

## **Estimating soil organic carbon stocks of Swiss forest soils by robust external-drift kriging**

This manuscript presents a national scale study of Switzerland where authors estimated the SOC stocks of forest mineral soils at 100 m spatial resolution using legacy soil pedon data and environmental covariates. This manuscript is well written (providing the rationale for choice of techniques), is timely, addresses an important issue, and well suited for GMDD. I like the author's care in calculating the soil bulk density which is a major source of uncertainty in SOC estimates. This manuscript improves upon the existing SOC estimating techniques and provides the uncertainty estimates of predictions which are essential for decision making. However the results would have been more convincing if authors had compared their improvement in predictions with either regression kriging or other new approaches as mentioned by authors in Page 7080 L5-10. Only minor suggestions are provided which I hope will improve the clarity of the content.

### **Introduction**

P7079L5 Should read like “ (SOC) stocks. SOC stock estimates.....”

P7079 L6 -7 Please replace “accounts in” with “uses”

P7079 L7 Should read like “for SOC stock changes.....”

P7079 L8 Should read like “other land cover types.....”

P7079 L10 Please move (Brassel and Lischke, 2001) at the end of the sentence.

P7079 L20 Delete “therefore”

P7079 L25 I can't understand what you mean by “averaging LM”

P7079 L28 What do you mean by “This restriction”?

P7080 L16-17 Should read like “Besides precision, estimates of prediction errors of national SOC stocks is needed for GHG inventories....”

P7082 L13 what is a.s.l. (has not been abbreviated yet)?

P7082 L22-23 should read like “carbon (OC) than cropland and 1.2 times.....”

### **Materials and methods**

P7084 L15 Replace “formed the” with “were used as”

P7085 L8 Rename the title as Soil bulk density

P7085 L10 what is ca.?

P7085 L14 What is “each levels”? Do you mean soil horizons?

P7085 L15 “to all soil samples” Is this soil horizons or bulk soil samples please clarify.

P7086 L9-16 I don’t understand what is “total volume of soil horizon”. I suggest to replace these equations with a simplistic ones such as below:

$$C_T = \sum_{j=1}^n C_j \rho_b D_j \quad (1)$$

where  $C_T$  = SOC stock ( $\text{kg m}^{-2}$ ) of the whole soil profile,  $j$  = soil horizon number (1, 2, 3, ...,  $n$ ),  $C_j$  the SOC concentration ( $\text{kg kg}^{-1}$ ),  $\rho_b$  the soil bulk density corrected for rock fragments ( $\text{kg m}^{-3}$ ), and  $D_j$  the thickness of each horizon (m).

P7088 L16-17 “Flow accumulation .....were available, too”. Its not clear whether you calculated these topographic attributes or used the existing ones?

P7091 L2-5 Its confusing, current sentence structure means the validation data were used for model calibration. If it is so then the results were not independently validated.

P7093 L3-6 Please define the notations in equations.

## Results

P7095 L11-24 Take this section to methods section.

P7096 L4 What do you mean by “loess smoothers”?

## Tables and Figures

Table 1. Please provide the reason in discussion section, why different topographic attributes were selected in models for SOC stocks of 0-30 cm and 0-100 cm?

Table 2. How do you interpret increased RMSE with increased R2 for different depths?

Fig. 3. Are these observed SOC stocks or predicted by models?