

Supplementary Materials: Forest Adaptation to Climate Change: Altitudinal Response and Wood Variation in Natural-Growth *Cunninghamia lanceolata* in the Context of Climate Change

NO.	Supplementary materials name
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Table S1 Basic information of sampling population of different altitudes of *Cunninghamia lanceolata*.

Populations	Number of sample trees	DBH/cm	H/m	Longitude (E)	Latitude (N)	Altitude/m	Aspect	Slope degree/°	Soil thickness	Soil texture	BIO1 /°C	BIO8 /°C	BIO9 /°C	BIO12 /mm	BIO16 /mm	BIO17 /mm
Pop1	30	29.52	15.39	110°15'50.5"E- 110°15'21.8"E	28°48'33.0"N- 28°49'04.8"N	550	southeast	5-10	>100	loam	15.23	22.81	5.1	1454.97	651.4	114.17
Pop2	30	28.63	13.55	110°15'57.0"E- 110°14'51.4"E	28°48'32.9"N- 28°49'31.4"N	750	southeast	15-20	65	loam	14.73	22.28	4.68	1470.87	653.07	116.1
Pop3	30	31.01	15.97	110°15'34.1"E- 110°14'34.0"E	28°49'34.9"N- 28°50'11.2"N	950	South western	15-25	50	loam	13.94	21.43	3.99	1499.97	656.77	120.87
Pop4	8	29.38	12.98	110° 12'15.4"E- 110° 13'39.3"E	28°49'1.4"N- 28°48'30.4"N	1150	south	15-25	35	loam	13.83	21.31	3.88	1496	655.5	119.75

Note: DBH, Diameter at Breast Height; H, Average Height; BIO1, Mean Annual Temperature; BIO8, Mean Wettest Season Temperature; BIO9, Mean Driest Season Temperature; BIO12, Annual Precipitation; BIO16, Wettest Season Precipitation; BIO17, Driest Season Precipitation.

Table S2 Principal component analysis of wood traits of *Cunninghamia lanceolata* at different altitudes.

Principal component	Eigenvalue	Variance.percent	Cumulative.variance.percent
Dim.1	2.66	37.98	37.98
Dim.2	1.62	23.14	61.12
Dim.3	1.31	18.67	79.79
Dim.4	0.76	10.82	90.61
Dim.5	0.63	9.06	99.67
Dim.6	0.01	0.21	99.88
Dim.7	0.01	0.12	100.00

Table S3 Contribution of variation in wood traits of *Cunninghamia lanceolata* at different elevations.

Wood property traits	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5	Dim.6	Dim.7
Rb, mm	16.30	1.08	2.09	9.21	71.30	0.01	0.00
P	3.65	21.08	0.00	68.40	6.84	0.00	0.02
WBD, g/cm ³	26.50	12.68	1.93	2.25	6.85	5.49	44.30
Hy, %	26.88	12.34	1.56	2.72	6.31	5.22	44.96
L, um	10.78	33.37	3.77	10.67	5.95	31.82	3.64
D, um	0.83	4.60	68.18	0.47	0.80	22.14	2.98
LD	15.06	14.86	22.47	6.28	1.93	35.32	4.09

Note: Rb, Average Annual Ring Width; P, Heartwood Ratio; WBD, Basic Wood Density; Hy, Water Absorption Rate; L, Tracheid Length; D, Tracheid Width; L/D, Tracheid Length-to-Width Ratio.

Table S4 Correlation coefficients between wood traits of *Cunninghamia lanceolata* at different elevations and climatic factors at elevation.

