Supplementary Material

for

Median to strong rainfall intensity favors carbon sink in a temperate grassland ecosystem in China

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Table S1 Results (*i.e.*, *P* values) of repeated measures ANOVAs on the effects of rainfall treatment (P), experimental year (Y), and their interactions on biotic and abiotic variables.

Abbreviations: ANPP, aboveground net primary productivity; BGB, belowground biomass; GEP, gross ecosystem productivity; ER, ecosystem respiration; NEE, net ecosystem exchange; C, organic C; N, organic N; ST, soil temperature; SM, soil moisture;

Source	ANPP	BGB	GPP	ER	NEE	Soil C	Soil N	Soil C:N	ST	SM
P	>0.1	>0.1	<0.01	<0.01	<0.01	>0.1	>0.1	>0.1	>0.1	<0.01
Y	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P × Y	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table S2 Results from linear mixed effects model analysis of SoilM (soil moisture) and SoilT (soil temperature) at the depth of 0-10cm and 10-20cm effects on NEE (net ecosystem exchange), ER (ecosystem respiration), and GPP (gross primary production) in early growing season (May to June).

P-values are statistically significant to an alpha value of 0.05
Num df: numerator degrees of freedom;
den df: denominator degrees of freedom.

0-10cm								
Fixed effect	df		NEE		ER		GPP	
	num	den	*tStat*	*P*	*tStat*	*P*	*tStat*	*P*
SoilM	2	225	-0.64	**>0.1**	14.8	<0.01	11.89	<0.01
SoilT	2	225	-3.79	<0.01	7.5	<0.01	9.29	<0.01
10-20cm								
Fixed effect	df		NEE		ER		GPP	
	num	den	*tStat*	*P*	*tStat*	*P*	*tStat*	*P*
SoilM	2	225	-2.4	<0.01	11.8	<0.01	12.8	<0.01
SoilT	2	225	-3.8	<0.01	3.9	<0.01	7.2	<0.01

Table S3 Results from linear mixed effects model analysis of SoilM (soil moisture) and SoilT (soil temperature) at the depth of 0-10cm and 10-20cm effects on NEE (net ecosystem exchange), ER (ecosystem respiration), and GPP (gross primary production) in middle growing season (May to June).

P-values are statistically significant to an alpha value of 0.05
num df: numerator degrees of freedom;
den df: denominator degrees of freedom.

0-10cm								
Fixed effect	df		NEE		ER		GPP	
	num	den	*tStat*	*P*	*tStat*	*P*	*tStat*	*P*
SoilM	2	295	-7.1	<0.01	26.3	<0.01	20	<0.01
SoilT	2	295	2.9	<0.01	8.6	<0.01	4.93	<0.01
10-20cm								
Fixed effect	df		NEE		ER		GPP	
	num	den	*tStat*	*P*	*tStat*	*P*	*tStat*	*P*
SoilM	2	295	-7.1	<0.01	21	<0.01	19.3	<0.01
SoilT	2	295	3.9	<0.01	2.3	<0.01	0.25	**>0.1**

