



Supplement of

Effects of a warmer climate and forest composition on soil carbon cycling, soil organic matter stability and stocks in a humid boreal region

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Figure S1. Relationships between temperature (DD) and aridity

Significance ($P > F$) of relationships between aridity and temperature (DD) with R^2 in bracket when significant at the 5% threshold and a + or - sign to indicating the direction of the relationship. Figure SM1: triangles: Balsam fir sites, circles: Black spruce sites

B. fir	B. Spruce	All
0.0001 ($R^2:0.86$)+	0.26	0.03 ($R^2:0.22$)+

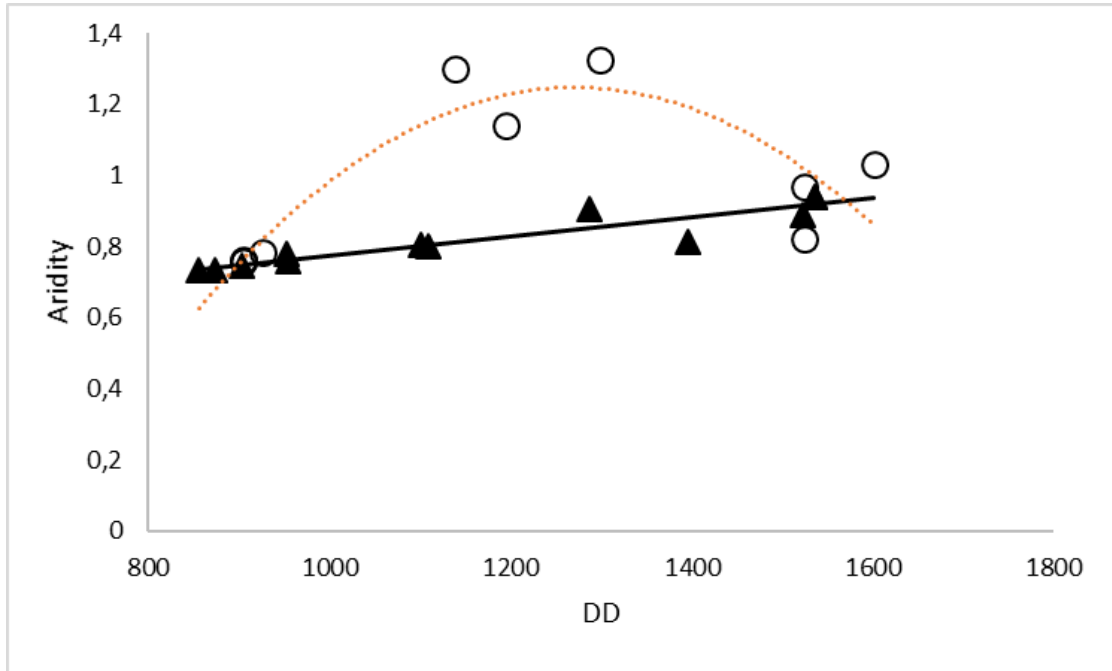


Table S1. Comparison of two methods (Rs1 and Rs2) for estimating cumulative seasonal soil respiration for intensively studied sites.

Rs1: $Q_{10} = 2$, $b = 0,0693$, Rs10 (a) varies during the season, method used in this study;

