**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "Soil carbon stock increases in the organic layer of boreal middle-aged stands" *by* M. Häkkinen et al.

Anonymous Referee #1

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General comments: The present study reports on temporal changes of carbon stocks in organic layers under spruce and pine. The authors present a methodology that can be applied for long term studies in which the plot scale spatial variation of carbon has not completely considered at previous sampling points. I find this a good approach to overcome limitations of earlier samplings. Overall the manuscript is well written and includes a detailed description of the statistical methods applied. However, the authors need to explain a bit more the background of their assumptions they made prior to statistical analyses. They assume that spatial variation of carbon is unchanged over time which is probably not true. They also apply spherical variogram models but this is not always supported by their data. Moreover information on the number of replicates in different lag distance classes of the variograms should be given.

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Specific comments: Line 53: Why does a positive autocorrelation enlarge the variance of the mean of single plots? Line 70: Usually, the organic layer comprises several soil horizons (Oi, Oe, Oa). You should clearly indicate which ones were studied here. Line 76: How were the 38 sampling points selected? By random? Line 113: Soil samples are usually dried at temperatures <40°C. Line 128: Did you use distance classes for the variogram analysis and how many replicates per distance class were available? Line 139: This is only true for the spatial scale you studied. This means it is true for a forest inventory plot of 300 m2. Line 141: I am not sure if the assumption of the similarity of variances at both sampling dates can be made, since forest structure is changing over time. Line 158: What exactly did you use as covariance? Did you take the sill variance? Then you would overestimate the real covariance at plots with a high spatial autocorrelation. This might explain the very high standard deviations in Table 1. Line 193: An annual carbon accumulation can not be calculated since the increase might not be linear. Line 227: It is important to mention that you discuss only the carbon stock of the organic layer but not of the complete soil. The spelling of references should be carefully checked (e.g. Peltoniemi et al., 2007) Table 1: Why is the standard deviation of carbon stocks at the first sampling systematically higher than at the second sampling? This has to be proved. Fig. 2: I do not completely understand the sampling scheme. I do not understand how a grey sampling point could be 0 m away from a black one. Please provide a more detailed description of the sampling. Fig. 3: This figure could be deleted without loss of information. Fig. A1: In many of the variograms one could argue that a pure nugget effect is obvious. Is there any reason why a spherical model is applied in most of the variograms. The extremely high small scale variation of carbon stocks might indicate that the number of replicates you took in the present study is not appropriate.

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