# AERONET Update

18-Jul-06

Dear Colleagues,

The AERONET Quarterly is now the 'AERONET Update' as I've rarely adhered to the quarterly schedule. Today I do have significant information to convey to you all in the form of a **new-look website**, **Version 2** of the Inversion products, other **new products**, release of a **data synergism website**, **staff changes**, new instrument **issues** and my perspective for the **future of the program**.

**New-look website**-Today we release the new look of the AERONET website to conform to NASA requirements but more importantly provides a more logical access to the various elements of the AERONET activities and accommodates the new data products. The address remains the same: http://aeronet.gsfc.nasa.gov. Note the various product types can be accessed and described from a menu bar across the top of the page. Data may also be accessed from the 'data access' block in the lower left page. The download tool defaults to Version 2 for both the AOD and inversion products. Once you are in the download tool you have the option to switch to Version 1. Each product is accompanied with an interactive location map and site table. Note the homepage map is the AOD and inversion retrieval site map. Updated descriptions of all the products are accessed through the menu bar. Most other features are largely the same. Please let us know of issues or suggestions that you may have with the new webpage. It's a dynamic development process that will evolve with the program. Thanks very much to Dave Giles for designing and developing the new page.

**AEROSOL Optical Depth**: As before the 'AOD download tool' provides access to spectral AOD, Angstrom Exponent and precipitable water retrievals. Version 2 is the default and triplet variability may be displayed. The O'Neill fine and coarse mode fraction retrievals from optical depth are now available from the AOD download tool for level 1.0 and 1.5. Level 2 will be generated before the end of 2006. Norm writes:

The aerosol optical depth processing includes the spectral de-convolution algorithm described in O'Neill et al. (2004). This algorithm yields fine (sub-micron) and coarse (super-micron) aerosol optical depths at a standard wavelength of 500 nm (from which FMF*, the fraction of fine mode to total aerosol optical depth can be computed). The algorithm fundamentally depends on the assumption that the coarse mode Angstrom exponent and its derivative are close to zero. Its advantage lies in the fact that it produces useful indicators of aerosol size discrimination at the frequency of extinction measurements. Please see the 'Data description' for more details.

* Fine Mode Fraction; the algorithm actually divides the world into fine and coarse mode fractions in an optical sense (based on an optical criterion involving

coarse mode Angstrom exponents). This is slightly to moderately different from the SMF (Sub-Micron Fraction) which divides according to a simple microphysical (radius) cutoff.

**Inversion products (Version 2)**: Yes it is now available thanks to a very consuming effort by Oleg Dubovik, Alexander Siniuk and the rest of the staff that put the re in front of search and evaluate. The **V. 2** AERONET retrieval provides a wide number of parameters and characteristics that are important for the comprehensive interpretation of the aerosol retrieval. The major difference is that the spherical and spheroid model output are internally evaluated to produce one set of retrievals rather than the two products in Version 1. In that regard Version 2 provides a parameterization of the degree of non-sphericity. The other major change is our assumption that the world had the spectral reflectance of green vegetation has been replaced by a dynamic satellite and model estimation of the surface reflectance. This accounts for vegetation dynamics, snow and ice and wind speed effects over water. Please read the 'Version 2 Inversion Product Descriptions' for a thorough discussion and references.

It has been a massive job to reprocess the entire AERONET database for Version 2 and is yet to be completed. As of this writing years 2005 and part of 2006 remain to be processed and is expected to be completed in early September 2006. Thus if you cannot locate version 2 products for your site it likely is in the queue for processing.

Thanks much to Ilya Slutsker for orchestrating this, reorganizing the database, modifying numerous programs, multiple reprocessing of beta versions and coordinating new hardware to make Version 2 happen.

**The Version 2 retrievals and parameters**: Total errors (systematic, random and bias) are available for the following inversion products: size distribution, complex index of refraction (real and imaginary), extinction AOD, single scattering albedo, and phase functions. Please note that the error bars are estimated and dynamic and may not necessarily represent true uncertainties particularly for systematic errors in the measurement data.

Particle Volume Size distribution (Volume concentration*, volume median radius*, standard deviation* and effective radius* for total, fine and coarse modes)
% Spherical particles*
Spectral Phase function
Spectral Asymmetry Parameter
Spectral Extinction optical depth
Spectral Absorption Optical Depth
Spectral Single Scattering Albedo
Spectral Complex Index of Refraction
Instantaneous:
Spectral upward and downward fluxes (TOA and BOA)*

Broadband upward and downward fluxes (TOA and BOA)*
Radiative forcing (TOA and BOA)*
Radiative forcing efficiency (TOA and BOA)*

*=Available via download tool, no data display available

**Almucantars**: Data from the field may have various numbers of spectral almucantars due to instrument type, how it was set up and the functionality of data collection. We imposed that our historical standard of four almucantars (440, 675, 870 and 1020 nm) must be included for a successful almucantar. We assume that more is an improvement thus almucantar retrievals are computed from four or more almucantars and we do not distinguish between them. Typically for the extended wavelength instruments we add almucantars at 500 and 1640 nm. The solar zenith angle and optical depth limitations from version 1 apply to version 2. Level 2 products will be available after 7/21/06.

