Supplementary materials

Role of photosynthesis and stomatal conductance on the long-term rising of intrinsic water use efficiency in three old-growth forests in Bosnia-Herzegovina and Montenegro

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Figure S1 – Location of the three experimental sites.

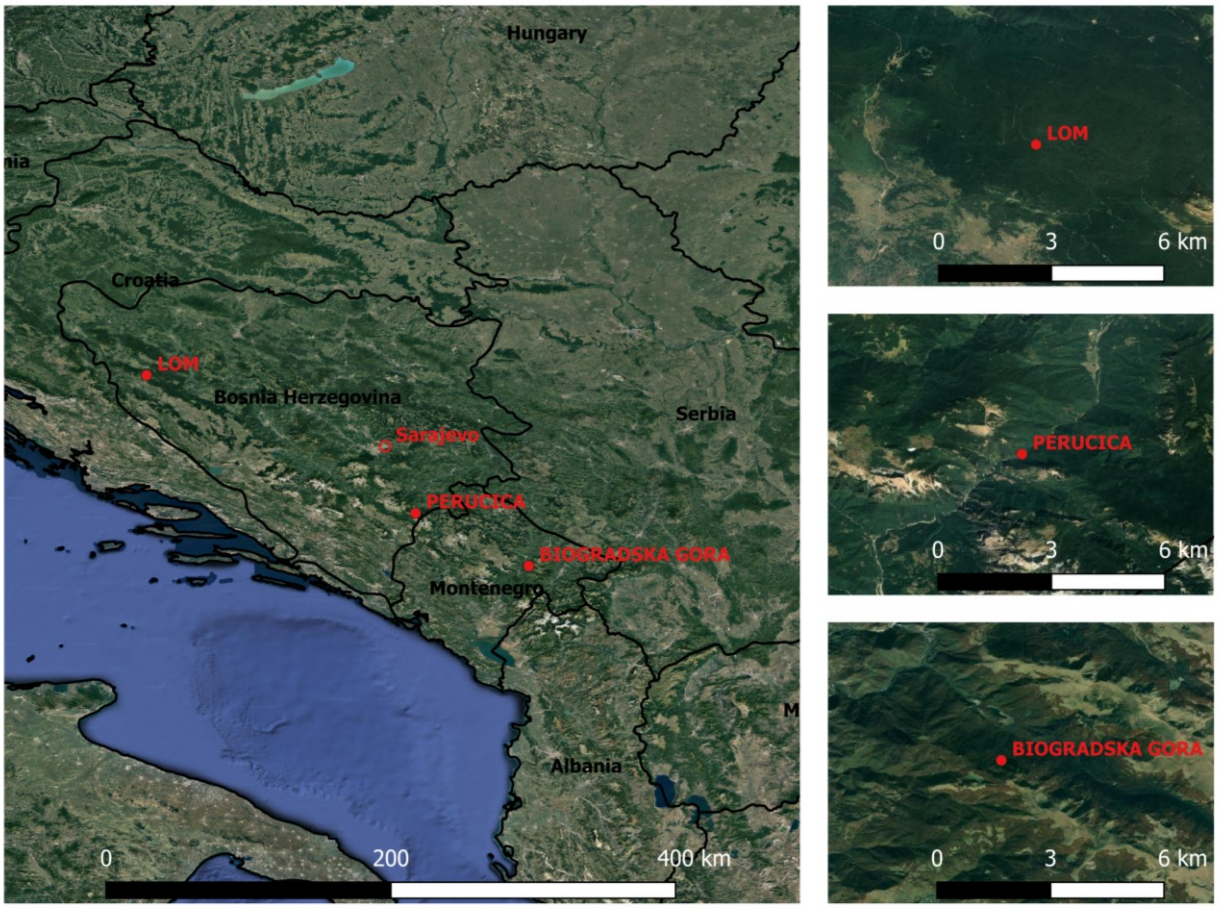

Figure S2 – Distribution of the standing trees by diameter and height class within the 1-ha permanent plot in Perucica (two panels on the top) and relative distribution of the sampled fir trees by diameter and height class in the same plot (two panels on the bottom).

