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Comment on soil-2021-80

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Referee comment on "How well does digital soil mapping represent soil geography? An investigation from the USA" by David G. Rossiter et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-80-RC3, 2022

This is a timely article on a subject of importance to many involved in soil survey programs. As the metrics show, some 400 views have been made in the United States alone.

Many soil scientists and administrators involved in soil survey see Digital Soil Mapping (DSM) as more than just a tool to aid the field soil scientists mapping soils using traditional methods. In their view DSM is the new method for mapping soils. Artificial intelligence and machine learning are tremendous tools in many medical and scientific studies, and it is logical to conclude that these methods when applied to soil survey will generate significant results, which they may. Yet, an assessment of DSM methods at this stage of development is needed that can articulate strengths, weaknesses, and opportunities.

The assessment that is made in this paper uses visual and statistical techniques that compare the DSM methods of POLARIS, SoilGrids, and SPCG to gSSURGO (and gNATSGO), which are used as references. Many challenges to DSM have come from field soil scientists using traditional methods—that is, an understanding of soil genesis, geomorphology, and Quaternary geology of the soils being mapped combined with on-site hypothesis testing. Authors of this study have such field experience as well as backgrounds in computer-assisted soil survey studies.

McBratney et al. object to comparing DSM to gNATSGO as the reference, stating that both DSM and "conventional" soil mapping have uncertainties and often a different focus (classes vs properties), why should one be used to measure the quality of the other? "Would we not reach a similar conclusion if we take maps from different soil surveyors to compared them with a DSM product? In order to do a convincing comparison, it is important to have an independently observed dataset with which to compare the various representations else we might simply realise a self-fulfilling prophecy." I predict that such a comparison will soon be made and, thus, reinforces the merit of this paper for moving the science forward.

Comments about retaining the familiar term “digital soil mapping” instead of the new term “predictive soil mapping” are reasonable. Overall, the paper generated a lot of discussion and thought and will be a good contribution to the literature. It may prompt some in the DSM community to reflect on whether DSM is over-sold, at least in some cases. The paper also makes a contribution by explaining terms to the non-specialists, such as SSURGO, STATSGO, WoSIS, NASIS, SPCG, etc.

The manuscript, combined with the discussion, will prompt many of us involved in soil survey to rethink about what is meant by soil classes versus soil properties, soil entities, taxonomic units or mapping units in the context of DSM. It may even cause many to re-visit the foundational mapping and taxonomy concepts of “soil body,” “polypedon,” and “soil individual.”

Several comments were made by the community and referee, which the authors acknowledge. I would add to those comments the need for making the figure captions (those actually attached to the figures) independently lucid.