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Atmospheric Measurement Techniques Discussions

Interactive comment on "Deriving clear-sky longwave spectral flux solely from hyperspectral radiance: a case study with AIRS observations" *by* Xiuhong Chen and Xianglei Huang

Anonymous Referee #1

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The manuscript titled "Deriving clear-sky longwave spectral flux solely from hyperspectral radiance: a case study with AIRS observations" by X. Chen, and X. Huang contains significant improvement over their previously developed algorithms for deriving spectral flux from hyperspectral radiances. The work is important since the spectral flux can provide important information for the climate model diagnostics. The main innovation of this study is that the TOA flux can be derived without using external satellite data. In their previous method, the radiance-to-flux conversion uses scene type information derived from other collocated satellite observations. Since the hyperspectral radiance spectra contain information on atmospheric temperature, water vapor, and clouds, it is possible to identify the scene types and estimate the spectral flux directly from the

hyperspectral radiances without using auxiliary information from other satellites. The accuracy of the proposed method has been demonstrated using both synthetic data and AIRS observations. The results show that the mean differences in the spectral fluxes obtained from radiance-to-flux method and those computed directly from ERA profiles using the MODTRAN radiative transfer model are small (about 0.03 W/m2). The RMS differences between the AIRS-only calculated OLR and the CERES clear-sky OLR are comparable to their previous method. The averaged OLR differences are comparable or less than the radiometric uncertainty of CERES OLR. Even for the misclassified sub-scene type, the error in the predicted OLR is only 1% or less. The robust performance of this technique at different viewing zenith angles indicates the success of this new approach. Thus, I suggest that Atmospheric Measurement Techniques to publish this work. The manuscript is well written; the reviewer only has a few suggestions for the authors:

1. The authors used a spatial inhomogeneity test, a bi-spectral test, and a thermal threshold test to verify a clear-sky spectrum. The accuracy is around 80-90%. What is the rationale for using 4 adjacent footprints for the spatial inhomogeneity test? Since the AIRS field of regard has 9 footprints, it makes more sense to use all 8 footprints around the center one. It will probably increase the sensitivity of the inhomogeneity test while not increasing the area size used for the test. 2. On page 12 line 211, change the "ADM (Rairs)" to "ADM, Rairs,"

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