Aerosol Properties over *Bright-Reflecting Source Regions*: *The Deep Blue Algorithm and its Applicability to MODIS*

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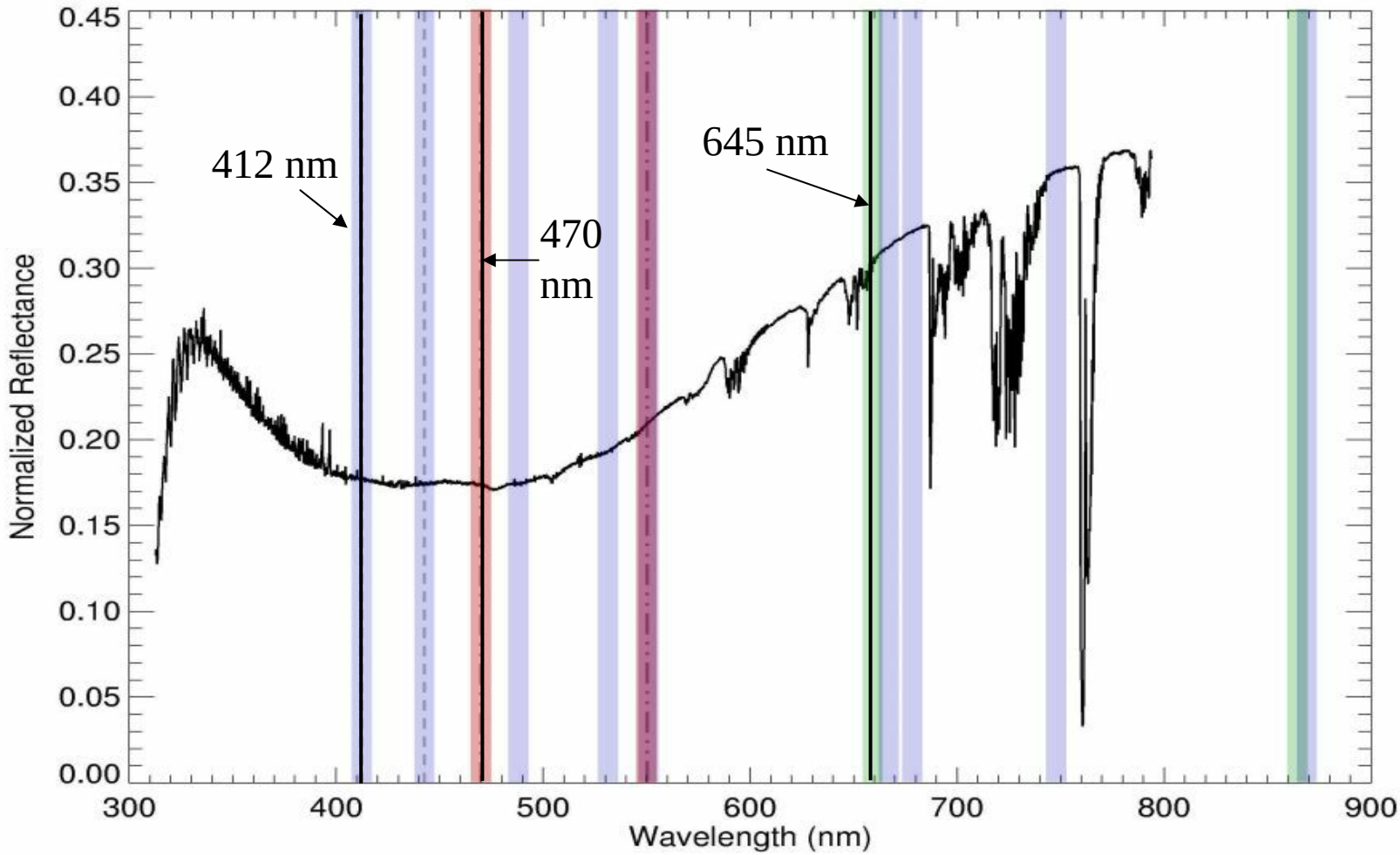
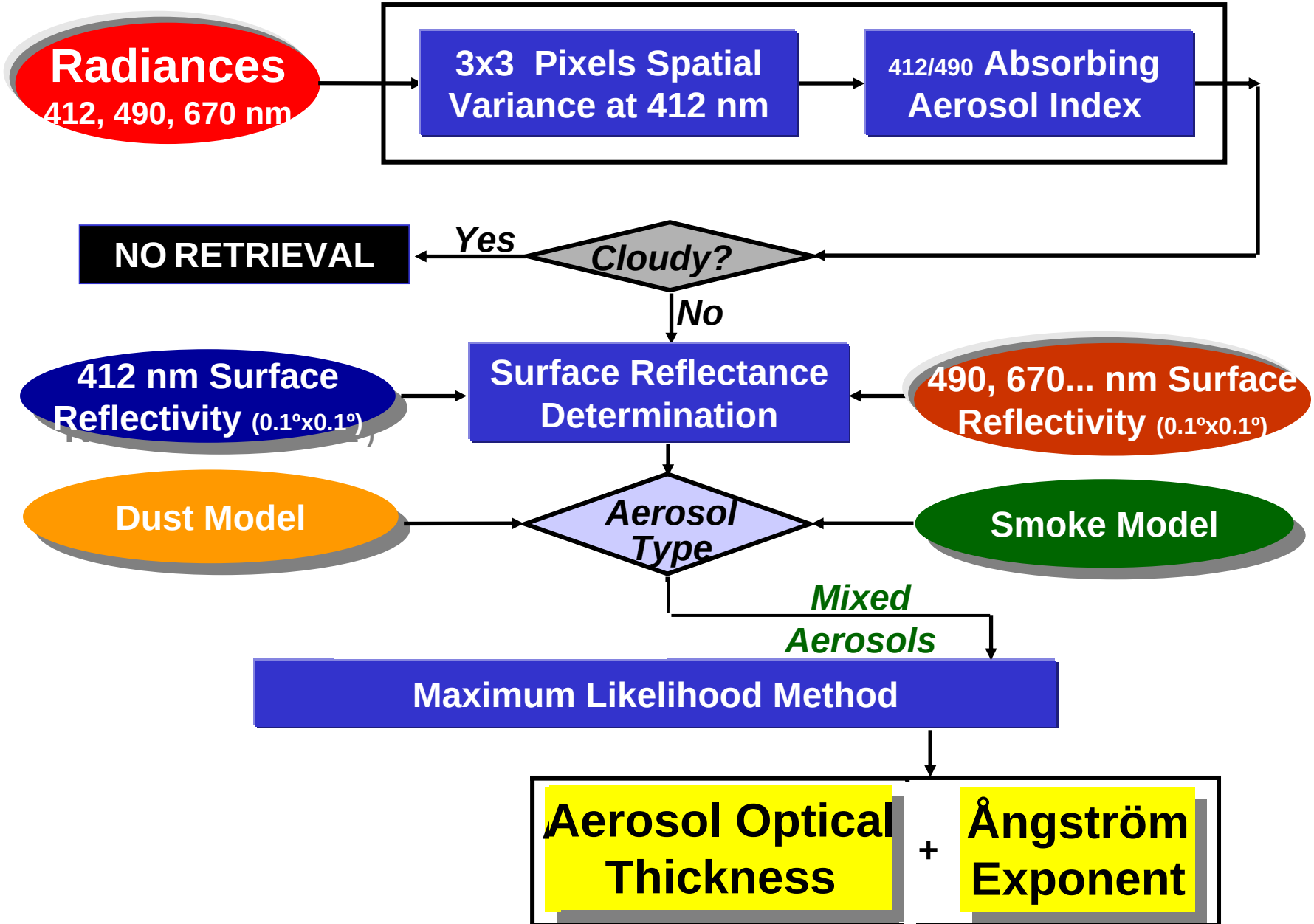
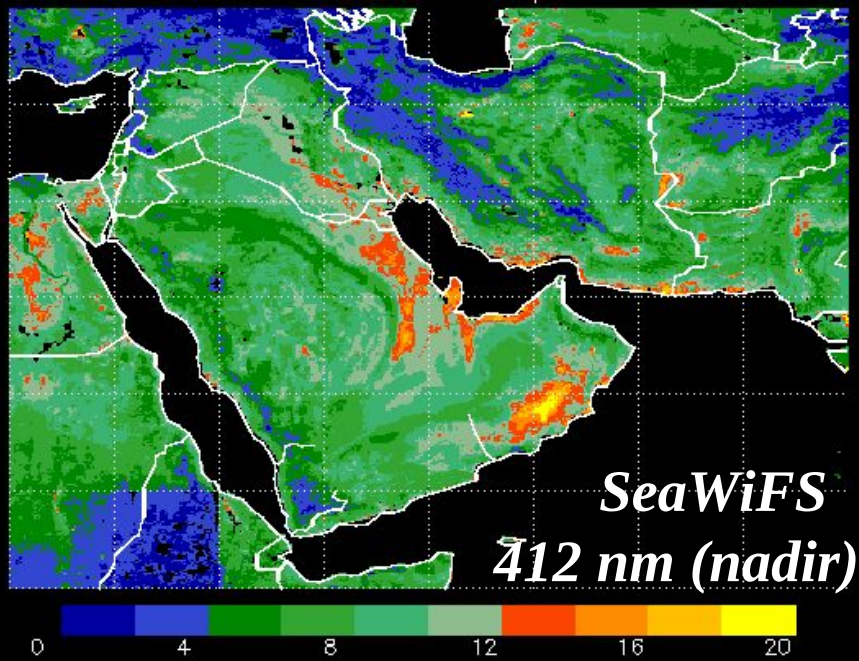
MODIS Visible & NIR Bands:
superimposed on the GOME spectral reflectance taken over the Sahara

