

A global Aerosol Absorption Product from OMI Near UV Observations

Omar Torres

NASA Goddard Space Flight Center

Ozone Monitoring Instrument (OMI)

- International Project (Holland, United States, Finland)
- EOS-Aura Satellite, Launched in July 15 2004, A-train

Nadir solar backscatter spectrometer

-270-500 nm

-13X24 km footprint (nadir)

-2600 km swath width (Daily global coverage)

-Products:

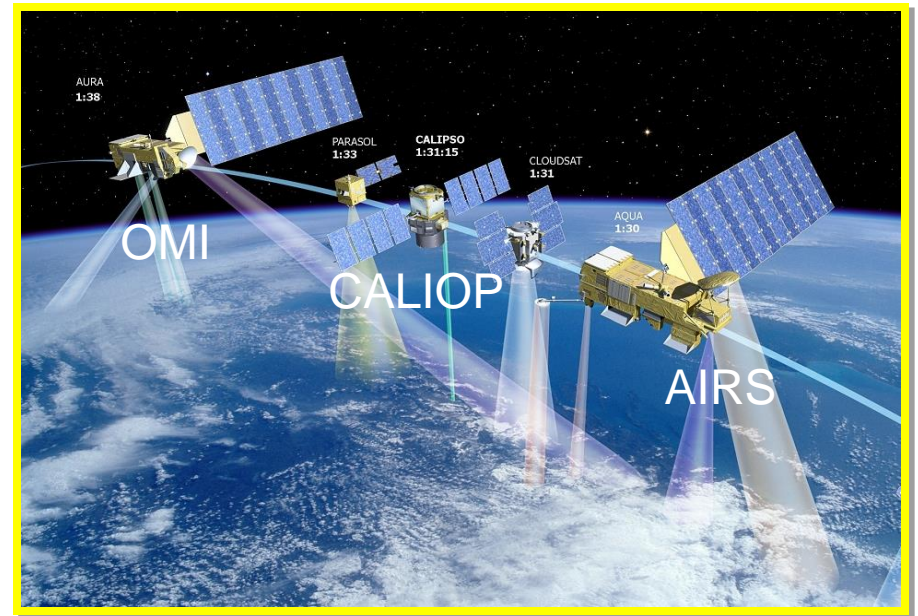
-Ozone, N₂O, SO₂

-Other trace gas

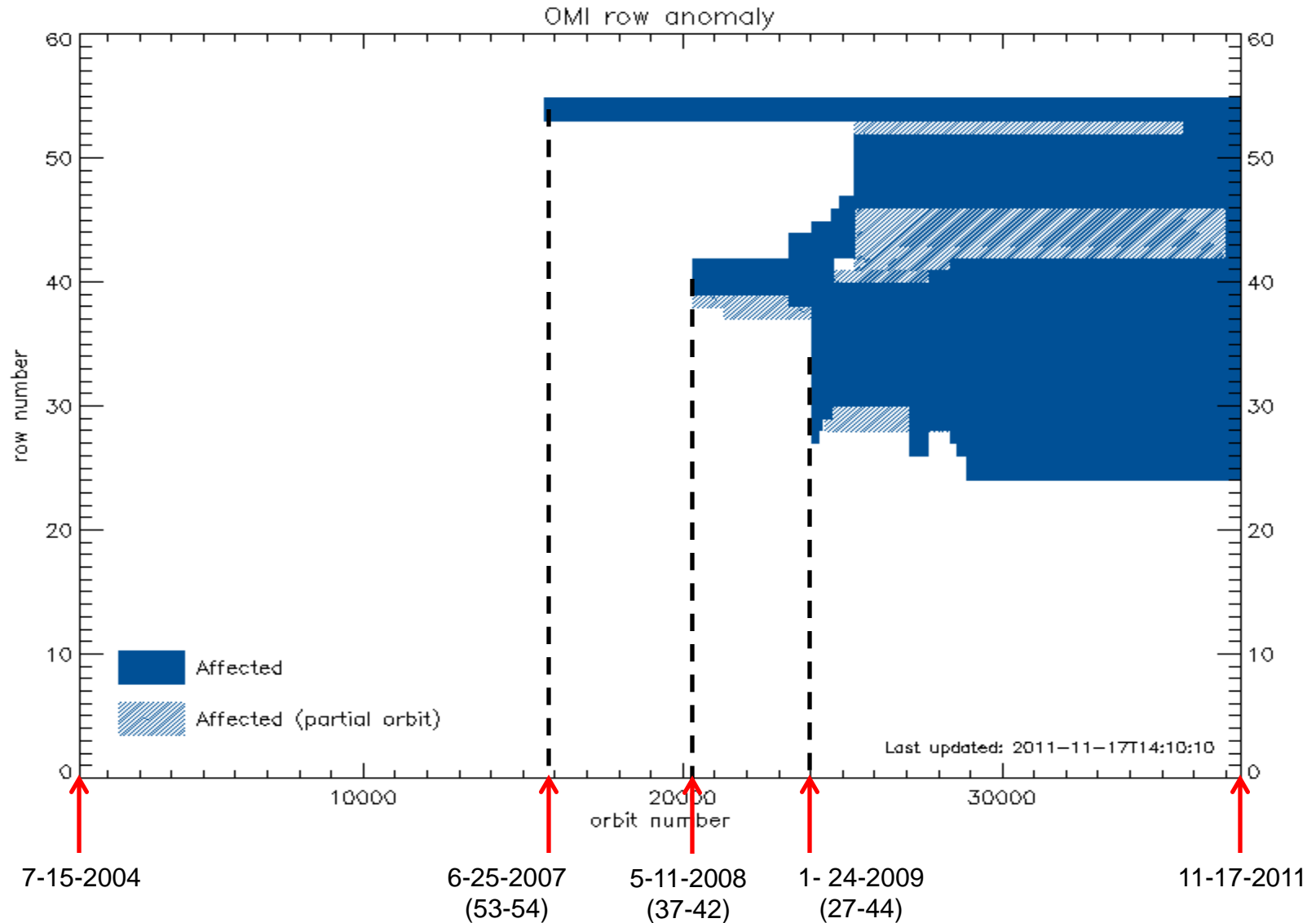
-Aerosols:

OMAERUV (NASA) (Near UV)

OMAERO (KNMI) (mult. wav.)



OMI Status: Row Anomaly Progression



- Physical obstruction external to the sensor affecting Earth-shine measurements
- As of Nov 17-2011, 29 rows (1 thru 24 and 56-60) out of 60 remain unaffected.
- Row anomaly has mostly stabilized over the last two years
- Currently OMI achieves global coverage in 2-3 days.

OMAERUV Algorithm

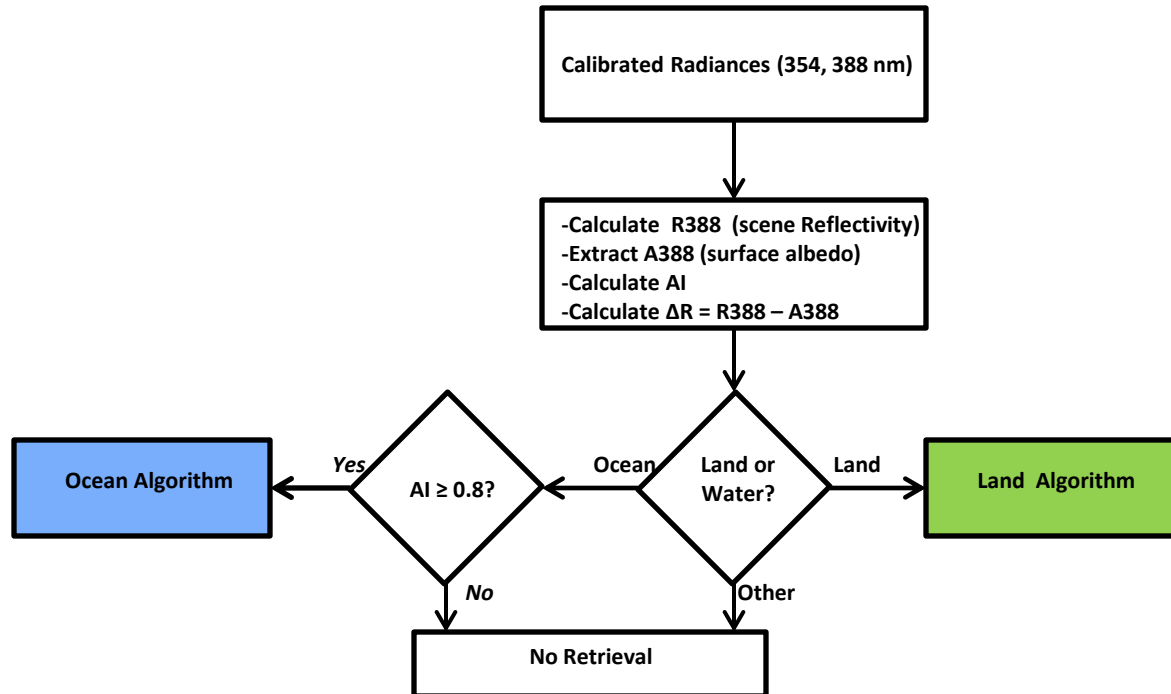
Aerosol absorption quantification using near UV observations, based on TOMS heritage.

