# Discussion to referee 1's new comments: Miniaturised visible and near-infrared spectrometers for assessing soil health indicators in mine site rehabilitation by Shen et al.

Thank you for taking the time to read our comments. We appreciate the opportunity that SOIL provides for an open discussion. We will not respond to comments we have already addressed to keep our discussion brief. Here, we give only further clarifications and supplementary responses.

We do not see a mismatch between our research and the journal's scope, which includes '...all topics that fall within the study of soil science'. Our manuscript pertains to the development of 'soil and methods' for improving 'soil protection and remediation'. Soil vis–NIR spectroscopy is a soil analytical method for estimating soil properties. The assessment of soil health indicators in post-mining soil assessment and remediation are also aspects of soil science relevant to this journal and its readership.

Our manuscript's aims are specific (MS P3-4, L87-88). Therefore, it is out of scope to cover topics related to spatial variability (lateral or vertical), spatial dependence, toxic bioavailability, hierarchical soil classification, soil formation processes, contamination by heavy metals, etc. The reviewer misunderstood. The samples we used were reference or stockpiled native soils; thus, they were not contaminated.

Our sampling method did not 'ignore vertical spatial variability', but in this specific study, we did not think it necessary to characterise the vertical spatial variability of the stockpiles. We sampled reference and stockpiled soils from the 0–20 cm layer. At the youngest stockpile in each mine, we collected additional samples from the 50—70 cm layer, which corresponds roughly to the top layer of the original soil before stockpiling. See section 2.1 Sampling design, which describes the procedure. It was more important to sample soil from across different mines with different soil types and soil conditions to test the applicability of the miniaturised spectrometers and the spectroscopic method using different soils with widely ranging

soil properties.

Of course, the cited references will help to understand the algorithms we used more deeply. We do not describe them in detail because these are published elsewhere, and it makes no sense to paraphrase text from current publications. If readers want the detail, then as is customary, and not unreasonably, we expect them to find the references and read those papers. We note, however, that in the submitted manuscript, we describe our implementation of those algorithms (e.g. the optimisation of the hyperparameters, etc.), which is essential for readers to understand better what we did. Please see section 2.4.1 Assessment of the spectroscopic modelling algorithms...

We have proposed a new figure to illustrate better and clarify the experimental design and methodology. We appreciate the reviewer's feedback that this figure is confusing. In a revision, we could consider this and draw a figure that is easier to understand with a 'higher level' description of what we did.

The reviewer writes that 'this study merely repeats the well-known findings on predictive models', but we have already explained that our study isn't simply a statistical exercise. Furthermore, we reiterate that we have not found publications with a comprehensive comparison like we have done or on the topic of our manuscript.

We strongly disagree that there are 'two fundamental problems' with our spectroscopic modelling ('Chemometric technique performances'). The reviewer suggests that one of these problems is that we 'compare soil properties only on the basis of depth', but nowhere in our manuscript do we write this because it is incorrect. The second problem '...that the paper does not discuss convincingly the limitations of the approach and potential biases due to the assumptions made...' isn't a fundamental problem of the spectroscopic modelling. We have already acknowledged (see our previous discussion Comment 5) that in a revision, we could enrich the manuscript by elaborating on the limitations of the spectroscopic method.

We once more thank the referee for reading and reviewing the manuscript, but

we remain perplexed by many of the comments made. The reviewer states that the manuscript is well-written, so we can only assume that his/her serious misunderstandings are due to our complex descriptions of the technology and analyses, which make parts of the manuscript dense reading. We are committed to improving our manuscript in a revision as we have previously proposed.