

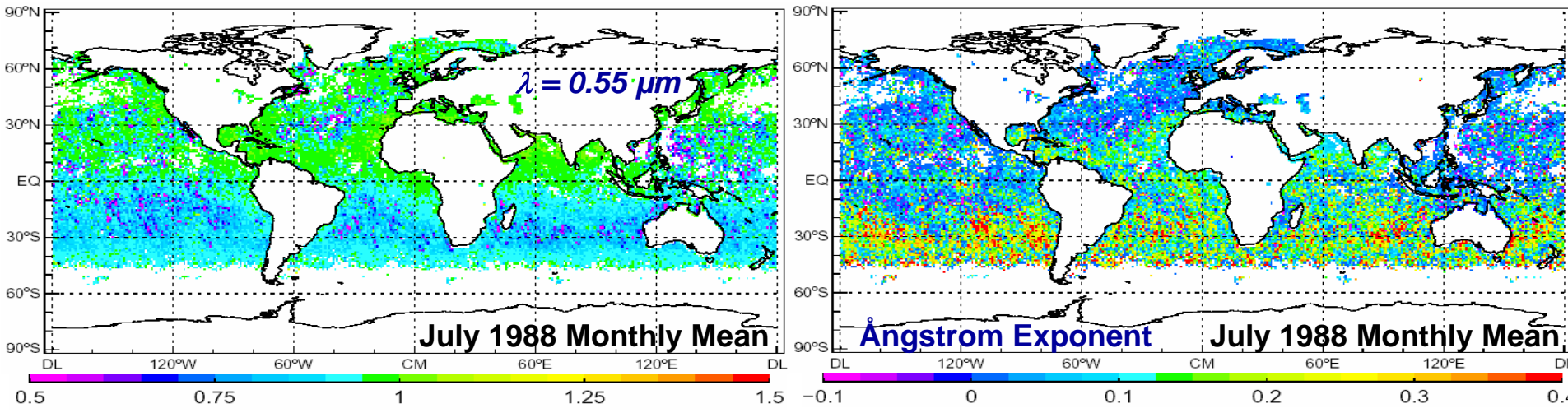
**Deep Blue Retrievals of Aerosol Properties
over *Bright-Reflecting Source Regions* from
*MODIS and SeaWiFS***

N. Christina Hsu

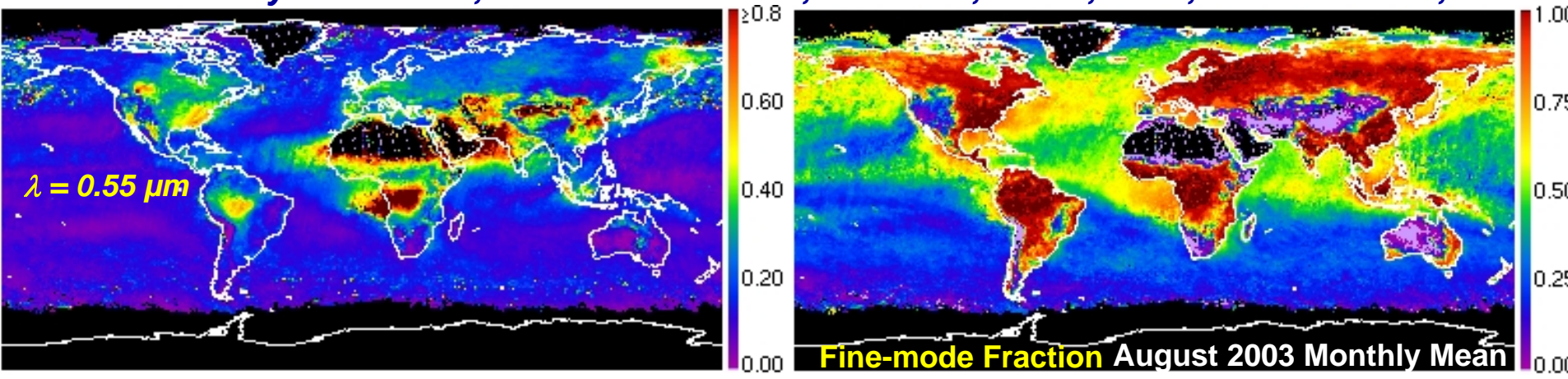
***NASA Goddard Space Flight Center
Greenbelt, Maryland USA***

Aerosol Remote Sensing & Retrieval

The early days of AVHRR, since 1983: Geogdzhayev, Mishchenko, et al., J. Atmos. Sci., 2002.



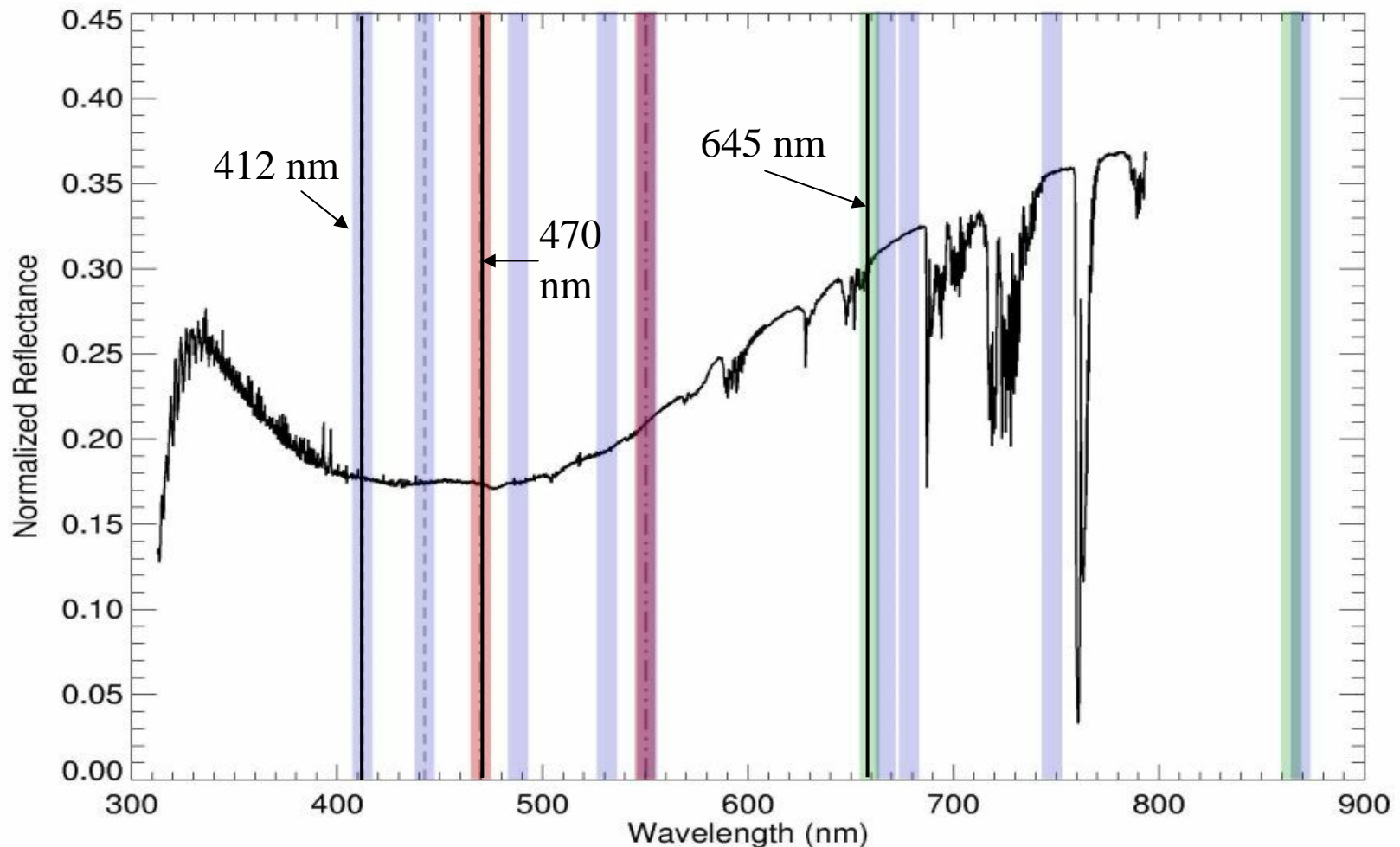
The current days of MODIS, since 2000: Remer, Kaufman, Tanré, et al., J. Atmos. Sci., 2004.



