

Ecography

ECOG-00086

Fang, J., Wang, X., Liu, Y., Tang, Z., White, P. S. and 2012. Multi-scale patterns of forest structure and species composition in relation to climate in northeast China. – *Ecography* 35: xxx–xxx.

Supplementary material

Appendix 1

Supporting information

Multi-scale patterns of forest structure and species composition in relation to climate in Northeast China

Jingyun Fang, Xiangping Wang, Yining Liu, Zhiyao Tang, Peter S. White, Nathan J. Sanders

Supporting information

Figures A1, A2, and A3

Tables A1 and A2

Figure A1. Locations of 10 study sites across NE China: 1, Mt. Daxue; 2, Mt. Baikalu; 3, Mt. Dabai; 4, Genhe; 5, Liangshui; 6, Langxiang; 7, Mt. Mao'er; 8, Mt. Datudingzi; 9, Mt. Changbai and 10, Mt. Laotudingzi.

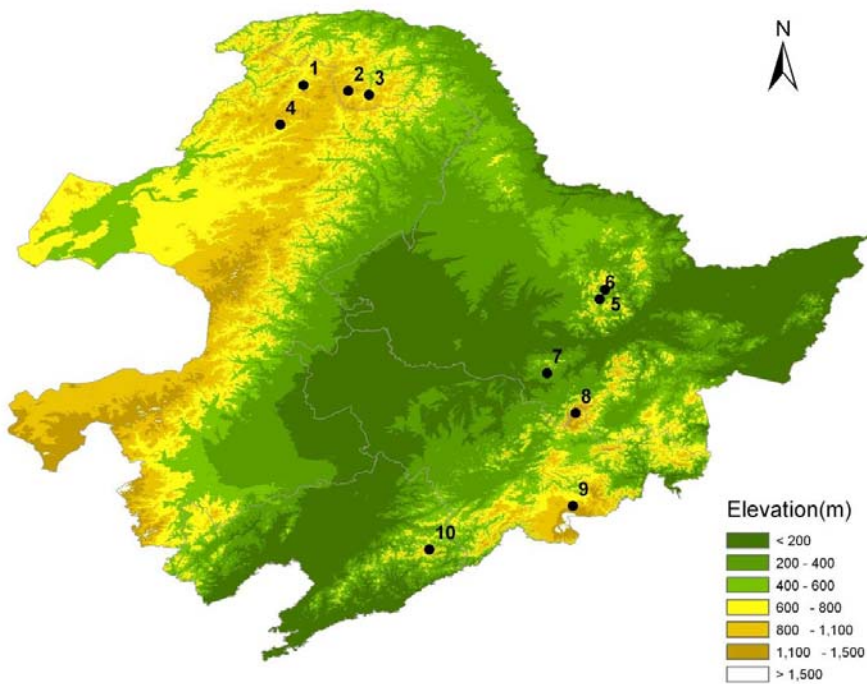


Figure A2. Dendrogram showing the classification of 141 forest plots in NE China, as derived by agglomerative cluster analysis using flexible beta group linkage method and Bray-Curtis dissimilarity. Nine forest types were detected at about 40% of relative distance: (1) *Betula ermanii* forest (Δ), (2) *Larix gmelini* forest (\circ), (3) *L. olgensis* forest (\square), (4) *Picea jezoensis* & *Abies nephrolepis* forest (\blacktriangledown), (5) *Pinus koraiensis* forest (\diamond), (6) *P. koraiensis* & deciduous broadleaf mixed forest (\blacklozenge), (7) *B. platyphylla* & *Populus davidiana* forest (\blacktriangle), (8) *Quercus mongolica* forest (\bullet), and (9) deciduous broadleaf mixed forest (\square , \blacksquare , \times and $+$).

