Biogeosciences

Open Access

EGU

Supplement of

Stand structural diversity rather than species diversity enhances above-ground carbon storage in secondary subtropical forests in Eastern China

Arshad Ali et al.

Correspondence to: En-Rong Yan (eryan@des.ecnu.edu.cn)

Supplementary information

Table S1. Summary of plot variables used in the bivariate relationship and structural equation models (SEMs) for the quantification of forest diversity and aboveground C storage in the secondary subtropical evergreen broadleaved forests of Eastern China. $n = 80$; ln = natural log.

Variable	Unit	Transformation	Minimum	Maximum
Dependent variable				
Aboveground C (AGC) storage	Mg ha^{-1}	ln and standardized	-3.42	1.58
Explanatory variables				
Stand age (SA)	years	ln and standardized	-2.06	1.07
Tree species diversity (Hs)	unitless	ln and standardized	-4.06	1.54
Tree DBH diversity (Hd, 2 cm)	unitless	ln and standardized	-3.27	1.30
Tree DBH diversity (Hd, 4 cm)	unitless	ln and standardized	-3.02	1.14
Tree DBH diversity (Hd, 6 cm)	unitless	ln and standardized	-4.07	1.17
Tree DBH diversity (Hd, 8 cm)	unitless	ln and standardized	-2.44	1.26
Tree height diversity (Hh, 2 m)	unitless	ln and standardized	-3.53	1.55
Tree height diversity (Hh, 3 m)	unitless	ln and standardized	-4.20	1.22
Tree height diversity (Hh, 4 m)	unitless	ln and standardized	-2.87	1.70
Tree height diversity (Hh, 5 m)	unitless	ln and standardized	-4.16	1.45

DBH, tree diameter at breast height

8 **Table S2.** Pearson's correlation coefficients between variables used in this study for testing

9 structural equation models (SEMs) of aboveground C storage. The highlighted gray portion

10 in the table indicates the variables used in the selected SEMs (see Fig. 2). All variables were

11 natural log transformed and standardized. Coefficients are significant at $P < 0.05$ (*), < 0.01

12 (**), and < 0.001 (***). See Table S1 for abbreviations and units of variables.

	Hs	Hh (2 m)	Hd (8 cm)	SA	AGC	Hh (3 m)	Hh (4 m)	Hh (5 m)	Hd (2 cm)	Hd (4 cm)	Hd (6 cm)
Hs											
Hh (2 m)	0.05										
Hd (8 cm)	0.21	0.53***									
SA	0.02	0.52***	0.66***								
AGC	-0.10	0.49***	0.74***	0.82***							
Hh (3 m)	-0.06	0.94***	0.59***	0.56***	0.50***						
Hh (4 m)	0.02	0.89***	0.58***	0.60***	0.53***	0.90***					
Hh (5 m)	-0.02	0.80***	0.60***	0.59***	0.51***	0.84***	0.87***				
Hd (2 cm)	0.28*	0.40***	0.80***	0.51***	0.62***	0.38***	0.34***	0.38***			
Hd (4 cm)	0.27*	0.50***	0.94***	0.63***	0.71***	0.52***	0.52***	0.56***	0.93***		
Hd (6 cm)	0.24*	0.42***	0.89***	0.61***	0.69***	0.45***	0.47***	0.50***	0.87***	0.95***	

13

14 **Table S3**. Model selection of good-fit structural equation model (SEM) for aboveground

15 carbon storage. Model fit summary, particularly AIC, was employed to determine the best-fit

16 SEM model. Selected models, based on three conceptual models in the study, are highlighted

17 in bold. All possible combinations of discrete classes for DBH and height diversity along

18 with stand age and species diversity were tested. (see Figure 1 for conceptual models).

19 df: degrees of freedom; CFI: comparative fit index; GFI: goodness of fit index; SRMR:

20 standardized root mean square residual; AIC: Akaike information criterion; R^2 indicates the

21 total variation in aboveground C storage that is explained by the combined independent

22 variables. Note: df is based on the number of 'knowns' minus the number of free parameters

23 in the model, not on the sample size.