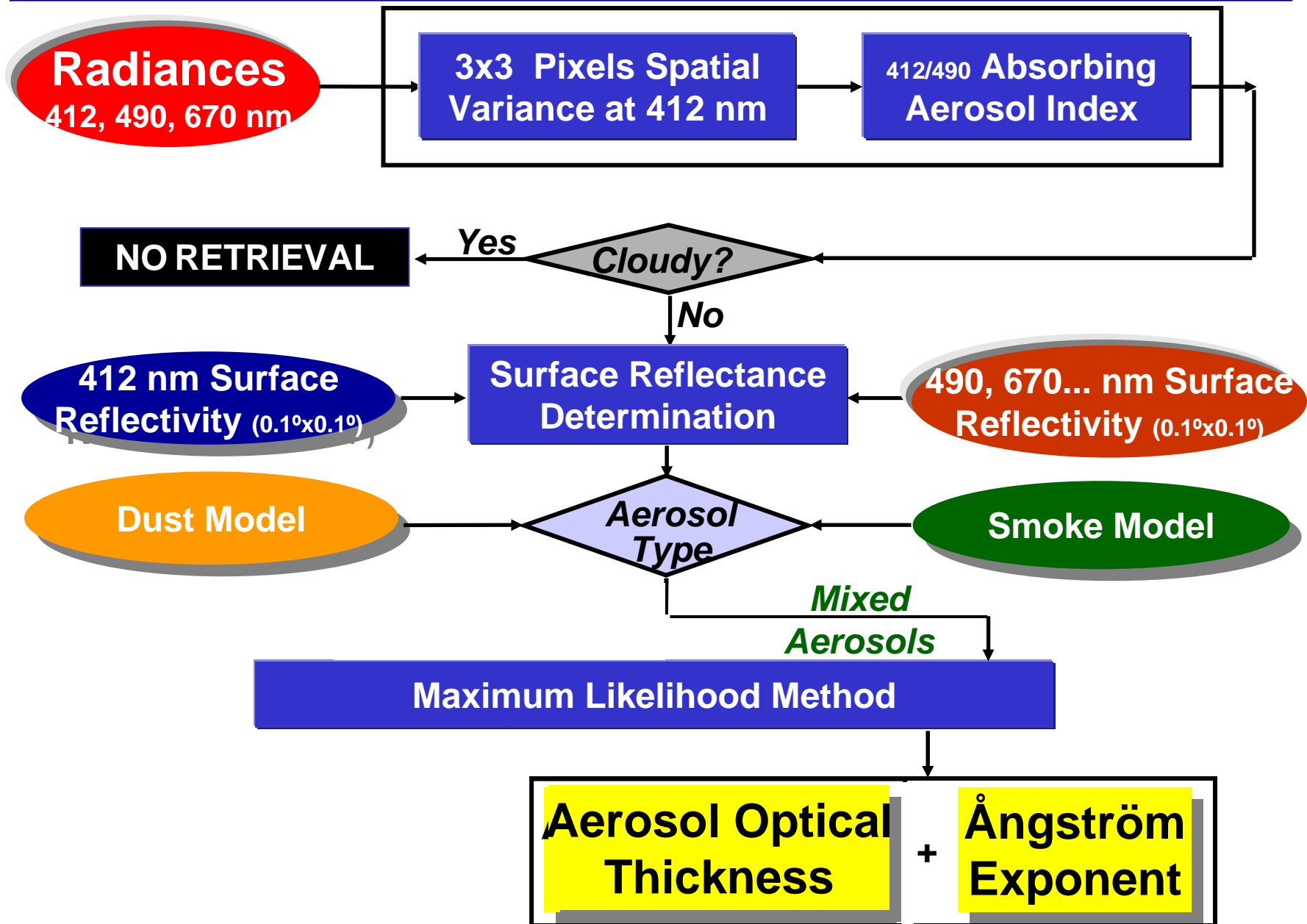
Why Do We Study Aerosols?

- ***Climate Forcing:** requires aerosol properties near source regions to achieve a complete picture of aerosol information from source to sink;*
- ***Carbon Cycle:** tracks iron sources from windblown dust for stimulating **plankton** growth in the open ocean;*
- ***Aerosol Transport Modeling:** needs accurate and realistic dust source locations; and*
- ***Visibility and Adverse Health Effects:** demands timely atmospheric turbidity information over affected regions.*

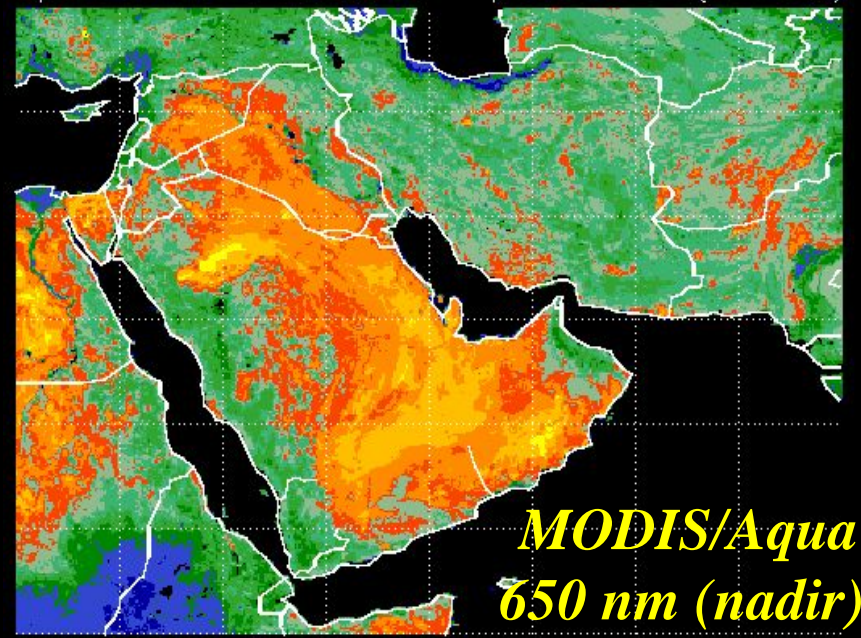
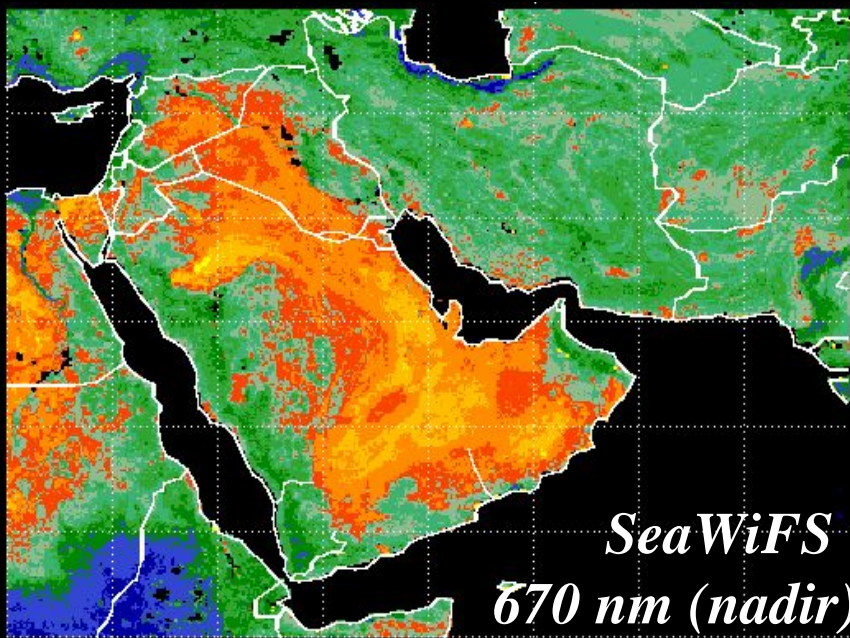
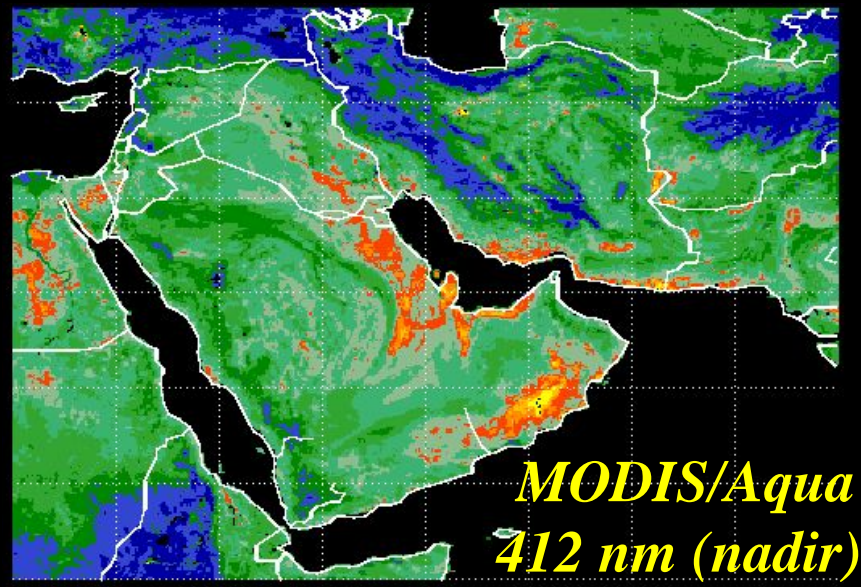
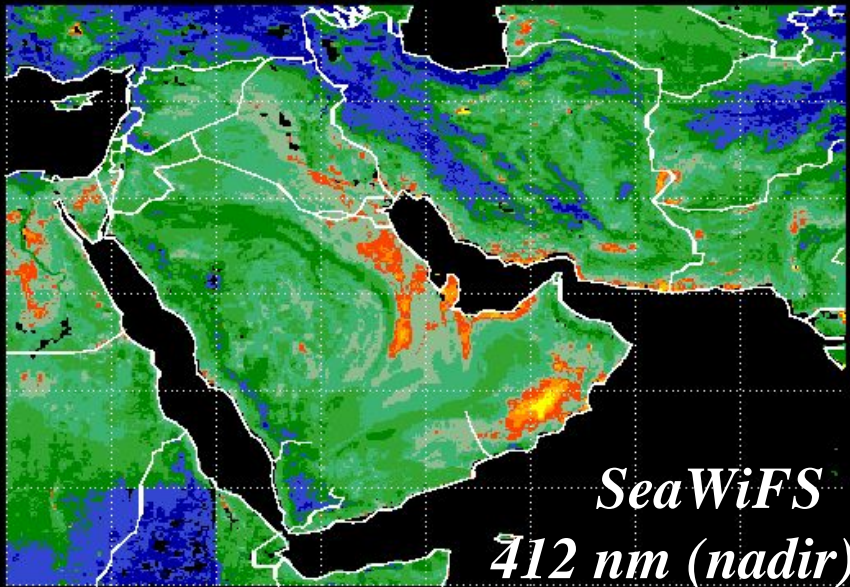
*MODIS Visible & NIR Bands: superimposed on the GOME spectral reflectance taken over **the Sahara***



