



**Magnitudes and regulations of carbon and water fluxes of alkali-saline ecosystems altered by contrasting land uses in the Songnen Plain**

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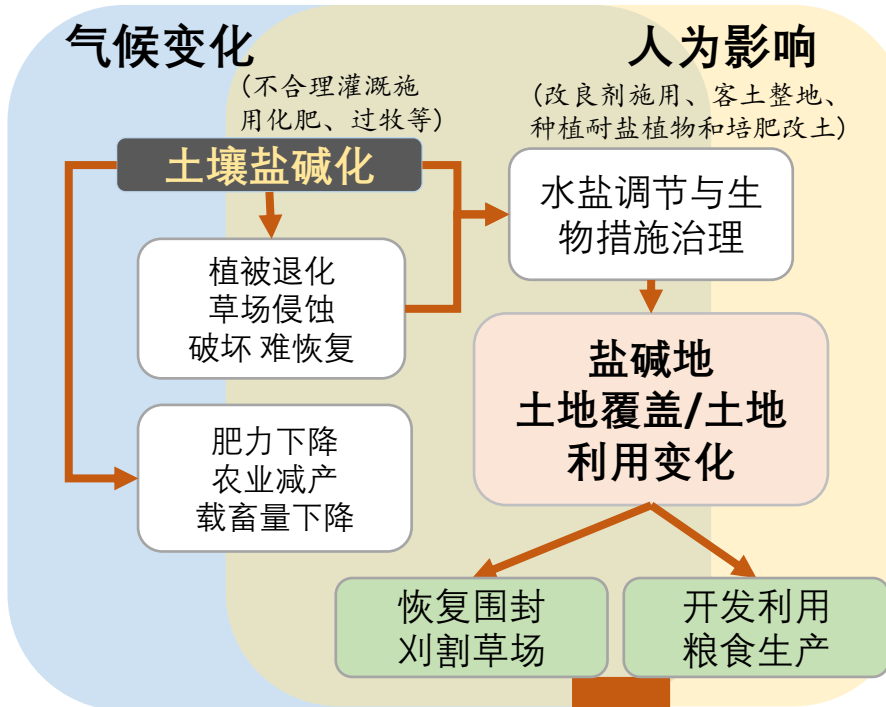
**Southwest University, Chongqing**

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# 背景 盐碱地土地覆盖/利用



盐碱化——干旱区典型土壤退化问题  
我国盐碱化土地已达 $41.7 \times 10^6$ 公顷



盐碱地五大类型分布 主要成因 (自然与人为双重综合作用)

滨海滩涂盐碱地

华北插花盐碱地

东北苏打碱盐碱地

河套灌区次生盐碱地

西北硫酸盐型盐碱地

“高”-地下水水位高

(使地下水中的盐分随水位上升在土壤中积聚)

“大”-土壤水蒸发量大

(降水量小蒸发大促进地下中的盐分向上运动累计)

“有”-有盐分积聚

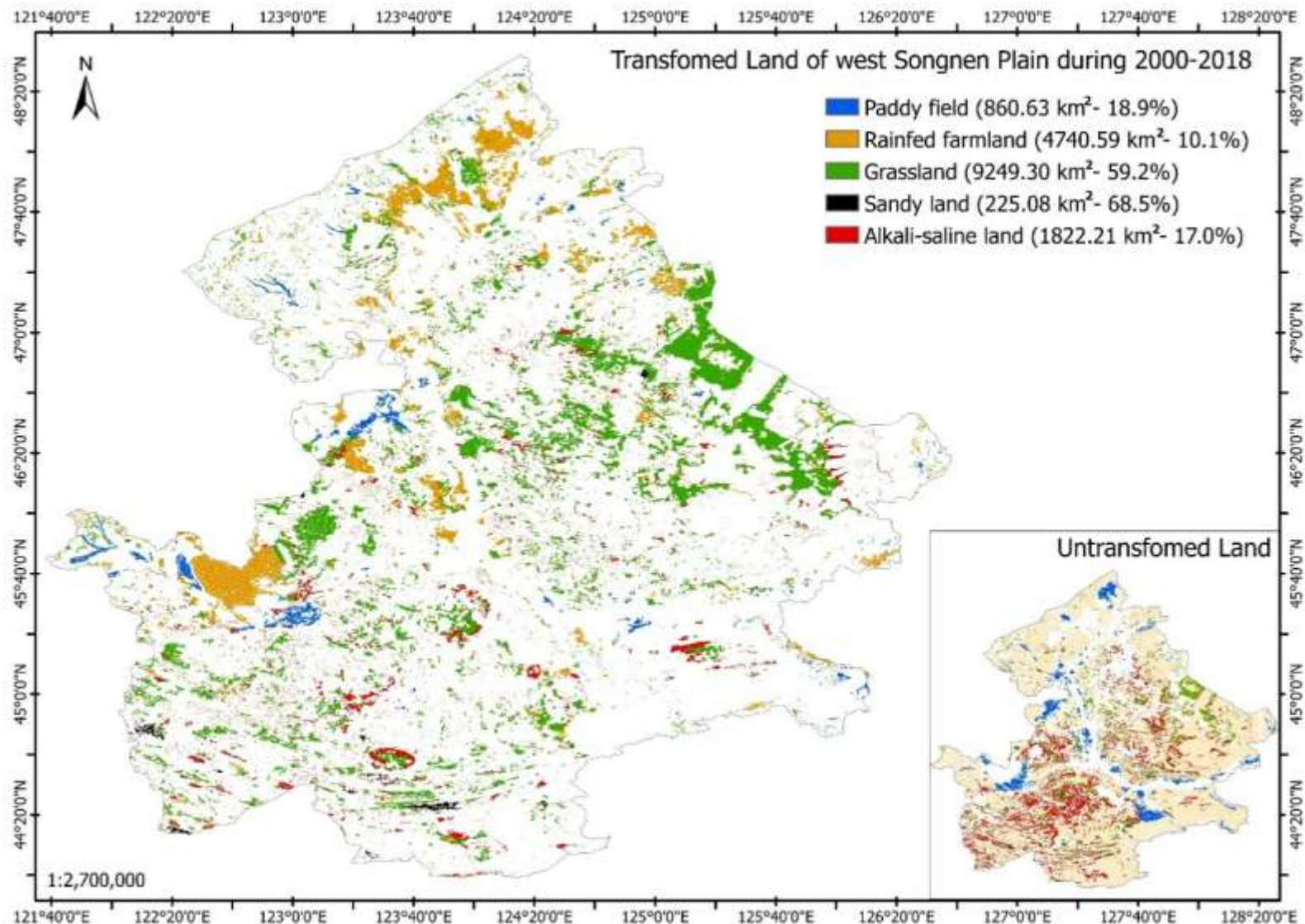
(最终达到一定浓度, 使土壤含盐量增加, 形成盐碱地)

