A global Aerosol Absorption Product from OMI Near UV Observations

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AEROSAT – International Satellite Aerosol Science Network
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Ozone Monitoring Instrument (OMI)

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

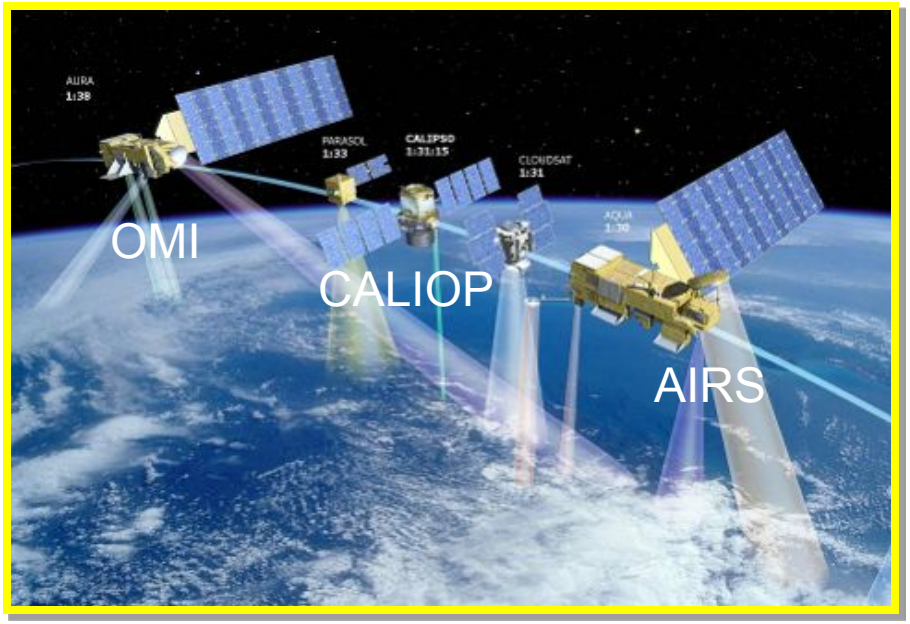
Nadir solar backscatter spectrometer
-270-500 nm

-13X24 km footprint (nadir)

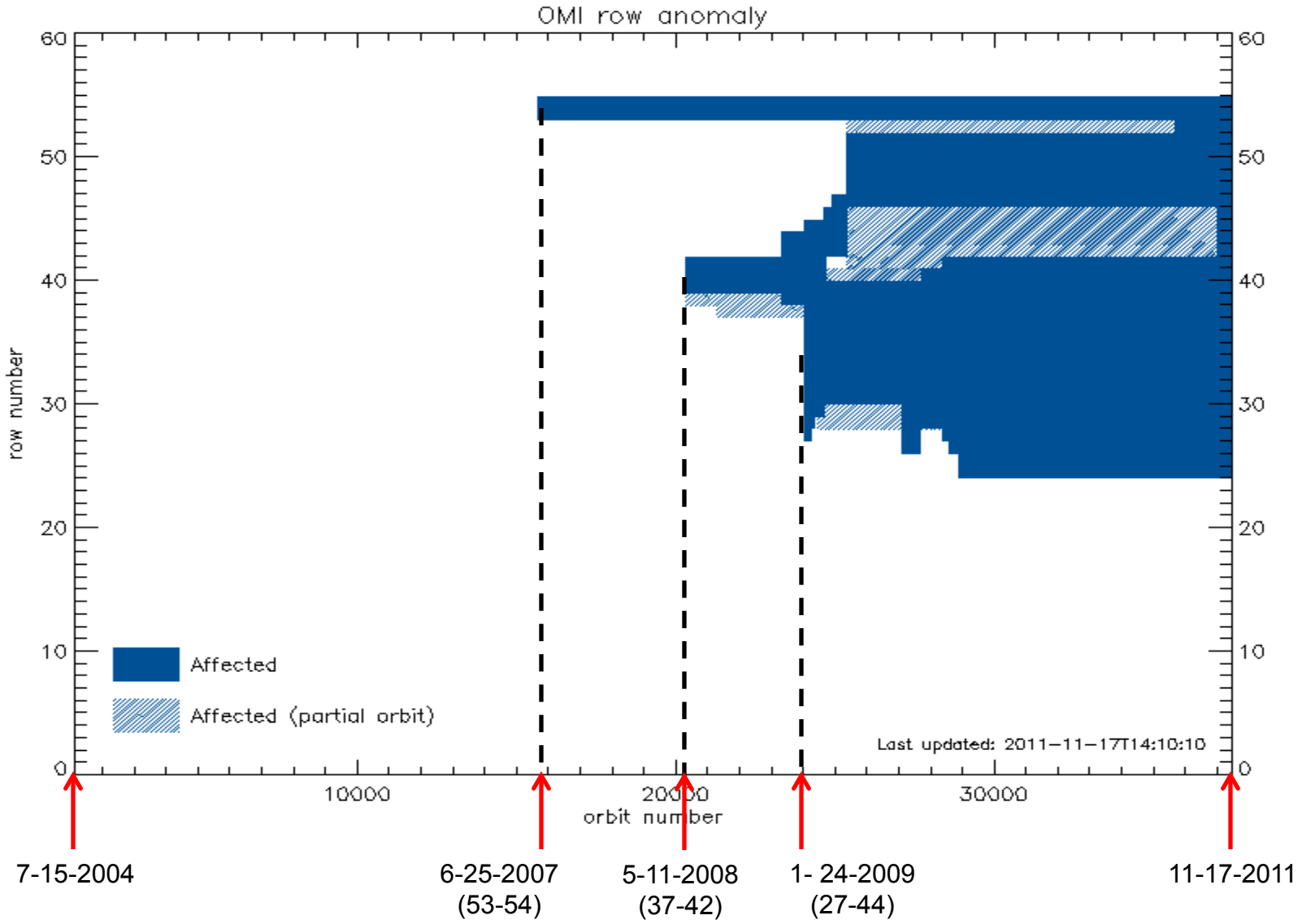
-2600 km swath width (Daily global coverage)

-Products:
-Ozone, N02, 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.