Flowchart for Deep Blue Algorithm

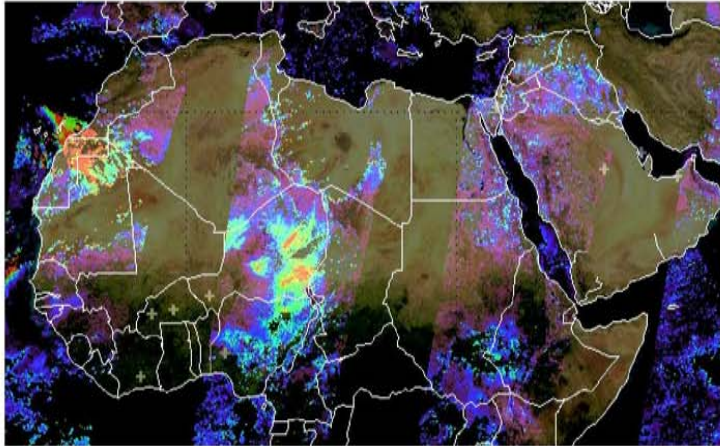


Surface Reflectance Data Base - Sep 2004

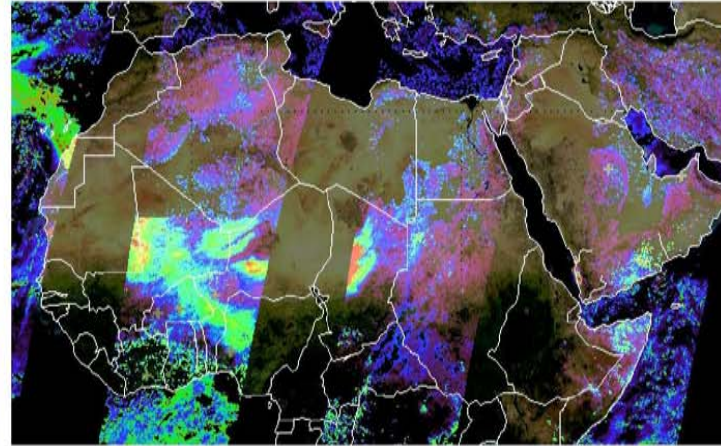


Aerosol Optical Thickness Retrieved from Deep Blue Algorithm: Dust plumes in Africa

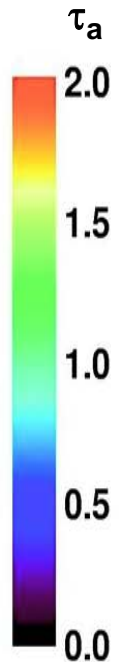
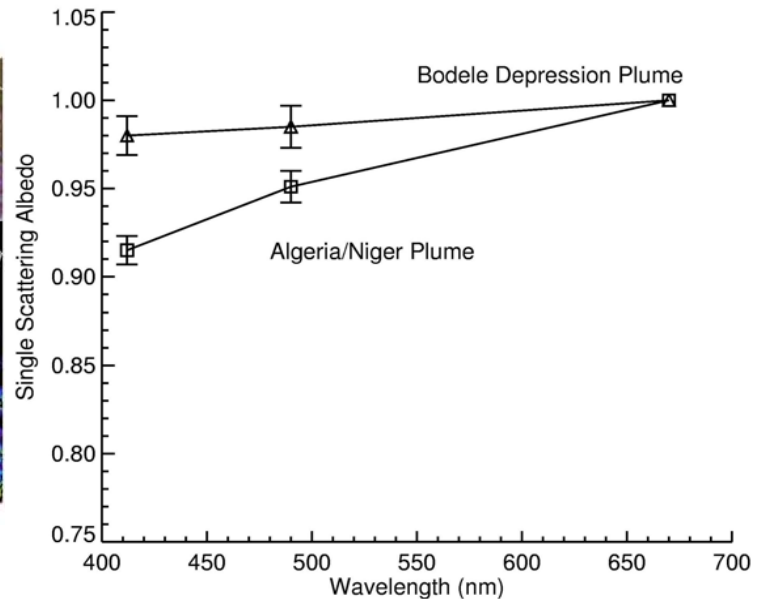
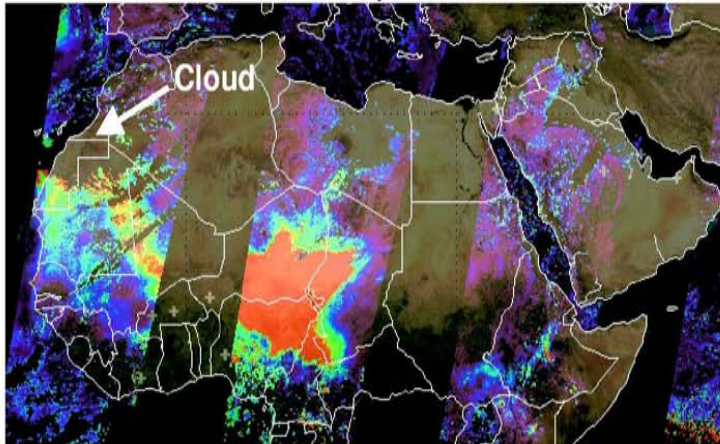
Feb 25, 2000



