near IR; Aerosol Depth Land/Ocean; Cloud Optical Thickness; Effective Particle Radius; Aerosol Depth Ratio Small)
  - + Average and Standard Deviation Statistics- 50km Box - Collocated with AERONET sites - Spectral AOT, Particle Size Information, and Reflectances from which the products are derived etc., separate for land and ocean.


9 7'04

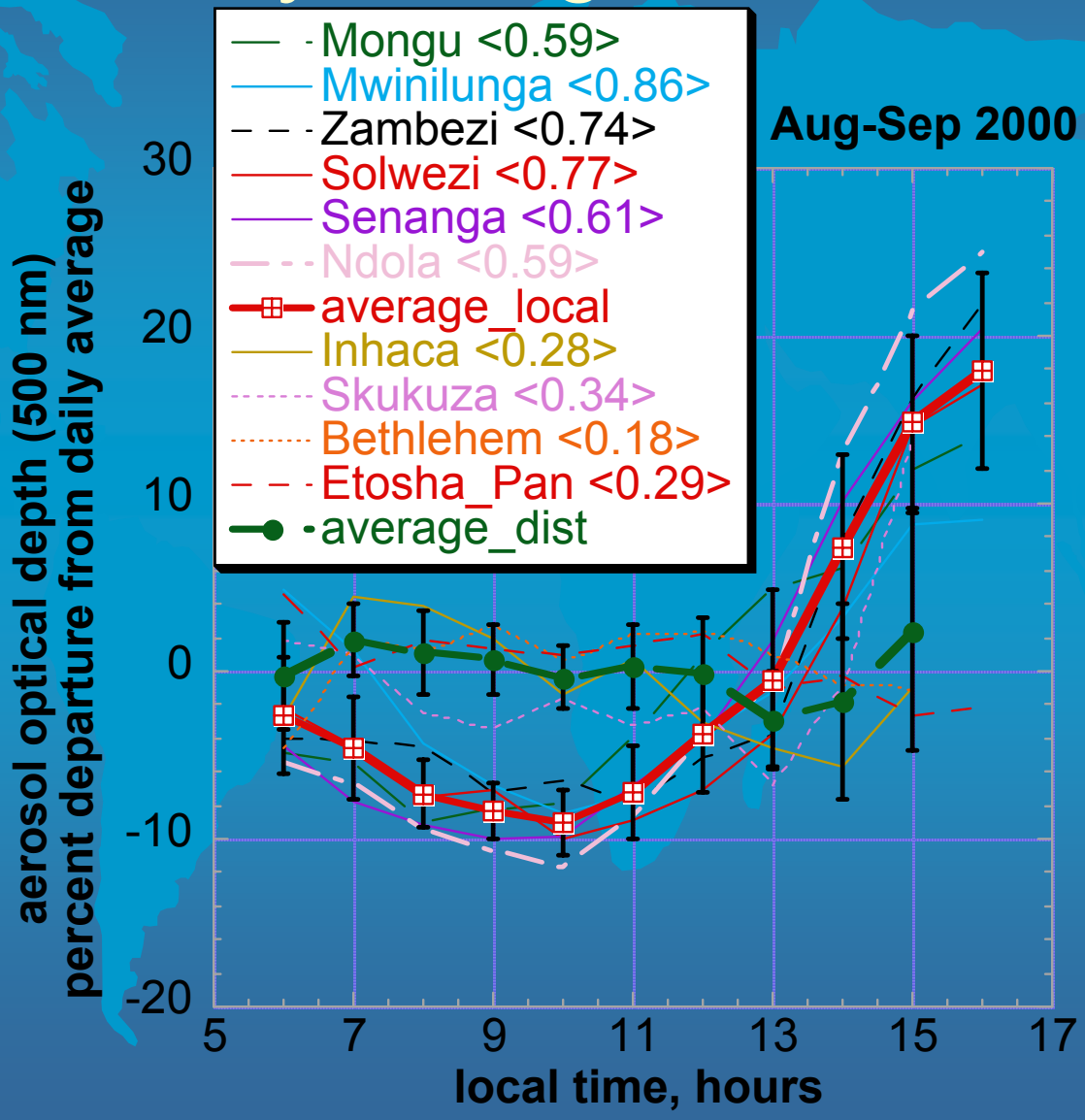
Goddard Space Flight Center



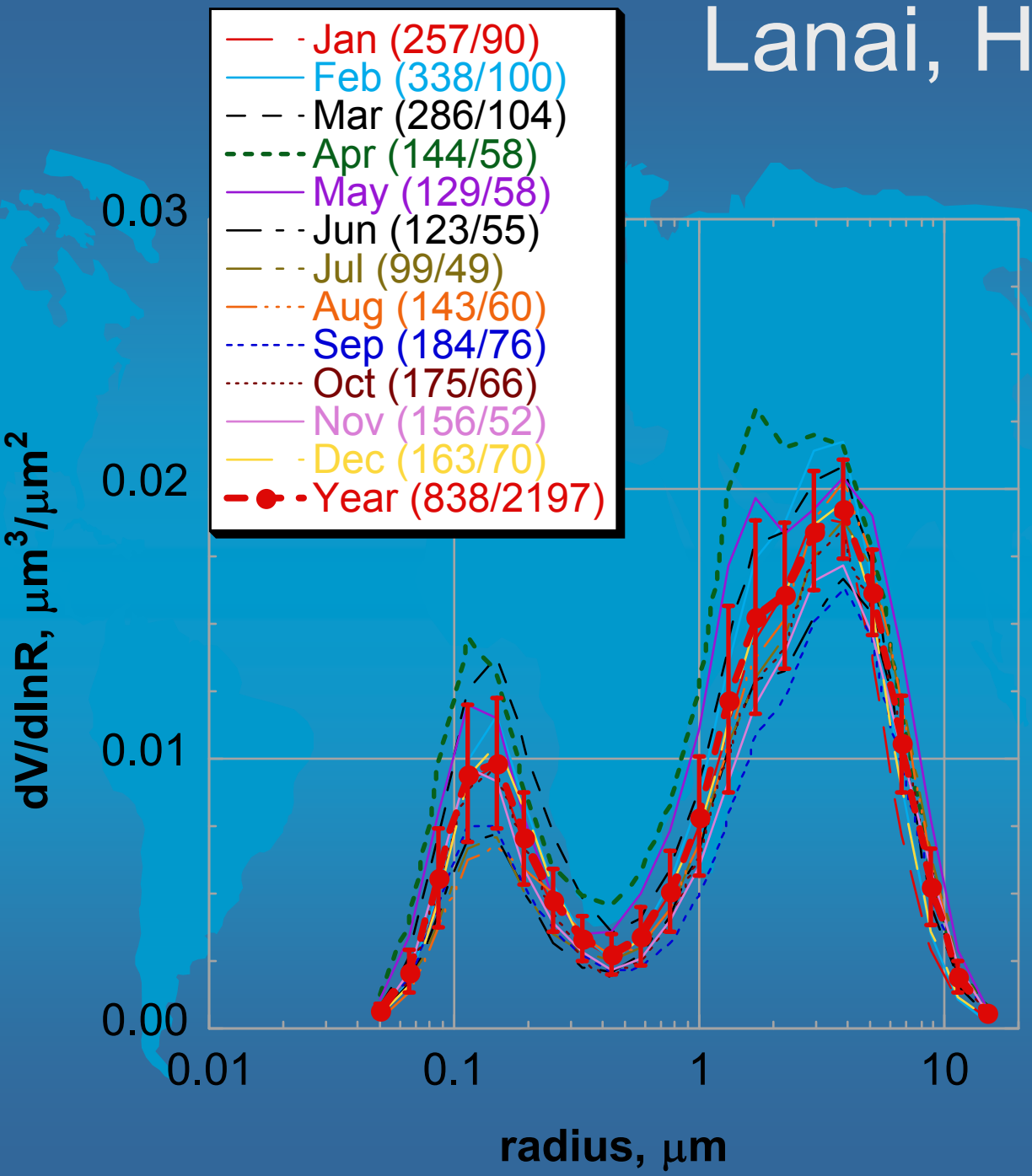
Aerosol optical depth diurnal variability at various urban sites