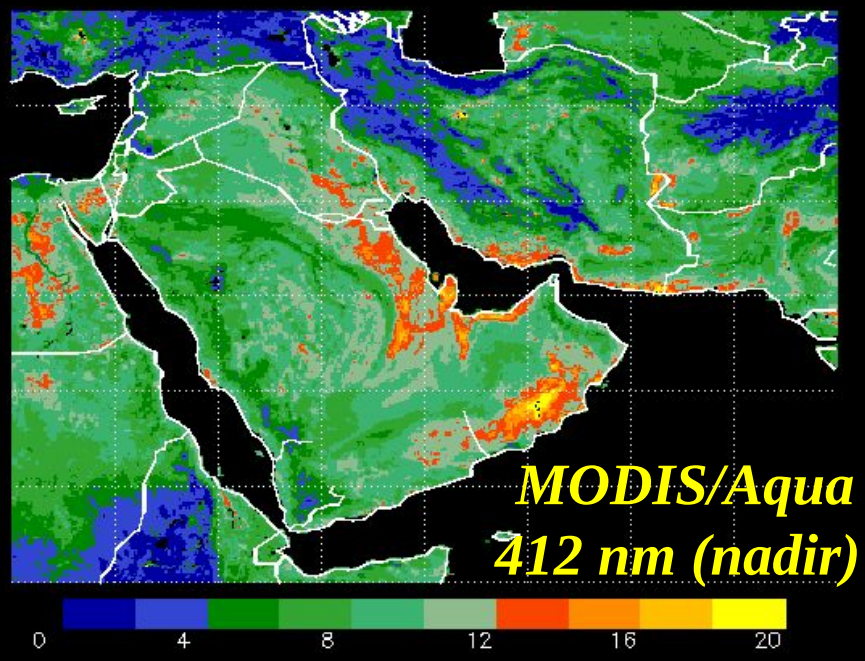


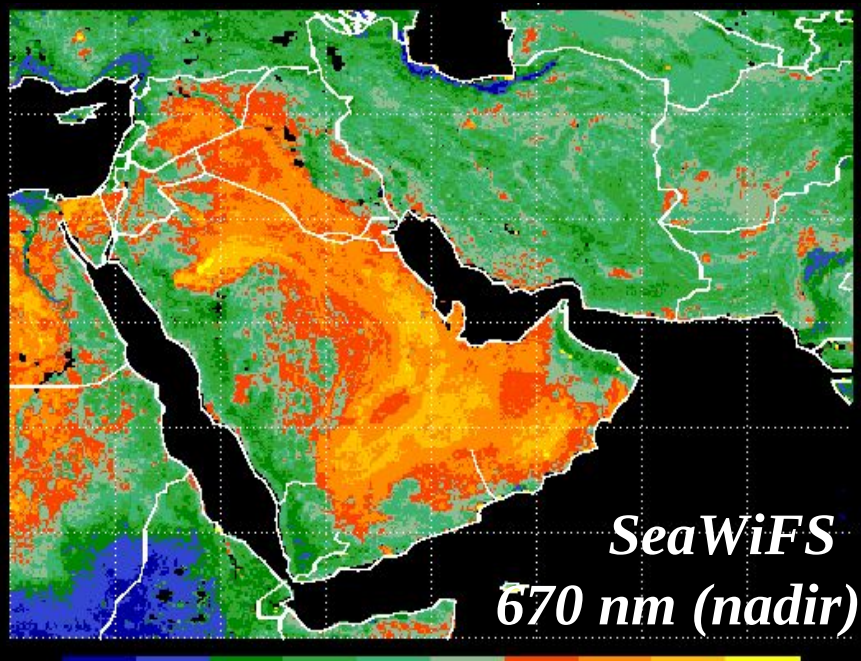
Flowchart for Deep Blue Algorithm

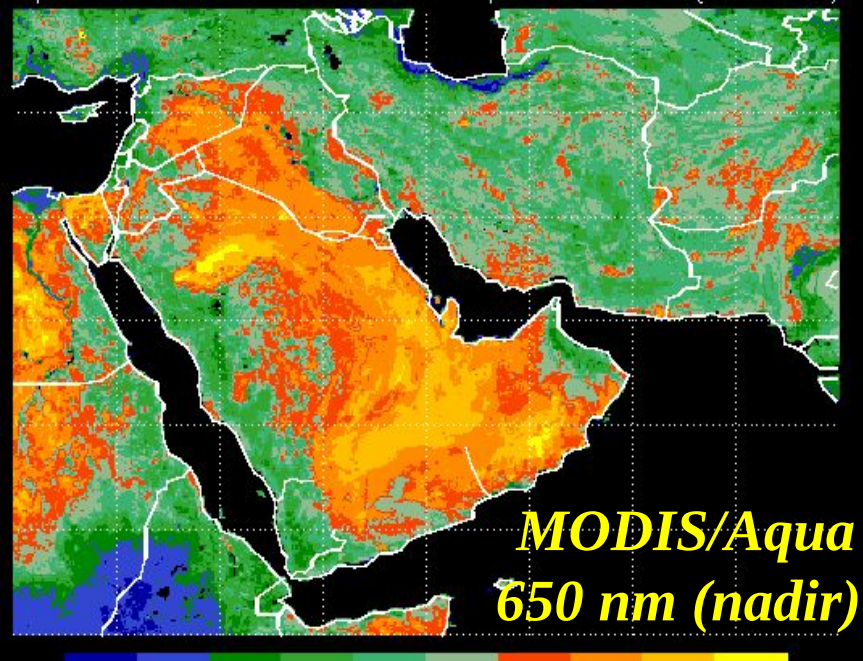


Surface Reflectance Data Base - Sep 2004

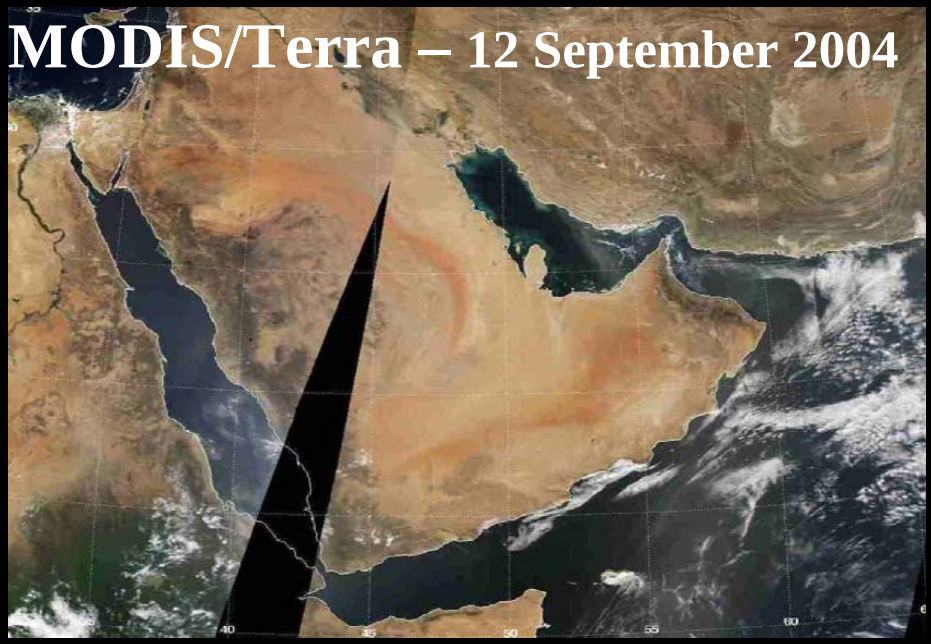