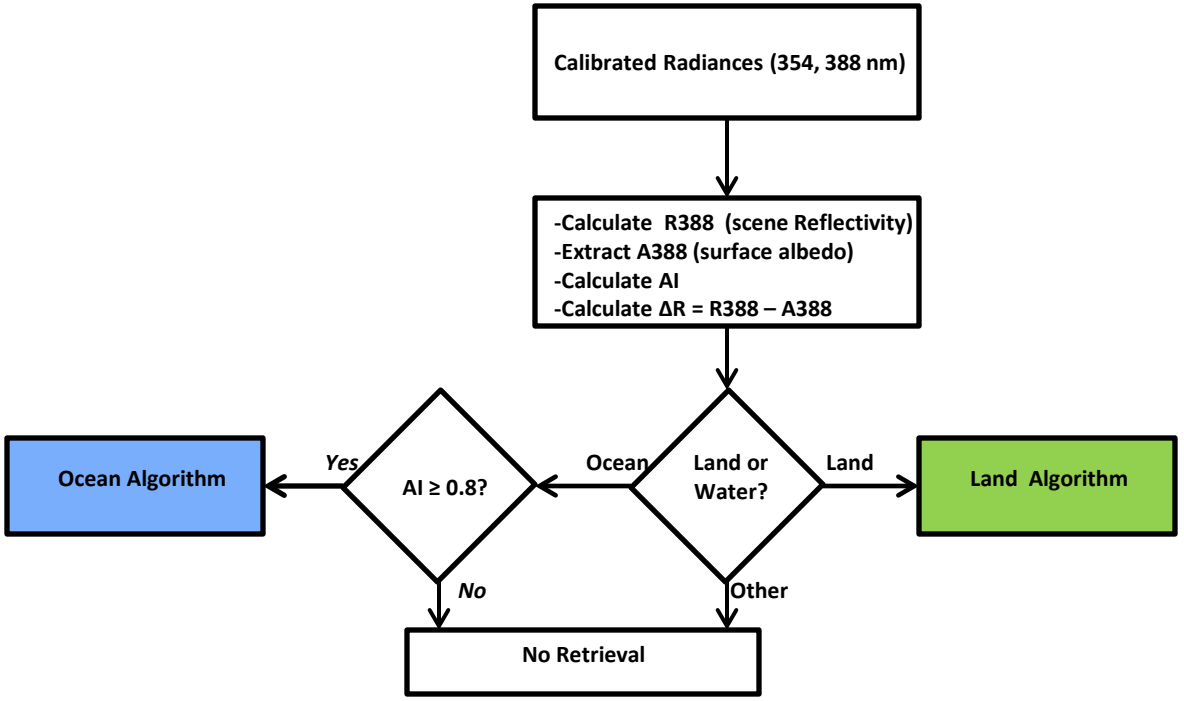
OMAERUV Algorithm

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

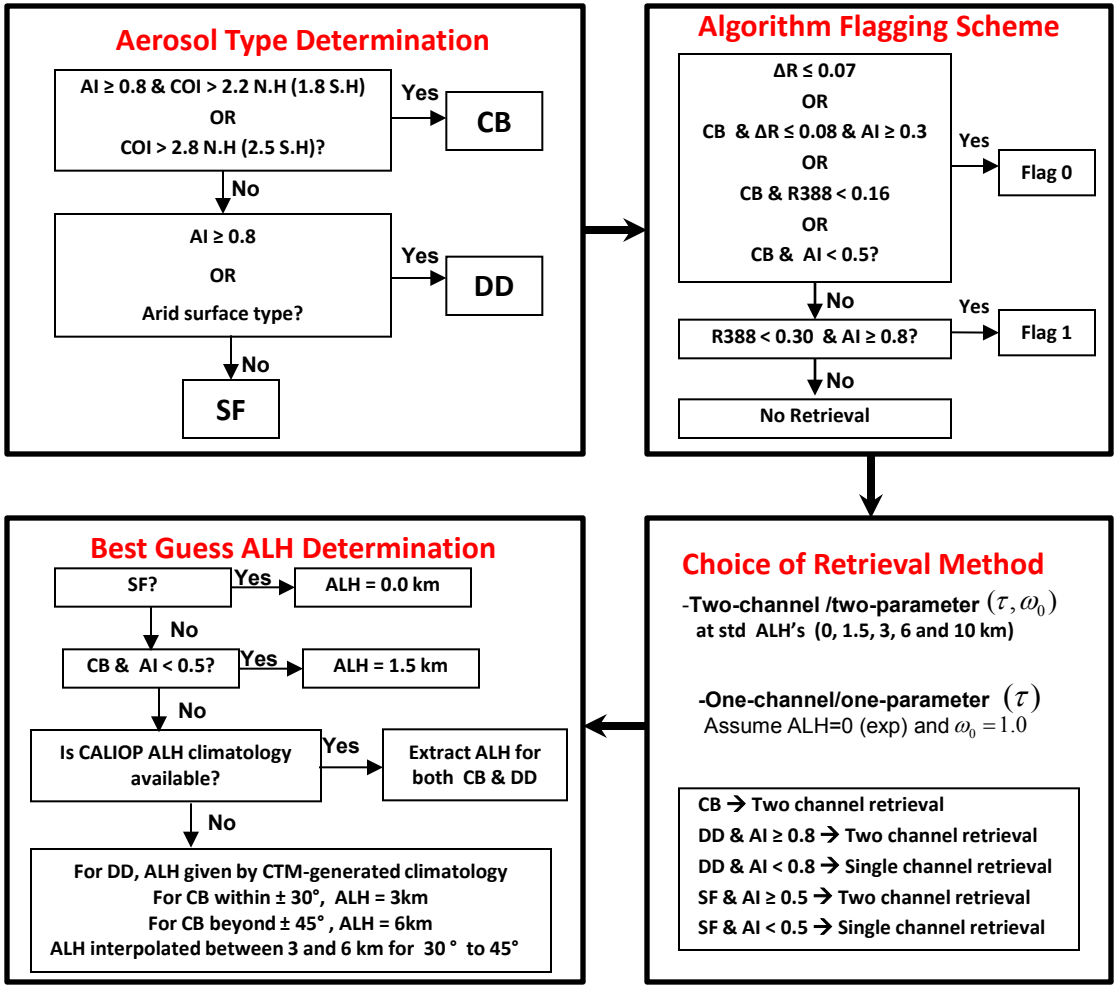


Ocean Algorithm: Absorbing Aerosols (Smoke/Dust) as identified by AI
(Difficulty in Separating Aerosol from Ocean Color Signal) for AI < 0.8

Land Algorithm: All aerosol types regardless of AI considerations.

