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Supplement of

Spatiotemporal variations of carbon-water-hydraulic risk for *Pinus tabuliformis* Carrière Plantations on the Loess Plateau under future climate change

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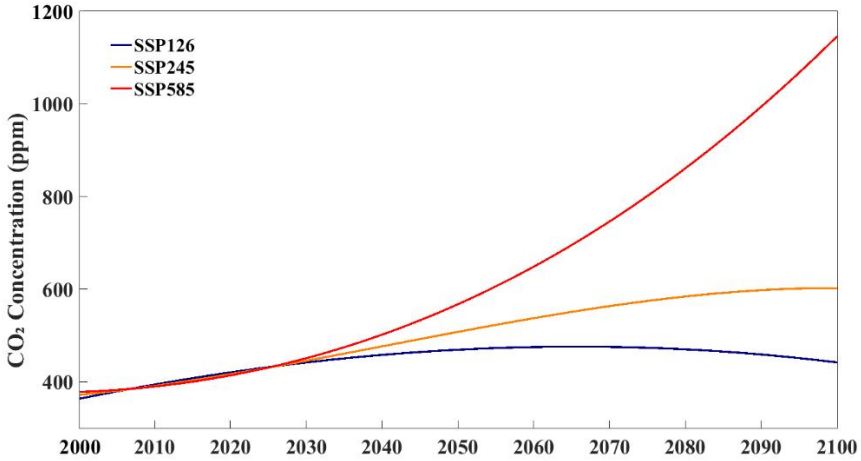


Figure S1. Carbon dioxide concentrations under SSP126, SSP245, and SSP585 scenarios from CMIP6.

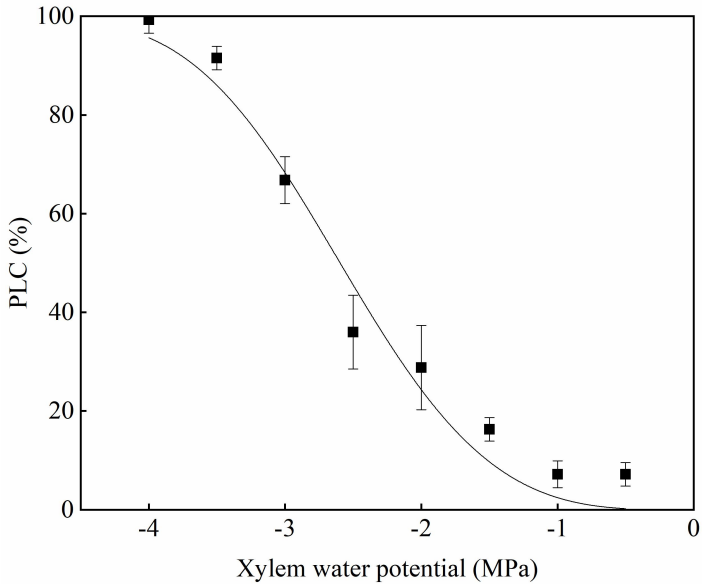


Figure S2. Stem vulnerability curve of *Pinus tabuliformis* L. plantations. The solid line represents the fit with a Weibull function. PLC, percentage loss of xylem hydraulic conductivity.