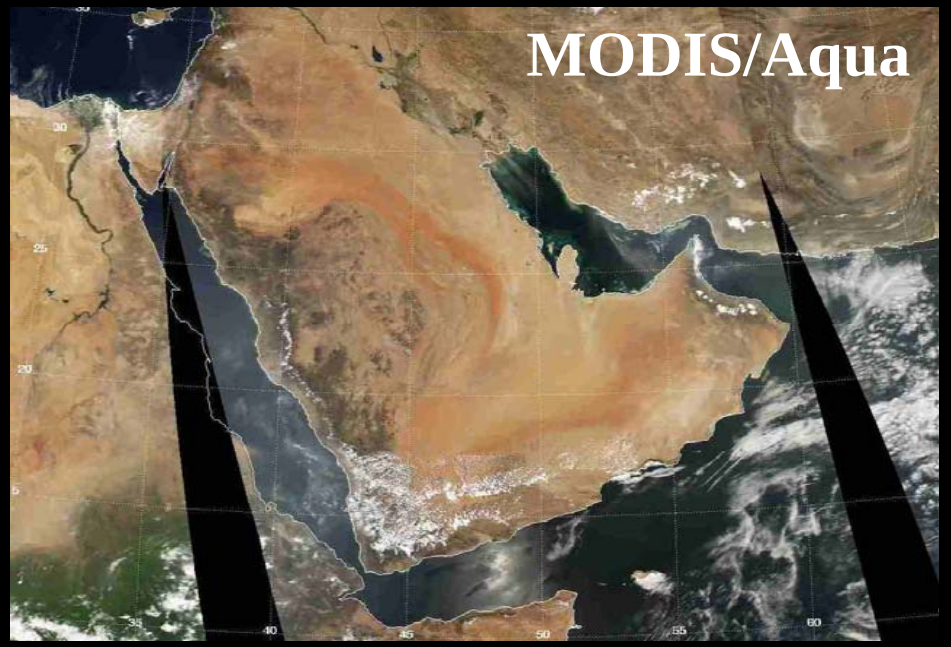


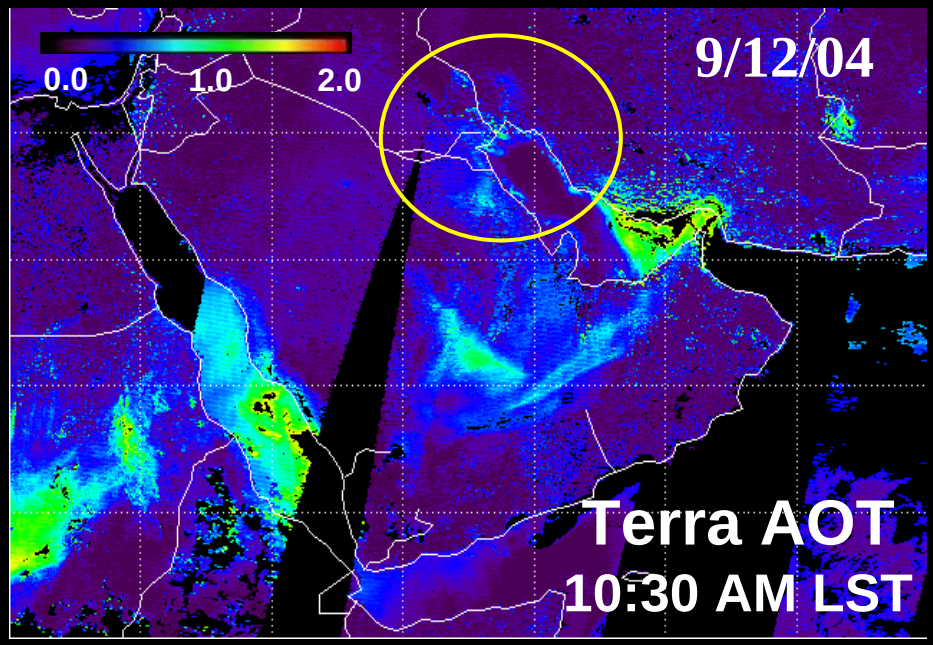


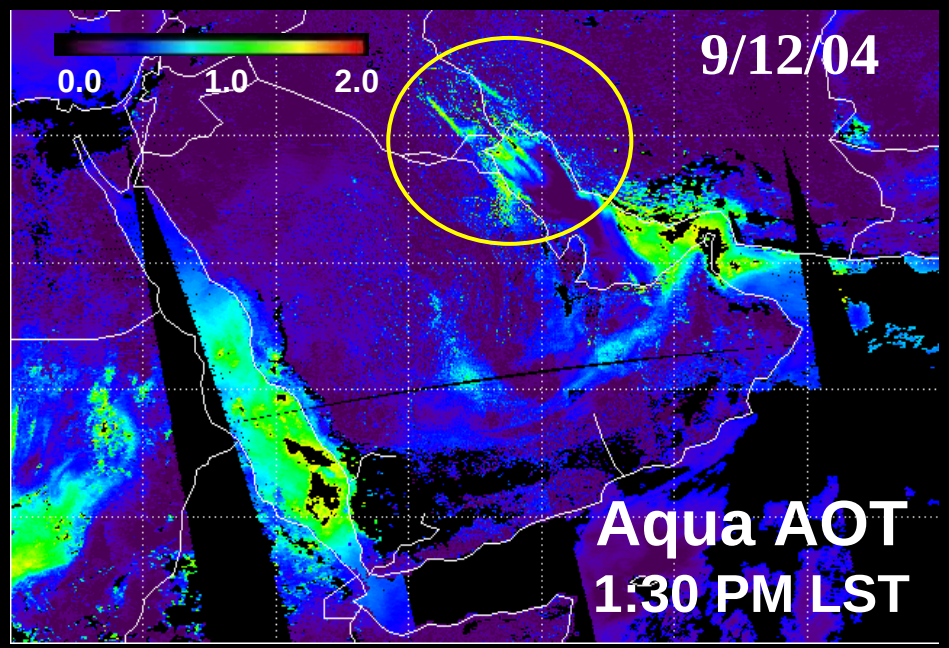


Tracking Movements and Evolutions of Aerosol Plumes



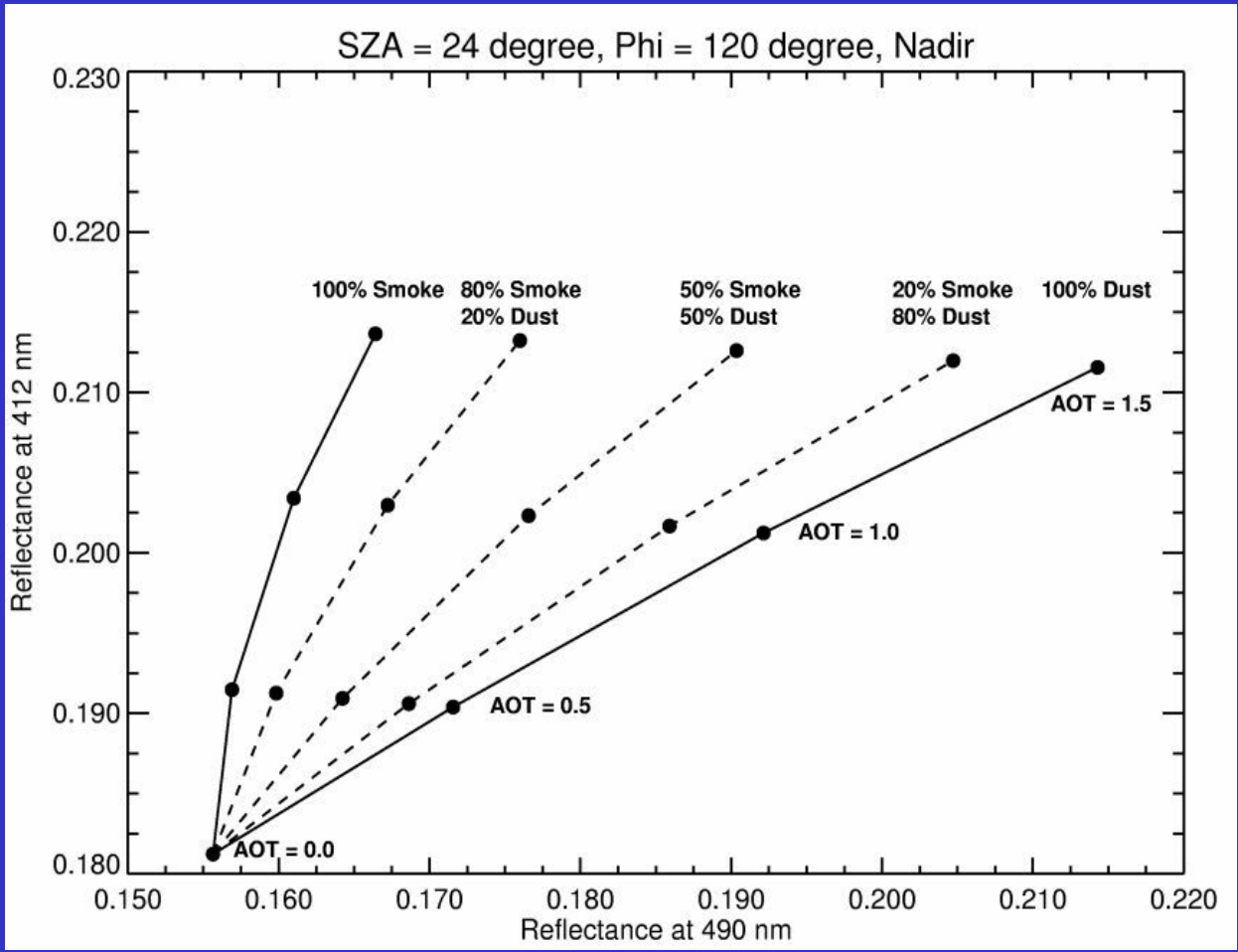






Aerosol Properties in Radiance Simulations

