AERONET Update: Development of Version 3 March 7, 2013

Colleagues and friends:

As many of you know, AERONET has been operating under what we call Version 2 processing that we implemented in 2006 and was based on 2004 knowledge and expertise. We feel that we can make improvements (although most are relatively minor) in many aspects of the processing system. Along with version 3 we hope to introduce a few new products as well. We are making real progress particularly in the elements that trigger a new version that result in a fundamental change in the database. In this case, it is **cloud screening of the AOD database**. Smirnov, as in version 2, leads this effort with the assistance of the rest of us on the project. It is a complicated task to develop an algorithm that is simple (understandable) and universal. Although we've not decided upon the final algorithm there are many elements that we've considered, modified and are testing in various combinations against our current Version 2 level 1.5 and level 2 databases. We are examining many case studies representing all types of aerosols and cloud conditions from convective, to stratus to Ci clouds. This has been quite helpful in posing and developing criteria for various algorithm elements under specific aerosol and cloud conditions including fine mode, coarse mode, mixed, sea salt, smoke plumes, dust storms, high aerosol loading, low aerosol loading etc. As in the past our basic screening test remains unchanged, the triplet variability. Any new algorithm builds upon that triplet variability screening.

We have considered: triplets for 3 near-IR wavelengths, changes in the magnitude of the triplets, various spike filters, removing stand-alone points, a minimum points left in a day, and SDA coarse mode triplets. The innovative kid on the block is the spatial variability check begun with a halo check that is sometimes detected in the PP or almucantar; this has morphed into a sky radiance variability check from 6° to 14° scattering angle from the sun. The spectral channels and temporal proximity to the sun are being evaluated.

With many variants of the above, we noted that we don't have a database that can independently inform us which measurements are contaminated by clouds. We've gone to the lidar community, MPLNET in particular, to develop from co-located lidars and photometers a coincident-in-time database of cloud assessment that we can use as validation data set. The proximity of coincidence in time and distance from the zenith is being considered in this comparison. The MPLNET database may be augmented by several sites in Dakar, Lille, sites in China and perhaps others as well as several HSRL sites that will facilitate our evaluation.

All assessments and cloud clearing algorithms have to consider the impact of imperfect data due to contamination of the optics and electronics as well as partial data dropouts, temperature dropouts, time varying calibration, etc.

Case studies are not sufficient alone and the final assessment will compare multiyear, multisite data sets to our Version 2, level 1.5, level 2 and the coincident lidar databases through assessment through database statistical analysis.

We look forward to an elegant straightforward universal algorithm in the next few weeks.

The inversions are coming and gives us an opportunity to upgrade the radiative transfer code from scalar to vector that incorporates polarization. QA criteria will probably not change however the limits on the retrievals will certainly change as a function of optical depth, fine/coarse fraction applied to PP and almucantars as shown by Sinyuk. Radiance corrections will be implemented and some new products will be introduced and error estimates included. Surface reflectance is TBD

We hope to incorporate **polarization algorithms** as they become available and vetted but they are not Version 3 dependent.

Temperature correction is completed and awaits implementation in version 3. This affects our master calibrations and field instrument intercomparisons thus it must be applied to the entire database uniformly under version 3.

New **assimilation databases and high resolution DEMs** will be used for pressure corrections and on-line dynamic **backtrajectories** using Hysplit.

The structure of the database will be improved and Ilya has many improvements completed in the new Demonstrat.

The **vicarious calibration** code has been written into Demonstrat and awaits the 'how to' needed for implementation.

The target timeline:

April 1: Complete cld clearing algorithm; incorporate vector code, continue renovation of AERONET website

May 1: Complete criteria for processing L1.5 and L2 inversions; complete inversion test runs with new RT code; begin assessment of Polar products, complete assessment of ancillary databases and O_3 and NO_2 corrections

June 1: Complete Demonstrat modifications and upgrades; Complete thresholds for L1, L1.5, L1.5v, L2 AOD and inversion products

July 1: Begin reprocessing the entire database under V3.

Aug. 1: Compare V2 to V3 AOD and inversions products

Oct 1: Release V3, continue V2 for 1 year to provide continuity for those with V2 dependent research

Other AERONET news:

Polarimeter: We are approaching a thorough evaluation of the dual polar. The past year has shown it to be mechanically stable. Team PHOTONS is leading evaluation of the measurement protocols and will have an assessment of the required wavelengths for the polar as well as a statement on the aerosol conditions where such measurements could be useful. Because of the complexity and uncertainty associated with the measurements, we will attempt to constrain its application in the network.

The new model photometer: Cimel Electronique has indicated a prototype for evaluation may be available for AERONET evaluation approximately May 1. Cimel has proposed a 12 channel instrument that would require smaller filters and cause a change in the measurement timings that we rely on for calibration. As an operational network, we cannot accept this modification for AERONET. The new model will come with many user defined measurement, data storage and communication options. In addition, we will need to evaluate the mechanical and radiometric performance and determine the optimal measurement protocol-that will be based on the current system–obviously. Higher AOD and sky measurement frequency is obvious, almucantars/PP vs. hybrid scans, sky scan with each AOD to screen for clds(?), FOV scans and other possibilities. We are not beginning at 0 so I don't anticipate this to be too difficult and indeed there may be two measurement protocols depending on the site communication infrastructure: transmitter vs. PC, for example.

I note that **Bernadette Chatenet** has retired from nurturing the photometers in the vast grasslands and desert scrub of the Sahel.

Thanks for taking the time to read the update.

Cheers,

brent