## 2014 EOS Aura Science Team Meeting

# Aerosol Remote Sensing from OMI Observations: An Overview

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# OMI Near-UV Aerosol Algorithm (OMAERUV)

**Purpose:** Retrieval of Aerosol Single Scattering Albedo and Absorption Optical Depth

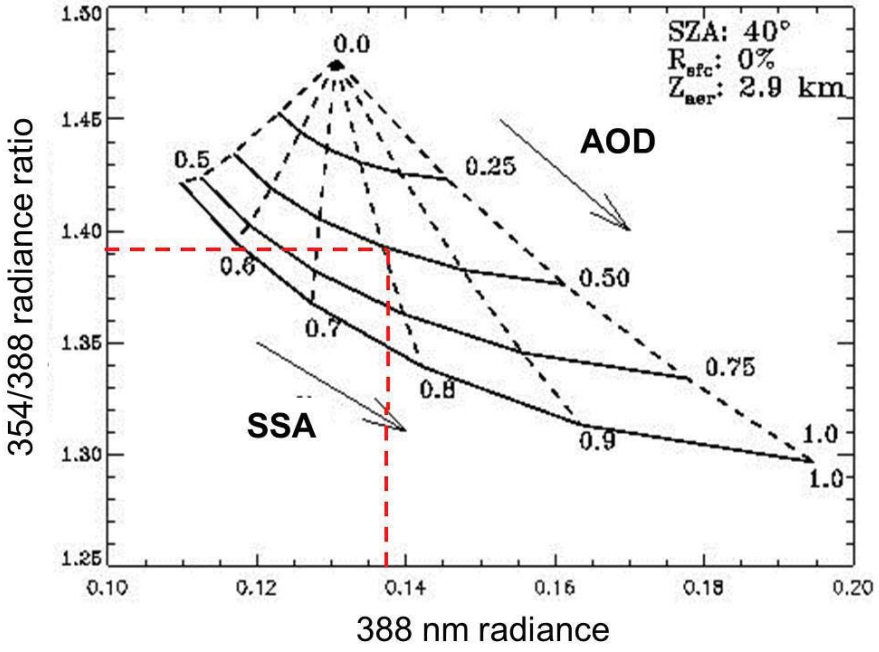
**Measurements:** Radiances at 354 and 388 nm.

**Physical Basis:** Radiative interaction between particle absorption and molecular scattering in the UV.

*In spite the sensor's coarse resolution for aerosol retrieval, valuable information on particle absorption can be derived from OMI near UV observations*.

**Retrieval Products:**
-AOD and SSA (388 nm)
-Absorbing Aerosol Index

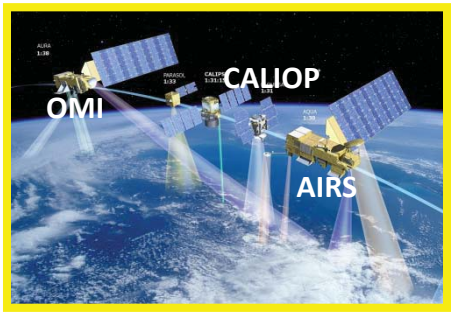
**Inversion Scheme:**
For a given aerosol type and ALH, satellite measured radiances at 354 and 388 nm are associated with a set of AOD and SSA values.

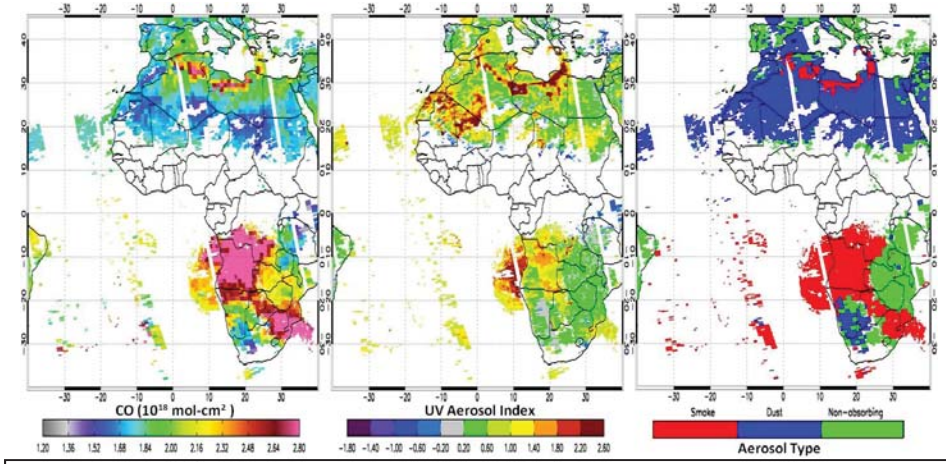



*Torres, O. et al., Aerosols and Surface UV Products from OMI Observations: An Overview, J. Geophys. Res., 112, D24S47, doi:10.1029/2007JD008809, 2007*

# Combined use of OMI, CALIOP and AIRS observations in OMAERUV Aerosol Retrieval

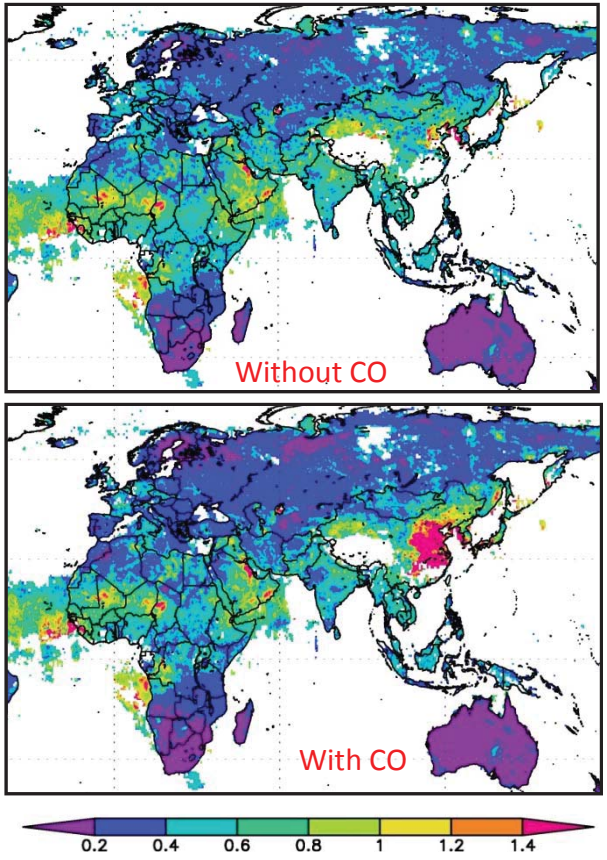
OMAERUV uses a CALIOP-based Aerosol Layer Height Climatology and real-time AIRS carbon monoxide data for aerosol type identification [Torres et al., 2013]




*The combined use of AI and CO allows the identification of smoke layers over arid areas.*

