

Toward a coherent detailed evaluation of aerosol data products from multiple satellite sensors

Charles Ichoku, Maksym Petrenko, and Greg Leptoukh

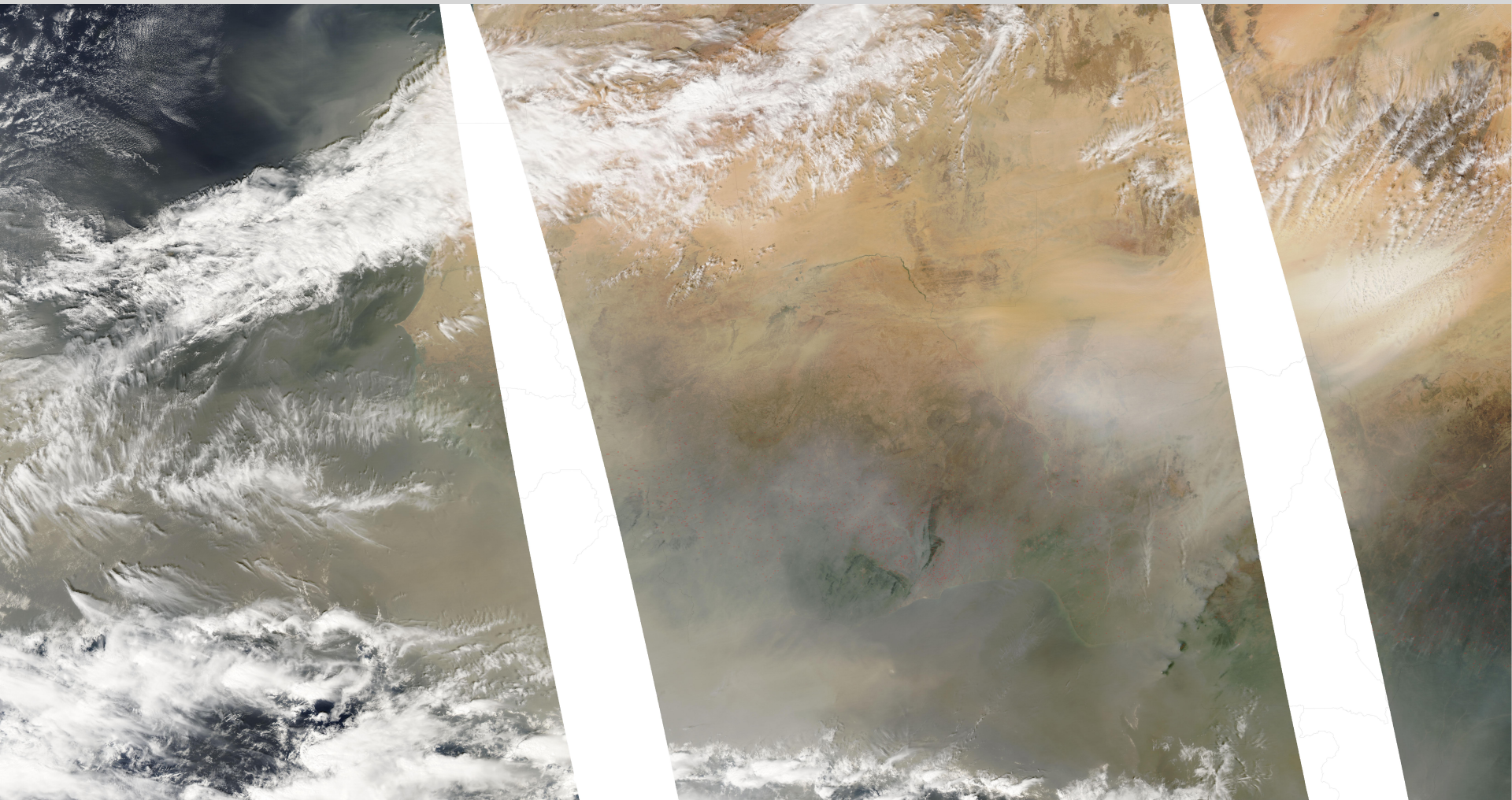


Image: Aqua-MODIS true color RGB of 09-Jan-2005 (courtesy: NASA EarthObservatory and MODIS Rapid Response Teams)

Presented at the Special Workshop on: "Observations and modeling of aerosol and clouds properties for climate studies", at the UPMC, Paris, France, 12-15 September, 2011 (Organized by LOA Lille in honor of Didier Tanre's 60th Birthday)

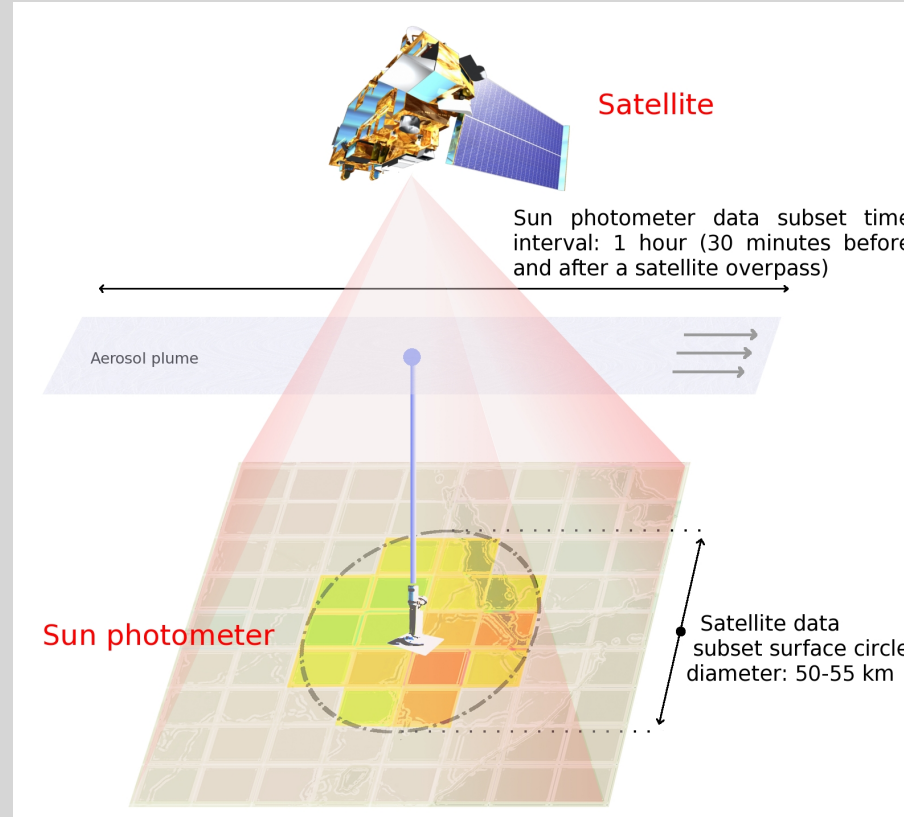
AEROCOM-2007, LOA, Lille

Didier
Tanre





MAPSS: Multi-sensor Aerosol Products Sampling System



- MAPSS uniformly samples Level-2 aerosol products and stores resulting statistics in simple CSV files

- Giovanni-based WEB interface for MAPSS provides a convenient customized access to the data, with on-line plotting and data export capabilities

- Aerosol data are available from different sensors

- MODIS
- MISR
- OMI
- POLDER
- CALIOP
- AERONET

- Hard to compare and inter-validate

- Different spatial and temporal resolution
- Different data access strategies

Functions and Web Sites

GIOVANNI – Level 3 Earth Science Data Visualization and Analysis

<http://disc.sci.gsfc.nasa.gov/giovanni/>

MAPSS – Level 2 Aerosol Point Sampling: Timeseries & Spreadsheet

<http://giovanni.gsfc.nasa.gov/mapss/>

AeroStat – Level 2 Aerosol Point Sampling: Scatterplots & Statistics

<http://giovanni.gsfc.nasa.gov/aerostat/>

This user interface is used to obtain selected parameter statistics from the [MAPSS](#) database for a chosen location and time period. Time Series Plot is the available service. Plot output is rendered as a graph and is also available in ASCII format.