Torres et al, JAS, 2007

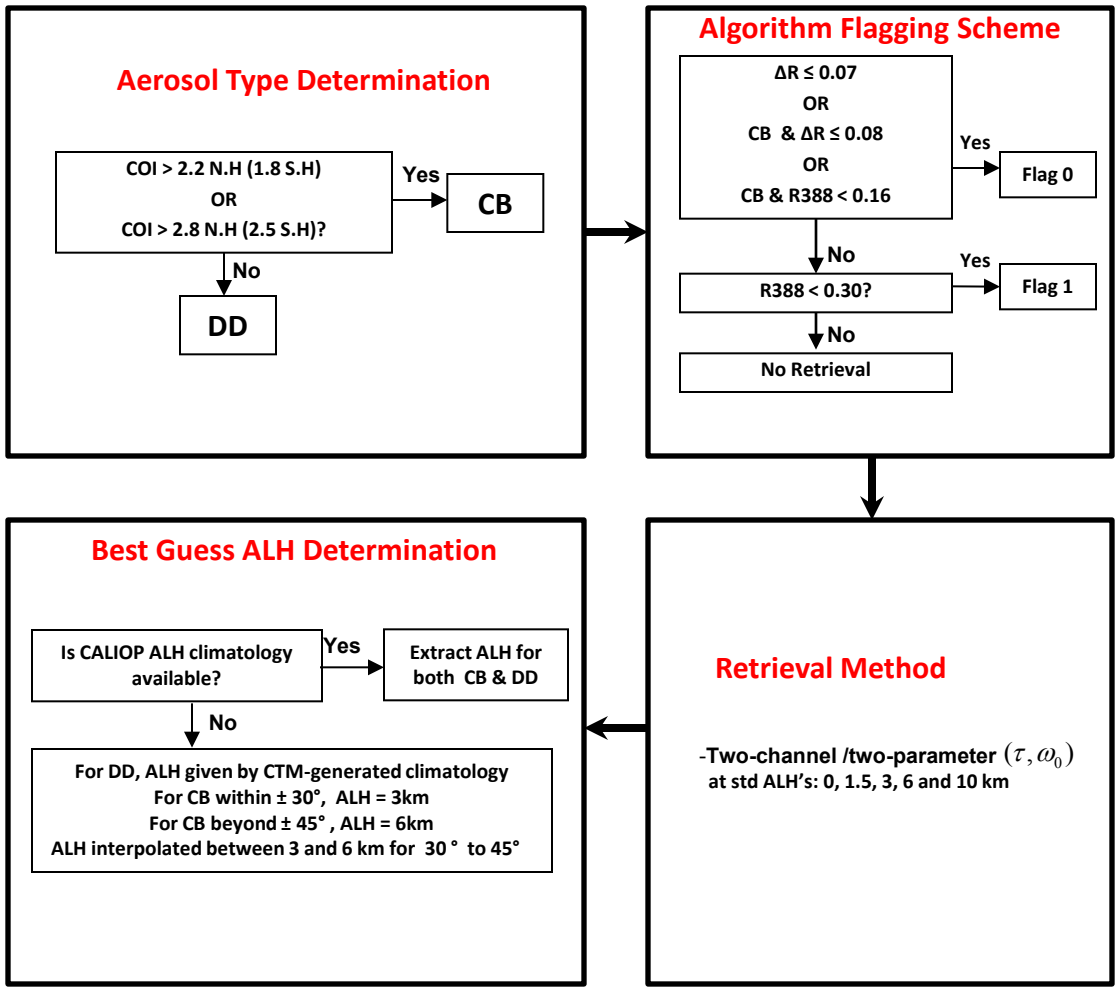
OMAERUV Land Algorithm



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



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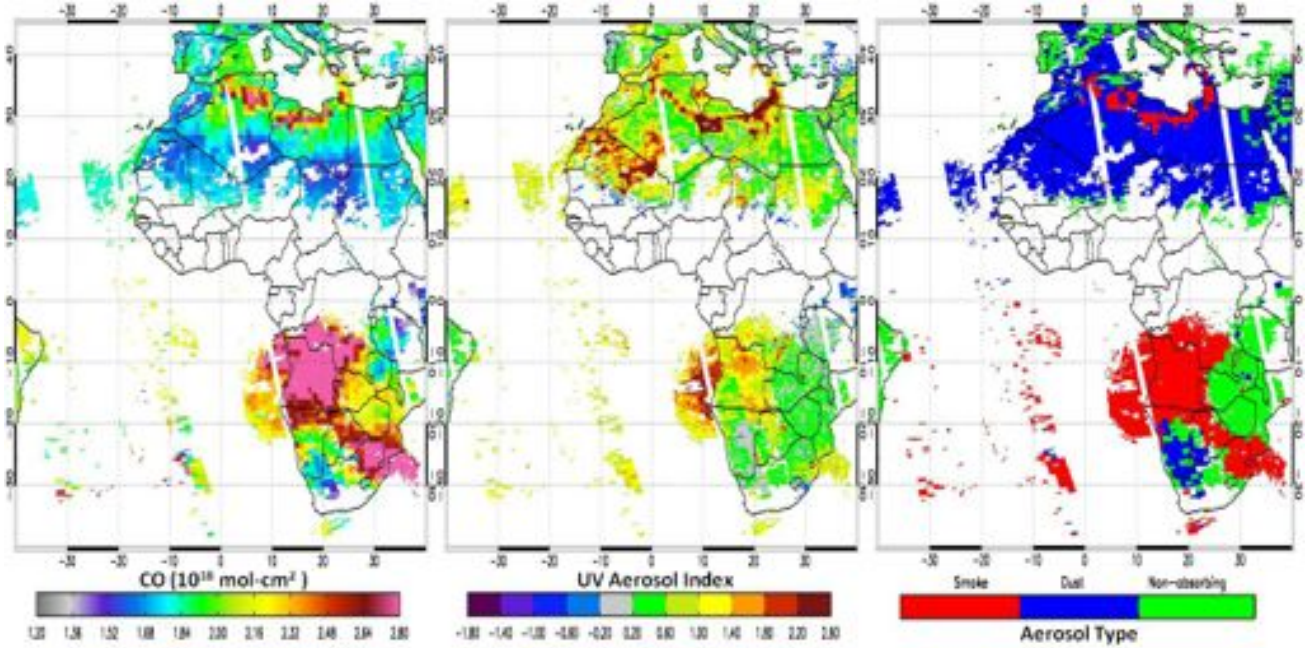
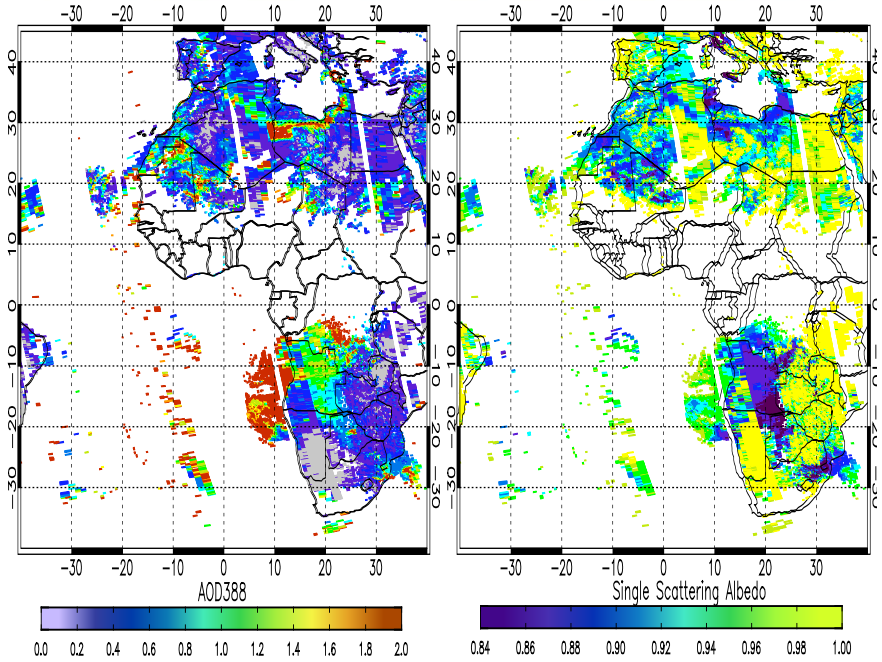
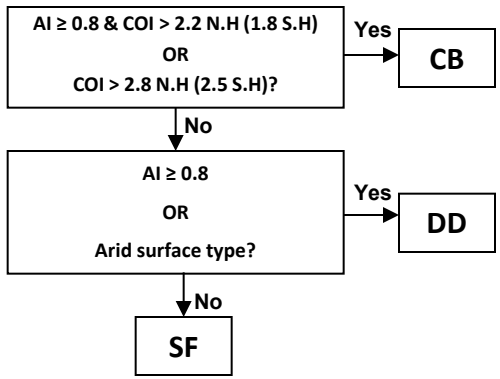
Aerosol Type Determination





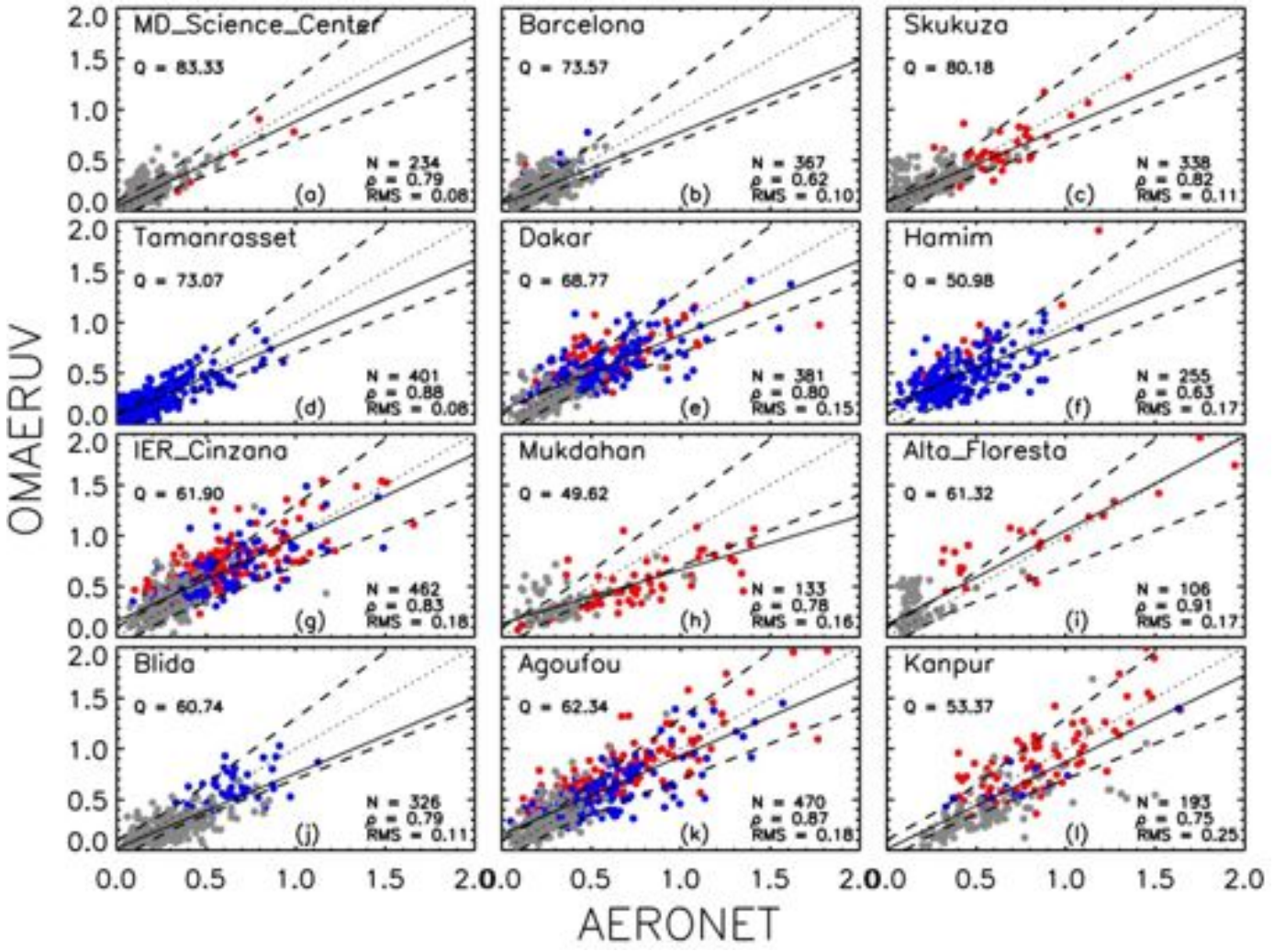
Combined use of CO and AI for Dust / Smoke Separation



Greece Fires plume, August 27, 2007

Torres et al, AMTD, 2013

AOD Validation (2005-2008)

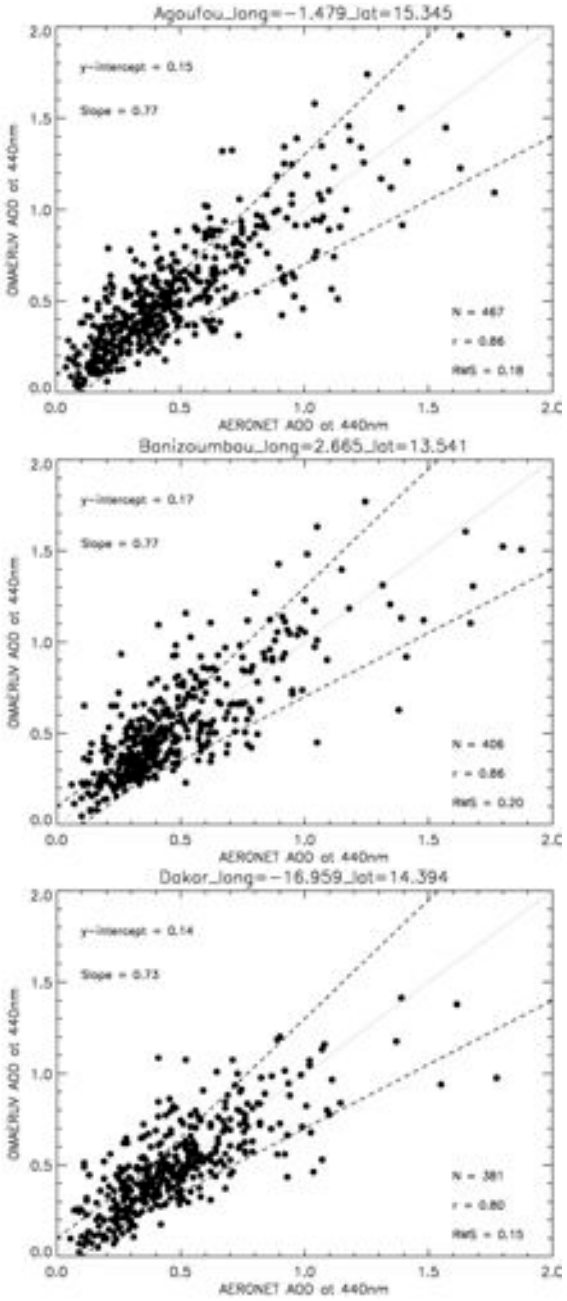


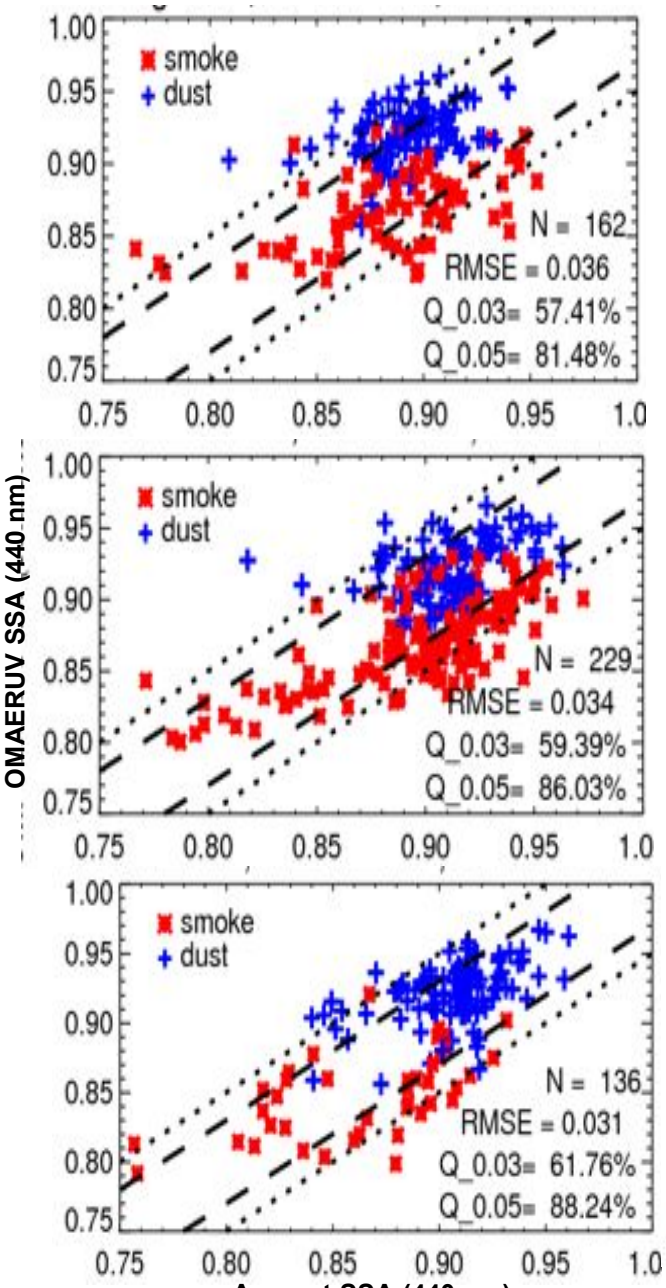
Red: Carbonaceous **Blue: Desert Dust** **Gray: Sulfate**

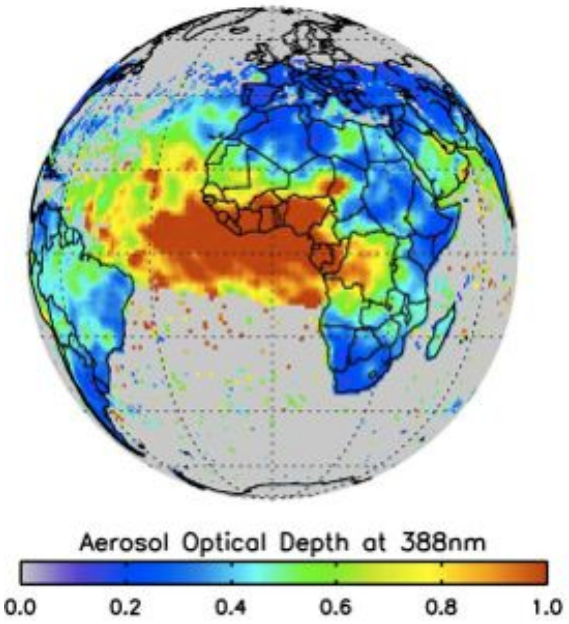
Most comparisons at 380 nm.
OMI AOD converted to 440 when Aeronet 380 was not available
Q=Percent of total OMI retrievals within 30% of AERONET measurements