Rs2: Q10 and Rs10 have a single value for each year/site

Site	YR	Rs1	Rs2	Rs2/Rs1	
		C g.m ⁻²	C g.m ⁻²	ratio	difference (%)
LS	1	763	744	0,98	2,49
	2	823	820	1,00	0,36
	3	604	590	0,98	2,32
	4	687	636	0,93	7,42
	5	262	327	1,25	-24,81
	5-yr avg	3139	3117	0,99	0,70
FR	1	751	615	0,82	18,11
	2	648	621	0,96	4,17
	3	439	388	0,88	11,62
	4	434	415	0,96	4,38
	5	213	182	0,85	14,55
	5-yr avg	2485	2221	0,89	10,62
FM	1	230	253	1,10	-10,00
	2	369	396	1,07	-7,32
	3	562	457	0,81	18,68
	4	405	364	0,90	10,12
	5	311	305	0,98	1,93
	5-yr avg	1877	1775	0,95	5,43
PR	1	738	694	0,94	5,96
	2	826	759	0,92	8,11
	3	585	539	0,92	7,86
	4	647	614	0,95	5,10
	5	310	372	1,20	-20,00
	5-yr avg	3106	2978	0,96	4,12
J2	1	320	342	1,07	-6,88
	2	355	391	1,10	-10,14
	3	266	274	1,03	-3,01
	4	251	290	1,16	-15,54
	5	183	158	0,86	13,66
	5-yr avg	1375	1455	1,06	-5,82
TIR	1	499	428	0,86	14,23

	2	680	480	0,71	29,41
	3	369	341	0,92	7,59
	4	525	416	0,79	20,76
	5	877	664	0,76	24,29
	5-yr avg	2950	2329	0,79	21,05
OESB 17	1	233	304	1,30	-30,47
	2	349	368	1,05	-5,44
	3	438	574	1,31	-31,05
	3-yr avg	1020	1246	1,22	-22,16
OESB 24	1	281	304	1,08	-8,19
	2	414	368	0,89	11,11
	3	476	574	1,21	-20,59
	3-yr avg	1171	1246	1,06	-6,40

Table S2. Estimated parameters describing the linear regressions between component of soil respiration ($\text{kg C ha}^{-1} \text{ yr}^{-1}$) and cumulative degree days ($>5^\circ\text{C}$) for total soil respiration (Rs), heterotrophic respiration (Rh) as derived from the Bond-Lamberty (2004) equation and autotrophic respiration (Ra) calculated as the difference between the Rs and Rh for 183 days (May 1st-October 1st). No distinction is made per tree species given the absence of a significant species effect (Table 3).

Component	a	b (slope)	R ²	p
Rs	1618	3.71	0.64	<0.0001
Rh	1663	1.64	0.64	<0.0001
Ra	-45	2.07	0.65	<0.0001

Table S3. Coefficients of the exponential function ($R_s = ae^{b(T_s)}$) relating field soil respiration (R_s) in $\mu\text{mol m}^{-2} \text{s}^{-1}$ to soil temperature (T_s) in $^{\circ}\text{C}$ taken at a depth of 10-15cm for each site for control and trenched plots. Nb indicates the number of respiration measurements performed by site.

