Atmos. Meas. Tech. Discuss., 8, C1483–C1485, 2015
www.atmos-meas-tech-discuss.net/8/C1483/2015/

Atmospheric Measurement Techniques Discussions

Interactive comment on "A new method for the absolute radiance calibration for UV/vis measurements of scattered sun light" *by* T. Wagner et al.

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Received and published: 9 June 2015

Authors are commended for doing this computationally extensive task to obtain radiometric calibration. Most likely running Monte Carlo vector RT code is amounts to "tracing" more virtual photons than there were in actual measurement. Below I list several remarks that occurred to me when reading the manuscript.

(1) The normalized radiance in eqs. (1) is atmospheric transmittance of radiance for given SZA, zenith and azimuth (SZ, SA) viewing angles, field of view angle, wavelength and wavelength FWHM.

(2) Page 5335: solar irradiance spectrum generated by Bernhard G. Bernhard, C.R. Booth, and J.C. Ehramjian, 'Supplement to "Version 2 data of the National Science Foundation's Ultraviolet Radiation Monitoring Network: South Pole"'SUPPLEMENT TO VERSION 2 NSF UV DATA: SOUTH POLE (Version 2 data of the National Science Foundation's Ultraviolet Radiation Monitoring Network: South Pole," J. Geophys. Res. 109, D21207, doi:10.1029/2004JD004937, 2004.)

who used Kitt Peak high resolution spectrum with low frequency envelope from Gueymard's spectrum. I trust this experimental spectrum much more than the synthetic Kurucz's spectrum. The low resolution Gueymard's spectrum is also based on experimental data.

Perhaps it should be emphasized that errors in solar spectrum are transmitted directly to the calibration constants of the proposed method.

(3) Page 5339. I find notation used in the equation (4) somewhat confusing if not misleading. The scaling factors S(AOD, lambda) is not dependent on i, i.e., i=SZA. Furthermore as it is instrument responsivity that converts detector counts to radiance units, it is independent of AOD. Formally, it might be dependent on AOD in the scheme proposed in this paper in terms as it is merely a result of model errors and erratic model assumptions on the actual AOD and other parameters that parametrize the atmospheric state in the sense of the model. For this reason the actual responsivity (the scaling factor) is not dependent on AOD or any other atmosphere's parameters.

The described method can yield many values of S depending on the "scenario". BTW, I would add AOD to the parameters (like SSA, g, phase function, pressure, profiles... and surface albedo) that describe atmosphere or define the "scenario" as a function of SZA. The only difference is that unlike other parametrs, AOD is presumably known from an ancillary measurement.

Which S should be decided upon in the described scheme? The residuals r(i)=R(AOD,lambda, i)-S*D(lambda, i) should have no discernable trends or systematic excursions from r=0 line as function of i=SZA. Perhaps this should be used as an auxiliary criteria to decide which scenario is “right”.

For the day considered in the paper (24/06/2009) AOD is not constant. One could use notation for scenario: SC={sc(i)}={AOD(i), SSA(i), g(i), phase function(i), pressure(i), profiles(i)... and surface albedo(i)} and then in eqs.(4) one would minimize RMS of residuals r(i)=R(sc(i),lambda, i)-S*D(lambda, i) with respect to S for a given set SC (scenario) of sc(i) and then from within different scenarios SC's pick that scenario for which r(i) demonstrate the smallest trends.

However if two scenarios SC1 and SC2 produce the same values of RMS and different values of scaling factors S1 and S2 there is no way to tell which one is correct without experimental data. The statistics of S among the likely scenarios SC's that produce similar RMS values should define the uncertainty of this calibration method. The statistics could be subdivide in different cases when AOD is known or not, when SSA is known or not...

It seems intuitively obvious that optimal day for calibration should be picked up among days that have clear sky and have constant AOD and furthermore have constant Angstrom coefficient. The latter brings you closer (necessary condition) to a case that within a given day scenario's SSA, g, profiles are constant. Meaning, lower number of scenarios.

(4) What is polarization sensitivity of the spectroradiometer in this study?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 5329, 2015.