Data Selection

Results

To see time series plots of MAPSS data, choose from the criteria below and click

Get Plot(s)

Select Stations

GSFC,Dakar

Select

Select Parameters

To select parameters, make a **single** selection from each list below (beginning with the left-most list), and then click 'Add'. Selected parameters will be added to the summary. Repeat for additional parameters.

Basic Advanced

Product [info](#)

AERONET aerosols L2, ver. 2
AERONET deconvolution L2, ver. 41
AERONET inversions L1.5, ver. 2
AERONET inversions L2, ver. 2
CALIPSO column and layer aerosols L2, ver. 301

Parameter

AOD
Angstrom exponent
Water vapor

Layer

Angstrom exponent for 380-500nm
Angstrom exponent for 440-670nm (Polar)
Angstrom exponent for 440-670nm
Angstrom exponent for 440-870nm
Angstrom exponent for 550-870nm

Variable

Measurement
Central value
Mean
Median
Standard deviation

Add

Summary

MODIS aerosols L2 (Aqua), ver. 051:AOD at 550 nm with best QA - land and ocean:AOD at 550nm:Mean

Delete

MISR aerosols L2, ver. 0022:Best estimate of AOD:Best estimate of AOD at 558nm:Mean

Delete

AERONET aerosols L2, ver. 2:Angstrom exponent:Angstrom exponent for 550-870nm:Mean

Delete

Select Date Range

Start Date: 01/01/2007



End Date: 12/31/2007

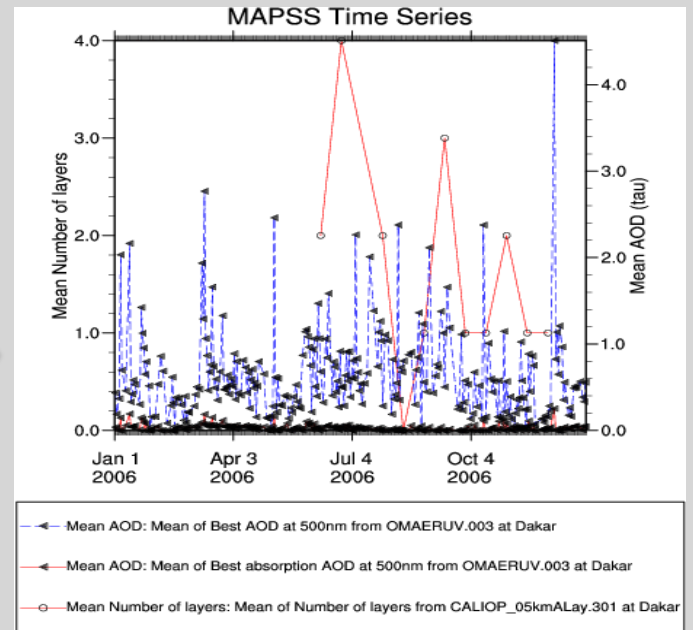
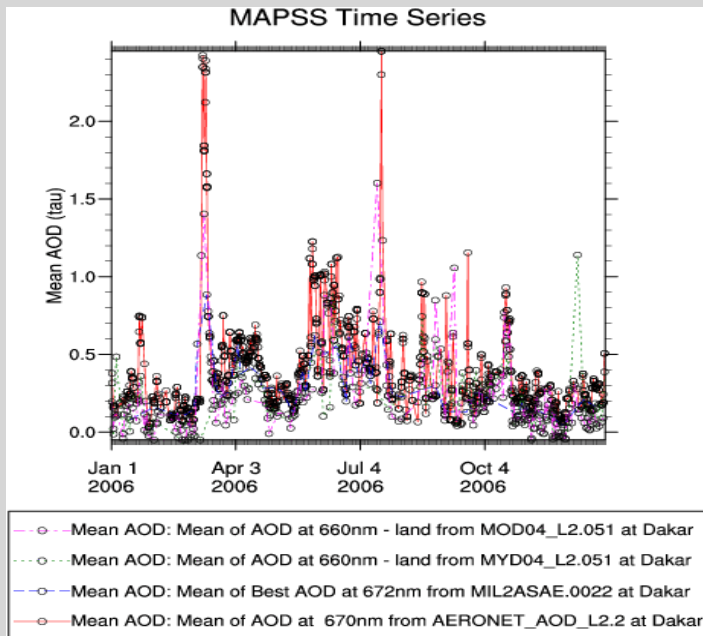


To see time series plots of MAPSS data, choose from the criteria below and click

Get Plot(s)

ACKNOWLEDGMENT: Support for the development of this data access system for integrated validation, intercomparison, and analysis of aerosol products from multiple satellites has been provided by NASA HQ through the ROSES 2006 ACCESS Program under Grant Number NNX08AN39A.

Outputs



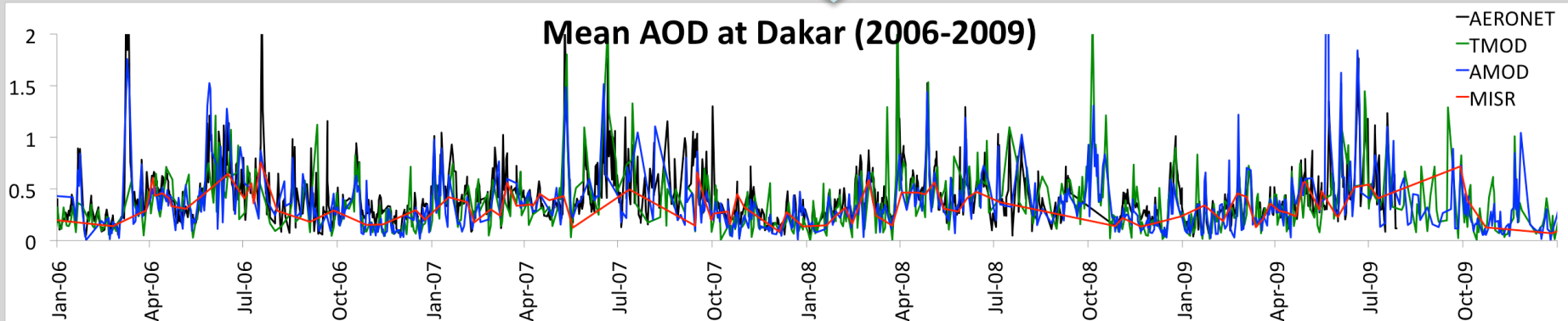
Time series

Title: MAPSS MAPSS Time Series
 Start date: 2006-01-01
 End date: 2007-12-31
 Station(s):
 datetime