# 松嫩平原土地覆盖/利用状况

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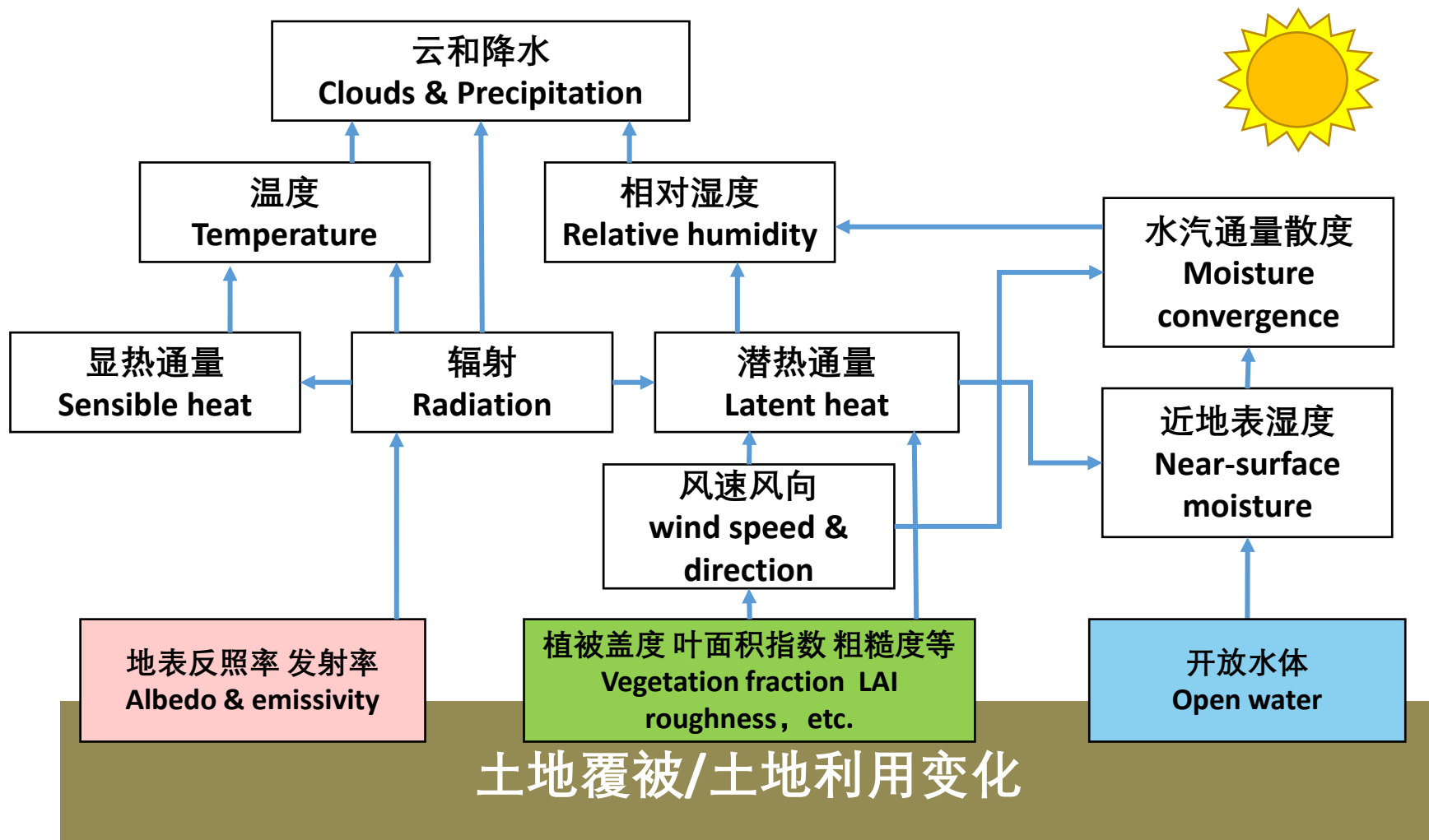


