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Interactive comment on "SoilGrids 2.0: producing quality-assessed soil information for the globe" *by* Luis M. de Sousa et al.

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Mapping soil properties for the globe is a very big challenge currently. I am happy to see the significant new progress made on the soilgrids project. Overall, the manuscript is written and organized very well. Here are my comments for the authors' consideration.

About the title: I think that assessing the quality of the resulting soil information from digital soil mapping is a very common practice. The assessment can only be a cross valiation of prediction accuracy. The "quality-assessed" seems not an obvious difference from other works. I guess that the biggest progress with regards to the SoilGrids1.0 is the addition of uncertainty estimations. I suggest revising the tile as ". . .producting global soil informaiton with spatial uncertainty.

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Discussion paper

The use of the cross validation procedure based on spatial stratification can guarantee a balanced spatial distribution within each validation fold. It is an improvement. However, in the model calibration, the same imbalance problem of spatial distribution of soil observations was totally neglected, which may lead to biased predictive models for the mapping and consequently poor performance in areas with very limited samples or even without samples.

The soil observations used in the work were from legacy soil surveys conducted at least three decades ago I think. But, some data of environmental covarites were derived from remote sensing observations of recent years, for example, the land use/cover data. The inconsistence in time may have significant influence on the predictions of easy-to-change soil properties such as SOC, N and PH.

I understand that the general way of modelbuilding in this work is still the same as SoilGrids1.0 version of Hengl et al (2017), simple 3D approach, which just takes observation (mid-point of horizon) depth as a covariate. I know this way is convenient in operation, one time modelbuilding can produce a soil property map of any depth. But there are some issues. One is that samples with high correlation at a same (profile) location may violate statistical modelling principles and lead to bias. Another is that taking depth as covariate may complicate model and make the model failed to focus its resources on capturing details of soil spatial variation but mainly the trend. This would lower the quality of the soil prediction overall. Some case studies also found that this way may tend to produce unrealistic soil predictions (Ma et al, 2021 and Nauman and Duniway, 2019).

I suggest that the authors also used R2 to express the performance from cross validation because it is very commonly used in soil mapping community and would be convenient to compare with other soil prediction studies.

The section of “Conclusions and future work” should be rewritten. I have difficulty to find a conclusion of this work. This section is not brief and clear. I feel that the discussion

and points of this section is too general and not going towards the SoilGrids Project. Readers may get nothing from it. The first paragraph of this section (Lines395-396) repeated the aim that already stated in the introduction section and should be deleted. The second paragraph does not belong to this section and should be removed. It would be better to condense the fourth paragraph (Lines405-411) into say two sentences. The last paragraph (Lines424-426) stated a very general point which can be applicable to any digital soil mapping work. With or without it does not make sense. I suggest putting words on the new progress of SoilGrids2.0, limitations and what next version would look like.

I suggest adding a map to show the time of the legacy soil survey projects of different countries if the time is very different among different regions. It is importance information for readers and data users to know what time/period of soil status the soil maps actually reflect.

Some expressions are confusing. The word "Quality-assessed" was frequently and somewhat widely used in the manuscript, which may have different specific meanings. For example, "producing quality-assessed soil informtion", "quality-assessed soil profile data", "Following data quality assessment and control", "Ultimately, upon final consistency checks, the quality-assessed and standardised data". This would make readers confused. Another similar problem is the use of "standardised", for example, "standardised soil profile data", does the "standardised" mean that all profile data were converted to the GSM depth intervals, as we saw ". . .six standard depths intervals" and ". . . standard depth interval for each soil property" in the title of Table2.

Line 14: "up to date information on world soil resources. . .is required to address . . .". SoilGrids was based on legacy soil samples and the produced soil maps in fact reflect the status of soil conditions at least three decades ago, which is not up to date soil information. This work cannot respond to the demand.

Lines 143-145: The time information of the remote sensing data is missing.

Lines 168-185: it is not clear that which model was used in the RFE processing.

Lines 217-218: "...considered constant for the whole depth interval". this practice is different from that of SoilGrids1.0 (Hengl et al 2017) which generated prediction of a depth interval through calculating mathematical integral over depths. Is it better?

Table 2: I do not understand this table, actually confused. I guess that the the depth intervals of the soil horizons data used in this work are not uniform among the profiles and mostly not same as the GSM depth intervals. So, how to assign a sample of for example 20-50cm to a GSM depth interval, 15-30 or 30-60? Or maybe the authors standarised all horizons data into GSM depth intervals before modelling, then get the number of observations of each depth interval.

Figure 5: one graph example is enough.

Table 5: I also do not understand this table. As mentioned above, the horizon observations are not uniform in depth intervals. How did you compared with the predicted values at 2.5cm (0-5cm) to calculate the performance metrics MEC?

Line259: What means the "standarised data"?

Lines299-300: what do you want to express? large observations and covariates lead to better predictive performance?

Line315: evaluation=validation?

Figure6: please add a legend to the maps

Line379: some representative papers may be useful for reference to illustrate your point about national soil mapping: Liu et al. 2020, High-resolution and three-dimensional mapping of soil texture of China, Geoderma, 2020, 361: 114061; Liu et al 2020, A soil colour map of China. Geoderma, 2020, 379: 114556

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