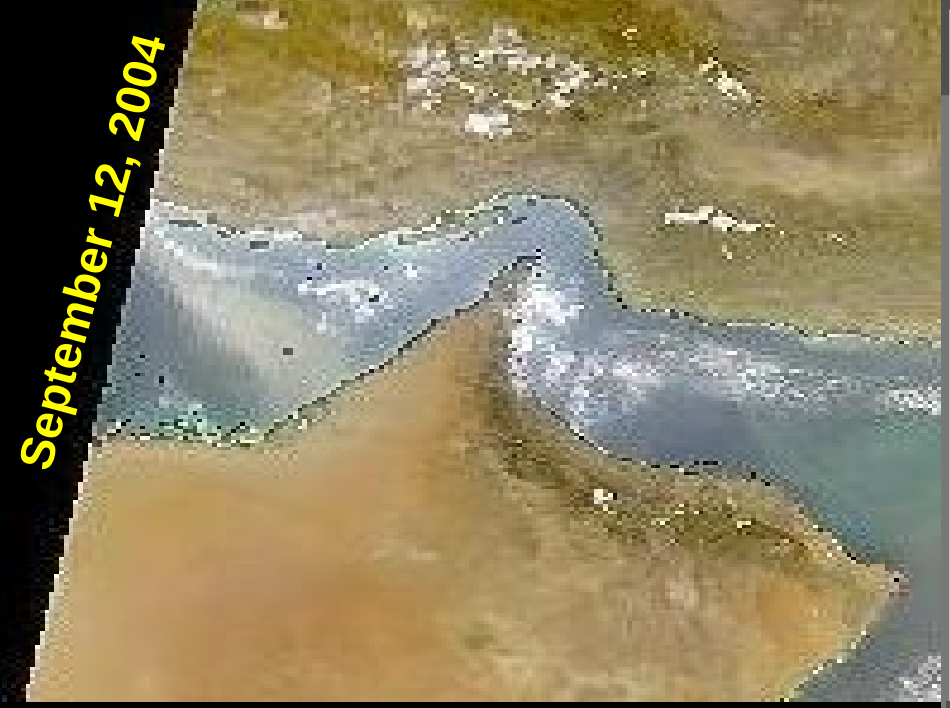
Aerosol Model	τ_{412}/τ_{470}	τ_{490}/τ_{470}	Refractive Index 412 nm	Refractive Index 490 nm	ω_0 412 nm	ω_0 490 nm
Dust	1.00	1.00	1.55 – 0.020i	1.55 – 0.008i	0.91	0.96
Smoke	1.30	0.92	1.55 – 0.022i	1.55 – 0.026i	0.90	0.89

