Response to Reviewer Comments

General Comments: In this study, the authors utilise real-time precise point positioning (RT-PPP) based on multi-GNSS data from IGMAS stations to evaluate the positioning performance and ZTD accuracies across different analysis centers. The findings provide a valuable reference for selecting SSR products in RT-PPP-derived ZTD. The results appear promising, and the logical structure of this study is well-organised. In general, the findings of this study have the potential to be encouraging for researchers in this field. However, at this stage, before recommending it for publication, I would suggest that the authors carefully address the following specific comments.

Response: Thanks to the reviewer for the encouraging comments. We have made a point-by-point response to each of the reviewer's comments in the following section.

Point 1:

- P2, L52: "SSR products have led to a remarkable 50% improvement in RT-PPP positioning accuracy compared to IGS ultra-fast products". It is recommended that the authors provide additional descriptions or cite relevant references to enhance the clarity of expression. Since this is a key point and a primary motivation for the study, expanding on it will help to make the statements more comprehensive and easier for readers to understand.

Response 1:

✓ Thanks for the reviewer's suggestion. We have added more descriptions and references to explain how SSR data improves the positioning accuracy of real-time PPP. Please see in P2L17-20.

Point 2:

- P10, L224: "The RT clock errors of G03 provided by CNE and WHU are excluded from this study due to their gross errors". This study indicates that the RT clock errors for G03 provided by the CNE and WHU are excluded; however, in Fig. 7, the RT clock errors for G03 provided by the CAS are similarly excluded. Could you please clarify this discrepancy? It would also be helpful to understand the reasoning behind the exclusion of the CAS data in this context.

Response 2:

✓ Thank you to the reviewer's reminder. We apologize for any confusion caused by our mistake. The G03 from CAS was not excluded; the issue occurred due to an unintentional error while creating Figure 5. We have now corrected Figure 5. Please see in P11F5.

Point 3:

- P7, Equation (10). The formula for the determination of Pearson correlation coefficient appears to be incorrect. I suggest that the authors double-check and correct it.

Response 3:

✓ Thank you to the reviewer's reminder. We have corrected equation (10) and proofread the other equations in the manuscript.

Point 4:

- P9, Fig. 3. Although this is a minor issue, the legend in Fig. 3 partially obscures the statistical data/points. I would suggest adjusting the position of the legend to improve clarity. Additionally, please ensure that all the figures presented in this manuscript are of high quality and resolution to maintain the overall readability of the manuscript.

Response 4:

✓ Thank you to the reviewer's reminder. We have modified the location of the legend in Figure 3. Please see in P9F3. In addition, we have revised similar errors throughout the manuscript.

Point 5:

- Generally, when utilising PPP technology, the selection of an appropriate elevation angle is crucial, as it directly affects the quality and coverage of the data. In this study, a 10° cut-off elevation was adopted, which is certainly acceptable. However, I would suggest that the authors provide a more detailed explanation of the rationale behind this choice, particularly in relation to the application and the specific characteristics of the selected study region.

Response 5:

✓ Thanks for the reviewer's question. Regarding the selection of the cut-off elevation, we referred to several studies (Li et al., 2022; Yu et al., 2022). We have explained it in the manuscript and cited the relevant literature. Please see in P13L1-2.

References:

Li, B.-F., Ge, H.-B., Bu, Y.-H., Zheng, Y.-N., and Yuan, L.-T.: Comprehensive assessment of real-time precise products from IGS analysis centers, Satellite Navigation, 3, 12, 2022.

Yu, C., Zhang, Y.-Z., Chen, J.-P., Chen, Q., Xu, K.-X., and Wang, B.: Performance assessment of multi-GNSS real-time products from various analysis centers, Remote Sensing, 15, 140, 2022.

Point 6:

- P17, L335: Please remove any unnecessary punctuation here and thoroughly double-check for any related errors.

Response 6:

✓ Thanks for the reviewer's reminding. We have removed redundant punctuation. Please see in P17L13. In addition, we have corrected similar errors throughout the manuscript.

Point 7:

- Please be mindful of the use of abbreviations throughout the manuscript. For example, in the abstract, some unnecessary abbreviations have been defined, e.g., SISRE, AC, and IGS, even though they are not used in this section. Conversely, some abbreviations that are used, e.g., STD and RMSE, have not been clearly defined. To further enhance readability, I suggest minimising the use of abbreviations, unless absolutely necessary, as an excess of them can burden readers and disrupt the flow of the manuscript. Additionally, please revise the manuscript to ensure that all abbreviations are clearly introduced and consistently used throughout. This will make the content more accessible and easier to follow.

Response 7:

✓ Thanks for the reviewer's reminding. We have added definitions for ill-defined abbreviations and deleted abbreviations that are used less frequently.