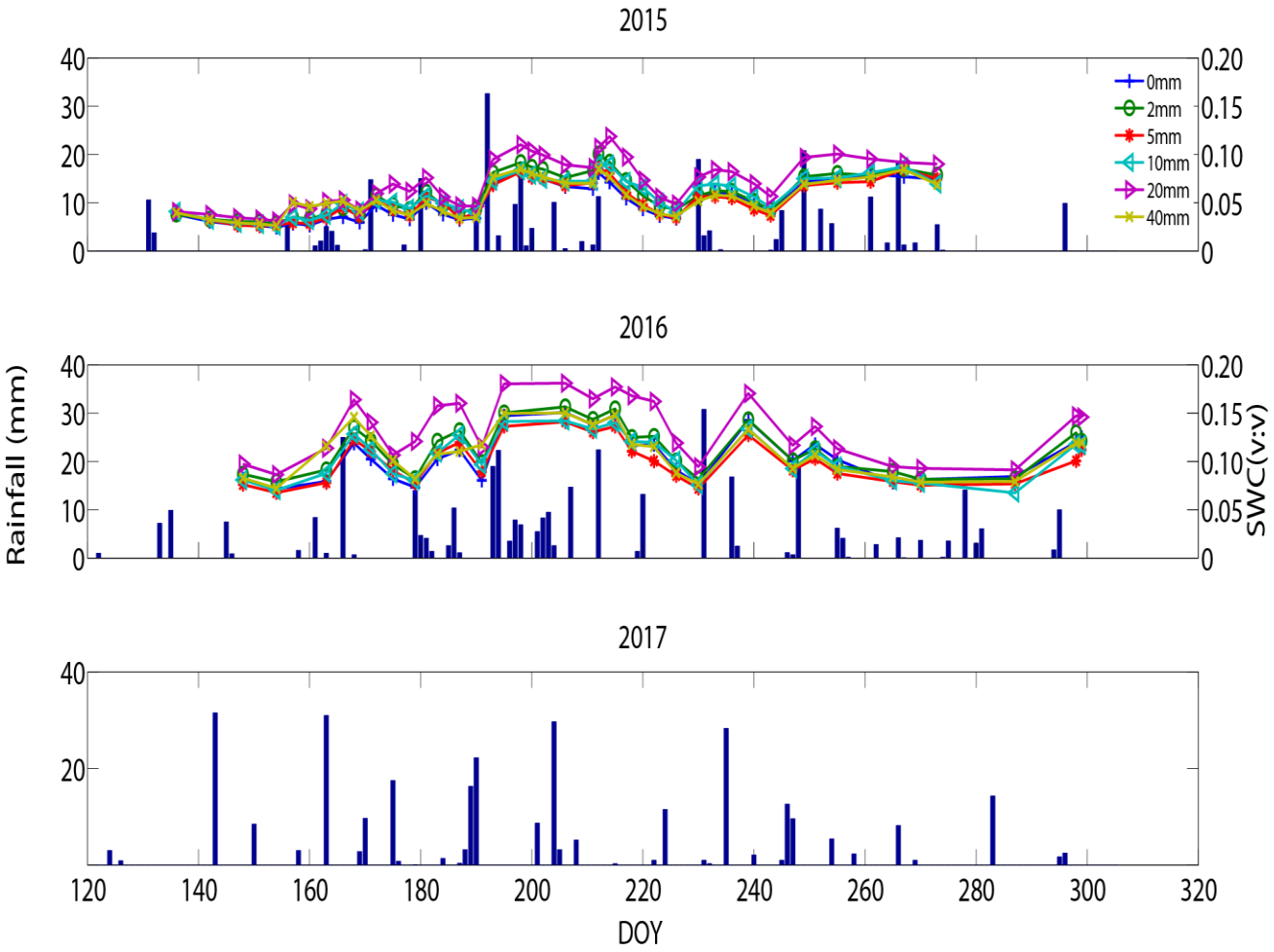

Fig. S1 Daily precipitation (bars) and average soil moisture (0-40cm, SWC, lines) during the growing season in 2015, 2016 and 2017 over a semiarid grassland. 0mm: ambient control, 2mm: 2mm treatment; 5mm: 5mm treatment; 10mm: 10mm treatment; 20mm: 20mm treatment; 40mm: 40mm treatment.

