Review 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”

This manuscript systematically analyzes the differences and sources of remote sensing datasets of formaldehyde column concentrations over the oceans using ATom data and multiple satellite HCHO inversion results. I believe that this work has important implications for both satellite dataset developers and users, especially given the scarcity of validation of oceanic atmospheric observations. The article should be finally published after addressing the issues below.

Major comments:

1. On the significance of the study for data developers and users The oceanic atmosphere HCHO retrieval may be highly noisy due to the instrument detection limits. Therefore, this study is of great importance to both satellite data developers and users in this area. In my opinion, quantitative assessment of the data quality and futher suggestions on retrieval improvement should be emphasized in the manuscript (e.g., abstract and introduction) in relation to the existing knowledge and shortcomings in the data application work, in order to directly highlight the significance and conclusions of the study to the readers. For example, it would be informative for readers to have the mean bias for each satellite HCHO products in the abstract and conclusion section.
2. Regarding the heterogeneity and transformation of atom and satellite observations The transformation of atom in situ observations into atmospheric column concentrations is essential to the comparisons results described in this paper. Although partially mentioned in L120-130, some doubts may remain. For example, missing atom data and the absence of observations in the upper atmosphere (> 10km) require interpolation and averaging, how much do these treatments affect the results? What percentage of Atom data is missing? Are there any uncertainties in the molecule number concentration method? Also in L127-129, "Average gas profiles from OMI SAO HCHO retrievals are used to estimate the contribution of HCHO above 10 km to the total HCHO column": how to derive the ratio of HCHO columns above 10 km from OMI SAO retrievals ? It should be total column HCHO retrieved from OMI spectral measurements. Does such conversion relying on OMI SAO HCHO affects the comparisons with other satellite products such as BIRA product.
3. When comparing different satellite products, may the author use the convolution of averaging kernels in satellite HCHO rertievals with Atom measurements, to minimizing the impact the using different a priori profiles in AMF calculations.

Minor comments:

1. L243-245: the unit of column density should be molecules cm -2?
2. Table 2-4: other metrics such as mean bias should be added and discussed in the main text.