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Atmospheric Measurement Techniques Discussions

Interactive comment on "Description of a formaldehyde retrieval algorithm for the Geostationary Environment Monitoring Spectrometer (GEMS)" *by* Hyeong-Ahn Kwon et al.

Anonymous Referee #1

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In this paper, Kwon et al. described the HCHO retrieval algorithm to be implemented with the Geostationary Environment Monitoring Spectrometer (GEMS). The authors discussed the three main steps in the algorithm (namely preprocessing, spectral fitting, and postprocessing), carried out uncertainty analysis, and also compared GEMS results (using OMI radiance data) with existing OMI HCHO results and MAX-DOAS at a few stations. Once launched, the HCHO data from GEMS can potentially be used in studies on regional air quality, and biomass burning in large areas over East and Southeast Asia. A paper providing detailed documentation of the retrieval algorithm is certainly of great interest to data users and the satellite remote sensing community. Overall, the paper is well organized, and figures and tables are mostly clear. I would

recommend publication in AMT after some clarifications (see below):

Specific comments: One would assume that there are some similarities and differences between the GEMS and OMHCHO algorithms. Some of these are discussed throughout the text, but it would be useful to have a table or a paragraph summarizing the different setups (and the resulting differences in HCHO) between the two instruments.

It appears that the background correction is a main contributor to the differences between GEMS and OMHCHO. And the two used different versions of GEOS-Chem for background VCDs. Is it possible to compare the model HCHO VCDs from the same model over the GEMS "background" area and OMHCHO "background" area? The easternmost part of GEMS FOR is still relatively close to Asia (and biomass burning and CH4 sources). A comparison may help to determine if the GEMS background is "background" enough.

Some symbols used in equations are not defined (immediately before or after the introduction of the equation), for example i and j in equation 11.

Page 7, Line 6: is 300 DU VCD of ozone for the pseudo cross section calculation?

Page 8, Line 7 and Figure 1: maybe you can define and plot the background areas?

Page 11, Line 15: would you expect that destriping would be necessary in the south/north direction?

It appears that latitudinal correction is implemented for the GEMS prototype algorithm – can the authors discuss uncertainties associated with this?

Figure 7: the figure is quite confusing – can the authors provide more detailed description and discussion?

Page 16, Line 29-34: can the authors briefly mention what kind of method/strategy/data will be used for aerosol correction, in the case of dust/smoke?

Figure 11 and related discussion: if ozone is an important contributor to the differences

between GEMS and BIRA OMI, maybe the authors can also compare the results from tropics and mid-latitude areas separately? One may expect somewhat better agreement between the two in the tropics? Or maybe the authors can run some test GEMS retrievals using the ozone cross section as used in BIRA retrievals?

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