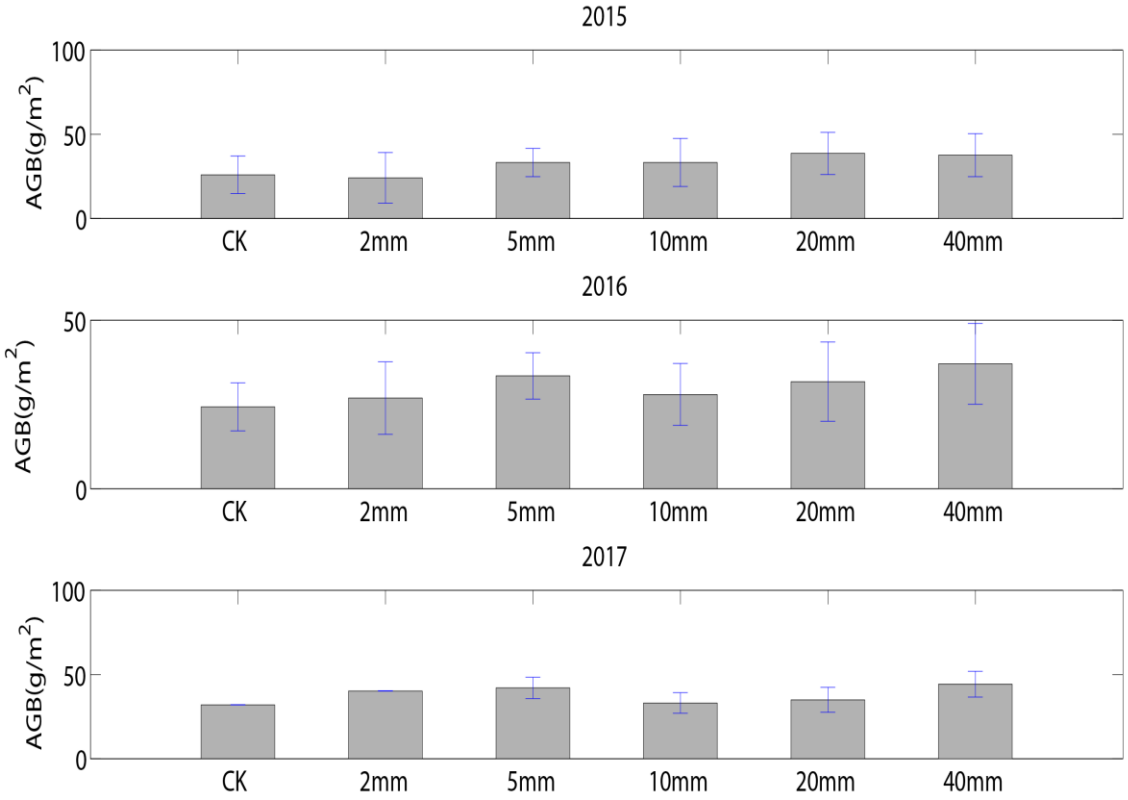

Fig. S2 Responses of aboveground biomass (AGB) to rainfall treatments. CK: ambient control, 2mm: 2mm treatment; 5mm: 5mm treatment; 10mm: 10mm treatment; 20mm: 20mm treatment; 40mm: 40mm treatment. Error bars show standard errors.

