

Interactive comment on “Mapping soil slaking index and assessing the impact of management in a mixed agricultural landscape” by Edward J. Jones et al.

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General comments

This paper focuses on the assessment of Slaking Index using the recent SLAKES application, and its mapping at the scale of a very diverse landscape. It is well written, pleasant to read and informative.

The study area was suitable due to the high diversity of soil and land use situations.

This paper is original in the sense that it combines a relatively simple soil test and DSM techniques to map a property of interest and produce maps useful for soil management

C1

also being understandable for farmers. The authors even attempt to imagine and map the effect on SI of a scenario of SOC content increase. They are searching for operability and I welcome their initiative that provides new ideas and allows progress in our community. It is daring because they based their calculation on weak relationships between SI and OC in 2 different conditions of clay content and CEC:clay ratio. Hence the use that will be made of this kind of map should be carefully managed because it could lead to simplistic interpretations and ultimately to counterproductive actions. I invite the authors to reinforce the limitation of such maps, based on a relatively limited and scattered dataset.

The effect on SI decrease of an increase of 1% OC was assessed, and the results shown a predicted map with bimodal distribution of the values. It could be interesting to test also the effect of a limited increase of 0.5%, which seems more realistic to achieve for farmers.

Specific comments

Line 22: Development of simple accessible metrics to assess soil health facilitates spatial and temporal sampling density but should also support the implication of farmers, consultants and even citizens in soil health assessment.

Line 28-29: The degree of slaking determines if the process produces a favourable or unfavourable environment for cultivation and plant growth. It is true but not sufficient. It also determines the degree of soil conservation because the aim is to cultivate but likewise to protect this resource.

Line 45: The authors focus on agricultural practices that increase soil susceptibility to slaking, but what about practices limiting susceptibility to slaking? Carbon management, crop successions, superficial or “light” tillage. . .

Line 59: Another group of widely used methods to estimate aggregate stability (that is the contrary of slaking) is the Mean Weight Diameter (MWD) after wet sieving of soil

C2

aggregates. You should mention this reference method.

Line 93-95: Please, provide the equivalent of soil references according to the World Base Reference for soil classification.

Line 96: Please define "broadacre".

Line 96: Is L'lara covered with a soil map? If yes it and if it is relevant, it could interesting to add this map (near figure 1 for instance). If not, a land use map could also be helpful to interpret figures 6 and 7.

Line 111: "in the area surrounding L'lara, an additional 50 samples. . ." or "50 additional samples"?

Line 108-119: Sampling scheme: collection of datasets with various sampling approach. I guess they came from various field campaigns and programmes. What are the dates for each one? A summary of the distribution of land use at the observation points is missing. It could be a table or a sentence in the text.

Line 121: What was the size of the 20 to 30 aggregates? I suppose that it was for each soil sample. Please mention that.

Line 130-132: These 2 sentence could be move to the 2.3 section and replace the 2 first sentences of this section. I suggest renaming this 2.3 section: "soil sample preparation and laboratory methods" (or something like that).

Line 141: '10 minutes'

Line 145: It the difference between replicates was more than one, only the unique additional reading was considered for the final result of SI? And what would happen if this additional reading was an outlier one? How many times a third observation was necessary?

Line 160: Please name other approaches.

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Line 174: All terrain attributes are not at the same spatial resolution. Slope, aspect, MrVBF and MrRTF could have been obtained from the 5m DEM since it was available.

Line 178: Why potassium concentration is of particular interest?

Line 184: How was made the split between training and test datasets?

Line 190: "The kriged residuals was were added. . .". There is non information in the text about the variogram of the residuals? Were residuals spatially structured?

Line 196: The first sentence is not clear. Please reword. You could also rephrase the second sentence.

Line 198: Observation points are allocated into classes having similar behaviour. How many classes? How the choice of classes and allocations of observations was done?

Table 2: It would be relevant to distinguish training and test datasets to confirm that they cover a similar range of soil attributes values, especially because of the difference in location between the 2 datasets: training data only located within L'lara boundaries.

Line 225: ". . .in these samples. . ." which ones? With clay content >25%?

Figure 2: It would be useful to know the number of samples in each of the classes land use/clay by adding this information in the figure. What about statistical significance of the differences between classes?

Line 267: I guess "3)" has to be suppressed.

Line 301: The scenario of an increase of SOC by 1% conduces to predict a reduction of SI of 1.59 units for soils with clay content >25% and CEC:clay ration >0.5 according to the decay function. Values of SI depending on OC are widely dispersed around the model (figure 4). Nevertheless, the map of change in SI after increase of C is based on this weak model. I suggest the authors to be more cautious in their conclusions concerning the effect of OC change on SI. Some elements of discussion about uncertainty are expected.

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Line 321: "...for some models". How many models were run? Please complete the section 2.6.

Line 345: 'patterns'

Line 353-354: The accuracy of the mapping process was assessed, but not the real effect of increasing SOC content by 1% because uncertainty of the decay function of SI with SOC (the map was based on) was not estimated. This must be specified to avoid misunderstanding of this result.

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