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Variations in diurnal and seasonal net ecosystem carbon dioxide exchange in a semiarid sandy grassland ecosystem in China's Horqin Sandy Land

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Supplemental material

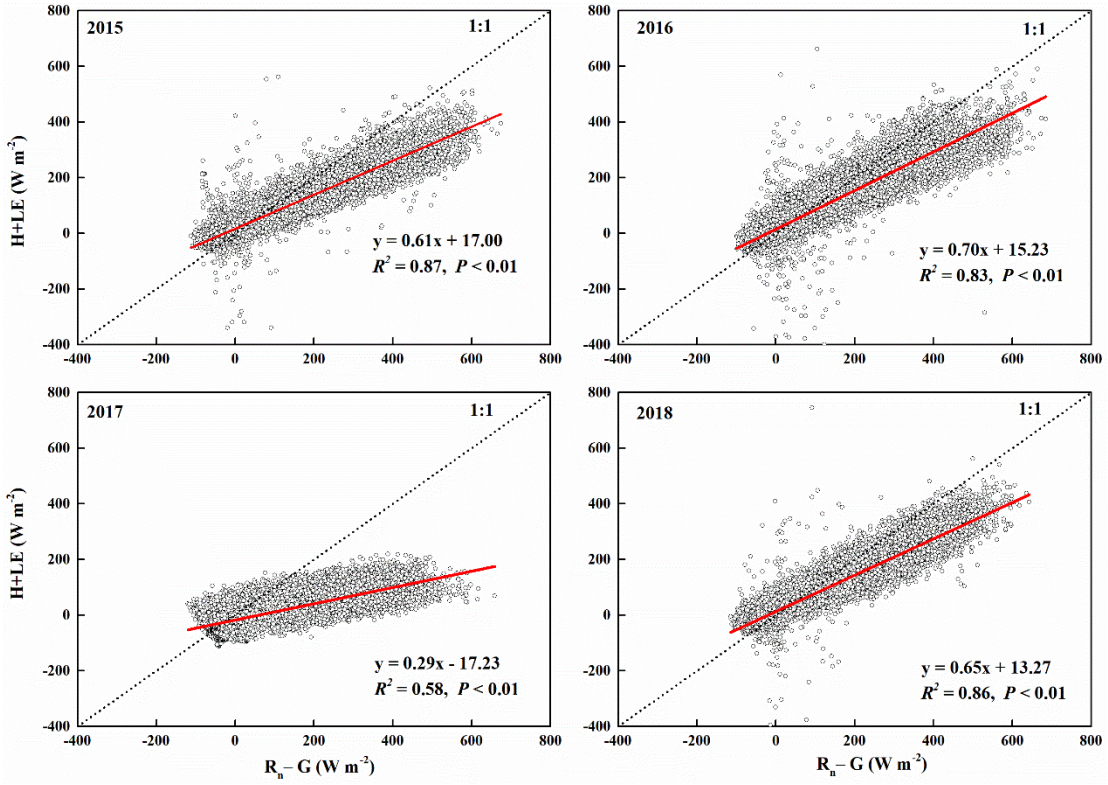

Fig. S1 | Relationships between the 30-min turbulent heat flux, which equaled the latent heat flux (LE) + the sensible heat flux (H), and the available energy, which equaled net radiation (R_n) – the soil heat flux (G).

