Atmos. Meas. Tech. Discuss., 6, C3200–C3202, 2013
www.atmos-meas-tech-discuss.net/6/C3200/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Fast reconstruction of hyperspectral radiative transfer simulations by using small spectral subsets: application to the oxygen A band" *by* A. Hollstein and R. Lindstrot

Anonymous Referee #1

Received and published: 1 November 2013

General comments:

The manuscript develops a fast hyperspectral radiative transfer model by computing the principal components for a small number of representative hypersectral spectra and a reconstruction matrix for a specific spectral subset of channels. The fast model leads to speedups up to two orders of magnitude compared with the full spectral simulations. The manuscript shows an important and novel model for the hyperspectral radiative transfer, and is well organized. Thus, it can be accepted by the AMT after some minor revision.

Specific Comments:

The following mentions some comments that should be considered by the authors.

1. Page 8341: The authors mentioned that two main approaches are used to increase the computational efficiency of the radiative transfer simulations. However, there are also other fast hyperspectral models based on pre-computed databases, e.g. Wang, C., Yang P., Platnic, S., Heidinger, A. K., Baum, B. A., Greenwald, T., Zhang, Z., and Holz, R. E. 2013: Retrieval of ice cloud properties from AIRS and MODIS observations based on a fast high-spectral-resolution radiatiove transfer model, J. Appl. Meteor. Clim. 52, 710-725. These kind of studies also be mentioned in the manuscript.

2. Page 8346: The last paragraph discusses the histogram of state vectors exhibiting the 10% smallest reconstruction SNR, and those states are related to the largest reconstruction errors. How about the ones that exhibits the largest 10% reconstruction SNR, and is there any special properties for those cases?

3. Page 8357: In the table, 9 state vector parameters are listed, and most of them are quite easy to understand. However, five different aerosol types are included, and classified as dust, urban, continental, neutral and absorbing aerosols. For completeness, a brief introduction about them should be given.

4. Page 8359: Fig. 2 shows the mean reconstruction SNR as well as its standard deviations based on different number of selected spectra. The arrow in the figure indicates the range from (mean - standard deviation) to (mean + standard deviation), while the label gives “standard deviation = 1359”, which is quite misleading.

5. Page 8261: Fig. 4 illustrates the occurrence frequency for different parameter state in the lowest 10% fraction. For the different parameters, the frequency shows quite different trends in the figure. How do those parameters affect the TOA reflectance and the accuracy of the method, and, thus, how are they related to the different trends? Can the authors explain those briefly?

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6. Pages 8367 and 8368: Figs. 10 and 11 show the reflectance differences between the original and reconstructed spectra, and, as expected, the differences are significantly oscillated. What are values for the averaged differences, and how much are the difference for the averaged values between the equally distributed or optimized selections?

That's all of my comments. Again, this paper is well organized and informative, and need only minor revision to give more accurate information to science community.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 8339, 2013.