Atmos. Meas. Tech. Discuss., 3, C859–C861, 2010
www.atmos-meas-tech-discuss.net/3/C859/2010/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Speeding up the AOT retrieval procedure using RTT analytical solutions: FAR code" *by* I. L. Katsev et al.

Anonymous Referee #2

Received and published: 8 July 2010

A review of manuscript "Speeding up the AOT retrieval procedure using RTT analytical solutions: FAR code" by Katzev et al. MS No: amt-2010-33 Authors propose a fast radiative transfer algorithm and its application for aerosol retrieval and possible atmospheric correction of satellite data. Using the fast radiative transfer instead of look-up table approach is a very good idea, especially when the number of variable parameter is large, as for example in case of multi-angle polarization measurements. Authors achieve acceleration of radiative transfer by modeling the atmosphere as a two-layer system, and by applying Sobolev's approximation to find the contribution from the lower layer where most of aerosol is contained. It seems to me that the accuracy of proposed solution is by far not good enough for the remote sensing applications. From the data presented, one can see the error of up to 10-15% for a limited set of used geometries. It may be larger at other geometries, especially when closer to the principle

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

plane. This error is not systematic. It depends on the view geometry, which will result in angular dependence of the retrieved AOT/surface reflectance. The radiative transfer model seems to be incomplete. For example, the surface bidirectional reflectance is not taken into account. Contrary to the statement on page 1651, there is a water vapor absorption in the red and near-infrared spectral regions. There is also a non-negligible NO2 absorption at wavelengths shorter than about 500 nm. The authors mention that the developed radiative transfer model has polarization components, but I am not sure what accuracy the Sobolev's approximation would give in case with polarization. The aerosol retrieval algorithm should handle all conditions, including rather asymmetric scattering by aerosols, and higher optical thickness where the accuracy of Sobolev's approximation is even lower. Several times the authors mention the developed and earlier described code RAY, which is used as a benchmark to establish the accuracy of the developed algorithm. I didn't find, however, any accuracy statement for the code RAY in this manuscript. I would presume that the accuracy of code RAY was established earlier against community-recognized RT codes, such as DISORT (in scalar case). If that is the case, I recommend authors to provide a simple accuracy statement for the code RAY, which will allow to better understand the results presented here. Modeling spectral dependence of surface reflectance using prescribed database albedo may work for aerosol retrievals locally, especially over deserted surfaces which don't change over time. However, this approach doesn't work at larger scale. The vegetated surface have a seasonal cycle and rapid changes. How does this algorithm account for the surface change (and for changes in the view geometry which call for the BRDF effect)? In general, treatment of surface reflectance in the aerosol retrieval algorithm should be discussed in more detail, as this is the main error source in the aerosol retrievals. Presented results on validation of AOT with AERONET measurements look promising, but it is not possible to have a reliable accuracy assessment from just several points, without representative statistics. Can you provide comparison with AERONET, for example, for one year of data? As a summary, presented idea is very promising for developing physically-based retrieval algorithms, especially in cases

AMTD

3, C859–C861, 2010

with high dimensionality of measurements (e.g., multi-angle, multi-spectral, polarization). The described approach moves in this direction, but it seems that some further work is needed to achieve the accuracy of better than 1-2% which is required for a reliable inversion of the remote sensing data. The work would also strongly benefit if some representative statistics of AERONET comparison were obtained expanding validation presented in this paper. It needs to be mentioned that the language of the manuscript needs extensive corrections, mainly in the first half of the manuscript.

Sincerely,

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 1645, 2010.