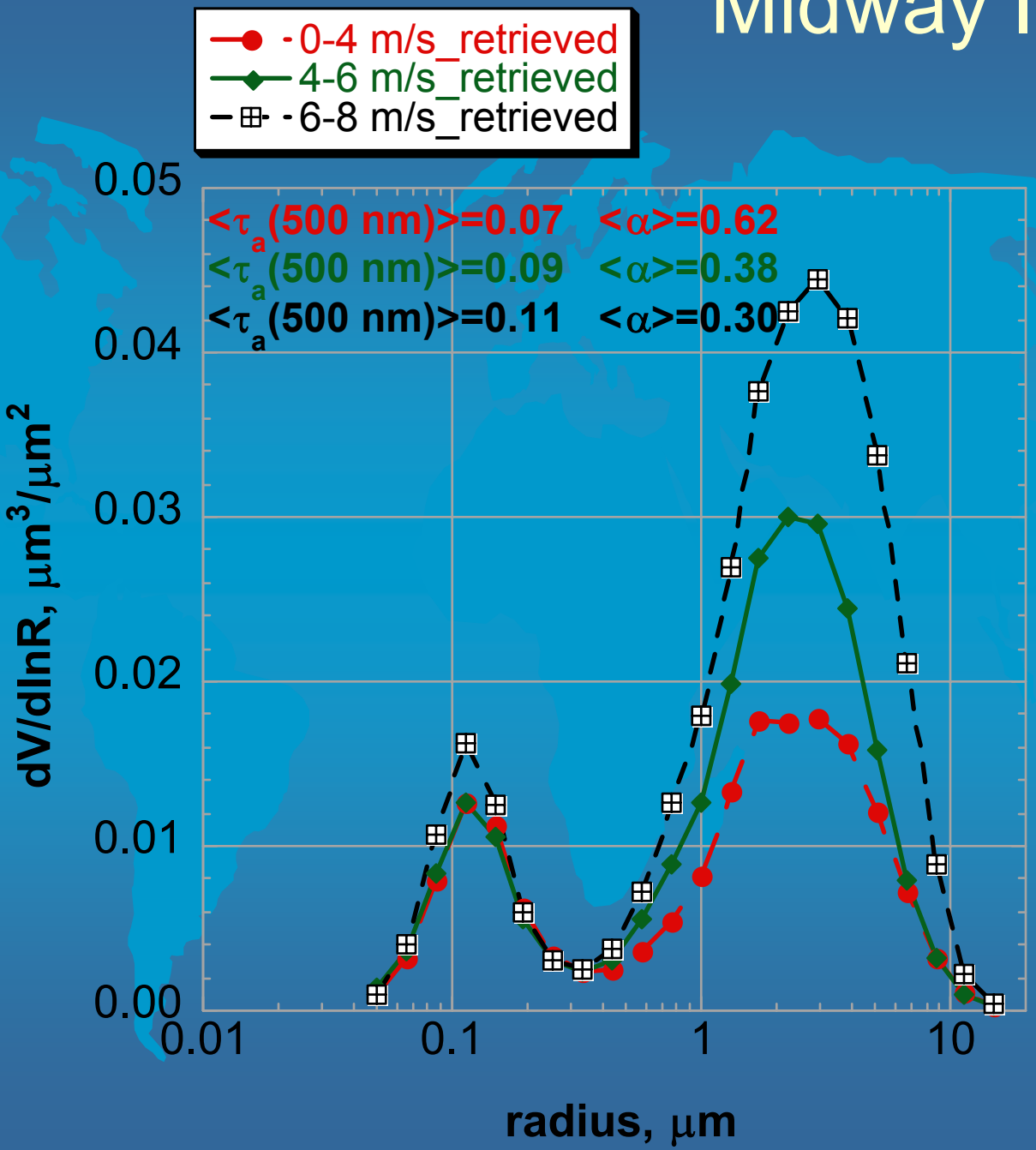
Aerosol optical depth diurnal variability during SAFARI 2000



Lanai, Hawaii



Midway Island



Acknowledgments

- **We thank Dr. Michael King of the EOS Project Science Office and Dr. Hal Maring of the NASA Headquarters for their support of AERONET**
- **We thank CNES and CNRS (France) for support of PHOTON**
- **We thank CCRS and NSERC (Canada) for support of AEROCAN**
- **We thank all other collaborators**