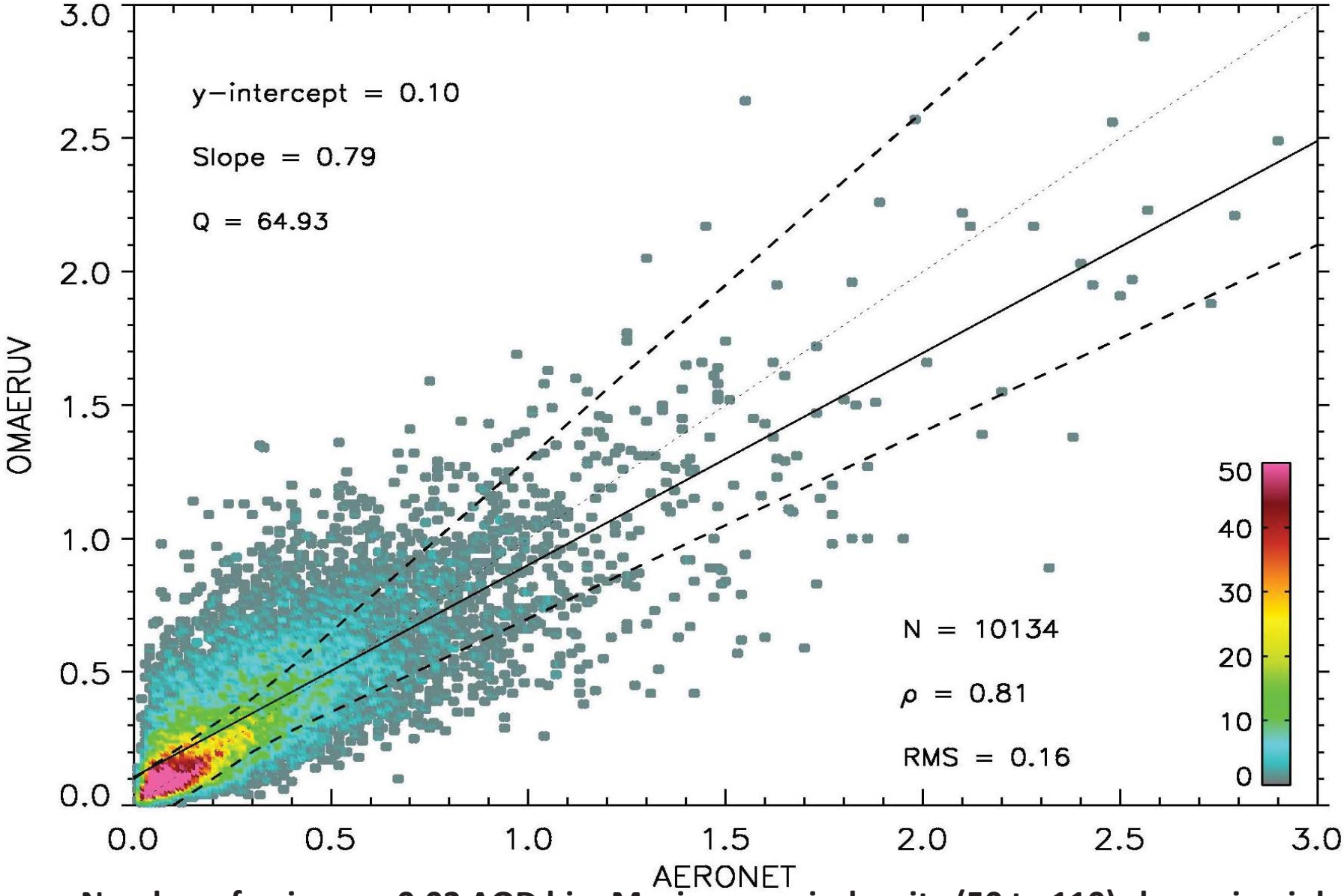
AOD June 2007 Monthly average




*AIRS CO allows the identification of heavy aerosol loads over China, and other regions, otherwise undistinguishable from cloud contamination.*

*Torres, O., C. Ahn, and Z. Chen, Improvements to the OMI Near UV aerosol algorithm using A-train CALIOP and AIRS observations, Atmos. Meas. Tech., 6, 3257-3270, 2013*

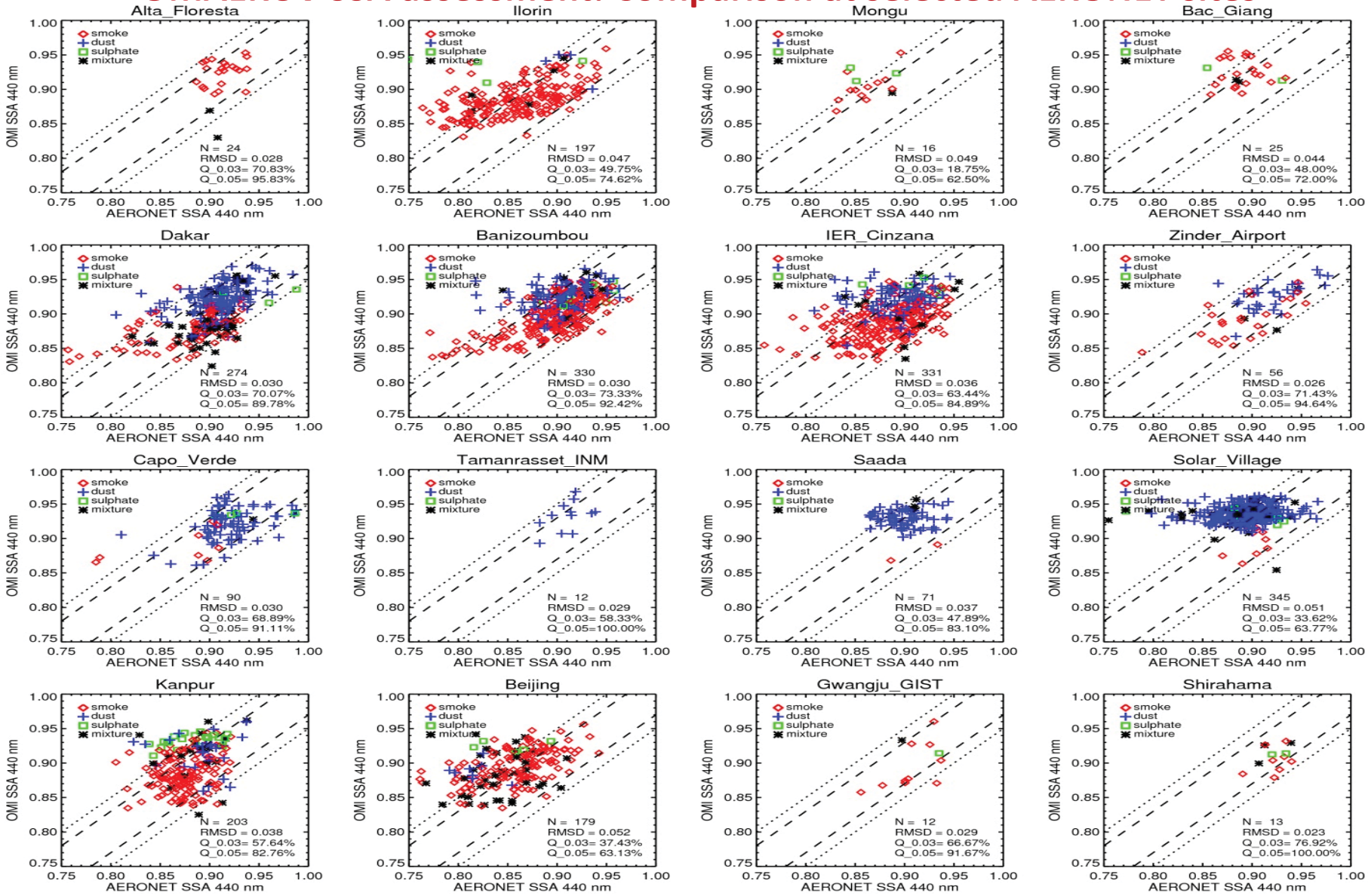
# OMAERUV AOD Validation: The Global Picture




