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Interactive comment on "Smithsonian Astrophysical Observatory Ozone Mapping and Profiler Suite (SAO OMPS) formaldehyde retrieval" *by* G. González Abad et al.

Anonymous Referee #2

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The latest paper from the SAO retrieval group documents the retrieval algorithm set-up for measuring HCHO columns concentrations from the OMPS sensor. Overall, the manuscript is generally written with clear graphics, and is well-suited to AMT.

I only have a few items that need to be clarified before acceptance.

Abstract, line 8: 'similar concept' is really a 'similar retrieval approach' is it not?

Abstract, line 21: Would be good to include which OMI datasets were used here.

P 9211, Line 21: Typo, 'trophosphere'

P 9214, Line 15: Regarding the radiance references I0, are the radiances on a static

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wavelength grid? Or are individual radiances interpolated onto a common wavlength grid, before being averaged to prdouce I0? How many spectra go into a single I0 spectrum? How do the retrievals change if a +/- 2 day window is used?

P 9215, Line 19: there are no 'a_x' in equation 1. There are 'a_n' and 'a_m'. Please be explict in what you mean here.

P 9217, line 18: Why is the TOMS reflectance used? I struggle to understand this point, given the similar viewing characteristics of OMI and OMPS, why not use the OMI reflectances by Kleipool et al (2008). Please discuss further.

p 9218: How many observations go into the correction at any given latitude bin? It was not clear but it appeared that the corrections were done on a monthly basis, and then applied to each observations (i.e daily)? I get the approach but it could be explained a little better.

p 9219: shouldn't eqn 7 uses the covariance matrix of HCHO, is this the cross-section? If so, shouldn't be the covariance matrix of all cross-sections fitted. Please clarify.

p 9220: Is the AMF error analysis conducted by implementing systematic changes in each input (e.g. 0.1 change cloud fraction) or are the individual sensitivities (or partial derviatives) calculated. it is not clear, and that latter approach is the more accurate for quantifying errors. Using a 10% error for GEOS-Chem profiles is also very optimistic. HCHO profile uncertainty is much greater over tropical latitudes (see Hewson et al, AMT, 2015). It is likely AMF errors are on avareage of order 50% - if we are really being honest.

p 9221: how do the OMI and OMPS comparsions change for other cloud radiance fractions

P 9222: What is the difference between SAO and BIRA OMI? Whilst the temporal variations are similarly observed, there are quite large biases in magnitude. This is quite disturbing, for data users this can result in large differences in results depending

on their application. Whilst it is evident that OMPS can retrieve HCHO, I still need to be convinced on the actual application of both datasets within a single science study (but this is early days). Also, there should be mentioned somewhere of the consistent GOME, SCIA, OMI data sets retrieved by the BIRA group (this is not really mentioned in the paper).

The lack of variability in the BIRA OMI data, does this point to an overcorrection in their dataset which smooths the retrievals too much, or alternatively, the SAO reference correction introducing variability. I think more room for discussion on this point. Figure 6 is quite interesting, especially over the Pacific ocean, here all three retrievals should be very similar but they are not. To me there is a lot 'hidden' possible effects and potential consequences in the reference correction approach, but it is what it is, and is unfortunately needed.

Include vcds from individual OMI vs OMPS swaths to get a visual comparison of different footprints.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 9209, 2015.