Data Table for Spreadsheet

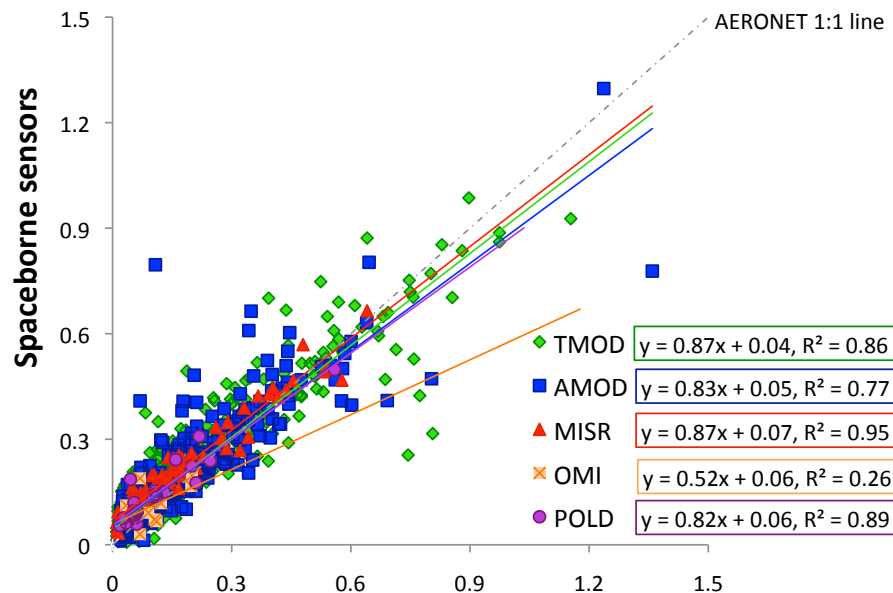
datetime	mean_AERONET_AOD_L2_2_AOD0670_Dakar	mean_MOD04_L2_051_AOD0660corr_Dakar	mean_MYD04_L2_051_AOD0660corr_Dakar	mean_MIL2ASAE_0022_AOD0672b_Dakar
1/1/06 12:20	0.38	0.19		
1/4/06 14:15			0.49	
1/5/06 11:55		0.11		
1/9/06 11:30	0.22	-0.04		
1/9/06 14:33			-0.01	
1/12/06 12:00		0.14		
1/13/06 14:09	0.23		0.1	
1/13/06 14:24	0.23			
1/14/06 11:45	0.3	0.18		
1/14/06 11:49				0.08

Mean AOD at Dakar (2006-2009)



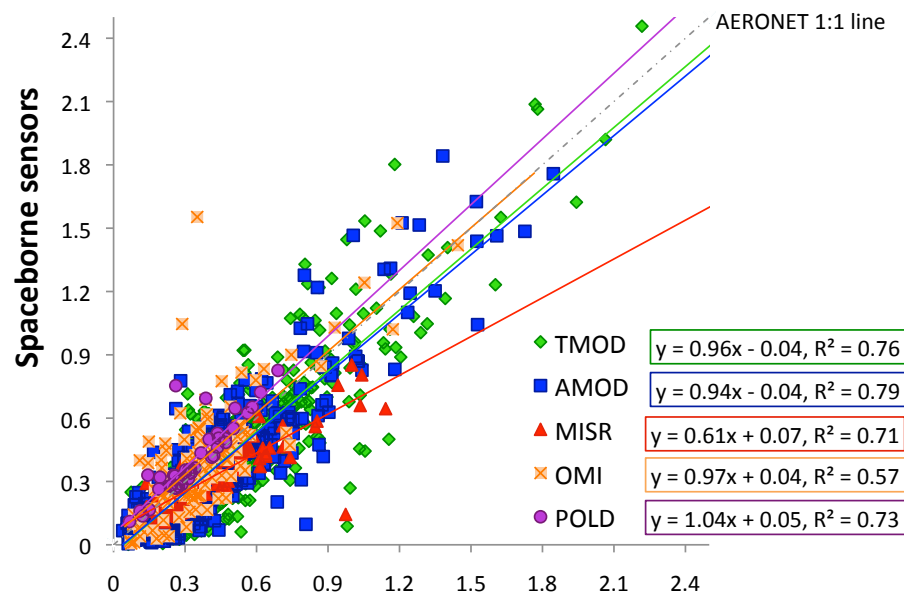
Mean AOD at COVE

(500nm=>OMI,670nm=>POLD,550nm=>MODIS and MISR)



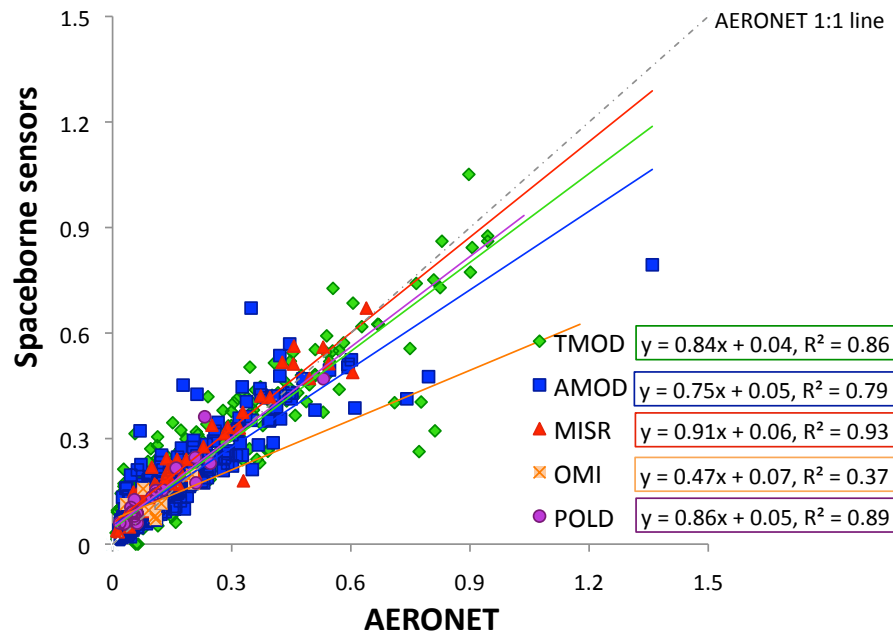
Mean AOD at Dakar

(500nm=>OMI,670nm=>POLD,550nm=>MODIS and MISR)



