

## AOS 580: Aerosol, Cloud, and Climate Change

### Final Examination PART A

You have the choice of either summarize in 1-2 pages the section 2.4 of IPCC AR-4 WG1 or answer the following problem:

On April 29, 2005, MODIS instrument on Terra platform took a picture of a haze layer over the Yellow sea (Figure 1).

By analyzing ground-based measurements (AERONET+MPLNET) data and back-trajectories at XiangHe, and satellite (MODIS+OMI) data and model (GOCART) output over East China, you will determine the type of aerosol which dominates the AOD on that day over XiangHe and its optical characteristics and located its origin.

Your analysis will be based on:

1. Angstrom exponent of AOD measured by AERONET sun-photometer,
2. Spectral variation of single scattering albedo retrieved from AERONET sun-photometer,
3. Backscattering profile from MPLNET,
4. Backtrajectories,
5. MODIS AOD (total and fine mode) over East China,
6. OMI Aerosol Index over East China,
7. GOCART simulated optical depth for each aerosol species.

You will compare visually the model AOD with MODIS AOD and OMI aerosol index, and estimate qualitatively the agreement (G, S, NS). If the agreement is S or G, then you may look at each component individually to determine the major aerosol component contributing to AOD over XiangHe.

To locate the origin (not the exact lat-long but more a region, a sea or ocean, another continent, a desert, etc.) of the major aerosol component, you will first locate the elevation of the aerosol layer and compare with the back-trajectories at this elevation.

By using the new AERONET Synergy Data tool ([http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas\\_interactive](http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas_interactive)) developed at NASA GSFC, you will be able in a few clicks to visualize the figures you will need:

- Open a window; navigate to the AERONET Data Synergy Tool ([http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas\\_interactive](http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas_interactive)), it should appear as in Figure 2.
- Enter *XiangHe* in the Site Name field and set the date field to *29 April 2005* in the Master Controls
- Make the 7 selections on the Master controls: AERONET AOD, Inversions (V2), Backscatter & Extinction, MOVAS (MODIS Daily), Ozone(TOMS&OMI Daily), Back trajectory, and GOCART. After completing the 7 selections, your window should appear as Figure 3.
- You then may refine your selection by:
  - Changing the Data Type of AERONET Data-Direct Sun from *AOT* to *Angstrom*;

- Changing the Data Product of AERONET Data-Inversions (V2) from *Size Distribution* to *Single Scattering Albedo*;
- Changing the GOCART Data types from *Combined GOCART/AERONET* to *View Hourly Maps*. Once this is done, you can change *Map AOD* types to specific aerosol component.
- Enlarging the region plots of GOCART, MODIS and OMI AOD

Figure 1. MODIS Level 1 RGB radiances on April 29, 2005. This image was obtained from <http://modis-atmos.gsfc.nasa.gov/IMAGES/index.html> after selecting the date: 2005; April; 29, and the 0215 granule.

