

Interactive comment on “Scaling impacts on environmental controls and spatial heterogeneity of soil organic carbon stocks” by U. Mishra and W. J. Riley

Anonymous Referee #2

Received and published: 16 April 2015

Using observational data and geostatistics approaches, this study discussed about environmental controls on soil organic carbon (SOC) stocks and spatial heterogeneity of SOC stocks at different spatial (sample) scale. The authors shows that 1) different environmental predictors of soil organic carbon (SOC) stocks at different spatial scales; and 2) the variance of predicted SOC stocks decreased with spatial scale over the range of 50 to ~500 m, and remained constant beyond 500 m scale. The conclusions make sense and are expected. The manuscript is well organized and well written. But before its publication in Biogeosciences, several concerns should be addressed.

1. This study only used data from Alaska, if using observational data from larger spatial range such as boreal to tropical (as normal scale ESMs works), the dominant predictors
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of SOC may be different as the results from Alaska even at the same scale such as 50 m. In the discussion, the authors should leave some space for larger scale. For example, if more samples were taken from whole USA, applying the same methods used in this study, the conclusions in this study are still the same?

2. Page 1730, line 7, how about the auto-correlation between independent variables for predicting SOC stocks? Does the auto-correlation impact the coefficients (beta) for each predictor (as shown in Figure 3)?

3. Page 1733, Line 6-13, it seems arbitrary to set the 25% as criteria of spatial dependency. It is really large difference between 27% at 50 m and 100 m scales and ~20% at other scales?

4. Page 1734, Line 22-26, how about soil texture controls on SOC in this study? Is it possible to show whether silt/clay fraction is a significant predictor on SOC, and at which scale?

Interactive comment on Biogeosciences Discuss., 12, 1721, 2015.