Biogeosciences

Discussions

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Interactive comment on "Spatial and seasonal variations of leaf area index (LAI) in subtropical secondary forests related to floristic composition and stand characters" *by* W. Zhu et al.

W. Zhu et al.

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We are grateful to the anonymous referee for the constructive comments and suggestions. We will carefully take the suggestions into consideration when we revise the manuscript. Our detailed responses to the comments are presented below.

The authors investigated seasonal variation, spatial heterogeneity of LAI and its controlling factors by using spatial statistics and generalized additive models (GAM) based on observed values of three forests in subtropical China. They found that LAI values differed greatly by forest types and seasons and showed strong spatial autocorrelation. Species diversity and stand variables like stand density affected LAI values. The work is new for subtropical forests. This is a well-written manuscript well suited for biogeo-

science. The topic is of general interest to readers in the field of forest ecosystem process. I only have a few questions/comments on model parts. Re: Thanks for the overall positive and valuable comments on our manuscript. Based on comments, we will revise the manuscript. Please see the detailed responses below.

1. The authors mentioned they used GAM followed by linear step regression (LSR). You may directly use GAM for stepwise regression by MGCV packages in R and not necessary perform LSR since GAM could describe both linear and nonlinear relationship. Re: It is a good point. Based on this comment, we used GAM model directly instead of fitting the model by two steps (that is LSR and GAM). Because there are two packages ("gam" and "mgcv") developed in R project for GAM and the two packages have the same function, we still used gam package for GAM analysis. Our results (see the following table and figures) showed that the factors affecting LAI variations differed slightly from the results in the previous manuscript, but the effects were significant. We will revise the manuscript accordingly. We hope our results are satisfactory for publication.

2. In the methods, you need to report which smooth method you used for GAM. Re: Yes, we will report that the smooth method for GAM is smooth spline method with two splines.

3. For the results of model fitting, you listed some variables which were not statistically significant (p>0.1). For example, BA (p=0.258), crown width (p=0.327) and crown coverage (p=0.333) in Table S1 for LSR and crown width (p=0.209) and crown coverage (p=0.456) for GAM in Table 2. This will change the conclusion on the variables related with LAI. Although the model is not for prediction, you may lower the significant level. Please carefully check the results. Re: Based on the comments above, we re-run the gam package directly and the variables with statistical significance are presented in the table (see the above table). Thus, the variables which are not significant are not shown and the results and conclusion will be revised accordingly.

4. Page 11 Line 11. "Tree species diversity" is better than "species diversity". Re: We will change "species diversity" into "tree species diversity" as suggested.

5. Page 21 Lines 395-396. It is interesting the authors recommended 30m as a reference for sampling plot size to estimate LAI in subtropical forests. However, you may use a range not point value to account this according to table 3. Re: We will replace the point value with the range value (i.e. from 13m to 27m) based on this comment.

6. As the author mentioned, there are many factors affecting LAI. As an important stand structure characteristic, stand structural diversity (tree size diversity in this case) may explain LAI variation partially. I suggest testing the factor in the study. Re: Good suggestion! We calculated the tree size diversity based on the reference (Lei XD, Wang WF, Peng CH. 2008. Relationships between stand growth and structural diversity in spruce-dominated forests in New Brunswick, Canada. Canadian Journal of Forest Research, 39, 1835-1847). Then we have added this variable to run GAM model and found no significance for it.

7. Fig. 1. P. massoniana-L. glaber and C. axillaris cannot be recognized clearly. Please change the legend. Re: We will change as suggested.

8. Fig.3. I am wondering you may have wrong values for BA (range from 0 to 6000?) and crown coverage (range from 0 to 1000?). What is the unit for them? Same as Fig. 4. Please carefully check them. Re: In the previous manuscript the unit for BA was cm2 and for crown coverage was m2. We only used the data of individual trees with height larger than average height in each stand, so some values of BA and crown coverage were within the range. After re-running the GAM model, only total crown coverage of the stand is a significant variable. We checked the data carefully and will present the right results.

9. Table S1. The summary of values of stem density, BA and IV by species are not equal to the whole stand. Re: In the previous manuscript, the data in Table S1 were for the all species and the top five tree species. The data of other species were not

provided in Table S1. Sorry for our carelessness. We will add one row to show the summed data for the rest species.

10. Table S2. Parts of the columns of mean sq and sum aq are the same? Actually you need not to report these values besides parameters, F values and p values. Re: Yes, you are right. We will delete these two columns as suggested.

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Table 4 Estimated coefficients of the generalised additive models (GAMs) for the factors with effects on LAI values measured in *P. massoniana - L. glaber, C. axillaris* and *L. glaber - C. glauca* forests.

Measurement seasons	Parameter	F-value	p-value	r^2	AIC
January	s (Stem number, 2)	16.716	<0.0001***	0.3481	655.91
	s(Crown coverage, 2)	4.545	0.034*		
	s (PESB, 2)	26.105	<0.0001***		
	s (PDSB, 2)	27.281	<0.0001***		
	factor(Forest types)	39.847	<0.0001***		
July	s (Stem number, 2)	5.027	0.026*	0.040	880.93
	s (PDSB, 2)	7.115	0.008**		

Fig. 1.

Fig. 3 Partial effects of stem number, crown coverage (m²), the proportion of evergreen conifer species to total stand BA (PESB), the proportion of deciduous species to total stand BA (PDSB) and forest types (calculated for overstory trees with height larger than average stand height) on the LAI values observed in January in *P. massoniana - L. glaber*, *C. axillaris* and *L. glaber - C. glauca* forests.
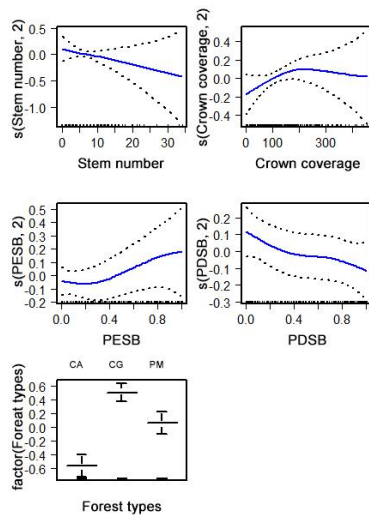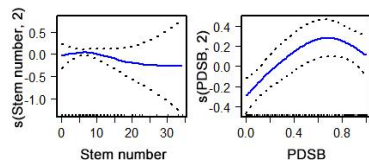

Fig. 2.

Fig. 4 Partial effects of stem number and the proportion of deciduous species to total stand BA (PDSB) (calculated for overstory trees with height larger than average stand height) on the LAI values observed in July in *P. massoniana - L. glaber, C. axillaris* and *L. glaber - C. glauca* forests.

Fig. 3.