

PhD Kateřina Zajícová

Examiner report

The thesis of Kateřina Zajícová has a classical structure with an introduction and a background around basic principles of ground penetrating radar and organic matter in general, followed by aims and methods. The thesis then introduces the results and provides a synthesis and a discussion. Both results and discussions lean on four published peer reviewed, international papers in soil related journals of high quality. The thesis then comes to an end with a conclusion and the reference list.

The topic of the thesis is highly relevant as it developed and tested an established method (here ground penetrating radar, GPR) to a level where the GPR could be used as an assessment and ground-truth-tool for the thickness assessment of the forest floor and underlying topsoil horizon. This information is highly wanted especially in areas where remote sensing approaches might fail due to thick canopy (trees, bushes).

The thesis is well written and structured. The introduction sets a good overview, although the term 'we' reads somehow strange as the thesis was written by a single person. I assume this is to demonstrate that the fieldwork etc. was performed in a team-work approach which is fine. I recommend using a more neutral writing for a revision.

The background provides much useful information and sets the scene for the following chapters well. It discusses especially the influence of soil moisture and the GPR results. The used literature is of high quality and shows that the candidate is well able to perform a literature review and extract most useful information to define potential knowledge gaps.

The term forest floor could be a bit stronger defined, not everyone is familiar with this term. It is important to clearly separate from underlying topsoil horizons which is done in the published papers but a short section that better describes this in the thesis would be helpful. The principles of the GPR, the main method in this thesis, is well explained and the additional figures clearly help the reader to understand the mechanisms. Fig 6 could explain and add the org C contents of the used materials as this is the main topic?

The aims which result from the introduction and the background information are well structures and clearly described. They are linked to the published papers, so that the reader can follow the workflow.

The finding/results section

This section starts with causes for organic carbon pool variability. Tab 3 provides an overview. Besides some inconsistencies with the font, I had problems to fully understand how 'variability' is defined in this context? You should at least add some units such as cm or g of C*kg⁻¹ soil or what ever you refer to, this table needs some updating. It is well explained in the publication but needs some additions here.

It is shortly discussed that tree roots and stones cause high variability in carbon pool estimation / using GPR. This is a field that could be explored more in the future and seems to be a bit understudied atm, esp. the limitations that GPR experiences in such highly heterogeneous soils.

There seems to be a difference how individual soil horizons are described. It is not clear what is meant by topsoil and mineral soil (page 25 bottom). In soil science there are the O horizons, followed by the A horizons often humic. However A-horizons by definition are topsoil horizons and they are mineral horizons. This could explain some of the discrepancies you experienced compared to other studies? I believe you should prepare a small figure that explains the terms as you have used it and maybe compare it to the standard model in soil science?

Overall, this is a thesis of high quality. I enjoyed reading the publications and the thesis which is certainly acceptable after the minor edits as suggested and it will achieve a high score.

I want to congratulate the candidate for an excellent thesis and I want to recommend the thesis for defence!

Perth, 12/06/2022

A handwritten signature in black ink, appearing to read 'Matthias Leopold', written over a light blue horizontal line.

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