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On-Orbit Calibration and Performance Validation of the Yunyao Polarimetric Radio Occultation System

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Overall Comments

In general, this a comprehensive summary of the analysis from the first of the Yunyao polarimetric RO systems. I have several comments below mainly to clarify several points and make this easier for the readers to comprehend.

Minor Comments

Title: You mention "on-orbit calibration", but then in the text the calibration is mentioned a couple times but not described / shown in detail.

Line 40. Usually, the abstract is written such that it can be provided “separate” or standalone from the main manuscript. So, don’t assume that acronym definitions made in the abstract will be carried over to the main manuscript. Therefore, define $\Delta\phi$ here and explain what it measures. To help explain to the reader, you can also refer to the Turk et al 2024 manuscript which has a short easy to understand summary of the polarimetric RO concept.

Lines 79-81: It looks like the PAZ group is associated with the ESA - Spire (-Spanish) team, from the way that I read this. It could look like the PAZ group participated in the development of the Spire satellites. Also, you cite the PAZ group validation paper when talking about PlanetiQ.

Line 72. When talking about traditional thermodynamics not being degraded, the correct reference should be Talpe et al. 2025.

Line 125. Define BDS and other GNSS constellations (or make a list of acronyms at the end of the manuscript.

Near Line 180. Can you (in a few sentences) explain what the difference is between open-loop and closed-loop processing? Readers may not be familiar.

Line 185. Suggest you better highlight that the Yunyao constellation (when it is fully deployed) will consist of a mixture of geostationary and polar satellites. I think this is similar to how the

local Indian GNSS system (IRNSS, otherwise known as NavIC) is configured. But your constellation will be global.

Page 115. 53000 profiles from which constellations?

Line 250. Equations 13 and 14: Is (13) for OL and (14) for CL? Clarify this.

Line 260-265. There are two places discussed where 1-sec averaging is being done to produce $\Delta\phi$ (first one) the "primary PRO observable" (second one). Clarify the need to do two 1-sec averages.

Line 300. You state, "Compared to H- and V-polarized observations, the synthesized data exhibit a higher signal-to-noise ratio and a greater success rate in retrieval." If I interpret this properly, you are saying that a PRO receiver, which splits the received signal into two orthogonal processing chains, does not "degrade" the performance of the usual/traditional non-polarimetric receiver. This is important to better highlight, as it addresses one of the concerns of the user community- That is, that PRO does not compromise or otherwise degrade the use of the usual bending angle data in numerical weather prediction data assimilation systems. Results like yours would better alleviate this concern.

General, End of Section 3. This is an interesting analysis, sort of along the lines of what Cardellach et. al. showed in their series of manuscripts, which you cite. But it would have been much more revealing if you had done the same analysis with PAZ data and then compared the two results. Obviously, PAZ collects less PRO and the analysis periods for the two could not be the same. But PAZ is also in a polar orbit. While your local crossing time is different than the PAZ early morning, over a long analysis period, you may see similar overall statistics as you show in your Tables 3 and 4.