	Alt	BIO1	BIO8	BIO9	BIO12	BIO16	BIO17	Rb	P	WBD	Hy	L	D	LD
Alt	1.0000	-0.8806	-0.8788	-0.8866	0.8673	0.8137	0.8667	0.2852	0.5793	-0.1690	0.1577	-0.5525	-0.2488	-0.3608
BIO1	-0.8806	1.0000	1.0000	0.9997	-0.9935	-0.9368	-0.9780	-0.1211	-0.5019	0.1026	-0.0908	0.4634	0.2111	0.3095
BIO8	-0.8788	1.0000	1.0000	0.9995	-0.9936	-0.9367	-0.9781	-0.1209	-0.5004	0.1019	-0.0900	0.4626	0.2103	0.3095
BIO9	-0.8866	0.9997	0.9995	1.0000	-0.9935	-0.9354	-0.9799	-0.1205	-0.5061	0.1002	-0.0884	0.4630	0.2135	0.3080
BIO12	0.8673	-0.9935	-0.9936	-0.9935	1.0000	0.9610	0.9923	0.1397	0.4752	-0.1020	0.0904	-0.4516	-0.2030	-0.3100
BIO16	0.8137	-0.9368	-0.9367	-0.9354	0.9610	1.0000	0.9518	0.1555	0.4153	-0.1282	0.1191	-0.4497	-0.1775	-0.3303
BIO17	0.8667	-0.9780	-0.9781	-0.9799	0.9923	0.9518	1.0000	0.1543	0.4687	-0.0927	0.0800	-0.4369	-0.2123	-0.2960
Rb	0.2852	-0.1211	-0.1209	-0.1205	0.1397	0.1555	0.1543	1.0000	0.0785	-0.4641	0.4668	-0.2363	0.0104	-0.2449
P	0.5793	-0.5019	-0.5004	-0.5061	0.4752	0.4153	0.4687	0.0785	1.0000	-0.0482	0.0645	-0.3525	-0.0600	-0.3011
WBD	-0.1690	0.1026	0.1019	0.1002	-0.1020	-0.1282	-0.0927	-0.4641	-0.0482	1.0000	-0.9908	0.1538	-0.0908	0.2182
Hy	0.1577	-0.0908	-0.0900	-0.0884	0.0904	0.1191	0.0800	0.4668	0.0645	-0.9908	1.0000	-0.1545	0.1077	-0.2280
L	-0.5525	0.4634	0.4626	0.4630	-0.4516	-0.4497	-0.4369	-0.2363	-0.3525	0.1538	-0.1545	1.0000	0.3570	0.6573
D	-0.2488	0.2111	0.2103	0.2135	-0.2030	-0.1775	-0.2123	0.0104	-0.0600	-0.0908	0.1077	0.3570	1.0000	-0.4466
LD	-0.3608	0.3095	0.3095	0.3080	-0.3100	-0.3303	-0.2960	-0.2449	-0.3011	0.2182	-0.2280	0.6573	-0.4466	1.0000

Note: BIO1, Mean Annual Temperature; BIO8, Mean Wettest Season Temperature; BIO9, Mean Driest Season Temperature; BIO12, Annual Precipitation; BIO16, Wettest Season Precipitation; BIO17, Driest Season Precipitation. R_b, Average Annual Ring Width; P, Heartwood Ratio; WBD, Basic Wood Density; Hy, Water Absorption Rate; L, Tracheid Length; D, Tracheid Width; L/D, Tracheid Length-to-Width Ratio.

Table S5 Mantel test for wood traits of *Cunninghamia lanceolata* at different elevations in relation to climatic factors at elevation.