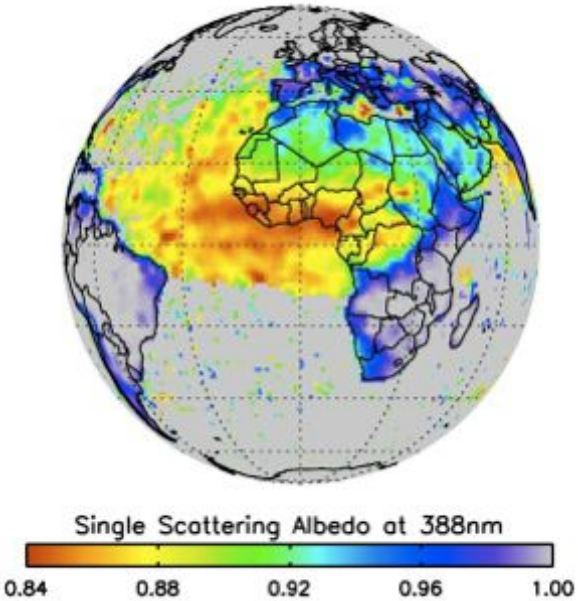
Ahn et al.,2013, JGR, in review

Regional Analysis: 4-year average

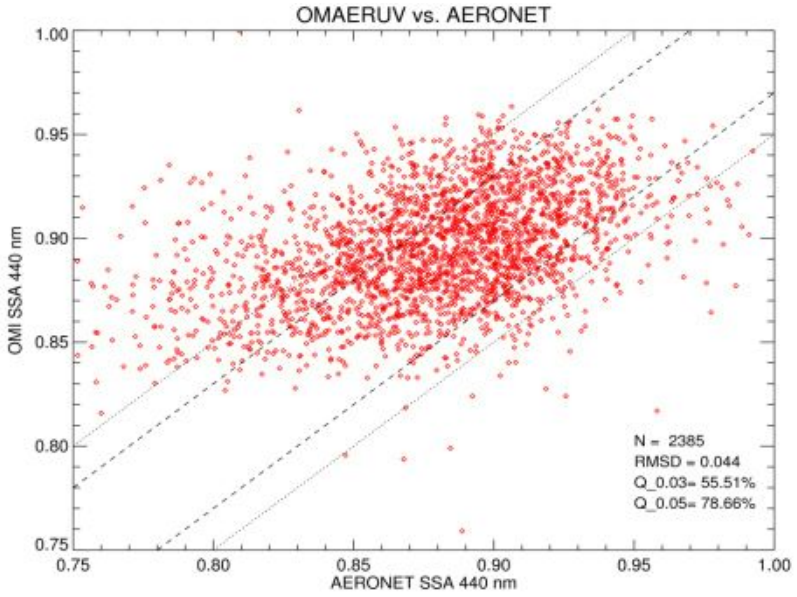


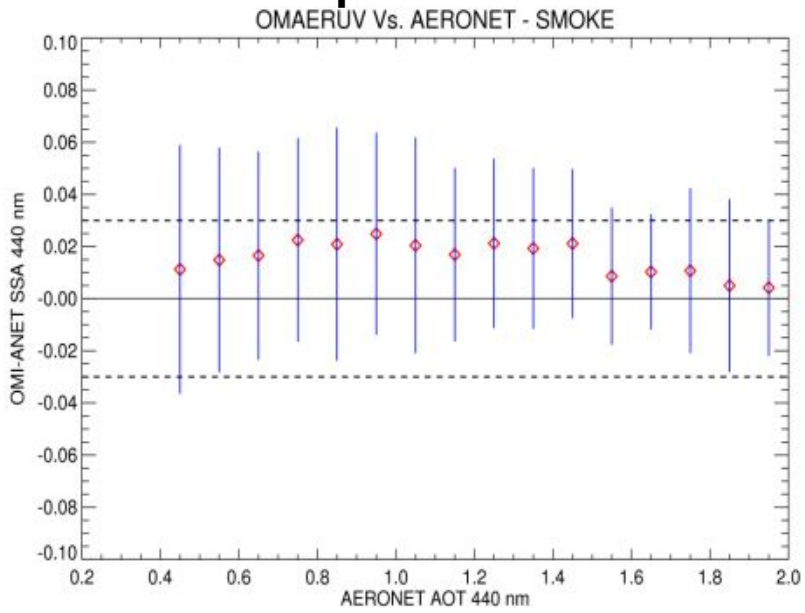


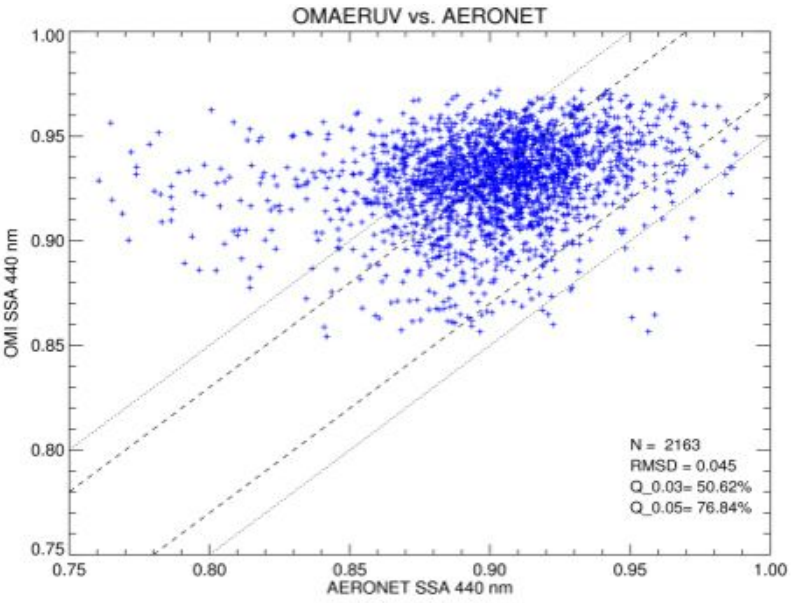


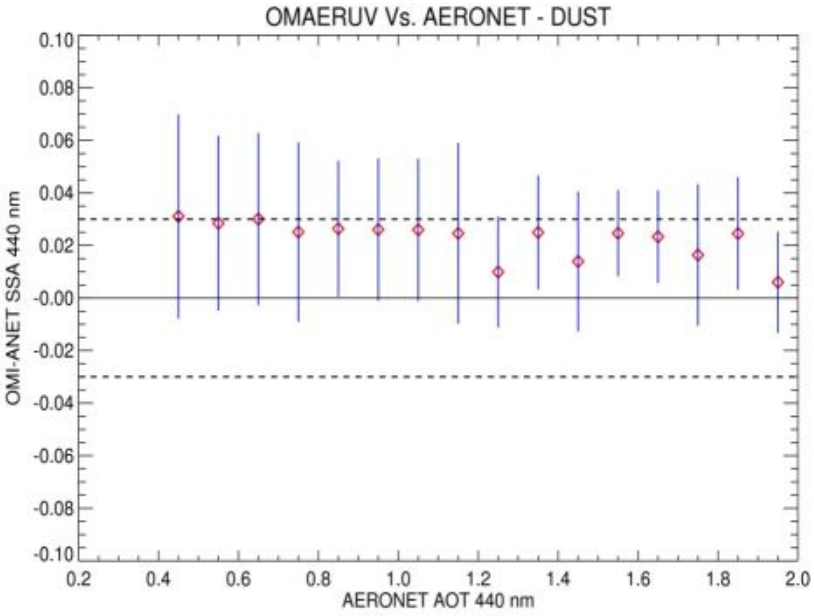


Global OMAERUV-AERONET SSA Comparison





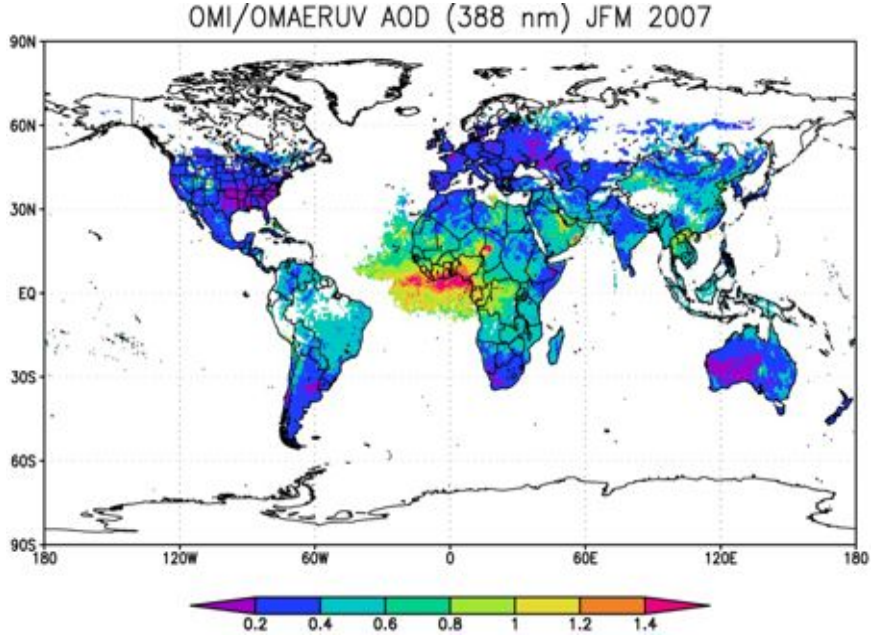


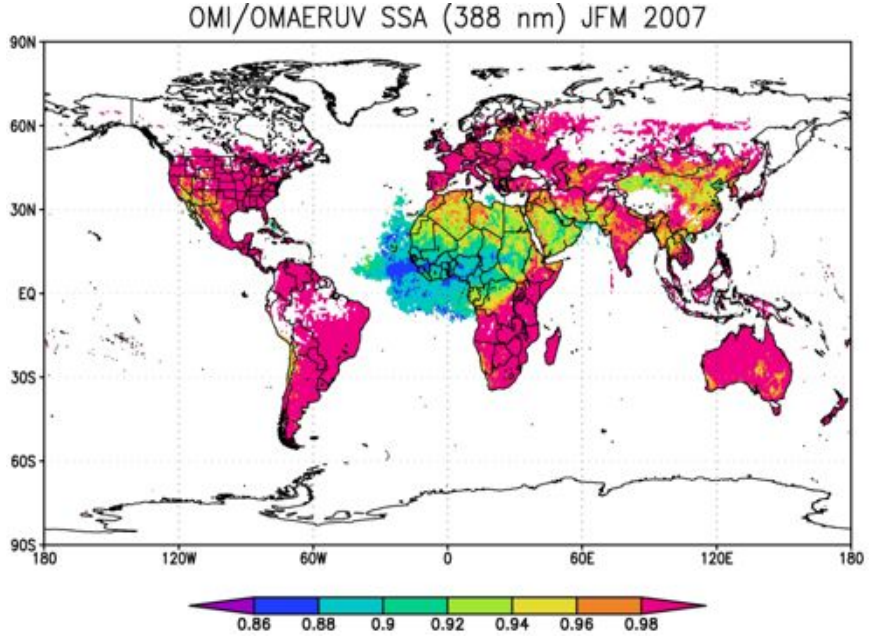


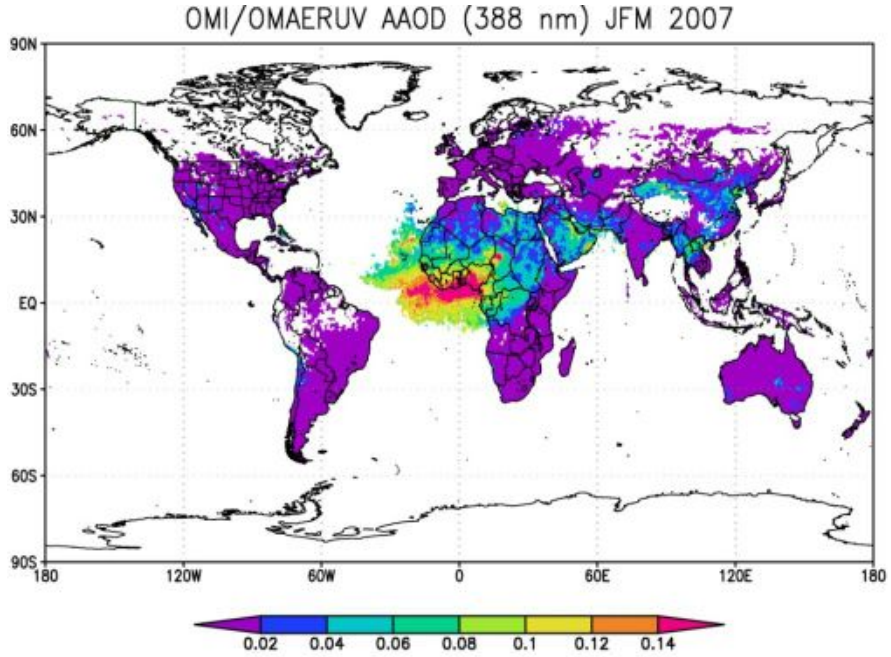
-OMAERUV higher than AERONET (within 0.03)
-Differences are smaller at large AOD's

