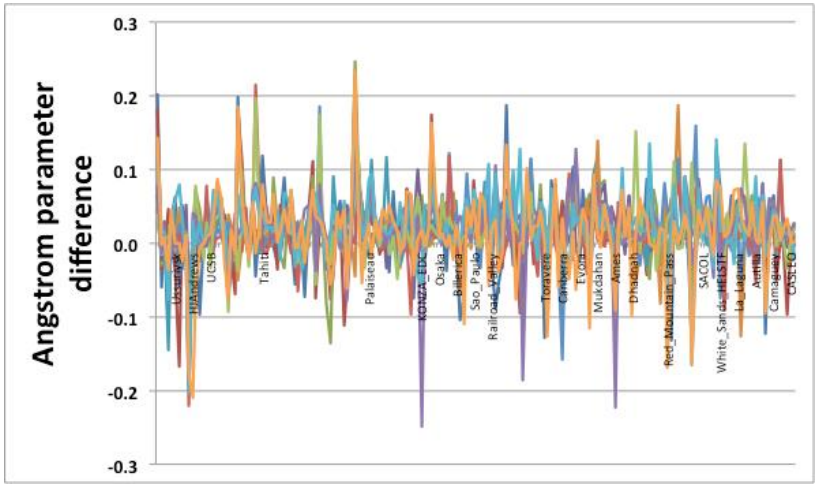
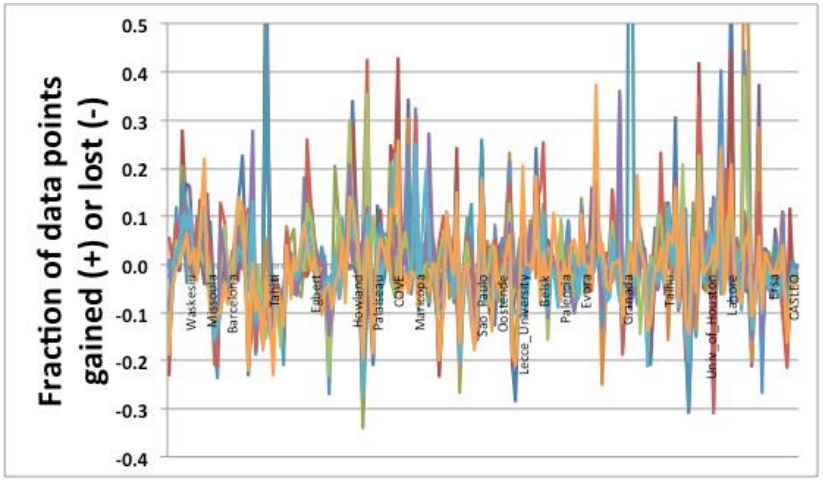
AERONET V3 Algorithms development completed

B. Holben[1], T. Eck, D. Giles[3], J. Schafer[3], A. Sinyuk[3], I. Slutsker[3], A. Smirnov[3]

[1]Code 618, NASA/GSFC, [2]Code 618, NASA/GSFC and USRA, [3]Code 618, NASA/GSFC and SSAI





AERONET Atmospheric Optical Depth and Angstrom exponent is considered the standard for validation of all satellite aerosol retrievals and model forecasts. In these plots of 182 long term sites of averaged Angstrom exponent (left) and number of points (right) of Version 3 (V3) relative to the current system we note the following significant characteristics:

- **Improved Cloud clearing - Over all the angstrom exponent is slightly higher under V3 as cloud contamination drives down the Angstrom exponent**
- **V3 Cloud clearing is most effective for fine mode aerosols but improvement is noted for coarse mode aerosols as well**
- **Overall there are slightly more points added to the database in V3 but large departures occur owing to the effectiveness of V3**
- **Sites with persistent Ci such as tropical western pacific show the greatest variation in gain or loss of points**
- **Comprehensive Analysis of the integrated V3 system will begin in August**
- **Planned release is early 2016**

Name: Brent Holben and AERONET team, NASA/GSFC, Code 618
E-mail: brent.n.holben@nasa.gov
Phone: 301-614-6658

AERONET V3 processing update:
AERONET's Ground based aerosol remote sensing made a significant advance in 1993 by imposing standardization of measurements, calibration and processing and including spectral sky radiance scans with the direct sun spectral measurements. Thus since1993 the federated network has grown to a globally distributed network of ~600 sites. Two major issues compromise any sun photometer data set including AERONET, cloud screening and quality assurance. Thin temporally stable Ci clouds are very difficult to distinguish from aerosols that are also relatively stable over hours. A three year effort by the AERONET team to develop new algorithms to address these issues and generally improve the quality of the AERONET data was concluded July 1, 2015. The new algorithms will be incorporated into a beta version in July and evaluated the remainder of the year. The comprehensive AERONET Version 3 will be released to the public database in early 2016.

New Ancillary Data Sources used in V3: The following ancillary data sources are used in the V3 processing:

MERRA 2: Ozone and aerosol extinction profiles
OMI: Total column NO_2 monthly climatology
ASTER: Digital Elevation Model
NCEP reanalysis: Surface pressure, geopotential heights, surface wind speed, temperature
MODIS: Spectral BRDF
NISE and MODIS: Snow and Ice surface coverage

Technical Description of Figures:
Graphic Left): Persistent thin cirrus is nearly indistinguishable from stable aerosol from typical direct solar spectral measurements. However enhanced forward scattering in the solar aureole (unique to AERONET measurements) by relatively larger particles provides an opportunity to screen these clouds from the sky scans. Examining the change in the monthly averaged Angstrom exponent relative to the current method for 182 long term AERONET sites, an increase in Angstrom exponent is interpreted as improved cloud screening. This figure shows the effectiveness of this technique relative to the current temporally based system and is unique to the AERONET database.
Graphic Right): The nujmber of points plot shows a slight positive trend indicating a gain in the over number of points being cloud cleared under V3. We note the large departures both positive and negative. Loss of points typically occur from fine mode dominated sites with persistant Ci contamination but result in higher Angstrom Exponent. Conversely coarse mode dominated sites such as the Sahel and Sahara regions have gained points indicating that V3 has not removed as many cloud free coarse mode cases as the old system. In these cases, the angstrom exponent is largely unaffected. Further analysis of the entire system processing including automatic quality assurance and the many improvements to the processing will begin in August. The V3 system is expected to be released in early 2016.

Scientific significance, societal relevance, and relationships to future missions:
Improved accuracy in satellite and model validation studies particularly over tropical and substropical sites where persistent Ci occurs. A new near real time QA products will allow immediate validation for new satellite missions and lends itself to assimilation for the modeling community. The entire 23 year record will be reprocessed under V3 providing processing standardization of the AERONET database and consistent climate data records, thus improved local, regional and global aerosol trends will be improved and readily available.