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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fast retrievals of tropospheric carbonyl sulphide with IASI" *by* R. Anthony Vincent and Anu Dudhia

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Dr. Kuai, thank you for your interest and comments on this paper. Here is a brief response as further discussion will be rolled into one response compiled from both referees.

1. The wired feature you mention is not due to scan angle, but rather relates to the geographical altitude (orography) of the region being observed. The figures shown in this paper are of OCS total column amount, so the vertical profile of OCS has been integrated with respect to pressure. As mentioned by the first referee, another option would have been to display these estimates as a representative OCS volume mixing ratio (VMR) at a certain level, e.g., 500 hPa. However, there is simply not enough information in the observation to resolve vertical structure of OCS using IASI. While displaying a representative VMR removes orography, it may mislead readers unfamiliar with the nuances of information theory applied to atmospheric retrievals and have them believe the vertical resolution is much greater than it really is. Therefore, I prefer to display total column, because this is what is actually being estimated and it forces the reader to contemplate this point.

2. Yes, a comparison to the HIPPO campaign would be great. However, the method developed in this paper uses the AVHRR cloud fraction product to discriminate between clear and cloudy scenes. Unfortunately, the AVHRR cloud fraction was embedded in the IASI Level-1c data towards the end of 2011 and just missed the last HIPPO flight. Introducing a second data stream from AVHRR separately requires a significant rewrite of the retrieval algorithm, which may be attempted in future work.

   Additionally, I tried to find other estimates of OCS total column taken from ground-based FTIR spectrometers. However, accessing this data required personal permission from approximately one dozen different scientists. Therefore, the ground samples taken by Steve Montzka and the NOAA team were the only *in situ* data accessible to most of the scientific community from 2014.

   Finally, I will point out that the NOAA site at Mauna Loa samples the atmosphere at an altitude higher than 13,000 feet; close to peak IASI sensitivity as you mentioned. Notice that the seasonal correlation between the IASI linear estimates and *in situ* samples at Mauna Loa have a correlation of 0.76.

Thank you again for your comments.

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