**Number of pairs per 0.02 AOD bin. Maximum pair density (50 to 110) shown in pink.**

*Ahn, C., O. Torres, and H. Jethva (2014), Assessment of OMI near-UV aerosol optical depth over land, J. Geophys. Res. Atmos., 119, 2457–2473, doi:10.1002/2013JD020188.*

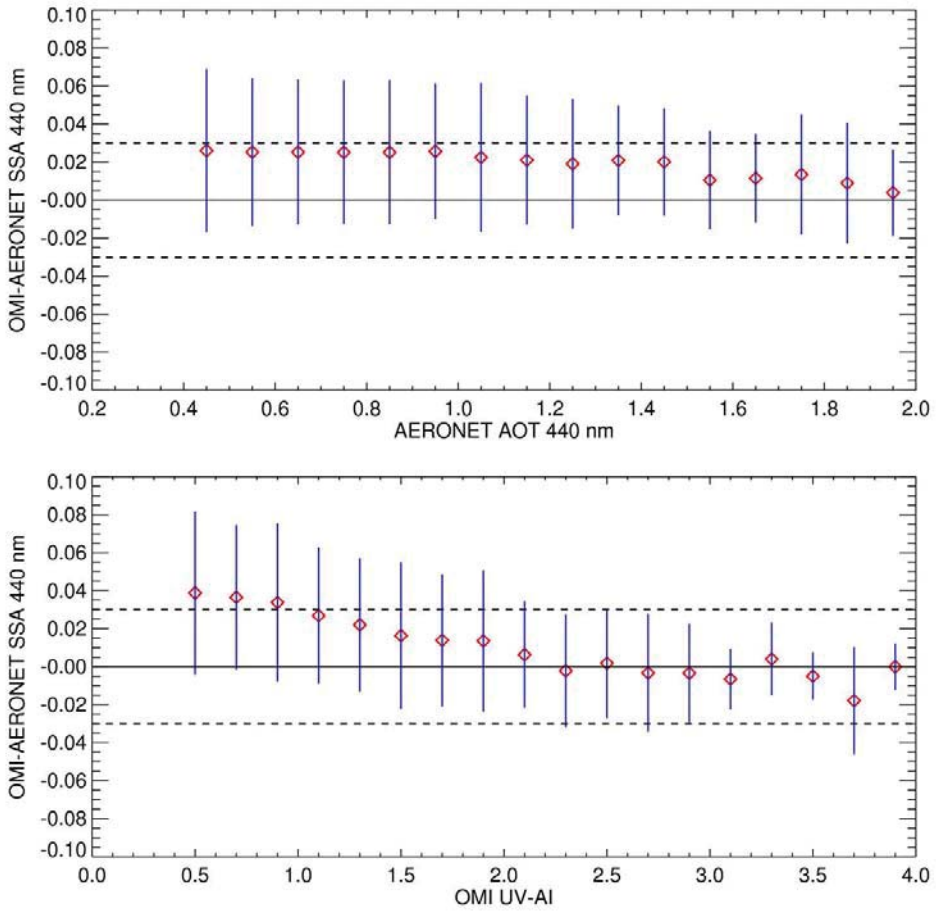
# OMAERUV SSA assessment: Comparison at selected AERONET sites




51% (75%) of matched pairs agree within 0.03 (0.05)

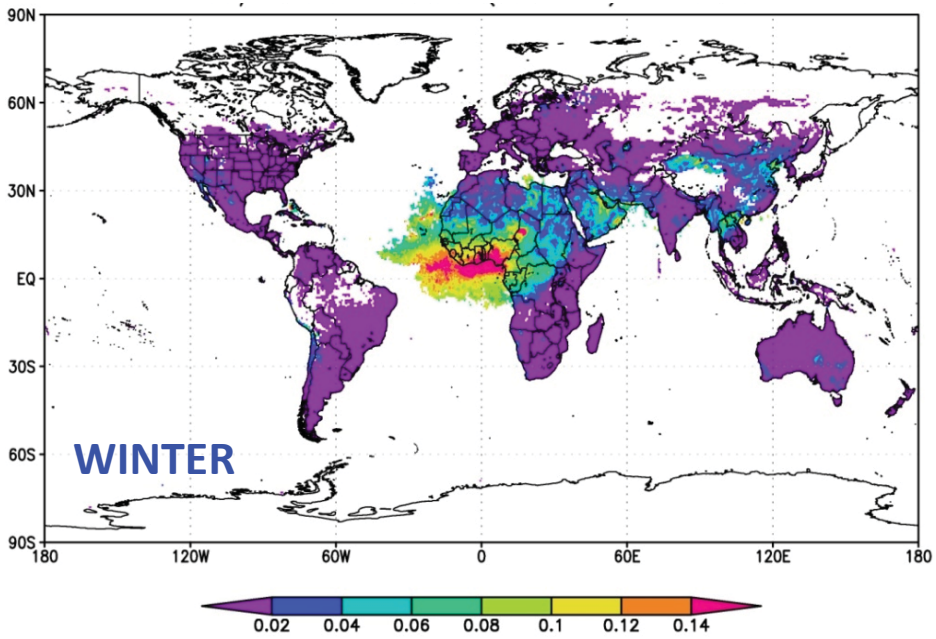
*Jethva, H., O. Torres, and C. Ahn (2014), Global assessment of OMI aerosol single-scattering albedo using ground-based AERONET inversion, J. Geophys. Res. Atmos., 119, doi:10.1002/2014JD021672.*