Year(s)	Species	T.reg	Site	<i>a</i>	<i>b</i>	R^2	$R_s 10^{\circ}\text{C}^{-1}$	Q_{10}	Nb
control									
2002-2005	BF	Cold	FM	1.15	0.1139	0.46	3.59	3.12	420
2002-2005	BF	Cold	RIVM	1.26	0.0802	0.41	2.81	2.23	150
2002-2005	BF	Cold	RIVN1	1.35	0.0911	0.46	3.36	2.49	160
2002-2005	BF	Cold	RIVN2	1.40	0.0801	0.33	3.12	2.23	160
2003-2005	BF	Cold	SAUT	1.36	0.0984	0.41	3.64	2.68	120
2002-2005	BF	Mild	FR	1.49	0.0954	0.46	3.87	2.60	391
2002-2005	BF	Mild	KM82	1.01	0.1092	0.52	3.01	2.98	160
2002-2005	BF	Mild	PTR	1.49	0.0785	0.32	3.27	2.19	160
2002-2005	BF	Warm	SE	1.17	0.1066	0.58	3.40	2.90	520
2002-2005	BF	Warm	STMAT	1.12	0.1033	0.50	3.15	2.81	190
2002-2005	BF	Warm	SLAC7	1.32	0.0865	0.42	3.14	2.38	190
2002-2005	BF	Warm	DUC2	0.95	0.0959	0.58	2.48	2.61	160
2002-2005	BS	Cold	J1	0.85	0.1042	0.31	2.41	2.83	190
2002-2005	BS	Cold	J2	0.96	0.1020	0.52	2.66	2.77	399
2003-2005	BS	Cold	J3	2.03	0.0437	0.17	3.14	1.55	110
2002-2005	BS	Cold	CJC	1.01	0.0876	0.35	2.43	2.40	160
2004-2006	BS	Cold	EOBS	0.89	0.1040	0.35	2.51	2.83	250
2002-2005	BS	Cold	TIR	1.67	0.0742	0.28	3.51	2.10	522
2003-2005	BS	Warm	AVRP	1.39	0.0786	0.62	3.05	2.19	130
2003-2005	BS	Warm	REPO	1.26	0.0894	0.53	3.08	2.44	140
2002-2005	BS	Warm	PR	1.31	0.0901	0.52	3.23	2.46	409
trenched									
2002-2005	BF	Cold	FM	0.66	0.1211	0.43	3.36	2.22	421
2002-2005	BF	Mild	FR	1.04	0.0956	0.40	2.60	2.70	421
2002-2005	BF	Warm	SE	1.05	0.0942	0.53	2.57	2.69	421
2002-2005	BS	Cold	J2	0.65	0.1180	0.58	3.29	2.11	439
2004-2006	BS	Cold	EOBS	0.67	0.0978	0.36	1.79	2.66	250
2002-2005	BS	Cold	TIR	1.36	0.0661	0.24	1.94	2.63	504
2002-2005	BS	Warm	PR	1.09	0.0768	0.42	2.16	2.35	450

Table S4. Model coefficients estimated from the linear regressions on the laboratory incubation data. Effects of incubation temperature (°C), species (balsam fir vs. black spruce) and climate (cold vs. warm) on cumulative C and N mineralization were analyzed separately for each element in the two soil layers (organic and mineral), on 16 observations. Temperature was centered on its mean before analysis. Therefore, intercepts represent estimated means for balsam fir in cold climate at average temperature.

Response variable	Soil layer	Coefficient	Estimate	Stand. Error	<i>t</i>	<i>p</i> value	Adjusted R ²
Cumulative C mineralization	Organic	Intercept	68.35	4.98	13.71	< 0.001	0.93
		Species (spruce)	-11.96	5.75	-2.08	0.06	
		Climate (warm)	23.78	5.75	4.13	0.001	
		Temperature	5.64	0.41	13.63	< 0.001	
	Mineral	Intercept	19.41	1.65	11.73	< 0.001	0.86
		Species (spruce)	-2.41	1.91	-1.26	0.23	
		Climate (warm)	1.93	1.91	1.01	0.33	
Cumulative N mineralization	Organic	Intercept	26.17	4.29	6.10	< 0.001	0.68
		Species (spruce)	-12.63	4.95	-2.55	0.03	
		Climate (warm)	21.84	4.95	4.41	< 0.001	
		Temperature	1.06	0.36	2.96	0.01	
	Mineral	Intercept	21.05	2.71	7.76	< 0.001	0.43
		Species (spruce)	-4.31	3.13	-1.38	0.19	
		Climate (warm)	-4.31	3.13	-1.38	0.19	
		Temperature	0.73	0.23	3.24	0.007	

Figure S.2. Significance (P>F) of relationships between Aridity and SOM stocks and fluxes with R² in bracket when significant at the 5% threshold and a + or - sign to indicating the direction of the relationship.

Stand type	C stocks O.L.	C stocks 0-20cm	RS ₁₀	Q ₁₀	RS	Needle-litter	All-litter
Fir	0.29	0.78	0.23	0.98	0.09	0.0056 (R²:0.59)+	0.0029 (R²:0.65)+
Spruce	0.72	0.03 (R²:0.44) -	0.05	0.82	0.08	0.70	0.24
all	0.36	0.015 (R²:0.29) -	0.29	0.53	0.01 (R²:0.30)+	0.21	0.07

Top left: Black spruce sites only; bottom left Balsam fir sites only; right column all sites.

