An Aerosol Optical Depth Algorithm for the SURFRAD Network

J.A. Augustine[1], J.J. Michalsky[1], and G.B. Hodges[2]

[1]NOAA Earth System Research Laboratory, GMD, 325 Broadway, Boulder, CO 80305;
303-497-6415, Fax: 303-497-6546; E-mail: John.A.Augustine@noaa.gov
[2]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder 80309

The new multi-spectral Aerosol Optical Depth (AOD) analysis method recently developed for NOAA's Surface Radiation Budget network (SURFRAD) includes several unique features that minimize error and facilitate the calibration and AOD calculation procedures. The once painstaking task of identifying calibration Langley plots is uniquely automated by cross-referencing the Multi-Filter Rotating Shadowband Radiometer (MFRSR) measurements with the SURFRAD clear-sky identification product. Use of the clear-sky product ensures that only the most pristine cloud-free conditions are used for Langley calibrations. Identifying mean channel-specific calibrations that represent two-month periods and grouping them over two-year periods allows for the resolution of, and removal of, the temperature dependence of the MFRSR (see figure), thus further reducing error in the ultimate product. Finally, the use of measured station pressure at the SURFRAD station for accurate molecular scattering calculations at the resolution of the measurements, and the automatic acquisition of daily total ozone over each station from NASA's TOMS website for ozone absorption calculations, further improve the accuracy of the SURFRAD AOD algorithm. Provisional AOD data for SURFRAD stations can now be computed. However, before a final product can be released, the central wavelengths of the MFRSRs that have been used at SURFRAD stations must be checked and verified.

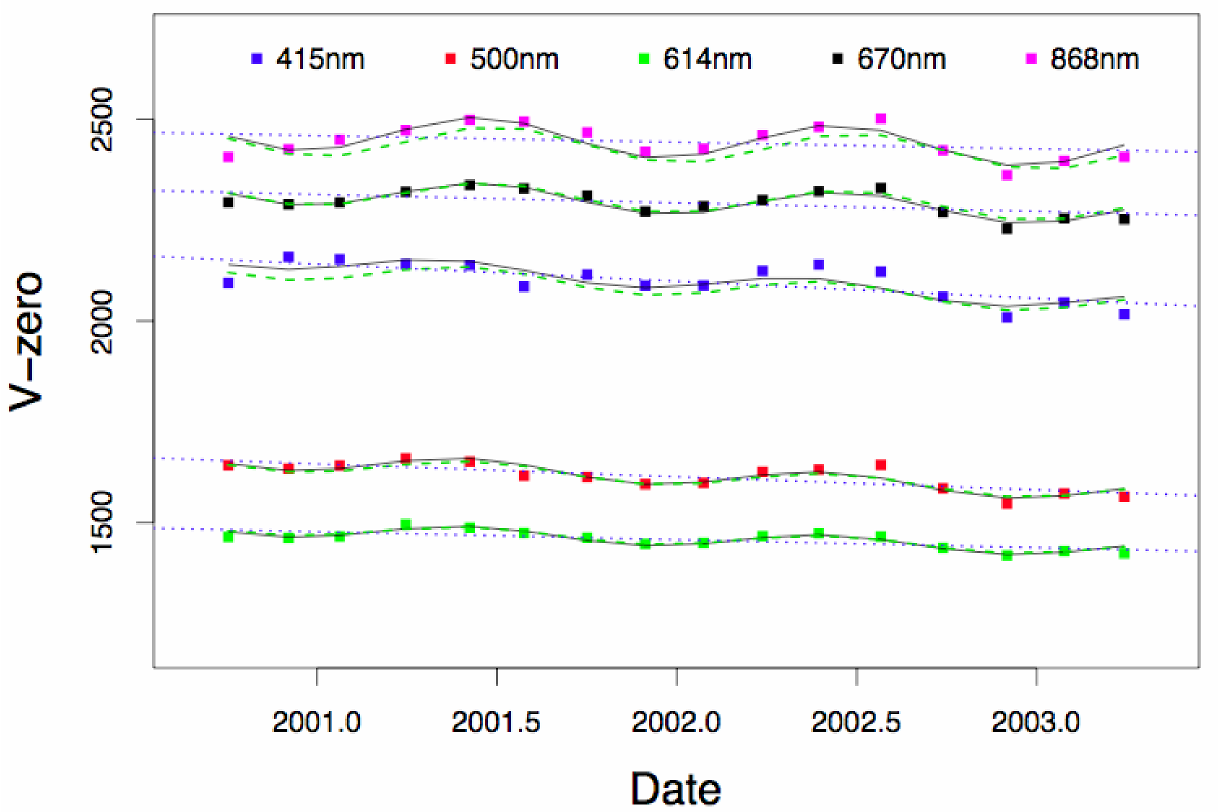

Figure 1. Time Series of Langley Vo calibrations for five visible spectral channels of the MFRSR at the Table Mountain SURFRAD station near Boulder, Colorado. Plotted points represent approximately two-month mean Vo's. The solid line is the best-fit function that is used to generate daily Vo calibrations in the AOD algorithm. The dashed green fit is weighted by the error of each point, and the dotted straight line is the best linear fit, shown for reference.