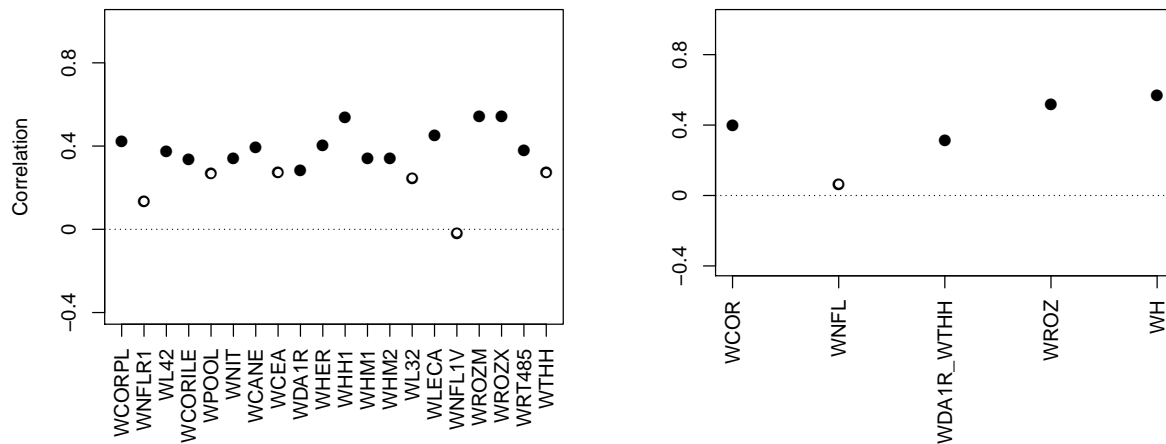


## S1: Supplementary materials

**Table S1.** Main constants linked to site conditions and control parameters in the MAIDEN model.

Parameter	Meaning	Units
<i>exp_site</i>	Indicates if the species at the site is a deciduous (1) or conifer (2) tree	no unit (1 or 2)
<i>base_elev_cst</i>	Station elevation	meters
<i>base_isoh_cst</i>	Station isohyet	centimeters
<i>site_lat_cst</i>	Site latitude	degrees
<i>site_elev_cst</i>	Site elevation	meters
<i>site_slp_cst</i>	Site slope	degrees
<i>site_asp_cst</i>	Site aspect	degrees
<i>site_isoh_cst</i>	Site isohyet	centimeters
<i>site_ehoriz_cst</i>	Site East slope	degrees
<i>site_whoriz_cst</i>	Site West slope	degrees
<i>thick1-2-3 or 4</i>	Soil layer thickness	meters
<i>finefrac1-2-3 or 4</i>	% of fine roots in the soil layer	Coeff. between 0-1
<i>clay1-2-3 or 4</i>	% of clay in the soil layer	%
<i>sand1-2-3 or 4</i>	% of sand in the soil layer	%