Jethva et al., 2013, JGR, in review

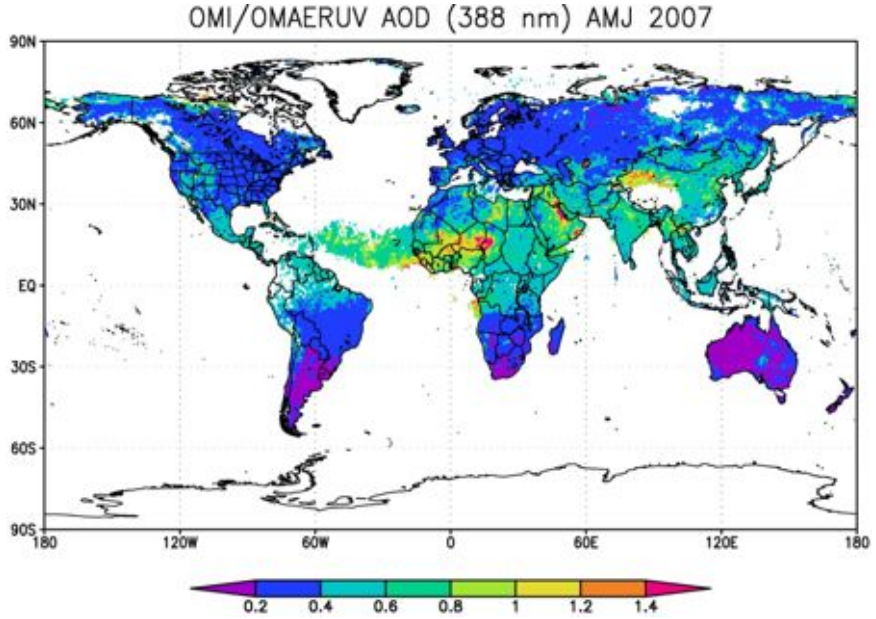
2007 Seasonal Climatology: Winter

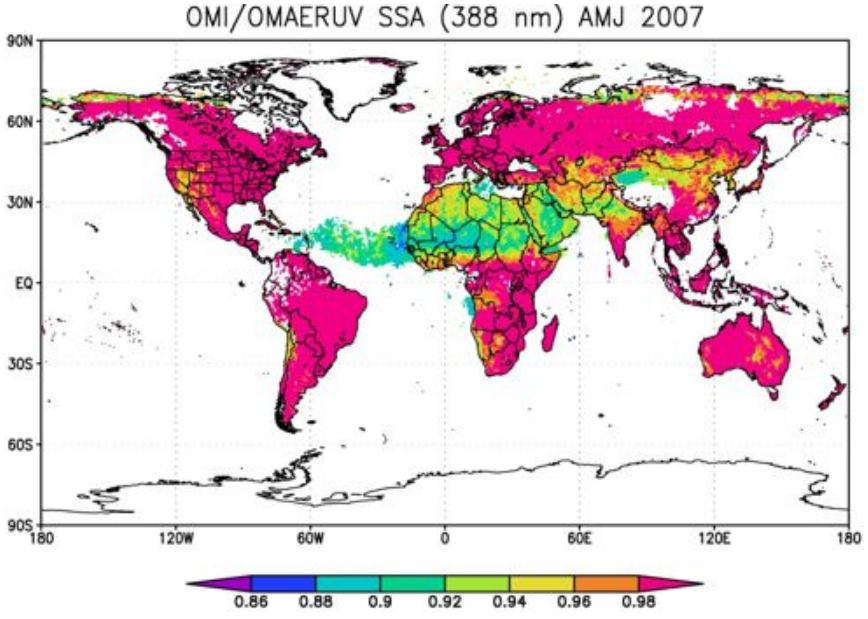


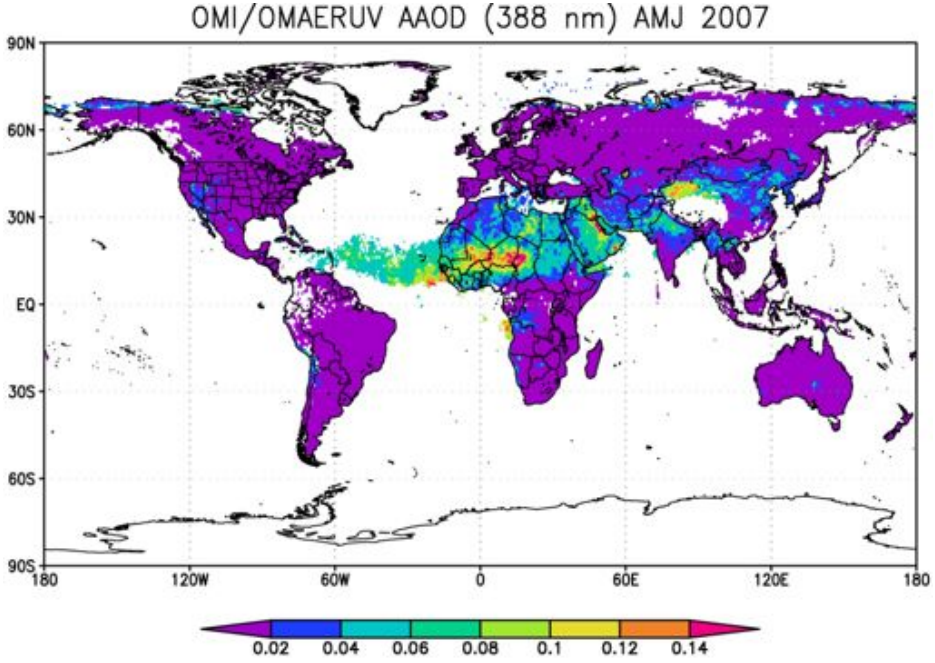




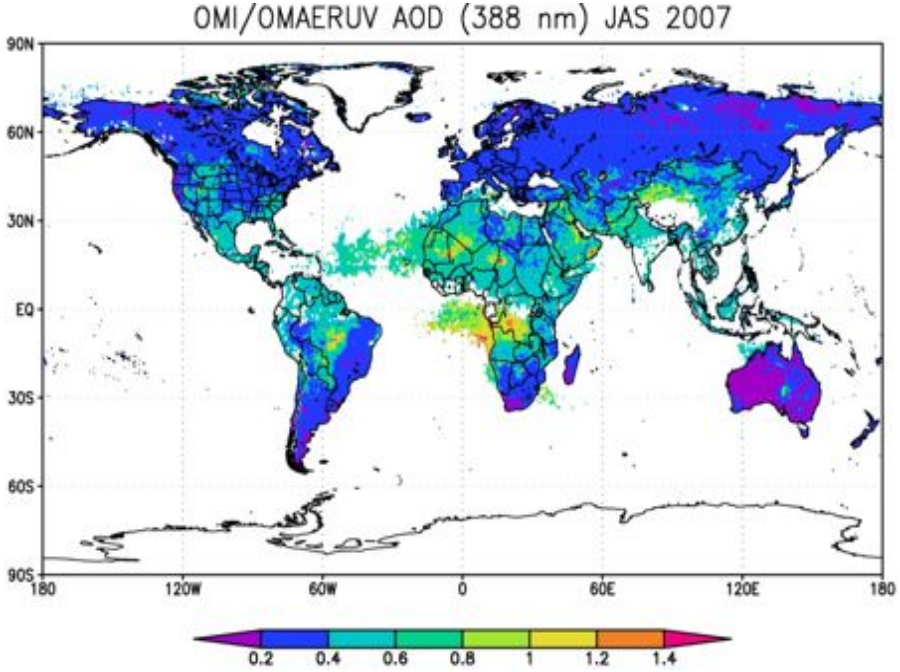
2007 Seasonal Climatology: Spring

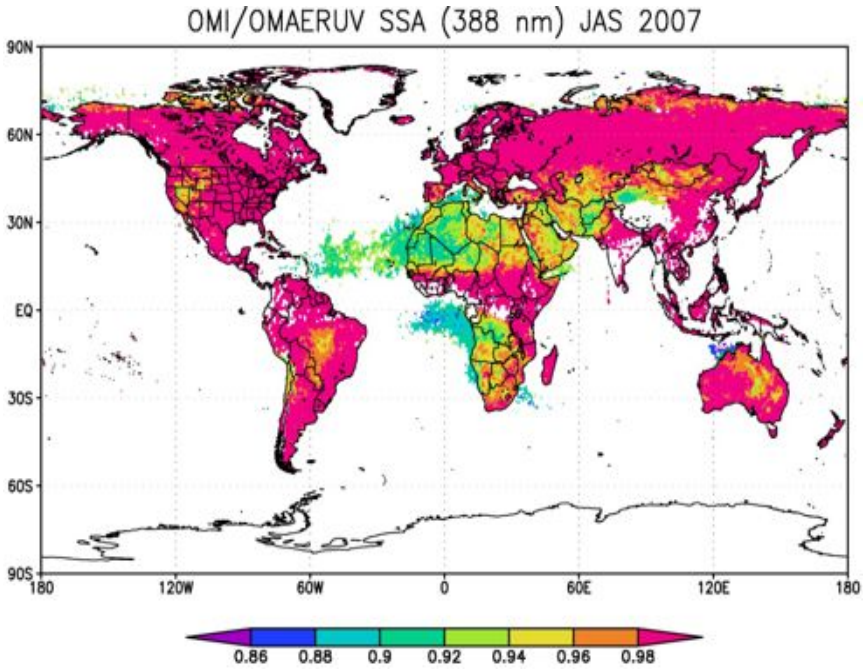