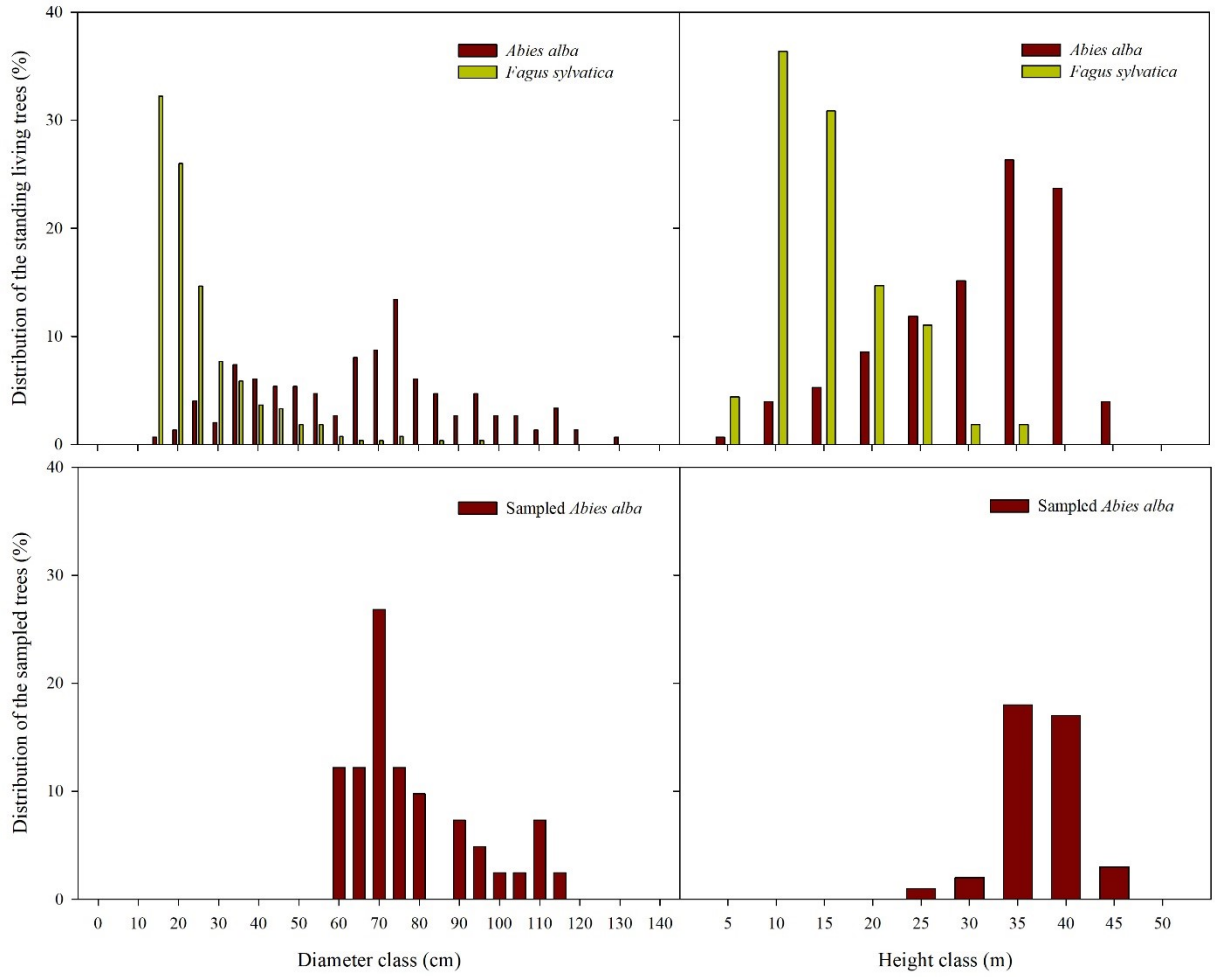

Figure S3 – $\delta^{18}O$ of the precipitation estimated following Barbour et al. (2001) (Equation 8) at the weather station in Sarajevo (top) and in Zagreb (bottom).