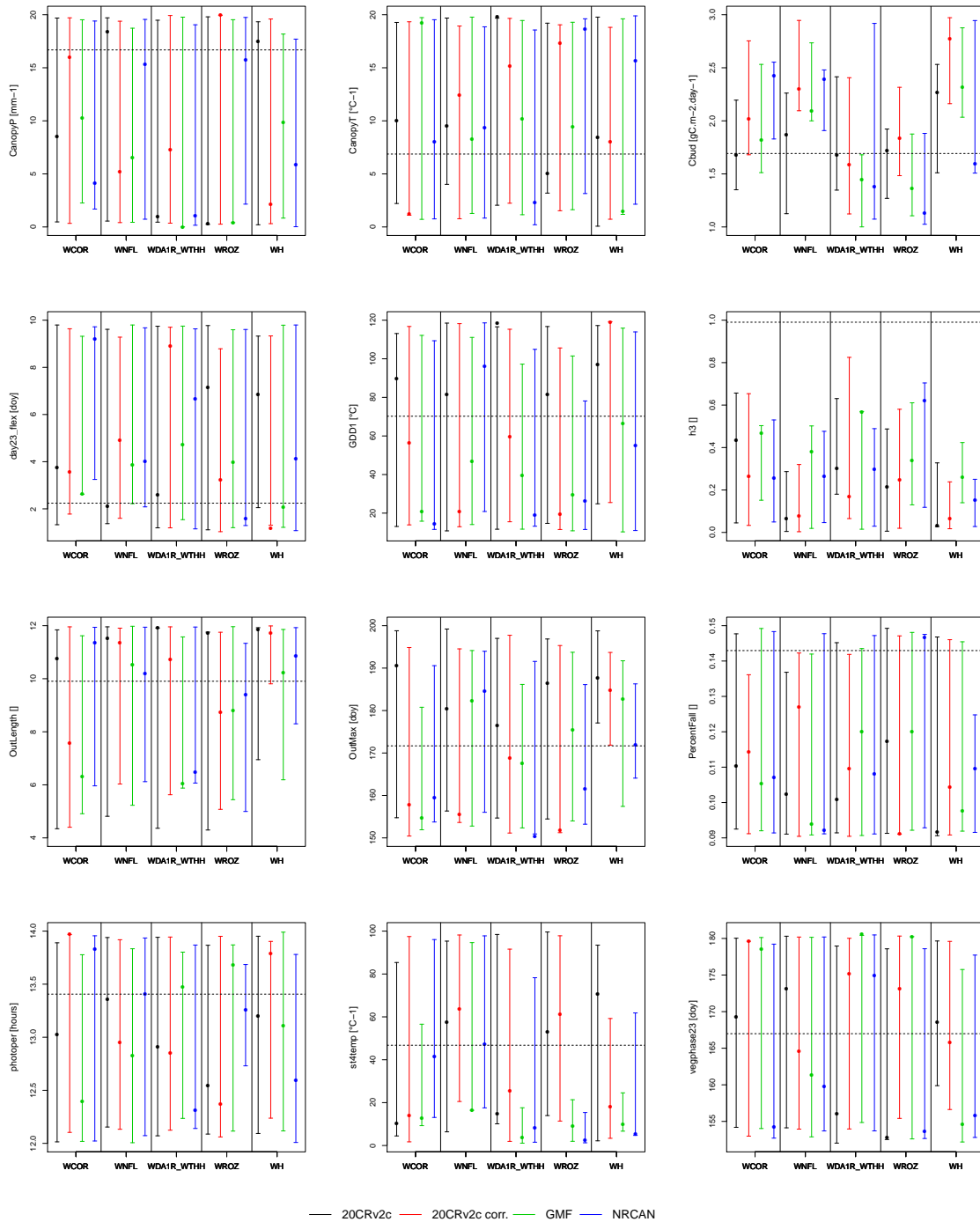
**Figure S1.** Pearson correlation coefficients between tree growth observations and simulations at the Eastern Canadian taiga sites (Fig. 1) with MAIDEN using NRCAN (5') as climatic inputs (Table 2) for the 1950-2000 period with *QC\_taiga* calibrated parameters from Gennaretti et al. (2017). Individual (left) and aggregated sites (right). The long-term decadal trends have been removed in observations and simulations. White inner circles stand for non-significant correlations ( $p$ -value  $> 0.05$ ). Plain circles stand for significant correlations ( $p$ -value  $< 0.05$ ).