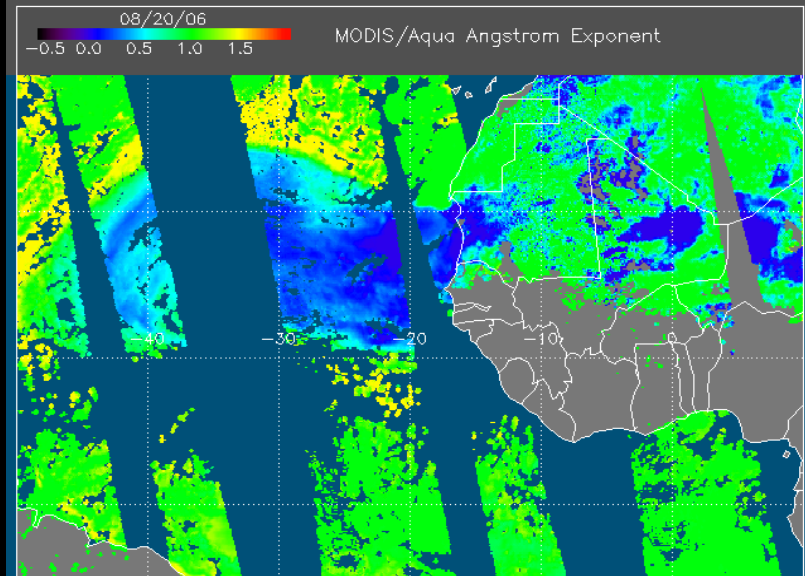
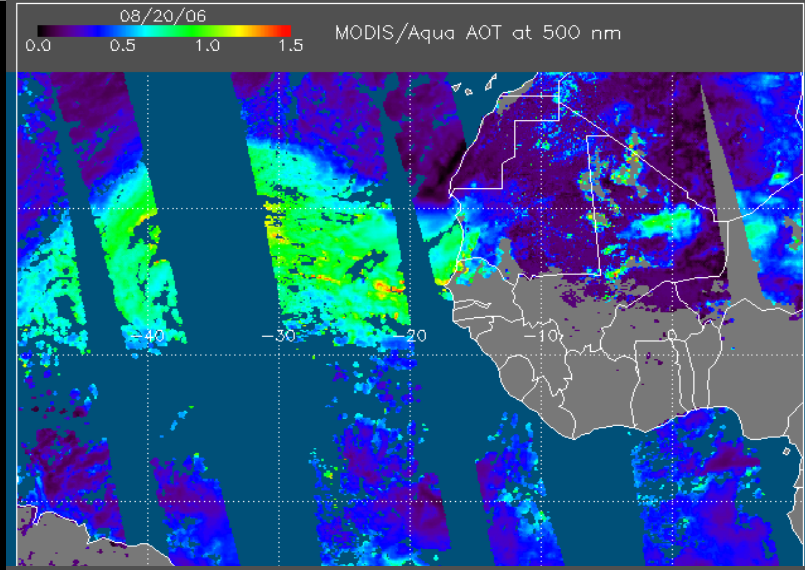
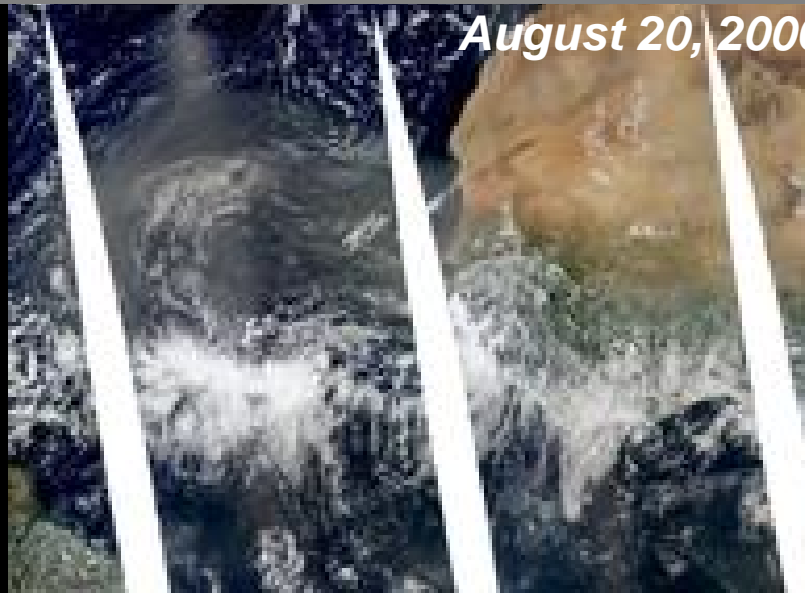
Feb 26, 2000



Feb 27, 2000



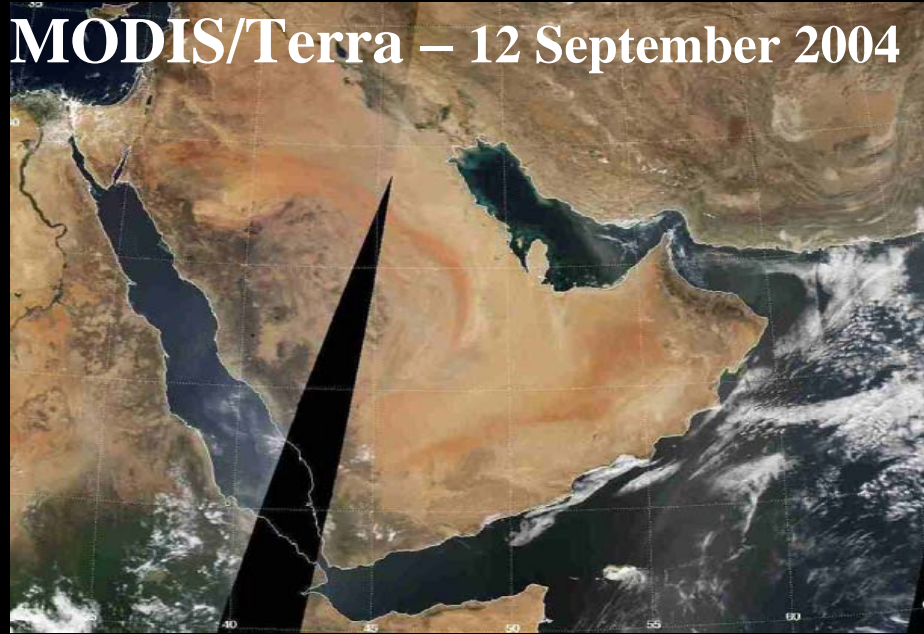
Satellite Near Real Time Support for NASA AMMA Experiment



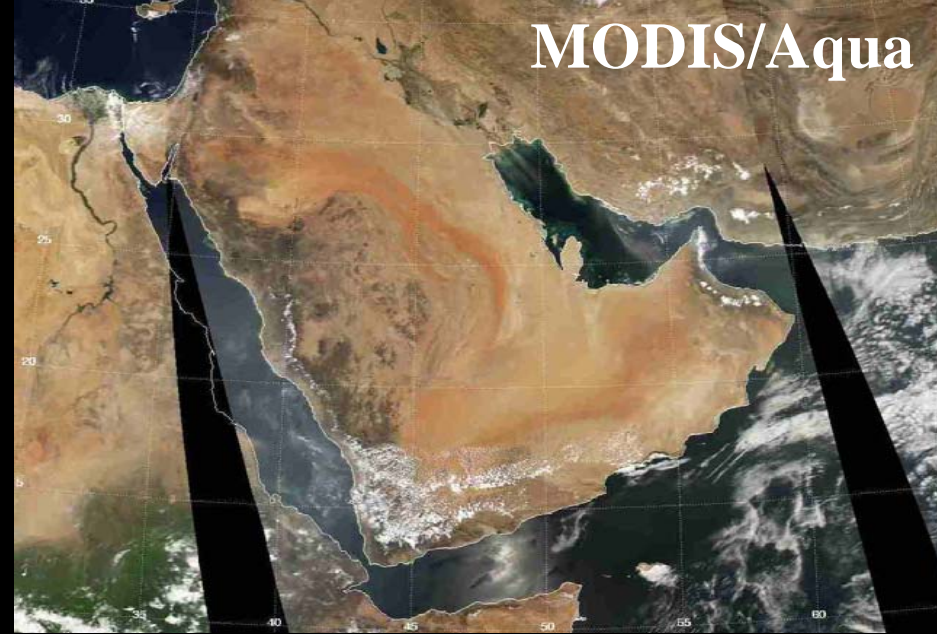
- Intensive *dust* activities over North Africa in the summer 2006
- *Saharan dust particles* found convoluted with cyclones in the Atlantic