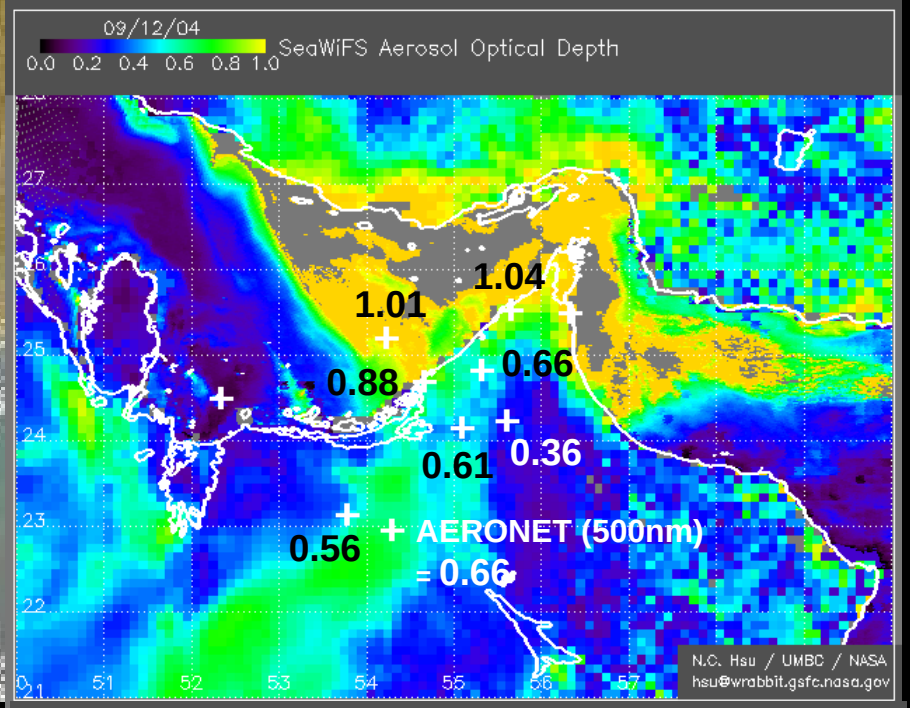


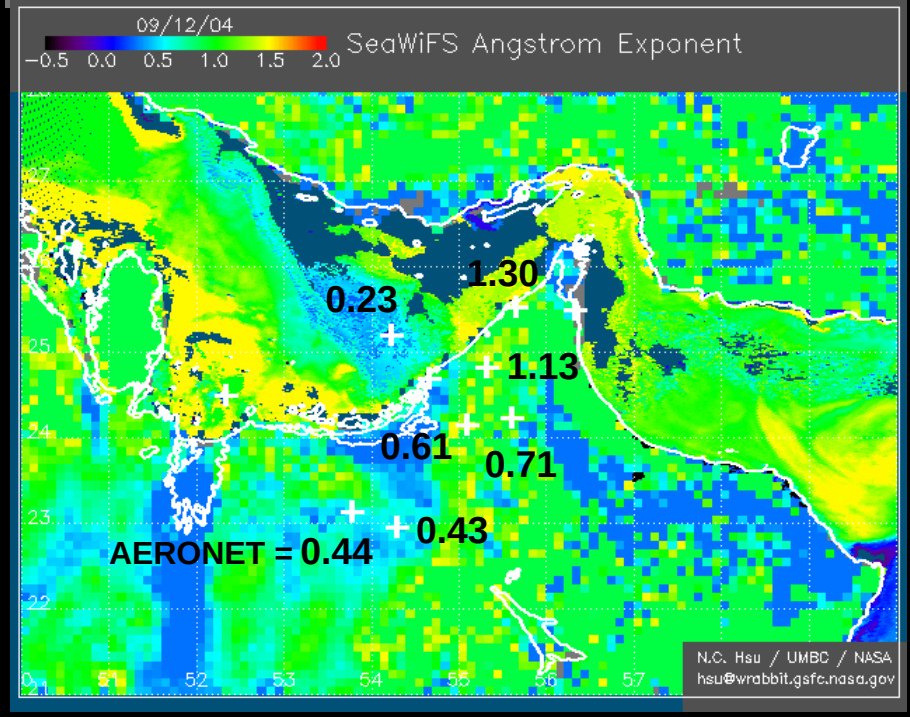
- **Aerosol layer: 1-km thick, peaked at 3 km height with a Gaussian distribution**

- **For mixed aerosol types:**

$$R^{mixed} = aR^{dust} + (1-a)R^{smoke}$$





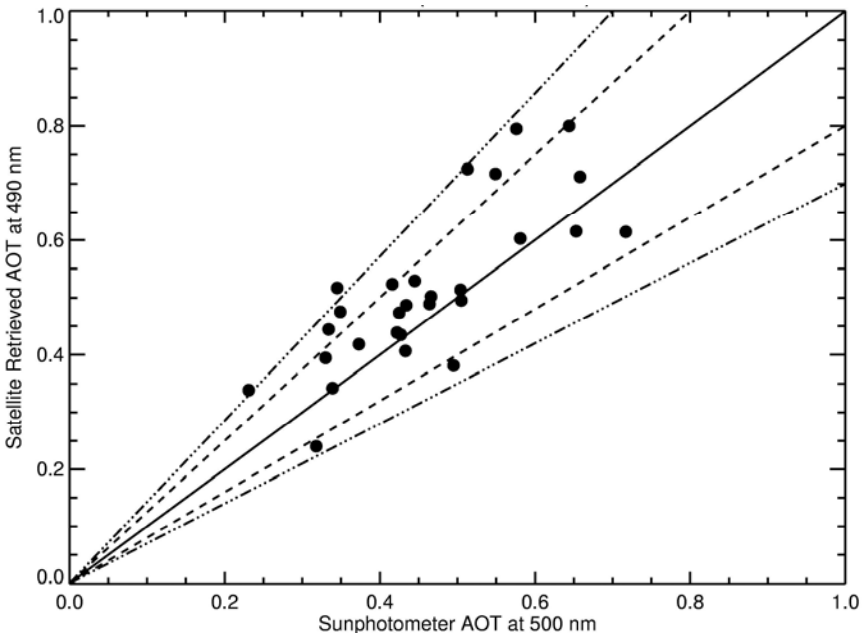


Deep Blue Algorithm

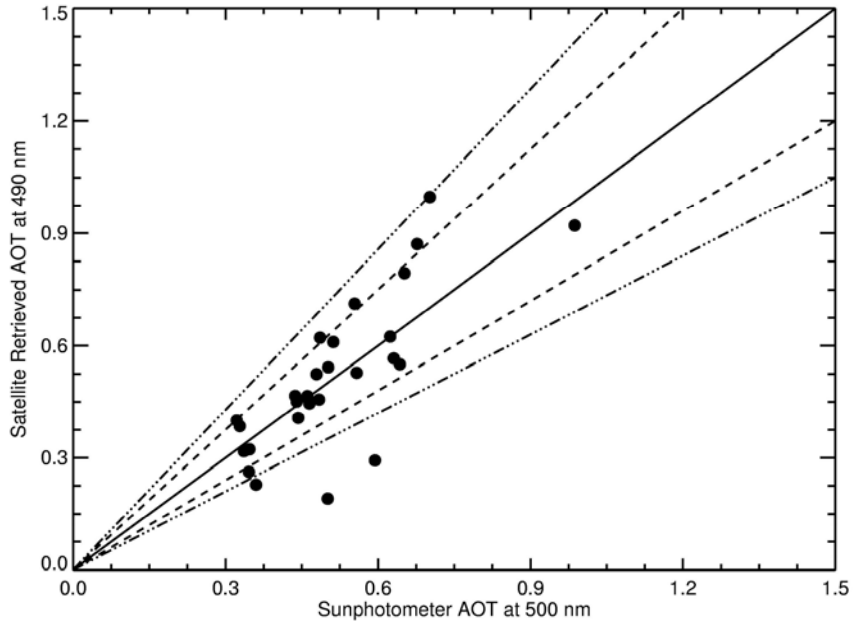
- The dust (coarse particles) front pushes the polluted air mass (fine particles) over both water and land on this day.
- Compared reasonably well with AERONET retrievals in UAE^2 (Aug.-Sep. 2004)

