This paper uses a pair of two ground-based GNSS receivers to estimate L-band VOD in a forested field. Similar configuration has been previously tested by others. Unique part of this study is for collection of a field data over a period of 8 months with analysis to get insights into vegetation response in different time scales such as hours-minutes for intercepted rainfall and dew, days-hours for canopy water content, and months-weeks for canopy structure. I think that the topic is very important for the community and the approach is very promising to monitor trees characteristics nondestructively in a continuous fashion. However, I have several major concerns on the VOD estimates, the model, and assumptions as they are the basis for the analysis.

(1) **Polarization**: The current setup measures the signal in RHCP-RHCP (RR) configuration, which might be significantly different from H-pol or V-pol VOD estimations from the satellites. This relation among various polarizations (RR, H or V pol) has not been established for VOD in the literature, so it is hard to interpret how RR-pol VOD estimates can be used for satellite data validation.
(2) **Model**: The model used here is a dielectric mixing model, which is valid for electrically small constituents. At L-band, primary (even secondary) branches can violate the assumption. In addition, the model ignores the polarization, which could be significant for tree canopies with certain preferred oriented branches.
(3) **Assumption**: The current model ignores volume scattering. As the data suggests (from my own experience as well), the signals at high elevation under canopy could be larger than the signal in open sky environment. This is a clear indication of volume scattering. The impact of volume scattering may vary from trees to trees and elevation angles to angles. Without physical modeling simulations for various scenarios, it would be difficult to develop methodologies to disentangle the direct signal from volume scattering.

Additional references (use a similar approach) to consider:
https://doi.org/10.1109/IGARSS47720.2021.9555155
https://doi.org/10.1155/2017/6941739

Specific Comments:

Page 1, Line 16: I think you meant “signal strength”.

Page 1, Line 24: Have you checked the impact of rainfall and dew on the instrument? Any water on the antenna surface can change its radiation characteristics.

Page 2, Line 29: I think you meant “receiver systems”.

Page 2, Line 40: I would say “continuously gathered network of ground truth data”.

Page 2, Line 53: Replace “either or” with “both and” as both mentioned factors impact the transmissivity simultaneously.

Page 3, Equation (1) : Add polarization symbol to this equation since VOD and gamma depends on polarization.

Page 4, Footnote: Coarse spatial resolution is not due to low signal energy. It is due to incoherent nature of the signal that requires real aperture antenna (limited in size).

Page 5, Line 114: Please state the polarization of antennas used with these receivers here. In addition, receivers could be placed on the ground (without tripod) as long as they are leveled and cleared from the surrounding obstructions.

Page 7, Lines 149 - 151: The pictures of receiver set-up would be useful to add to the manuscript.

Page 7, Line 156: Please state the polarization of the antenna.

Page 8, Line 179: This model is “dielectric mixing model”. The physical model implies either “discrete scatter” based radiative transfer or wave theory, none of which are used in this paper. I would suggest not to use term “physical” for the model.

Page 8, Line 181: This is a major assumption which is not true for well-developed trees. Tree branches scatter and attenuate significantly while leaves attenuate mostly at L-band, so the received signal is expected to be a blend of both volume scattering and attenuation, depending on the vegetation, polarization, and incidence angle.

Page 8, Equation (4): This is repetition of Equation (1). I would define VOD here, instead.

Page 8, Equation (5): This formula is applicable if inclusions are much smaller than wavelength as you correctly stated in the following paragraph. The formula can be applied to randomly oriented agricultural crops with no preferred scattering orientation and smaller than wavelength, but the validity region would be way off for tree canopies. The more descriptive formulation can be written as a function of forward scattering amplitudes of individual tree constituents. An example can be found at equation (8) of reference Guerriero et al. 2020.

Page 8, Line 196: That is correct that Guerriero et al. 2020 showed that coherent line-of-sight signal mostly dominates over volume scattering for RHCP-transmit RHPC-receive cases. However, it is hard to generalize this statement as this behavior can depend on the elevation, biomass, and type of trees. The question is if it is applicable to your case.

Page 9, Lines 231-214: This semi-empirical formula is developed for agricultural crops. It is not clear how it can be applied to trees, which are electrically much larger at L-band.

Page 9, Line 220: I would call the dielectric mixing model approach as “zero-order” as the first order has completely different meaning in physical models such as RTE or wave theory.

Page 11, Lines 248-249: I would say “yield information on VOD” as stated at page 5, Line 116 as I stated above difference SNR can include some of the volume scattering.

Page 12, Lines 260-261, Page 13, Lines 275-276: It is true that ground reflections would be small since your antenna is designed to reject reflected LHCP signals from the ground, but it would still receive volume scattering that comes from the upper hemispherical area of the antenna.

Page 13, Line 271: Not all GNSS systems are explicitly designed to reject such signals, but geodetic antennas are.

Page 14, Equations, 10, 11: These need polarization subscripts.

Page 14, Lines 292-293: I completely disagree with this statement. The result is physical as it is measured in the physical world. The reason for negative VOD (or higher under canopy measurements than open-sky ones) can be explained by volume scattering contributions that the antenna is picking up in upper hemispherical region. As stated correctly in the following sentences, this mainly happens at high elevation angles where direct line-of-sight signal go through gaps without much attenuating, but volume scattering within antenna field of view can add additional scattering. This is well aligned with my previous comment on your assumption at Page 8, Line 196.

Page 14, Lines 304-305: As I stated earlier, VOD depends on polarization. Your setup collects data at RHCP-RHCP (RR), but spaceborne measurements are at either H-pol or V-pol. Without physical model justification for the specific trees, the comparison is uncertain.

Page 16, Line 327: It would be good to add a formulate for serial autocorrelation and describe how it is implemented.

Page 19, Line 374: What is the spatial resolution for EVI index?

Page 27, Lines 525-529. I think that these references are misinterpreted. To my knowledge, tree branches scatter and attenuate significantly while leaves attenuate mostly at L-band.

Page 28, Lines 531-533: This assumption is not valid for trees with electrically large branches.

Page 29, Line 577: Again, the model used here is not a physical model. It is a dielectric mixing model.

Page 34, Section 5.3: Rainfall and dew can impact the instrument performance. Without knowledge of instrument under such circumstances, it is difficult to attribute all the changes to the scene.