

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-195

Anonymous Referee #2

Referee comment on "Far-ultraviolet airglow remote sensing measurements on Feng Yun 3-D meteorological satellite" by Yungang Wang et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-195-RC2>, 2021

Review Report

The manuscript describes the data and products from an ionospheric photometer (IPM). The IPM measures FUV emissions, such as O 135.6 nm and N₂ LBH bands. It is a sensitive instrument. The data products include TEC, NmF₂ and O/N₂ column density ratio. They are useful data products. However, it lacks of details on the methods for estimating these products. The O/N₂ product is not validated or compared with existing O/N₂ data from other missions. Some of the O/N₂ features, likely artifacts, are not discussed.

Specific comments

- Are the IPM data open to public for an independent evaluation since that data in published papers are usually required to be accessible by public?
- IPM calibration was done on ground. Was IPM calibrated in orbit?
- Fig 2 (nightside channel). The non-zero responsivity around and below (likely) 130 nm suggests it is possible to pick up bright Lyman α emission around 121.6 nm. A discussion on this will be helpful.
- Fig 3. Dayside. Both bright 130.4 and 121.6 nm emissions could contribute the 135.6 channel.
- Figure 4. The LBH band includes emission of N-1493, NO ϵ band, etc. Does the algorithm ignore the impact of none N₂ LBH emissions?
- Fig 5. It is necessary to show the data from the red leak channel. Furthermore, what is the responsivity of the red leak channel?
- Fig 6b. Change the color bar to show the equatorial arcs. Is the SAA contamination removed in the same way as the red leak? If yes, why can it be done this way? If not,

describe the method.

- The plots show that data cover the entire Earth. Does the photometer scan in a cross track direction?
- Line 175. How can one estimate NmF2 based on the ratio between NmF2 and 135.6 nm intensity? It needs more details on the method.
- Figure 8. The derived NmF2 should be plotted in the same format of Figure 6 to show the ionosphere morphology. It also needs a map of errors in the derived NmF2. What is the altitude of the Feng Yun 3-D? If the altitude is around NmF2 or above, the method wouldn't work.
- Line 165. What is the local time of the observations in other studies?
- Line 180. How is the TEC estimated using the 135.6 nm radiance?
- Line 215. The net 135.6 nm and LBH radiances are estimated already. What is the reason to use a Butterworth filter to estimate the red leak due to cloud?
- This reviewer found a reference Wang and Wang 2016. It has the same title " Airglow simulation based on the Atmospheric Ultraviolet Radiance Integrated Code of 2012" and author names. Is this the same to the reference (Wang and Wang, 2015)?

If they are the same paper, this reviewer couldn't find a AURIC based lookup table for the IPM O/N2 calculation.

- Line 220. A plot of the O/N2 look up table should be added in the manuscript. Since both 1356 and LBH channel include LBH, N-1493, NO ϵ bands. Are the contributions removed?
- Figure 9. How is the O/N2 data product validated? O/N2 depletion was seen on Aug 26, 2018 (storm-time). What are the sporadic enhanced O/N2 (vertical bars in red) over one or two orbits? Are they artifacts? If not, what cause the enhancements? What is the reference N2 column density for the O/N2 ratio?