

Author's response

Dear Referee #1,

thank you very much for reviewing our manuscript and for your prompt and helpful comments. Your remarks are summed up in black below, and our responses are provided in blue italic.

Remarks:

1. I found this to be a very well written and clear paper about the measurement methods being deployed in the DryTrees Project. There are a wide variety of instruments being deployed and a good description of them. The geography of the area is well described, as is the soil structure and the tree stand.

I have one overall concern that the authors should address. When the results of the measurements are considered at points in the future, questions will arise on the stability of the timeseries, short and long term. I believe that readers will benefit from more description of how the individual measurements were set up and continuity maintained. There will be a variety of methods used to underpin this. For example, some sensors are likely to have a formal calibration certification from an accredited laboratory or from the manufacturer. This will include a period of validity. The individual certificates need not be published but a general description for that set of sensors would add value. Other sensors will not have this level of documentation, but may have been widely used in other studies and therefore an assumption of suitability is made. This should be stated. If sensors have been tested by the project team prior to installation, this should be stated and the method described. These points will apply more to the in-situ measurements, but a few sentences on assumptions made for remote sensing may be possible.

Thank you very much for raising this important point. In the revised manuscript we have added a new subsection entitled "Data continuity and quality assurance", which provides additional information on the installation, operation, and monitoring of the different sensors used in the project.

This section describes the measures implemented to ensure the stability and continuity of the recorded time series, including regular field inspections, data logger checks, and quality control procedures during preprocessing (e.g., plausibility checks and gap detection). In addition, a table has been included summarising the sensors used in the study, their measurement accuracy or resolution, and the procedures applied to ensure data continuity.

To further support the reliability of the instrumentation, we added references to

previous studies in which similar sensor configurations have been successfully applied. While some commercially available sensors provide manufacturer specifications and calibration information, several sensors used in the project were developed in-house. For these sensors, formal calibration certificates are not available; however, their measurement resolution and stability are assessed during post-processing and through continuous inspection of the recorded time series.

2. If any of the sensors are to be 'field checked', during the project this should be described. If sensors are to be tested after the project has finished the field work phase, then this can form an important part of the trust in the stability of the time series and again this should be described.

Thank you for this helpful suggestion. In the revised manuscript we added a paragraph describing the regular field maintenance and inspection of the installed sensors during the project. These visits include checks of sensor positioning, cables, and the operation of the data loggers. In addition, we describe the data quality control procedures applied prior to analysis, including plausibility checks and inspection of the temporal continuity of the recorded time series.

3. These points could be presented in a subsection (adding a table may be useful) which adds details or assumptions made.

We have added a subsection and a table as suggested. Thank you very much.

4. I have no technical or typing corrections to add.

Thank you very much.

Author's response #2

Dear Referee #2,

thank you very much for reviewing our manuscript and for your prompt and helpful comments. Your remarks are summed up in black below, and our responses are provided in blue italic.

Remarks:

The manuscript "Multi-scale and multi-compartment monitoring of tree vitality – Integrating soil, stem, crown, and remote sensing observations" reports on the authors experimental setup for assessing tree vitality with a multiple sensors/sensing approach in their DryTrees project. The manuscript is well written, and the authors faithfully describes the setup in clear English language.

Given that the manuscript is devoted to describing an experimental setup composed of generally well-known tools and methods there is not much scientific "excitement" in the text, but I am confident that follow-up papers based on this experimental setup will be interesting.

The abstract of the paper is clear and the introduction to the paper sets the context in a very appropriate manner with adequate references.

The experimental sites are discussed, and the many different methods are laid out. In a few places, details I would normally consider unnecessary are given, i.e., the number of rotors on the drone platform, but it doesn't disturb the manuscript.

Minor comments:

1. In section 3.5.3 and 3.5.4 the authors describe culling of data if they are "obvious outliers". It is not clear to me what "obvious" covers, so I suggest the authors revise these sections adding a few more details.

This section has been revised. We defined the term "outliers" for the two sensors, and the section will be clearer now.

2. Section 4 on results dive directly into presenting specific observations. I would suggest that the authors start this section by guiding the reader into what's coming in section 4.

Valid point. We have added a paragraph to guide the reader from "Methods" to "Results". The reader will now know what to expect.

3. Section 4.1.1 should be rewritten for clarity. The two years 2024 and 2025 are mixed up in the text which becomes unnecessarily confusing.

Section 4.1.1. has been rewritten. The years are now presented chronologically and subsequently. We also added a summarising sentence to improve overall clarity.

4. Figures 6, 9, and 10 are all time-series but they have quite different visual appearances, i.e., grid or no-grid, box or no-box, and different x-axis phrasing. I suggest the authors reconsider the visual appearance and adhere to one standard to minimize the risk of confusing the reader.

Fair point. We have updated Figures 9 and 10 to match all plots to one standard. In the same step we merged both figures into one to increase the readability of the whole section.

Author's response #3

Dear Referee #3,

thank you very much for reviewing our manuscript and for your kind review. Your remarks are summed up in black below, and our responses are provided in blue italic.

Remarks:

The publication is well conceived and written, the research program is mature, comprehensive and up-to-date. The combination of different methods in comparison is goal-oriented and innovative. The results so far are interesting and a good basis for further investigations. They are very well presented.

The state of knowledge on the topic is presented comprehensively and almost completely. On this basis the investigations have been designed and carried out in a way that is easy to retrace.

There is still a lack of further discussion, but it is probably too early for that, as the article only presents the preliminary interim status. I have no further comments to specific sentences or topics.

Overall, I rate the motivation of the investigations, methods and presentation of the results as valuable and forward-looking. There are very good prospects for new findings from the advanced stage investigations.

Thank you for this positive assessment and for highlighting the need for further discussion. We agree that a comprehensive discussion would be premature at this stage, as the manuscript presents preliminary results of an ongoing research project.

To address this point, we have added a new subsection (Section 4.3: Preliminary interpretation of results), in which we briefly discuss the main patterns emerging from the current data. This section outlines initial observations regarding site-specific and species-specific responses, while clearly emphasizing the preliminary nature of these findings and the need for further analysis as the dataset develops.

#####

Most relevant changes in the revised manuscript:

1. We addressed the issue of data continuity by adding a new subsection and supplying additional sources/references.
2. We added an additional table to provide an overview of all sensors and their respective maintenance, limitations and sensitivities.
3. Following the suggestions of referee #2 and #3 we reorganised section 4. We added a subsection discussing the (preliminary) results as far as we could. We also combined former Fig. 9 and Fig. 10 into one figure.