Ancillary Data:

- Global Monthly Climatology of Surface Albedo (354, 388 nm)
- Global Monthly Climatology of Aerosol Layer Height (CALIOP)
- Global surface type distribution (CERES)
- Real Time CO data from AIRS

21 Aerosol Models (LUT's):

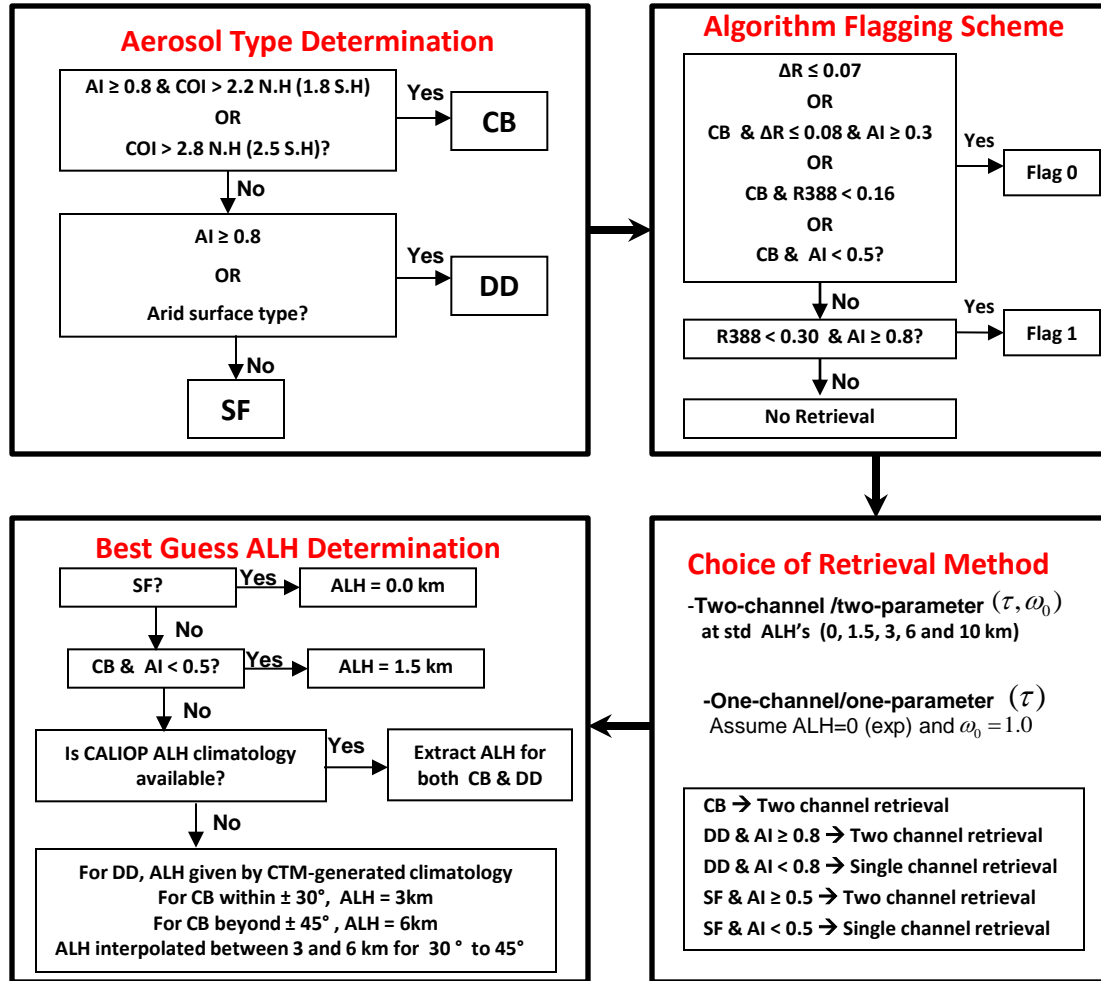
- Three major aerosol Types: Assumed PSD and real refractive index
Desert Dust (DD), Carbonaceous (CB), Sulfate-based (SF)
- Each type is further categorized in 7 sub-types (varying absorption)
Nodal points on viewing geometry, AOD, ALH, SSA



Ocean Algorithm: Absorbing Aerosols (Smoke/Dust) as identified by AI
(Difficulty in Separating Aerosol from Ocean Color Signal) for AI < 0.8

Land Algorithm: All aerosol types regardless of AI considerations.

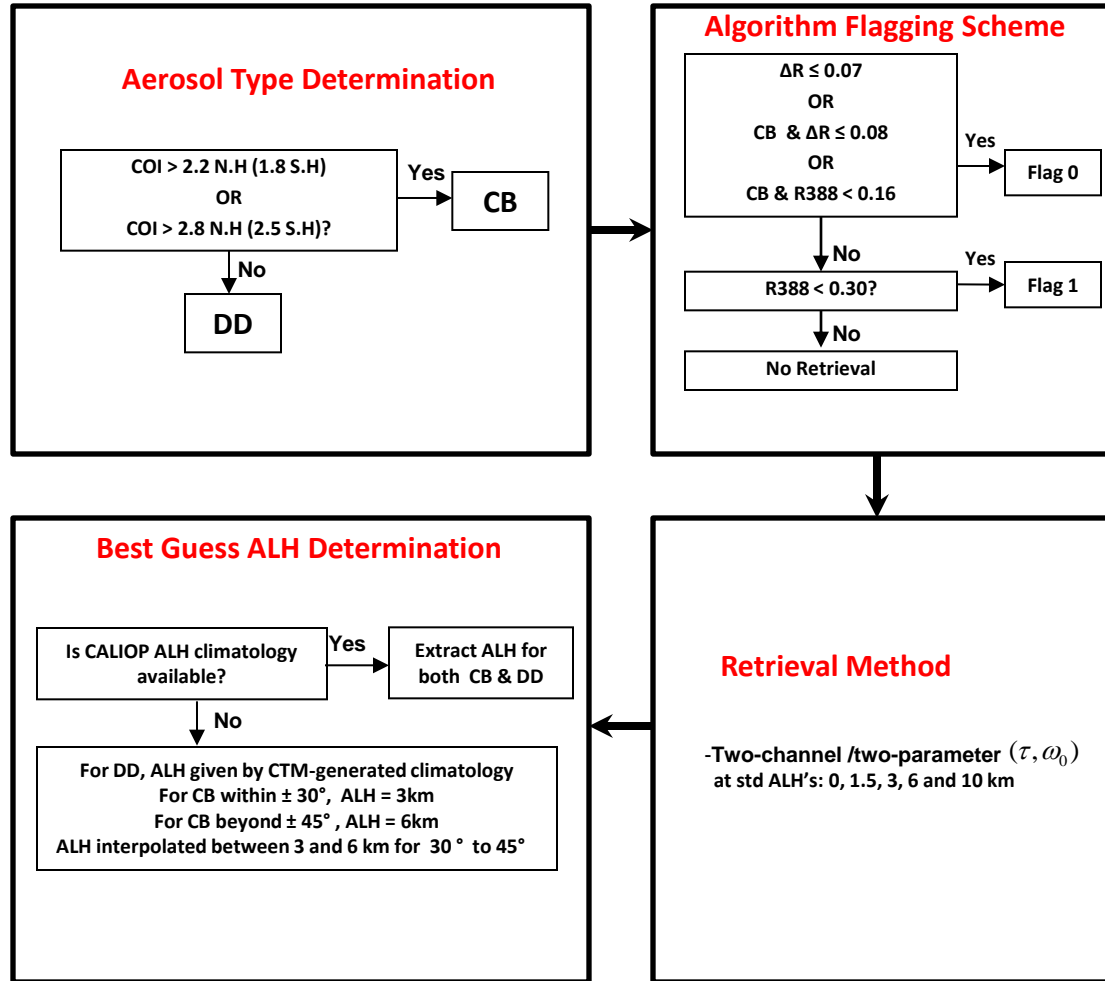
OMAERUV Land Algorithm



Retrieval Product

τ, ω_0 at 388 nm (also reported at 354 and 500 nm) at std ALH's (0, 1.5, 3.0, 6.0 and 10 km) and a best guess ALH (generally from CALIOP climatology)

