We would like to thank reviewer #3 for his/her corrections and recommendations. Additions to the text are highlighted in blue and text that has been removed from the original text is highlighted in red. The reviewer comments are included in bold.

Given that the Match approach has been applied to similar measurements (e.g., from POAM), and one of the authors is highly versed in that technique, it is perhaps a little surprising that that method was not included, or even discussed very much. That said, I can well believe that the ACE-FTS sampling presents a challenge to the implementation of Match-based calculations. Whatever the reason, it would make sense to comment on why it is omitted here. If its left for "future work", then its fine to just say that. On the other hand, if there is some reason why its not practical in this case, it would be good to note it here, as this may prevent others from potentially spending time fruitlessly investigating it in future.

The reason for not including the Match approach is that due to the orbit of ACE-FTS there is a measurement gap in the Arctic in February that is typically 2-3 weeks. This time period is too long for trajectory estimations to match the observations and track the air parcels. We have investigated applying the Match approach, but it would only be possible to use this approach either in January or March, but not over the entire winter/spring period that was investigated in this study.

Specific comments:

Page 2 line 10: Add a comma after "March 2005" possibly.

We have changed the text accordingly.

Page 7 line 16 and line 20: "blue dots" should be "green dots" in both places. Also, its a little jarring to be talking about dot color before the figure has been formally introduced (line 16/17).

The sentence has been changed to:

"~~The~~ Figure 1 shows the O_3-tracer correlation between for these six tracers for the winter/spring 2011, displayed are the ACE-FTS measurements in January (black dots) and March (~~blue dots) for 2011~~ green dots) together with the estimated early vortex reference function (red solid line)~~are displayed in Fig. 1.~~ ."

Page 7 line 29/30: I think "One method that provides a correction for both mixing and for descent..." would be clearer. That is unless Ive misunderstood the currently ambiguous wording (it currently could be read as saying that "descent" is another "method" that fixes the

mixing issue, rather than another problem to be addressed).

The sentence has been changed accordingly to:

"One method that provides a ~~mixing correction , in addition to~~ correction for both mixing from the vortex edge and for descent, is the artificial tracer method."

Page 8 line 21: "blue dots" should be "green dots" again.

This has been corrected.

Page 11 line 5: Just to clarify this is a "horizontal" interpolation only, correct? From the text I get the sense that the vertical "interpolation" is simply "nearest neighbor", correct? Would be good to clarify.

Yes, the interpolation is only horizontal. But for the vertical, we simply used the points that have the same potential temperature levels as the ACE-FTS measurements within the the ATLAS resolution without interpolation. To clarify, we added the following sentence in Sect. 3.4.1 (p.11):
"The interpolation is only done horizontally, we did not apply interpolation in the vertical direction but instead chose only ATLAS points that were at the same potential temperature levels as the ACE-FTS observations, within the resolution of ATLAS. "

Page 11 line 29: "reset" to what (presumably "ozone that responds to chemistry", but would be good to be clear).

We have changed the sentence to be more clear:

"The passive ozone from the SLIMCAT model run was reset on 1 January for each year to the values of the model chemical ozone field at that time."

Page 12 line 3: I suggest you change "up to" to "within" and add "great circle" after 0.5 degrees (unless its actually latitude or longitude specifically you mean here).

We changed the sentence accordingly:

"Although the geo-location of the ACE-FTS measurements change with altitude, the location of the measurements at the altitudes of interest (approximately 15-25 km) are ~~up to~~ within an approximately 0.5° great circle of the location of the 30 km tangent altitude and, therefore, within the model resolution."

Page 14 lines 14-19: It feels odd to have the "artificial tracer" discussion after the discussion of descent here, given that earlier, in section 3, you introduced those techniques in the other order.

The order in section 3 has been changed to 3.1 Tracer-tracer method, 3.2 Average vortex profile descent technique, 3.3 Artificial tracer method.

Page 14 line 32: Id suggest changing "error" to "estimated uncertainties" here, to avoid anyone thinking your taking some kind of inter-method difference as a measure of a (potentially "correctable" error).

This has been changed accordingly.

"The uncertainties of these averages have been computed by propagating the ~~error~~ uncertainties from each method and tracer."

Page 15(ish): It does feel a little disjoint to have section 4.1 talking about the various tracer methods, and yet not have any discussion of the ATLAS/SLIMCAT results until you get to the overall intercomparison discussion in 4.2. Might some of the ATLAS/ SLIMCAT discussion not merit a subsection of its own.

Sec. 4.1 discusses different tracers that can be used for any of the measurements only methods and the differences we found between them. There are up to six different results for each of the measurement only methods for each year due to the different tracers that can be used. Each of the CTM methods have only one single solution for each year. The discussion of the CTM methods is included in the overall comparison between all methods in Sec. 4.2. There is no section of its own for the passive subtraction methods using CTMs since we found it repetitive to have another section to discuss only the CTM results.

Page 16 line 7: Here I think youre using "passive subtraction" to only mean the ATLAS/SLMICAT methods, correct? However, in the opening discussion of the manuscript, you have used "passive subtraction" to describe all of your methods (rightly so, as all involve some kind of estimate of passive ozone). Might be better to use a different term here.

We changed the term used to "passive subtraction method using CTMs" throughout the text.

Figure 1. Im curious as to where the cluster of black points ("fliers" actually) with O3 around 4.5-5 ppmv in panels a,b,c and d have "gone" in e and f? Are these cases where there were no OCS or CCl3F measurements? Or are they all hiding under the "e)" and

"f)" legends (I hope not). Also, in the former cases (a-d) I would expect that they may be contributing significantly to the "uncertainty" in the fit. Might there be something geophysically unusual about them (their ozone abundance clearly implies as much) that would give you a good basis for discounting them? Also, you might want to think about moving the a-f legends to a different corner of the plot to avoid clutter.

We have used the recommended ACE-FTS quality flags as Sheese et al. (2015) suggested for all species. In the case of OCS and $CClF_3$ no extreme values were left after applying the quality flags. For the other trace gases outliers with high ozone can be seen, however, since we applied the quality flag filter as recommended we have no justification to remove these.

Figure 2: I'd move the legend (January, March) somewhere else so it doesnt get in the way. Also you dont need it on all four panels (you only had it on one panel in figure 1). That should make it easier for you to find an out of the way place.

Figure 2 has been changed accordingly.

Figure 5, caption, line 2: "...2011, with the combined regression fit for January and March...", assuming thats a correct interpretation.

We have changed the sentence as suggested.

"Panel (a) shows a comparison between the SLIMCAT ozone and ACE-FTS ozone dataset inside the polar vortex for January (black dots) and March (green dots) 2011, ~~where~~ with the combined regression ~~plot~~ fit for January and March ~~is~~ shown as a red line. "