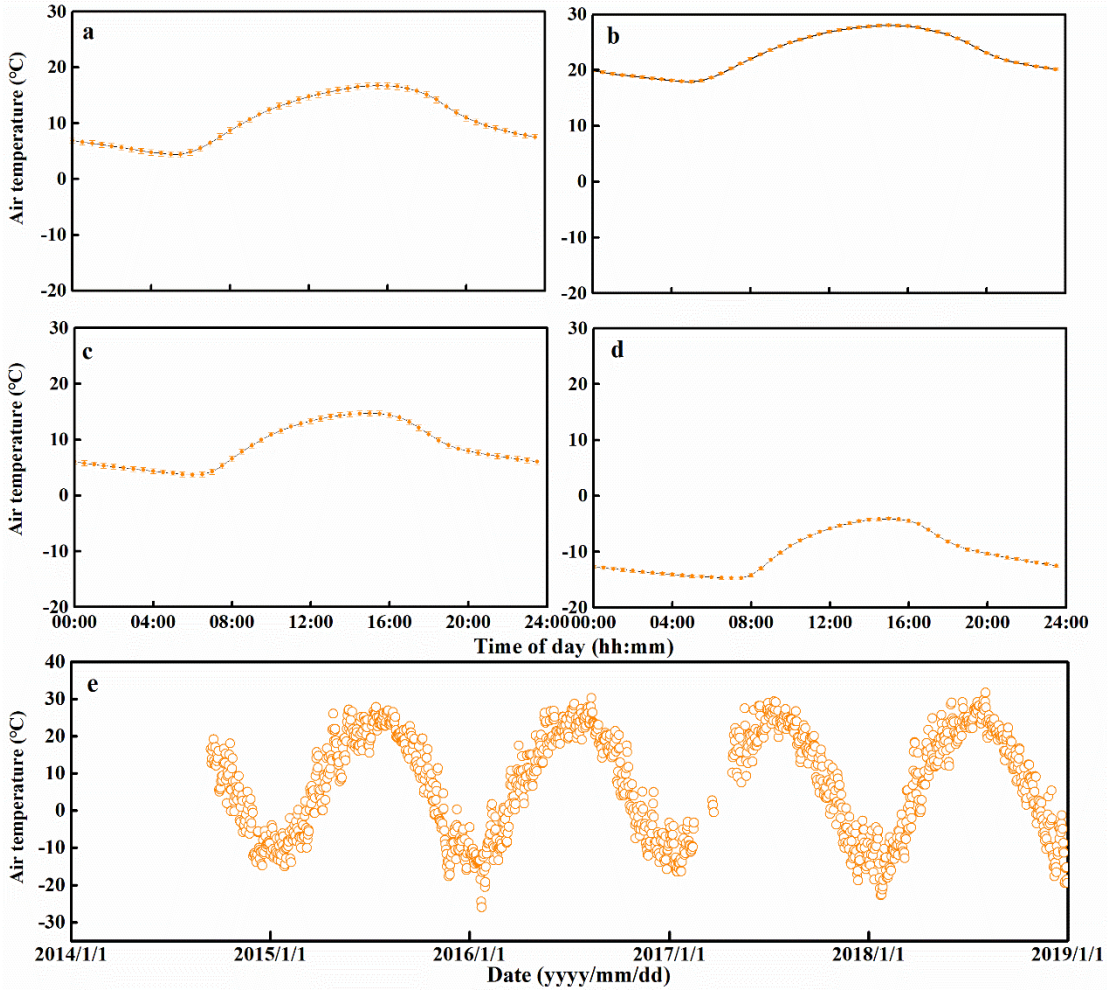

Fig. S2 | Air temperature (T_{air}) measured 2 m above the ground surface: (a), (b), (c), and (d) are 30-min mean values for combined data from all years in spring, summer, autumn, and winter, respectively; (e) Seasonal and inter-annual variation in daily average T_{air} from late 2014 to late 2018. The error bars represent standard errors for the mean T_{air} at the same time in every season for all study years combined.

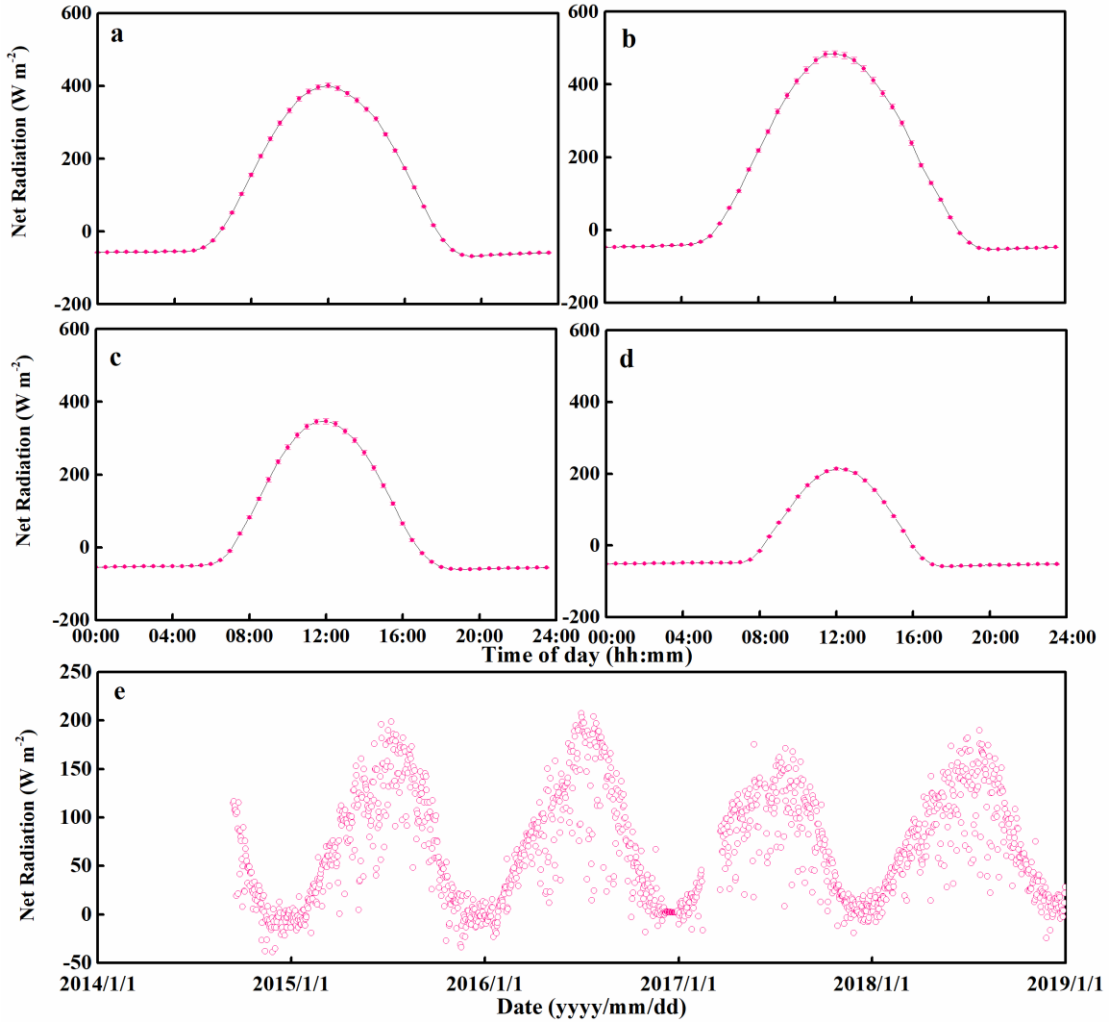

Fig. S3 | Net radiation (R_n) measured 2 m above the ground surface: (a), (b), (c), and (d) are 30-min mean values for combined data from all years in spring, summer, autumn, and winter, respectively; (e) Seasonal and inter-annual variation in daily average R_n from late 2014 to late 2018. The error bars represent standard errors for the mean of R_n at the same time in every season for all study years combined.

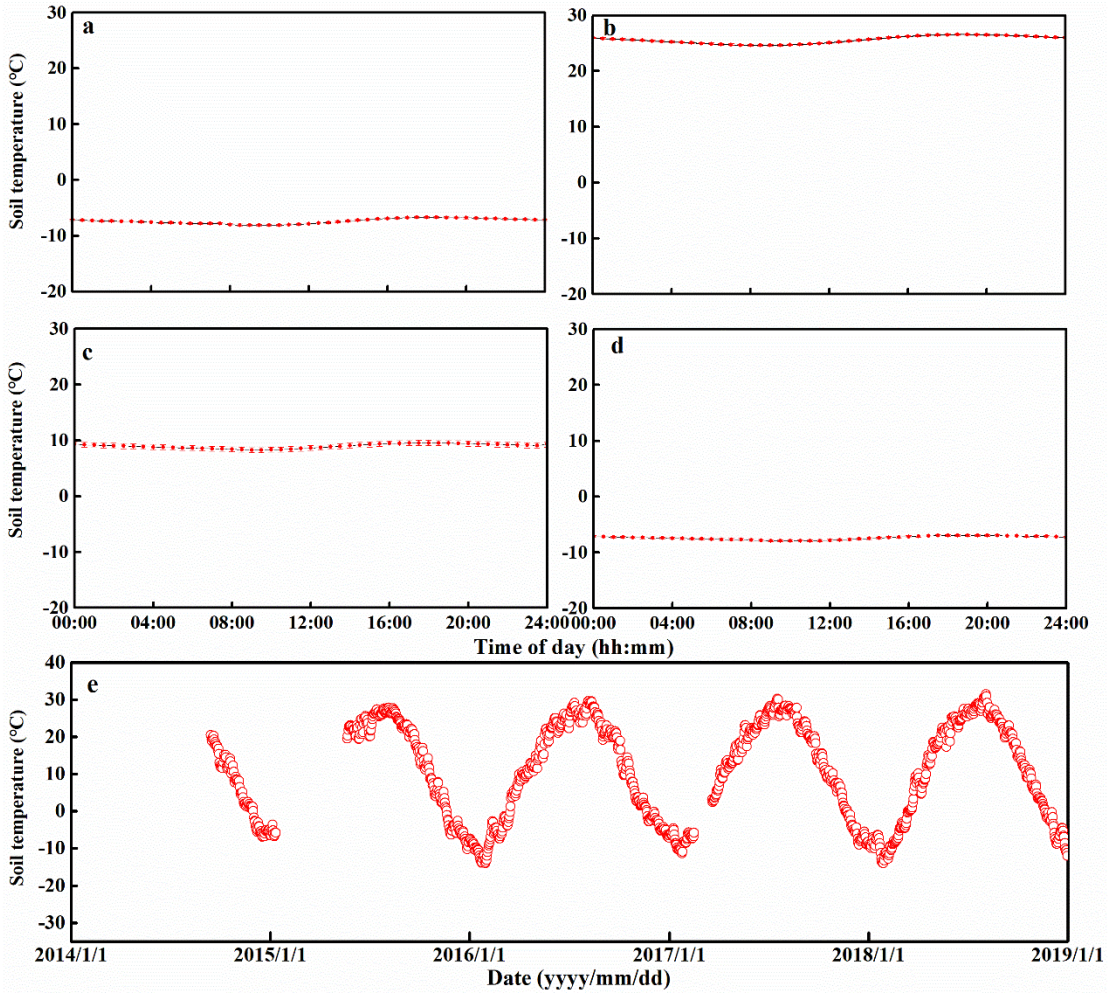

Fig. S4 | Mean soil temperature (T_{soil}) at depths from 0 to 50 cm: (a), (b), (c), and (d) are 30-min mean values for combined data from all years in spring, summer, autumn, and winter, respectively; (e) Seasonal and inter-annual variation in daily average T_{soil} at depths from 0 to 50 cm from late 2014 to late 2018. The error bars represent standard errors for the mean of T_{soil} at the same time in every season for all study years combined.