**Table S2.** Calibrated parameters of the MAIDEN model (Gennaretti et al., 2017).

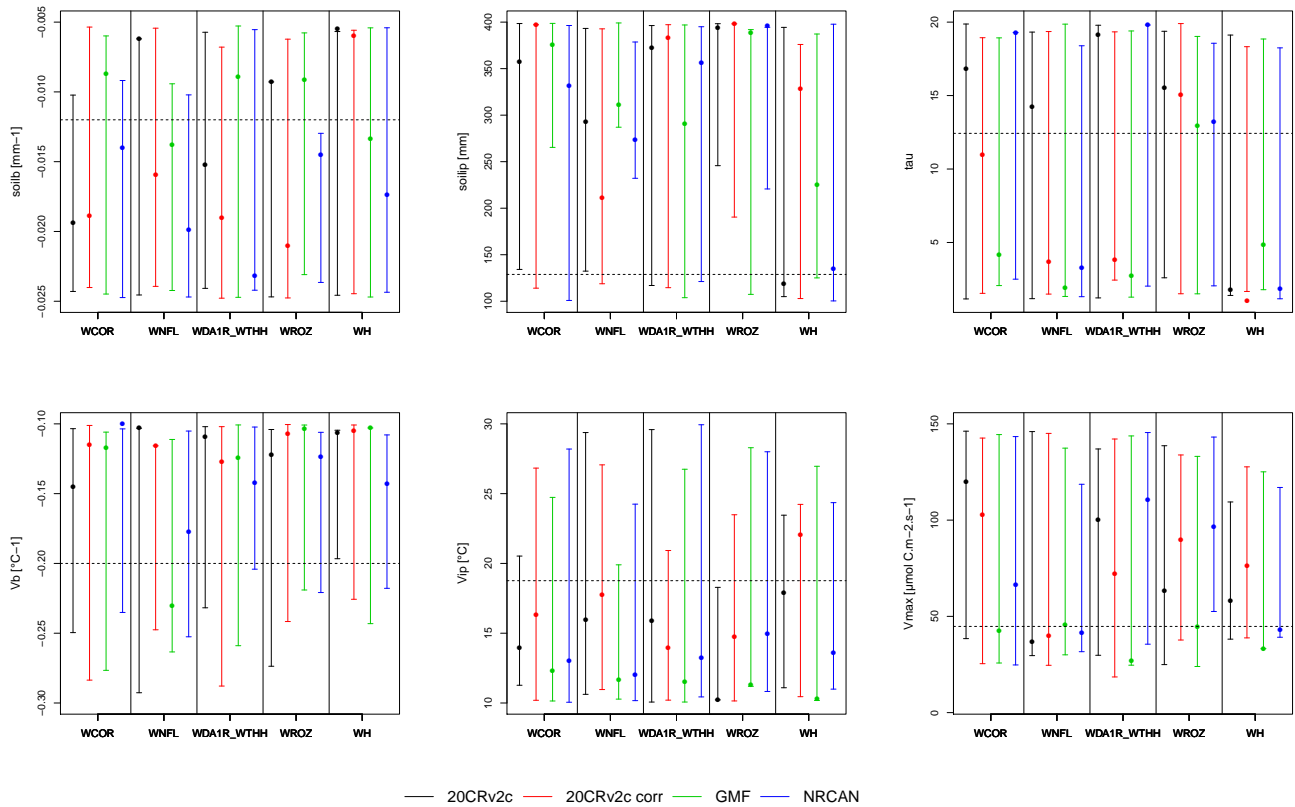
	Process		Parameter	Units
<b>Photosynthesis</b>	Temperature dependence of photosynthesis	Asymptote	$V_{max}$	$\mu\text{mol C.m}^{-2}$ de feuilles . $\text{s}^{-1}$
		Slope	$V_b$	$^{\circ}\text{C}^{-1}$
		Inflection point	$V_{ip}$	$^{\circ}\text{C}$
	Water stress dependence of stomatal conductance	Slope	$soil_b$	$\text{mm}^{-1}$
		Inflection point	$soil_{ip}$	mm
	Acclimation to temperature of photosynthesis	Needed days	$\tau$	days
<b>Carbon allocation</b>	Definition of canopy maximum amount of carbon	Slope of temperature dependence	$CanopyT$	$^{\circ}\text{C}^{-1}$
		Slope of precipitation dependence	$CanopyP$	$\text{mm}^{-1}$
	Start of the growing season (budburst)	GDD sum threshold	$GDD_1$	$^{\circ}\text{C}$
		Day before the later start	$vegphase23$	day of the year
		Acclimation to changing GDD sums	$day23\_flex$	day of the year
	Daily available carbon from buds reservoir	Storage C used by the tree	$C_{bud}$	$\text{gC.m}^{-2}$ of stand . $\text{day}^{-1}$
	Partition of carbon to different tree compartments during growing season	Portion allocated to canopy and roots	$h3$	fraction (0-1)
	Partition of carbon to different tree compartments during summer period	Inflection point of the temperature dependence	$st_{Atemp}$	$^{\circ}\text{C}^{-1}$
	Photoperiod for transition from summer to fall season	Photoperiod threshold	$photoper$	hours
	Carbon losses from the canopy	Yearly canopy turnover rate	$PercentFall$	fraction (0-1)
		Approximate day of the year with maximum losses	$OutMax$	day of the year
		Index proportional to the length of the period with losses	$OutLength$	NA