Tracking Movements and Evolutions of Aerosol Plumes

MODIS/Terra – 12 September 2004



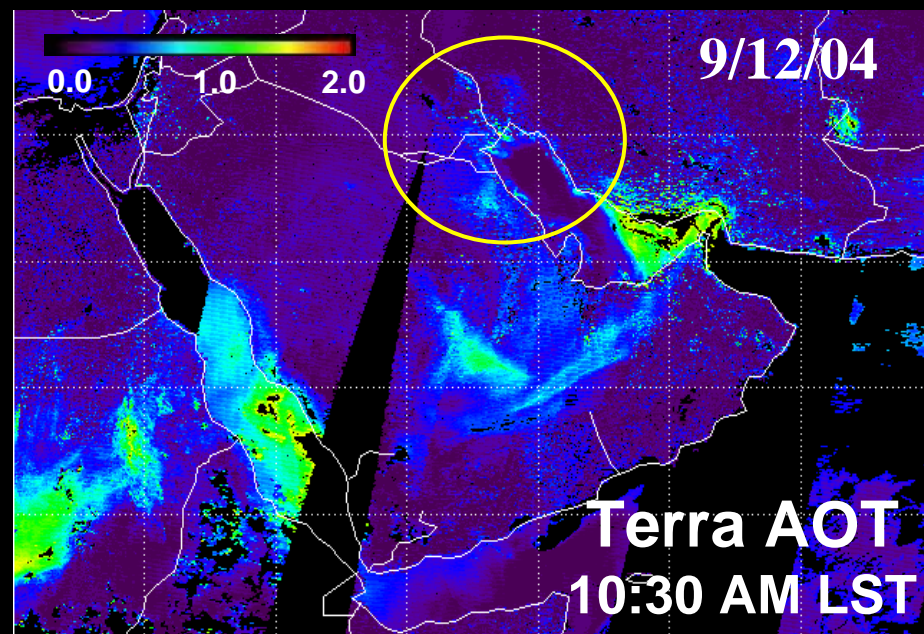
MODIS/Aqua



0.0 1.0 2.0

9/12/04

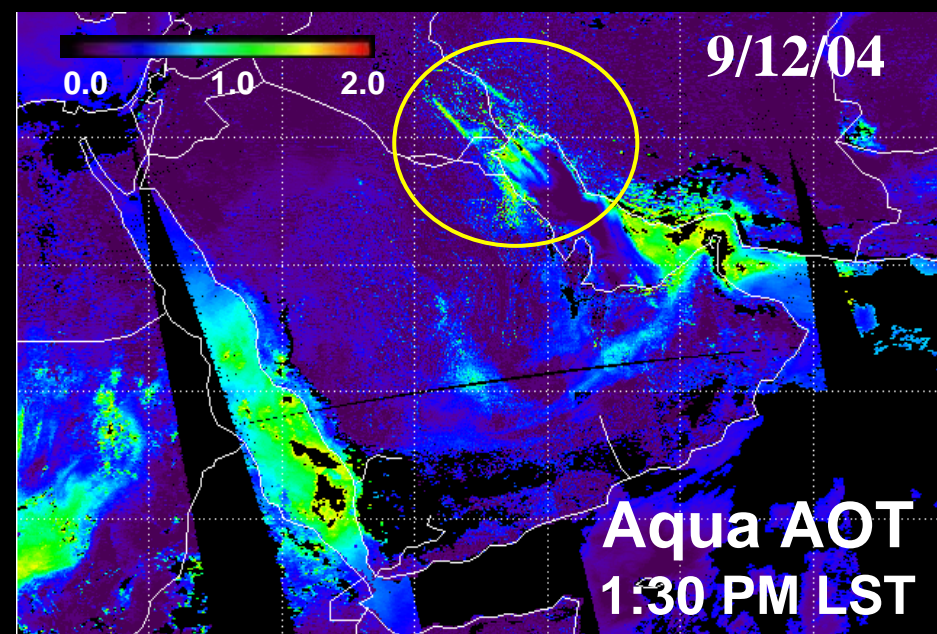
Terra AOT
10:30 AM LST

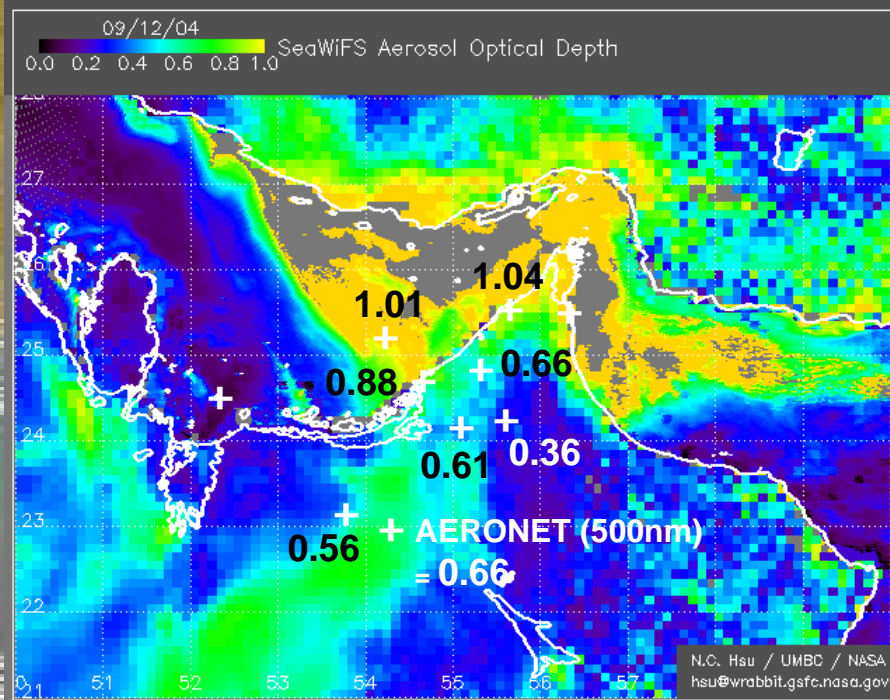


0.0 1.0 2.0

9/12/04

Aqua AOT
1:30 PM LST

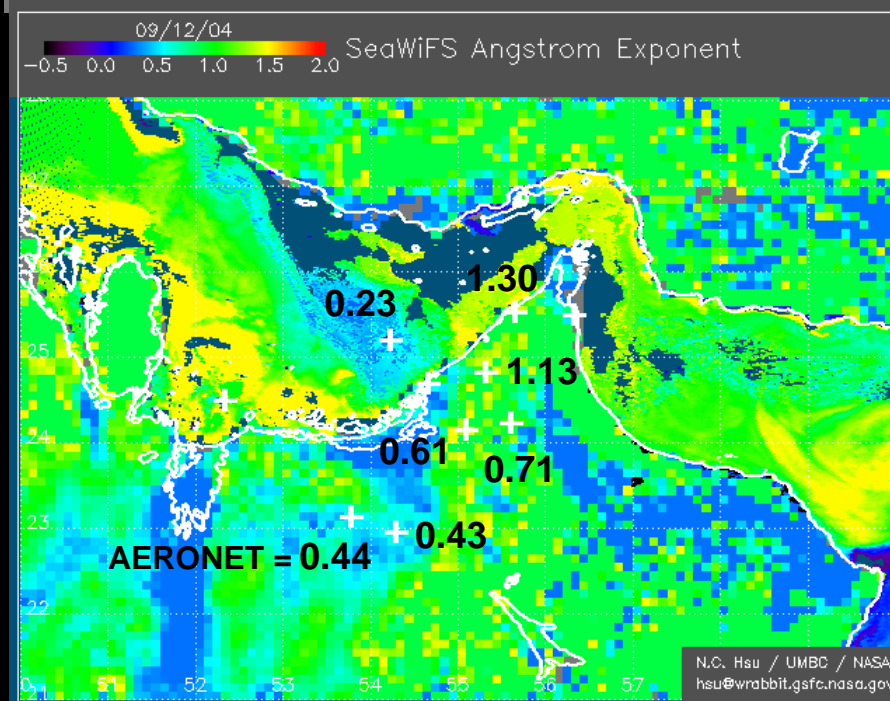




Deep Blue Algorithm

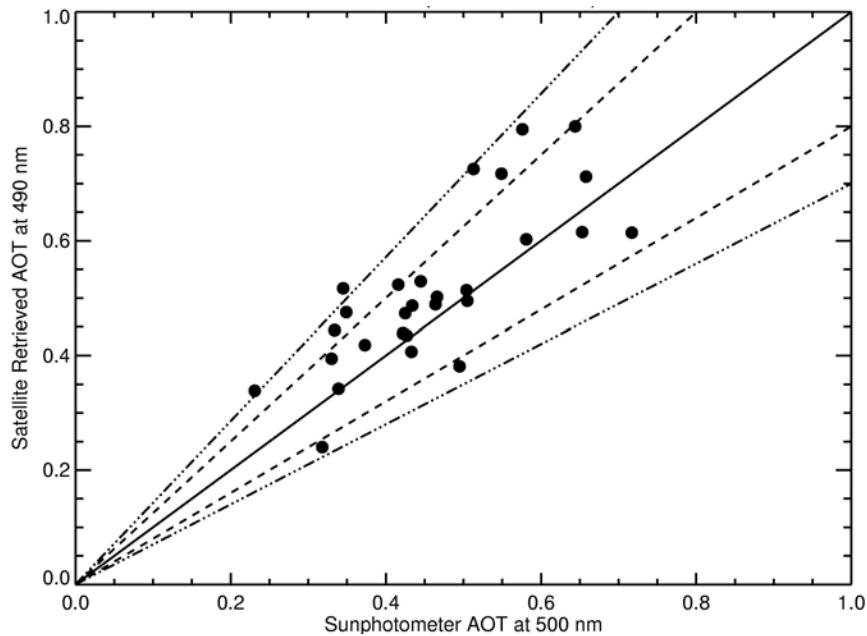
↓ The dust (coarse particles) front pushes the polluted air mass (fine particles) over both water and land on this day.