ID	Populations	Factors	r	p	rd	pd
1	Pop4	Alt	0.440	0.001	>= 0.4	< 0.01
2	Pop4	BIO1	0.132	0.004	< 0.2	< 0.01
3	Pop4	BIO8	0.128	0.003	< 0.2	< 0.01
4	Pop4	BIO9	0.140	0.004	< 0.2	< 0.01
5	Pop4	BIO12	0.040	0.167	< 0.2	>= 0.05
6	Pop4	BIO16	-0.006	0.52	< 0.2	>= 0.05
7	Pop4	BIO17	0.030	0.23	< 0.2	>= 0.05
8	Pop4	Rb	-0.108	0.986	< 0.2	>= 0.05
9	Pop4	P	0.343	0.001	0.2 - 0.4	< 0.01
10	Pop4	WBD	-0.020	0.596	< 0.2	>= 0.05
11	Pop4	Hy	0.003	0.433	< 0.2	>= 0.05
12	Pop4	L	0.094	0.101	< 0.2	>= 0.05
13	Pop4	D	-0.010	0.525	< 0.2	>= 0.05
14	Pop4	LD	-0.068	0.774	< 0.2	>= 0.05
15	Pop3	Alt	0.118	0.018	< 0.2	0.01 - 0.05
16	Pop3	BIO1	0.262	0.001	0.2 - 0.4	< 0.01
17	Pop3	BIO8	0.266	0.001	0.2 - 0.4	< 0.01
18	Pop3	BIO9	0.265	0.001	0.2 - 0.4	< 0.01
19	Pop3	BIO12	0.328	0.001	0.2 - 0.4	< 0.01
20	Pop3	BIO16	0.390	0.001	0.2 - 0.4	< 0.01
21	Pop3	BIO17	0.403	0.001	>= 0.4	< 0.01
22	Pop3	Rb	0.260	0.001	0.2 - 0.4	< 0.01
23	Pop3	P	-0.013	0.543	< 0.2	>= 0.05
24	Pop3	WBD	-0.059	0.83	< 0.2	>= 0.05
25	Pop3	Hy	-0.061	0.845	< 0.2	>= 0.05
26	Pop3	L	0.010	0.414	< 0.2	>= 0.05
27	Pop3	D	-0.025	0.595	< 0.2	>= 0.05
28	Pop3	LD	-0.151	0.982	< 0.2	>= 0.05
29	Pop2	Alt	-0.280	1	< 0.2	>= 0.05
30	Pop2	BIO1	-0.210	1	< 0.2	>= 0.05
31	Pop2	BIO8	-0.212	1	< 0.2	>= 0.05
32	Pop2	BIO9	-0.212	1	< 0.2	>= 0.05
33	Pop2	BIO12	-0.209	1	< 0.2	>= 0.05
34	Pop2	BIO16	-0.224	1	< 0.2	>= 0.05
35	Pop2	BIO17	-0.197	1	< 0.2	>= 0.05
36	Pop2	Rb	-0.141	0.993	< 0.2	>= 0.05
37	Pop2	P	-0.086	0.922	< 0.2	>= 0.05
38	Pop2	WBD	0.025	0.333	< 0.2	>= 0.05
39	Pop2	Hy	0.033	0.309	< 0.2	>= 0.05
40	Pop2	L	-0.170	0.999	< 0.2	>= 0.05
41	Pop2	D	0.040	0.294	< 0.2	>= 0.05

ID	spec	env	r	p	rd	pd
42	Pop2	LD	0.009	0.417	< 0.2	>= 0.05
43	Pop1	Alt	0.206	0.001	0.2 - 0.4	< 0.01
44	Pop1	BIO1	0.116	0.005	< 0.2	< 0.01
45	Pop1	BIO8	0.117	0.005	< 0.2	< 0.01
46	Pop1	BIO9	0.115	0.005	< 0.2	< 0.01
47	Pop1	BIO12	0.120	0.004	< 0.2	< 0.01
48	Pop1	BIO16	0.085	0.053	< 0.2	>= 0.05
49	Pop1	BIO17	0.058	0.076	< 0.2	>= 0.05
50	Pop1	Rb	-0.032	0.652	< 0.2	>= 0.05
51	Pop1	P	-0.058	0.817	< 0.2	>= 0.05
52	Pop1	WBD	0.050	0.205	< 0.2	>= 0.05
53	Pop1	Hy	0.030	0.321	< 0.2	>= 0.05
54	Pop1	L	0.172	0.007	< 0.2	< 0.01
55	Pop1	D	0.003	0.471	< 0.2	>= 0.05
56	Pop1	LD	0.215	0.004	0.2 - 0.4	< 0.01

Note: r, Correlation Coefficient of Mantel's Test; p, P-value of the Correlation; rd, Ranking of Correlation Coefficients for the Mantel Test; pd, Hierarchy of P-values for Correlation. BIO1, Mean Annual Temperature; BIO8, Mean Wettest Season Temperature; BIO9, Mean Driest Season Temperature; BIO12, Annual Precipitation; BIO16, Wettest Season Precipitation; BIO17, Driest Season Precipitation. R_b, Average Annual Ring Width; P, Heartwood Ratio; WBD, Basic Wood Density; Hy, Water Absorption Rate; L, Tracheid Length; D, Tracheid Width; L/D, Tracheid Length-to-Width Ratio.