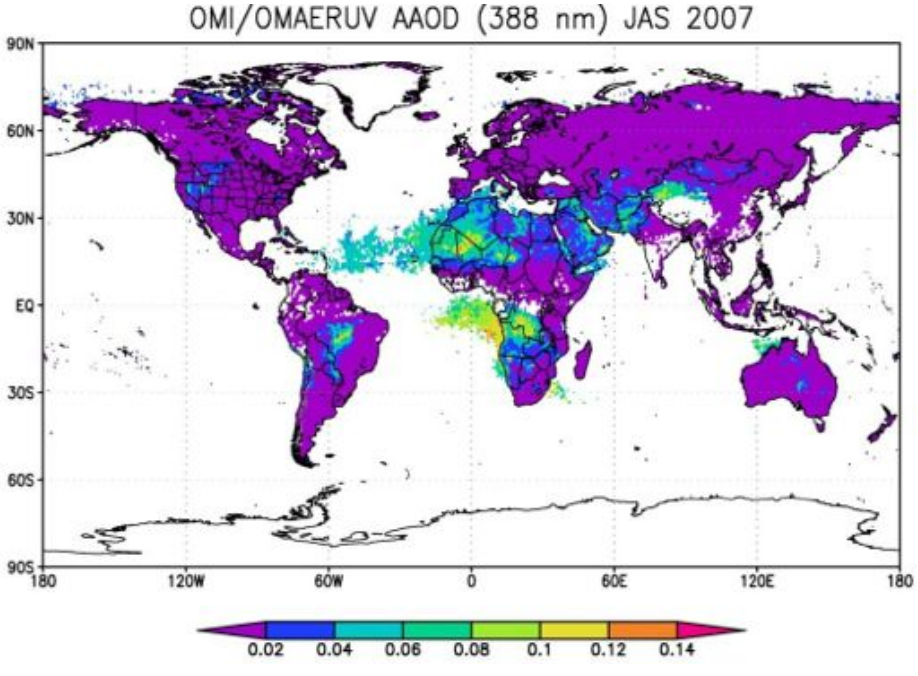




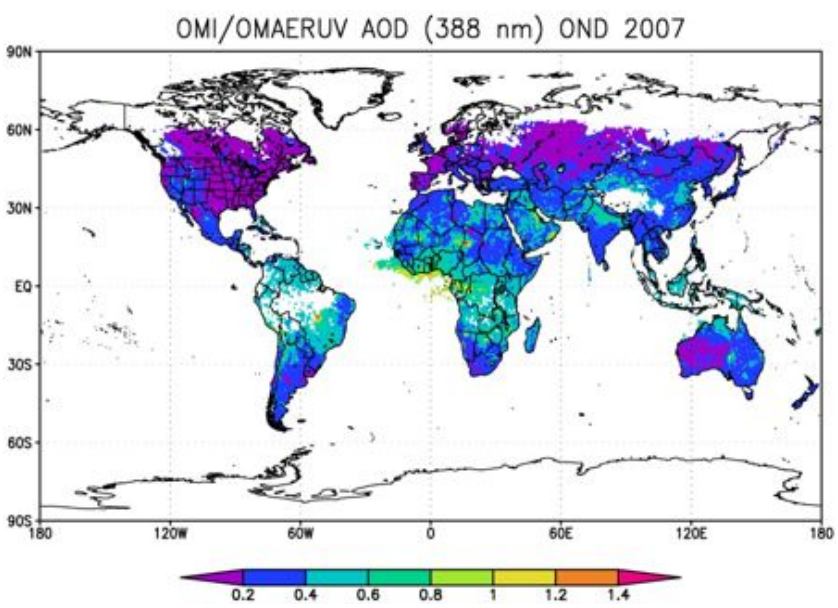
2007 Seasonal Climatology: Summer

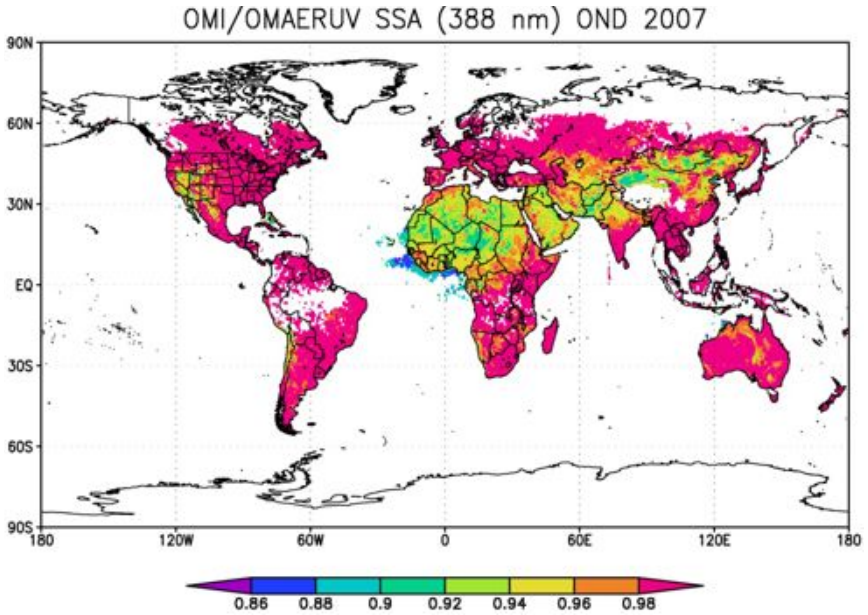


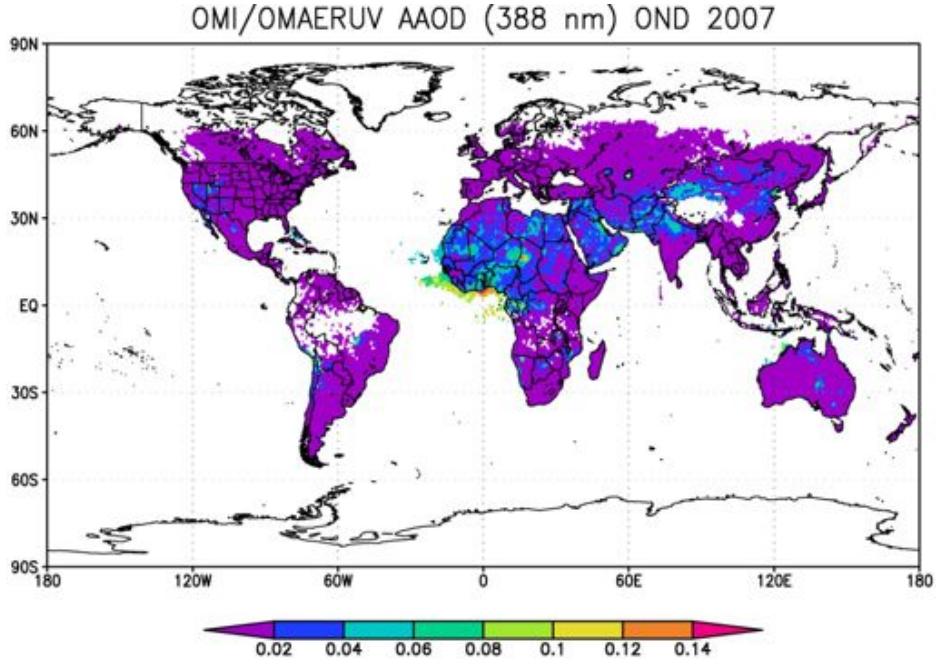




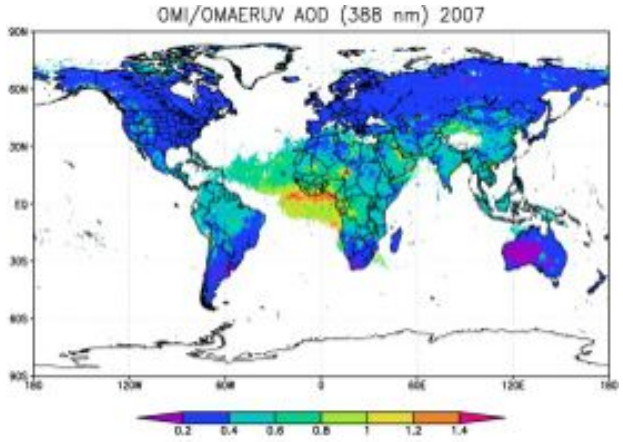
2007 Seasonal Climatology: Autumn

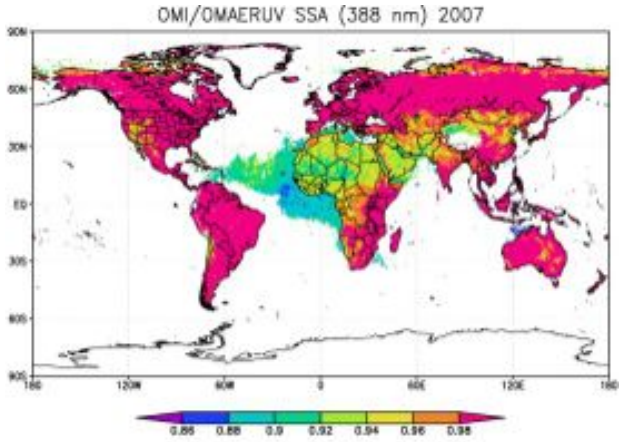


