Biogeosciences
Open Access
Discussions

Interactive comment on "Local spatial structure of forest biomass and its consequences for remote sensing of carbon stocks" *by* M. Réjou-Méchain et al.

Anonymous Referee #1

Received and published: 23 May 2014

This paper poses and attempts to answer several important questions that are significant in the context of current efforts to infer large scale biomass maps from remote sensing and to make more general inferences on landscape scale biomass from a set of sample plots. In fact, the paper is not really about remote sensing per se, but about how accurately one can extrapolate measurements at one scale to a larger scale. In general, it illustrates that the sampling error when small plots are used to represent the average biomass of a larger area can lead to significant errors in the regression relation between the two. This is of special importance when training remote sensing data with plots that are significantly smaller than the resolution of the instrument. Though these conclusions seem fairly sound, the methodology could be improved, and there

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

is some misleading text. The following are the main scientific issues: 1. The wavelet approach is unhelpful for the purposes of this study. Given the autocorrelation structure of the data, it is relatively straightforward to calculate the variance associated with multiple samples. The wavelet analysis does not help for this and it is not at all clear why the authors have used this tangential approach rather than a less complicated and more informative autocorrelation analysis. 2. On a related note: the statement about autocorrelation giving rise to a dependence of form s^{-gamma} is wrong, as is clear from an analysis based on autocorrelation. 3. In their discussion of dilution bias, the authors mix up two effects. The motivation in the text concerns errors in the ground measurements; this is not the same as accurate measurements of a variable quantity. The implications of this distinction need to be clarified in their analysis. 4. Why wasn't Deming regression used? This takes account of errors in both dependent and independent variables? 5. The authors have not properly understood the implications of negative autocorrelation in sampling to estimate a quantity. In particular, the second sentence of para from p.5727-p.5728 is not true. In fact, if there is negative correlation then averaging reduces the variance, so gives a better estimate; if there is no correlation it makes no difference what the spacing of the plots is. 6. The authors allude to it only once, but an issue that is at least as serious as the topic of this paper, certainly in the tropics, is how representative the available set of plots is. This should be discussed somewhere, as it has effects very relevant to but well beyond the remote sensing problem and is important for REDD+. A weakness of the paper is its slipshod use of language, which may be because the first author is not a native English speaker (but many of the co-authors are!), but some of which is carelessness. These language issues are scientifically significant, as they change the meaning of many pieces of text. Examples of such (and related) issues include: a. Heterogeneity is not the same as variability, and in most cases the authors mean the latter. This is fundamentally important for discussing statistical properties which rely on an underlying homogeneous population. b. In related vein, what is meant by topographic heterogeneity, given the meaning of heterogeneity? c. The authors consistently talk about biomass when they

really mean average biomass per unit area. This distinction is crucial as without it much of the paper is wrong. The initial text in Section 2.2 is therefore misleading. d. They misuse "uncertainty"; in several cases they mean "error" e. On p. 5719 there is an appeal to the Central Limit Theorem, but this is spurious: the result quoted is just a standard result on averages of independent samples. On the same page, what does $\sim$ mean? f. The labelling of some of the Figs is misleading, e.g. Fig. 2a does not show sampling error; Fig.3a does not show spatial correlation, nor does 3b; it is wavelet variance. Following are some more detailed comments on the text: On p.5717, l.5, it states that small ground samples will have large sampling errors if there is substantial local "heterogeneity". That is a tautology. The end of the 1st para talks about the need to correct various errors, then fails to comment further on this. How meaningful are measurements at 5 m scale (p. 5719), given their dominance by edge effects? The use of the word "grain" instead of "scale" is unnecessary and confusing. On p.5720 there is a reference to an area s^2, but s is an area. On p.5721 what does the phrase beginning "was perfectly perceptive . . . ." mean? That the remote sensing measurement is assumed to be correct?? On p. 5721 it implies that remote sensing fields of view are circles (or ellipsoids earlier); this may approximately be true for optical data but not for radar, where they are typically rectangular. It is the root mean square error, not the mean error. In (2) is it a condition that the field plot lies entirely within the circle? And why is the term ErrCV used;? This is misleading as it is not a CV and its connection to CV is not explained. There are repeated statements in para 2 on p. 5722. What is meant by a "realistic reliability study"? Why and how is the ICC used? ICC is relevant to measurements made on units that are organized into groups. What are the groups here? The whole of this para following (4) is unclear. On p.5724, in para. 1, it seems strange not to mention at this point that the Asian sites show more elevation change, hence more AGB variation. This is not pointed out until several pages later. It is unclear what the sentence about lower gamma values is meant to be saying. What does "expected" mean in Fig. 4? Is it being used in some statistical sense? p.5725. I could not see how the figure quoted tells us about shape effects, and the text does not

explain this. In para 2 what does "such models" refer to? This sentence is unhelpful overall. It should really say that "if the field measurements have large errors, etc. ....". As noted above, the authors are mixing up errors in the ground measurements with accurate measurements of a variable quantity. 1st para. in Section 4: "spatial" should be omitted. Where does 26% come from and what does it refer to? p.5727. the first sentence confuses detection of change with estimation of biomass change. p.5730, Conclusions: there have been numerous studies of the errors in field sampling and their effects on carbon estimates. How do the authors suggest topographic variation be accounted for?

Interactive comment on Biogeosciences Discuss., 11, 5711, 2014.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper