hess-2022-121 – Author’s response to Anonymous Referee 2

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Referee comments are written in blue italics; author’s responses are written in normal font; and implemented changes are highlighted in green font.

I am a new reviewer in this round, and noticed the manuscript has been reviewed before, and authors have made a big effort on the improvement of the manuscript. Generally, the manuscript is well-written and the findings are very interesting.

We thank Lei Fan for the review of our revised manuscript.

Thus I recommend a minor revision before an acceptance, based on the following minor comments:

1. Fig 2 d,e,f could be deleted? Because these plots were not linear significantly, namely, the information is not clear for readers, although I can understand the meaning of the authors.

We removed panels d-f based on your suggestion.

2. I am wondering whether Ku-band VOD was affected by the atmosphere, although it is derived from microwave. If yes, please add some discussions about this point.

3. The quality of Ku-band VOD is similar with or lower than the quality of C/X-VOD? Could you add some discussion about this.

Based on the comments 2 and 3, we added the following discussion to section 3.1.3:

The higher correlation for Ku- and X-VOD with LFMC than for C-VOD might be confounded by an effect of rain on the atmospheric transmissivity of those wavelengths. Although microwaves are generally assumed largely independent of atmospheric conditions, thick water clouds and rain reduce the transmissivity of the atmosphere especially for shorter wavelength microwaves. For example, the atmospheric transmissivity is between 60 and 80% in the case of water clouds and between 20 and 70% in the case of rain for Ku-band (Ulaby et al., 1981, p.2–3). However, effects of rain on the retrievals of Ku- and X-VOD in the VODCA product are not known. Overall, the quality of the Ku-band VOD is comparable to X- and C-VOD (Moesinger et al., 2020): Ku-VOD correlates higher (global average r = 0.39) with MODIS LAI than C-VOD (r = 0.37) but a bit weaker than X-VOD (r = 0.42). The effect of RFI on C-VOD is not present in Ku-VOD. Moreover, Ku-VOD has a larger data coverage because the CDF matching approach used in the VODCA dataset was more often successful for Ku-VOD than for the X- or C-VOD data. Multi-year trends in Ku-VOD agree with trends in X and C-VOD. Hence, the higher correlation of Ku-VOD with LFMC and the quality and overall similarity of the Ku-VOD data with X- and C-VOD, suggests using Ku-VOD to estimate LFMC.

4. Until now, all VOD products are not updated in real time (If I am wrong, let me know). For LFMC which is an important index for fire risk, the real time product of VOD or VOD-derived LFMC will be much helpful for the application of VOD on fire risk. Authors could add some sentences to propose the real-time VOD products in the future.

This is a very good point. We added this in section 3.5.3.

5. Font size in most figures should be enlarged to better understand the information of figures.

We agree that font size was specifically small in Figure 3 and increased the size in this figure.

References

Moesinger, L., Dorigo, W., Jeu, R. de, Schalie, R. van der, Scanlon, T., Teubner, I., and Forkel, M.: The global long-term microwave Vegetation Optical Depth Climate Archive (VODCA), Earth Syst. Sci. Data, 12, 177–196, https://doi.org/10.5194/essd-12-177-2020, 2020.

Ulaby, F. T., Moore, R. K., and Fung, A. K.: Microwave remote sensing: Active and passive. Volume 1 - Microwave remote sensing fundamentals and radiometry, 1981.