

Interactive comment on “Estimating spatial variation in Alberta forest biomass from a combination of forest inventory and remote sensing data” by J. Zhang et al.

Anonymous Referee #1

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This paper "Estimating spatial variation in Alberta forest Biomass from a combination of forest inventory and remote sensing data" makes a very good contribution to the task of quantification biomass over a huge territory. The manuscript is a well-written paper focused on spatial estimation of biomass. The use of four approaches to measuring and modeling biomass is a very interesting work. The use of almost 2000 plots and available LIDAR data for quantify biomass is very impressive. The strengths of the study are that it (1) makes use of a huge available data base from PSP and ABMI plots in Alberta, (2) quantification of biomass is evaluated comprehensively across a diversity of ecosystem-level, and (3) the impact of climatic variables were correlated with the biomass estimation. I have several comments listed below, which some are

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not rather easy to deal with in a course of a minor revision. 1) Estimating biomass is difficult due to the use of many plots (where localization and representativeness of all different conditions and species have a major role) and LIDAR on quite large scale, which must deal with uncertainty (quantifiable). The essence of the problems is quantify bias and errors when changes in canopy height distribution could be affected by other environmental (eg. slope, aspect, hydrology) and ecological (eg. species) properties. The authors could read the work of Næsset and Gobakken, 2008; Naesset et al 2009 - 2011 and Disney et al., 2010 to take into account effects of canopy height estimation derived from LIDAR. 2) Error is my principal concern in this manuscript. I have several questions that need more details; a) what is the error on localization of dataset? And what is the quantitative impact of this in the biomass calculation? b) Which is the margin of error for different data sources (eg. ground plots + LIDAR + cover map). 3) The authors speak about "accuracy" in the abstract, how a reader could know if this estimation is accurate? There is a lack of confidence interval in the analyses; the only one presented is for ground forest inventory plots - density of total tree biomass (see section 3.1). 4) The numbers of data used for validation are not clearly detailed in the methodology (section 2.3.6). 5) Please complete the names of species in the study area such black spruce (eg. picea mariana Mill., Briton). 6) Please clarify what means "sufficiently deep" in section 2.1. 7) The validation seem perform very well for the entire average area. What happens with the performance of the models for each natural region ? (see Table 2).

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