

***Interactive comment on* “Statistical analyzing the effect of ionospheric irregularity on GNSS radio occultation atmospheric measurement” by Mingzhe Li and Xinan Yue**

Anonymous Referee #2

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This manuscript investigated the effect of ionospheric irregularity on atmospheric RO data. Specifically, the authors took the S4 index as a proxy of the occurrence of ionospheric irregularity, and examined two atmospheric metrics - failure rate of atmospheric RO retrievals, and bending angle oscillation. Through comparing the morphology and seasonal dependency of two atmospheric metrics with the ones from irregularity occurrence, the authors demonstrated the pattern similarity between them, which indicated the impact of irregularity on the atmospheric retrievals. It is overall an interesting study and well written. The topic fits well to the scope of the AMT. Therefore, I would recommend this manuscript for publication after a few minor revisions.

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Specific Comments: L144: LC → ionospheric-corrected LC L217-218: The occurrence rates of Es and FI are mixed together in this study, which makes the interpretation of results a bit complicated, though the authors already tried their best to explain the impact of Es and FI separately in the text. What if you do the occurrence rate analysis separately for Es and FI based on the altitude of the S4 maximum? L288-292: Is there any proof to support the statement that the FI occurrence plays the main role in the failed inverted RO occurrence? Beside the large ionospheric residual caused by ionospheric irregularity, atmospheric RO data can be identified as "Bad" for many different reasons. For example, over the time period selected in this manuscript, 2011-2013, there are couple of sudden warming events happened, which makes the atmospheric structure changes significantly and far from the climatology, especially over the polar winter. The RO retrieval could be "Bad" because of the large deviation from the climatology under such condition. Fig. 2: What if the figure just focuses on the low and mid-latitude herein since you already presented the polar results in Fig. 3? Also, you might consider to use the discrete color bar instead of the gradient one. Fig. 3. This is a polar coordinate, not a Cartesian one. It's better to delete "MLAT" and "MLT" herein.

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