# 松嫩平原土地覆盖/利用状况

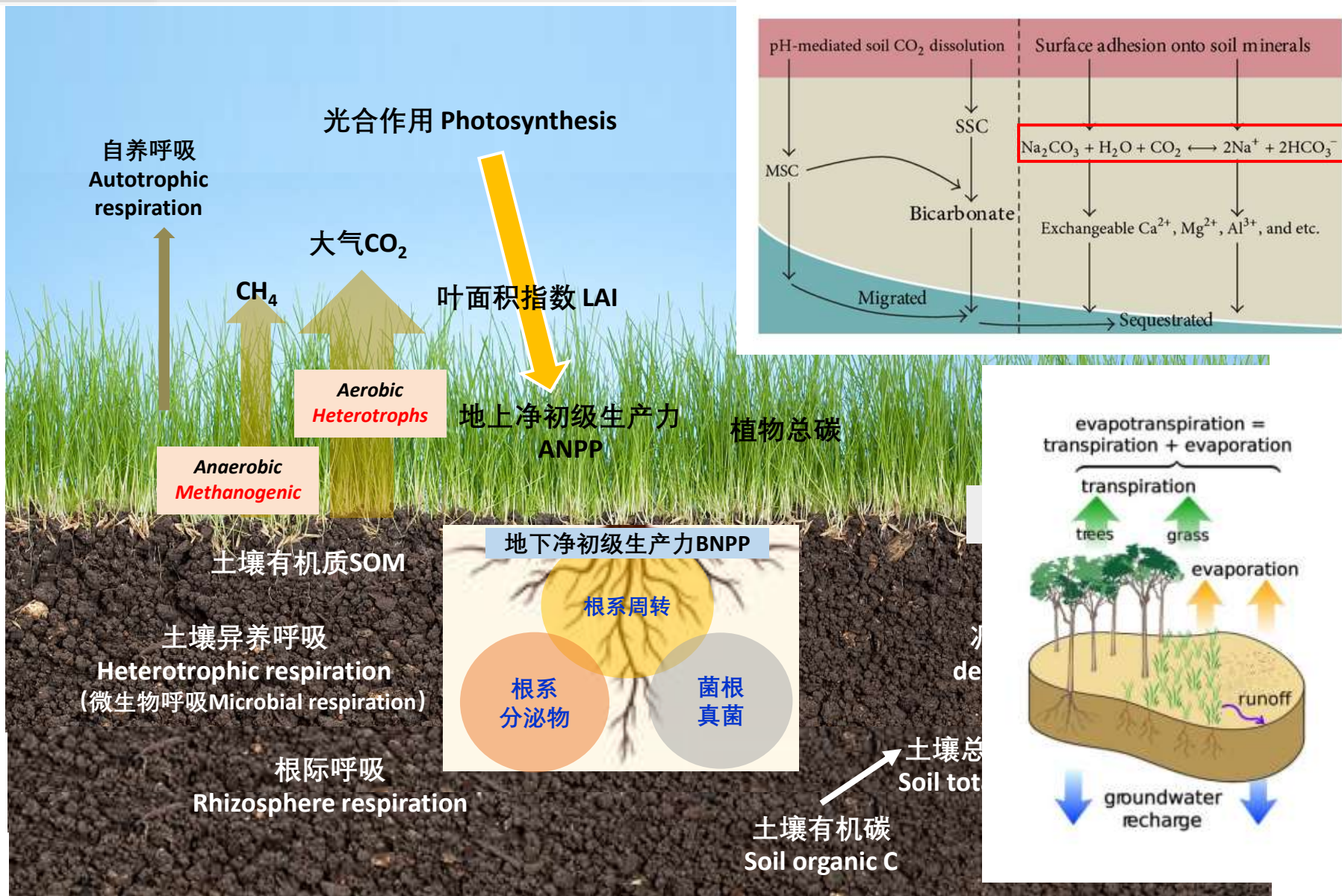


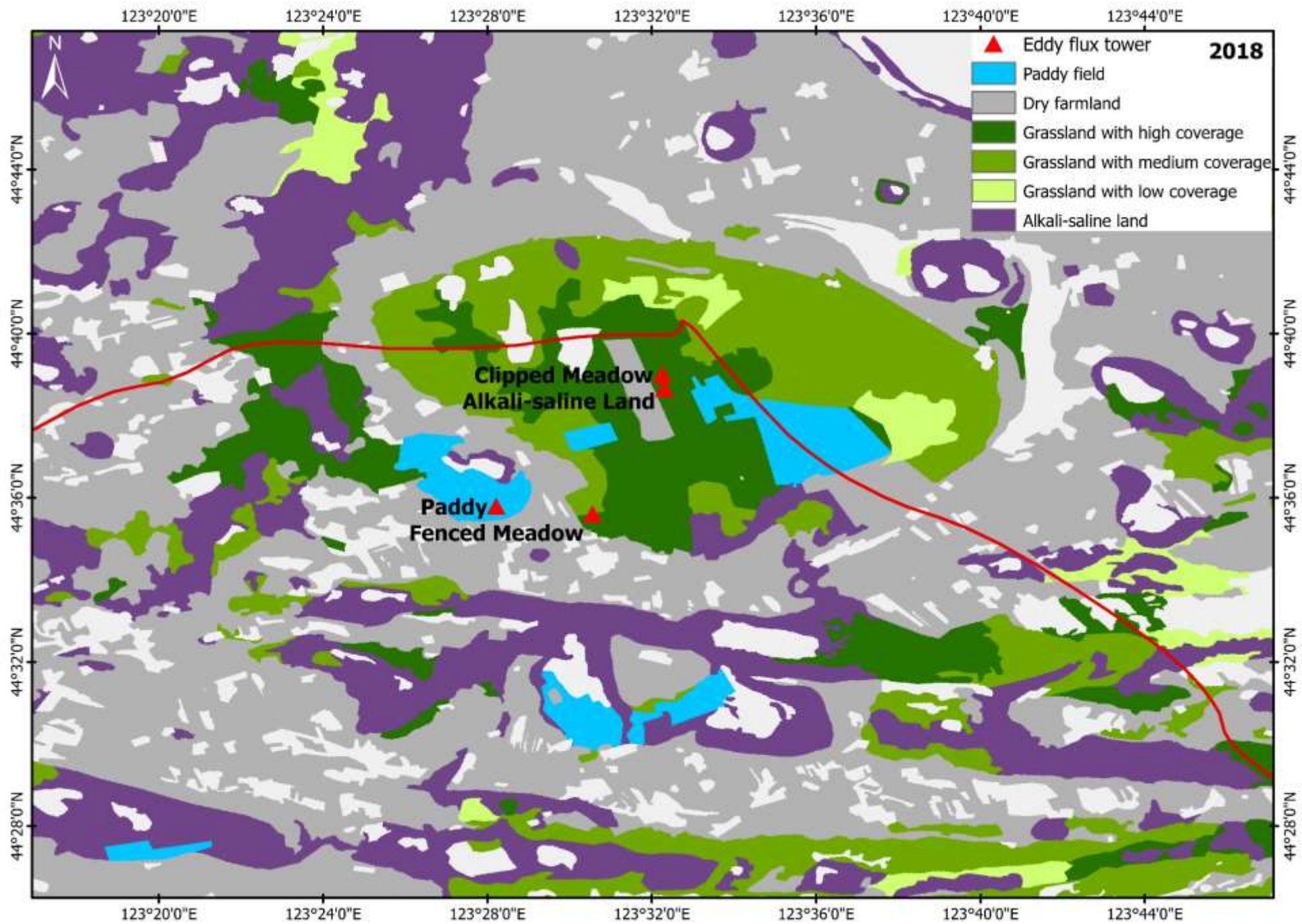
# 土地覆被/土地利用变化影响气候

土地覆被/土地利用变化 (LCLUC) 是全球变化的主要动因之一。



# 土地覆被/利用变化影响碳-水循环





# 站点介绍



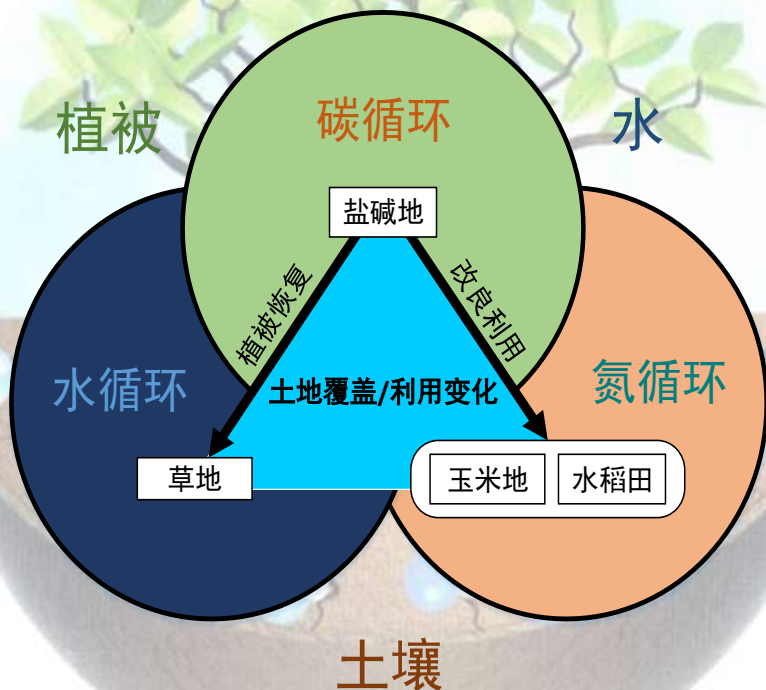
Site	Fenced meadow	Clipped meadow	Alkali-saline land	Paddy field
Longitude	123°30'33" E	123°32'15" E	123°32'18" E	123°28'13" E
Latitude	44°35'37" N	44°39'01" N	44°38'40" N	44°35'48" N
Altitude (m)	141	139	140	143
Dominant species	<i>Leymus chinensis</i>	<i>Leymus chinensis</i>	<i>Leymus chinensis</i> <i>Chloris virgata</i>	<i>Oryza sativa</i>
Years	2018 up to now	2018 up to now	2018 up to now	2018 up to now