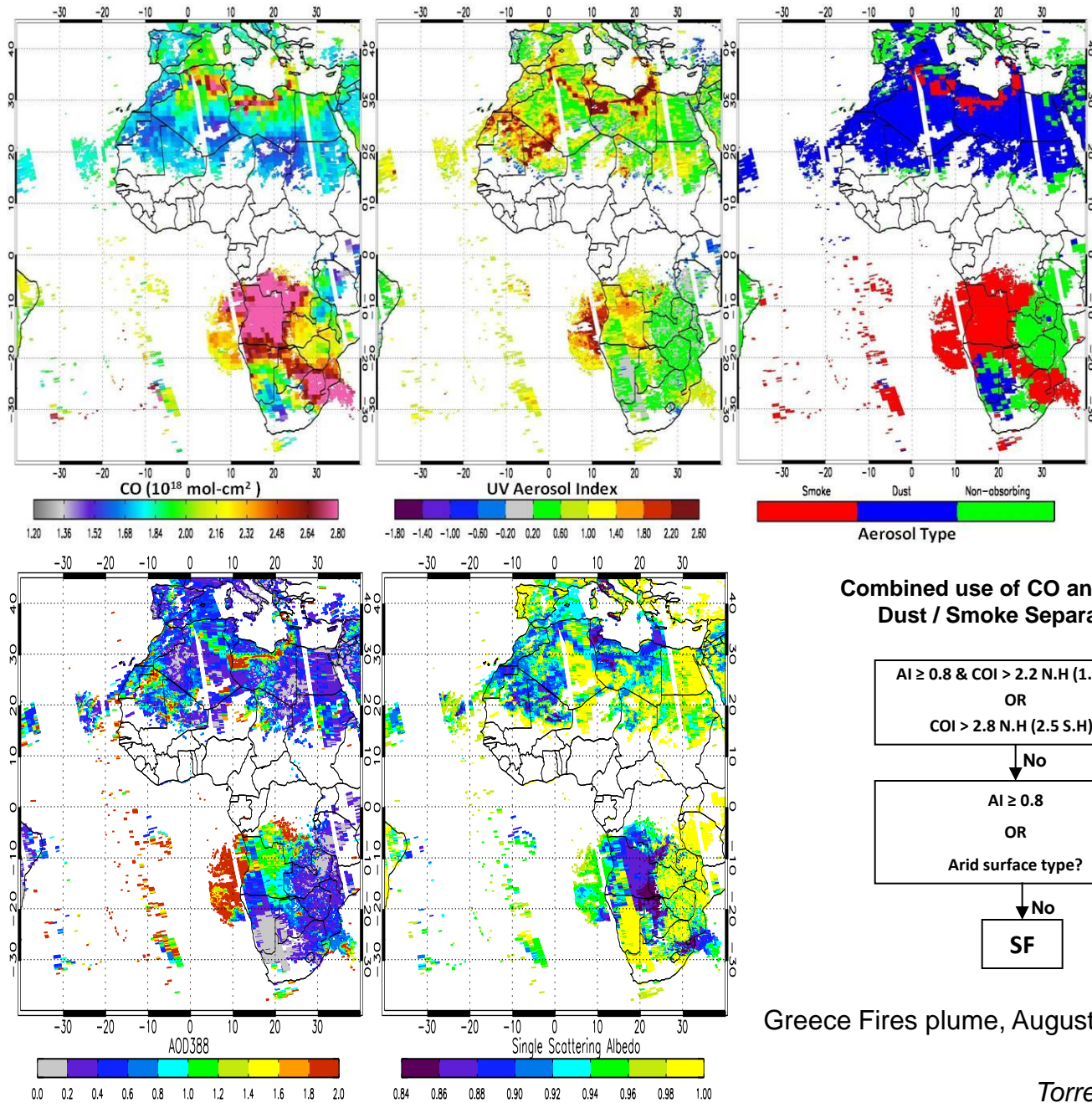
OMAERUV Ocean Algorithm



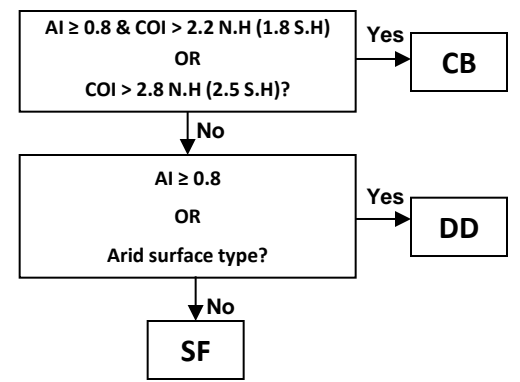
Retrieval Product

τ, ω_0 at 388 nm (also reported at 354 and 500 nm) at std ALH's (0, 1.5, 3.0, 6.0 and 10 km)
and a best guess ALH (generally from CALIOP climatology)

