We sincerely thank the reviewer for their valuable comments and constructive suggestions. We have carefully addressed each of the points raised. Below, we provide a point-by-point response to the specific comments:

(1)

We fully endorse your proposal regarding data sharing, an area in which PAZ has already set a commendable precedent. However, due to the Chinese government's stringent regulations on sensitive data, the commercial nature of this satellite mission, and the fact that its funding is entirely derived from profit-oriented entities, we are currently able to share only the data corresponding to the observation period discussed in this paper (such as Level 2 products). We will actively explore possibilities to make data from other periods and of higher processing levels accessible to the scientific community in the future.

(2)

The study primarily focuses on YunYao PRO data. Numerous existing studies have already validated the correlation between PAZ data and precipitation. We recognize that if YunYao data were collocated not only with PAZ data but also with GPM precipitation data, the final matched YunYao PRO dataset would be insufficient in volume for meaningful research.

(3)

Based on my understanding, the distribution pattern can be attributed to the following factors. The satellite, which operates in a 535 km altitude orbit with an inclination of 97.4° and a local time of approximately 4–6 AM/PM, is equipped with a dual-polarization occultation antenna only on its backward-facing side. Due to the non-overlapping paths of the ascending and descending orbits, combined with the higher signal-to-noise ratio required for polarized occultation measurements, occultation events tend to be preferentially concentrated in the backward direction during both ascending and descending orbital phases.

(4)

In Section 2.2, precise orbit determination, excess phase processing, and profile inversion are also essential steps in the PRO data processing chain. Precise orbit determination requires different parameters to adapt different orbits and satellites. The excess phase processing and profile inversion are indispensable components of PRO data analysis. On one hand, PRO data can be processed through the standard radio occultation procedure to generate relevant products. On the other hand, the process of obtaining excess phase for both H and V polarizations in PRO is consistent with standard RO processing.

(5)

The satellite mission in question was conducted as a technology demonstration payload. Building upon our existing, standardized occultation platform, we implemented a moderate upgrade to validate our capability in tracking and processing polarized radio occultation signals. Accordingly, the forward-facing antenna, signal channels, and processing methods retained the conventional occultation configuration. In contrast, the backward-facing antenna, channels, and data processing procedures were specifically designed to accommodate the characteristics of polarimetric occultation—such as the handling of dual-polarization data, fusion of polarized signals, integration with standard occultation retrieval workflows, and calculation of differential phase.

The transition between open-loop and closed-loop tracking was set at a tangent height of 0 km, following expert recommendations presented at the ROMEX meeting. The resulting measurement performance on highest vs lowest tracking altitudes is illustrated in Figures 10 and 13, which we deem sufficient for presentation without introducing additional diagrams.

Furthermore, the signal-to-noise ratio (SNR) characteristics—for horizontal (H) and vertical (V) polarizations, as well as the combined signal—were found to be consistent with those observed by payloads such as PAZ, SPIRE, and PlantiQ. Specifically, the variation trends of SNR (H, V) closely resemble those of the combined SNR, with magnitudes approximately equal to 1/sqrt(2) of the latter. Given this alignment with established missions, we have chosen not to include further comparative analysis in this regard, and instead focus our discussion on the correlation experiment between PRO (Polarimetric Radio Occultation) profiles and precipitation.

(6)

The primary reason for setting delta alpha corrected as constant below 20 km is the frequent risk of L2 signal loss of lock in this region, coupled with the generally compromised reliability of the signal even before loss of lock occurs. Therefore, it is standard practice to use L2 and L1 combinations from above 20 km to correct for ionospheric errors. Additionally, below this altitude, the ionospheric influence becomes relatively small in magnitude compared to the dominant bending effect caused by atmospheric refraction. This approach is consistently adopted in several established processing software packages, such as ROPP and ROAM.

(7)

We have added the following formulas in the manuscript to illustrate the combined signals:
The H- and V-channel I/Q streams are time- and frequency-aligned and coherently combined into a complex baseband as followed:

$$I_H + jQ_H \cdot conj(I_V + jQ_V) = (I_{H-V} + jQ_{H-V}), \quad (12)$$

$$\Delta\varphi_{H-V} = \angle(I_{H-V} + jQ_{H-V}), \quad (13)$$

$$S_{combined} = (I_H + jQ_H) + (I_V + jQ_V) \cdot e^{-j\Delta\varphi}, \quad (14)$$

where I_H and I_V represents horizontal and vertical polarization in-phase component, respectively; Q_H and Q_V represents horizontal and vertical polarization orthogonal component, respectively; $\Delta\varphi_{H-V}$ represents the relative phase difference between horizontal and vertical polarized signals; $S_{combined}$ represents the combined complex signal.

(8)

In the study by Katona et al., ray paths below 6 km or 12 km were used to construct a circle with a diameter of 2° or 0.6°, and the average GPM precipitation data within this circle was taken as the reference precipitation for the corresponding PRO event. In this study, since YunYao data has a sampling rate of 100 Hz, which is higher than that of PAZ, we utilize the GPM precipitation data corresponding to each sampling point along the actual ray path. Although this approach may consumes more resources and time in practice, we believe it provides a more accurate validation of the precipitation sensitivity of YunYao data.

(9)

Your point is very insightful. Indeed, below 5 km, the penetration depth of BDS PRO in YunYao data is not as deep as that of GPS and GLONASS. This may be attributed to the frequency of the BDS B3 signal. The B3 signal operates at a higher frequency, which is more susceptible to atmospheric refraction effects and signal attenuation when propagating through dense atmospheric layers.

(10)

We will include more detailed descriptions in the captions of Figures 11 and 12.

(11)

For Figures 11 and 12, we have added matched infrared brightness temperature data along the PRO profiles and marked the freezing level in the $\Delta\phi$ profiles to better observe the transitions between ice and liquid water. In order to represent the actual ray paths more accurately, the bending angle has been taken into account in the ray tracing for these figures, although its impact is minimal in practice.

(12)

At altitudes of 5–6 km, clouds are often concentrated, and the PRO rays traverse the longest path within this region. Since $\Delta\phi$ represents the accumulated phase difference along the ray path, water contents, if present in a PRO event, tends to maximize its contribution to $\Delta\phi$ around 5–6 km.

(13)

The term "stable" here refers to the stability of the occultation retrieval results. Specifically, it indicates that the temperature and pressure profiles are smooth and continuous in the vertical direction, without significant discontinuities or spikes. The errors in the retrieval results are bounded and predictable, and their magnitude and variation patterns are consistent with theoretical expectations.