

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 #1

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The manuscript "Understanding the aerosol information content in multi-spectral reflectance measurements using a synergetic retrieval algorithm by Martynenko et al. analyses the information content of synergetic aerosol retrieval from Envisat instrumentation. The information content of combined AATSR and SCIAMACHY observations is estimated using two well established techniques: optimal estimation and principal component analysis.

This topic is relevant for the community and fits in the scope of AMT; the approach is sound, and the manuscript is well written. I recommend publication of the manuscript

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in AMF after the minor revisions below have been made.

1. The present study builds on work by Holzer-Popp et al, 2008, who has already addressed the information content to some extent. It should be stated explicitly in the present manuscript what is new to the present study.
2. It should be made more clear what assumptions are made regarding the spectral surface reflectance; is the spectral surface reflectance part of the state vector in the DFS analysis using Rodgers optimal estimation? how is the surface albedo treated in the SYNEAR retrieval?
3. It should be discussed in more detail why two methods are employed for estimating DFS and what the associated advantages or disadvantages are. Also it needs to be made more clear in which context the PCA is applied: is the surface albedo variability included in the set of input spectra? Is the PCA analysis aiming at distinction of aerosol types restricted to cases where the spectral surface reflectance is known?
4. The text says that an "a priori covariance matrix" is shown in Figure 1. In contrast, Figure 1 shows a covariance matrix of the 40 aerosol models used in the PCA.
5. The literature list seems incomplete.
6. The assumed values for the measurement error should be discussed.
7. A discussion on which kind of information comes from which instrument would be desirable.
8. It is recommended to discuss the results of the present study also in context of the findings of Hasekamp et al JGR 2005.
9. It is recommended to refer also to Tanre et al JGR 1996 for the PCA.

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