Atmos. Chem. Phys. Discuss., 12, C10135–C10137, 2012
www.atmos-chem-phys-discuss.net/12/C10135/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A unified approach to aerosol remote sensing and type specification in the infrared" *by* L. Clarisse et al.

Anonymous Referee #2

Received and published: 4 December 2012

This paper looks to introduce a new 'unified' detection method, linking spectral fitting, minimisation, principal component analysis and the sensible use of auxiliary information to develop a 'discriminant analysis' technique. This is designed to be applied to detect different classes of aerosol using infrared hyper-spectral observations, here from IASI, although the method could be adapted to other similar instruments.

More than half of the paper is spent reviewing the previous techniques before essentially combining these in the new framework. This part is in general very well written (bar a few missing definitions of some of the terms in equations) but unsurprisingly rather technical in nature and for this reason (and those given in the next paragraph) I would suggest that the paper as it stands is better suited for submission to Atmospheric Measurement Techniques.

Rather less emphasis is given to the examples of the application of the new technique. The writing in these sections becomes less clear, and it would be difficult for a reader to repeat the analysis performed by the authors because an insufficient amount of information is provided. For example, 'tuning' is often mentioned but without any description of what this actually entails. There is also, in my opinion, a lack of independent evaluation of the success of the approach. While for some aerosols such as ammonia sulphate this might be difficult to obtain, for windblown sand, smoke aerosol and volcanic ash there are plenty of existing datasets that could be used. The additional merit that this new approach brings above and beyond what can be done already is not, in my opinion, adequately demonstrated at the moment. It may be easier to do this if the authors focus on fewer aerosol types - perhaps pick those where this approach offers the biggest potential for improving our knowledge of the global distribution - and describe exactly what they have done and what the benefits are. I would certainly lose cirrus clouds as considering these as an aerosol seems rather odd to me if not technically incorrect.

A few small additional comments:

I think it would be highly beneficial to explain to the reader what the range of RN actually means in the various figures if the authors decide to stick with this representation.

In the ash and dust sections, I think it would make more sense to give an indication of where the various categories (1-10) come from geographically.

There is no real discussion of the effects of variations in aerosol size distribution. This, in combination with the chemical composition, will influence the optical properties that then propagate through to the radiative signature. Are the authors convinced that this will be a secondary effect? A similar comment could be made for particle shape.

I wonder whether the separation used in practice into 'clean' and 'polluted' cases gives enough samples to exclude the impacts of variations in, in particular water vapour. While the atmospheric window is less influenced by this gas than other spectral re-

ACPD

12, C10135–C10137, 2012

gions, insufficiently characterising its effects will alter the precise spectral signature seen here. Similarly, when calculating covariances, is any account taken of the fact that the presence of aerosol is likely to change the thermal structure of the atmosphere?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 26871, 2012.

ACPD

12, C10135–C10137, 2012