Atmos. Meas. Tech. Discuss., 3, C2449–C2451, 2011
www.atmos-meas-tech-discuss.net/3/C2449/2011/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Statistically optimized inversion algorithm for enhanced retrieval of aerosol properties from spectral multi-angle polarimetric satellite observations" *by* O. Dubovik et al.

E. Zege (Referee)

eleonor@light.basnet.by

Received and published: 11 January 2011

General Comments:

The paper "Statistically optimized inversion algorithm for enhanced

retrieval of aerosol properties from spectral multi-angle polarimetric satellite

observations" by Dubovik et al. is a really outstanding work that describes developed innovative technique for satellite remote sensing of atmosphere aerosols and spectral

land characteristics.

Authors do not use the traditional LUT (Look-up-Table) technique for aerosol retrieval. Extensive information provided by POLDER-PARASOL instrument (multi-angle, multi-spectral data, polarization measurements, more than 100 readings per pixel) opens a wide possibility of using statistical optimizations in satellite data processing. Even for the detailed aerosol retrieval (when the particle size distribution of the two -component aerosol with non- spherical coarse fraction, its spectral complex refractive index and shape of the particles are retrieved) the amount of observations exceeds the number of retrieved parameters. The developed algorithm fits total and polarized spectral radiances observed in all directions using generalized multi-term Least Square type numerical inversion formulation. It is very important that the developed formulation allows fitting several sets of both observations and a priori data. This challenging and cumbersome problem was brilliantly solved; the retrieval algorithm was developed and verified by Dubovic and coauthors and presented in the reviewing paper. The presented retrieval technique incorporates methods and instruments developed by Dubovic and coauthors earlier for the retrieval of aerosol characteristics from AERONET data with modeling the aerosol coarse fraction by non-spherical particles.

The fundamental result of this work is that the method of the usage of the statistical optimization has been introduced into the concept of satellite data inversion.

One more outstanding new concept described in this paper is the Multiple-pixel retrieval that is a simultaneous inversion of a large group of pixels within one or several images. This regime allows the usage of limitations on spatial and temporal variability in both aerosol and surface properties that allows to use of additional set a priori constraints.

We may congratulate the authors with such achievements and Atmospheric Measurement Techniques may be proud to publish this work.

Specific comments:

A lot of the slips of the pen have been already done by reviewers. I will list only few.

1. P. 42, Sec 4.2 the first sentence is :

"In a contrast with the most of satellite retrievals, the algorithm developed here does implement the measurement fitting for each single pixel independently. Instead, the fitting is implemented for a group of pixels. . . "

May be

"In a contrast with the most of satellite retrievals, the algorithm developed here does **not** implement the measurement fitting for each single pixel independently. Instead, the fitting is implemented for a group of pixels. . . "

2. Table 7.

It is a little bit strange that retrieval at wavelength 0,44μ looks better than at 1.02, because the channel 0.44$\mu$is not the best. Of course, this result may arrive from statistical optimization with the set of data. A comment is recommended.

3. In spite of the details of aerosol characteristic are very important, still the accuracy of the retrieval of spectral AOT is of a primary importance for climatology. I recommend to include a clear statement about this accuracy achieved with POLDER-PARASOL instrument and used retrieval technique.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4967, 2010.