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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of SMILES ClO profiles with other satellite and balloon-based measurements" *by* H. Sagawa et al.

Anonymous Referee #1

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General Comments: This paper is a validation study for the ClO measurements retrieved by one of the alternative algorithms for the SMILES radiometer. SMILES flew on the International Space Station, and made measurements for approximately 6 months in 2009-2010. It has 3 notable features compared to other ClO data sets. SMILES has an extremely low-noise receiver, which allows it to make measurements of the very weak signal of ClO in the mesosphere with good precision. It simultaneously measures the middle and lower stratosphere. The non-solar synchronous orbit of the Space Station allows measurements at a full range of solar times (over a range of '1-2 months'), which enables an indirect measurement of ClO's local diurnal variation in the stratosphere and mesosphere.

The paper is well-written and detailed, is good documentation of the current NICT ClO

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data product, and may serve as a valuable reference for those wishing to use that data product scientifically. However the analysis of the data set seems somewhat immature. One imagines another paper will need to be written in a year or two to update the results reported here. It is not clear to me that it is urgent to present them now, though I would be willing to be corrected by potential data users. In addition I have concerns about the methodology which I believe should be addressed before publication.

Specific Comments: My concerns about the immaturity of the data set are based on three facts. First, there are two competing algorithms employed for the analysis, only one of which is addressed here. Some of the differences between the algorithms (for example, spectroscopic parameters) should be resolved internally, or at least assessed in detail. It should not be left to the data user to assess how much error is due to which choice. Second, the use of a single a priori profile always and everywhere is clearly causing a significant, entirely unnecessary, error in some circumstances, as the authors themselves freely acknowledge. Third, the narrow spectral region considered also causes errors which could be avoided or minimized. Both my second and third points will be addressed in the next version of the data set, according to the authors, at which time I would think a new validation paper would be submitted. Thus I question the need for this one.

I also have concerns about the comparison methodology as described in section 3. First, the use of averaging kernels to compare different data sets is justified and reasonably well described, but it does not completely eliminate error due to the measurement's vertical resolution and use of different a priori profiles. There seems to be no attempt made to assess the remaining uncertainty. Further, the use of Eq (1) is justified if one measurement's resolution is » than the other's. But Fig 5 suggests the difference is no more than a factor of 2. Again, what error remains in the comparison? Finally, the use of triangular smoothing functions rather than averaging kernels in some comparisons (p 626 l. 13) seems arbitrary, and its impact is also not quantified.

Second, the authors say the do not compare to ground-based measurements because

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of the 'large difference in sensitivity.' But ClO measurements by the ground-based radiometer at Mauna Kea, Hawaii have accuracies very similar in the mid-stratosphere to those claimed here for SMILES, namely 22-40 pptv in 20-40 km (Solomon et al, 2006). Those measurements have been made continually over 30 years, and near-continuously for the last 20. Further SMILES emphasizes its diurnal variation measurements. The first such were made in the stratosphere from Mauna Kea 30 years ago, and are arguably as good as any such measurements available at present for a single location (Solomon et al, 1984). The data from the Mauna Kea instrument and its sibling in Antarctica have been used extensively for validation by the Aura and UARS MLS teams (Nedoluha et al, 2011, Santee et al, 2008, Connor et al, 2007). Thus I think there is a compelling case for their use in a study such as this, which otherwise seems to include an exhaustive list of ClO instruments.

P 618, l7: 'latitude range shifted' – from what to what?

References

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 613, 2013.