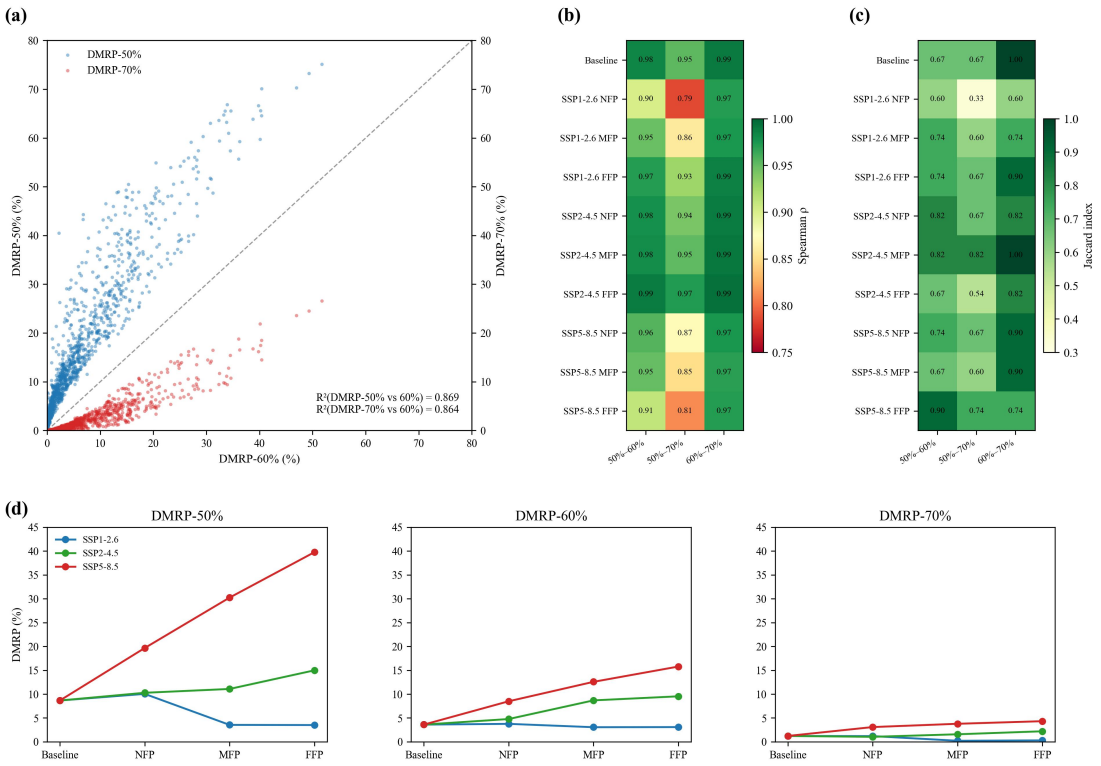


Figure S3. Sensitivity of drought-induced mortality risk (DMRP) to the choice of the hydraulic mortality threshold (50%, 60%, and 70%). (a) Comparison of DMRP values among hydraulic mortality thresholds (n = 1300 data points; blue points, left axis: DMRP-50% vs. DMRP-60%; red points, right axis: DMRP-70% vs. DMRP-60%; dashed line indicates the 1:1 reference). (b) Spearman rank correlation coefficients of site-level DMRP between thresholds for each period. (c) Spatial agreement of the top-20 highest-risk sites identified under different hydraulic mortality thresholds. (d) Temporal changes of DMRP-50%, -60%, and -70%. Baseline, NFP, MFP, and FFP are the same as defined in Fig. 5.

Table S1 Major parameters of the BBGC-Sperry model for *Pinus tabuliformis* L. plantations

Parameter	values
(a) Biome-BGC model	
Transfer growth period fraction of growing season (%)	0.3
Litterfall fraction of growing season (%)	0.3
Annual leaf and fine root turnover fraction (yr^{-1})	0.35
Annual live wood turnover fraction (yr^{-1})	0.7
Allocation new fine root C:new leaf C	0.9
Allocation new stem C:new leaf C	2.51
Allocation new live wood C:new total wood C	0.059[a]
Allocation new root C:new stem C	0.29
Allocation current growth proportion (%)	0.5
C:N of leaves	33.1[b]
C:N of leaf litter	132.0[b]
C:N of fine roots	38
C:N of live wood	50
C:N of dead wood	1400
Leaf litter labile proportion	0.26[b]
Leaf litter cellulose proportion	0.49
Leaf litter lignin proportion	0.25
Fine root labile proportion	0.25[c]
Fine root cellulose proportion	0.5
Fine root lignin proportion	0.25
Dead wood cellulose proportion	0.71
Dead wood lignin proportion	0.29
Canopy light extinction coefficient	0.50[d]
All-sided to projected leaf area ratio	2.6
Specific leaf area ($m^2\,kg^{-1}$ C)	12.7[f]
Ratio of shaded SLA:sunlit SLA	2
Fraction of leaf N in Rubisco	0.05
Maximum stomatal conductance ($m\,s^{-1}$)	0.003[d]
Cuticular conductance ($m\,s^{-1}$)	0.00001
Boundary layer conductance ($m\,s^{-1}$)	0.01
Leaf water potential: start of conductance reduction (MPa)	-0.5[a]
Leaf water potential: complete conductance reduction (MPa)	-2.2[a]
VPD: start of conductance reduction (Pa)	50[e]
VPD: complete conductance reduction (Pa)	2500[e]
(b) Sperry model	
Weibull function *b* and *c* for root, stem, leaf	b=2.9, c=3.5
Maximum whole-plant hydraulic conductance per leaf area (mmol s^{-1} m^{-2} MPa^{-1})	2.4

Maximum diffusive conductance (mmol s^{-1} m^{-2})	37.9
Average resistance in rhizosphere (%)	50
Root depth coefficient	0.98
Number of root and soil layers	5

Note: C = carbon; N = nitrogen; LAI = leaf area index; SLA = specific leaf area; VPD = vapor pressure deficit

[a] = Pietsch et al. (2005);

[b] = Berg et al. (1984);

[c] = Aber et al. (1990);

[d] = Zhang et al. (2024a);

[e] = Kellomäki and Wang (1997);

[f] = Ouyang et al. (2014).

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