Atmos. Chem. Phys. Discuss., 9, C11394–C11396, 2010
www.atmos-chem-phys-discuss.net/9/C11394/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol spectral absorption in the Mexico City area: results from airborne measurements during MILAGRO/INTEX B" *by* R. W. Bergstrom et al.

Anonymous Referee #2

Received and published: 6 March 2010

Review: Bergstrom et al "Aerosol spectral absorption in the Mexico City area: results from airborne measurements during MILAGRO/INTEX B"

General comments

The paper describes combined airborne measurements of spectral solar irradiance (using Solar Spectral Flux Radiometer, SSFR instrument) and spectral aerosol extinction optical depth (AOD, using Ames Airborne Tracking Sunphotometer, AATS) during MILAGRO campaign in March 2006. The measurements are combined with high resolution radiative transfer (RT) model to infer spectral aerosol single scattering albedo (SSA) and aerosol absorption optical depth (AAOD) in 350nm and 1622nm spectral

region outside of strong gaseous absorption lines. The methodology is sound because good quality data (SSFR and AATS) are utilized with state of the art RT model to derive spectral dependence of SSA and AOT, which potentially opens up new applications for remote discrimination of aerosol types (e.g black carbon versus organic carbon or dust). Paper analyses results from 5 flights; 2 over Gulf of Mexico and 3 over MCMA. Since there is little measurements of spectral aerosol absorption, especially in UV spectral region (AERONET inversions provide SSA and AAOT measurements at 4 visible and SWIR wavelengths 440nm, 670, 870 and 1020nm) the results are important and appropriate for publishing in ACP MILAGRO special issue. Especially interesting are SSA and AAOT retrievals in UVA spectral region (350-400nm) that indicate enhanced aerosol absorption attributed to organic carbon and/or dust. The SSA and AAOT results agree reasonably with other mostly ground based studies at MCMA and other locations that are well discussed. I found absorption results at SWIR wavelengths less convincing because of typically small AOD values, when the retrievals are highly uncertain. However, there is proper acknowledgement of this problem and the error bars in the figures correctly reflect the difficulties.

To my opinion the SSA retrieval method needs to be described either in section 3.2 or , perhaps in a separate section, which gives necessary background and explanation of equation (1).

Although the results presented in figures 3-6 contain sufficient details, the description is mostly in terms of extinction Angstrom Exponent (EAE) and absorption Angstrom Exponent (AAE). Both AAE and EAE are oversimplified approximations of the spectral dependence of AOD and AAOD, especially when combing UV and visible spectral regions. It is not surprising that using different wavelength pairs one can obtain different AAE and EAE values. Fitting second degree polynomial to the AOD or AAOD spectral dependence would provide better results.

I suggest tightening text and using abbreviations throughout (e.g. Fractional absorption – FA).

ACPD
9, C11394–C11396, 2010

I recommend publishing the paper in ACP with minor corrections aimed at improving the text.

Specific comments

27548, 15 provide references for DOSORT RT, Rayleigh OD, spectroscopic constants. What surface albedo has been used?

27550, 3.2 Describe retrieval of SSA

27552, 25 Use AAOD abbreviation " AAE fit for the [350] to 500nm region"

27554, 25 ". . .with the thickness of the [aerosol] layer above the airplane . . ."

p.27556, 15 Last sentence not clear.

27558, first sentence: " . . .compared the [filter sample absorption] results . . ."

Next paragraph, 1st sentence: remove repetitive words : "the absorption data with ". Second sentence is not needed.

15: AERONET only provides SSA and AAOT at wavelengths longer than 440nm. Therefore higher AE and lower AAE are expected.

7. Conclusions

5: - [350]-500nm region

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27543, 2009.

ACPD

9, C11394–C11396, 2010

Interactive Comment