Atmos. Chem. Phys. Discuss., 11, C2691–C2694, 2011
www.atmos-chem-phys-discuss.net/11/C2691/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of satellite-derived HCHO using statistical methods" *by* J. H. Kim et al.

J. H. Kim

jaekim@pusan.ac.kr

Received and published: 4 May 2011

This reviewer criticized our work as a "Friday afternoon experiment" with HCHO and gave several arguments. We appreciate the reviewers' thoughts and answer them here..

(1)Reviewer comment: This work does not have any meaningful insight.

Response: This work is concerned with the validation of satellite-determined HCHO resulting from a difficult retrieval due to weak signals and significant interference. As discussed in the paper, the validation of satellite-derived HCHO is difficult because there are very few in-situ measurements. Due to this limitation, this paper introduces a new application of a well-known statistical method for qualitative evaluation of the

HCHO data. Based on this validation, we can correct the HCHO retrieval and made a contribution for producing an improved HCHO data set. Although Barkley et al., (2009) used similar analysis techniques to analyze GOME and SCIMACHY HCHO, that analysis assumed the data were correct. They did not investigate the accuracy of the satellite retrievals. We modified this part and discussed our validation results with respect to the analysis results from Barkley (2009) as well as referencing Barkley et al. (2009). Although we did not invent a new validation tool, this application has resulted in contributing to the improvements of satellite data products. We think this statistical approach to validation is new and has had an influence on improving satellite-derived HCHO. In this validation, we used EOF and SVD statistical methods, which have been used widely in climate studies. We find no reference to another group that used these tools for satellite data validation. These statistical tools were firstly applied to validate satellite tropospheric ozone products determined by various methods, which had a controversial dispute among the products (Kim et al., 2008, GRL). We showed this approach is better, and certainly more sophisticated than the traditional, pair-wise satellite validation method, which uses simple comparisons between satellite retrievals and in-situ measurements or theoretical model calculations.

(2)Reviewer comment: Because EOF and SVD have been widely used for satellite data analyses, no significant contribution was made by this work.

Response: Although EOF and SVD have been used in atmospheric science for several purposes, no one has used these tools for satellite validation. After the fact, like the 'Columbus Egg', the application looks simple, but the first instance requires scientific insight. We contend that this insight for this validation purpose constitutes a significant contribution to the literature.

In the revised version, we add more previous works and reference about the EOF and SVD analysis of satellite data according to the comment.

(3)Reviewer comment: "Given the differences in spatial footprints and overpass times

ACPD
11, C2691–C2694, 2011

of the different sensors measuring HCHO should I expect any similarity in modes of variability over regions with biomass burning?"

Response: There have been three satellite platforms that measure HCHO. These are GOME, SCIAMACHY, and OMI. Yes, they have different spatial footprints and overpass times. In this study, we want to know what are their similarities and differneces. In this paper, we want to determine if these similarities and differences derive satellite retrieval errors or just from differences in the field of view and equator crossing time. This paper deals with all of those issues.

(4)Reviewer comment: "Biomass burning has a strong diurnal variation, as acknowledged by the authors. The different sensors span different years in which biomass burning emissions can vary substantially."

Response: Yes, biomass burning has strong diurnal variation. That is the reason why we use monthly averaged data. Even though biomass burning has strong diurnal variation, that variation can't alter the burning season into non-burning season. It is true that the different sensors span different years in which biomass burning emissions can vary substantially. A careful examination of the results of the EOF and SVD analyses indicatesthe yearly amplitude of the burning signal. This is the reason why we use these statistical tools because they answer the question that the reviewer raised.

(5)Reviewer comment: "The authors then go on to make rash statements about separating the influence of biogenic and biomass burning contributions to HCHO. Simple-minded data analysis just doesn't work in interpreting such a complicated scene." . . . a detailed chemical analysis is beyond the scope of this study." but unfortunately, something more than reported is required to make this study worthwhile publishing.

Response: We think that beauty of this technique comes from producing a simple explanation that can clearly indicate what is accurate and inaccurate about satellite products. We expressed the results from what the statistical analyses showed us. We believe that simpler is the better. Do we need in-situ measurements from a huge cam-

ACPD

11, C2691–C2694, 2011

paign or theoretical model outcome for comparisons because many scientists devoted a lot of effort to get those field measurements and model output?

Most scientists using satellite data for their research think that satellite data is just like cheap but excellent beer for a Friday afternoon Happy Hour. They have done various analyses with the data sets. However, only a few people know that the beer is poisoned. In other words, the satellite data contains a number of errors. Therefore, evaluation of satellite products is very important, but it is very difficult because of limitation of the ground truth measurements. We believe our approach is scientifically and mathematically solid and that this approach is new and worthwhile to remove possible sources of errors and thereby provide a better quality data sets to scientific community than previously available.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 8003, 2011.