**Principal Plane retrievals**: We are providing PP retrieval products but only at level 1.5. We have not had sufficient time to evaluate these products but feel that the larger community should have the opportunity to assist in the evaluation.

**Solar Flux**: Co-located high frequency solar flux measurements (pyranometers and PAR) have been taken at selected AERONET sites since 1996. These data were and continue to be collected as affiliated AERONET research coordinated by Joel Schafer with additional contributions by other participating investigators. An independent access website with more details is available. These data are also available through the 'Data Analysis tool' button.

**AERONET-Ocean Color**: AERONET instrumentation (Cimel photometer renamed to SeaPRISM) provides in addition to the sun and sky measurements capability of measuring the radiance emerging from the sea (i.e., water-leaving radiance) with modified sun-photometers installed on offshore platforms like lighthouses, oceanographic and oil towers. AERONET-OC is instrumental in satellite ocean color validation activities through standardized measurements a) performed at different sites with a single measuring system and protocol, b) calibrated with an identical reference source and method, and c) processed with the same code. The quality assured product is normalized water leaving radiance, Lwn. This product is also available through the 'Data Analysis Tool'.

**Data Synergy Tool:** The data synergy tool was developed to provide ready access to related aerosol data sets in graphic and digital form over AERONET sites for in-depth analysis. These data sets included backtrajectories, MPLNET lidar data, GoCART chemical transport model simulations, MODIS RGB imagery and AERONET products. The scope is expanding and now includes the numerous monthly Giovanni MOVAS (atmospheric) and Ocean products, Solar

Flux (SolRad-Net previously described), Ocean Color (AERONET-OC, previously described), and AOD modes from AERONET optical depth. Other contributed data sets will soon follow including meteorology, Satellite data sets and model data sets as funding and time and resources allow. David Giles deserves tremendous credit for designing, developing and implementing this website and the many folks that have contributed their data sets to this for the communities analysis.

This website will serve as host for the MPLNET (micropulse lidar) data set and perhaps others as it evolves into a major resource for any number of locations beyond the AERONET site. The design provides for single page thumbnails of data sets to be graphically displayed on a single webpage. The data mixture is interactive and selectable according to the users needs and all products can be downloaded from the screen. All AERONET data can be retrieved from this tool and may become the preferred mode of accessing the AERONET database.

Please browse and use the DST and let us all know your suggestions.

**Staff Changes**: Oleg Dubovik has left AERONET and Goddard to work at LOA in Lille France. We will maintain a close relationship with Oleg and his research. Dr. Alexander Siniuk who has worked closely with Oleg for the past three years has capably assumed Oleg's responsibilities in full. Joel Schafer has come onto AERONET full time providing research, management of the flux network and assistance with Tom Eck's calibration activities.

**Issues**: The extended wavelength instrument continues to be a work in progress precipitating a series of mechanical design, software and upgrade issues. I feel that the quality of the data has at times been compromised preventing Level 2 in some cases. It has slowed our operational activities particularly since an adequate reference instrument has not been identified for that flavor of instrument. This has been compounded by the, at times, poor quality of UV filters supplied by our vendors. These issues often co-vary making them particularly difficult to isolate and solve. We as a whole are making progress and I feel that within 6 to 9 months the instrumental problems will be worked out. I highly recommend that owners of old faulty instruments upgrade to the new electronics and optics as the instrument is improved over earlier models. However if your instrument is working fine, don't fix it! The greatest operational downside of the new instrument is the poor ability to determine obstructions in the collimator since we basically are taking all sun and sky observations out of a single collimator, thus eliminating the sun and sky collimator observations of the older instruments.

We have in the past month re-proposed the Goddard portion of the AERONET project to carry out our mission to expand the network in poorly covered regions, expand the distributed calibration activities and provide more and improved data access and products for the user community. We intend to be more closely

aligned with satellite missions in our research activities and hope to develop a ship-based ocean AOD capability. New opportunities for field campaign research are planned as well as development of a photometer network for $CO_2$ assessment. There is still much to do in the realm of polarization and synergism between satellite, model and ground-based systems and improving our processing and data access capabilities.

On behalf of the NASA AERONET team, PHOTONS and data contributors, thanks for your support and interest in the data and program. Please feel free to contact me or other staff members should you have comments on V2, data access issues or any suggestions.

Cheers,

Brent