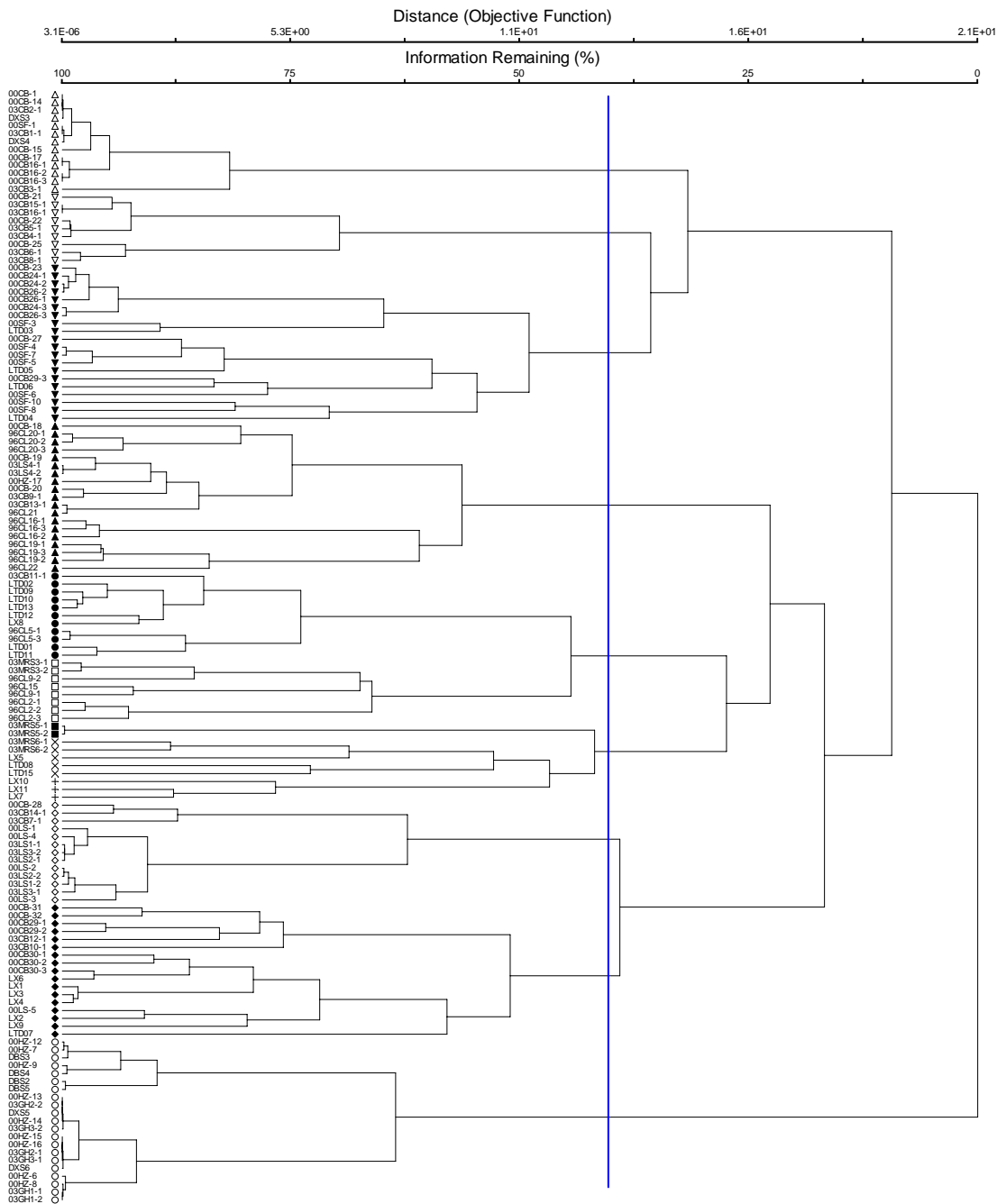


Figure A3. DBH frequency distribution for nine forest types in NE China. The lines were fitted with the power function [$f(D) = c D^{-\lambda}$] by pooling all plots in each forest type across sites. The exponent (λ) was estimated with the maximum likelihood method (White et al. 2008), instead of using the number of stems in each DBH class (*i.e.* the traditional binning method). Abbreviations: BE, *Betula ermanii* forest; BP, *B. platyphylla* & *Populus davidiana* forest; LO, *Larix olgensis* forest; PA, *Picea jezoensis* and *A. nephrolepis* forest; PK, *Pinus koraiensis* forest; PKDB, *Pinus koraiensis* & deciduous broadleaf mixed forest; LG, *L. gmelini* forest; QM, *Q. mongolica* forest, and DBM, deciduous broadleaf mixed forest.