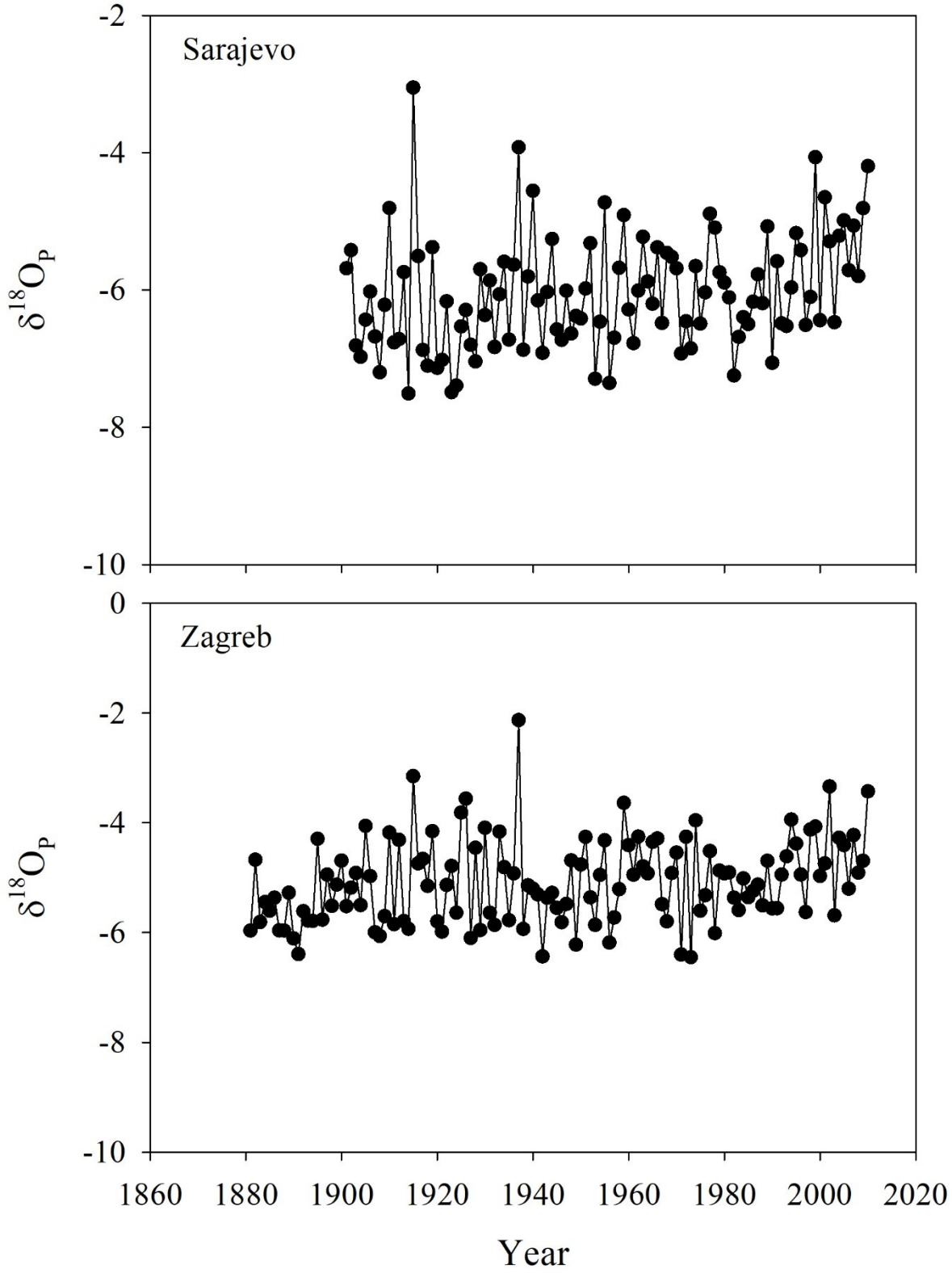

Figure S4 – Ratio between intercellular CO_2 concentration (C_i) and atmospheric CO_2 concentration (C_a) by selected decades at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora). Mean ± standard error. Different letters indicate significant differences among periods ($p<0.05$).

