Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
https://doi.org/10.5194/amt-2021-406-RC1, 2022
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Comment on amt-2021-406

Anonymous Referee #2

Referee comment on "Measurement of the vertical atmospheric density profile from the X-ray Earth occultation of the Crab Nebula with Insight-HXMT" by Daochun Yu et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-406-RC1, 2022

This paper presents a new measurement of the atmospheric density, based on the atmospheric occultation of X-ray emission from the Crab Nebula observed with Insight-HXMT. The authors analyzed a single egress event occurred on 2018-09-30T15:38:36. They showed that the density in altitude range of 105-200 km, 95-125 km, and 85-110 km are 88.8% (109.7%), 81.0% (92.3%), and 87.7% (101.4%) of the density prediction by NRLMSISE-00 (NRLMSIS 2.0), respectively. The density is qualitatively consistent with the previous results with RXTE. This study clearly demonstrates that Insight-HXMT can provide an approach for the study of the occultation sounding of the upper atmosphere.

I have two comments on the current manuscript.

1) I suggest the authors to estimate the uncertainty on the tangent point altitude. Two main sources of altitude errors are satellite position and pointing direction. Currently, the authors assume that these two parameters are perfectly known. However, it would be better to quantitatively give their errors and estimate how the errors affect the tangent altitude.

2) Table 5 and Figure 13: It may be interesting to add the light curve in 1.0-2.5 keV, because the lower-energy band (i.e., higher altitude) seems more sensitive to the solar activity. Also, it would be better to bin the data (rather than sub-sampling as the authors did in the current paper) to improve the photon statistics.