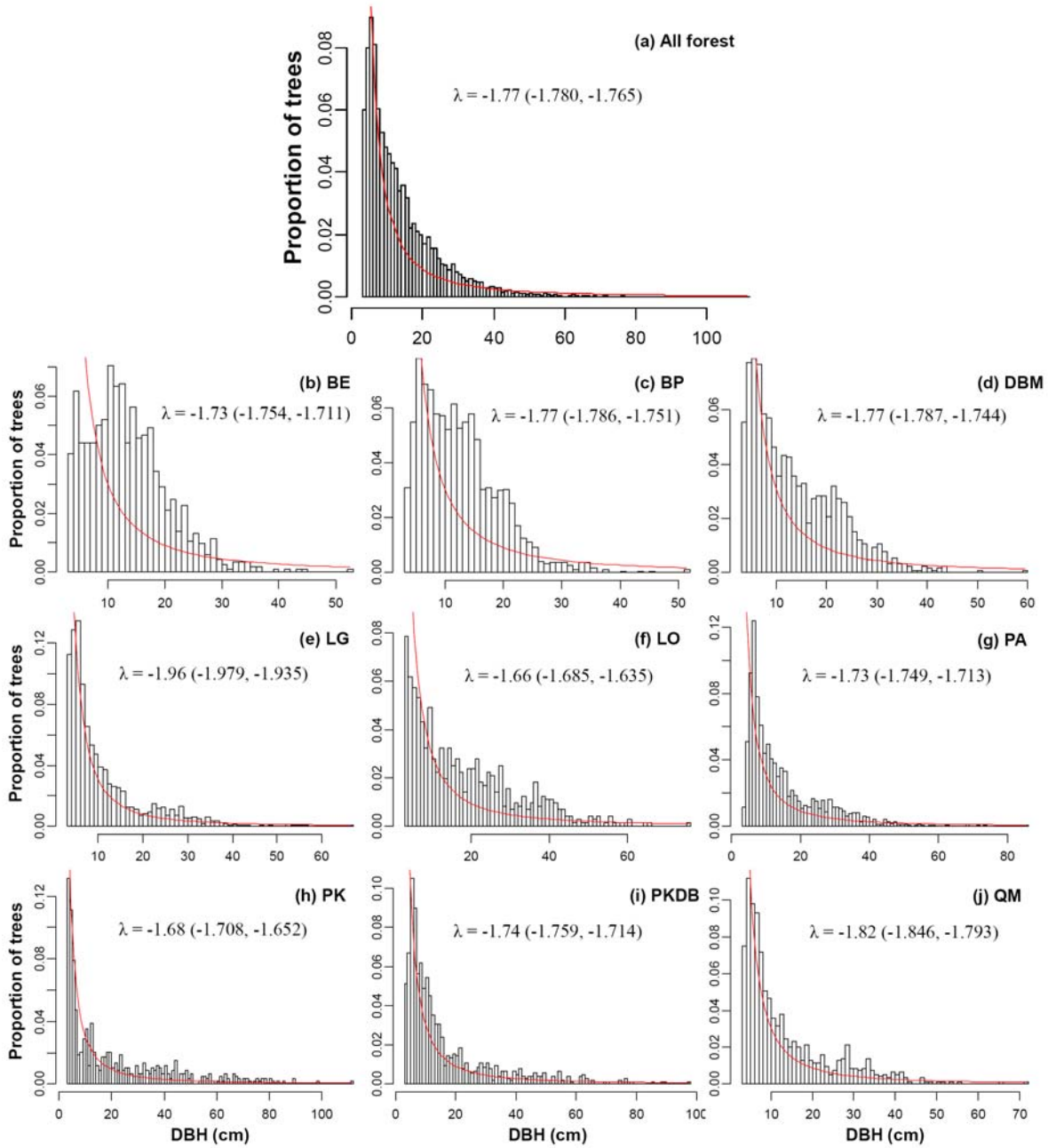


Table A1. Species composition difference (measured as R_B , see Methods) between forest types for tree, shrub and herb layers. The significance of R_B was assessed by permutation test (999 permutations). All differences were significant at $P < 0.05$ except those labeled with ^{NS}. The nine forest types are: (1) BE, *Betula ermanii* forest; (2) LG, *Larix gmelini* forest; (3) LO, *L. olgensis* forest; (4) PA, *Picea jezoensis* and *Abies nephrolepis* forest; (5) PK, *Pinus koraiensis* forest; (6) PKDB, *Pinus koraiensis* & deciduous broadleaf mixed forest, (7) BP, *B. platyphylla* & *Populus davidiana* forest; (8) QM, *Quercus mongolica* forest; and (9) DBM, deciduous broadleaf mixed forest.

