

Interactive comment on “Characterization of soil organic matter by near infrared spectroscopy – determination of glomalin in different soils” by J. Zbiral et al.

Anonymous Referee #2

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General comments:

The paper presents a new approach for determining the presence of arbuscular mycorrhizal fungi in soils, through the detection of the glomalin content. They aim at detecting glomalin by NIR spectroscopy. Although in general well written and fairly structured my main comment is that the authors do not show convincing evidence that what they are determining actually is the glomalin content (or GRSP fraction).

I was surprised that the authors chose a NIRS signal as a proxy, as it is well established in literature that NIRS of soils give very broad, superimposed vibration peaks generally not suitable for assessing soil organic matter components in detail. In order to see individual peaks that can be related to the vibrations of specific chemical bonds, MIRS

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are usually required. NIRS is most successful in assessing total organic carbon.

Hence, when looking at the rather scarce data provided regarding the samples, the GRSP seems to correlate strongly with the total or oxidisable C present and figures 1 and 2 indicate quite some scatter. I am therefore not convinced that the NIRS successfully determines GRSP: it may actually determine carbon content, which may happen to correlate with GRSP. Hence, I would like to see some statistical analysis to establish if the two are correlated, and the same graphs as in figure 1 and 2, but with the NIRS prediction for GRSP plotted against the total organic carbon content.

A second major comment is that – although section 3 is labeled “Results and Discussion”, I do not see a lot of discussion in the text. The section is almost exclusively a description of the results.

Specific comments:

- In the abstract and the introduction, glomalin is repeatedly described as a promising indicator of SOM quality (or soil carbon changes, page 2 - line 20). Given the substantial difficulty in measuring glomalin, it is not very suitable as an indicator: many other proxies for SOM quality/dynamics exist, which are much easier to obtain. Hence, the authors should clearly indicate the additional value of globalin content for e.g. large scale surveys (page 1 -line 13) as compared to existing indicators.

- The rest of the introduction is mainly a methodological state of the art, towards the procedures to be followed to extract and process the GRSP. For a reader not too familiar with the protocol, it is quite confusing. Many problems are listed, but in the end it is concluded that the method is nevertheless valid, yet no strong arguments for that point are provided.

- For NIRS: the introduction is very general. Some critical reflections about the possibilities and limitations of the technique are in order, either in the introduction or in the conclusion

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- Introduction and materials and methods: There are many types of NIRS, which one did you use (DRIFT?)
- Section 2.1: mention which soil classification system you use and use correct terms (e.g. Fluvisol, Cambisol etc is written with a capital in WRB).
- Section 2.3: specify the type of NIR (diffuse reflected? Fourier transformed? Etc). Much more interesting than the type of software is the type of statistical analysis it performs.
- Section 3.1: specify further the kind of model that was used and how optimisations were done. Were all wavelengths included in the final model?
- Section 3.3: Not clear, description of the method rather than a result.
- Table 1, 2 and 3: why are different soil properties listed in the tables? Sometimes CeS is measured, sometimes Cox and sometimes both Cox and Ctot. I do not see a rationale in it. Also, these results are not described nor discussed.
- Figure 1: two observations clearly have a higher value for both the measurements and the prediction, with a big gap between them and the rest. How good is your model if you repeat it without these two observations? Also, indicate what the line depicts. A regression plotted between the two? Indicate an R2 value if this is the case. Idem for figure 2.
- Figure 3: why the difference in baseline? 1 sample or an average? Specify

Technical:

- The UKZUZ is a national institute, this should be specified more clearly - Page 4, lines 19-25: structure is confusing as first it seems that there should be 92 samples in table 1, etc. - In the results section, you often mention using “a reference method” – do you mean the one specified in the materials and methods section? Then clearly indicate so. - Many typo's regarding units – consistently leave a space between the value and

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the unit and do not leave spaces in values (e.g. page 6 - line 5; 2500 in stead of 2 500

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