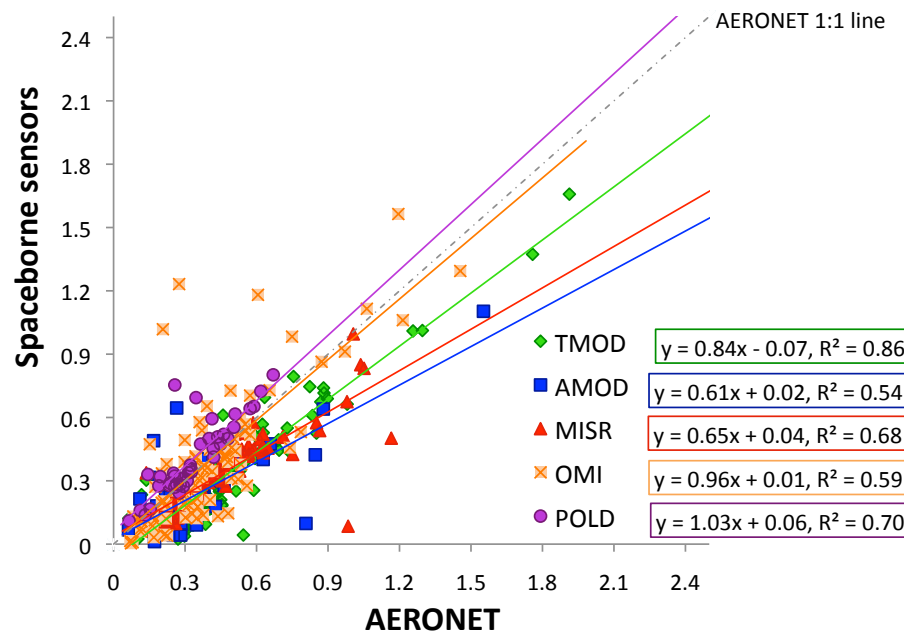
Central pixel AOD at COVE

(500nm=>OMI,670nm=>POLD,550nm=>MODIS and MISR)

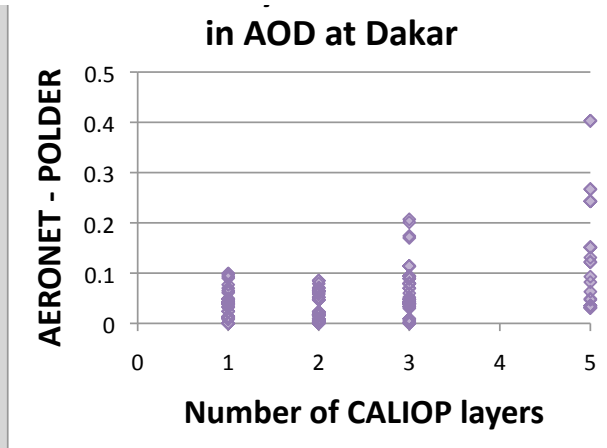
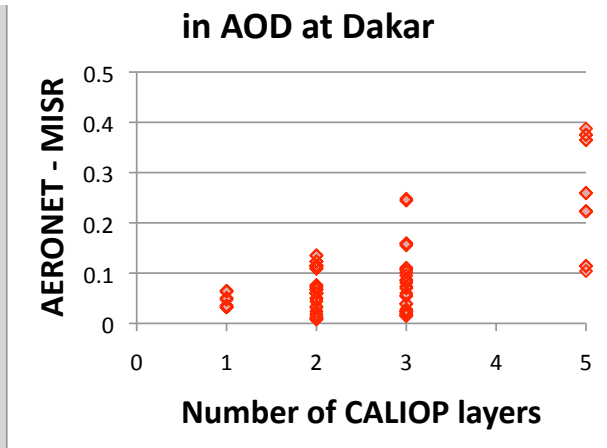
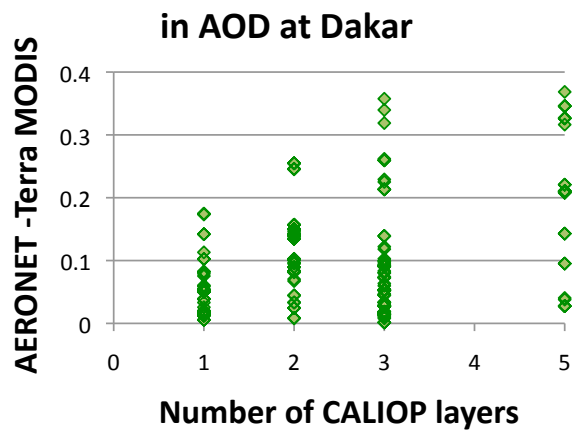


Central pixel AOD at Dakar

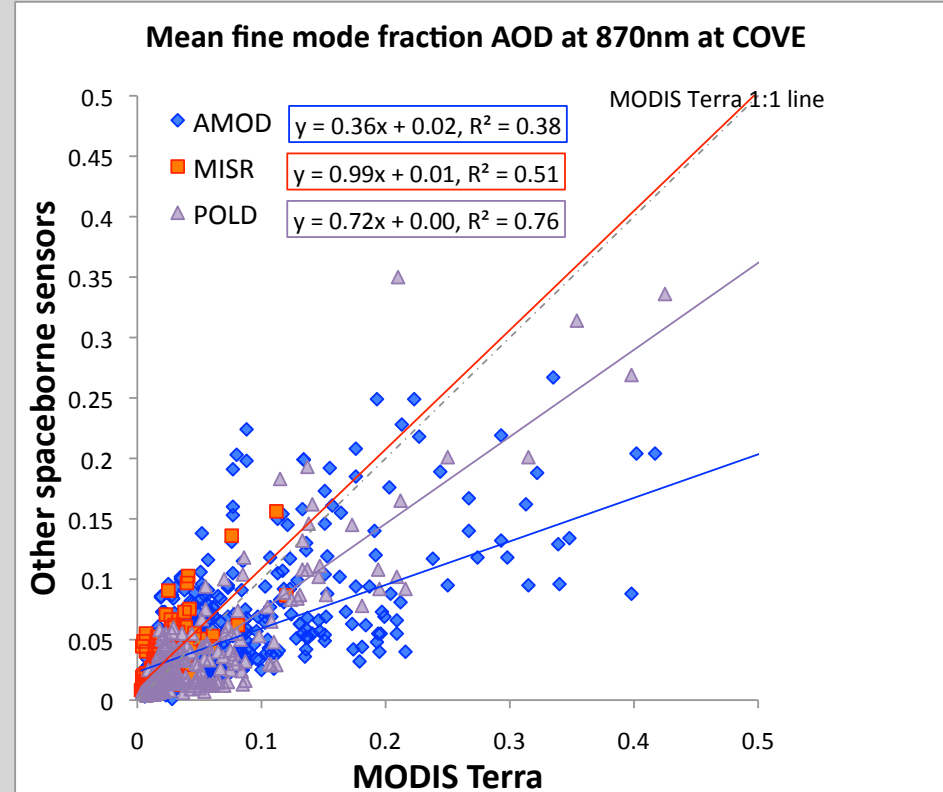
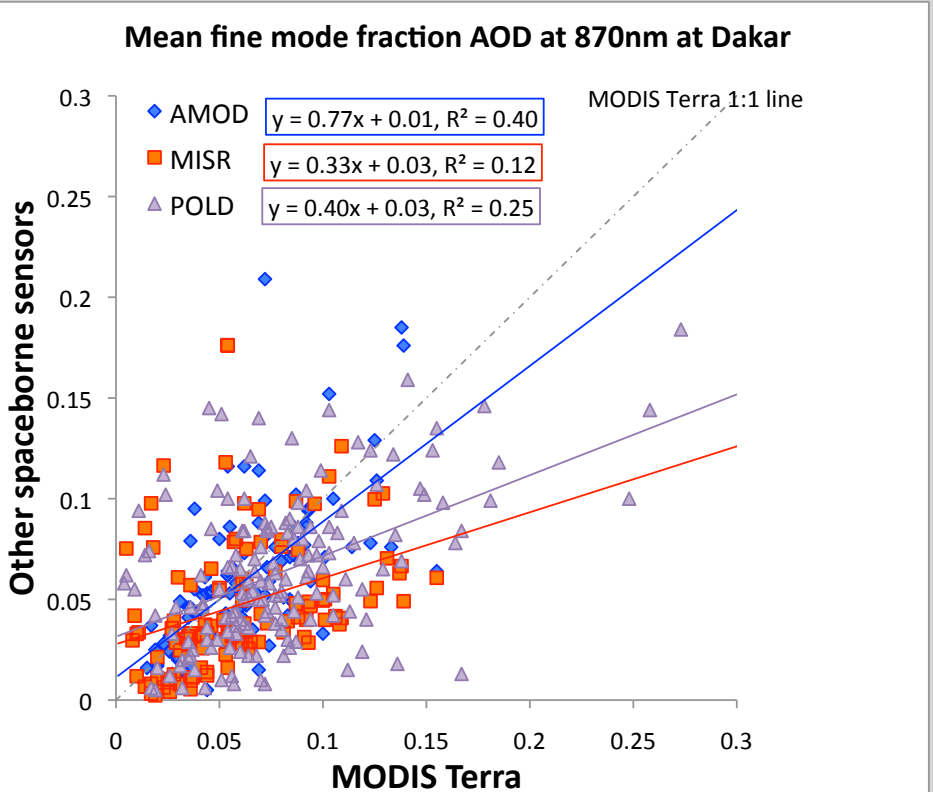
(500nm=>OMI,670nm=>POLD,550nm=>MODIS and MISR)



