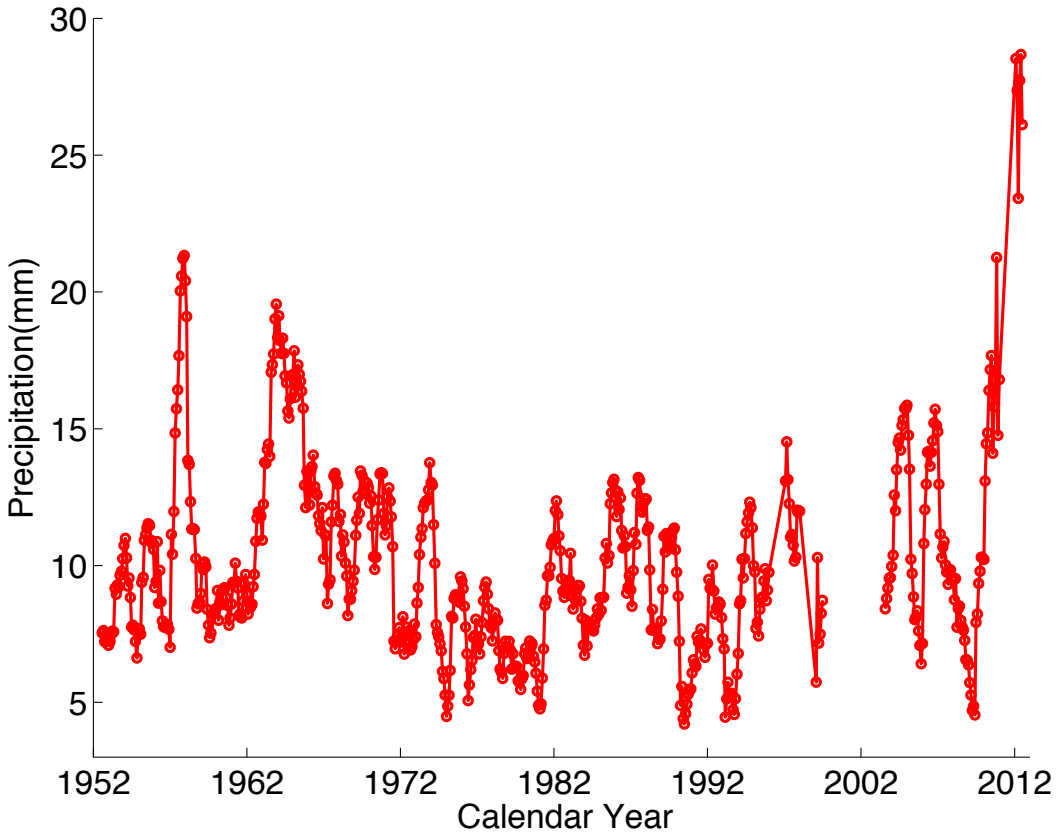
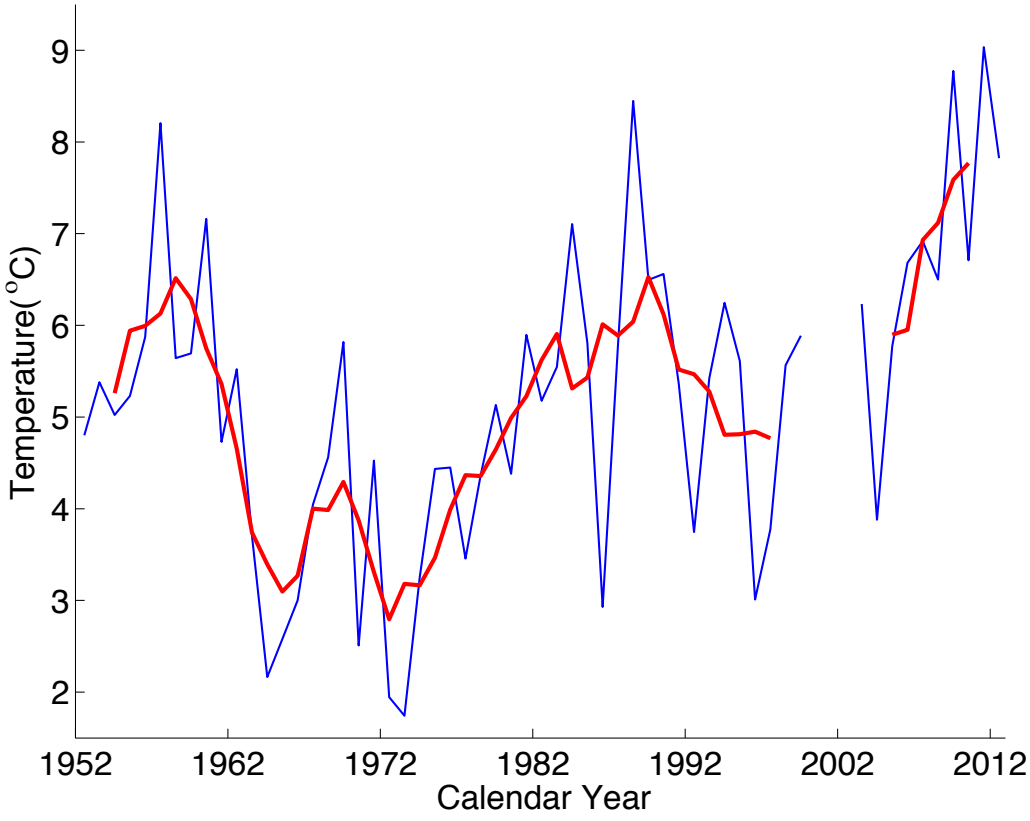
Supplement Table 1: Radiocarbon content of bulk carbon for the top 40 cm of soil under control and experimental treatments conditions (+2, +4°C, +4°C×W, W).