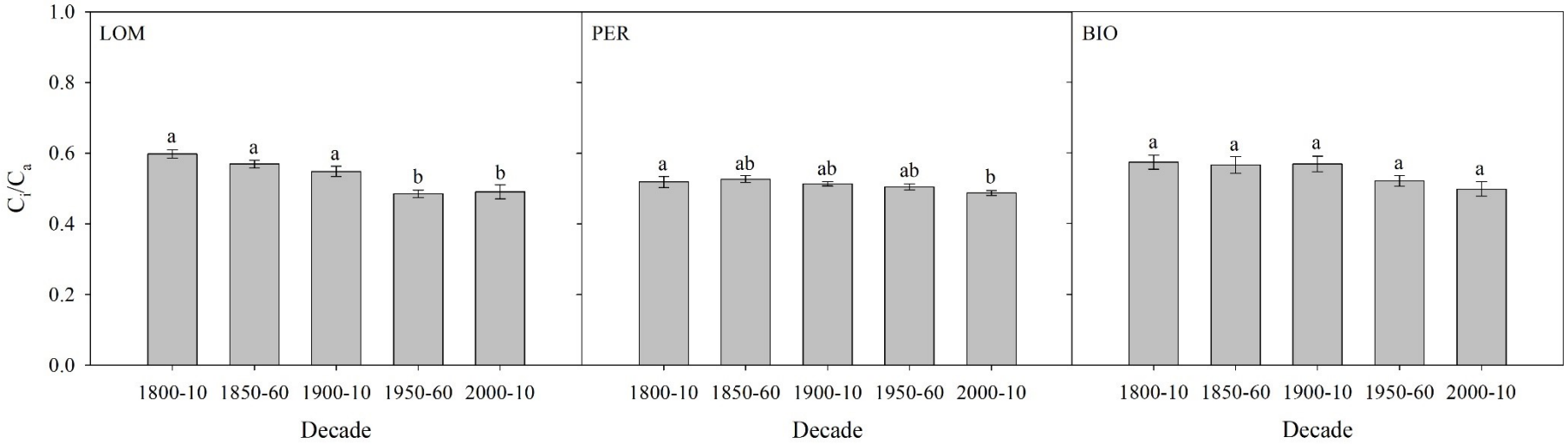

Table S1 – ANOVA results for intercellular CO_2 concentration C_i by selected decades (see Figure 1 in the main text) at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

Source of Variation	DF	SS	MS	F	P
Between Groups	4	3680.201	920.050	7.348	<0.001
Residual	25	3130.415	125.217		
Total	29	6810.616			

PER

Source of Variation	DF	SS	MS	F	P
Between Groups	4	5590.168	1397.542	35.549	<0.001
Residual	22	864.900	39.314		
Total	26	6455.069			

BIO

Source of Variation	DF	SS	MS	F	P
Between Groups	4	3298.950	824.738	4.071	0.014
Residual	20	4051.613	202.581		
Total	24	7350.563			

Table S2 – ANOVA results for basal area increment (BAI) by selected decades (see Figure 2 in the main text) at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

Source of Variation	DF	SS	MS	F	P
Between Groups	4	1163.229	290.807	11.282	<0.001
Residual	25	644.382	25.775		
Total	29	1807.611			

PER

Source of Variation	DF	SS	MS	F	P
Between Groups	4	836.463	209.116	5.268	0.003
Residual	25	992.303	39.692		
Total	29	1828.765			

BIO

Source of Variation	DF	SS	MS	F	P
Between Groups	4	3697.236	924.309	6.821	0.001
Residual	20	2710.165	135.508		
Total	24	6407.402			

Table S3 – ANOVA results for intrinsic water use efficiency (iWUE) by selected decades (see Figure 2 in the main text) at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

Source of Variation	DF	SS	MS	F	P
Between Groups	4	19729.437	4932.359	48.948	<0.001
Residual	25	2519.164	100.767		
Total	29	22248.600			

