Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/hess-2022-121-RC2, 2022

Comment on hess-2022-121

Anonymous Referee #2

Referee comment on "Estimating leaf moisture content at global scale from passive microwave satellite observations of vegetation optical depth" by Matthias Forkel et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-121-RC2, 2022

In this study, the authors used passive microwave satellites observations of vegetation optical depth (VOD) to estimate leaf moisture content (LFMC) at the global scale. VOD is a relatively new vegetation product compared with classic optical vegetation indicators, and the exploration of its application should be encouraged. However, I found it is a bit difficult to follow. The authors need to address the issues elaborated below during the revision.

- Based on the description of the current manuscript, I think the logic order is (1) establishing the relationship between Ku-VOD and site measurements of LFMC using the models (A, B, C and D), (2) applying these regional relationship to the globe to derive VOD-based LFMC, and (3) comparing with existing satellite-based LFMC (i.e. MODIS-LFMC) at the global scale (rather than only Australia and Europe) to illustrate their similarities and differences. Otherwise, the analysis is incomplete.
- Model B uses both Ku-VOD and LAI as the input. The authors need to show whether the relationship between Ku-VOD and LAI is consistent over different countries/continents, on top of what has been presented in Figure 3A. That is, a map showing the correlation between Ku-VOD and LAI on a pixel-by-pixel basis would further illustrate the possible uncertainties of the new LFMC developed in this study.
- When I read the abstract, my understanding/expectation is that the authors will generate daily VOD-based LFMC, and we will get LFMC updated every day with only 1 day delay. However, the LFMC generated in this study uses daily VOD and monthly LAI as the input, which means that we have to wait until the end of the month to get daily LFMC for the past month. At that time, we will already get MODIS-LFMC for the past month with a higher spatial resolution. In that case, what are the advantages of the 0.25 degree VOD-LAI-based LFMC if we cannot get near-real-time update more frequently than MODIS-LFMC?

Minor comments:

- Line 145: “primarily” should be “primary”.
- The authors mentioned in line 149-150 that China has 229 sites in the Globe-LFMC database. However, these site measurements were not used in this study. Why?
- Why did the authors use Spearman rank correlation in line 199, but Pearson correlation in line 295.
- Figure 2. These dots can be plotted using different colours for different countries/continents, i.e. Australia, Europe and USA. It will help the audience understand whether the relationship between LFMC and VOD varies over different countries/continents.