This manuscript describes the NASA Ames COMA instrument, a high-altitude airborne sensor for measurement of carbon monoxide and nitrous oxide gas concentrations. The manuscript describes the customization and refining of the core commercial sensor and laboratory and chamber testing. Data from the ACCLIP science campaign is discussed, along with carbon monoxide intercomparisons with two other sensors during that campaign. The paper is well within the scope of AMT, and presents new, novel measurement technology. The paper is clearly written with some small exceptions. I recommend publication after addressing some minor changes detailed below:

The authors would like to thank the referee for their reviews and comments; we have responded to each comment separately below; our response is in italics.

Line 93: Last sentence seems unnecessary since this describes the next section.
Response: This has been deleted.

Figures 2 & 4: The choice of colors may be challenging for color-blind individuals. I would recommend altering the colors or adding dashed/dotted lines. At a minimum, reorganizing the legend in the same order as the color traces vertically would help.
Response: Figure 2 and 4 have been updated with an update on colors, legend layout/ordering and legend description to address these concerns.

Line 120: I would recommend citing the calibration source papers directly rather than the website.
Response: the website gives the most update information on the scales https://gml.noaa.gov/ccl/refgas.html . We have added additional references for NO2 scale from 2007 (doi:10.1029/2006JD007954.) and CO from (https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/91JD01108).

Line 153: Which segment in figure 4 was used to perform the Allan variance calculation? Was it the entire timeseries? Seems like this would be somewhat of a worst case scenario, since most UTLS missions would have a single ascent to altitude with some profiling up high (similar to the latter half of the chamber timeseries in Fig 4). A little more information would be useful for context.
Response: The Allen variation calculation does indeed reflect worst case scenario and was based on the timeseries in Figure 4.

Sect. 2.2.2 & Fig 6: this section is a bit light and imprecise. Linearity is always with caveats with respect to uncertainty. How accurate are the flow controllers? Are they new with factory traceable calibrations or were they recalibrated for the experiment? I suppose the uncertainty in the standard would cancel out when just proving linearity, but the mixing errors are definitely important. Usually one can say something like “instrument is linear to within X% between MM-NN ppm”.

Response: We have added more context to this section to better describe the mixing system and its traceability.

Line 174: "Slight degradation…was accounted for." How was it accounted?
Response: We have expanded on this sentence to include: "Slight degradation in instrument response was observed over the course of the campaign and was accounted for with the inclusion of an elapsed time term in the final calibrations."

Line 175: maybe change "small terms due to accuracy of the standard gases" to "small contributions due to the accuracy of the standard gases", it took me awhile to figure out what a small term was referencing
Response: Done.

Line 178: I think there is a word missing here…maybe "equally between the residuals"?
*Response: We have changed this sentence to read '*Accuracy for N_2O is comprised equally of contributions from the residuals after calibration to NOAA standards'

Line 189: Is there any theory as to why the precision varies
Response: Instrument precision is impacted by both internal (ability to maintain sample cell pressure, flow rate, internal temperatures etc) and external variables (temperature, humidity, variation etc). We ran laboratory and chamber tests and an in-flight calibration system to be able to define COMA's overall uncertainty to the best of our ability.

Eq. 1&2: this might be more readable if the slopes were expressed as percents? That's what I'm typically looking for here…just a suggestion.
Response: We have left these equations as is as we don't think that adding one more operation to get to percents will make it easier to understand.

Figure 7: what happened after the Aug 8th so that there are no longer 2 point NOAA gas calibrations?
Response: We filled the in-flight calibration system with the NOAA gases (primary standards) in our laboratory, prior to field deployment in Korea. We had no means of re-filling the NOAA standards once we left Ellington Air Force Base in Texas, but did have the secondary (Matheson) standards, which had been shipped ahead to the field site. We first used just NOAA standards to run the in-flight calibration cycles. Once we had exhausted these, we switched to the Matheson standards. We have added as a note to Figure 7 caption.

Line 214: Cite data DOI?
Response: This is cited in the following section – 3. COMA In-flight Data.

Sect 3.1/Figure 9: Why only data from one flight? I think it is important to include all data from the campaign unless there are flights where this is not possible (e.g. missing data), along with a discussion of where they disagree and what that might mean. I also usually like either ratio or

difference plots for intercomparisons rather than full scale concentration timeseries, as it highlights differences more.
Response: We have re-plotted Figure 9 to include a comparison of COMA with COLD2 and ACOS instruments during the entire ACCLIP flight data, which shows a more thorough comparison of the different instruments. By doing this we have had to remove the timeseries plot as there is not a constructive was a showing this when the entire dataset is used. We feel the ratio plot is the best method to display the intercomparison of ACCLIP flight data from the three independent instruments.

Conclusion: the summary is a little slim, I would add more summa□on about the laboratory experiments and calibration.
Response: We have re-written and added to this section to provide a more detailed summary of this study.