

Answers to comments by Philippe Lagacherie (RC C2581) of 17 February 2014

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Many thanks for your positive comment. Your only concern is the missing evaluation of the “*added value of using the proposed robust external-drift kriging approach because a comparison with a more classical model is not provided in the paper*”. Unfortunately, we are not quite sure what is meant by “a more classical model”.

We explained in our answer to the general comment by referee #1 (AC C2823) why we did not use regression kriging. Here we comment on the advantage of robust external-drift kriging (EDK) over

- a) non-robust conventional EDK and
- b) use of multiple linear regression models fitted by ordinary least squares (OLS) or robustly (MM estimator) to the data under the (wrong) assumption that the residuals are spatially uncorrelated.

To compare the precision of the respective predictions with the validation data we used the same set of covariates as for the final robust EDK model (robEDK) and did not go through the model building process again for these methods. In Table 1 below we report for the mentioned approaches the statistics of the relative prediction errors as in Table 2 of the article.

Table 1: Statistics of relative prediction errors of soil organic carbon (SOC) stocks in two depth compartments (0–30 cm, 0–100 cm) for the validation set ($n = 175$). The statistics are reported for the method used in the article (robEDK), for non-robust external-drift kriging (EDK), and predictions by a non-robustly (OLS) or robustly fitted (MM estimator) linear regression models (ignoring residual autocorrelation).

	model	BIAS	RMSE	R^2	robBIAS	robRMSE	rob R^2	CRPS
0–30 cm	robEDK	0.135	0.488	0.346	0.070	0.388	0.337	0.221
	EDK	0.128	0.483	0.349	0.063	0.394	0.342	0.220
	MM est.	0.142	0.519	0.286	0.072	0.407	0.279	0.229
	OLS	0.143	0.500	0.335	0.077	0.389	0.321	0.222
0–100 cm	robEDK	0.152	0.556	0.477	0.066	0.420	0.403	0.247
	EDK	0.147	0.553	0.473	0.067	0.425	0.401	0.248
	MM est.	0.149	0.566	0.482	0.074	0.402	0.408	0.245
	OLS	0.162	0.569	0.468	0.082	0.428	0.391	0.249

In general, the differences in the precision of the predictions by the four methods were small: For topsoil stocks (0–30 cm depth) ignoring autocorrelation impaired the precision somewhat. For bulk stocks (0–100 cm) this was the case only when the regression model was estimated by OLS. In fact MM-regression performed best for these data. When comparing robust and customary EDK we see again small differences only, which is in accordance with the cross-validation results (see section 3.2 of article). robEDK, although not performing consistently best for all criteria, performed on average well. Hence, taking autocorrelation into account and using robust procedures offered some slight advantage over a more customary analysis.