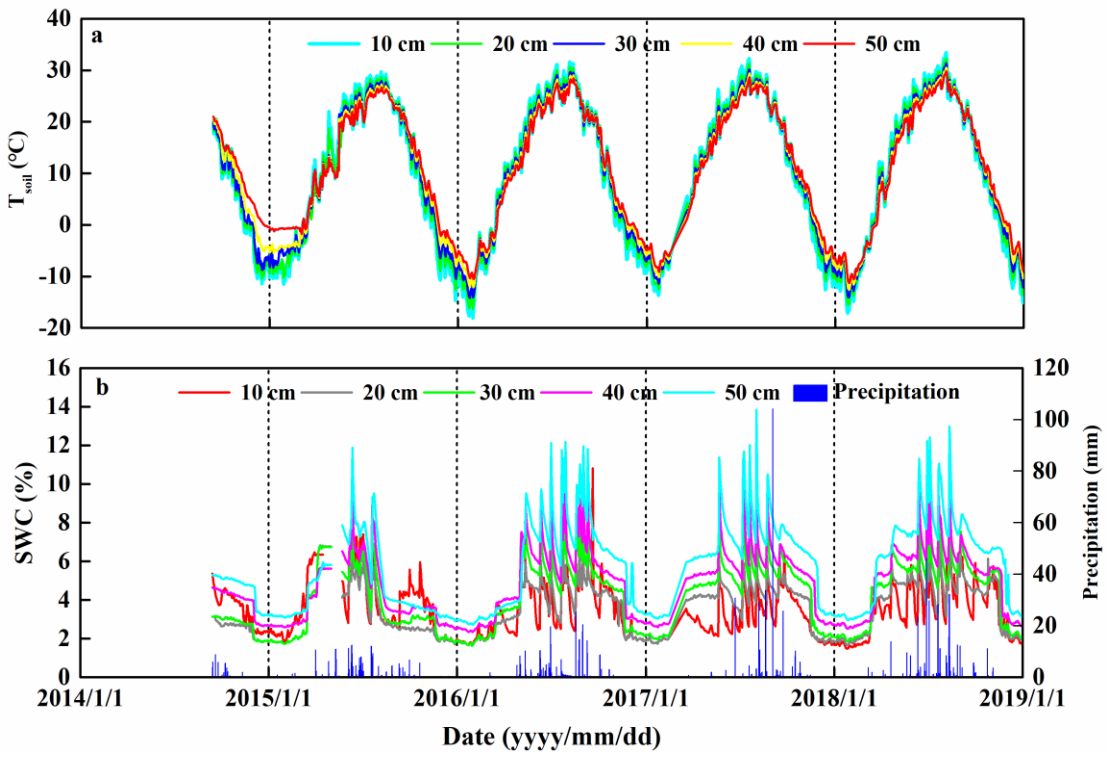

Fig. S5 | (a) Seasonal and inter-annual variation in daily average soil temperature (T_{soil}) and (b) soil water content (SWC) at depths of 10, 20, 30, 40, and 50 cm, and seasonal and inter-annual variation in daily precipitation, from late 2014 to late 2018.