↓ Compared reasonably well with AERONET retrievals in $11A\tau^2$ (Aug, Sep, 2004)

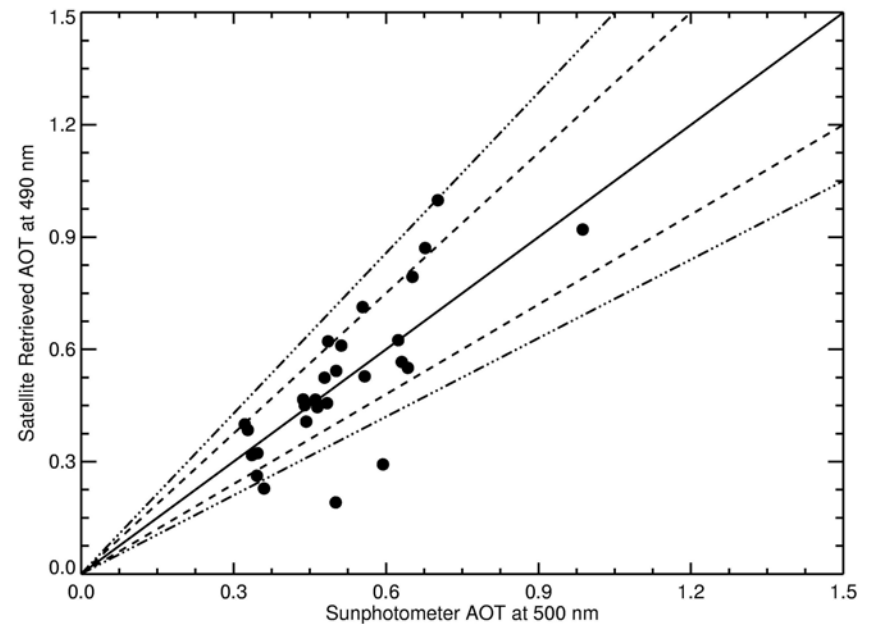


Comparisons With AERONET Sun Photometer Measurements (August - September 2004)

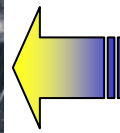
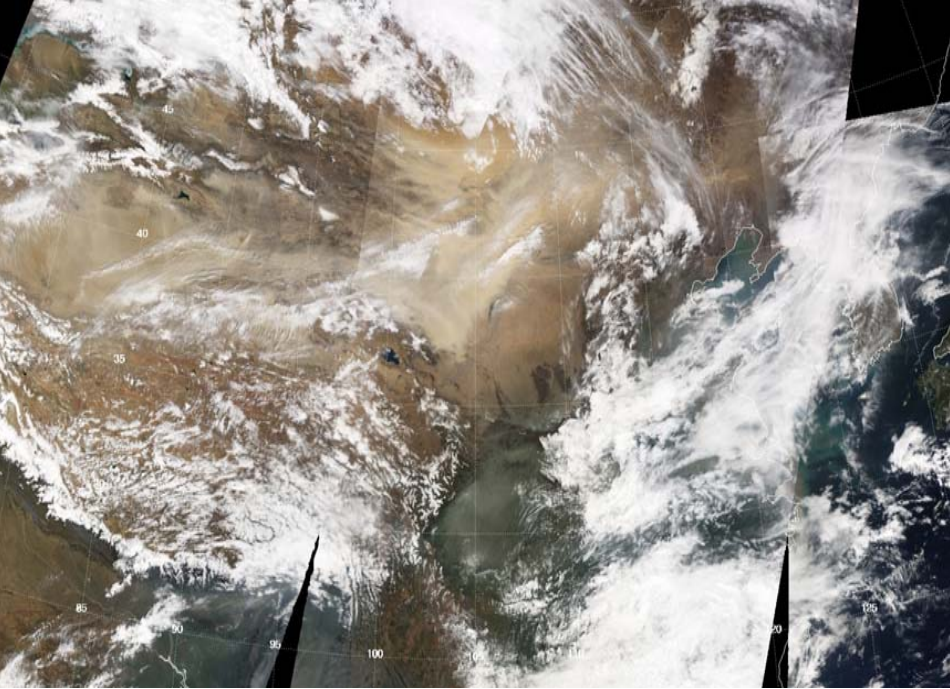
Harmim, UAE



Mezaira, UAE



6 April 2001

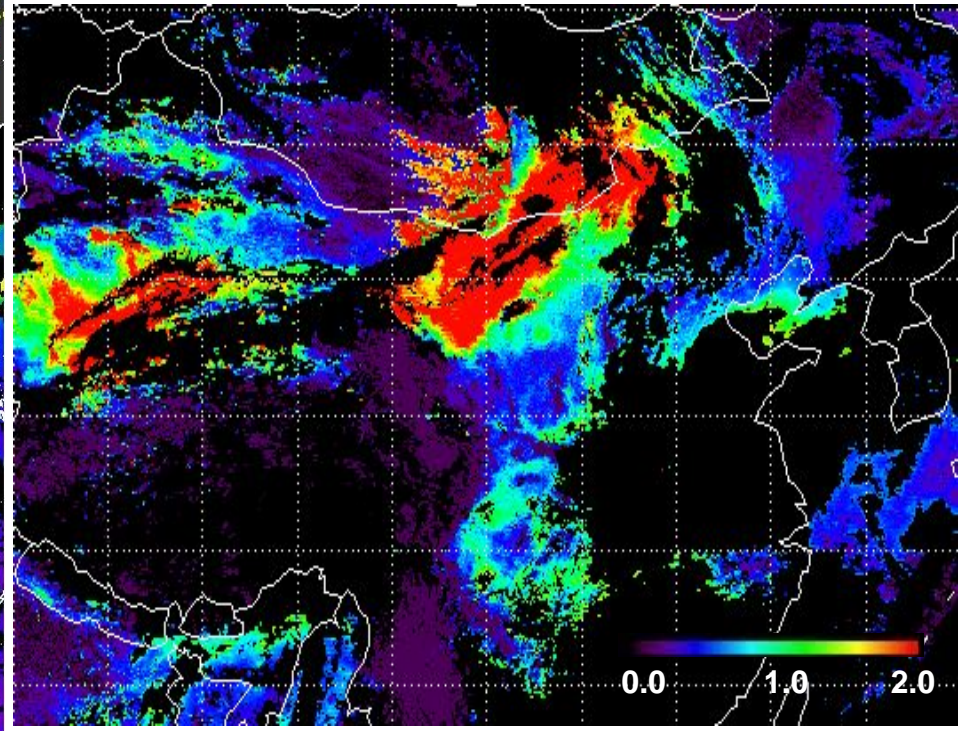
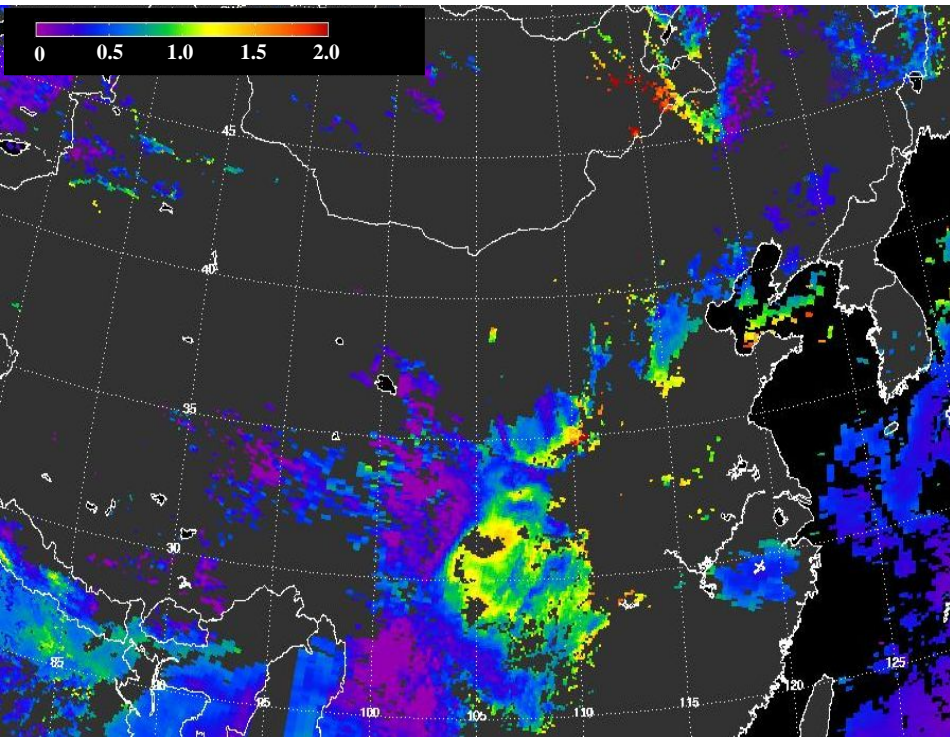


