

Comments to the manuscript « Mapping soil slaking index and assessing the impact of management in a mixed agricultural landscape » submitted by Jones et al.

This paper is a very interesting contribution to the quantification and mapping of a recently developed proxy to soil physical health. The quick and low cost soil slaking index has for the first time been successfully mapped at the landscape/farm scale, thus providing an interesting management tool to farmers through the management of the OC status of their plots. The manuscript is overall very well written. The aims, results and discussions are clearly presented, a few clarifications are needed in the methods section. I therefore recommend acceptance of the manuscript, providing a few minor issues are dealt with.

Abstract :

Line 13 : explain in full words the term LCCC

Introduction :

Lines 48-49 : state (if relevant) that an initial low soil water content increases slaking.

Lines 76-78 : add that in the paper by Annabi et al., 2017 the method used to measure soil aggregate stability is the normalized method (ISO/DIS 10930, 2012), which is time and cost consuming, which is not the case of the SLAKES approach.

Methodology

Lines 93-95 : please refer to the WRB soil classification as the Australian classification is unknown by most of readers.

Lines 93-100 : it would be interesting to present the soil and land use maps of the study area, as they are primary drivers of soil aggregate stability. These maps would be very useful to help the reader interpret the SI maps you present later in the paper. These data are moreover used for soil sampling as input parameters.

Lines 108-119 : the reading of this paragraph is not straightforward, as the sampling strategy is quite complex. I think the 108 samples described lines 108 to 116 should be introduced by a short sentence line 108, such as for example : "A training set of 108 samples and a test set of 50 samples were defined. The training set comprises 58 on- and 50 off-farm samples."

Lines 112-113 : why are the input parameters for the sampling strategy different for off-farm samples ? Is it due to the fact that a soil map is not available ? This could be mentioned.

Lines 113-114 : I do not understand on which sampling set the K-means clustering is applied, and for what purpose.

Line 130 : why are 20 to 30 soil aggregates necessary for the slaking test, as only 3 aggregates are necessary for the test, and the test is repeated three times at most ?

Lines 144-146 : I think it is important to provide information on the repeatability of the measurements, e.g. to ensure the average value calculated for the SI is representative of the whole sample SI. Indeed, the SI is calculated on 3 aggregates, which could be considered as a low number. It is therefore important that you provide at least a graph with the distribution of the differences in SI values for the 108 samples, including 'outlier readings'. In that respect, and to further explore the representativity of the measured aggregates, it would be interesting to present the values of the 'a' coefficient for each aggregate that is tested.

Line 145 : I do not understand what are these 'outlier readings', and on what basis they could be discarded.

Line 175 : what is the unit of the aspect ? How did you go around the circular nature of the variable ?

Results :

Line 209 : you state that some aggregates "increased in size by 730%". As I understand it, it is not the actual increase that is measured after 10 mn of immersion at the end of the SLAKES experiment, but rather a final aggregate size using the Gompertz function at $t=\infty$.

Line 210-211 : you mention that all SI values are below the maximum theoretical value of 7.8 suggested by Fajardo et al. (2016). What about the 'outlier readings' you mentioned line 145 ? This should be clarified.

Line 246 : just to make sure, you mention average SI values, is it an average or a median value ?

Line 261 : make reference to Table 2.

Lines 302-304 : is there a way to account for the uncertainty due to the (relatively weak) regression applied for the mapping ?

Lines 340-341 : this assumption is not straightforward, and requires to provide a soil and landuse map.

Lines 345-346 : the same deals for MrVBF : a MrVBF map would help the reader.

Lines 362-363 : I do not think the mapping of SI change is the main result that "shows" the benefit of increasing soil OC on SI values. This was shown by the results leading to Figure 4. Here, the mapping allows to precisely locate where there is a real benefit to increase soil OC to increase aggregate stability.

Figures, tables :

Figure 1 : the black lines (bold and not bold) on the map are not defined in the legend.

Table 3 : for readability, emphasize in bold characters the correlations that are significant at a given confidence level.

Minor edits :

Line 200 : "[...] on SI has been investigated"

Line 240 : "[...] natural vegetation (Fajardo et al., 2016 ; Flynn et al., 2020)."

Line 244 : remove "In a review of"

Line 267 : remove "3)"

Line 283 : remove one "been"

Line 354 : remove "under"

Line 356 : remove "be"

Line 381 : "through the use of"