Second Reply to Anonymous Reviewer #1

Dear Anonymous Reviewer #1,

We appreciate for giving us valuable comments and suggestions. Please find the manuscript, which has been done for native-checking of the grammar and revised according to your suggestions. There are a lot of revisions w.r.t incorrect grammar, so that we cannot list by point by point. As following, we answer to, and list only about major revisions related with your comments. We hope that the current manuscript become suitable for the publication in Atmospheric Measurement Techniques.

Sincerely yours,

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Comments 1-1

I will make a suggestion for the title:

Validation of acetonitrile (CH3CN) measurements in the stratosphere and lower mesosphere from the SMILES instrument on the International Space Station

Answer to Comments 1-1

We appreciate your suggestion. As you suggest, we have changed the title as the following.

Revisions to Comment 1-1

'Validation analysis of deriving acetonitrile ($¥chem{CH_{3}CN}$) profiles by observations of SMILES from the International Space Station, in the stratosphere and lower mesosphere' was changed as

'Validation of acetonitrile (CH$_3$CN) measurements in the stratosphere and lower mesosphere from the SMILES instrument on the International Space Station'.

Comment 1-2

I will point out a sentence that requires rewriting:

The difference between the two decreases down to less than 10 % at an upper altitudes than 4.8 hPa.

Answer to Comment 1-2

As you suggest, we have replaced this sentence as the following.

Revisions to Comment 1-2

Lines 140: "The difference between the two decreases down to less than 10 % at an upper altitudes than 4.8 hPa." was replaced by

→

"The relative difference between the two AOSs decreases to less than 10 % at an upper altitude than 4.8 hPa, except at 0.3 hPa, showing a good agreement of the two AOS observations from the middle stratosphere".

Comment 1-3

The word "indicating" suggests that the magnitude of the difference and/or the pressure level at which the maximum difference occurs somehow proves that the discrepancy is due to "sensitivity differences." I don't really follow that logic. At the very least, I think you should rephrase ("We believe the discrepancy is due to sensitivity differences in the two AOSs" or "It

is likely that these discrepancies between the two AOSs result from sensitivity differences") to something less definitive, unless there is proof provided here that I am missing.

You seem to basically attribute the inconsistencies between the AOSs to problems in the instrument characterization during manufacturing. I don't know if this means you see similar effects (higher VMR from AOS 1) for all molecules, weak or strong, from band A, or whether the problem relates to difficulties in properly characterizing instrumental effects in the shape of the stronger, overlapping HCl spectral feature, which then pollutes the retrieval using the weak CH3CN spectral feature. I am imagining it is the latter.
This would be beyond the scope of this paper, but as food for thought, would it be possible to refine the instrument characterization to achieve improved agreement between the two instruments? I don't know how many moving parts go into that characterization.

Answer to Comment 1-3

We appreciate pointing this out. As you comment, we replaced some words, and added some descriptions about the inconsistencies between the two AOSs, as below.

Revisions to major comment 1-3

Line 136 and following : "Note that the sensitivity differences indicate inherent sensitivity differences between the two AOSs derived from instrumental characterization determined when manufacturing." was replaced by
'We believe that the sensitivity differences indicate inherent sensitivity differences between the two AOSs derived from instrumental characterization determined during manufacturing.'.

The sentences,
'Kasai et al. (2013) also reported the discrepancies between the two different AOSs, albeit for the analysis of ozone profiles using the SMILES L2 version 2.1.5 product.
As mentioned above, in this analysis, we used the SMILES L2r version 3.0.0 product that improves the AOS response function.
However, there may still be disagreement between the two AOSs.
The relative difference between the two AOSs decreases to less than 10¥,¥% at an upper altitude than 4.8¥,hPa, except at 0.3¥,hPa, showing a good agreement of the two AOS observations from the middle stratosphere.' was added.