Biogeosciences Discussions

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Comment on bg-2022-85

Martin Baur (Referee)

Referee comment on "Assessing the sensitivity of multi-frequency passive microwave vegetation optical depth to vegetation properties" by Luisa Schmidt et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-85-RC1, 2022

General comments:

Dear Authors,

Thank you for the submitted manuscript. I believe the presented analysis of multi-frequency VOD is interesting and complements recent work. I think the study design, analyzing multiple VOD products with statistical models and predictor datasets, gives new insights into VOD dynamics and might help to understand the underlying reasons for these dynamics at different frequencies. Nevertheless, I think the manuscript gives away o lot of potential by not communicating methodology and results in a clear and intuitive way. Some parts of the discussion make claims that are not fully supported by the presented figures and results. I believe a main reason for some of these problems is the fact that the main manuscript has five figures only and a lot of result presentation and discussion is done referencing figures in the supplementary document. This makes it very difficult to follow the storyline of the manuscript. If this problem arises from a figure limit, please try to aggregate results into higher level figures with multiple labeled panels, I think this might be the best way to improve the manuscript.

Specific comments:

- I am not sure about the usefulness of Fig. 1, most of the shown maps are known to many readers and have been shown in many studies. Even if a reader is unfamiliar with VOD at multiple frequencies Fig. 1 does not provide much information as VOD is

normalized to 0-1. This removes the frequency component. Even if the patterns are interesting 80% of the maps is not even used in the rest of the study as LFMC is only available for some regions. Most of the RF model results and discussion does not really include and spatial component, so a reader would hardly go back to Fig. 1 and look at a specific VOD map.

- The use of the LFMC parameter seems to be motivated by Eq. 2. Predictor variables AGB, LFMC and landcover type explicitly and implicitly (through analysis of landcover classes) recreate Eq. 2. It seems a little bit unintuitive that this logic is applied when average LFMC over whole Europe is 100% or even larger. It seems like this dataset might only work well in Australia or Southern Africa. Even if this is not a problem for the GAMs and RF analysis, I can't retrace why you would introduce Eq. 2 and then have a LFMC which is larger than 100% for nearly whole Europe. Even you could fix the range to 0-100% it is a problem that AGB is not dynamic in time. Furthermore, LFMC and LAI are probably quite similar as both originate from MODIS. At some point you say that LAI and LFMC are strongly correlated. I do not really see the point of introducing Eq. 2 and then not having the datasets to check whether this VOD formulation is sufficient or not.
- Section 2.5, which introduces the ALE figures should be simplified. I think it is crucial to have a sound understanding of what these plots show to understand the manuscript. I am sorry but currently I don't. ALE plots are introduced relative to PDP plots, readers might not know about neither of them. Can you try to work on this section and describe what the y-axis in Fig. 4 really shows?
- Currently GAMs results are only presented in text and not in a figure. If it is a goal of this manuscript to show that VOD to predictor relationship is complex, and therefore not captured well by GAMs, it would be nice to have visual results. I guess you ended up with many figures, one for each model type, landcover and monthly or 8-daily. Nevertheless, it would greatly improve the manuscript if these results could be aggregated into high level figures.
- I don't fully understand why all VOD products were normalized. Can you please explain this? I am not sure whether this is a requirement for the RF and GAMs model.

Technical corrections:

- I added multiple comments to the pdf of the manuscript. Please try to address them.

Thank you,

Martin Baur

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2022-85/bg-2022-85-RC1-supplement.pdf