	Depth cm	Bare $\Delta^{14}C$	Int.err	Depth cm	Veget $\Delta^{14}C$	Int.err
Control	0-5	-345.4	1.3	0-5	7.0	1.4
	10-15	-695.5	0.6	1015	-556.0	0.7
	20-25	-806.9	0.6	20-25	-694.1	0.8
	30-36	-889.7	0.6	30-36	-744.9	0.6
+4°C	0-5	-331.7	0.7	0-5	-0.5	1.2
	10-15	-715.8	0.9	10-15	-339.8	0.7
	20-24	-772.3	0.8	15-20	-577.3	0.7
	31-35	-774.1	1.9	27-30	-603.4	0.7
+4°C×W	0-5	-114.8	1.3	0-5	-47.0	1.4
	19-25	-823.5	0.7	13-18	-476.0	0.9
	29-35	-919.0	1.4	26-30	-739.2	0.7
W	0-5	-235.6	1.0	0-5	49.8	1.4
	10-15	-715.9	0.7	10-15	-408.5	1.1
	20-26	-877.9	0.6	20-25	-780.0	0.7
	33-36	-816.4	0.6	32-36	-909.0	0.5

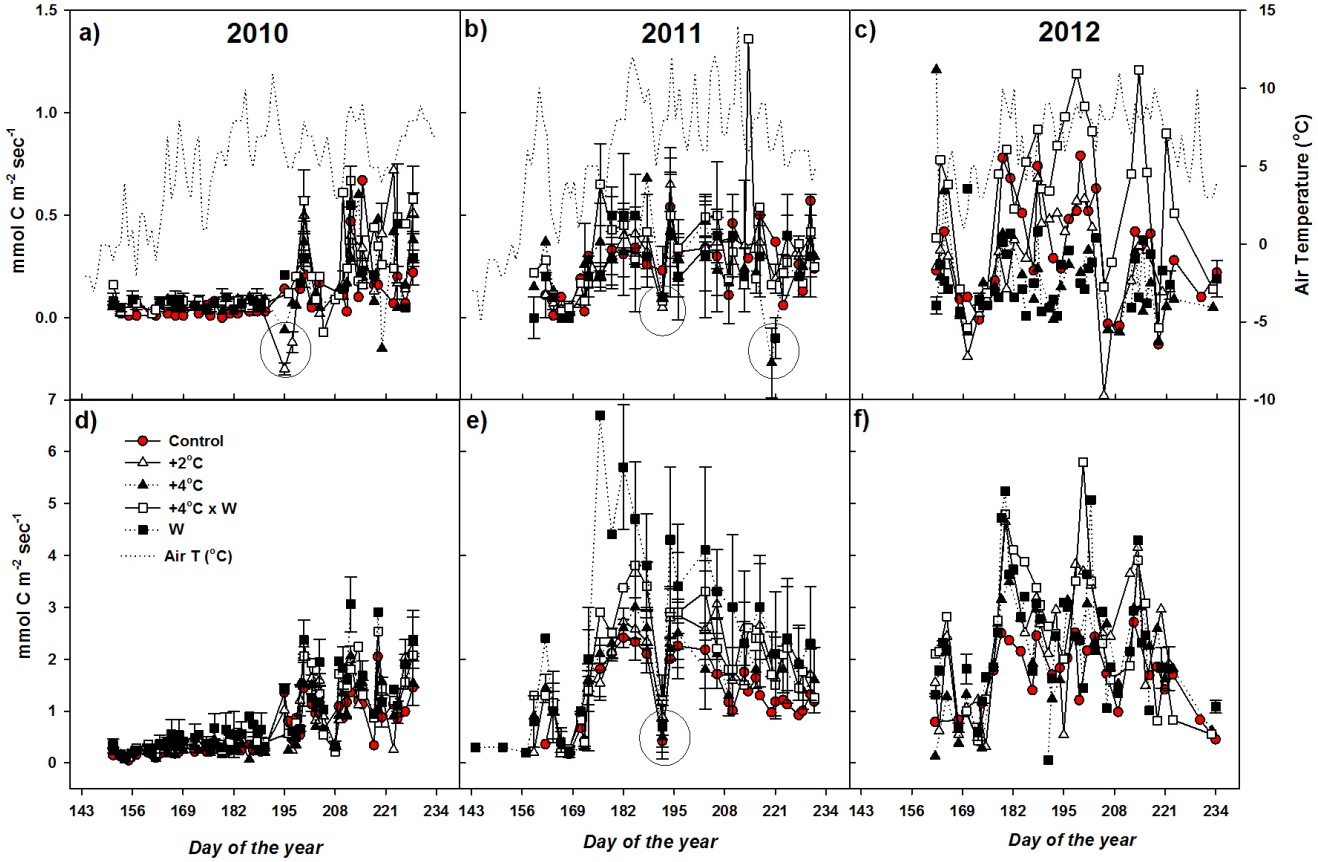
Supplement Figure 1: Time series of monthly precipitation at Thule airport (THU) weather station after applying a 13-month running mean.