**Table S3.** GHCN (Table 2) stations used for daily climate data at the European sites (Fig. 2).

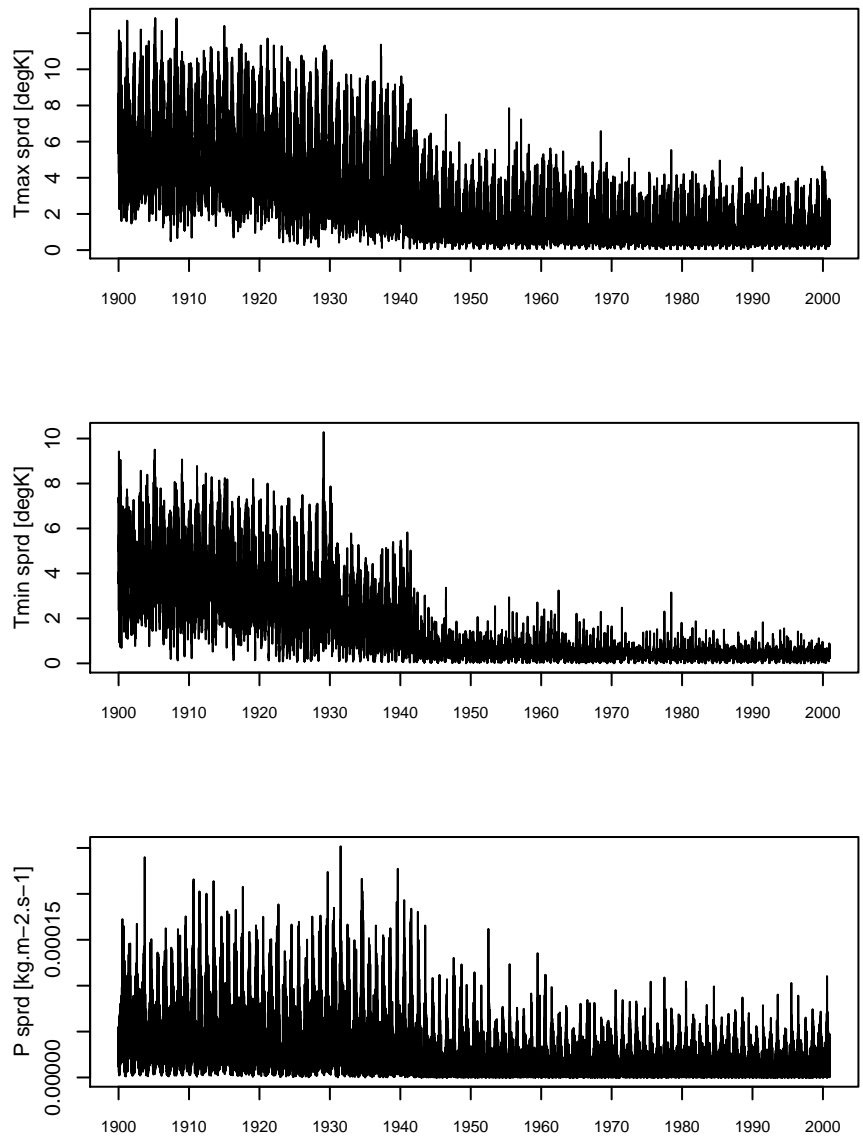
Site	Time period	Station name	Station lat/lon	Station elevation
FINL	1900-1944/1950-2000	Sodankyla	67.37N26.65E	179m
EALP	1950-2000	Zugspitze	47.42N10.99E	2964m
	1910-1949	Innsbruck	47.27N11.4E	577m
SWIT179	1910-2000	Saentis	47.25N9.35E	2502m



