*I think this paper is suitable for publication, but the authors should address the following concerns first:*

1. *The authors compare PCAND to a recent lightweight LIF instrument, but should also compare its performance to other drone-based IBBCEAS NO2 instruments such as Zheng et al., 2024 and Womack et al., 2022.*

    Response: Thank you for your comment. PCAND was specifically designed for balloon flight. Therefore, any mention of Drone flights has been removed from the paper. Although we validated our instrument with a ground-based instrument (CANOE), our intent was to build an instrument light enough (less than or equal to 6 lbs) for balloon flight. We feel comparing our instrument to heavier airborne instruments is not applicable.

2. *The sample cell is made of aluminum alloy, but the authors later say that FEP tubing was used in all plumbing, presumably to reduce NO2 losses. Have the authors tested losses of $NO_2$ on the aluminum alloy surface? Similarly, did the authors test for $NO_2$ losses on the Nafion dryer? And is the charcoal filter expected to completely scrub out the NO2 or will there be a small fraction remaining?*

    Response: Testing for the loss of NO2 on surfaces was performed with NO2 concentrations typically found in the PBL, that is between 0.1 ppb – 20 ppb. Losses on the tubing between the inlet and cell were found to be most significant depending on the material, perhaps due to the large surface area to volume ratio in the 0.3 cm ID tubing. Teflon lined tubing was found to eliminate loss of NO2 within the detection limit of the instrument (< 0.1 ppb). Losses on the three-way solenoid valve, detection cell and the Nafion tubing were not significant within the detection limit of the instrument. The charcoal filter removes all of the NO2 in the 0.1 - 20 ppb range.

    We have modified the text in lines 164-168 (of the revised paper) to include this point.

3. *There are inconsistencies in how the mirror reflectivity is reported. Line 68 says >99.9%, the Figure 1 says >99.98%, and Line 91 says 99.97%, which correspond to significantly different values when converted to effective pathlengths.*

    Response: Thank you for your comment. All references to mirror reflectivity have been changed to R = 99.97%.

4. *The authors should discuss the 3 second flush time in the context of the speed of the drone or balloon. What kind of vertical resolution will be expected with this smearing? Is it sufficient for atmospheric chemistry studies?*

   Response: Thank you for your comment. We don't expect any smearing during the 3 second flush time as this data is thrown out.

5. *How frequently is the effective pathlength measured? Even if the cavity alignment is stable over months, is there any concern that mirror cleanliness will degrade faster than that?*

   Response: Thank you for your comment. We have been very surprised at how clean the mirrors have been over months of both field testing and lab use. Particles of dust are what have a largest negative effect on mirror reflectivity. Use of a particle filter before the cell has mitigated this problem quite well.

6. *Section 4.1 is somewhat confusingly written. It's not really clear how these two methods are derived from the equations. Has this method been used before?*

   Response: Thank you for your comment. Yes, this method has been used before on an instrument (ROZE) we helped develop. (Hannun, *et al*., https://doi.org/10.5194/amt-13-6877-2020, 2020).
   Equation 1 comes from Washenfelder *et al*., https://doi.org/10.5194/acp-8-7779-2008, 2008. Equation 4 comes from Min, *et al*., K.-E., https://doi.org/10.5194/amt-9-423-2016, 2016.

   See my response to comment 7 below for clarification on equation 8.

7. *Additionally, I would recommend moving equation 8 to section 4.1, because it doesn't follow from equation 7, but is rather derived in section 4.1*

   Response: Thank you for your comment. The leap to equation 8 is vague, so I moved it below the next paragraph with the following text added:

   By varying the pressure of the cell with zero air, we can extrapolate a value for $I_0$. Substituting $I_0$ for $I_Z$ in equation 4, we arrive at equation 8. At vacuum ($I_0$), both $\alpha_{Ray,Z}$ terms go to zero. The $\alpha_{NO2}$ term also goes to zero with no $NO_2$ in zero air.

$$\alpha_{Ray,S} = \left(\frac{I_0}{I} - 1\right)\alpha_{cav} \quad (8)$$

8. *Line 196: How are the "known" $NO_2$ concentrations provided? More detail is needed here.*

   Response: Thank you for your comment. Text from figure 5 "PCAND calibration: a) The effective pathlength ($L_{\text{eff}}$) as determined by attenuation (Attn) due to known additions of $NO_2$ from a reference tank of $NO_2$ mixed with zero air".

9. *Line 201: More details should be included about how leaks and contamination could affect the data. How would they affect the data? Are leaks independently checked for?*

   Response: Leaks or contamination can affect the calibration. The Rayleigh cross section of Air is small, sigma = $1.5 \times 10^{-26}$ $cm^{-2}$ /molecule. Small amounts of strong absorbers can bias the calibration. For example, the cross section of $NO_2$ is $6 \times 10^{-19}$ $cm^{-2}$/molecule. Adding 1 ppb of $NO_2$ to the air during a calibration results in a $(1\times10^{-9})(6\times10^{-19})/1.5\times10^{-26}$ = 0.04 bias. Because leaks are pressure-dependent, in practice, a leak usually results in curvature of the Rayleigh calibration curve. We have added this statement at line 223-224 (of revised paper).

   Leaks could affect the measurement if the leaked air is different than the sampled air. In this case it depends on how big the leak is. Yes, leaks are checked for, but this depends on the operator not the instrument.

10. *Figure 7: There are quite a few data points in this vertical profile with values close to -1 ppb. However, the reported uncertainty in the laboratory is 0.1 ppb. Do the authors expect that the precision degrades at higher altitudes? If not, how do they explain these negative values?*

    Response: Thank you for your comment. We experienced RF noise from the attached iMet weather sonde for data downlink. This was the best flight where the noise was partially mitigated. This accounts for the negative values. We since have moved the instrument to a thin, aluminum box which acts a faraday cage keeping all RF noise out.

11. *Additionally, the profile shows $NO_2$ concentrations of >5 ppb at 7 km, which is unusually high. Did this occur in all the profiles? Was it possible the flight was affected by lofted biomass burning plumes? The authors should discuss this in detail,*

*as accuracy at high altitudes will be critical if this instrument is to be used on balloon platforms.*

Response: Thank you for your comment. We can only speculate as to why the $NO_2$ concentration was so high at 7 km. It could be a lofted biomass burning plume, but without an adjoining measurement from another instrument, it is impossible to say.