	BE	BP	DBM	LG	LO	PA	PK	PKDB
Tree layer								
BP	1.00							
DBM	1.00	0.77						
LG	1.00	0.96	1.00					
LO	0.98	0.95	0.98	1.00				
PA	0.80	1.00	0.99	1.00	0.62			
PK	1.00	0.99	0.97	1.00	0.97	0.96		
PKDB	1.00	0.98	0.56	1.00	0.96	0.91	0.66	
QM	1.00	0.96	0.07 ^{NS}	1.00	1.00	1.00	1.00	0.51
Shrub layer								
BP	0.75							
DBM	0.90	0.35						
LG	0.74	0.79	0.89					
LO	0.38	0.46	0.98	0.77				
PA	0.65	0.52	0.90	0.83	0.17			
PK	0.78	0.12	0.60	0.87	0.62	0.60		
PKDB	0.86	0.08 ^{NS}	0.70	0.89	0.54	0.46	0.02 ^{NS}	
QM	0.57	0.14 ^{NS}	0.28 ^{NS}	0.83	0.57	0.62	0.43	0.28 ^{NS}
Herb layer								
BP	0.62							
DBM	0.87	0.27						
LG	0.70	0.62	0.82					
LO	0.67	0.39	0.78	0.62				
PA	0.55	0.27	0.55	0.69	0.06 ^{NS}			
PK	0.85	0.22	0.36	0.77	0.51	0.29		
PKDB	0.87	0.05 ^{NS}	0.49	0.77	0.45	0.08 ^{NS}	0.24	
QM	0.94	0.24 ^{NS}	0.18 ^{NS}	0.92	0.85	0.54	0.64	0.50

Table A2. Statistics (mean, standard deviation, and maximum and minimum values) for regional measurements of forest structures for nine major forest types in NE China. N, Stem density; D_{mean} , Mean DBH; D_{max} , Maximum DBH; H_{mean} , Mean tree height; H_{max} , Maximum tree height; TBA, Total basal area.

Forest type	Item	N (stem/ha)	D_{mean} (cm)	D_{max} (cm)	H_{mean} (m)	H_{max} (m)	TBA (m ² /ha)
<i>B. ermanii</i> forest	Mean	1456	14.5	36.4	8.8	14.4	26.5
	SD	550.1	3.15	7.40	1.75	3.39	4.79
	Max	2317	19.5	52.7	11.4	19.1	33.9
	Min	783	9.7	23.3	6.4	9.4	18.6
<i>L. olgensis</i> forest	Mean	1322	20.8	56.7	15.4	28.0	52.6
	SD	791.2	5.39	10.89	4.05	3.46	11.40
	Max	3067	28.9	75.5	22.9	34.3	69.3
	Min	383	11.8	39.2	9.6	22.7	35.8
<i>Picea jezoensis</i> and <i>A. nephrolepis</i> forest	Mean	1339	15.4	54.8	11.0	23.5	35.8
	SD	436.0	2.99	15.56	1.95	4.41	9.12
	Max	2667	21.5	85.9	14.1	31.5	52.9
	Min	767	11.1	30.9	8.3	18.0	20.8
<i>L. gmelini</i> forest	Mean	1540	13.2	38.7	11.8	23.6	23.1
	SD	970.4	5.06	10.78	4.01	5.67	6.35
	Max	4400	25.1	66.9	20.7	34.0	38.4
	Min	467	6.2	20.4	5.0	12.5	11.2
<i>Pinus koraiensis</i> forest	Mean	762	23.4	77.8	14.0	31.7	50.8
	SD	366.6	7.11	14.76	2.06	2.00	10.82
	Max	1600	36.9	111.4	18.0	34.8	79.6
	Min	417	14.0	54.8	11.0	28.0	39.6
<i>Pinus koraiensis</i> & deciduous broadleaf mixed forest	Mean	1026	17.7	69.0	13.7	33.1	39.0
	SD	460.4	5.09	16.96	2.41	7.93	10.34
	Max	1967	30.5	97.1	19.5	34.4	62.6
	Min	383	11.8	28.0	9.9	21.3	23.9
<i>B. platyphylla</i> & <i>Populus</i> <i>daurica</i> forest	Mean	1698	12.9	34.1	13.5	24.6	27.2
	SD	491.9	1.68	8.18	1.93	3.67	5.85
	Max	2883	16.3	51.4	16.2	32.6	37.1
	Min	1133	10.2	23.0	9.6	17.4	18.8
<i>Q. mongolica</i> forest	Mean	1436	14.0	45.2	10.7	24.0	32.7
	SD	554.1	2.41	12.05	0.91	9.88	9.09
	Max	2867	16.7	71.7	11.8	33.5	51.0
	Min	983	9.2	24.2	9.6	15.0	18.6
Deciduous broadleaf mixed forest	Mean	1217	14.0	37.0	12.0	23.7	24.2
	SD	398.5	2.61	8.70	1.57	6.15	7.10
	Max	2383	18.6	59.7	14.9	37.2	40.1
	Min	717	9.8	26.0	9.5	15.0	14.7