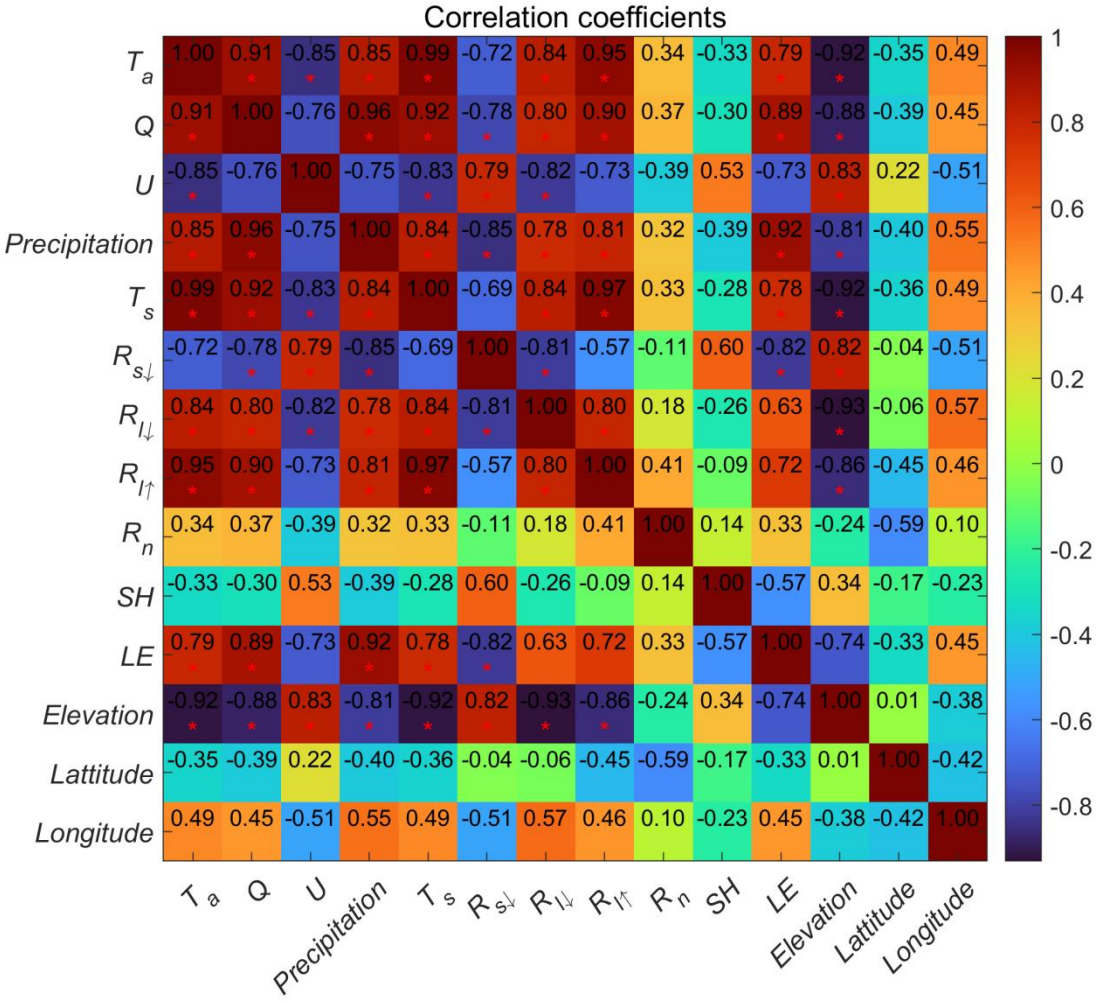

Figure S1. The heat map of correlation coefficients for air temperature (T_a), air humidity (Q), wind speed (U), precipitation, land surface temperature (T_s), downward short wave radiation ($R_{s\downarrow}$), downward long wave radiation ($R_{l\downarrow}$), upward longwave radiation ($R_{l\uparrow}$), net radiation (R_n), sensible heat flux (SH), latent heat flux (LE), elevation, latitude, longitude for 15 stations.