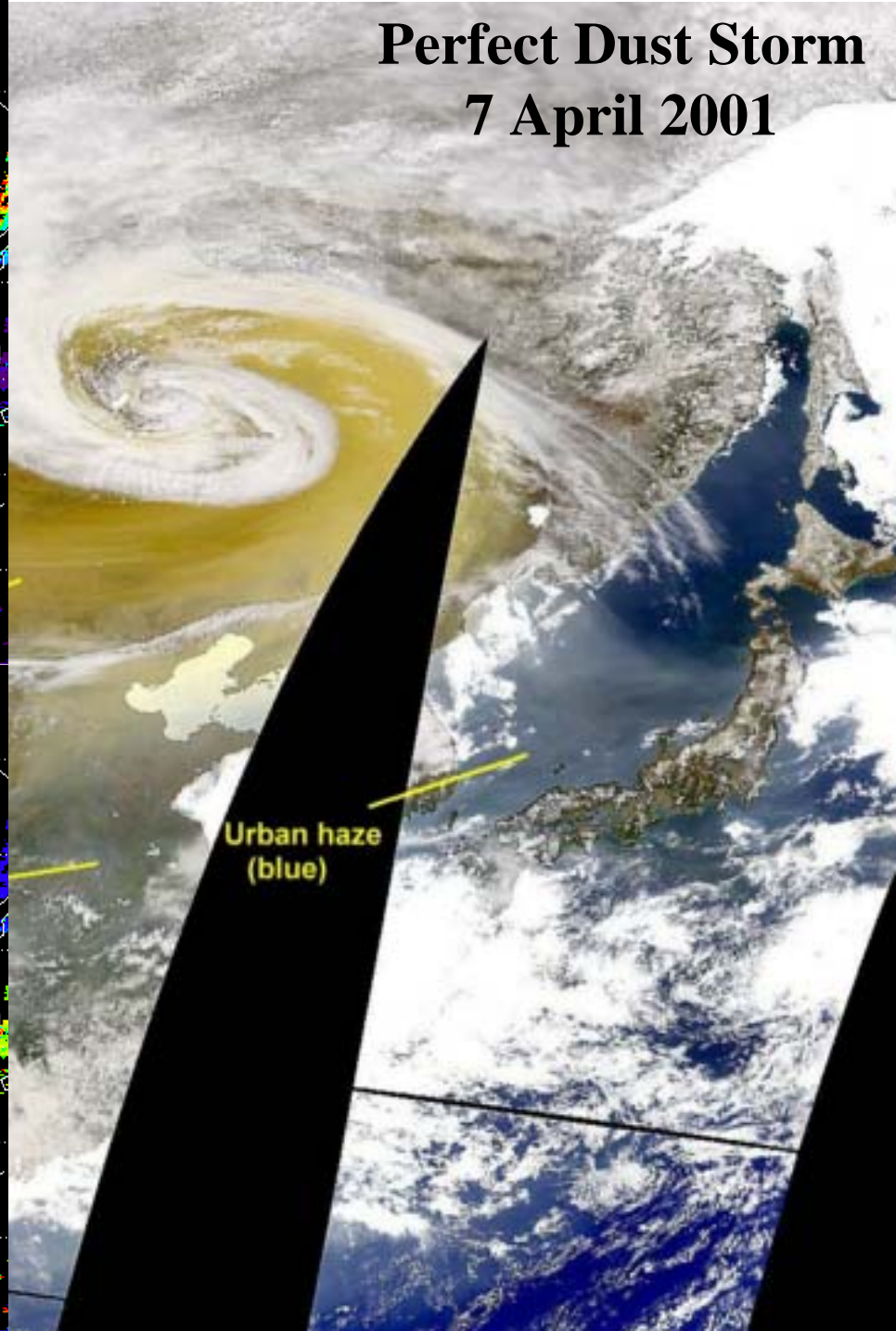
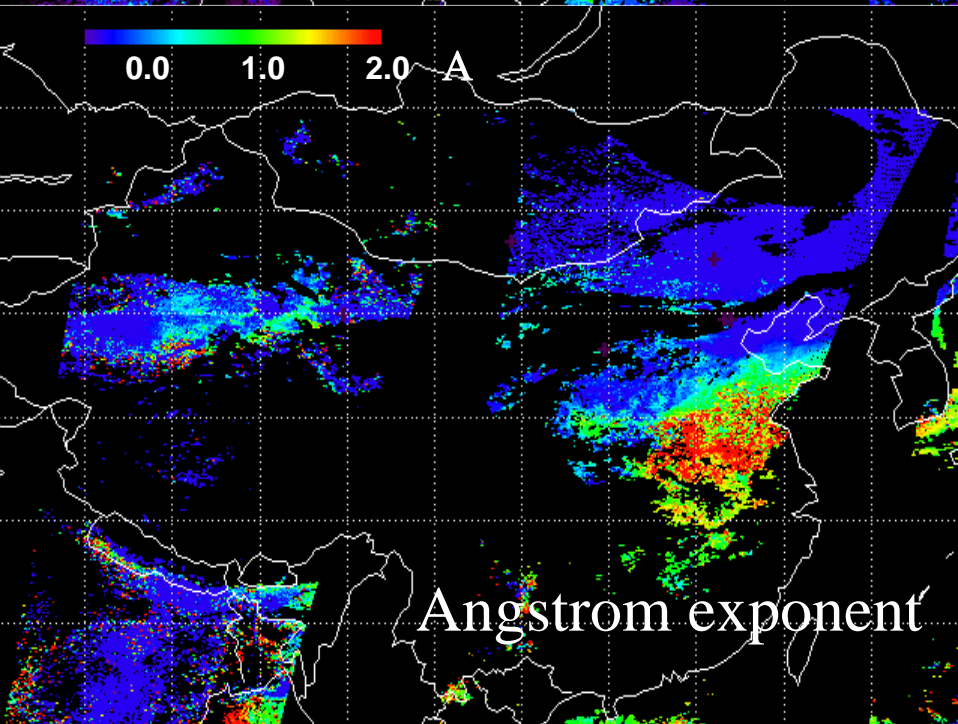
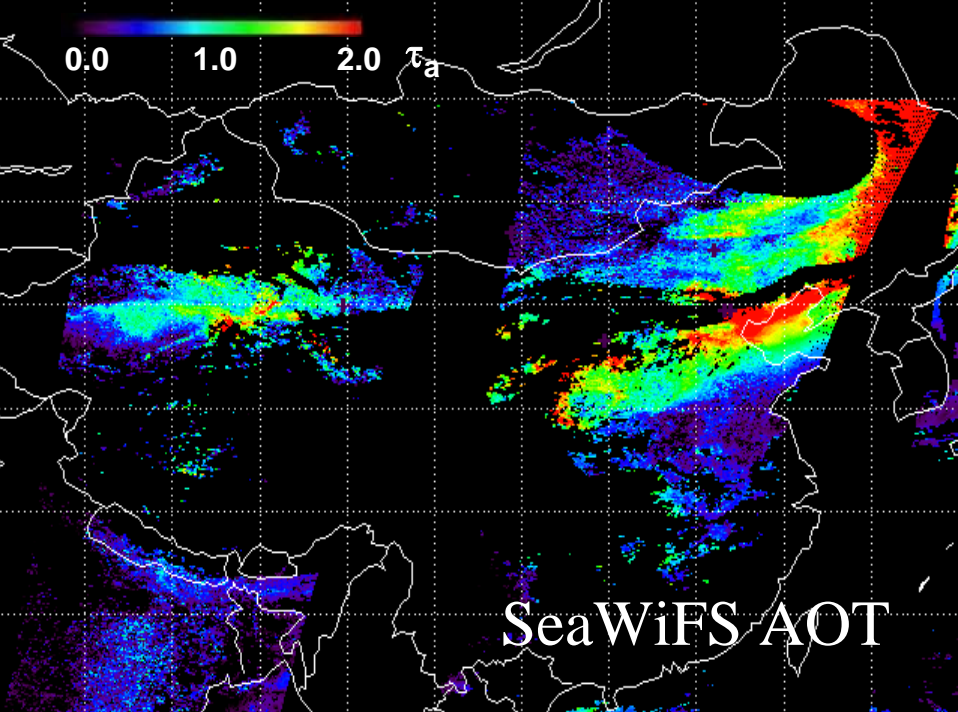
**MODIS *Red-Green-Blue* with
Rayleigh scattering removed**