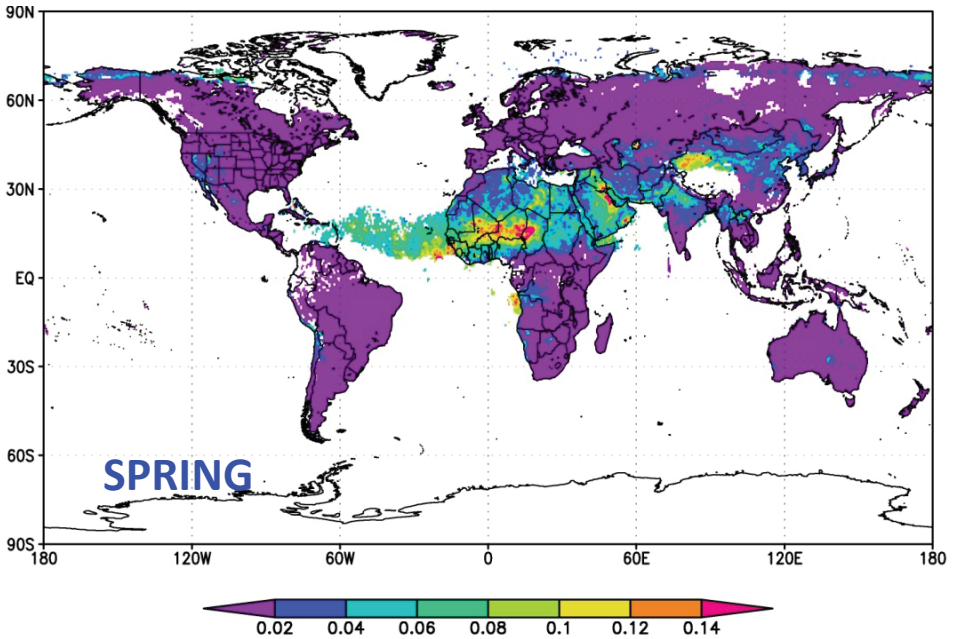
# OMI versus AERONET
# Global Composite

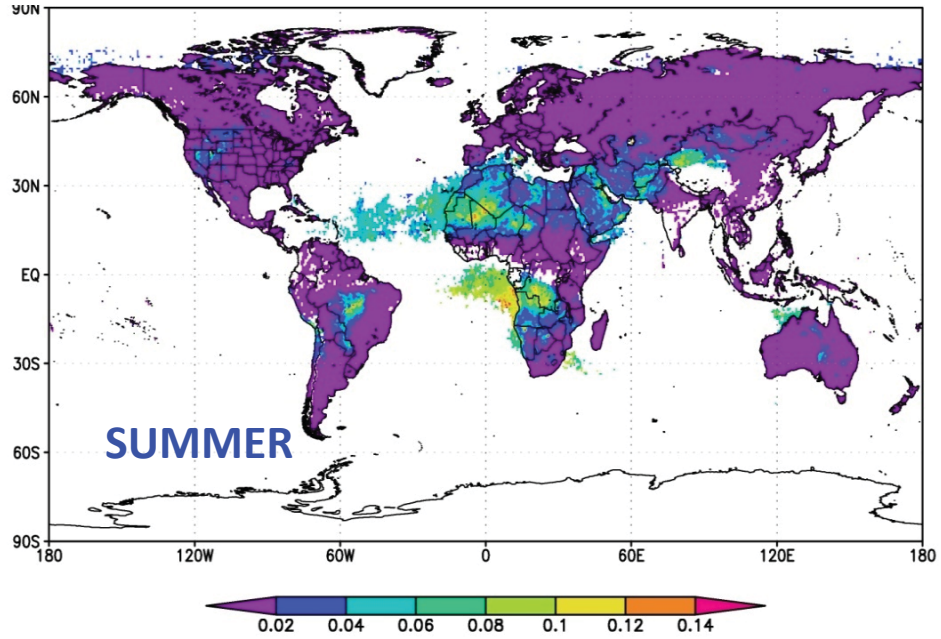


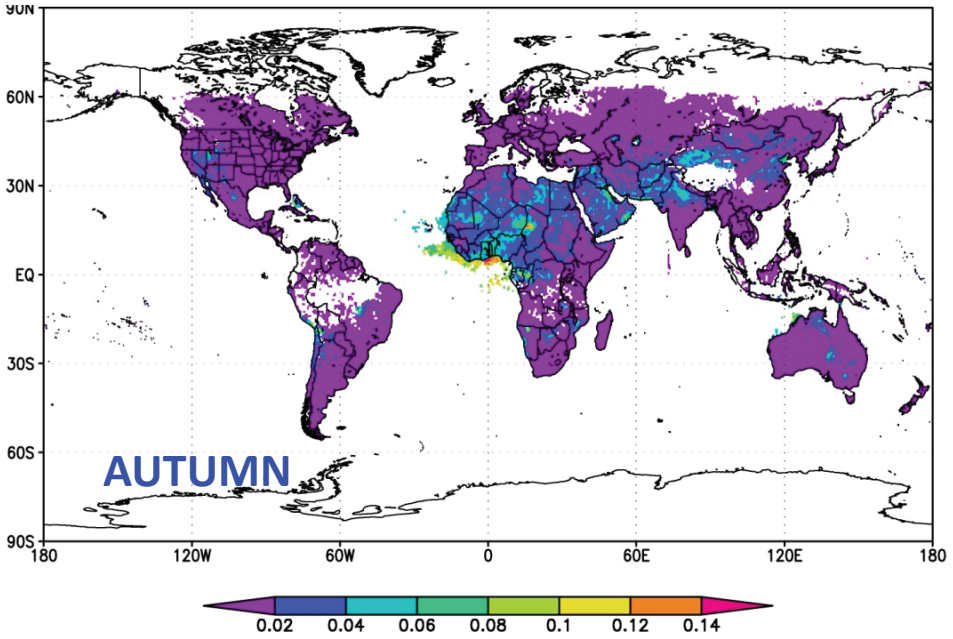

- OMI and AERONET are within their expected uncertainties (±0.03) for AOD>0.4 and UV-AI>1.0
- Closer agreement for larger aerosol loading