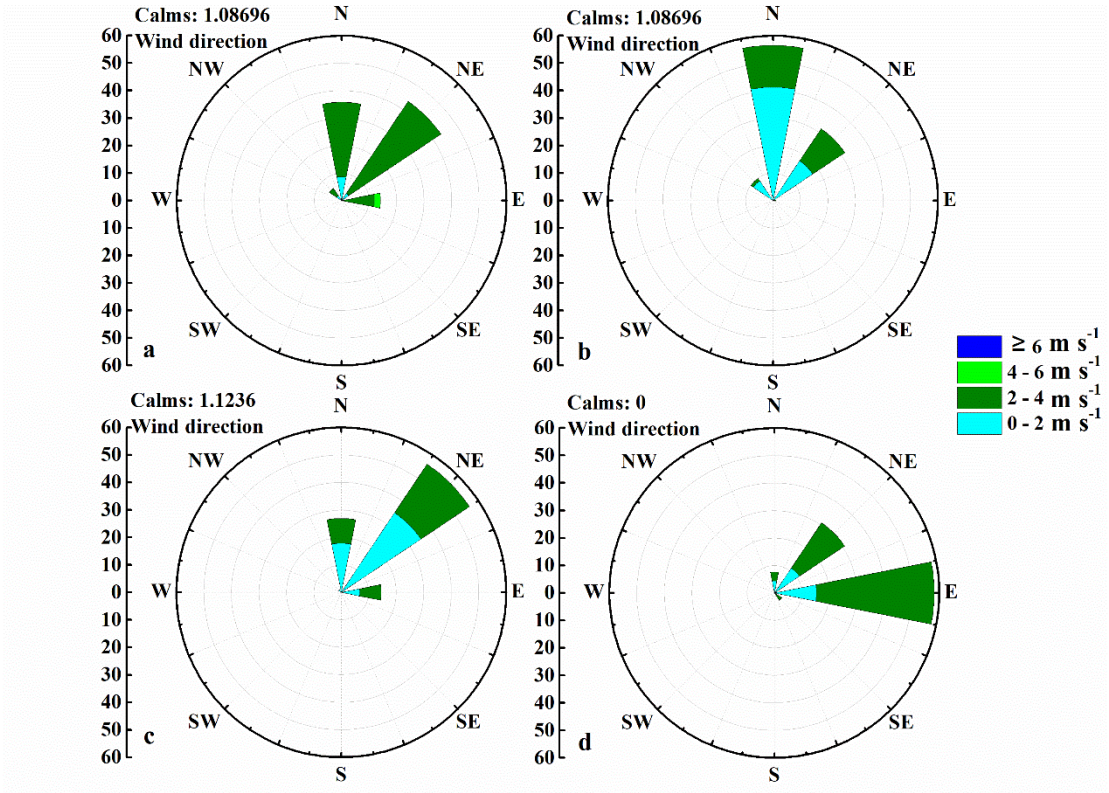

Fig. S6 | Diurnal mean wind speeds and directions between 2015 and 2018: (a) spring, (b) summer, (c) autumn, and (d) winter. Note that the wind direction means the direction the wind blows *from*.

Table S1 | Seasonal-scale correlations (Pearson's *r*) between net ecosystem exchange (r_{NEE}), gross primary productivity (r_{GPP}), and ecosystem respiration (r_{Rec}) and the key environmental factors. N represents the sample size. Abbreviations: SWC, soil water content; T_{soil}, soil temperature. **, $p < 0.01$; *, $p < 0.05$.

Environment factors	Spring				Summer				Autumn				Winter			2014-2018			
	r_{NEE}	r_{GPP}	r_{Rec}	N	r_{NEE}	r_{GPP}	r_{Rec}	N	r_{NEE}	r_{GPP}	r_{Rec}	N	r_{NEE}	r_{Rec}	N	r_{NEE}	r_{GPP}	r_{Rec}	N
SWC at 10 cm	-0.167**	0.158**	0.138**	314	-0.063	0.167**	0.225**	369	0.185**	0.330**	0.442**	418	-0.004	-0.004	379	-0.254**	0.370**	0.380**	1476
SWC at 20 cm	-0.356**	0.467**	0.379**	314	-0.060	0.164**	0.223**	369	0.138**	0.453**	0.509**	418	-0.129	-0.129	379	-0.391**	0.532**	0.519**	1476
SWC at 30 cm	-0.391**	0.565**	0.533**	314	-0.037	0.170**	0.273**	369	0.163**	0.465**	0.541**	418	-0.255**	-0.255**	379	-0.433**	0.609**	0.610**	1476
SWC at 40 cm	-0.371 **	0.631**	0.721**	314	-0.062	0.199**	0.288**	369	0.094	0.539**	0.546**	418	-0.210**	-0.210**	379	-0.464**	0.660**	0.669**	1476
SWC at 50 cm	-0.338**	0.623**	0.768**	314	-0.168 **	0.318**	0.347**	369	0.091	0.515**	0.523**	418	-0.209 **	-0.209 **	379	-0.484**	0.688**	0.696**	1476
T_{soil} at 10 cm	-0.507**	0.755**	0.742**	314	-0.337**	0.485**	0.395**	369	0.211**	0.677**	0.765**	418	-0.254**	-0.254**	379	-0.549**	0.758**	0.749**	1476
T_{soil} at 20 cm	-0.515**	0.770**	0.760**	314	-0.310**	0.494**	0.457**	369	0.211**	0.678**	0.766**	418	-0.314**	-0.314**	379	-0.545**	0.758**	0.753**	1476
T_{soil} at 30 cm	-0.519**	0.773**	0.761**	314	-0.276**	0.490**	0.506**	369	0.211**	0.680**	0.767**	418	-0.362**	-0.362**	379	-0.541**	0.756**	0.754**	1476
T_{soil} at 40 cm	-0.524**	0.778**	0.763**	314	-0.244**	0.490**	0.557**	369	0.209**	0.682**	0.767**	418	-0.369**	-0.369**	379	-0.535**	0.753**	0.755**	1476
T_{soil} at 50 cm	-0.526**	0.781**	0.765**	314	-0.222**	0.488**	0.591**	369	0.207**	0.682**	0.765**	418	-0.250**	-0.250**	379	-0.527**	0.748**	0.756**	1476

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