

Responses to reviewers' comments on "Validation of formaldehyde products from three satellite retrievals (OMI SAO, OMPS-NPP SAO, and OMI BIRA) in the marine atmosphere with four seasons of ATom aircraft observations"

We appreciate the valuable feedback and support from two reviewers and Jean-Francois Muller regarding the publication of this manuscript following revisions. In response to their suggestions, we have carefully revised the manuscript. To facilitate the review process, we have included the reviewers' comments in black text, with our responses in blue. All comments have been addressed, and the corresponding changes to the manuscript are tracked.

Comments from Jean-Francois Muller

Hello,

Although I appreciate the very nice work presented in this paper, I am concerned by the spatial averaging of the OMI column data, as shown on Equation 7. Why this uncertainty weighting? Higher columns have generally a higher uncertainty, in absolute terms (their RELATIVE uncertainty is however generally lower). Equation 7 gives therefore less weight to higher columns. As a consequence, the average is too low. The authors should repeat their calculations by using a regular weighting as given by Equation 6. I played with the OMI data myself and found that the averaging has a substantial impact on the results. I am very curious to see the impact on the analysis presented in this paper.

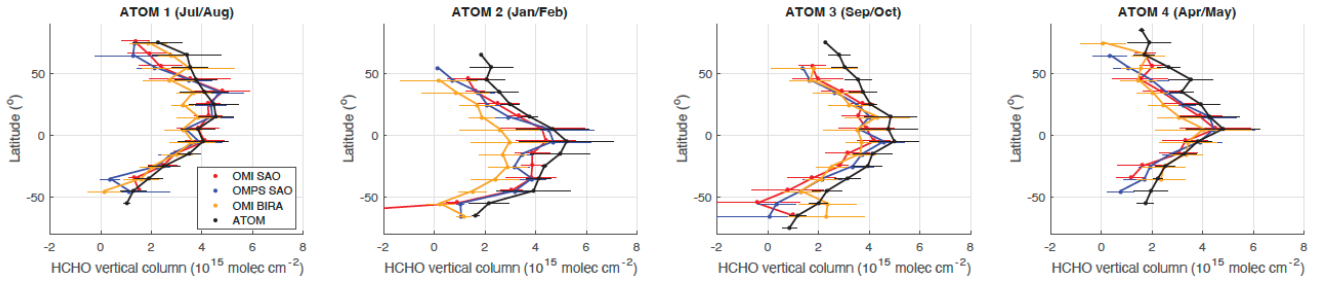
Best regards,

Jean-Francois Muller

There is no clear consensus within the satellite community on whether uncertainty weighting is preferable.

Sect 3.2 added "Uncertainty-weighted satellite HCHO columns (Eq. (6), all figures in main text) are generally slightly lower than area-weighted satellite HCHO columns (Eq. (7), Figure S6) over the remote oceanic atmosphere, particularly in the OMI BIRA retrieval. However, the different weighting methods do not affect the overall conclusions of the analysis results."

SI added Figure S6



**Figure 6S. Area weighted HCHO column density from three satellite retrievals (OMI SAO in red, OMPS SAO in blue, and OMI BIRA in orange) and ATOM in situ measurements (black) at different latitudes. The dots represent the averaged column density for  $\pm 5^{\circ}$  latitude bins and the bars are the standard deviation within the latitude bin. OMI SAO error bars are vertically offset for clarity.**