# 2007 AAOD Global Seasonal Average Maps



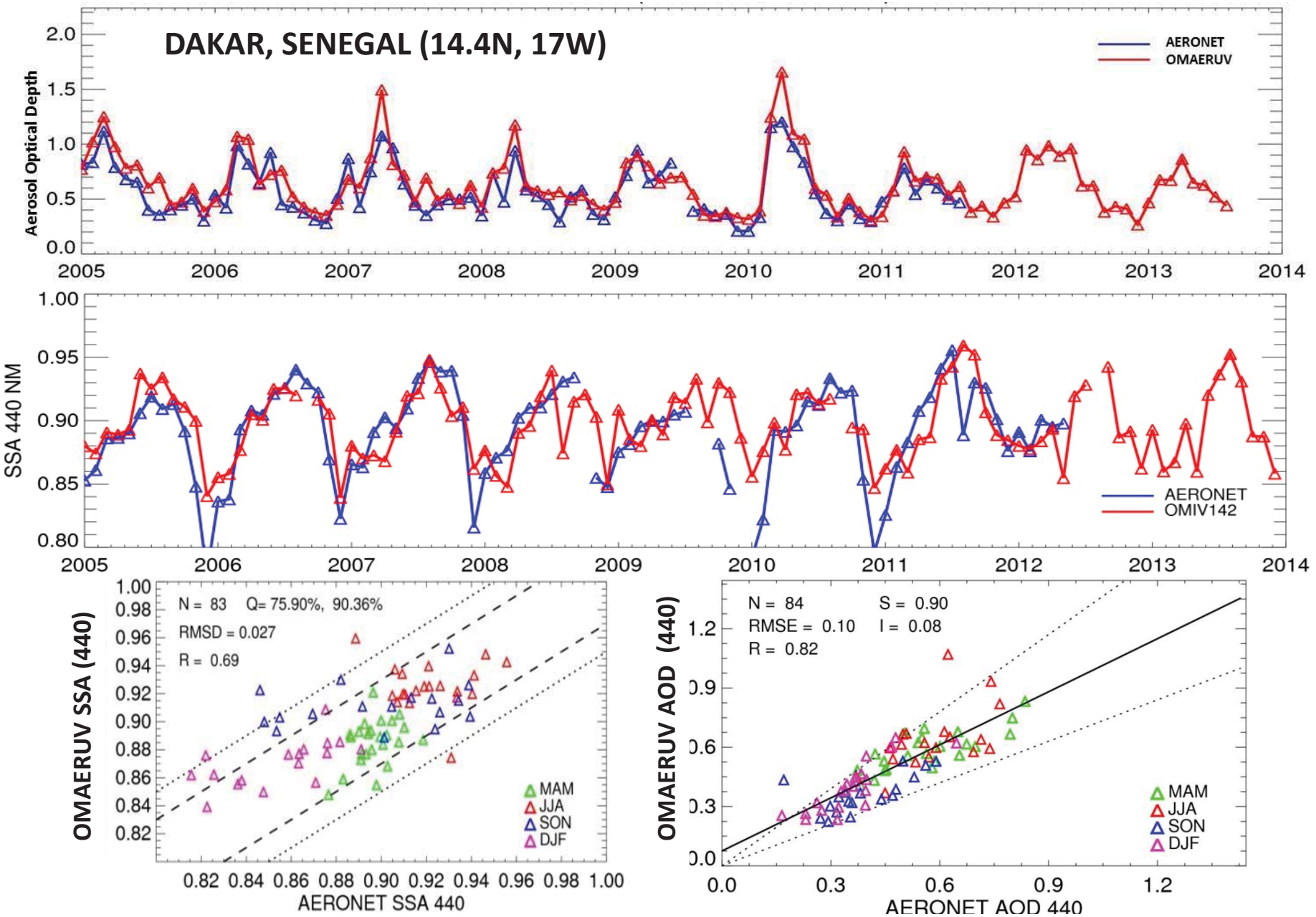



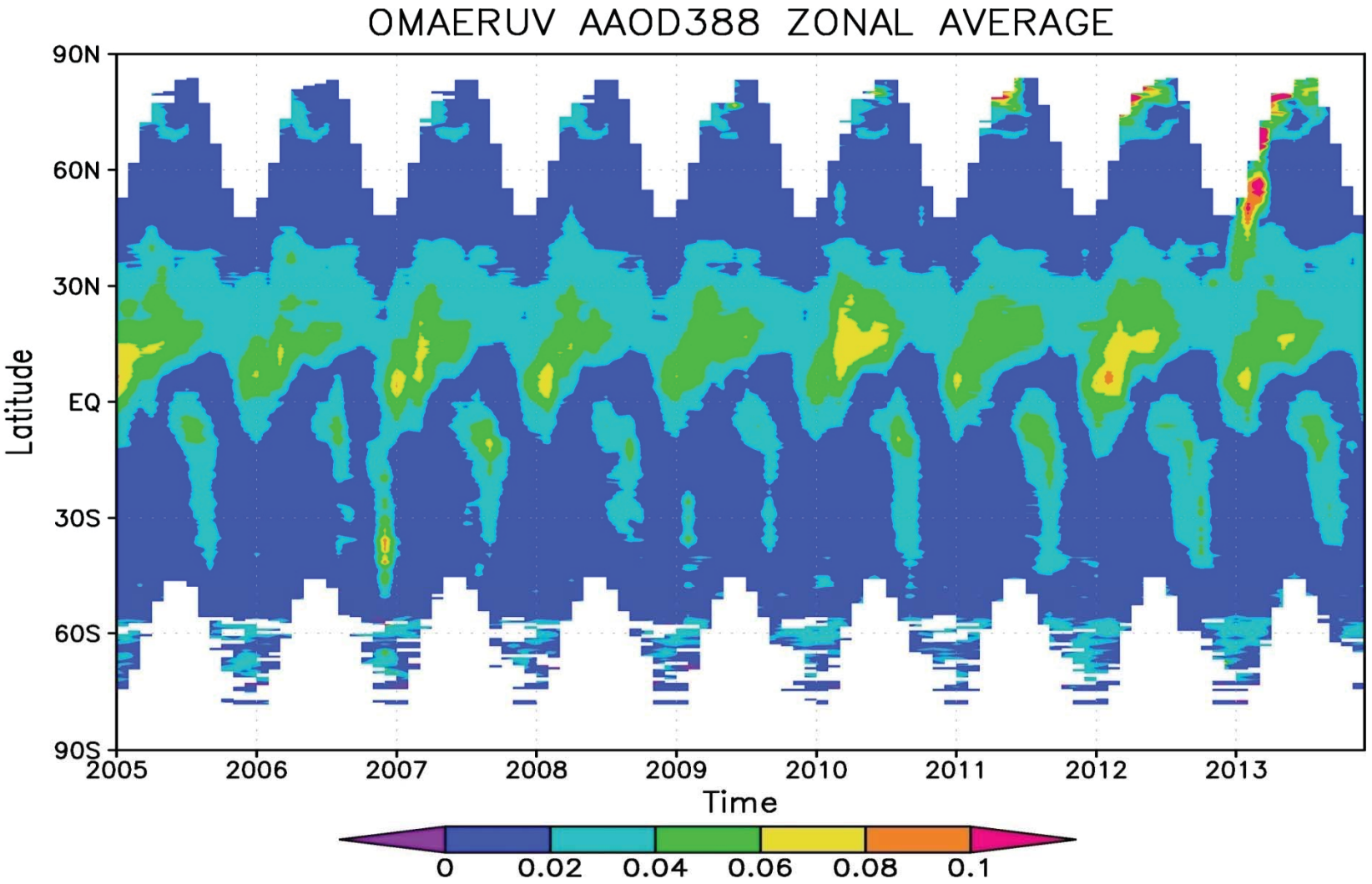



# Validated long-term record of OMAERUV Aerosol Optical Depth and Single Scattering Albedo

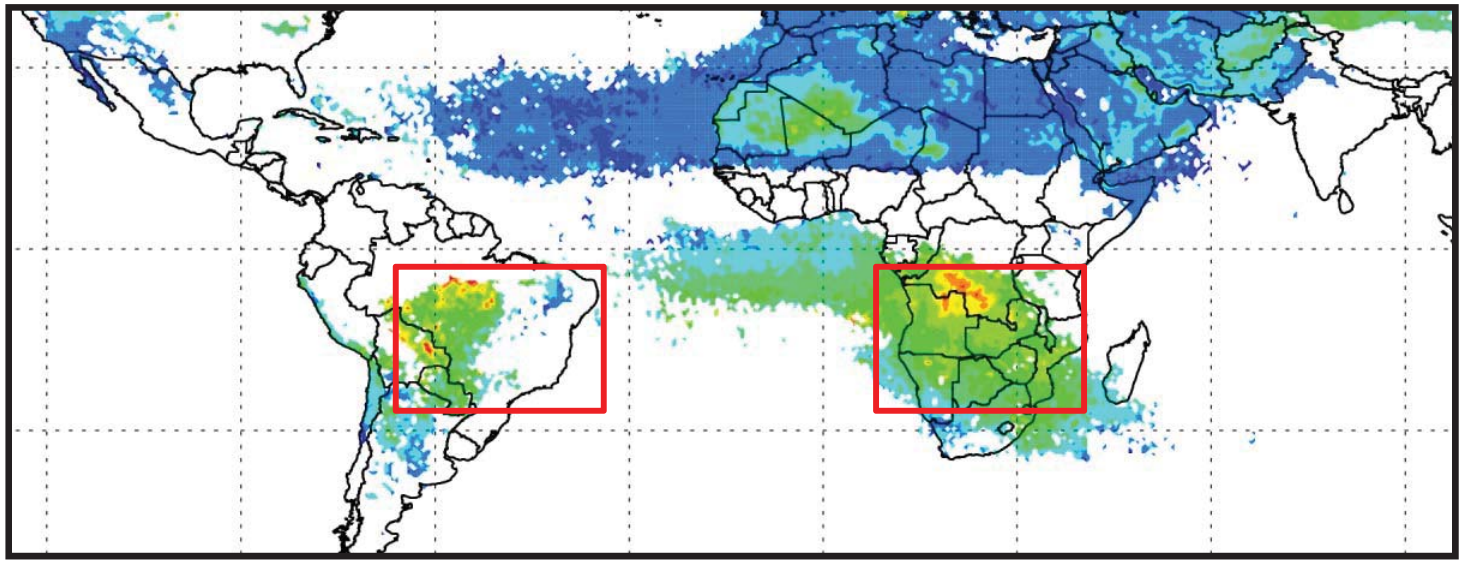
*OMI-AERONET comparison of monthly mean values of AOD and SSA over nine years*

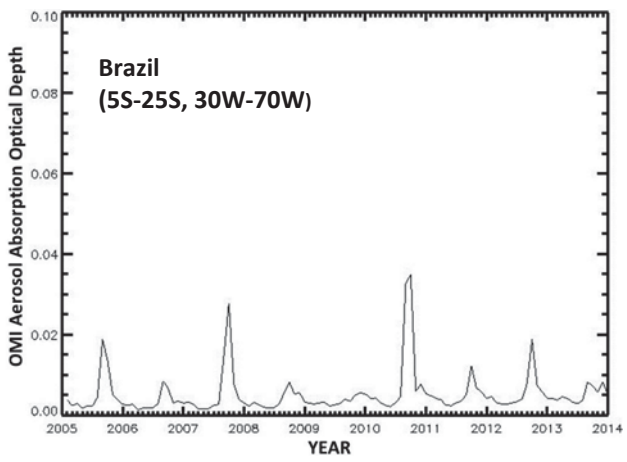