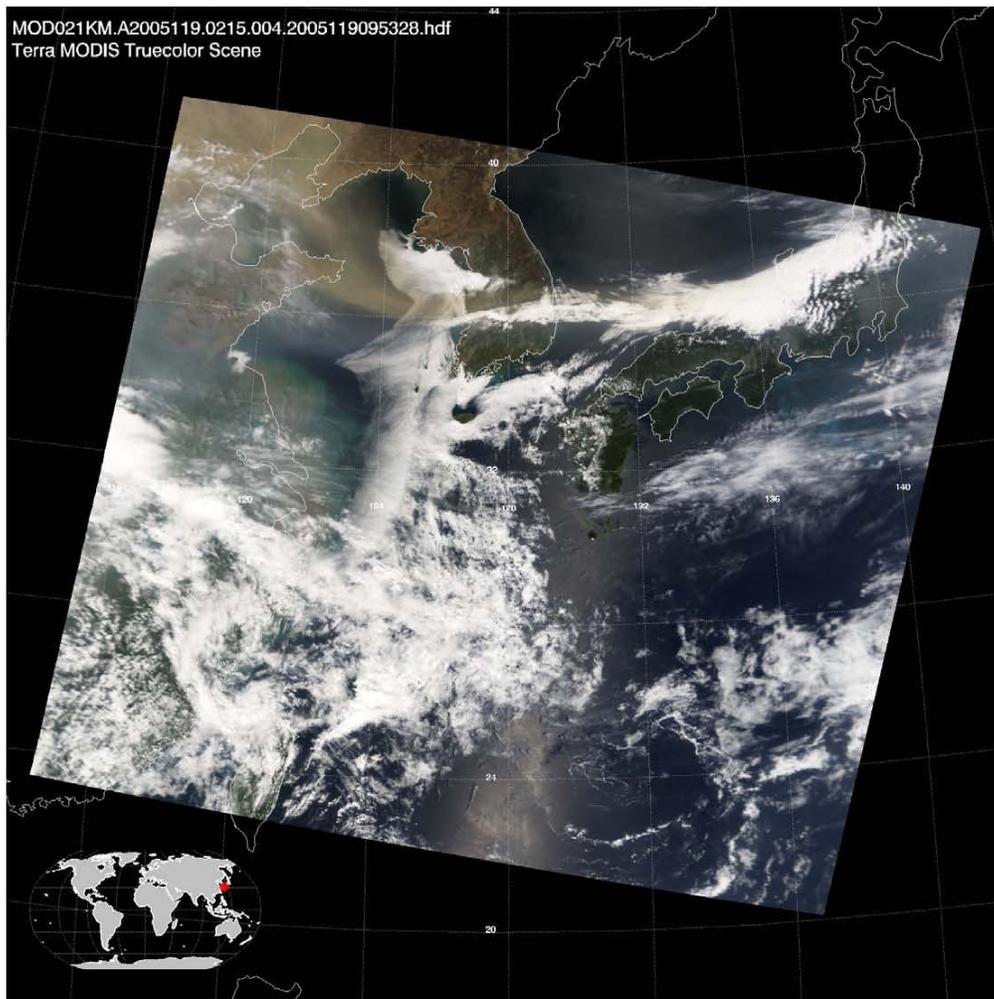


Figure 2. The AERONET Data Synergy Tool web page:  
[http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas\\_interactive](http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas_interactive)

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# AERONET DATA SYNERGY TOOL

+ AERONET + MODIS + BACK TRAJECTORY + MPLNET + GOCART + GIOVANNI

Select the above buttons to find information for products provided by this data display



Use world map to find products for AERONET sites:

**Master Controls**

Initial Date: Year 2008 Month JAN Day 1

Enter Site Name:    
38.902500° N, 76.839833° W  
 Elevation: 87m

<b>Surface Data</b>	<b>Satellite Retrievals</b>	<b>Model Output</b>
<input type="checkbox"/> AERONET <input type="checkbox"/> AOD <input type="checkbox"/> Inversions (V2) <input type="checkbox"/> Ocean Color <input type="checkbox"/> SolRad-Net Flux <input type="checkbox"/> AOD Modes (Provisional) <input type="checkbox"/> Inversions (V1)	<input type="checkbox"/> MODIS Rapid Response <input type="checkbox"/> GIOVANNI <input type="checkbox"/> MOVAS (MODIS Monthly) <input type="checkbox"/> MOVAS (MODIS Daily) <input type="checkbox"/> OCEAN (SEAWIFS & MODIS Monthly) <input type="checkbox"/> OZONE (TOMS & OMI Daily) <input type="checkbox"/> AIRS (Daily Daytime and Nighttime)	<input type="checkbox"/> Back Trajectory <input type="checkbox"/> GOCART <input type="checkbox"/> NOGAPS Weather <input type="checkbox"/> Select All

Change Image Size:  Small  Large

**Primary Contacts**

Data Synergy Tool: David Giles

FIRST GOV  NASA Curator: David Giles NASA Official: Brent Holben

Figure 3. AERONET Data Synergy Tool web page with the 7 selections of the given problem.