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

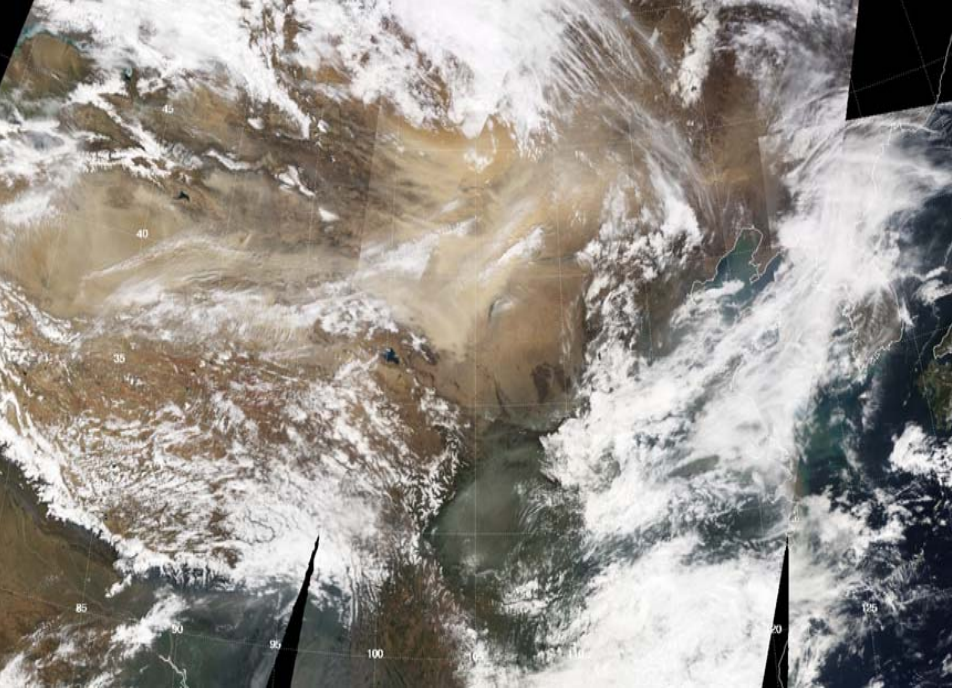
Harmim, UAE



Mezaira, UAE



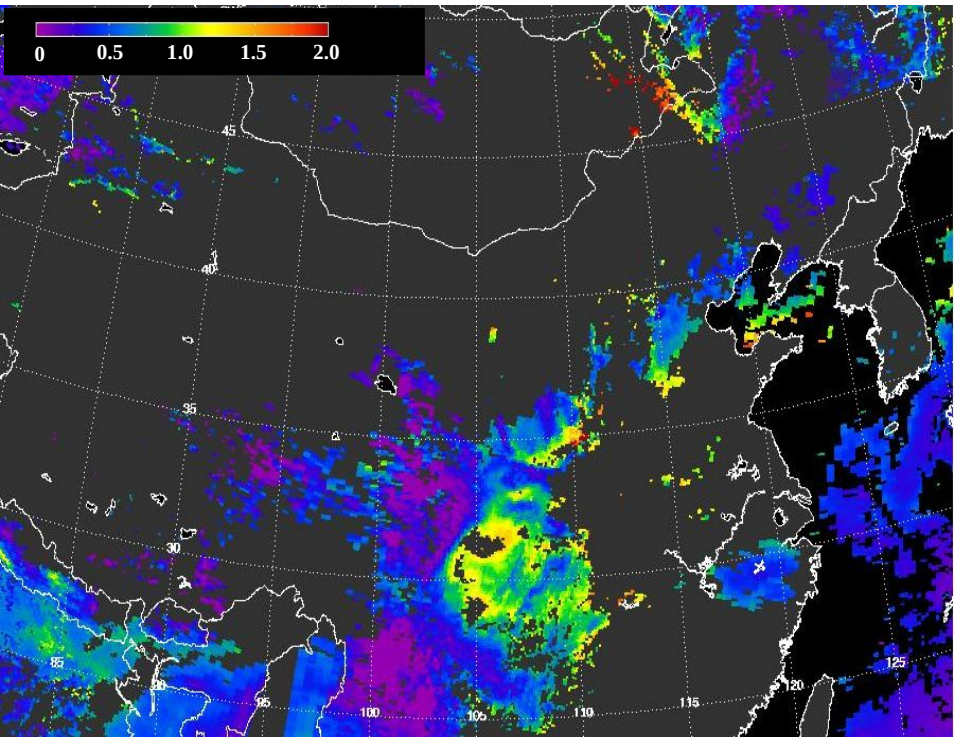
6 April 2001

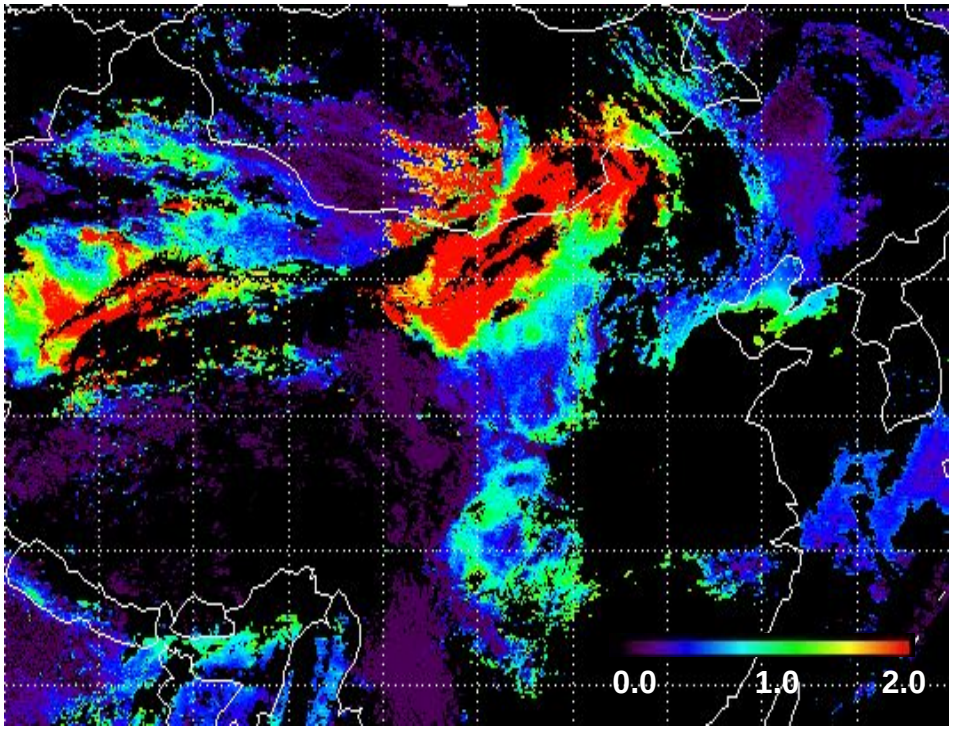


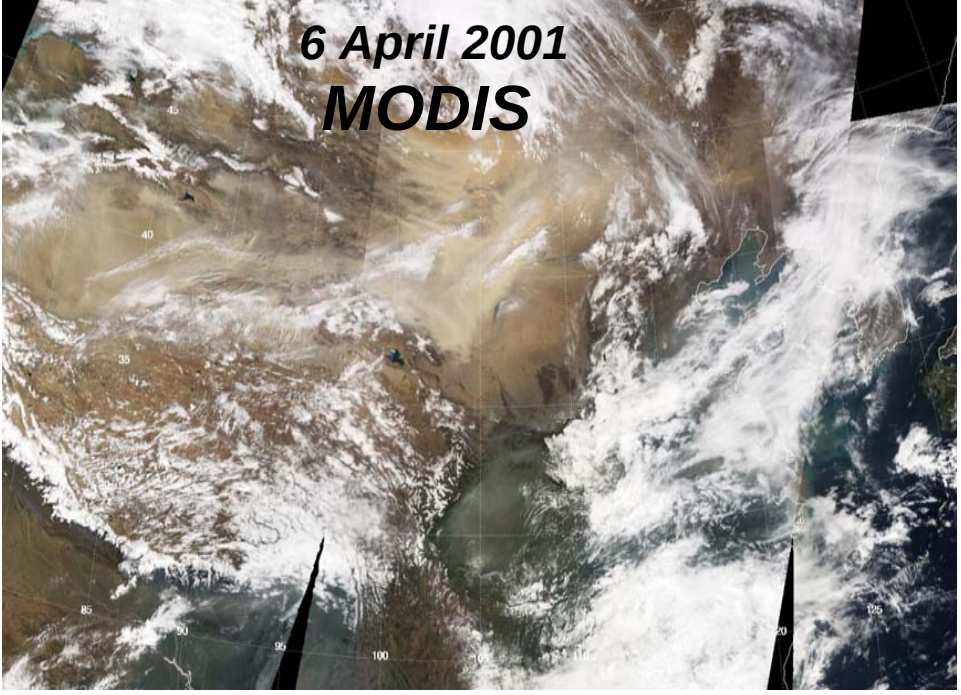