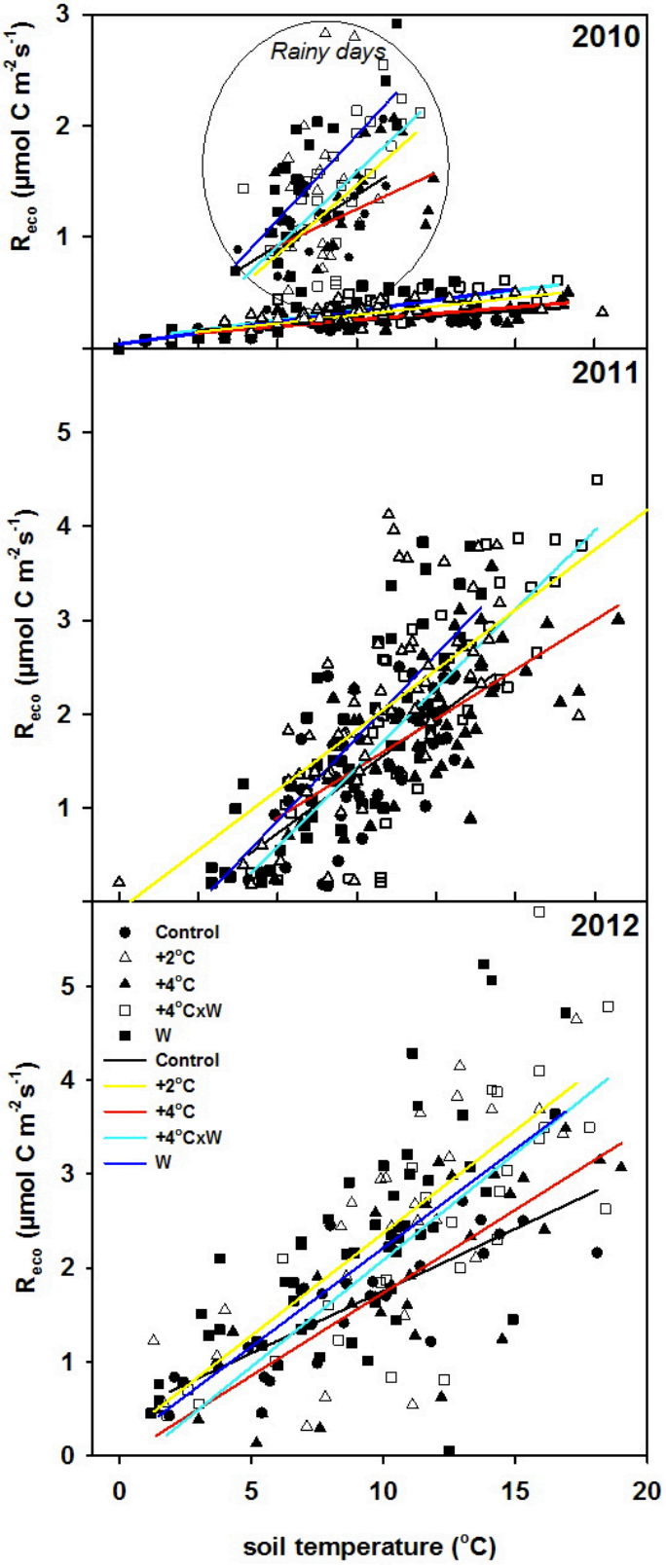
Supplement Figure 2: The July air temperature series (blue line) and their 5 year running means (red line) from Thule airport (THU) weather station.



Supplement Figure 3: Seasonal patterns of R_{eco} in bare (a,b,c) and vegetated areas (d,e,f) under control and experimental treatments conditions (+2, +4°C, +4°C×W, W) (average±SE, n=1-3 plots) during the summers of 2010-2012. [Circles represents some of the cold spells].



Supplement Figure 4: Correlation between daily R_{eco} flux and soil temperature at 5 cm depth measured manually during the flux measurement for the control and treatments plots (+2°C, +4°C, +4°C × W and W).



Supplement Figure 5: Pore space CO_2 concentration along the soil profile before and 1, 3, 6, 8, 12 and 24 hrs after water irrigation in vegetated and rocky areas [legend in the veg. area apply also to the rocky ones].