AERONET-Satellite AOD Differences as a Function of Number of Layers from CALIPSO



Comparison of Satellite-Satellite Fine Mode Fraction at 870 nm at two locations



Ongoing Work

Recently Funded (2011) under ROSES 2009 Uncertainty Analysis

“Coherent uncertainty analysis of aerosol data products from multiple satellites”

PI: Charles Ichoku

Postdoc: Maksym Petrenko

Collaborators: Greg Leptoukh, Oleg Dubovik, Ali Omar

PROJECT METHODOLOGY: Utilize MAPSS and AeroStat to do:

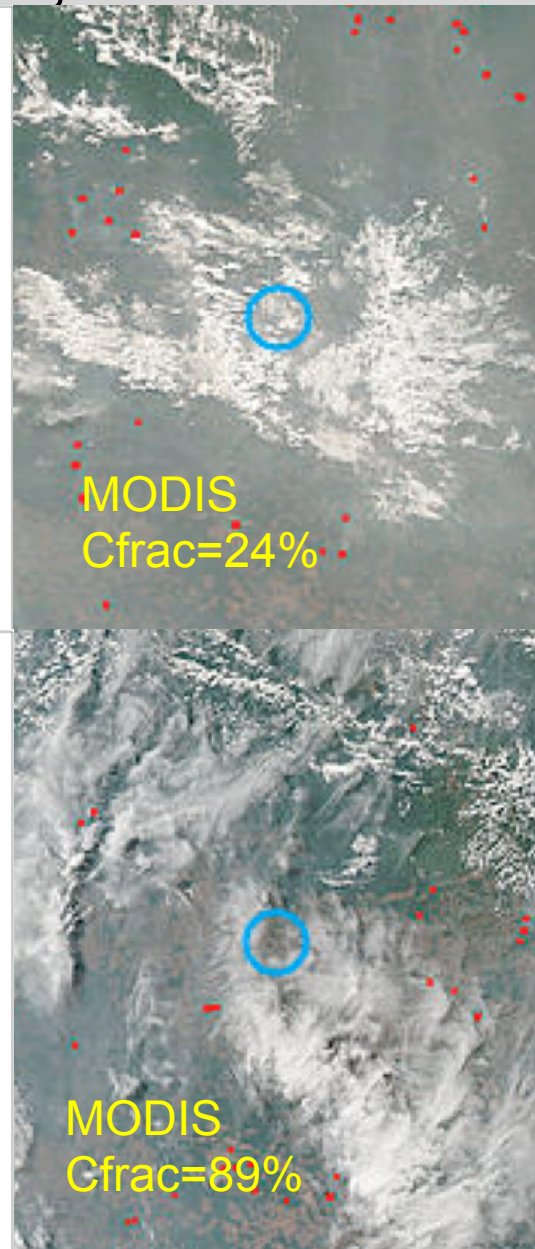
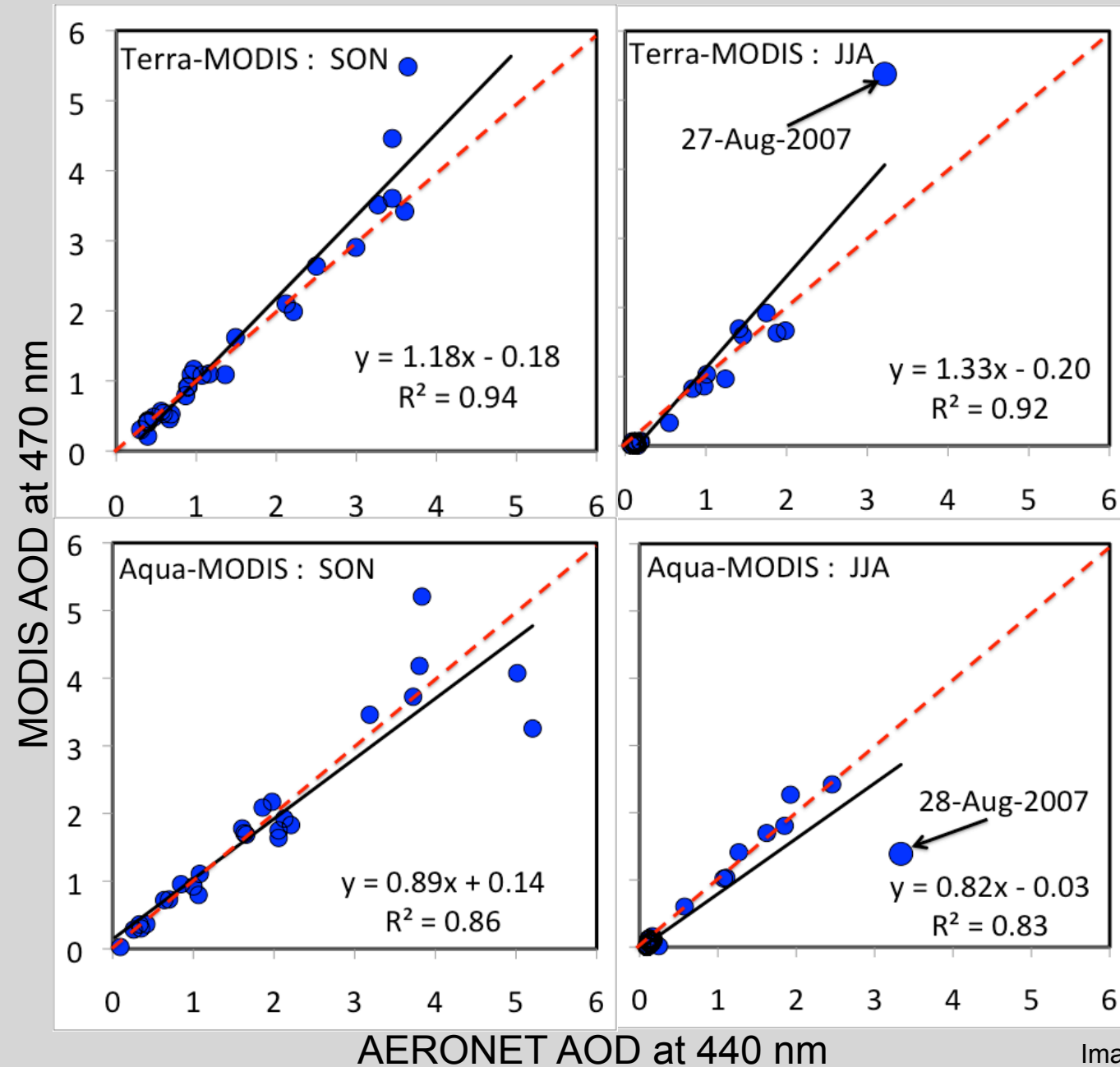
Uncertainty Analysis at Individual Sites