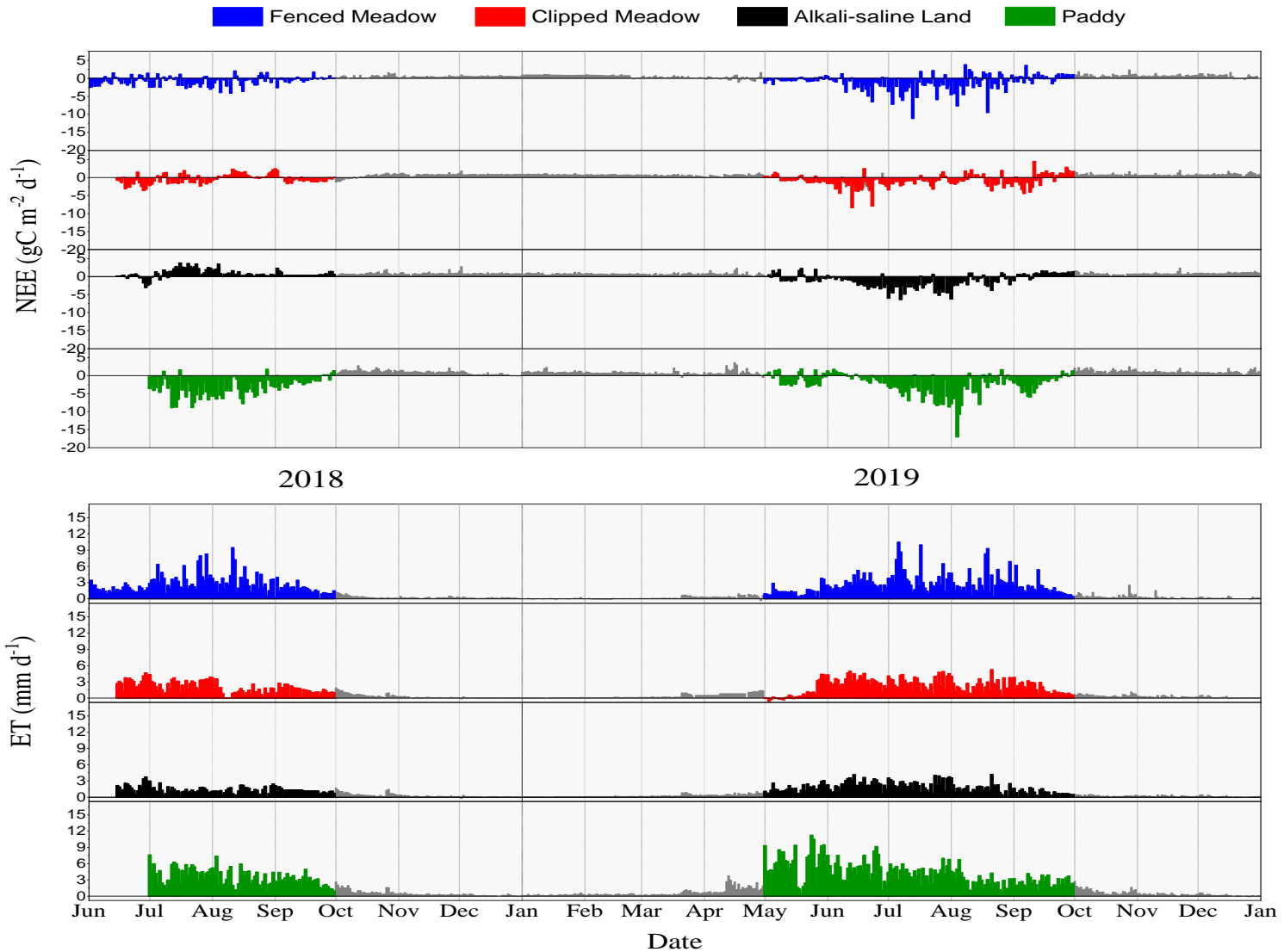
# 科学问题

❖ 以盐碱为特征的松嫩平原农牧交错带不同土地利用方式(草地-封育/刈割, 农田-水稻(水田)/玉米(旱), 退化盐碱地)



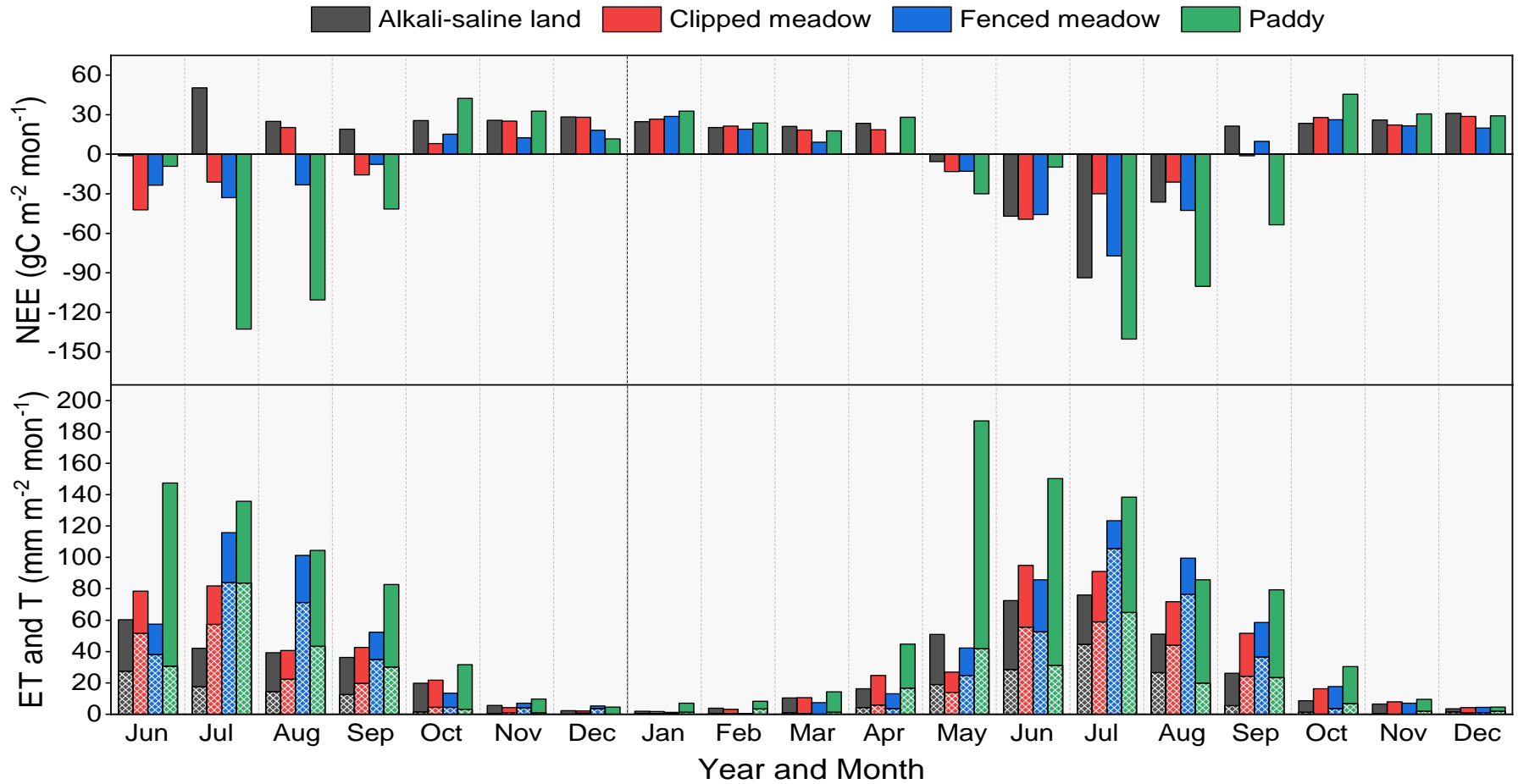
- I. 碳水通量、水分利用效率和能量流动
- II. 土壤水分和养分-氮素变化对区域碳水交换潜力的影响
- III. 草地管理对生态系统结构功能作用
- IV. 土地盐碱防治、区域水资源消耗、作物产量提高之间的权衡,
- V. 改变食物-能源-水 (FEW) 关联体系、土壤-水-植被耦合体系各环节及响应机制和资源承载力
- VI. 改变对气候变化的响应