Conceptual model	Discrete classes used for stand structure indices		df	Model fit summary						Model remarks based on chi-square test, selection based on lowest AIC and other parameters
	Height (class in m)	DBH (class in cm)		CFI	GFI	SRMR	AIC	R^2	Chi-square (*P*-value)	
1a	2	2	2	0.97	0.97	0.05	33.25	0.88	7.25 (0.027)	Rejected
1b	2	2	2	0.97	0.97	0.05	33.25	0.88	7.25 (0.027)	Rejected
1c	2	2	2	0.97	0.97	0.05	33.25	0.88	7.25 (0.027)	Rejected
1a	2	4	2	0.98	0.98	0.04	31.27	0.83	5.27 (0.072)	Accepted
1b	2	4	2	0.98	0.98	0.04	31.27	0.83	5.27 (0.072)	Accepted
1c	2	4	2	0.98	0.98	0.04	31.27	0.83	5.27 (0.072)	Accepted
1a	2	6	2	0.99	0.98	0.04	30.20	0.90	4.20 (0.123)	Accepted
1b	2	6	2	0.99	0.98	0.04	30.20	0.90	4.20 (0.123)	Accepted
1c	2	6	2	0.99	0.98	0.04	30.20	0.90	4.20 (0.123)	Accepted
1a	**2**	**8**	**2**	**0.99**	**0.98**	**0.03**	**30.18**	**0.82**	**4.18 (0.124)**	**Accepted & selected**
1b	**2**	**8**	**2**	**0.99**	**0.98**	**0.03**	**30.18**	**0.82**	**4.18 (0.124)**	**Accepted & selected**
1c	**2**	**8**	**2**	**0.99**	**0.98**	**0.03**	**30.18**	**0.82**	**4.18 (0.124)**	**Accepted & selected**
1a	3	2	2	0.92	0.94	0.07	40.87	0.88	14.87 (0.001)	Rejected
1b	3	2	2	0.92	0.94	0.07	40.87	0.88	14.87 (0.001)	Rejected
1c	3	2	2	0.92	0.94	0.07	40.87	0.88	14.87 (0.001)	Rejected
1a	3	4	2	0.94	0.94	0.07	39.78	0.80	13.78 (0.001)	Rejected
1b	3	4	2	0.94	0.94	0.07	39.78	0.80	13.78 (0.001)	Rejected
1c	3	4	2	0.94	0.94	0.07	39.78	0.80	13.78 (0.001)	Rejected
1a	3	6	2	0.95	0.95	0.06	37.45	0.83	11.45 (0.003)	Rejected
1b	3	6	2	0.95	0.95	0.06	37.45	0.83	11.45 (0.003)	Rejected
1c	3	6	2	0.95	0.95	0.06	37.45	0.83	11.45 (0.003)	Rejected
1a	3	8	2	0.95	0.94	0.07	38.75	0.78	12.75 (0.002)	Rejected
1b	3	8	2	0.95	0.94	0.07	38.75	0.78	12.75 (0.002)	Rejected
1c	3	8	2	0.95	0.94	0.07	38.75	0.78	12.75 (0.002)	Rejected
1a	4	2	2	----	----	----	----	----	----	Bad-fit
1b	4	2	2	----	----	----	----	----	----	Bad-fit

1c	4	2	2	----	----	----	----	----	----	Bad-fit
1a	4	4	2	0.96	0.95	0.05	36.45	0.83	10.45 (0.005)	Rejected
1b	4	4	2	0.96	0.95	0.05	36.45	0.83	10.45 (0.005)	Rejected
1c	4	4	2	0.96	0.95	0.05	36.45	0.83	10.45 (0.005)	Rejected
1a	4	6	2	0.96	0.96	0.05	34.75	0.87	8.75 (0.013)	Rejected
1b	4	6	2	0.96	0.96	0.05	34.75	0.87	8.75 (0.013)	Rejected
1c	4	6	2	0.96	0.96	0.05	34.75	0.87	8.75 (0.013)	Rejected
1a	4	8	2	0.96	0.96	0.04	35.44	0.81	9.44 (0.009)	Rejected
1b	4	8	2	0.96	0.96	0.04	35.44	0.81	9.44 (0.009)	Rejected
1c	4	8	2	0.96	0.96	0.04	35.44	0.81	9.44 (0.009)	Rejected
1a	5	2	2	0.93	0.94	0.07	41.01	0.91	15.01 (0.001)	Rejected
1b	5	2	2	0.93	0.94	0.07	41.01	0.91	15.01 (0.001)	Rejected
1c	5	2	2	0.93	0.94	0.07	41.01	0.91	15.01 (0.001)	Rejected
1a	5	4	2	0.94	0.94	0.07	40.81	0.79	14.81 (0.001)	Rejected
1b	5	4	2	0.94	0.94	0.07	40.81	0.79	14.81 (0.001)	Rejected
1c	5	4	2	0.94	0.94	0.07	40.81	0.79	14.81 (0.001)	Rejected
1a	5	6	2	0.95	0.95	0.06	38.27	0.81	12.27 (0.002)	Rejected
1b	5	6	2	0.95	0.95	0.06	38.27	0.81	12.27 (0.002)	Rejected
1c	5	6	2	0.95	0.95	0.06	38.27	0.81	12.27 (0.002)	Rejected
1a	5	8	2	0.95	0.94	0.06	39.71	0.79	13.07 (0.001)	Rejected
1b	5	8	2	0.95	0.94	0.06	39.71	0.79	13.07 (0.001)	Rejected
1c	5	8	2	0.95	0.94	0.06	39.71	0.79	13.07 (0.001)	Rejected