Aerosol Type Determination

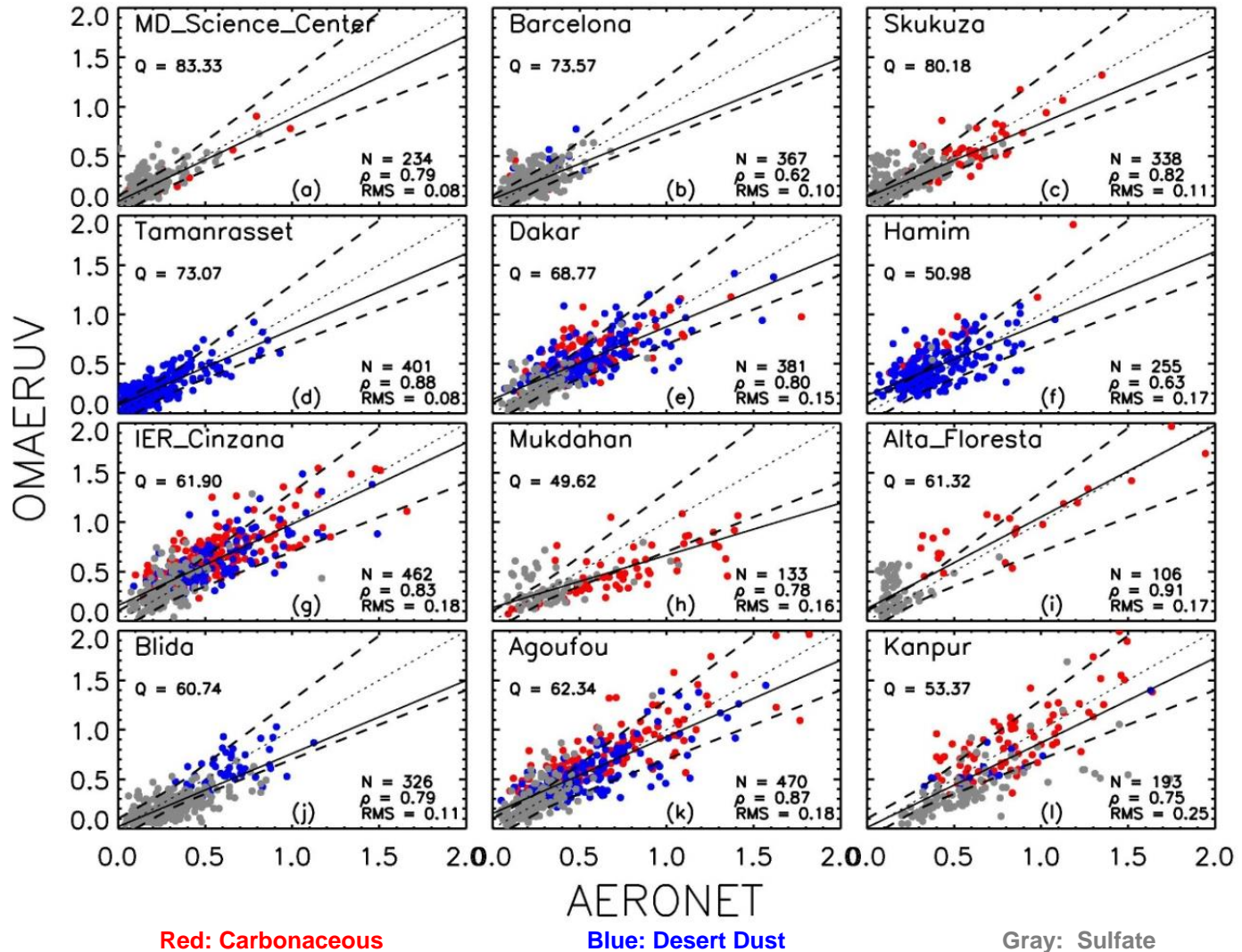


Combined use of CO and AI for Dust / Smoke Separation



Greece Fires plume, August 27, 2007

AOD Validation (2005-2008)

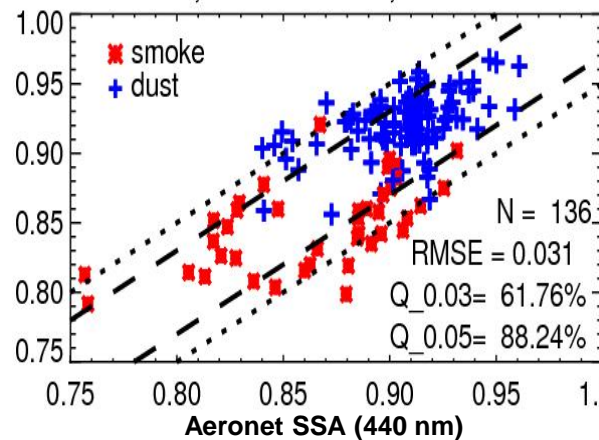
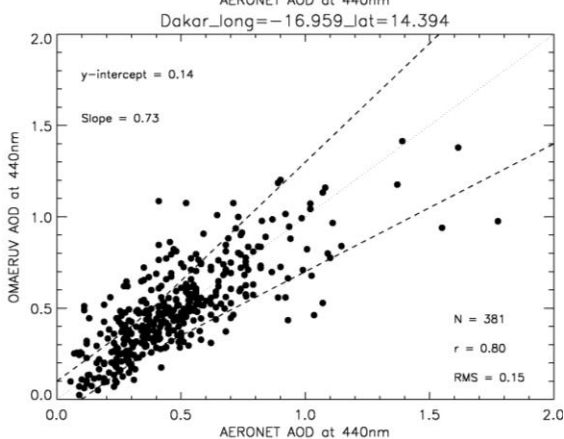
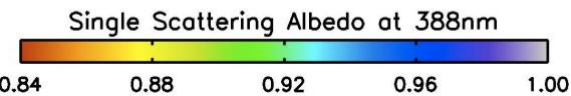
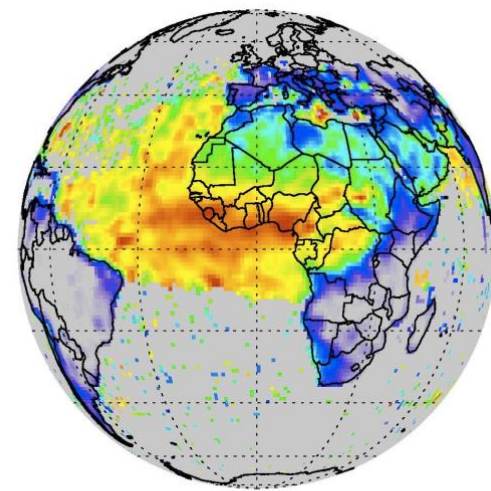
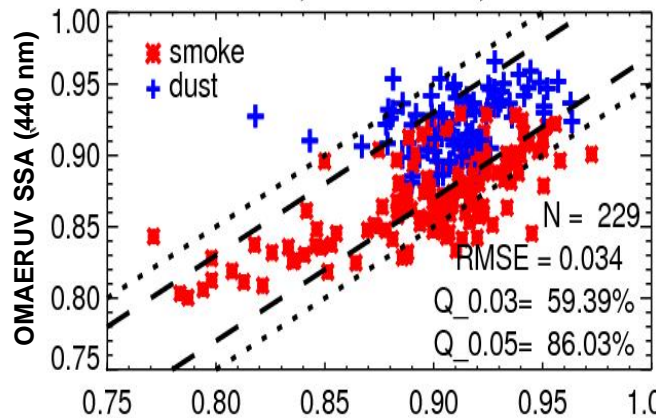
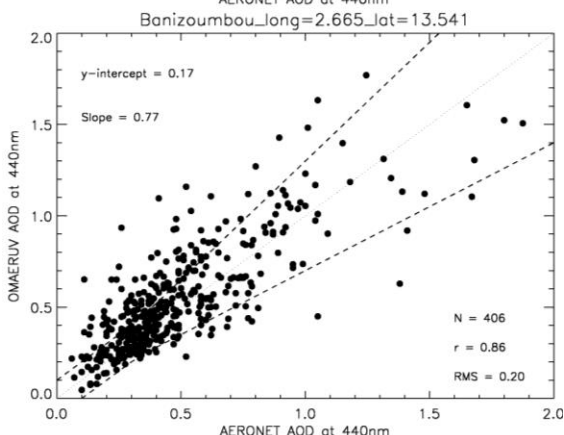
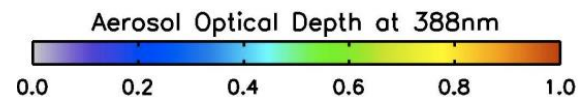
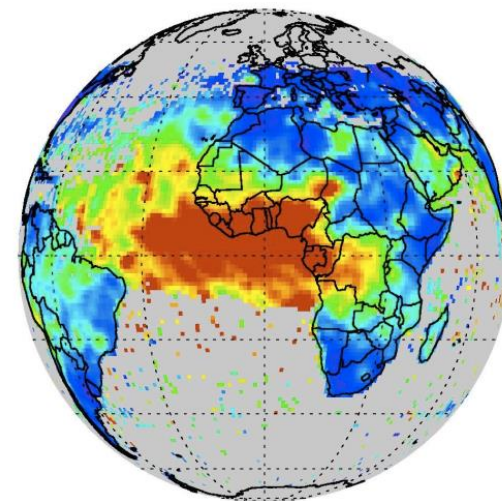
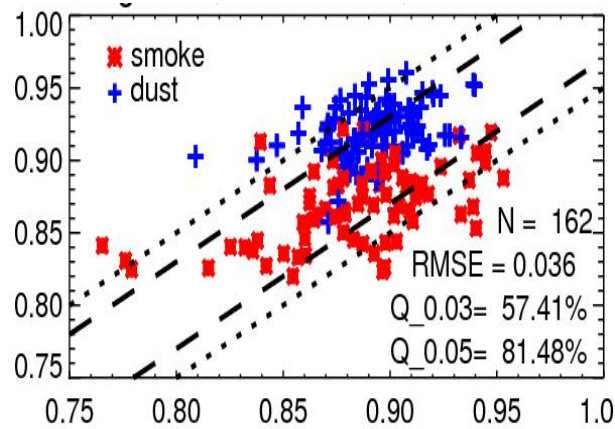
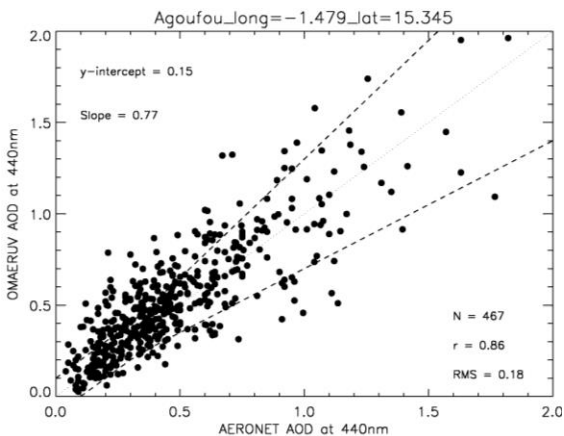


Most comparisons at 380 nm.

