

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-71

Anonymous Referee #1

Referee comment on "Toward estimation of seasonal water dynamics of winter wheat from ground-based L-band radiometry: a concept study" by Thomas Jagdhuber et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-71-RC1>, 2021

General Comments

In this paper the authors seek to show that L-band radiometry can improve water dynamics estimation based on the Soil-Plant-Atmosphere System (SPAS). The methodology presented in the paper is relevant to the special issue and current L-band missions such as SMAP, and builds upon previous L-band research in Vegetation Optical Depth (VOD). While the method utilizing L-band radiometry and existing physical models to estimate wheat water dynamics is described in some detail, I have two major concerns:

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The field data used does not contain in situ measurements for the target variables Transpiration Rate (TR) and Plant Water Uptake (PWU), leaving the authors to discuss results in vague terms of what 'might be a first indication to the feasibility' of their method without any validation. In the absence of any strong validation data, the paper could be a short communication rather than a full-length research paper.

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If I understand correctly, m_g used in Figure 2 is derived from L-band retrieved VOD. While lines 130 through 132 mention that VWC was measured using destructive sampling during the study, there is no mention of sampled values being used in the processing workflow to derive later values outside of the comparison in Figure 10. Figures 13 and 14, therefore, appear to compare variables that are both derived from L-band measurements, which results in a circular comparison and leaves the method unvalidated.

Without comparison to values derived from sampled VWC, the statement on line 569 that 'the presented results indicate the unique potential of using passive microwave observations with on-site information of soil and atmosphere to estimate seasonal water dynamics' remains unjustified and is based upon both target variables derived from L-band measurements that are 'overall concurrent and similar in trend' to their like derived counterparts.

This paper could be significantly improved by addressing the above concerns and explaining the following:

- How, if at all, in-situ destructive measurements of VWC were used in the study.
- If in-situ measurements were used, provide a more rigorous validation and comparison to L-band based results, instead of vague sentences such as on line 550 'VWP seems to be appropriate and fitting ... '.

In my view, the above major concerns need to be comprehensively addressed before this paper can be of publishable quality.

Specific Comments

- Soil moisture measurements are only at 5cm and 30cm, however wheat root zone can go to 100cm (as mentioned on line 279). Additional justification is required to state how 5 and 30 cm is sufficient to capture seasonal water dynamics. This would presumably affect Soil Matric Potential and PWU estimates.
- Figure 11 and related discussion: Comparison of $RWC_{season, VOD}$ and $RWC_{season, mg}$ seems to be superfluous and does not add to the paper. A statement on the shortcomings of directly calculating RWC from VOD (e.g. because plant biomass changes) would suffice.
- Figure 9 and related discussion: Figure 9 does not add to the paper. That soil permittivity varies with precipitation impulse is a given and neither permittivity nor Soil Matric Potential (SMP) are derived from L-band in this study. SMP as plotted in Figure 12 alongside Vegetation Water Potential is sufficient.
- Lines 616-617: It is stated that wind speed can be remotely sensed by radar/scatterometers and radiometers. Please provide references for how to derive wind speed on land from these instruments.
- Lines 461-462: Please provide a reference and expand on the meaning of the statement 'Due to the onset of senescence ... water availability is not the limiting factor any more'

Technical Corrections

Multiple grammatical errors in this paper. For example:

- Line 84: 'microwave remote sensing techniques should be capable to obtain ...'
- Line 265: 'Van den Honert in 1948 was one of the first realizing and showing ...'
- Line 657: 'We advocate in future a fully remote sensing-based, wide area (up to global) SPAS assessment can be a major achievement ...' as well as several typos.

This paper would benefit from a thorough review by a copy editor.