Mapping soil organic carbon Content over New South Wales, Australia Using Local Regression Kriging

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When SOC mapping over a large region is required, the usual approach has been to employ a model calibrated for the whole area. An alternative is to use a series of locally calibrated models to map smaller areas that collectively cover the large region of interest. The accuracy of the SOC products generated by these two approaches can potentially vary. However, performance of whole-area calibrated models versus locally calibrated models in mapping SOC of large extents has seldom been explored in detail. Our study aims to fill this gap by evaluating the SOC prediction performance of three common models, multiple linear regression (MLR), Regression tree model; Cubist and Support Vector Regression (SVR) that are calibrated locally and for the whole study area.

This study was carried out using eight identified local areas in New South Wales (NSW), Australia and across the whole state entirely. Every model was calibrated separately for each local area and for the entire state. The local and whole-area models were validated using the same test dataset over 50 realizations. The results show that SVR models have a superior performance out of three tested models for all standardised depth layers. In general the local models outperform the whole-area models for all three tested models with respective to the accuracy of predictions. All models displayed area specific performances proving the importance of inclusion of prevailing local conditions in SOC modelling and mapping. Therefore, we introduce a moving window approach where a hybrid series of locally calibrated models and a whole-area calibrated model can be used against using one calibrated model to represent the entire mapping extent. With more accurate and least biased predictions, this novel approach provides a promising way of increasing the efficiency and accuracy of digital soil mapping.