

## ***Interactive comment on “Multi-constellation GNSS interferometric reflectometry with mass-market sensors as a solution for soil moisture monitoring” by Angel Martín et al.***

**Anonymous Referee #1**

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General comments Martin et al. promise a study regarding the multi-constellation GNSS interferometry for soil moisture retrievals. The study does not live up to its title, since in fact, multiple single constellations are analyzed, yet there is no integration of data from the different constellations. Because of this, the current study merely seems a replication of a well-known methodology with little novelty. As expected, the authors do indeed show reasonable agreement between soil moisture estimated from GNSS interferometry and in situ measurements. I found the paper poorly structured, the statistical analysis incomplete, and the discussion lacking depth. The findings of this study are at best incremental.

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Specific comments - From figure 2, can you please explain where exactly the reference soil moisture measurements were taken in reference to the ellipses around the antenna? How did you account for spatial offsets in the order of meters between the reference and GNSS soil moisture measurements? P1L21: Correlation coefficients are not expressed as percentages P1L27-28: The native resolution of the SMAP passive sensor is approximately 36 km. With no active sensor, the 9 km product is created by integrating non-SMAP data sources. Therefore, 36 km is the more correct resolution to mention in comparison with SMOS. Sentinel-1 sensors have a revisit time of 12 days. 2 Sentinel-1 sensors are in orbit, which decreases the revisit time. The spatial resolution is in the order of 10s of m. Please modify. P3L82-84: Please elaborate on what L1, E1, L2, E5 and L2C are for non-specialist readers. P6L166-167. Figures 7-10 portray very little additional information in reference to Figures 5-6, and the differences with Figures 5-6 are not well described in the text. - Can you please elaborate on the comparison between the GNSS-derived soil moisture and reference datasets? And on the difference between the results from the geodetic and mass-marked antennas. A statistical analysis could include simple linear regression, from which deviation from the 1:1 line and goodness-of-fit values could be discussed, among others. The statistical analysis is poor and incomplete. P6L175-176. The discussion starts with a table of results. Please move this to the Results section. Can you in the Discussion section elaborate a bit more on your findings, for example why did the GLONASS retrieval outperform the other retrievals? - The paper is poorly structured: parts of the Introduction (including figures) would fit better in the Methods section, the Results has preprocessing and processing headers but not really results, some results are given in the Discussion section. - It is unclear to me why the authors wrote an opening paragraph covering spaceborne soil moisture retrievals when the paper covers another topic. - It is unclear to me why the authors did not integrate the BEIDOU constellation.

Technical corrections See attachment.

Please also note the supplement to this comment:

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<https://www.hydrol-earth-syst-sci-discuss.net/hess-2019-560/hess-2019-560-RC1-supplement.pdf>

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-560>, 2019.