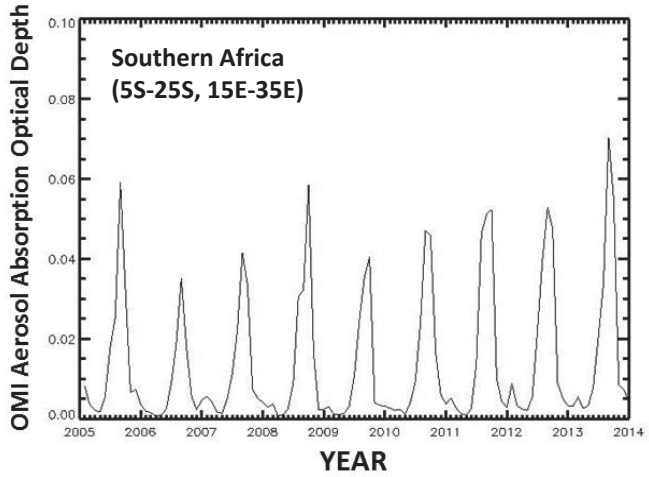
# Nine-year Global record of OMI Aerosol Absorption Optical Depth



# AAOD time series over SH biomass burning regions





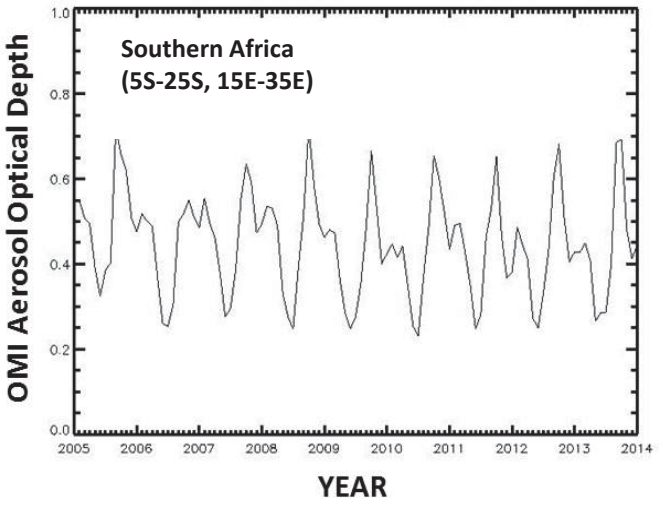



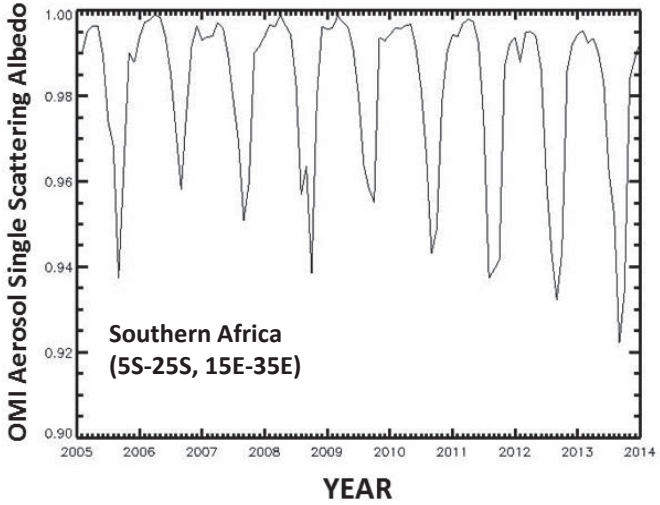

An AAOD increase (~ 0.01/year) is apparent in Southern Africa

AAOD = AOD(1-SSA)

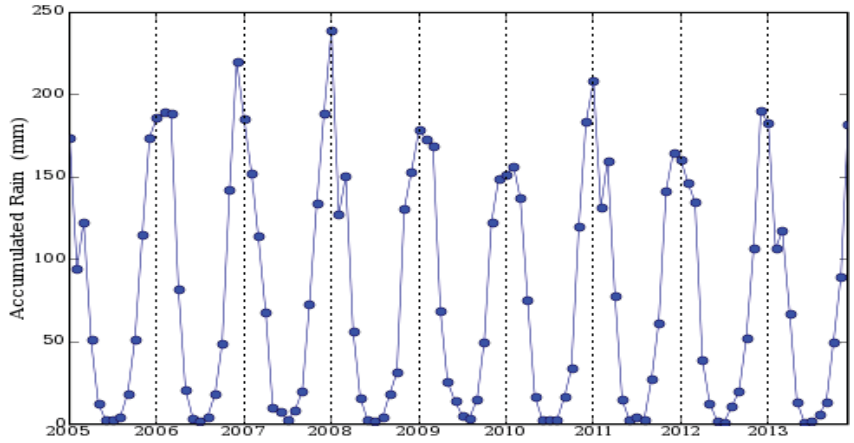
Is AOD increasing or SSA decreasing?