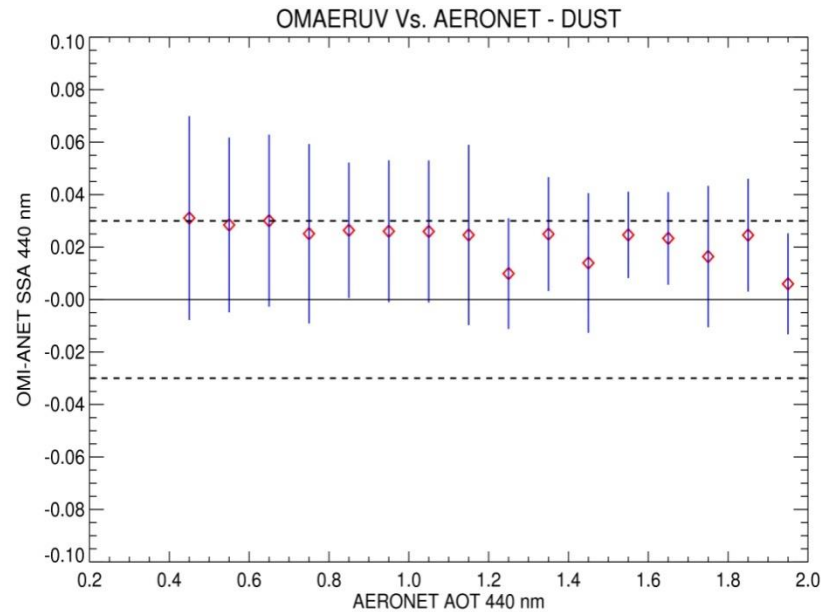
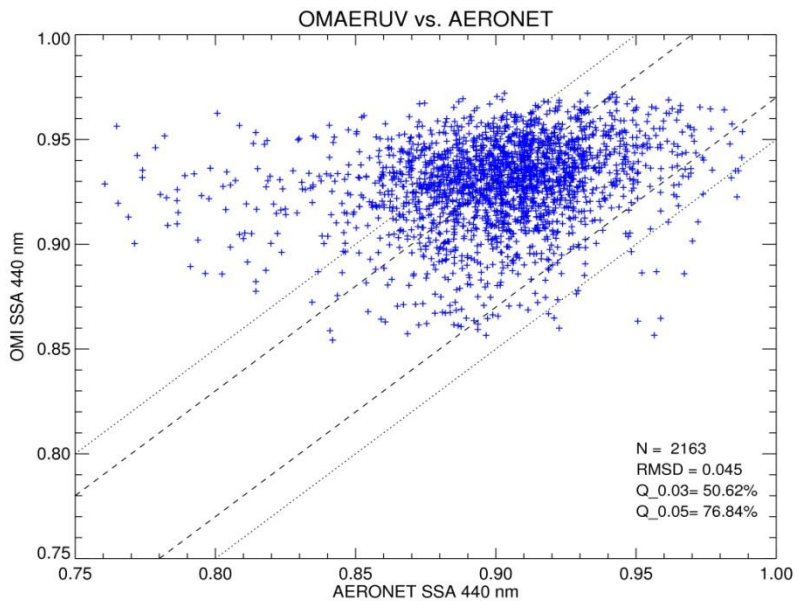
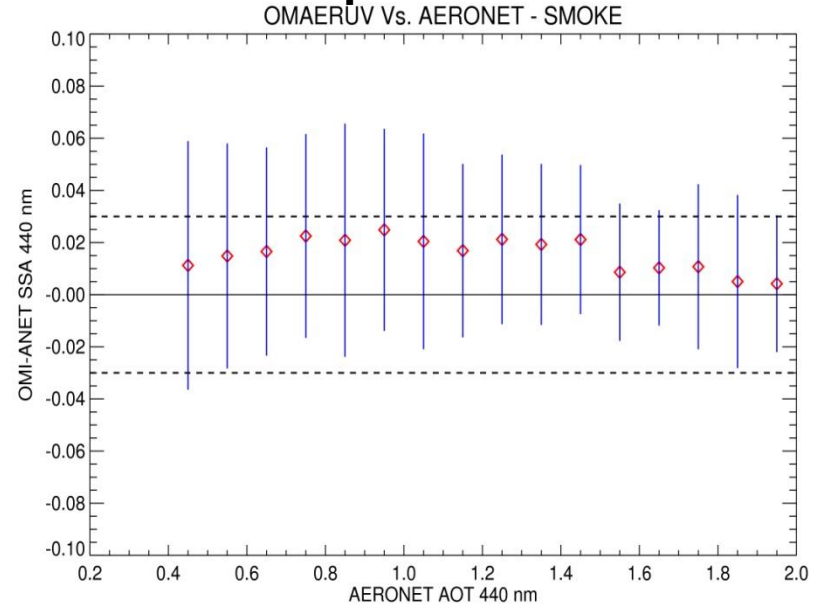
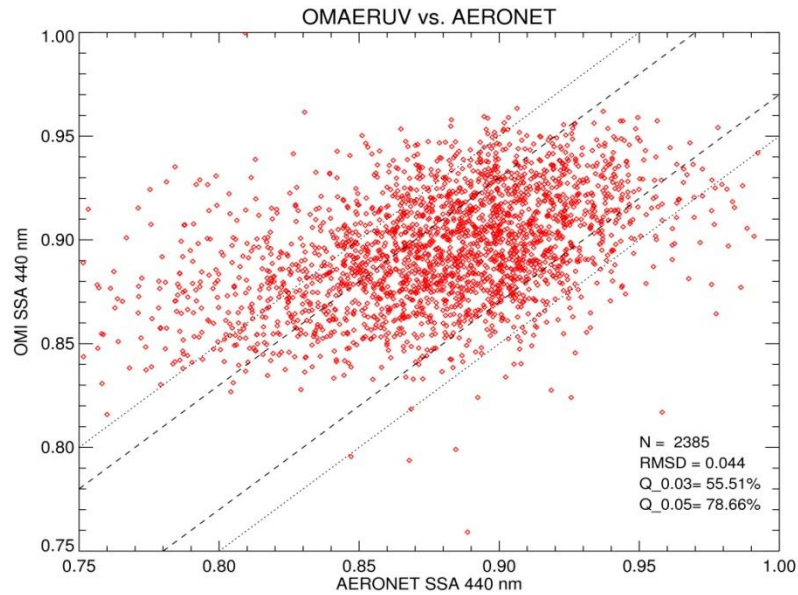
OMI AOD converted to 440 when Aeronet 380 was not available