# NEE ET日动态



Daily NEE ( $\text{gC m}^{-2} \text{d}^{-1}$ ) (a) and ET ( $\text{mm d}^{-1}$ ) (b) in 2018 and 2019 under different land use/management.

# NEE ET月波动与蒸散分解



Monthly NEE ( $\text{gC m}^{-2} \text{mon}^{-1}$ ), ET ( $\text{mm m}^{-2} \text{mon}^{-1}$ ) and T ( $\text{mm m}^{-2} \text{mon}^{-1}$ ) (bars with cross patterns) under different land use/management in 2018 and 2019.

# NEE月值

Month	Daily average NEE (gC m <sup>-2</sup> day <sup>-1</sup> )				C uptake change ratio relative to fenced meadow (%)		
	Fenced	Clipped	Saline	Paddy	Clipped	Saline	Paddy
5	-0.615	-0.428	-0.179	-0.965	-30.5 ↓	-70.9 ↓	56.9 ↑
6	-1.155	-1.968	-0.944	-0.325	70.5 ↑	-18.3 ↓	-71.8 ↓
7	-1.776	-0.827	-0.703	-4.401	-53.4 ↓	-60.4 ↓	147.9 ↑
8	-1.064	-0.002	-0.185	-3.403	-99.8 ↓	-82.6 ↓	219.9 ↑
9	0.030	-0.248	0.674	-1.587	↑	↓	↑
6-8	-1.331	-0.932	-0.610	-3.187	-30.0 ↓	-54.2 ↓	139.4 ↑
5-9	-0.916	-0.724	-0.277	-2.509	-20.9 ↓	-69.7 ↓	174.0 ↑

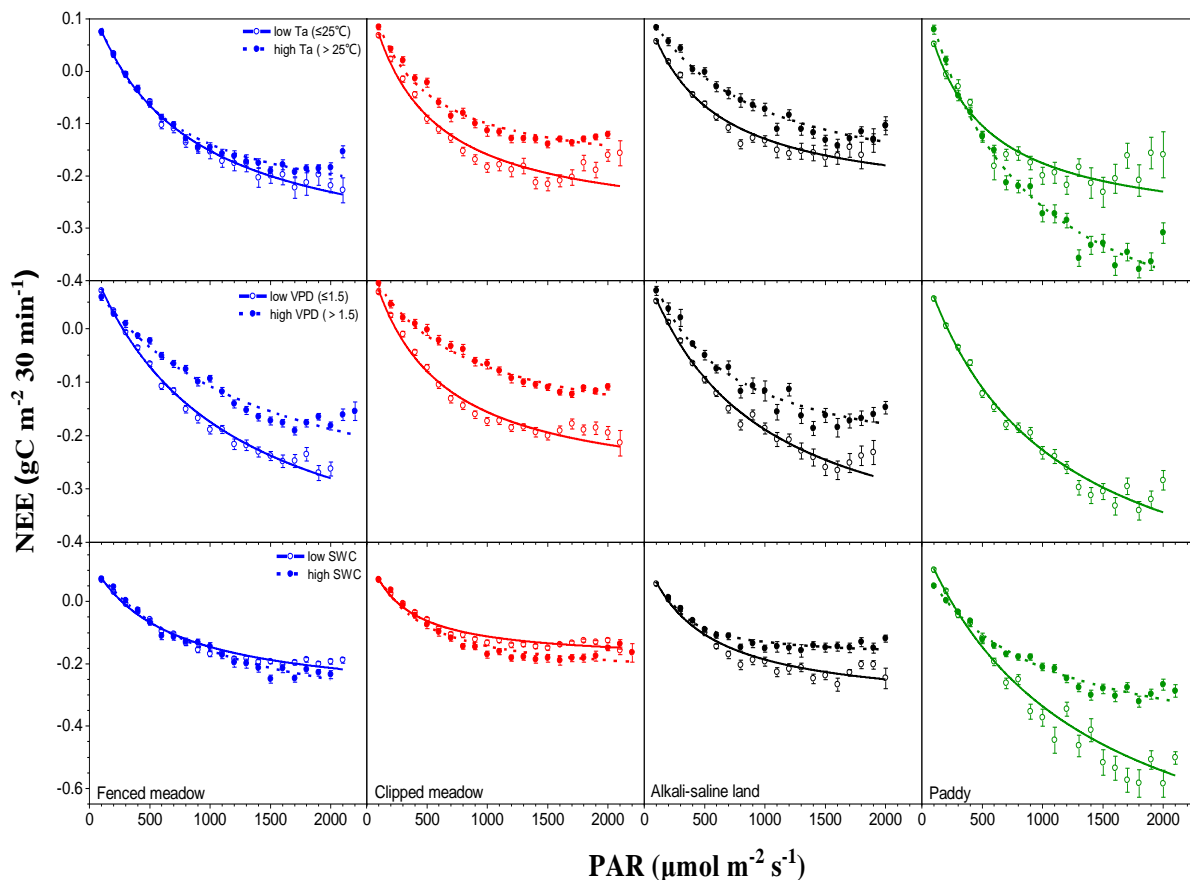
Daily average NEE (gC m<sup>-2</sup> day<sup>-1</sup>) among different months and C uptake change ratio relative to fenced meadow (%) for clipped meadow, alkali-saline land and paddy field

# ET月值

Month	Daily average ET (mm m <sup>-2</sup> day <sup>-1</sup> )				ET change ratio relative to fenced meadow (%)		
	Fenced	Clipped	Saline	Paddy	Clipped	Saline	Paddy
5	0.961	0.868	1.644	6.031	-9.8 ↓	71.0 ↑	527.3 ↑
6	2.386	3.114	2.254	5.010	30.5 ↑	-5.5 ↓	110.0 ↑
7	3.859	2.789	1.905	4.423	-27.7 ↓	-50.6 ↓	14.6 ↑
8	3.239	1.815	1.457	3.067	-44.0 ↓	-55.0 ↓	-5.3 ↓
9	1.849	1.570	1.042	2.701	-15.1 ↓	-43.6 ↓	46.1 ↑
6-8	3.161	2.573	1.872	3.998	-18.6 ↓	-40.8 ↓	26.5 ↑
5-9	2.459	2.160	1.662	3.928	-12.1 ↓	-32.4 ↓	59.8 ↑

Daily average ET (mm m<sup>-2</sup> day<sup>-1</sup>) among different months and ET change ratio relative to fenced meadow (%) for clipped meadow, alkali-saline land and paddy rice field.

