

Interactive comment on “Sensitivity of formaldehyde (HCHO) column measurements from a geostationary satellite to aerosol temporal variation in East Asia” by Hyeong-Ahn Kwon et al.

Anonymous Referee #1

Received and published: 19 December 2016

This paper presents an OSSE study to evaluate the retrieval sensitivity of HCHO vertical columns observed by geostationary satellites due to the temporal variations of aerosols. This study is conducted specifically to evaluate the retrieval algorithm for the upcoming Korean geostationary satellite, GEMS. The OSSE was conducted with no noise, such that the resulting retrieval should be considered a "best-case scenario".

The authors found that the temporal variation of aerosols result in significant changes in AMF, leading to errors in HCHO retrieval. Specifically, the effects of aerosols were attributed to the single-scattering albedo, the AOD, and the vertical distribution of aerosols relative to the HCHO, consistent with previous studies. Overall, the authors showed that neglecting the temporal (hourly) variability of aerosols would lead to -37%

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to 84% biases in the retrieved HCHO VCD. Thus the impact of aerosols cannot be neglected for future geostationary observations.

The topic is of great interest to the community, as the use of satellite observations of trace gases in air quality studies continue to expand and several geo-stationary satellite instruments are soon coming online. The experiments were thoughtfully designed, and the paper was well written. Personally I only have one major comment that I wish the authors would further address.

My only major suggestion is for the authors to consider the use of monthly mean "hourly" AMF, e.g. monthly mean AMFs for 9AM, 10AM, 11AM local time ... The only reason for using monthly mean AMFs would be to reduce computation such that operational VCD products can be delivered quickly. It seems the use of "monthly mean hourly" AMFs would not only be quick, but also address a lot of the aerosol temporal effects, since for each month, the main diurnal variability of AMFs is driven by the vertical profile of aerosols (which in turn is driven by the development of the PBL). This seems like something the authors can address without too much additional computation.

Minor comment: Page 8, lines 20-21: "In biogenic emission regions, the effects of biogenic aerosols on AMF are negligible ..." This may be true, but it would be nice to have some quantification. How large is the contribution of biogenic aerosols to total AOD?

Interactive comment on *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2016-712, 2016.

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