

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-360

Anonymous Referee #1

Referee comment on "Monitoring Vegetation Condition using Microwave Remote Sensing: The Standardized Vegetation Optical Depth Index SVODI" by Leander Moesinger et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-360-RC1>, 2022

This work presents an effective integration of different microwave remote sensing VOD into a novel vegetation index. The index is estimated from the different sensors with different Spatio-temporal coverage fitting the multivariate distribution, merging in a singular Spatio-temporal data set. This new index, SVODI, is demonstrated to be highly sensitive to the vegetation water content conditions.

The presented study makes a clear explanation of the process to integrate the different microwave data and presents sufficient proof of the sensitivity to the vegetation water content of its index comparing it with the VHI, VCI, TCI, and root moisture at different ground levels.

With a short battery of questions, I suggest this manuscript be accepted subject to a minor revision.

A few questions have to be answered:

- For the estimation, only night or descent orbits have been used. Using also ascendent orbits can increase the Spatio-temporal coverage but probably introduce lower quality data. Can you make a short comment about if introducing extra orbital data will increase/decrease de quality of the index?
- As you pointed out in line 206, long-term VOD trends are related to biomass changes. To extract vegetation structural changes, the data have been linearly detrended. Since the data set covers a long period, can rapid changes in biomass introduce variability into the index not related to the vegetation water content? Is the detrend enough to

decouple both contributions, the biomass, and the vegetation water content? Can this mask the index sensitivity in regions with no water growth limitations as for example the peninsula of India? Make an extended comment on this.

- Question two leads to this one: SVODI appears to be sensitive to vegetation water content in arid regions where the vegetation growth is water-limited. The correlation analysis with SOI and DMI shows this clearly. Is SVODI also sensitive to vegetation water content during a drought? Can capture as for example the 2010 Russian drought?
- To estimate SVODI you integrate microwave data from C-, X-, and Ku- bands from different sensors. Since the last decade, there are other microwave sensors that integrate the L-band as SMOS and SMAP. L-band is sensitive to upper layer soil moisture variability but also can be used to extract VOD measures. Have you tried to integrate this sensor? It will be great to have a short discussion in the text to clarify the decision of not taking it into account.
- Comparing SVODI with root moisture at different layer levels shows a good representation of ground physical processes. Can these results be reproduced using soil moisture from observational data as SMOS or SMAP upper layer soil moisture?

Other comments concerning the manuscript presentation:

- line 51: Missing space --> "low.Some"
- Figure 2: In the figure description: put a "□" between "X1,X2" and "N(0,1)"
- Figure 10 and 11: It will be useful to have in the legend the name of climate time series (SOI and DMI)