Q=Percent of total OMI retrievals within 30% of AERONET measurements

Regional Analysis: 4-year average



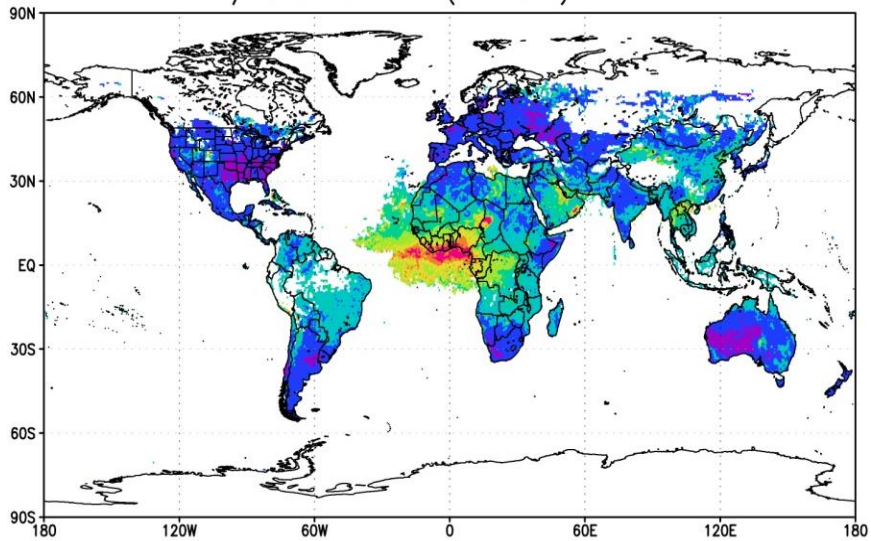
Global OMAERUV-AERONET SSA Comparison



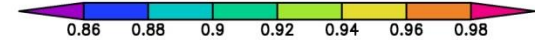
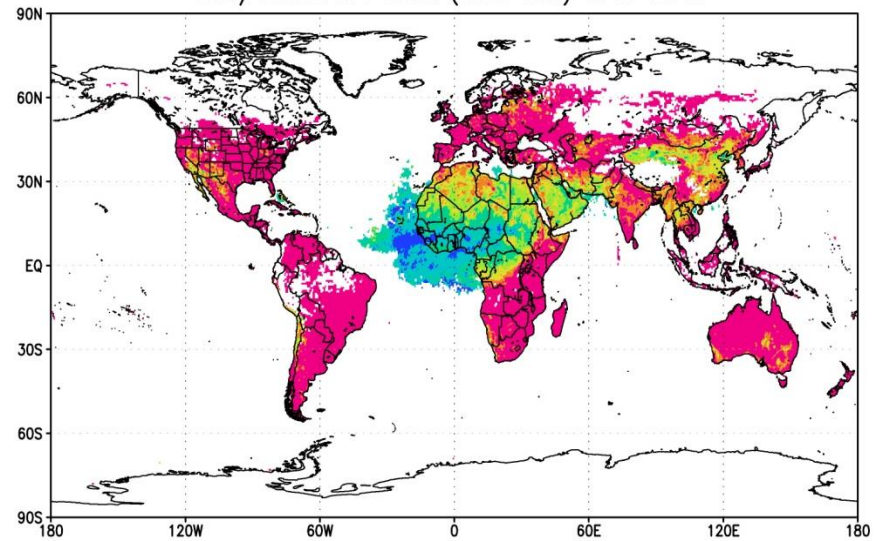
- OMAERUV higher than AERONET (within 0.03)
- Differences are smaller at large AOD's