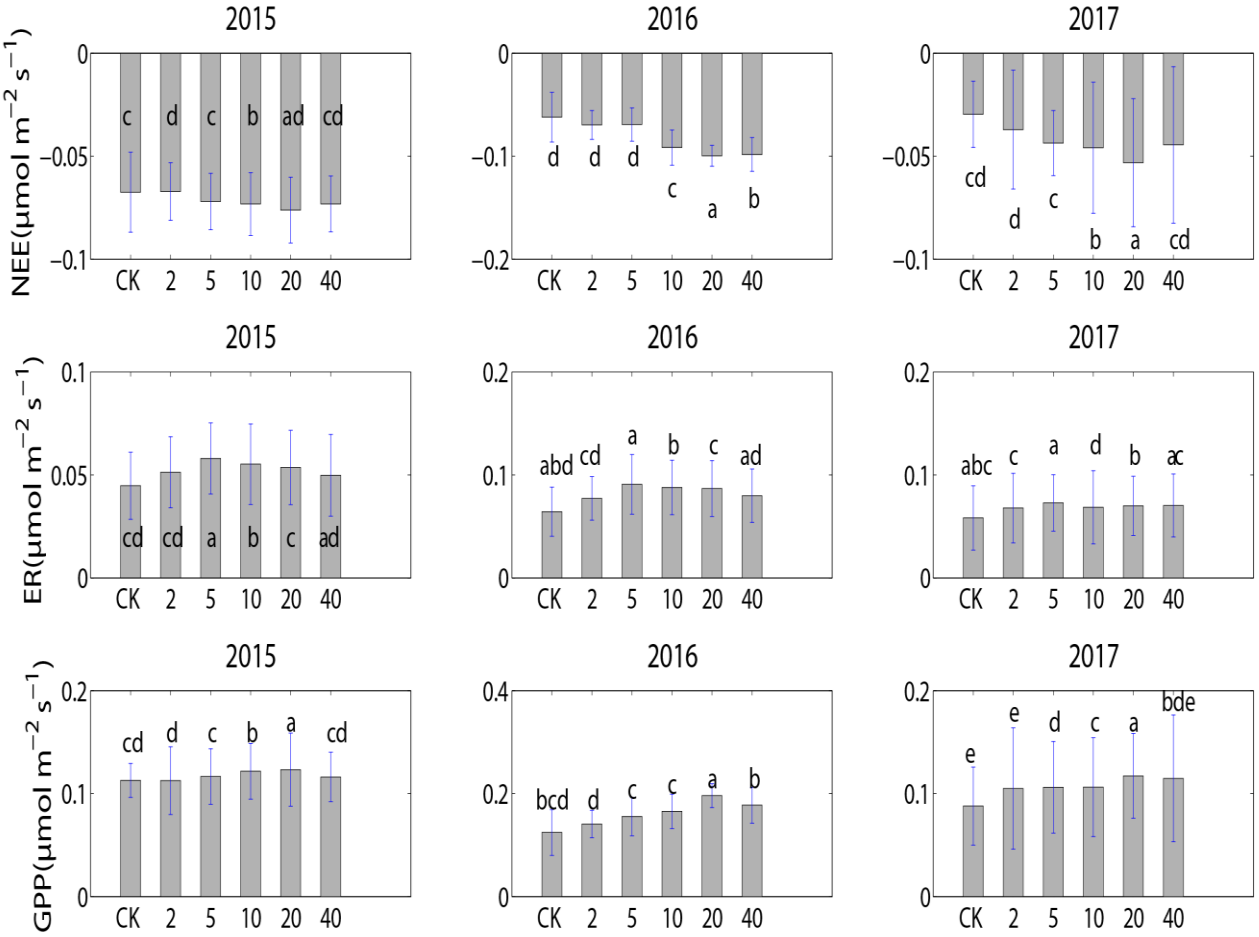

Fig. S3 Responses of NEE (net ecosystem exchange), ER (ecosystem respiration), and GPP (gross primary production) to different rainfall treatments in middle growing season (from June to August) in 2015, 2016 and 2017. ck: control, 2: 2mm treatment, 5: 5mm treatment, 10: 10mm treatment, 20: 20mm treatment, 40: 40mm treatment. Error bars show standard error. The different letters represent significant difference rainfall treatments ($p<0.05$)

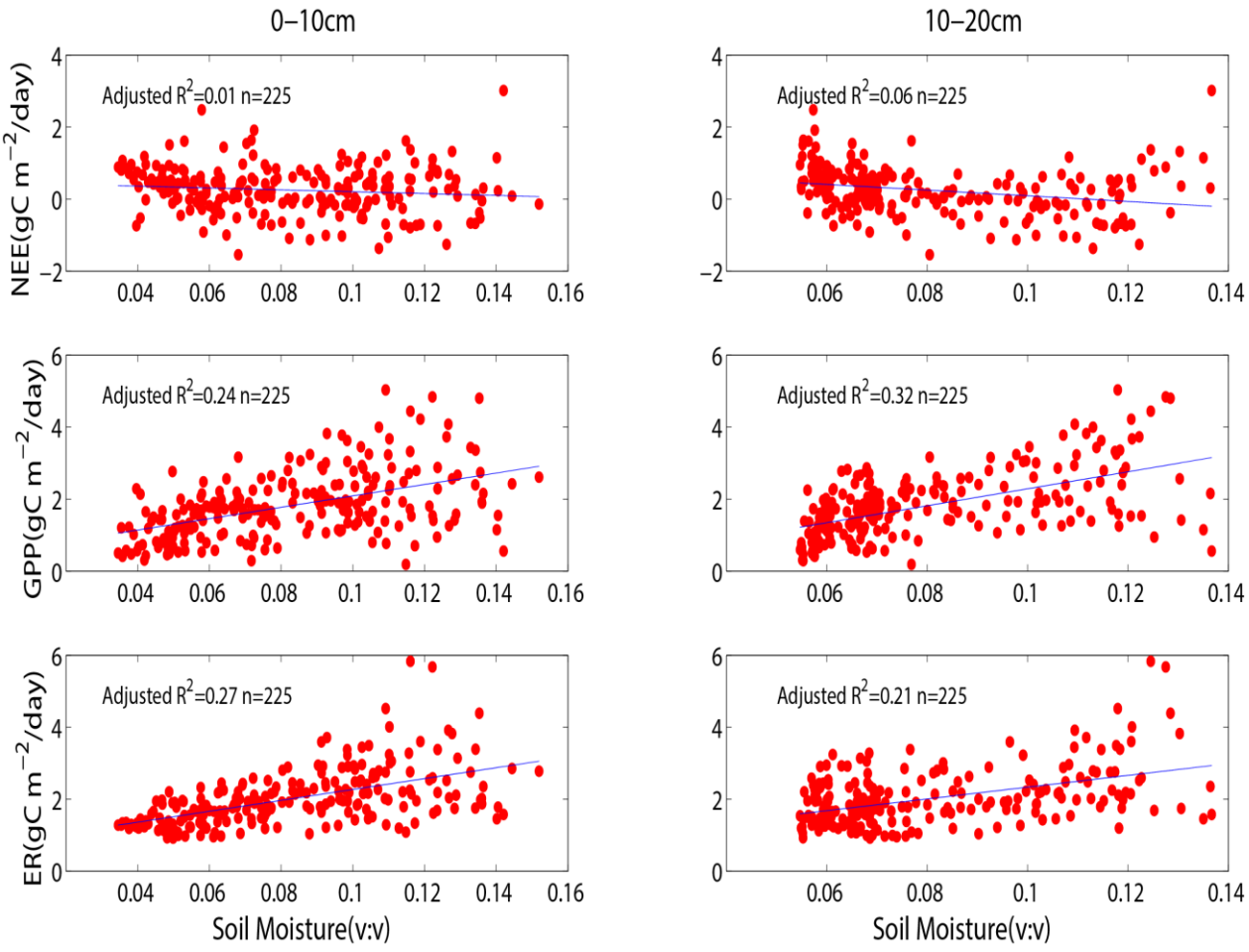

Fig. S4 The relationship between normalized NEE (net ecosystem exchange), ER (ecosystem respiration), and GPP (gross primary production) and soil moisture at different depth (0-10cm and 10-20cm) in early growing season. Blue lines represent trend.

