

Interactive comment on “Effect of OH radiance on the temperature and wind measurements derived from limb viewing observations of the 1.27 μm O₂ dayglow” by Kuijun Wu et al.

Anonymous Referee #2

Received and published: 3 December 2019

Review of Wu O₂ 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 O₂ 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”. Overall Comments: 1. I find the units and nomenclature somewhat com-

C1

plicated. For some reason the O₂ is always “O₂ 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. 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. Minor comments: 1. On line 39, O₂(a1D) should have a delta, rather than a “D”. 2. On line 47, “will surely contribute” is premature to the analysis, perhaps better to use “may potentially contribute”. 3. On line 89 we find “spectral irradiance”, shown in Figure 2, which is close to the Integrated Emission Rate. 4. On line 95 we find “total radiance”, “limb spectral radiance”, “O₂ dayglow” and “OH radiance”. 5. Line 96: “too closed” should be “too close”. 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. 7. Line 132: Here we find FPA, but the explanation of it is missing. 8. Line 166: “ring” should be “bring”. 9. Line 173: “closed” should be “close”. 10. Figures 6 and 7. The plots go off scale. Aren’t the off-scale values relevant?

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-244, 2019.

C2