2007 Seasonal Climatology: Winter

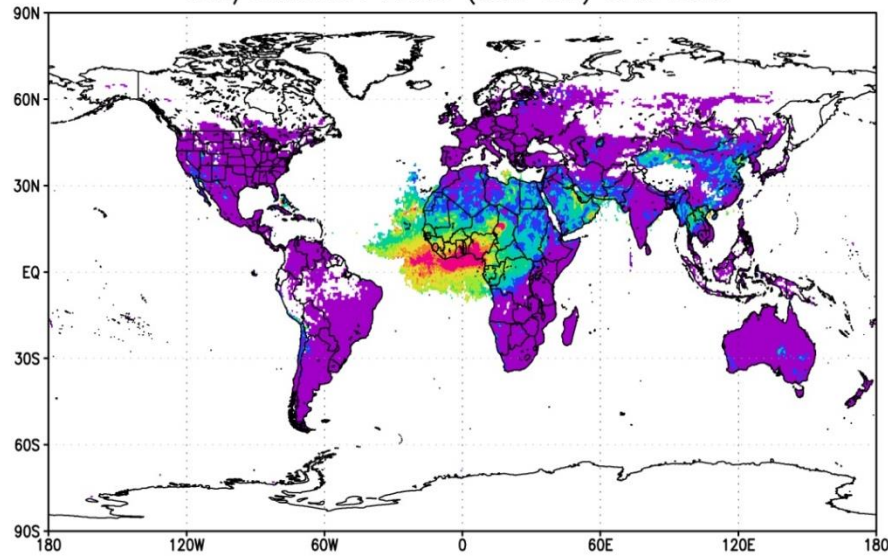
OMI/OMAERUV AOD (388 nm) JFM 2007



OMI/OMAERUV SSA (388 nm) JFM 2007

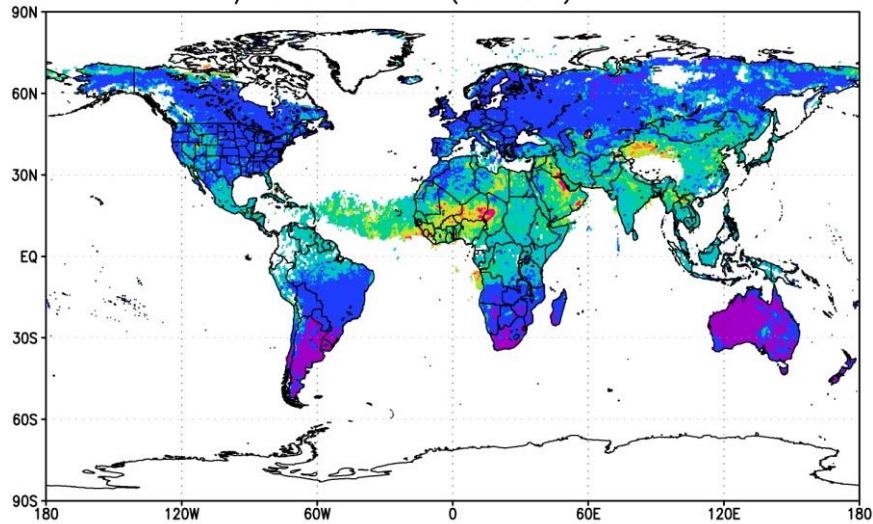


OMI/OMAERUV AAOD (388 nm) JFM 2007

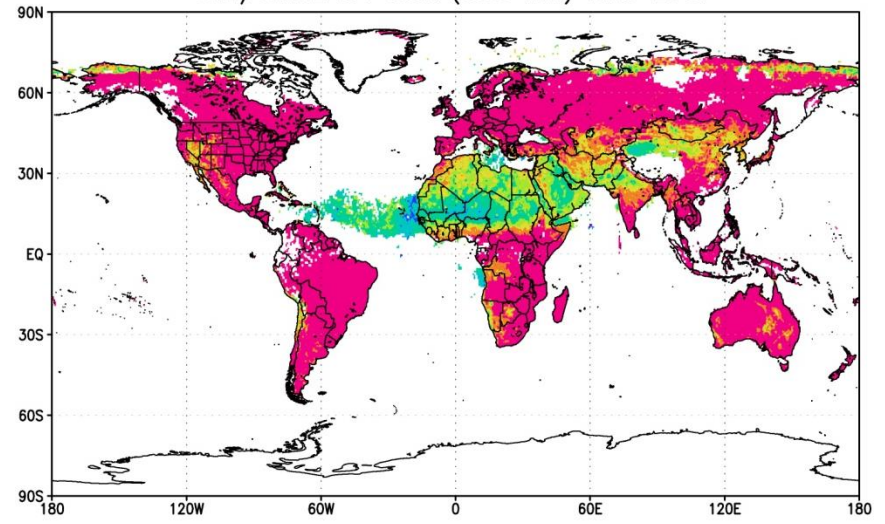


2007 Seasonal Climatology: Spring

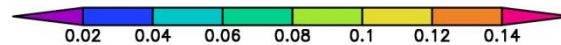
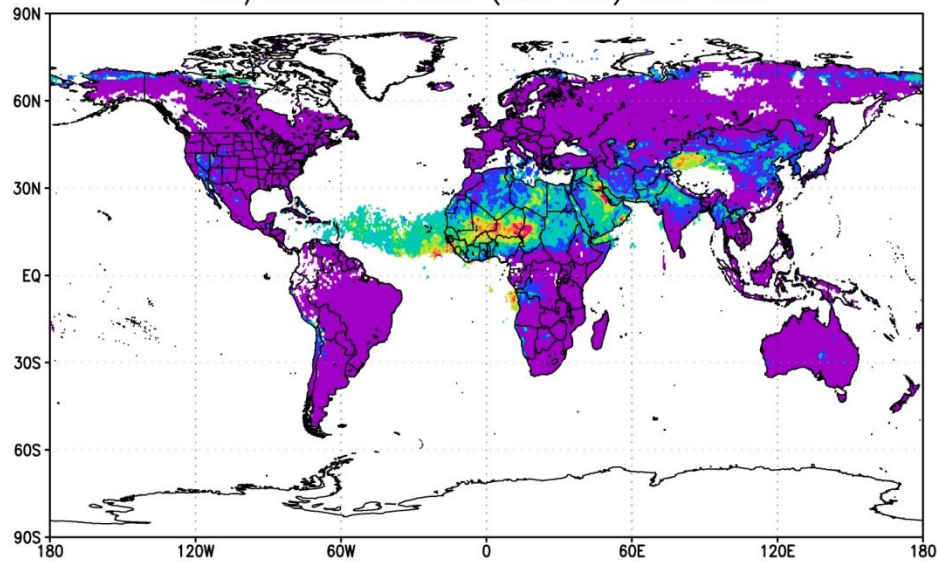
OMI/OMAERUV AOD (388 nm) AMJ 2007