# AERONET

## DATA SYNERGY TOOL



+ AERONET
+ MODIS
+ BACK TRAJECTORY
+ MPLNET
+ GOCART
+ GIOVANNI

Select the above buttons to find information for products provided by this data display



Use world map to find products for AERONET sites:  
Select Map Browser

Master Controls

Initial Date: Year 2005 Month APR Day 29

Enter Site Name:  XiangHe  
39.75360° N,  
116.96150° E  
Elevation: 36m

Change Site

**Surface Data**

AERONET

AOD

Inversions (V2)

Ocean Color

SolRad-Net

Flux

AOD Modes (Provisional)

Inversions (V1)

MPLNET

Backscatter and Extinction

**Satellite Retrievals**

MODIS Rapid Response

GIOVANNI

MOVAS (MODIS Monthly)

MOVAS (MODIS Daily)

OCEAN (SEAWIFS & MODIS Monthly)

OZONE (TOMS & OMI Daily)

AIRS (Daily Daytime and Nighttime)

**Model Output**

Back Trajectory

GOCART

NOGAPS

Weather

Select All

Change Image Size:  Small  Large

Primary Contacts

Data Synergy Tool: David Giles  
AERONET-AOD: Brent Holben  
Back Trajectory: Tom Kussera  
MPLNET: Elsworth Welton and Larry Belcher -  
Disclaimer:  
GOCART: Mian Chin and Tom Kussera  
GIOVANNI: Steve Kempfer and Gregory Leptoukh  
AERONET-Inversions: Alexander Sinyuk and Brent Holben

AERONET Data - Direct Sun

Current Site: XiangHe

2005 APR 29				
Available days for APR 2005				
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

AERONET Data Controls:

Version:

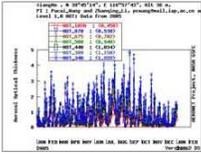
Level:

Data Type:

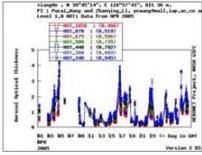
Data Format:

Error Bars:

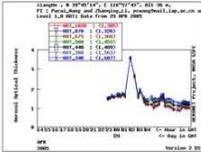
AERONET Yearly Product - Data Description



AERONET Monthly Product - Data Description



AERONET Daily Product - Data Description



AERONET Data - Inversions (V2)

Current Site: XiangHe

2005 APR 29				
Available days for APR 2005				
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

AERONET-Inversion V2 Data Controls:

Level:

**Data Product:**

Size Distribution  
Refractive Index (Real)  
Refractive Index (Imaginary)  
Absorption Optical Depth

Error Bars:

Download: AERONET Direct Sun Data

More AERONET Downloadable Products...

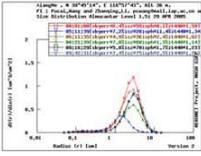
Download: AERONET Direct Sun Data

More AERONET Downloadable Products...

Download: AERONET Direct Sun Data

More AERONET Downloadable Products...

AERONET - Almucentar Inversion - Data Description



AERONET - Principle Inversion - Data Description

No Data Available

Download: AERONET Version 2 Inversions

More AERONET Downloadable Products...

**Back Trajectory Analyses**

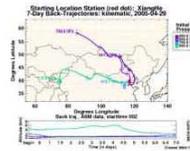
Current Site: **XiangHe**

2005 APR 29

Available days for APR 2005

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

**00 UTC**

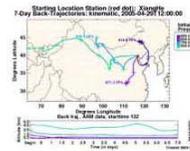


950-500hPa | 950-200hPa

[Download 950-700 hPa Google Earth](#)

[Download All Levels \(text\)](#)  
[Level 1 - Data Description](#)

**12 UTC**



950-500hPa | 950-200hPa

[Download 950-700 hPa Google Earth](#)