Global Uncertainty Analysis Maps

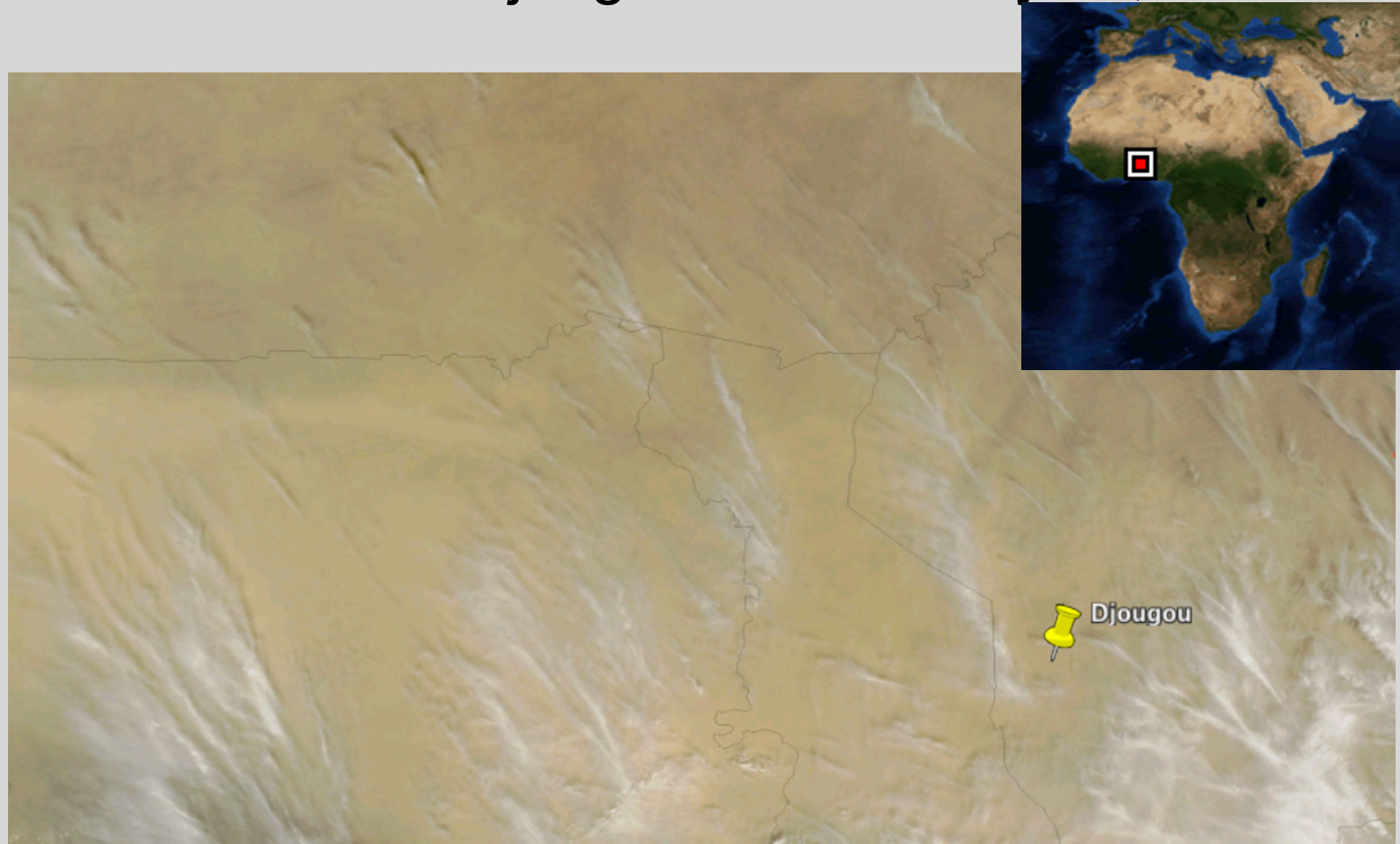
Identification of Sources of Uncertainty

Integration of Aerosol Products from Future Sensors

Smoke Aerosols in Alta-Floresta, Brazil

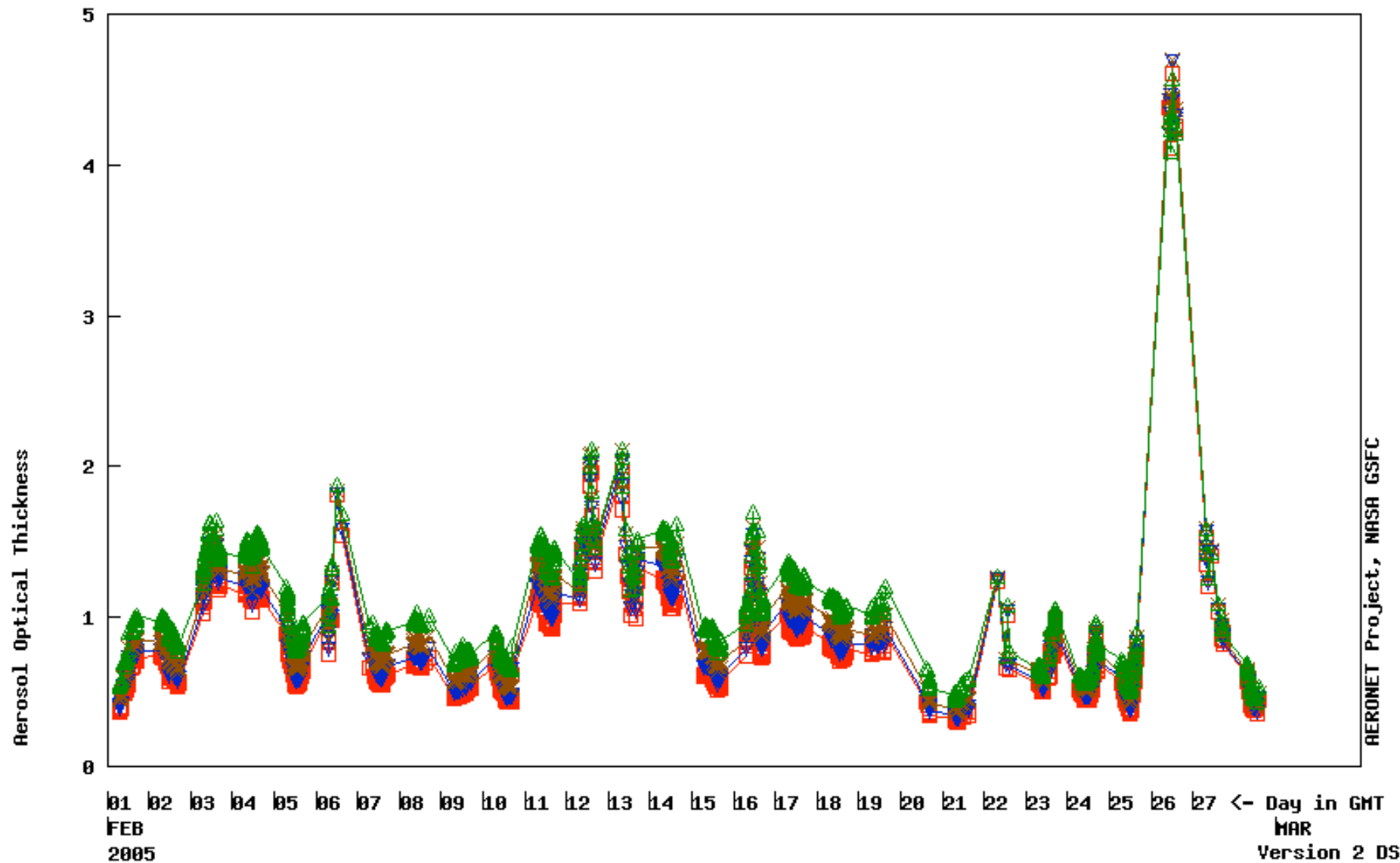
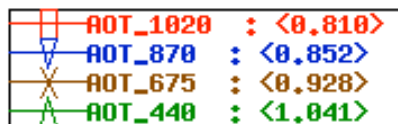


