

Interactive comment on “Year-long, broad-band, microwave backscatter observations of an Alpine Meadow over the Tibetan Plateau with a ground-based scatterometer” by Jan G. Hofste et al.

Anonymous Referee #2

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The manuscript describes a dataset of backscatter observations of an Alpine Meadow with significant soil freezing-thawing processes, which includes measurements of both diurnal and seasonal cycles. I found this is a valuable study and dataset for Earth system sciences. It is suggested to accept it for publication after a minor revision.

Comments are listed as bellow.

Line 17: As the system is measuring data from 1 to 10 GHz at four linear polarization combinations, it is strongly suggested to provide time-series data at L-band with all four

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polarizations, which will benefit the community a lot and future satellite missions operating at L-band, including the NASA-ISRO SAR (NISAR) mission [1] and the Terrestrial Water Resources Satellite (TWRS) [2]. Especially for the potential TWRS mission, it is aimed to measure the surface soil moisture and freeze/thaw state by the synergy use of active and passive observations at L-band. [1] Rosen, P. A., Kim, Y., Kumar, R., Misra, T., Bhan, R., & Sagi, V. R. (2017, May). Global persistent SAR sampling with the NASA-ISRO SAR (NISAR) mission. In 2017 IEEE Radar Conference (RadarConf) (pp. 0410-0414). IEEE. [2] Zhao, T., Shi, J., Lv, L., Xu, H., Chen, D., Cui, Q., ... & Zhao, K. (2020). Soil moisture experiment in the Luan River supporting new satellite mission opportunities. *Remote Sensing of Environment*, 240, 111680.

Line 109: Is the Maqu site a permafrost or a seasonal frozen ground area? Have you confirmed that all the soil depths would be thawed during the summer?

Line 219: should it be m^2/m^2 ?

Figure 8: Should the line in between be solid for the cyan lines (model simulations for HH)? Is that possible to include the S- and C-band also? How about the data at cross-polarizations?

Figure 9-10: It is suggested to include data and results from all four typical bands (L/S/C/X) in this Section, which would attract more interests.

Line 475: Are there any other observations to show it is snowfall, such as the camera, albedo etc.? It is better indicated of snow information in Figure 12. It is also suggested to indicate the date of soil freezing and thawing, as it seems to be the main target for this measurement as mentioned in the abstract.

Line 501-505: I am not very convinced by your argument. Even the longer wavelength will penetrate deeper into soil, the S-band should also be sensitive to the top-layer soil as the major contribution comes from the top soil, in which larger water phase transition (liquid to ice) occurs. We have conducted a similar multi-frequency observation by mi-

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crowave radiometry over a seasonal frozen ground. It is very interesting that brightness temperature and backscatter performed differently for the freezing-thawing process. Might be this is out of the scope of this data description paper; however, this is the value of presented measurements in this paper.

Line 515-516: Is that possible to process sigma0 for cross-polarization also? It would be more interested to share with the community with the processed sigma0 for all the four polarizations and typical bands (L/S/C/X).

To make it clear, I added references in my comments, not asking the authors specifically cite them but supporting my claims, these references could be cited in the manuscript only if authors deem it necessary.

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