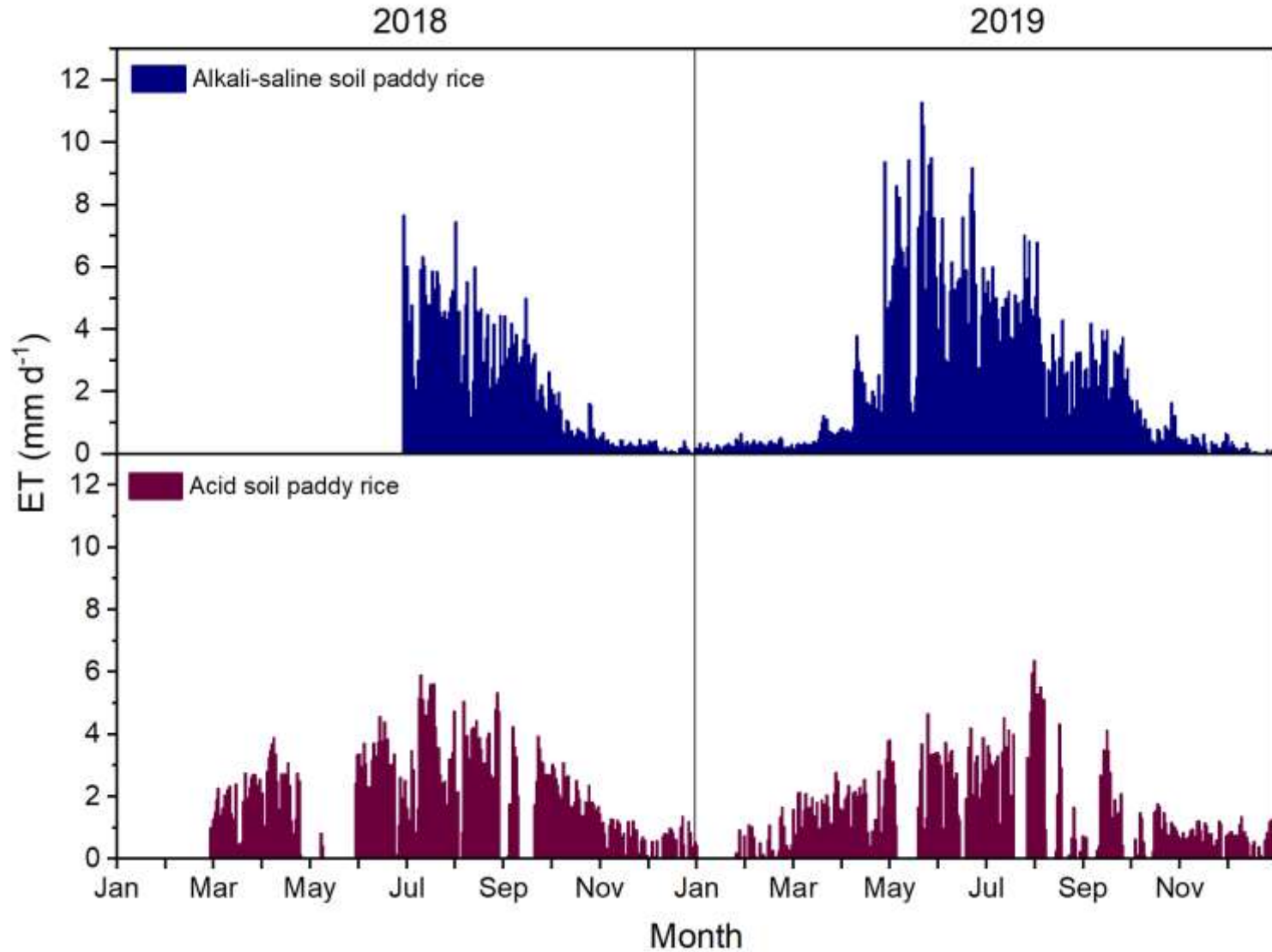
# Ta/VPD/SWC水平下光合响应曲线变化



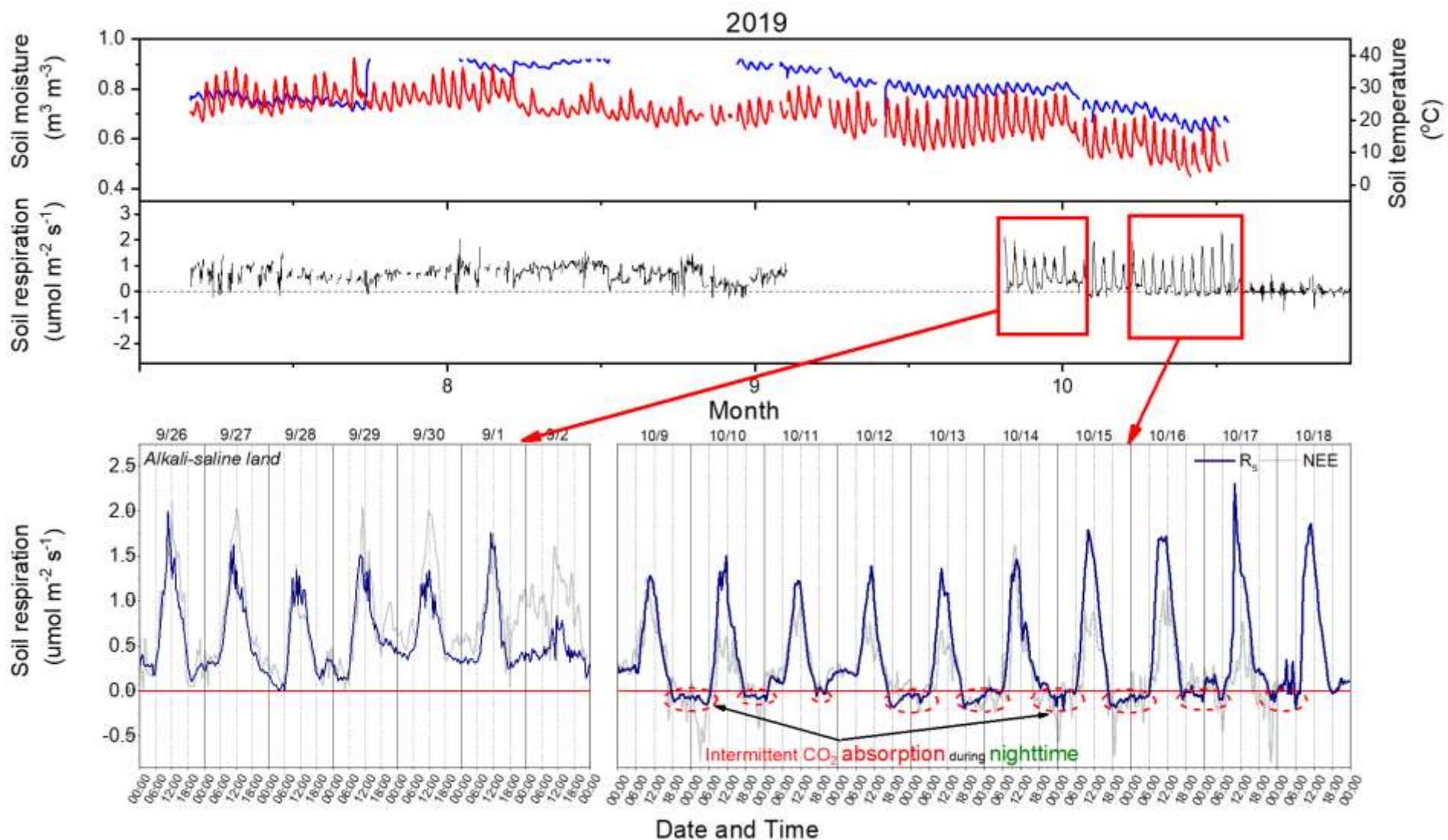
Site	Class	Pm	a	Rd
<b>Ta Level</b>				
Fenced meadow	Low Ta	-0.5050	0.000672	0.1364
	High Ta	-0.4407	0.000909	0.1577
Clipped meadow	Low Ta	-0.4541	0.001020	0.1553
	High Ta	-0.3678	0.000984	0.1679
Alkali-saline land	Low Ta	-0.3787	0.000751	0.1227
	High Ta	-0.3737	0.000434	0.1256
Paddy	Low Ta	-0.4484	0.001090	0.1421
	High Ta	-0.7691	0.000982	0.1726
<b>VPD Level</b>				
Fenced meadow	Low VPD	-0.6279	0.000587	0.1289
	High VPD	-0.4694	0.000351	0.0932
Clipped meadow	Low VPD	-0.4573	0.000907	0.1481
	High VPD	-0.3386	0.000454	0.1227
Alkali-saline land	Low VPD	-0.5734	0.000641	0.1138
	High VPD	-0.4079	0.000717	0.1391
Paddy	Low VPD	-0.7010	0.000699	0.1229