# AOD and SSA time series over SH biomass burning regions

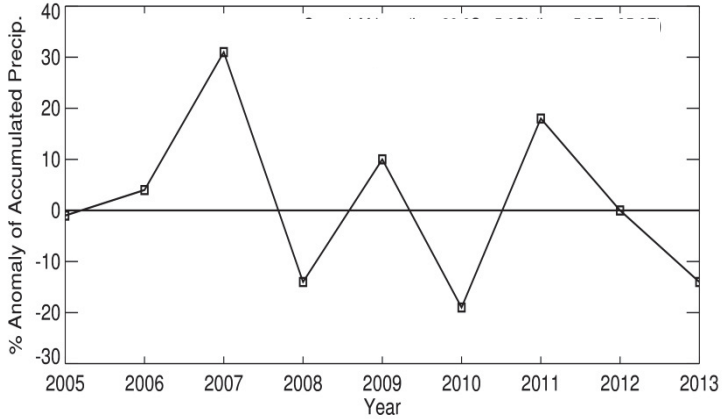



A decrease in the water-content of fuel can produce more absorbing particles

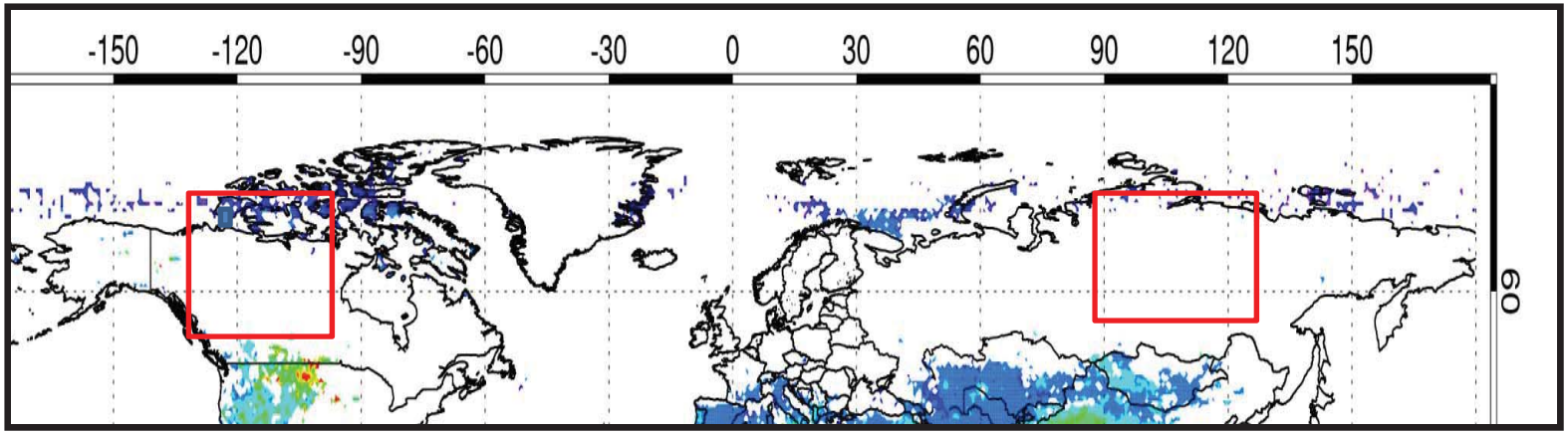


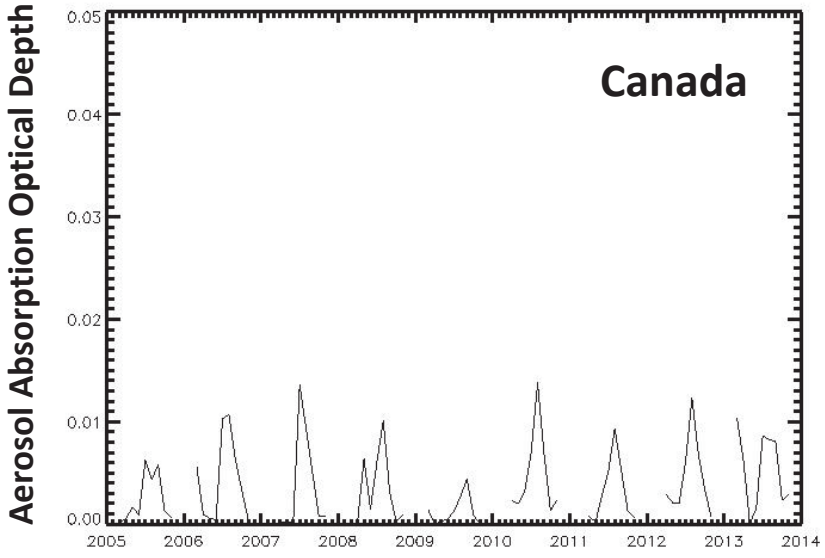

Time series of monthly accumulated rain (TRMM)

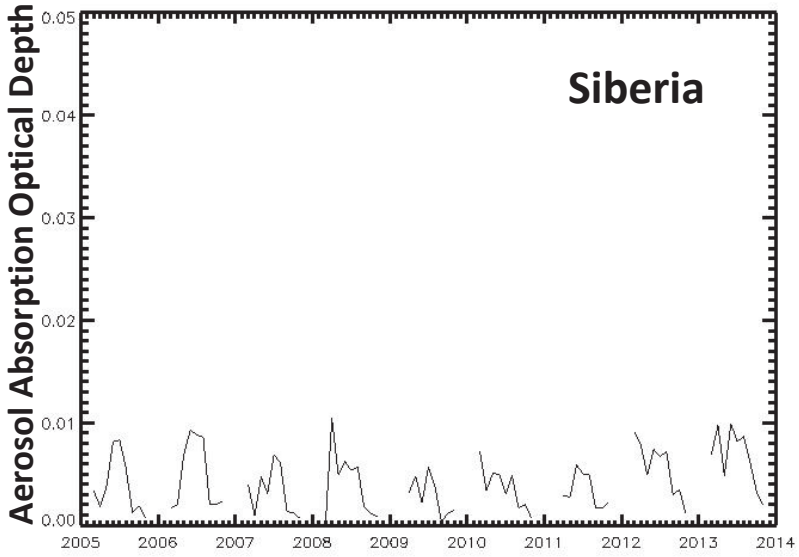



May-Oct. Precipitation Anomaly (%)