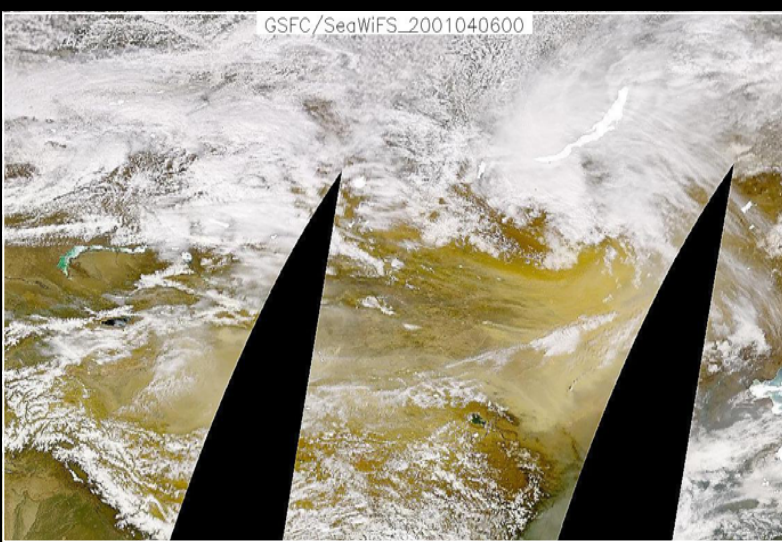
***Current MODIS retrievals:
Aerosol Optical Thickness***



***New MODIS Deep Blue:
Aerosol Optical Thickness***





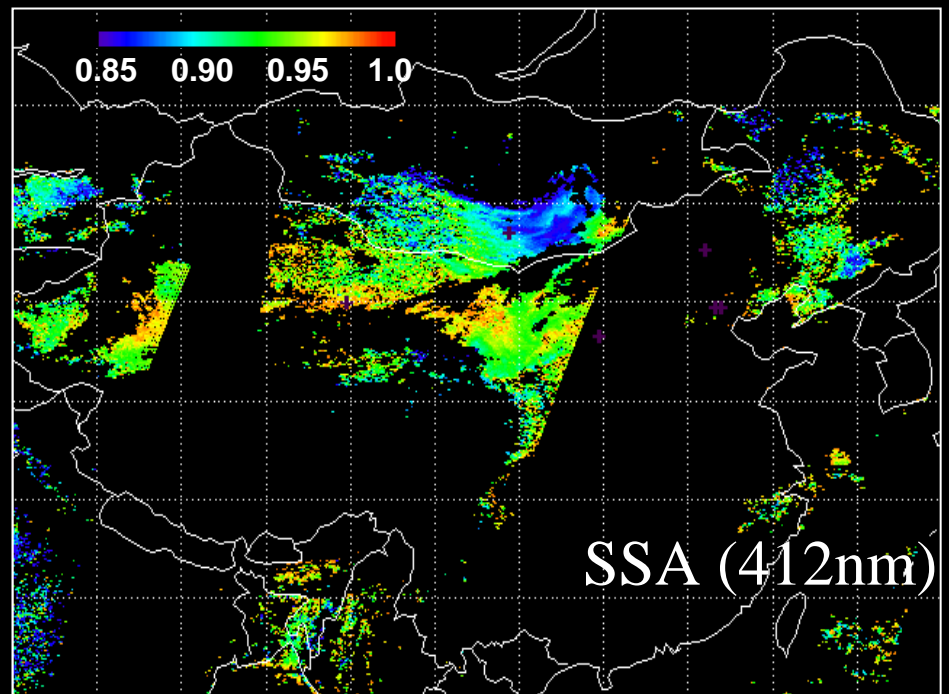
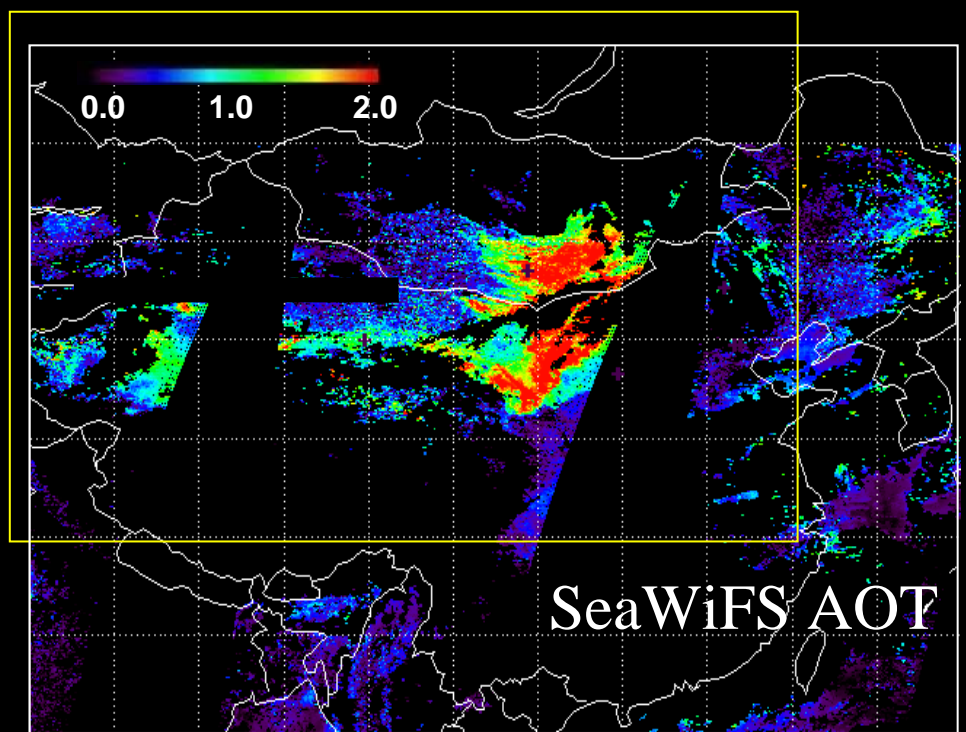


SeaWiFS RGB - Rayleigh

Asian Dust Outbreak **6 April 2001**

➤ **Deep Blue Algorithm:**

- *Cloud mask works very well*
- *Aerosol retrievals indicate dust storms originated from Gobi and Inner Mongolia regions*
- *Single scattering albedos are quite different between these two regions*



Summary

- ***It works!***
 - *Deep-Blue Algorithm* **well** for SeaWiFS and MODIS measurements (... *as well as future MODIS-like sensors*);
 - Compared **well** with surface/aircraft products;
 - Separate dust **well** from other anthropogenic sources.
- ***We expect:***
 - Implement *Deep-Blue Algorithm* for MODIS **underway**;
 - Produce MODIS *Deep-Blue* products over bright-reflecting surfaces, and to be integrated into operational MODIS product stream;
 - *Deep-Blue products* will be part of MODIS collection 5 for **Aqua** and scheduled to be released to the public in **January 2007**.