	High VPD	-	-	-
<b>SWC Level</b>				
Fenced meadow	Low SWC	-0.4618	0.000743	0.1392
	High VWC	-0.5631	0.000616	0.1371
Clipped meadow	Low SWC	-0.3560	0.001270	0.1662
	High VWC	-0.4289	0.001300	0.1792
Alkali-saline land	Low SWC	-0.4916	0.001060	0.1497
	High VWC	-0.7363	0.010070	0.5564
Paddy	Low SWC	-1.2157	0.000931	0.1910
	High VWC	-0.6229	0.000694	0.1167

Daytime light response curves and the regression coefficients of different land use types based on Michaelis-Menten model under low/high Ta ( $^{\circ}\text{C}$ ), VPD (kPa) and SWC ( $\text{m}^3 \text{m}^{-3}$ ) levels during the active growth periods of June-August.

# 研究结果



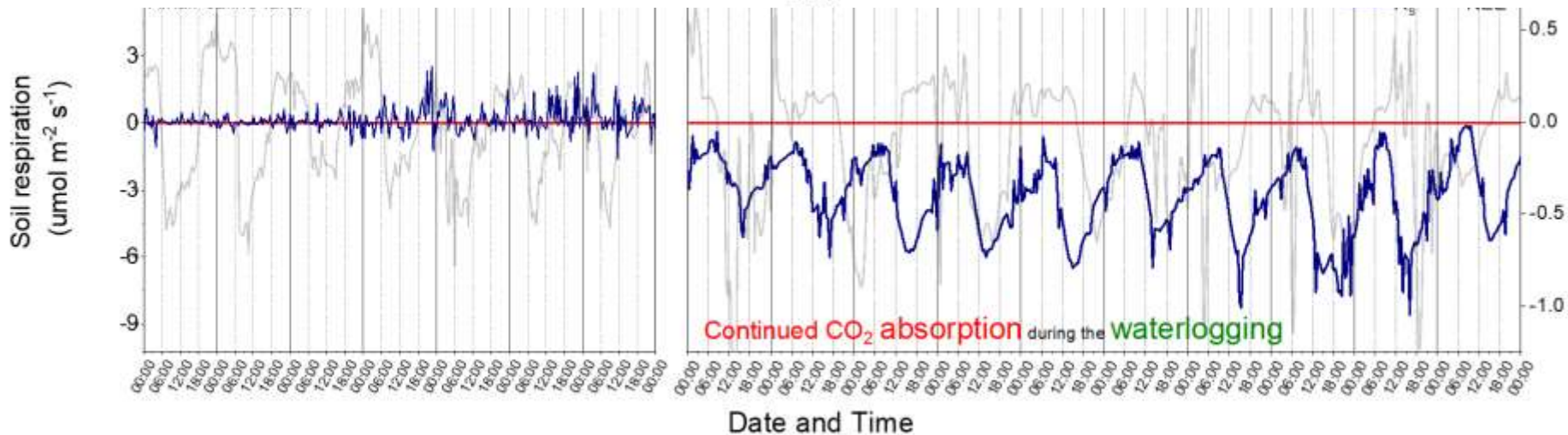
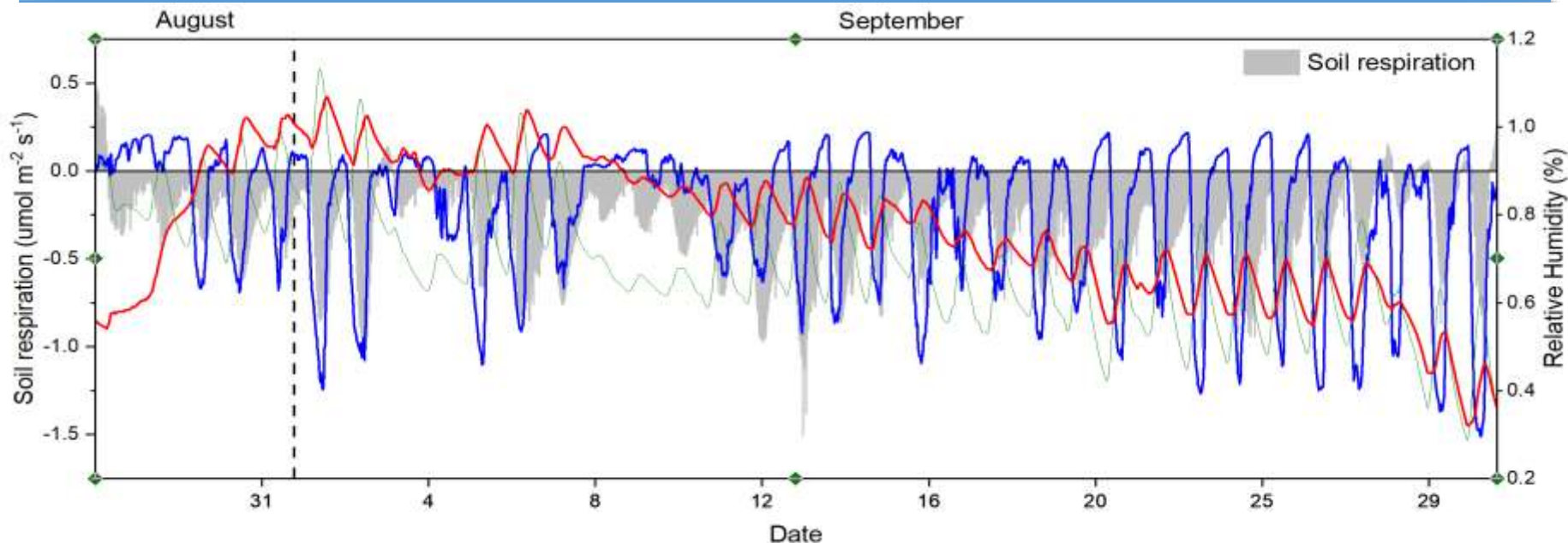
# 研究结果



