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Interactive comment on "Three-in-one: GPS-IR measurements of ground surface elevation changes, soil moisture, and snow depth at a permafrost site in the northeastern Qinghai-Tibet Plateau" by Jiahua Zhang et al.

Anonymous Referee #2

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This is a review three-in-one: GPS-IR measurements of ground surface elevation changes, soil moisture, and snow depth at a permafrost site in the northeastern Qinghai-Tibet Plateau by Jiahua Zhang et al. The authors used one GNSS station to estimate soil moisture, snow depth, and ground surface elevation changes. They used the estimated ground surface elevation to improve the soil moisture estimates. Although GNSS-IR looks very promising these days, the manuscript in the current format is rejected and it is not recommended for the publication. Larson et al. (2019) used several stations from the PBO network and reported soil moisture, snow depth,

vegetation water content, and water loading. It should be noted that the reported soil moisture estimates from 11 GNSS sites by Small et al. (2016) look way better than what is reported in this manuscript for the soil moisture. In addition, ground surface elevation changes over the permafrost area using GNSS-IR were already reported by Liu at al. (2018). The reported bias for the snow depth estimates is also much larger than what is already reported, i.e. Larson et al. (2016); Siegfried et al. (2017). Therefore, the authors should explicitly answer which challenge/challenges of GNSS-IR is tackled where recent publications have demonstrated even way better results. In addition, it is very hard to assess the results qualitatively using just one single GNSS station. The authors also discard the impact of the GNSS antenna by using the gin pattern of TRM29659.00.

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