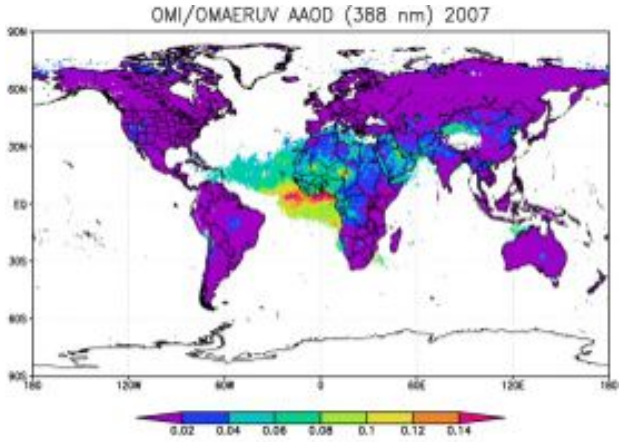


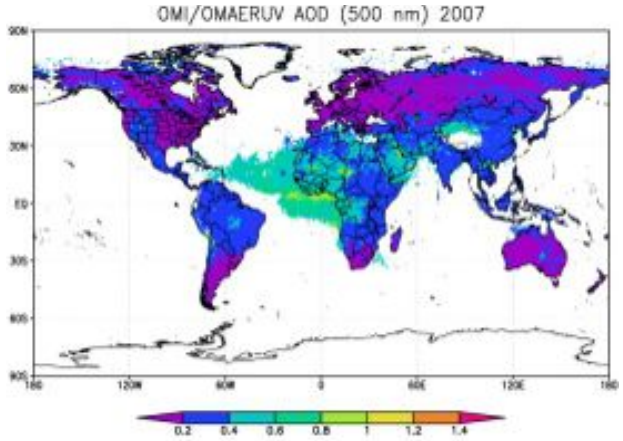


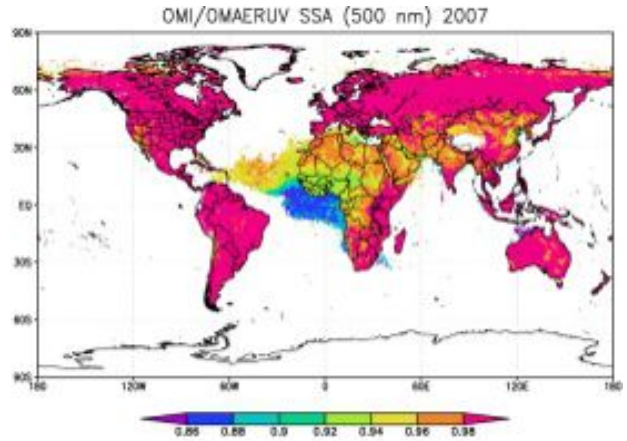
388 nm retrieved (top) and 500 nm converted (bottom) products

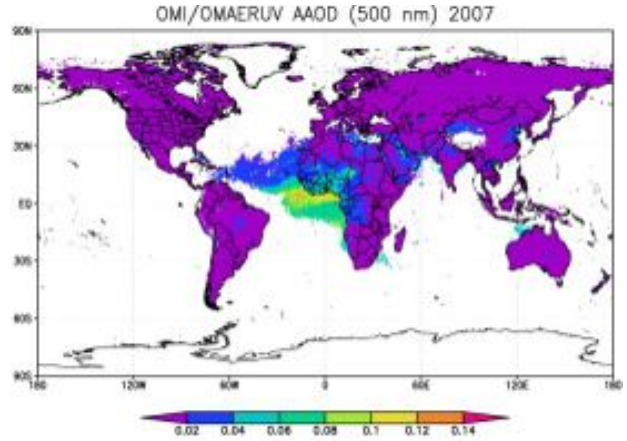












2007 Annual Averages

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