**Soil carbon uptake in saline-alkali land provides a potential C neutral and uncertainty in vulnerable ecotones of Songnen Plain**

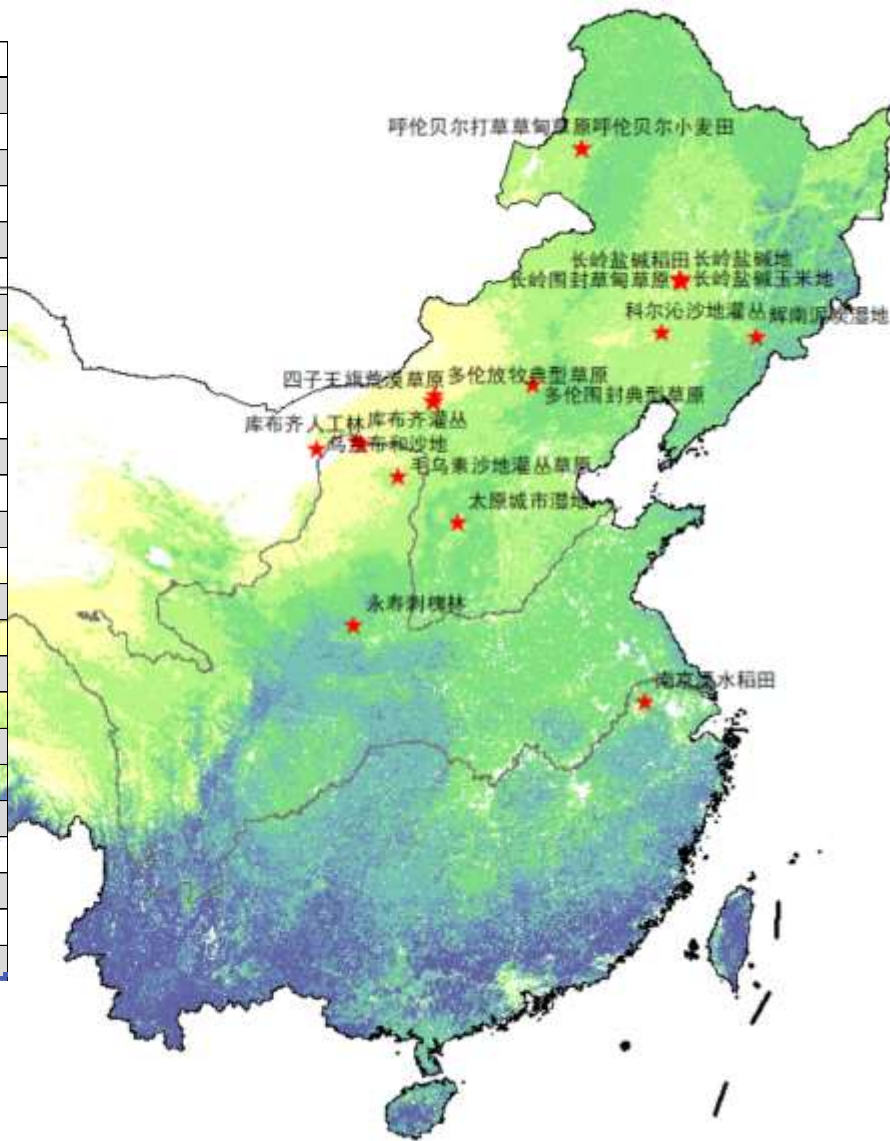


# 研究结果



# 合作邀请

站点名称	站名	类型	地点
CL-SAL	长岭盐碱地	草甸草原	长岭
CL-MDW	长岭打草草甸草原	草甸草原	长岭
CL-CLP	长岭围封草甸草原	草甸草原	长岭
HL-CLP	呼伦贝尔打草草甸草原	草甸草原	海拉尔
HL-Grazed	呼伦贝尔放牧草甸草原	草甸草原	海拉尔
HL-Fenced	呼伦贝尔围封草甸草原	草甸草原	海拉尔
NJ-URB	南京城市	城市	南京
DL-Fenced	多伦围封典型草原	典型草原	多伦
DL-Grazed	多伦放牧典型草原	典型草原	多伦
KBQ-SHB	库布齐灌丛	灌丛	库布齐
EDS-SHB	毛乌素沙地灌丛草原	灌丛	鄂尔多斯
SZW-DRT	四子王旗荒漠草原	荒漠草原	四子王旗
SZW-Fenced	四子王旗围封荒漠草原	荒漠草原	四子王旗
SZW-Grazed	四子王旗放牧荒漠草原	荒漠草原	四子王旗
CL-PDY	长岭盐碱稻田	农田	长岭
CL-MZE	长岭盐碱玉米地	农田	长岭
LS-PDY	南京溧水水稻田	农田	溧水
CL-CRP	呼伦贝尔小麦田	农田	海拉尔
HL-CRP2	呼伦贝尔农田	农田	海拉尔
YS-FOR	永寿刺槐林	森林	永寿
KBQ-FOR	库布齐人工林	森林	库布齐
TL-SHB	科尔沁沙地灌丛	沙地	通辽
DK-SHB	乌兰布和沙地	沙地	磴口
TY-WET	太原城市湿地	湿地	太原
HN-WET	辉南泥炭湿地	湿地	辉南





**感谢聆听!**

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