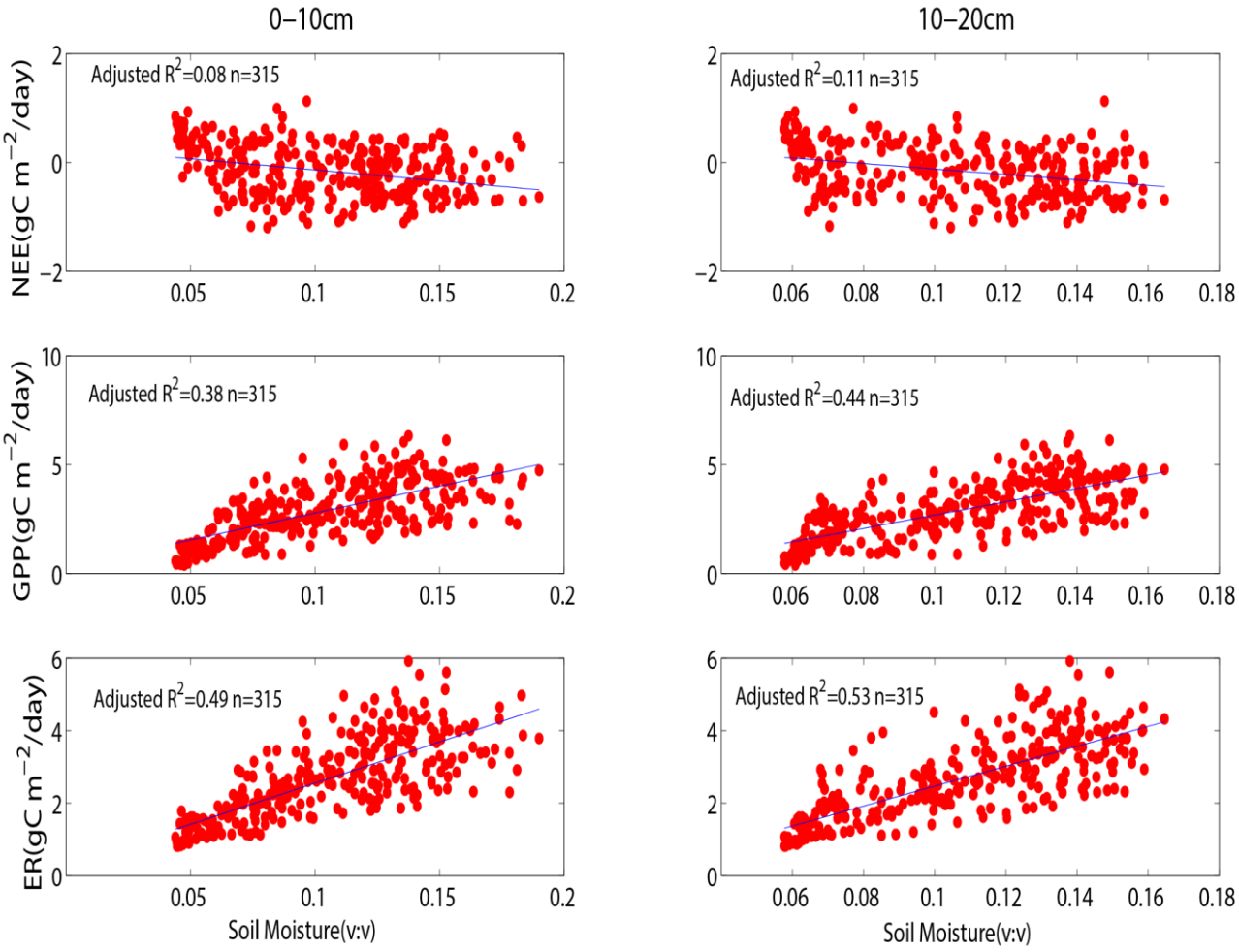

Fig. S5 The relationship between NEE (net ecosystem exchange), ER (ecosystem respiration), and GPP (gross primary production) and soil moisture at different depth (0-10cm and 10-20cm) in early growing season. Blue lines represent trend.