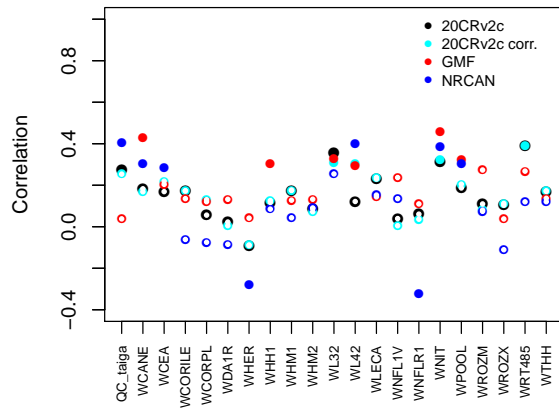
**Figure S2.** Selected carbon allocation parameters value (Table S2) based on the calibration procedure detailed in Sect. 2.3.1 and 95% confidence interval of each parameter (computed based on all iterations of the third step of the calibration process, with a five iterations thinning and a burn-in period of 3000 iterations, see Sect. 2.3.1) for the five aggregated Eastern Canadian sites (Fig. 1b) and for all climatic datasets (Table 2) over the 1950-2000 time period. Dashed line corresponds to the parameter value at *QC\_iaiga* site from Gennaretti et al. (2017).



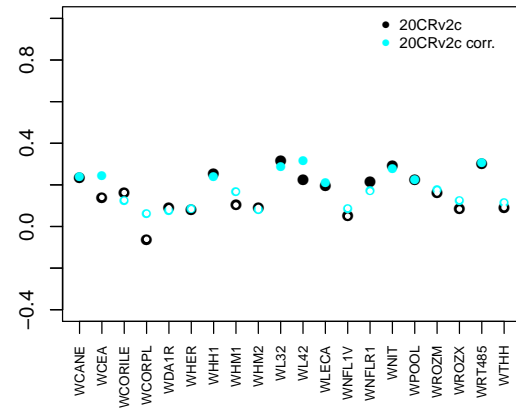
**Figure S3.** Selected photosynthesis parameters value (Table S2) based on the calibration procedure detailed in Sect. 2.3.1 and 95% confidence interval of each parameter (computed based on all iterations of the second step of the calibration process, with a five iterations thinning and a burn-in period of 1000 iterations, see Sect. 2.3.1) for the five aggregated Eastern Canadian sites (Fig. 1b) and for all climatic datasets (Table 2) over the 1950–2000 time period. Dashed line corresponds to the parameter value at *QC\_taiga* site from Gennaretti et al. (2017).



**Figure S4.** WL42 (Fig. 1a). Ensemble spread of maximum temperature (Tmax sprd), minimum temperature (Tmin sprd) and precipitations (P sprd) for the NOAA-CIRES 20th Century Reanalysis V2c (Table 2) for the 1900-2000 time period.



(a) 1950-2000



(b) 1900-2000

**Figure S5.** Pearson correlation coefficients between tree growth observations and simulations at the Eastern Canadian taiga sites (Fig. 1a) with VS-Lite using the different climatic datasets described in Table 2 for the 1950-2000 (a) and 1900-2000 (b) calibration periods. White inner circles stand for non-significant correlations ( $p$ -value  $> 0.05$ ).