Dust storm in Djougou on February 26, 2005

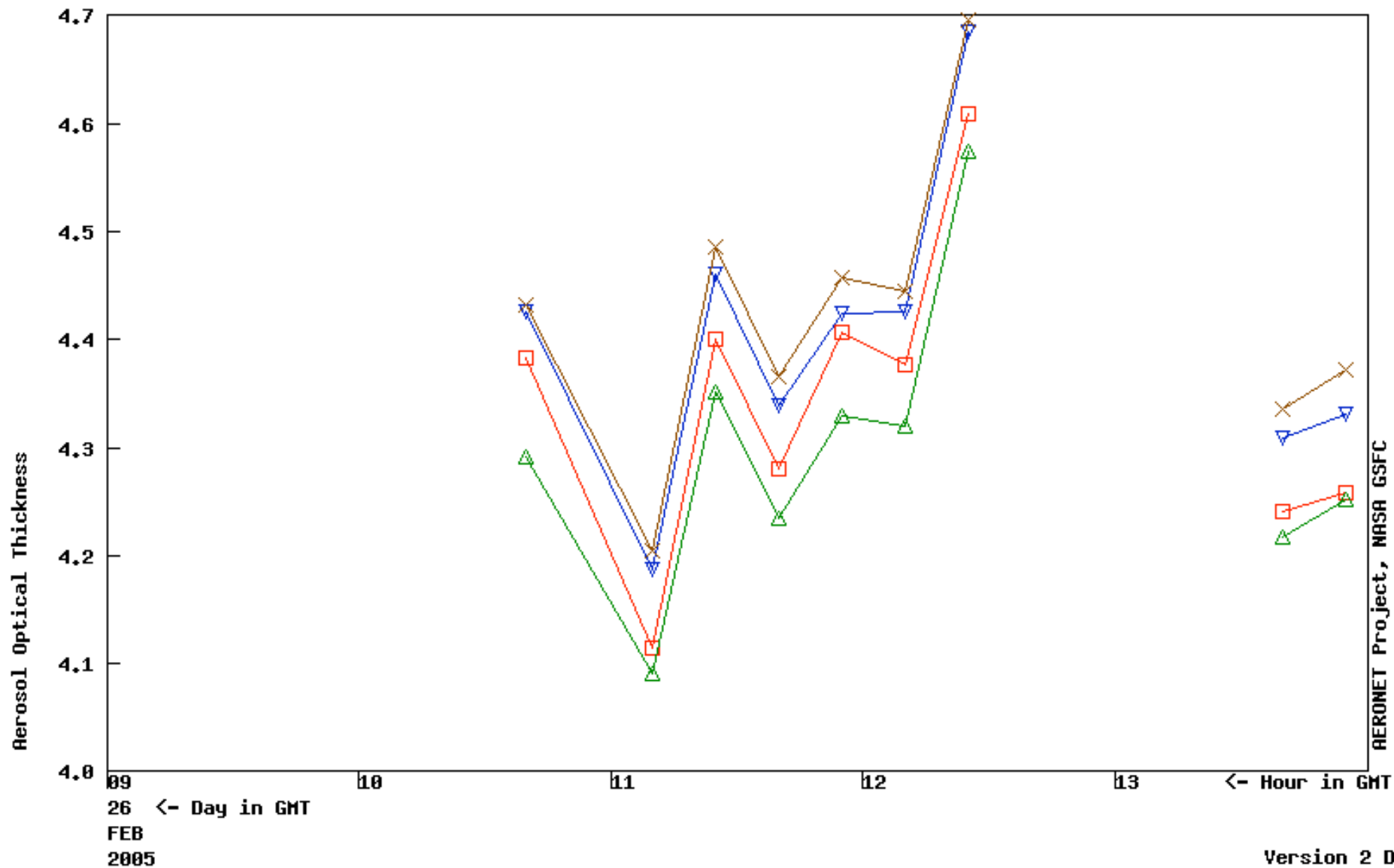
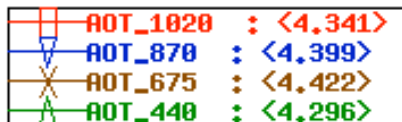


Source: MODIS Terra Rapid Response, AERONET Data Synergy Tool

Djougou , N 09°45'36", E 01°35'56", Alt 400 m,
PI : Philippe_Goloub, philippe.goloub@univ-lille1.fr
Level 2.0 AOT; Data from FEB 2005

