Biogeosciences

Supplement of

Soil carbon release responses to long-term versus short-term climatic warming in an arid ecosystem

Hongying Yu et al.

Correspondence to: Zhenzhu Xu (xuzz@ibcas.ac.cn) and Guangsheng Zhou (zhougs@cma.gov.cn)

Supplementary Tables

Supplementary Table S1 The belowground biomass, soil nutrition, and microbial characteristics in 0–10 cm depth soil profile under the control, long-term and moderate, and short-term and acute warming treatments (mean ± SE, n = 3-6).

Soil variables	Control	Moderately Warmed	Acutely Warmed	F	P
BB (g soil-collar^{-1})	1.91±0.81	0.93±0.56	1.15±0.58	0.44	0.66
SOC (g·kg^{-1})	13.41±0.70	12.06±1.22	11.18±0.62	1.85	0.21
NH_4^+-N (mg·kg^{-1})	7.18±0.78	8.54±1.05	6.69±1.27	0.74	0.51
NO_3^--N (mg·kg^{-1})	6.72±1.13	6.43±1.53	8.43±1.74	0.48	0.63
MBC (mg·kg^{-1})	165.53±25.07	175.49±38.96	170.95±36.27	0.03	0.97
MBN (mg·kg^{-1})	11.17±2.23	13.44±4.04	12.88±4.50	0.15	0.86

BB, SOC, NH_4^+-N, and NO_3^--N represent belowground biomass, soil organic carbon, ammonium- and nitrate-nitrogen concentrations, respectively; and MBC and MBN represent soil microbial biomass carbon, and nitrogen concentrations, respectively. The BB dry weight was determined with a precision balances (its readability>= 0.001 g), and soil dry sample weight was measured on an analytical balance (readability>= 0.0001 g) semi-analytical balance, respectively.

Supplementary Table S2 Path analysis between soil respiration (R_s) and key factors.

Variables of the key factors	Correlation coefficients with R_s	Path coefficients (direct effects)	Indirect path coefficients (indirect effects)				
			X_1	X_2	X_3	X_4	Total
Soil moisture (X_1)	0.78**	0.72		0.08	0.03	-0.06	0.06
Soil temperature (X_2)	0.69**	0.55	0.11		0.04	-0.01	0.14
Belowground biomass（X_3）	0.48	0.12	0.21	0.20		-0.06	0.36
Soil organic carbon（X_4）	0.47	-0.10	0.44	0.06	0.07		0.57

*, $P < 0.05$; ** $P < 0.01$, n = 12.

Supplementary Figures
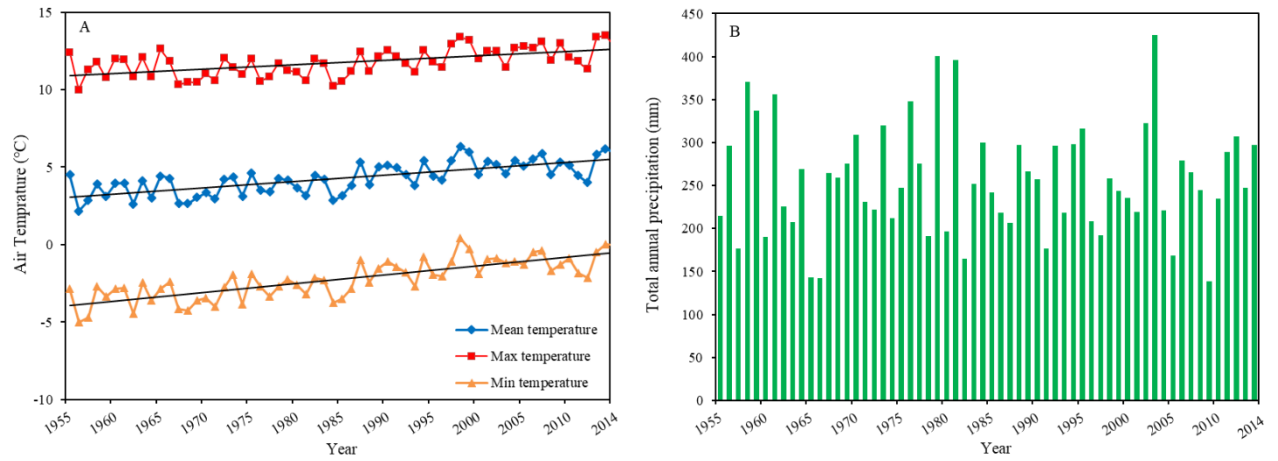
Supplementary Figure S1. Long-term air temperature (a) and total annual precipitation (b) records from 1955 to 2014 in the experiment site in the desert steppe ecosystem, Damao Banner, Nei Mongol, China.
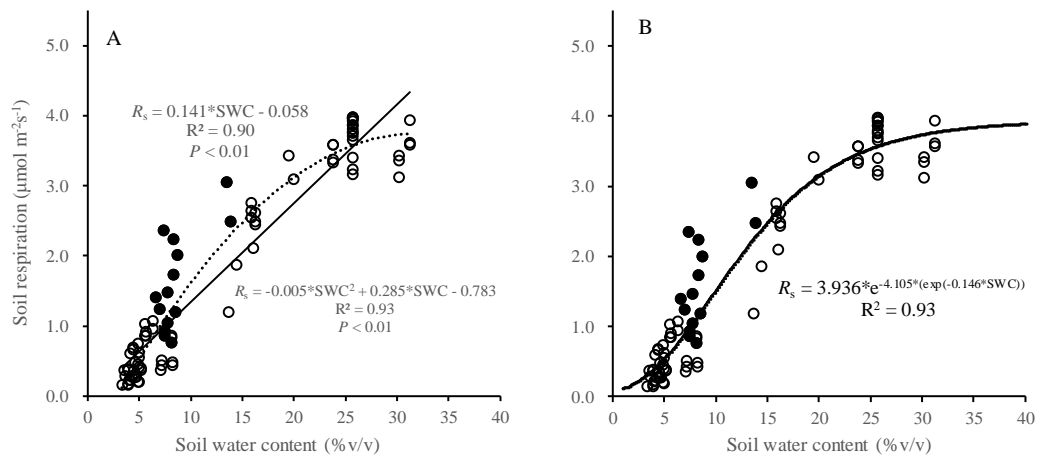
Figure S2 Relationship between R_s and soil water content based on a linear (black line) and a quadratic (dotted line) functional model (a), and Gompertz functional model (b). Close and open circles denote the data in 2014 and 2017, respectively. The functional fitting does not substantially affect despite a slight improvement with greater R^2 values when the outlier point was removed (ref. Fig. 2). Note, we measured the R_s during 9:00-10:00 in the cloudless days with calm/gentle wind in order to maintain other environmental factors such as soil temperature and radiation to relatively stable and constant (n = 91).