PER

Source of Variation	DF	SS	MS	F	P
Between Groups	4	9693.210	2423.303	76.670	<0.001
Residual	22	695.356	31.607		
Total	26	10388.566			

BIO

Source of Variation	DF	SS	MS	F	P
Between Groups	4	13063.888	3265.972	19.987	<0.001
Residual	20	3268.105	163.405		
Total	24	16331.993			

Table S4 – ANOVA results for leaf water evaporative enrichment ($\Delta^{18}O_L$) by selected decades (see Figure 2 in the main text) at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

Source of Variation	DF	SS	MS	F	P
Between Groups	2	3.855	1.927	1.080	0.365
Residual	15	26.773	1.785		
Total	17	30.628			

PER

Source of Variation	DF	SS	MS	F	P
Between Groups	2	0.510	0.255	0.0725	0.930
Residual	15	52.711	3.514		
Total	17	53.221			

BIO

Source of Variation	DF	SS	MS	F	P
Between Groups	2	3.720	1.860	0.756	0.491
Residual	12	29.535	2.461		
Total	14	33.255			

Table S5 – ANOVA results for the ratio between intercellular CO_2 concentration (C_i) and atmospheric CO_2 concentration (C_a) by selected decades (see Figure S4) at the three old-growth forests (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

Source of Variation	DF	SS	MS	F	P
Between Groups	4	0.0582	0.0145	12.665	<0.001
Residual	25	0.0287	0.00115		
Total	29	0.0869			

PER

Source of Variation	DF	SS	MS	F	P
Between Groups	4	0.00509	0.00127	3.079	0.037
Residual	22	0.00910	0.000414		
Total	26	0.0142			

BIO

Source of Variation	DF	SS	MS	F	P
Between Groups	4	0.0231	0.00578	2.748	0.057
Residual	20	0.0421	0.00210		
Total	24	0.0652			

Table S6 – Regression results of figure 4 (PER = Perucica; LOM = Lom; BIO = Biogradska Gora).

LOM

R: 0.8217
R^2: 0.6752
Adj R^2: 0.6636
Standard Error of Estimate: 16.0645

	Coefficient	Std. Error	t	P
y0	86.4602	5.2475	16.4765	<0.0001
a	2.8828	0.3778	7.6297	<0.0001

Analysis of Variance:

	DF	SS	MS
Regression	2	444571.4845	222285.7422
Residual	28	7225.9309	258.0690
Total	30	451797.4154	15059.9138

Corrected for the mean of the observations:

	DF	SS	MS	F	P
Regression	1	15022.6695	15022.6695	58.2118	<0.0001
Residual	28	7225.9309	258.0690		
Total	29	22248.6005	767.1931		

PER

R: 0.6462
R^2: 0.4175
Adj R^2: 0.3942
Standard Error of Estimate: 15.5579

	Coefficient	Std. Error	t	P
y0	112.0536	4.9184	22.7825	<0.0001
a	1.6031	0.3787	4.2331	0.0003

Analysis of Variance:

	DF	SS	MS
Regression	2	450664.1382	225332.0691
Residual	25	6051.2229	242.0489
Total	27	456715.3611	16915.3837

Corrected for the mean of the observations:

	DF	SS	MS	F	P
Regression	1	4337.3431	4337.3431	17.9193	0.0003

Residual	25	6051.2229	242.0489
Total	26	10388.5660	399.5602

BIO

R: 0.6722
R^2: 0.4519
Adj R^2: 0.4280
Standard Error of Estimate: 19.7286

	Coefficient	**Std. Error**	**t**	**P**
y0	98.3622	5.8708	16.7544	<0.0001
a	0.8524	0.1958	4.3544	0.0002

Analysis of Variance:

	DF	**SS**	**MS**
Regression	2	351313.2271	175656.6136
Residual	23	8952.0094	389.2178
Total	25	360265.2365	14410.6095

Corrected for the mean of the observations:

	DF	**SS**	**MS**	**F**	**P**
Regression	1	7379.9833	7379.9833	18.9611	0.0002
Residual	23	8952.0094	389.2178		
Total	24	16331.9927	680.4997		