[Download All Levels \(text\)](#)  
[Level 1.5a - Data Description](#)

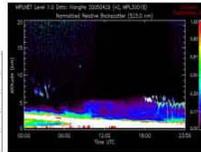
**MPLNET**

Current Site: **XiangHe**

2005 APR 29

Available days for APR 2005

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30



No Data Download

[Access Additional MPLNET Products...](#)

No Data

MPLNET PI: [Si-Chee Tsay](mailto:Si-Chee.Tsay@nasa.gov)  
[Si-chee.tsay-1@nasa.gov](mailto:Si-chee.tsay-1@nasa.gov)

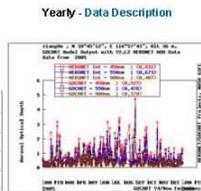
**GOCART V4INE and AERONET V2/L2**

Current Site: **XiangHe**

2005 APR 29

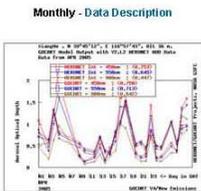
Available days for APR 2005

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30



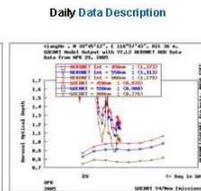
[Download GOCART/AERONET Combined Data](#)

[TERRA-MODIS Daily Product - Data Description](#)



[Download GOCART/AERONET Combined Data](#)

[AQUA-MODIS Daily Product - Data Description](#)



[Download GOCART/AERONET Combined Data](#)

**GOCART Data Charts & Maps:**

Data types:

Combined GOCART/AERONET

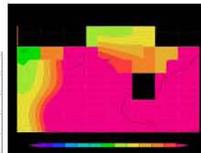
**GIOVANNI MOVAS Daily Data**

Current Site: **XiangHe**

2005 APR 29

Available days for APR 2005

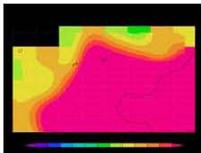
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30



Pixel  1°X2°  2°X4°  4°X8°  8°X16°  32°X64° Global Map

[Download Data](#)

Select a data type:  HDF  CDF: Pixel 1°X2° 2°X4° 4°X8° 8°X16° 32°X64° Global Map



Pixel  1°X2°  2°X4°  4°X8°  8°X16°  32°X64° Global Map

[Download Data](#)

Select a data type:  HDF  CDF: Pixel 1°X2° 2°X4° 4°X8° 8°X16° 32°X64° Global Map

**Data Controls:**

Aerosol Optical Depth at 0.55 micron  
Aerosol Fine Mode Fraction Land  
Deep Blue Aerosol Optical Depth at 0.55 micron (QA-weighted Land only)  
Angstrom Exponent over Ocean from 865 and 2130 nm (QA-weighted)

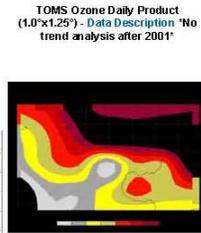
**GIOVANNI Ozone Data**

Current Site: **XiangHe**

2005 APR 29

Available days for APR 2005

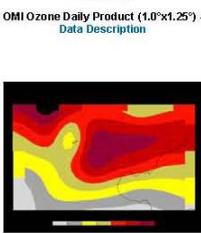
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30



Pixel  1°X2°  2°X4°  4°X8°  8°X16°  32°X64° Global Map

[Download Data](#)

Select a data type:  HDF  CDF: Pixel 1°X2° 2°X4° 4°X8° 8°X16° 32°X64° Global Map



Pixel  1°X2°  2°X4°  4°X8°  8°X16°  32°X64° Global Map

[Download Data](#)

Select a data type:  HDF  CDF: Pixel 1°X2° 2°X4° 4°X8° 8°X16° 32°X64° Global Map

**Data Controls:**

UV Aerosol Index  
Column Amount Ozone  
Radiative Cloud Fraction



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Curator: **David Giles**  
NASA Official: **Brent Holben**