MODIS *Red*-*Green*-*Blue* with Rayleigh scattering removed

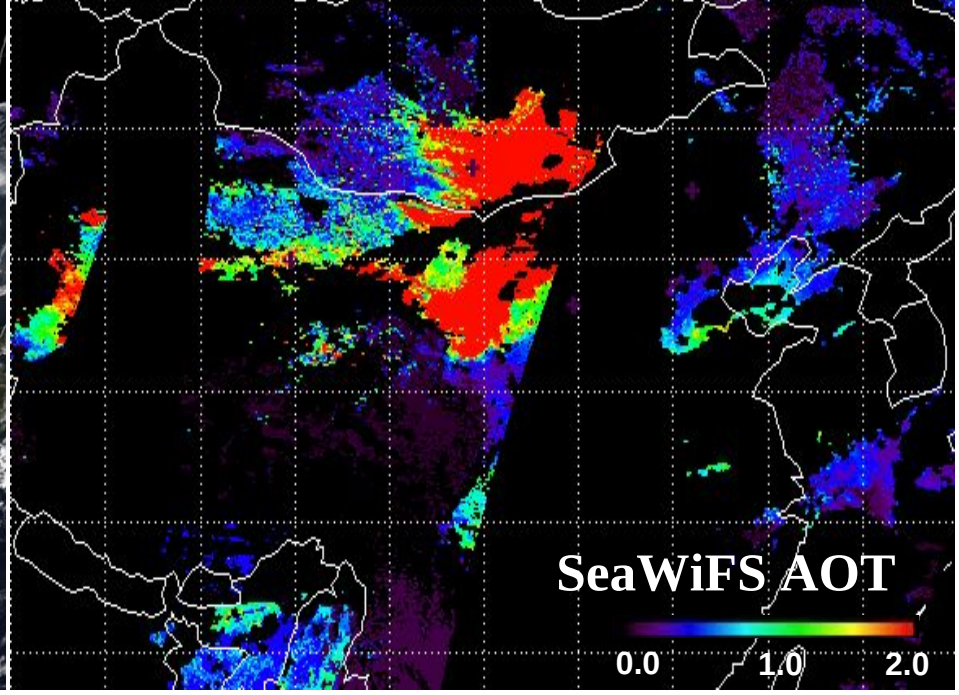
Current MODIS *retrievals:*
Aerosol Optical Thickness

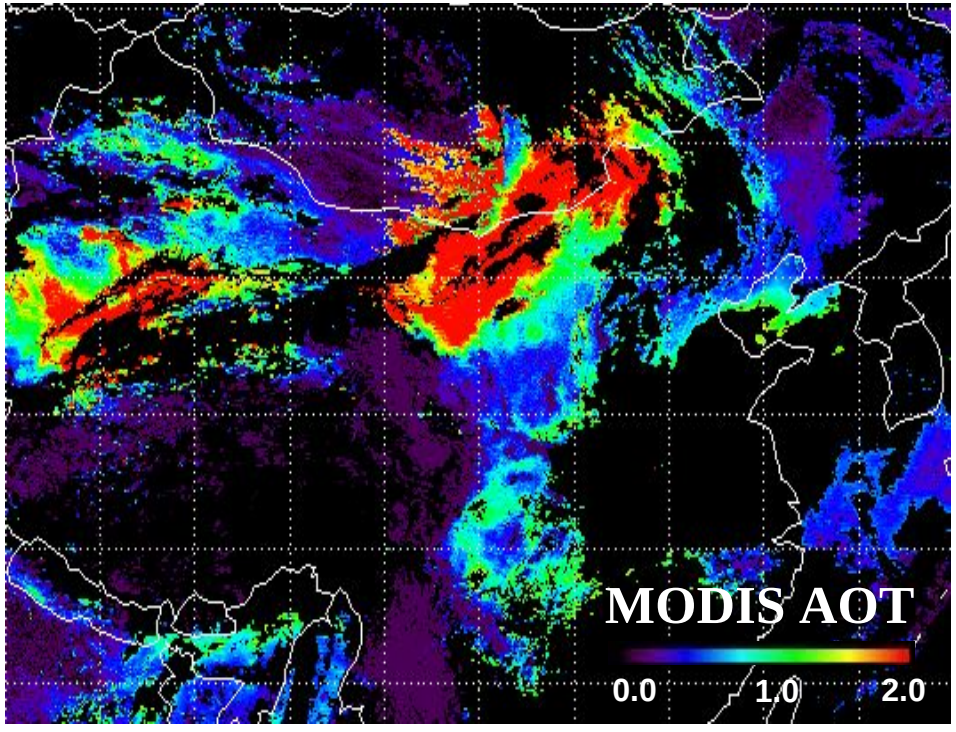
New MODIS *Deep Blue:*
Aerosol Optical Thickness

