Atmospheric Measurement Techniques Discussions

Interactive comment on " Understanding the aerosol information content in multi-spectral reflectance measurements using a synergetic retrieval algorithm" *by* D. Martynenko et al.

Anonymous Referee #3

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General Comments:

The manuscript entitled "Understanding the aerosol information content in multi-spectral reflectance measurements using a synergetic retrieval algorithm" by Martynenko et al. presents the work on extracting and analyzing the aerosol information content in the multi-wavelength reflectance measurements made by two ENVISAT instruments namely AATSR and SCIAMACHY. In particular, authors attempt to quantify the number of independent pieces of information, termed as degree of freedom of signal (DFS), using combined measurements from the two instruments, with emphasis

on discriminating different aerosol types. Authors find that given the accurate spectral reflectance and cloud-free condition, the multi-spectral measurement used in the SYNAER algorithm can provide 2 to 4 degree of freedom with which one can derive aerosol parameters: aerosol optical depth, aerosol type, and surface albedo. The DFS is found to be dependent on the magnitude of AOD, surface type, observation geometry, and noise.

Overall, this paper is well-written, however it needs more clarity at important places, for instance, while discussing the degree of freedom of signal and its interpretation/application presented in the results section. The content of this manuscript fits in to the scope of this journal and worth publishing.

I have few specific comments on the content of this paper which I have attached with this review. Authors are requested to provide satisfactory response to these queries.

Thank you,

Specific comments on manuscript # amt-2010-70

Abstract. Line 1-5: This is misleading. Authors apply SYNAER technique on synthetic spectral reflectance (also mentioned between line 10-15) and do not use actual measurements made by the two sensors. However, authors mention on line 15 of section: Introduction that SYNAER is already in operation at DFD and derived AOD along with the type of aerosol over both land and ocean based on OPAC model.

Introduction Line 5: "The characterization of aerosols using satellite observations is challenging...". The characterization of aerosol type depends on surface type (ocean or land, dark or bright surface) and 'non-uniqueness' of inversion. Many combination of aerosol types would produce similar spectral signature in reflectance measured by the satellite sensor.

Line 25: I have some doubts with Table 1. Why there is repeatation in the aerosol model composition, for instance, with model no. 15-16-17 (also with model 5-6 and

7-8? Do authors change hematite content with water soluble and mineral component?

Section 3.3: Distinction between aerosol type Page 2590, line 9-10: "Domains of different aerosol models are well distinguished." Not true completely. Its valid only for dust. There is a considerable overlap over the lower part of the domains. Please clarify this.

Page 2590, line 11-14: Not clear.

Section 4: Discussion and conclusions: Page 2591: Repeatative content (on separating biomass burning and pollution aerosols) in paragraph 1 and 2

Figures Fig. 6c: replace 'wies' with 'meadow'

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