OMI/OMAERUV SSA (388 nm) AMJ 2007

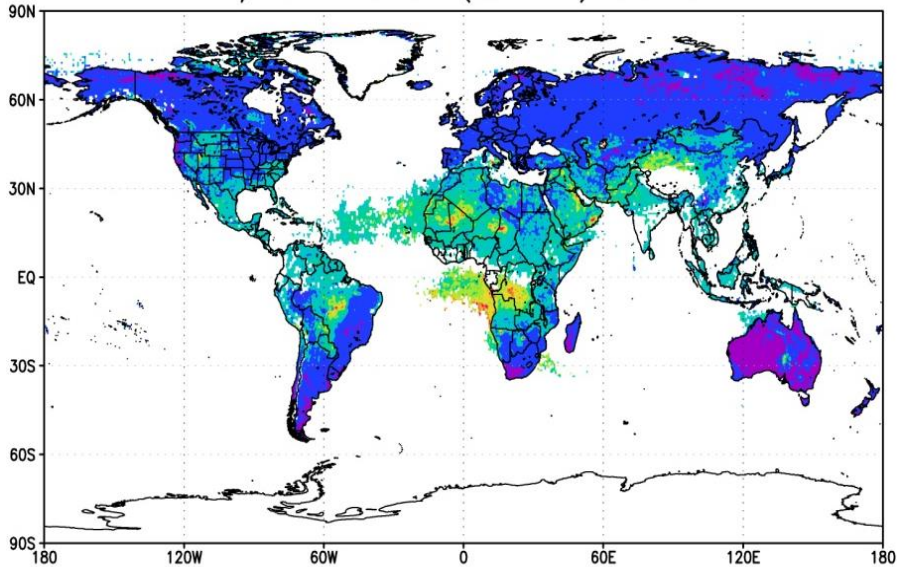


OMI/OMAERUV AOD (388 nm) AMJ 2007

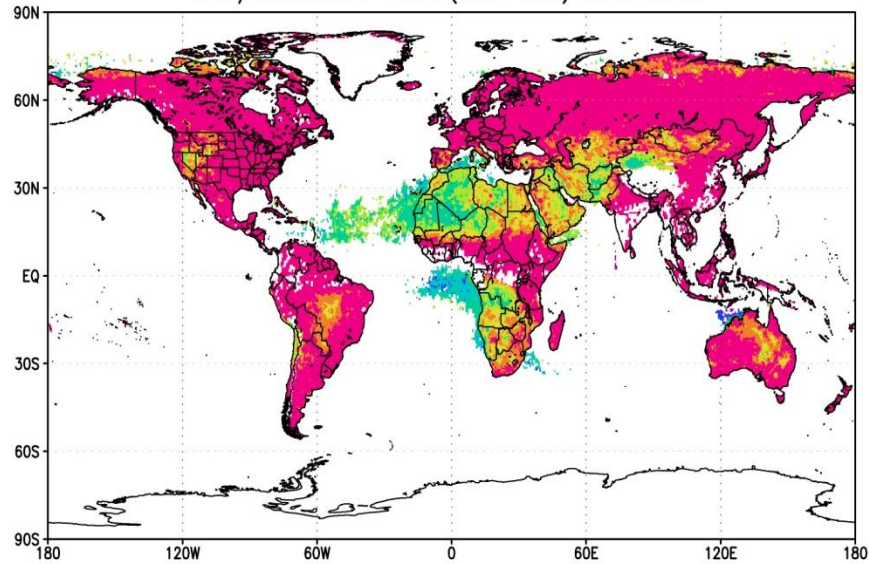


2007 Seasonal Climatology: Summer

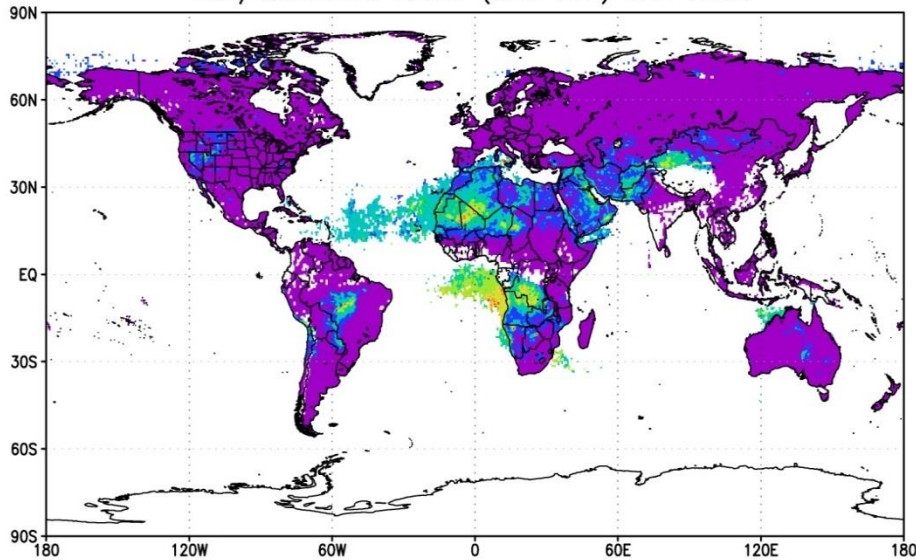
OMI/OMAERUV AOD (388 nm) JAS 2007



OMI/OMAERUV SSA (388 nm) JAS 2007

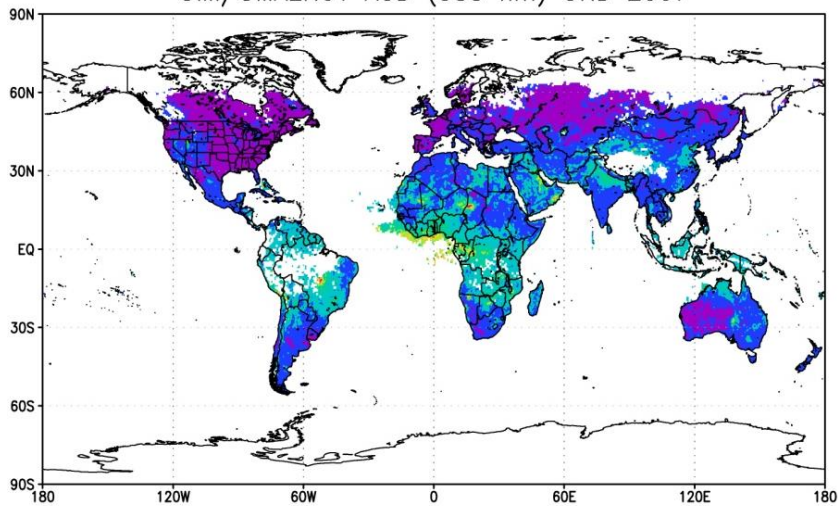


OMI/OMAERUV AAOD (388 nm) JAS 2007

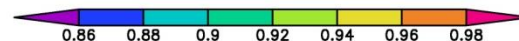
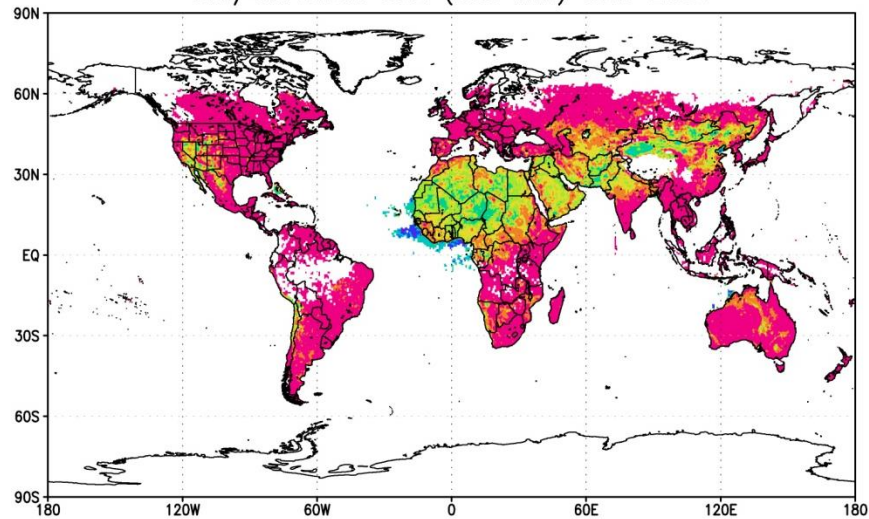


2007 Seasonal Climatology: Autumn

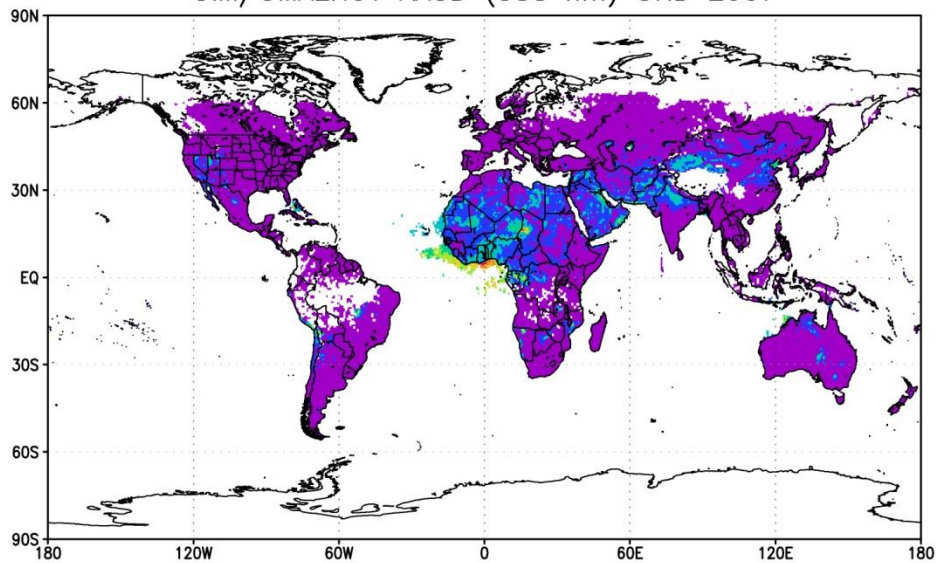
OMI/OMAERUV AOD (388 nm) OND 2007



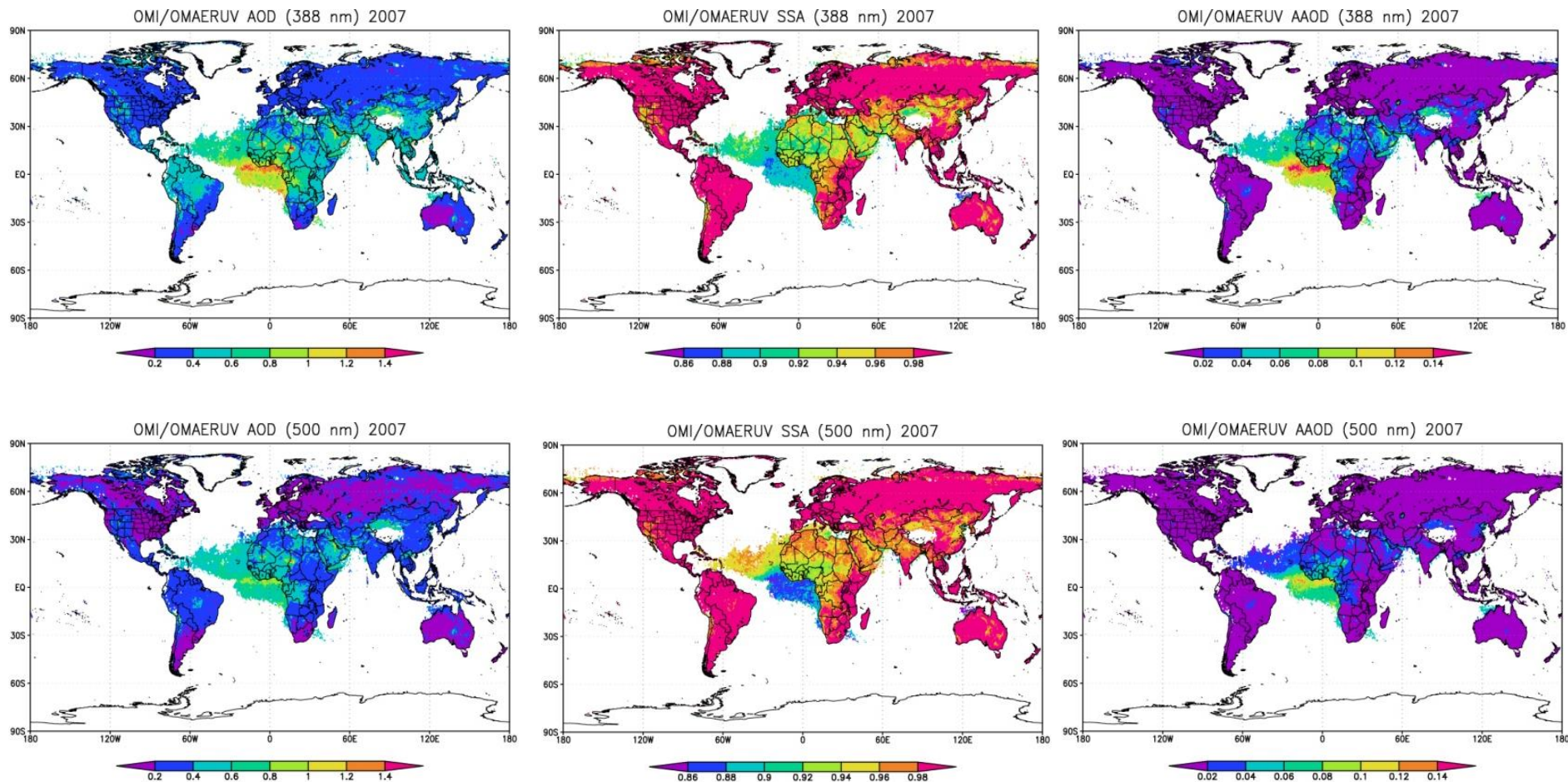
OMI/OMAERUV SSA (388 nm) OND 2007



OMI/OMAERUV AOD (388 nm) OND 2007



388 nm retrieved (top) and 500 nm converted (bottom) products



2007 Annual Averages

Summary

- A multi-year (2005-present) global record of aerosol absorption optical depth and single scattering albedo has been produced from OMI near UV observations.
- OMI SSA retrievals are generally consistent with ground based AERONET observations.
- OMI SSA data is available for evaluation and integration with other satellite and ground based products through AEROSAT.
- OMI SSA data is available from NASA/DAAC