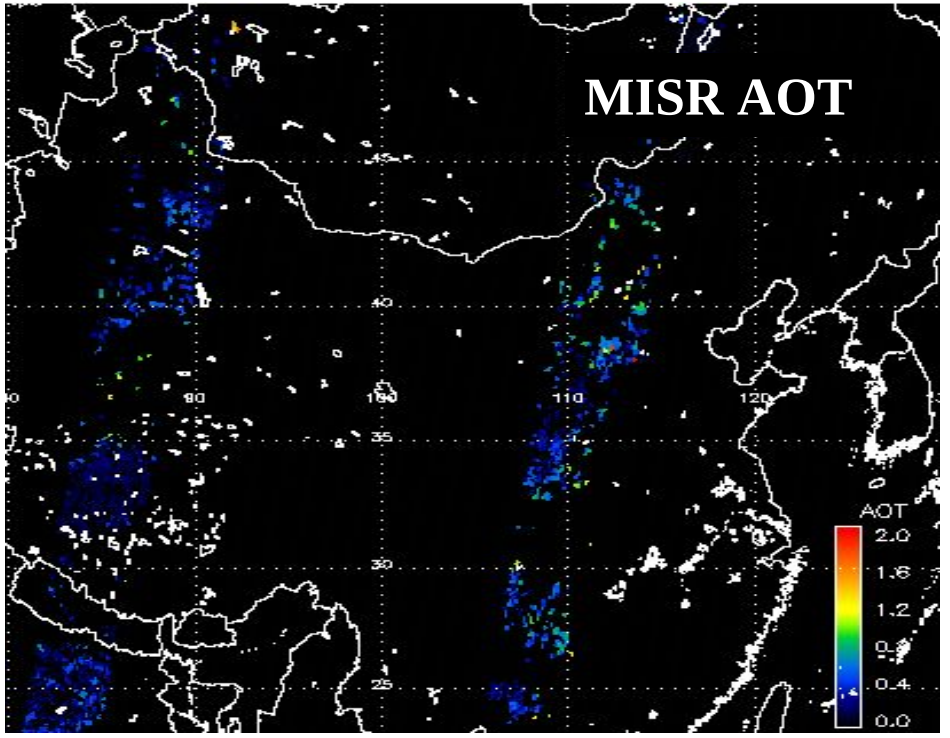




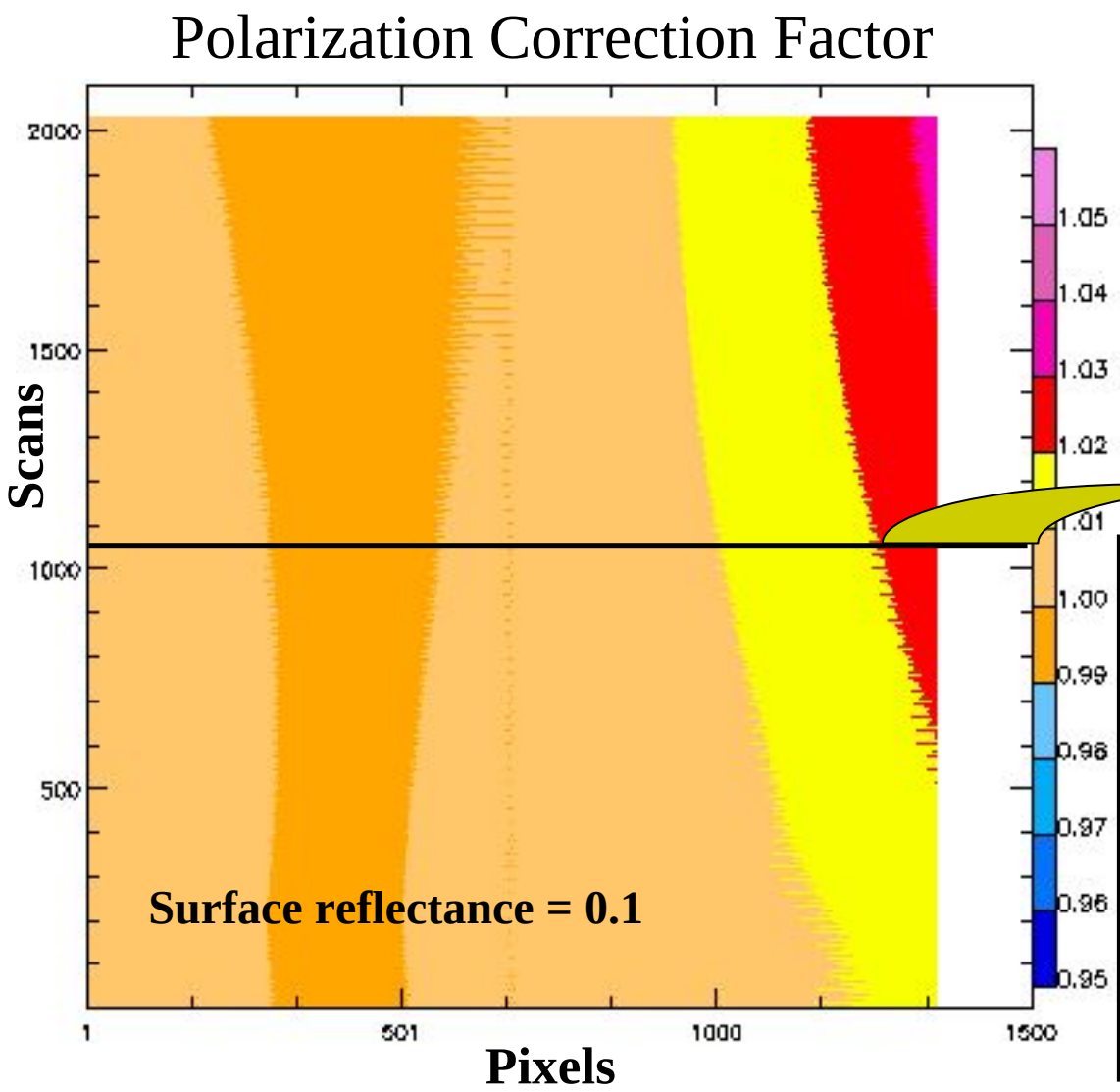

6 April 2001
MODIS


SeaWiFS AOT
0.0
1.0
2.0

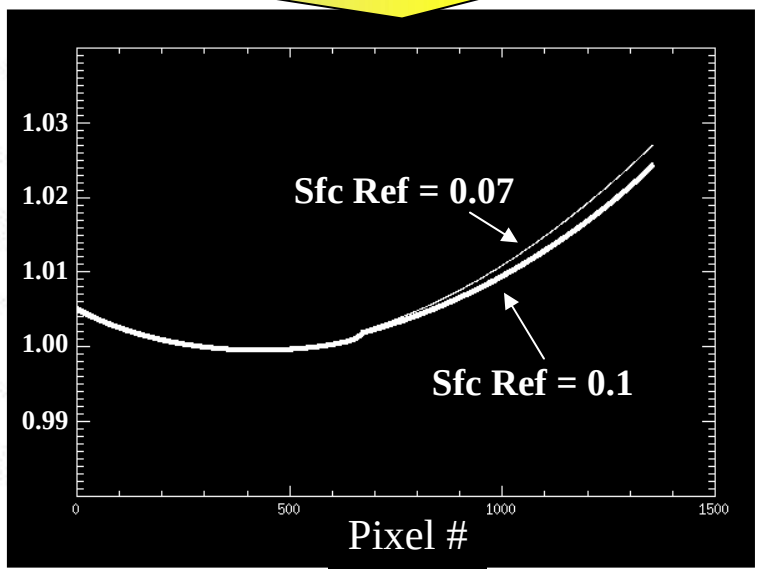

MODIS AOT
0.0
1.0
2.0


MISR AOT
AOT
2.0
1.6
1.2
0.8
0.4
0.0

Polarization Correction for MODIS



- **Use MODIS pre-launch polarization coefficients from MCST and GSFC ocean group.**
- **Generate lookup tables for Stokes parameters and simulate correction factors.**



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;**
  - **Continue to refine MODIS *Deep-Blue* retrievals, with polarization correction due to scanning mirror.**