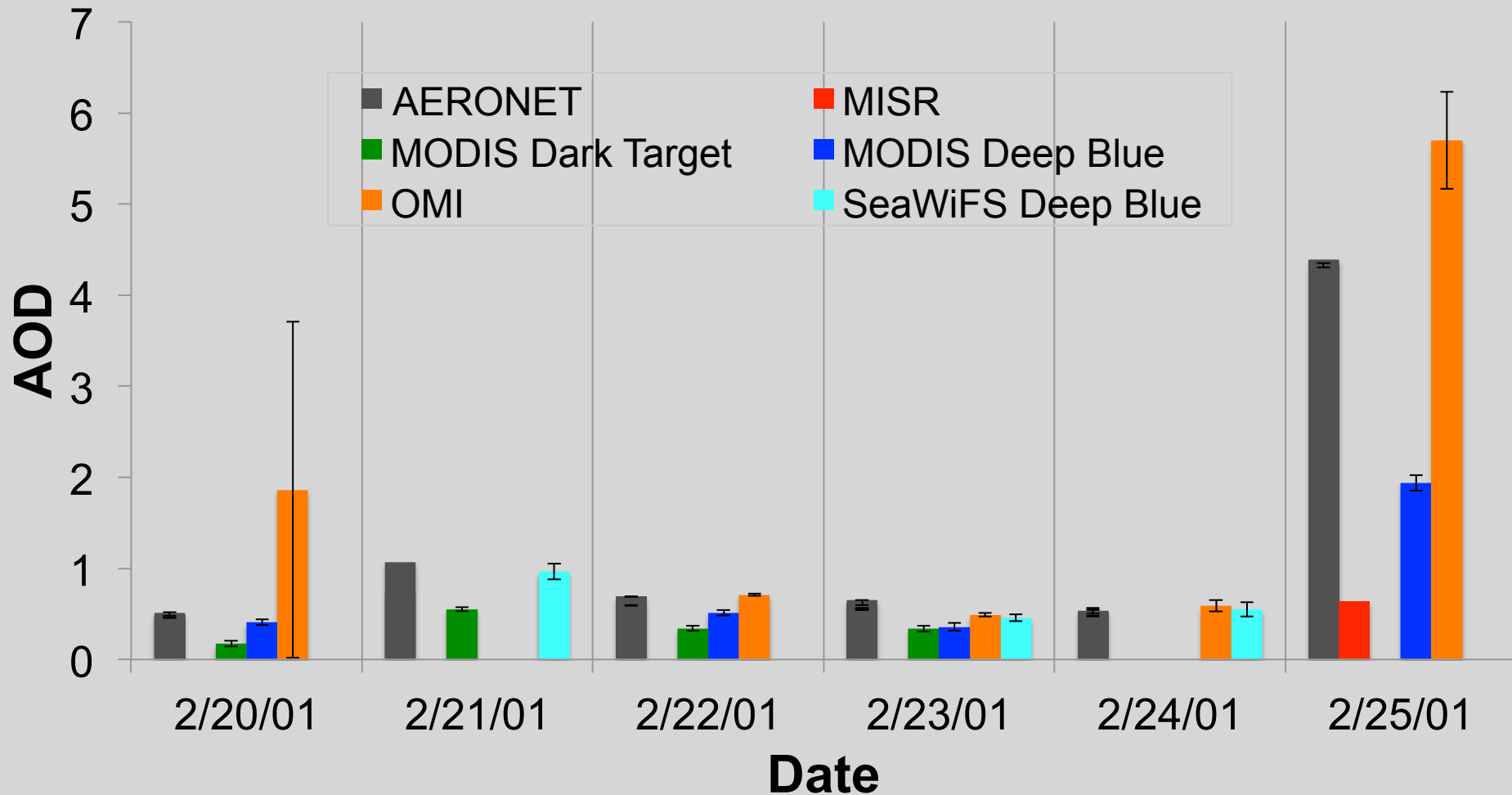


Djougou , N 09°45'36", E 01°35'56", Alt 400 m,
PI : Philippe_Goloub, philippe.goloub@univ-lille1.fr
Level 2.0 AOT; Data from 26 FEB 2005



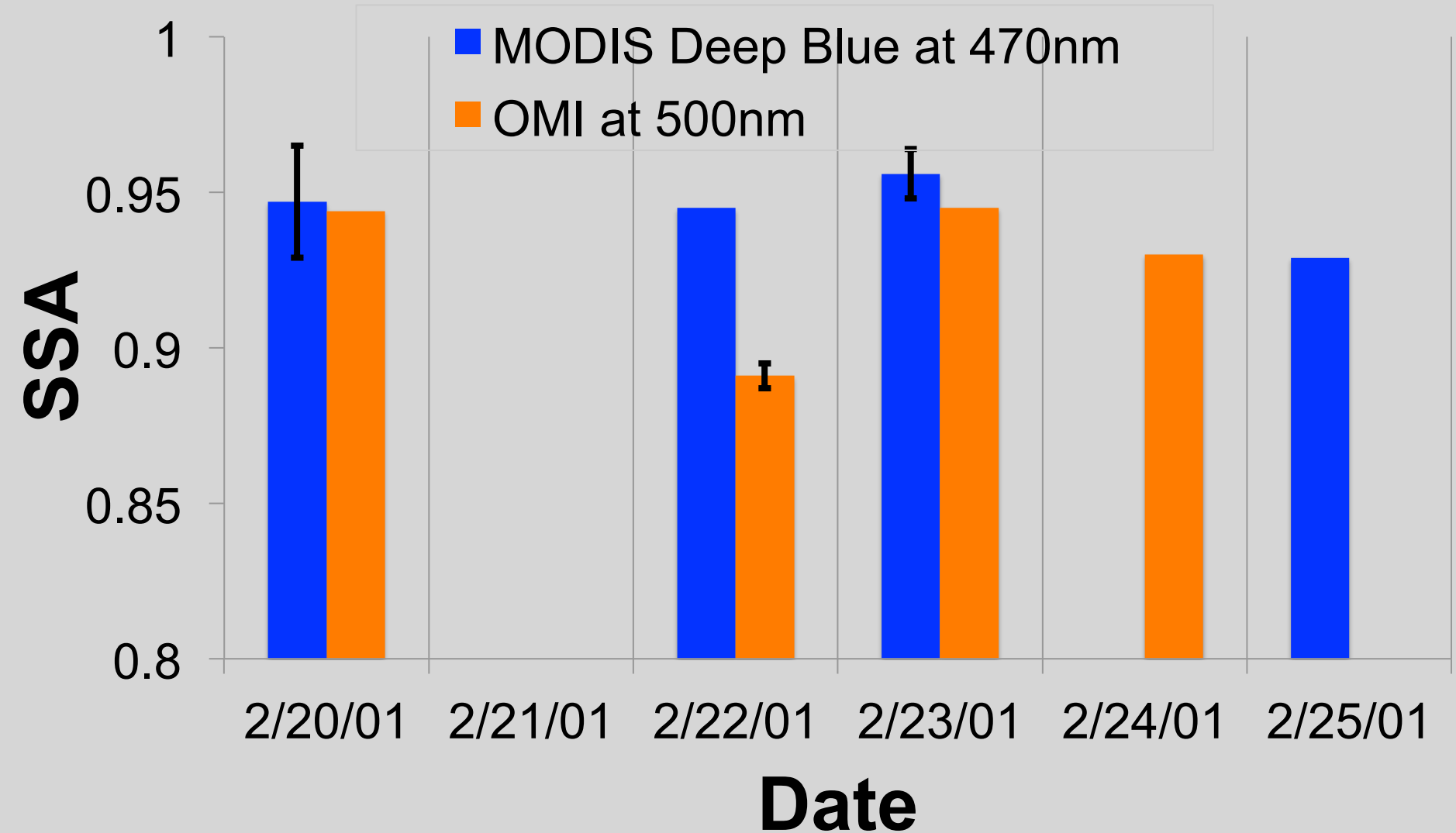
All-QA AOD from multiple sensors over Djougou

(AERONET, MODIS and SeaWiFS at 550nm, MISR at 555nm, OMI at 500nm)



Mean Single Scattering Albedo at Djougou

(MODIS Deep Blue QA=all, OMI QA=best)



Acknowledgement

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 - Steve Berrick.

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 - AERONET: Brent Holben, David Giles, Ilya Slutsker
 - MODIS: Lorraine Remer, Rob Levy
 - MISR: Ralph Kahn
 - OMI: Omar Torres
 - POLDER: Didier Tanre, Fabrice Ducos, Jacques Descloitres
 - CALIOP: Dave Winker, Ali Omar
 - SeaWiFS: Christina Hsu