

Earth Syst. Sci. Data Discuss., referee comment RC3
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Comment on **essd-2022-264**

Anonymous Referee #3

Referee comment on "A global long-term, high-resolution satellite radar backscatter data record (1992–2022+): merging C-band ERS/ASCAT and Ku-band QSCAT" by Shengli Tao et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-264-RC3>, 2022

In this study the authors presented a monthly global C-band backscatter data record by combining ERS (C-band), QScat (Ku-band) and ASCAT (C-band) data for the time period 1992–2021. QScat data has been used to fill a six year gap between the C-band backscatter datasets (1999–2009). For this reason the Ku-band dataset has been rescaled using the overlapping period with ASCAT (2007–2009). The presented rescaling method was found to be robust to both signal trends and sudden changes. Monthly signal differences have been corrected after rescaling based on a decision tree regression. ERA5-land data (monthly rainfall, snow depth and skin temperature) was used to model signal differences in C- and Ku-band. Two types of quality assessments have been carried out. The first one is based on a comparison between the C-band and scaled Ku-band signal on a pixel by pixel bases reporting the distribution of Pearson R, RMSE and rRMSE for the periods 1999–2001 and 2007–2009 before and after the monthly signal correction for 13 regions. The second quality check is using ERS-2 data for the time period 2001–2011 reporting Pearson R for 10 regions. The results overall show that the rescaling and correction method are doing reasonably job fitting the Ku-band data in the C-band data space generating a homogeneous dataset.

Major comments:

1. While it is clear that this "C-band" dataset is one of its kind, I doubt the novelty of the presented "new data scaling method". It is a simple mean-std rescaling and part of "standard data rescaling techniques". See e.g. [10.1201/b15610-21](https://doi.org/10.1201/b15610-21), [10.1016/j.rse.2008.11.011](https://doi.org/10.1016/j.rse.2008.11.011), [10.5194/hess-14-1881-2010](https://doi.org/10.5194/hess-14-1881-2010)

2. I can see the importance of long-term C-band radar data, but a monthly temporal resolution is a big disadvantage and perhaps a no-go criteria for certain applications. The study doesn't explain why this temporal resolution has been chosen in the first place and

is also not discussed in chapter 4.3. What is the reason? Would it be possible to get a 14-day, 10-day or lower temporal resolution? Please discuss possible applications and limitations of monthly C-band radar data. E.g. how is it possible to describe/separate vegetation and soil moisture (trends), also taking long-term land cover changes into consideration?

3. The manuscript is missing essential background information on decision tree regression. The authors describe that they performed three separate regressions (against monthly rainfall, snow depth and skin temperature) and used MSD to decide on the optimal regression. The term "decision tree regression" is far-fetched and not correct in this context. A decision tree regression would separate the feature space using nodes/leaves thereby selecting the optimal regression/parameter. See e.g. 10.1007/s00704-019-03048-8

Minor comments:

- Title: It is a "C-band" dataset so it should certainly have a C-band signal dynamic. I'd suggest to highlight the fact that a Ku-band dataset is used to fill a gap and create a long-term "C-band" data set.
- p2 - l38: remove "and can be acquired in all weather conditions"
- p2 - l53-54: No unit for RMSE/rRMSE in abstract, is it dB? Also missing in the rest of the article and graphics
- p4 - l102: Metop-SG
- p5 - l131: Please add references
- p7 - l180: wording
- Figure 4: remove connection of Ku-band time series for the temporal break
- Figure 8: why is there an overlap? shouldn't it be one map indicating type 1,2,3?
- Figure 9: why two different y-axis?
- p22 - l450: typo

On this basis, I found the topic of the paper interesting, but I suggest a major revision and after that reconsider a possible publication.