Response to Reviewer 2:

Review of Wu O_2 dayglow and OH radiance. This manuscript describes the analysis the authors have made of a proposed new instrument (NWTSI) for the measurement of upper atmospheric wind and temperature, based on an earlier version (WAMI). It deals specifically with a challenge in the design arising from contamination of the primary O_2 emission from the overlapping OH emission and computes the impact of this overlap on the observed winds and temperatures. The rather complex analysis is well done, and the paper is clearly written. However, I have some recommendations with respect to the nomenclature which I have listed under "Overall comments", and others which are minor but need some consideration which I have listed under "Minor comments".

Our reply: Thank the referee for the valuable suggestions and comments that are indispensable in improving the quality of our manuscript.

Overall Comments:

1. I find the units and nomenclature somewhat complicated. For some reason the O_2 is always "O_2 dayglow" and the OH is always "OH radiance" throughout, even though they are the same thing. On line 60 we find "VER" for the first time, without explanation. The volume emission rate (VER) is the number of photons emitted from a cubic centimeter per second (see Figure 1) and is what is most widely used in the field for the airglow. Its integral (photons emitted per second from a 1 square cm column along the line of sight) is called the "integrated emission rate". Radiance is the column-integrated quantity but in milliwatts per square meter per steradian per cm-1 (wavenumber) (see Figure 2), so is similar but not the same, although it contains almost the same information, except for the spectral range.

Our reply: Thank the Referee for the important comment and good suggestion. We are very sorry for making a mistake of confusing expressions about "dayglow", "radiance", "VER" and "spectral irradiance". We have corrected this incorrect-used terminology and improved the clarity of those sentences including corresponding mistakes in the revised manuscript as suggested.

2. The proposed new instrument contains an "ultra-narrow" filter, described in Line 138: The "ultra-narrow" filter certainly is ultra. The spectral width is not stated, but from the spectral width/free spectral range = 2.0/20 = 0.1 nm. While the fabrication of this filter/etalon is feasible for an highly skilled fabricator, it would be extremely challenging to monitor the changes in its width and central wavelength during the duration of the mission. While this comment is perhaps beyond the scope of this document, the challenge should at least be acknowledged.

Our reply: Thank the Referee for the important comment and good suggestion. We have made this clear in the revised manuscript as suggested. The spectral width of the ultra-narrow filter has been added. And the challenge to monitor the changes in the width and central wavelength of the ultra-narrow filter during the duration of the mission has also been point out.

Minor comments:

1. On line 39, O2(a1D) should have a delta, rather than a "D".

Our reply: Thank the Referee for careful reading the manuscript and pointing out this

problem. We have corrected this mistake in the revised manuscript as suggested.

2. On line 47, “will surely contribute” is premature to the analysis, perhaps better to use “may potentially contribute”.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have corrected this mistake in the revised manuscript as suggested.

3. On line 89 we find “spectral irradiance”, shown in Figure 2, which is close to the Integrated Emission Rate.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. In truth, $L(\nu)$ is “spectral irradiance”. $L(\nu)=\int_{-\infty}^{\infty}\eta(s)D(\nu,s)\exp[-\int_{-s}^{\infty}n(s')\sigma(s')\,\mathrm{d}s']\mathrm{d}s$. Here, the line-shape function of the emission line has been taken into account in this formula. $D(\nu)$ is the Doppler line-shape of a spectral line. The line-shape function $D(\nu)$ is normalized such that $\int D(\nu)\,\mathrm{d}\nu\equiv 1$. Therefore, the unit of $L(\nu)$ is W/m^2/sr/cm^{-1}.

4. On line 95 we find “total radiance”, “limb spectral radiance”, “O_2 dayglow” and “OH radiance”.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have corrected this incorrect-used terminology and improved the clarity of this sentence in the revised manuscript as suggested.

5. Line 96: “too closed” should be “too close”.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have corrected this mistake in the revised manuscript as suggested.

6. Line 111: Here the Michelson interferometer is described, but the Optical Path Difference is not given, which is a critical quantity in its design.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have given the value of the Optical Path Difference in the revised manuscript as suggested.

7. Line 132: Here we find FPA, but the explanation of it is missing.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. FPA is the short for focal plane array. We have added the explanation of it in the revised manuscript.

8. Line 166: “ring” should be “bring”.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have corrected this mistake in the revised manuscript as suggested.

9. Line 173: “closed” should be “close”.

Our reply: Thank the Referee for careful reading the manuscript and pointing out this

problem. We have corrected this mistake in the revised manuscript as suggested.

10. Figures 6 and 7. The plots go off scale. Aren't the off-scale values relevant?

Our reply: Thank the Referee for careful reading the manuscript and pointing out this problem. We have provided new figures in the revised manuscript as suggested (please see Fig. 6).

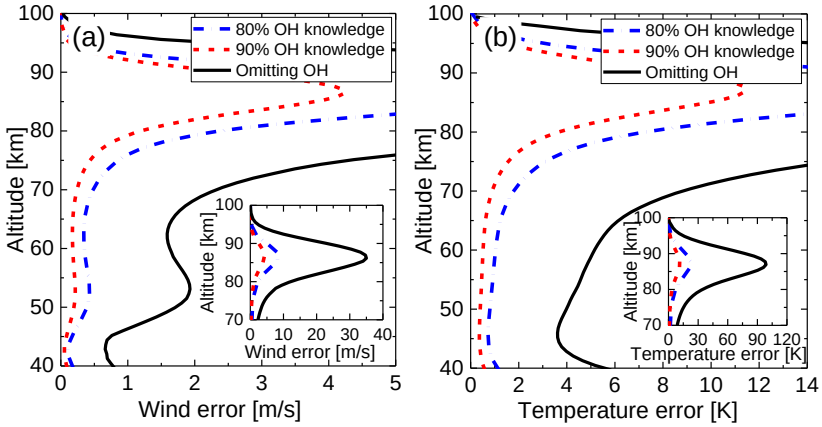

Figure. 6: Inversion errors in wind and temperature due to omitting the presence of OH dayglow (black curve) and with 80% and 90% knowledge of the OH dayglow (blue short dash dot and the red short dash). (a) the wind error profiles. (b) the temperature error profiles. Inset to (a) or (b) shows the wind or temperature error in the altitude range 70-100 km.