# AAOD time series over NH boreal fires regions



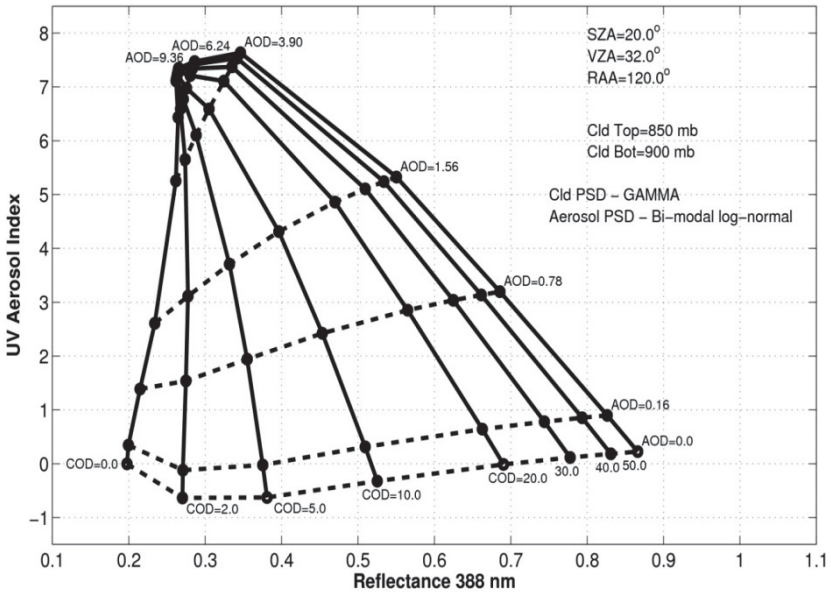



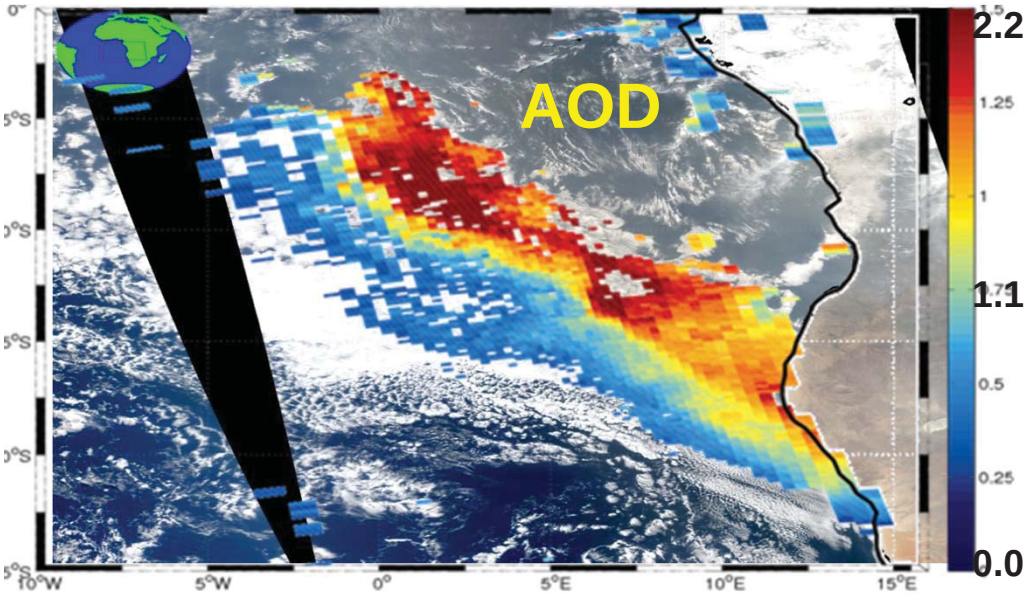




**The observed high latitude NH increase in AAOD is likely associated with increased boreal fire activity in Canada**

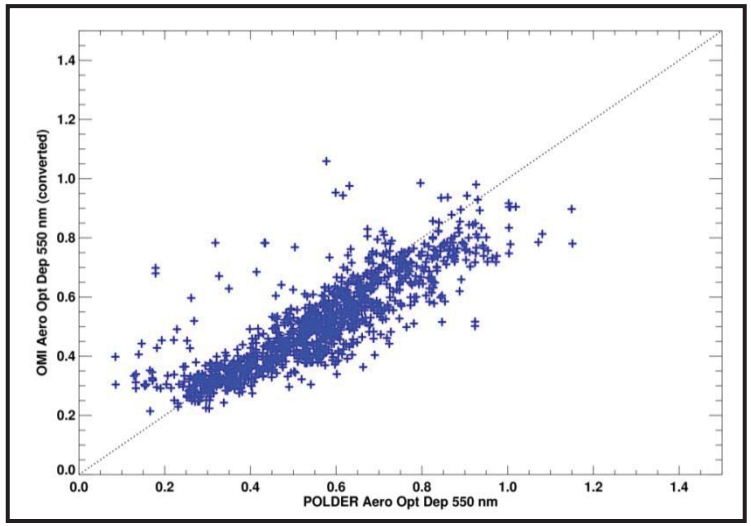
# Simultaneous Retrieval of Cloud (COD) and Aerosol (AOD) Optical Depth

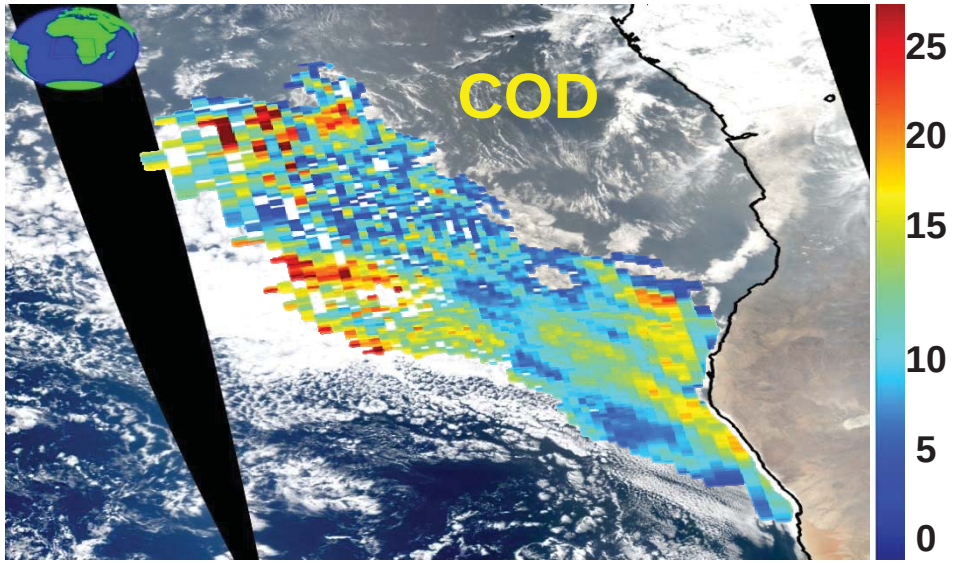
## Inversion Scheme




August 4-2007




*Torres, O, H. Jethva, and P.K. Bhartia, Retrieval of Aerosol Optical Depth above Clouds from OMI Observations: Sensitivity Analysis and Case Studies, Journal. Atm. Sci., 69, 1037-1053, doi:10.1175/JAS-D-11-0130.1, 2012*

# Summary

Significant progress on the quantification of aerosol absorption has been achieved during the first decade of OMI operation.

- A ten year data set of 388 nm AOD and SSA has been derived from OMI observations.

- The capability of retrieving aerosols above clouds using UV/VIS observations has been developed.

The decadal OMI AOD and SSA records have been evaluated by direct comparison to independent ground-based AERONET observations.

The OMI SSA and AAOD data sets are the first ever quantitative multi-year records on aerosol absorption from satellite-based observations.

Continuation of the OMI record on aerosol absorption is required for conclusive analyses of global/regional trends.