Dr. Peter Alexander and Richard Anthes

We would like to thank you for your careful reading, valuable comments, and constructive suggestions, which have greatly improved the presentation of our manuscript. We have carefully considered Richard Anthes' comments and revised the manuscript accordingly. The manuscript has also been thoroughly checked, and any typos and grammatical errors found have been corrected. We believe that our responses have effectively addressed all the concerns raised by the reviewers. Not only that, we also revised the color schemes of Figures 3, 5, 6, 7, 8, and 9 to better ensure that the color schemes of the lines allow readers with color vision deficiencies to correctly interpret our findings. To better highlight the differences, Figures 1, 2, and 4 were not further modified. Although Figures 1, 2, and 4 are not friendly to individuals with monochromacy, the relevant descriptions in the main text help in understanding these figures.

1. This version is improved over the first version, which was already very good, and the authors have been responsive to the two reviews. The addition of the information on how the processing of the Yunyao data was improved since the original evaluation of the data provided to ROMEX about one year ago is a good addition. The paper is now acceptable for publication after the authors consider a few more comments. The authors may respond as they wish to each one, but they are not requirements before the paper is published. I do not need to review the paper again.

The authors have added some welcome details concerning the future launches of Yunyao RO satellites, and a few more details would be interesting if it is not too difficult. First, please give an estimate of the total number of RO profiles per day that are expected from the 90 satellites in lines 13, 56, and 352. Second, the sentence in line 354 “As of September 25, 2024...” should be updated with a more recent date in 2025. A timeline showing the number of RO profiles per day as new launches occur and previous satellites die would be interesting, but it is not necessary for the publication of this paper.

Response: We appreciate your comments. Due to potential changes in satellite orbits and signal reception, we are currently unable to accurately estimate the number of RO profiles that can be obtained daily from future satellite launches. In line 91, we have described the number of RO profiles that can currently be obtained from a single satellite, which helps to roughly estimate the number of RO profiles that can be obtained from 90 satellites. The sentence in line 354 has been

modified to "As of 2024, 30 satellites have been successfully launched" and Table 2 has been updated accordingly.

2. The statement in lines 94-97 is interesting: “Notably, the YUNYAO satellite's data transmission to the ground is primarily dependent on ground stations located within China. During the data transmission process, the satellite is required to execute specific onboard operations, thereby reducing the number of occultation observations over China and its surrounding areas, as well as throughout its entire trajectory from the United States into China.” However, I do not see a noticeable reduction in numbers of RO from GPS (b) and GLONASS (d) in Fig. 2. There are noticeable reductions (dark blue) over the middle east/eastern Europe and Indonesia in all three figures (b, d, and f), but I don’t see any noticeable reduction over China and between China and the US in figures 2b and 2d.

Response: We appreciate your comments. We have revised the description in this section (Lines 93-98).

3. Section2.1.3: The authors used a limited, low-resolution version of the ERA5 reanalysis, with 37 layers and top at 1 hPa (about 47 km). The full ERA5 dataset consists of 137 levels with a top at 0.01 hPa (80 km) https://cds.climate.copernicus.eu/datasets/reanalysis-era5-complete?tab=overview. This means they cannot compare RO data with ERA5 above about 40 km and the low resolution produces a wavy structure in some of the profiles (e.g. Fig. 5), as the author note. The authors should acknowledge that they are using a low-resolution version of ERA5 and give a reason why they don’t use the full version.

Response: We appreciate your comments. We only used the 37-layer ERA5 reanalysis dataset and evaluated the data quality below 40 km. Since 40 km is above the layer (8-35 km) where observations exert a greater influence on NWP models, we consider the 37-layer ERA5 data to be sufficient. Numerous studies evaluating GNSS RO data primarily focus on data accuracy below 40 or 45 km (Cucurull et al., 2007; Ho et al., 2023; Sun et al., 2018). The wavy structure in Figure 5 is attributable to the lower vertical resolution of the ERA5 data. However, this phenomenon may also occur even when using the 137-layer dataset (Schreiner et al., 2020, Fig. 5). In the subsequent phase of our research, we will employ model-level data with higher vertical resolution to evaluate the

quality of GNSS-RO data at higher altitudes and examine its impact on the assimilation system.

4. In Fig.8b, the Yunyao N biases between 20 and 40 km of ~-0.5% with respect to ERA5 look a bit too large compared to what we find in the ROMEX data. The biases in Fig. 8a are much closer to zero and are more like what we find. This is just a comment for the authors to consider. It looks like the sample in di\erent in Fig. 8b compared to 8a. Are there other reasons?

Response: Thank you for your comments. We believe that the discrepancy in biases between Fig. 8a and Fig. 8b is primarily due to differences in the sample sets. Fig. 8a uses global observations, whereas Fig. 8b uses observations limited to the region between 45°S and 45°N. No additional processing was performed. The latitudinal differences in biases can be seen in Fig. 4.

5. In the Summary, the authors may want to revise the sentence to focus on the 8-35 km layer where the observations have much more effect on NWP models: “Compared to the refractivity calculated from ERA5, the absolute value of the mean bias (MB) of YUNYAO RO refractivity and bending angle data within the 0–40 km range are less than 1.54% and 4.51%, respectively, with larger biases mainly occurring in the lower troposphere. The negative bias in the lower troposphere has been extensively discussed in previous studies (Sokolovskiy et al., 2014; Xie et al., 2010). The standard deviation (SD) of refractivity and bending angle data between 0 and 40 km are less than 3.35% and 11.06%, respectively, with larger values mainly found in the lower troposphere and upper stratosphere.” The biases and SD are much smaller in this layer.

Response: Thank you for your comments. We have added a description of the MB and SD between 10 and 30 km (Lines 357-362). The selection of 10–30 km is made to maintain consistency with the description in the main text.

6. Line 9: “is” should be “are”

Response: Thank you for your careful review. We have made modifications in the manuscript (Line 9).

7. Line 86: Caption to Table 3-I suggest replacing “main parameters” with “Characteristics”. Line

Response: Thank you for your careful review. We have made modifications in the manuscript (Line

86).

8. 105-replace “at bottom atmosphere” with “in the lower troposphere”

Response: Thank you for your careful review. We have made modifications in the manuscript (Line 106).

9. Line 107-replace “is greater” with “is not as deep.”

Response: Thank you for your careful review. We have made modifications in the manuscript (Line 109).