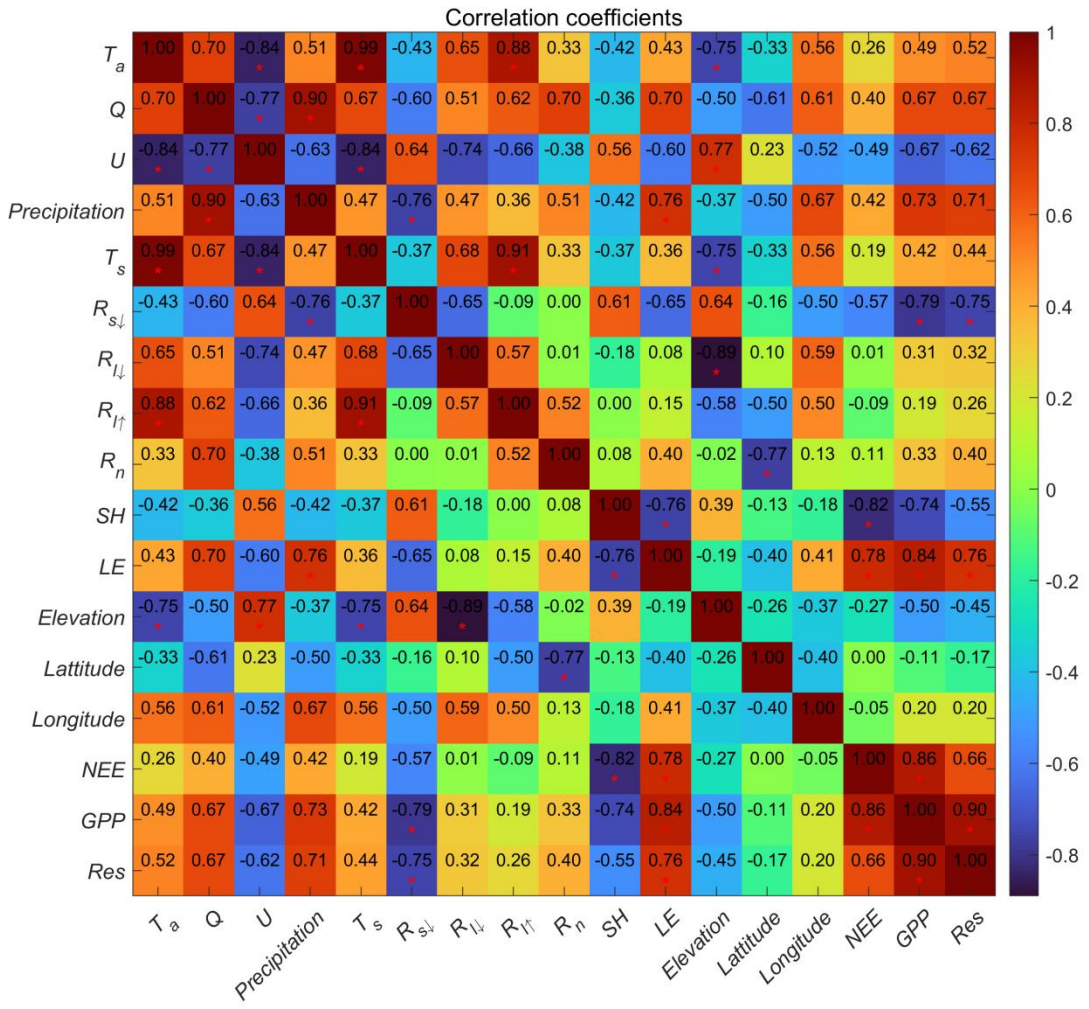

Figure S2. The heat map of correlation coefficients for air temperature (T_a), air humidity (Q), wind speed (U), precipitation, land surface temperature (T_s), downward short wave radiation ($R_{s\downarrow}$), downward long wave radiation ($R_{l\downarrow}$), upward longwave radiation ($R_{l\uparrow}$), net radiation (R_n), sensible heat flux (SH), latent heat flux (LE), elevation, latitude, longitude for 12 stations with an exception of Baingoin, QOMOS, NAMORS.

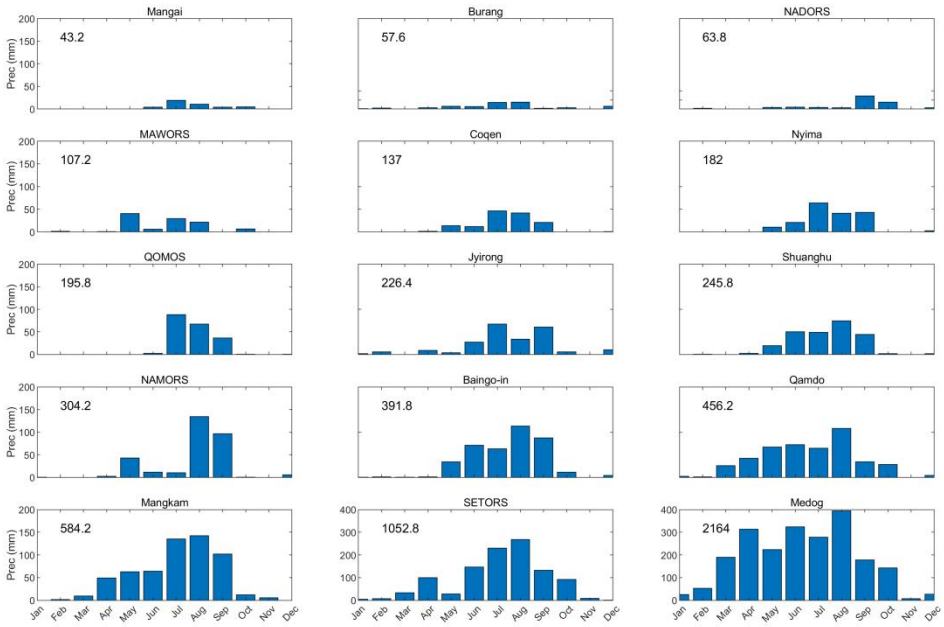

Figure S3. The seasonal variations of monthly precipitation at 15 stations, with the annual precipitation value marked at each subplot.

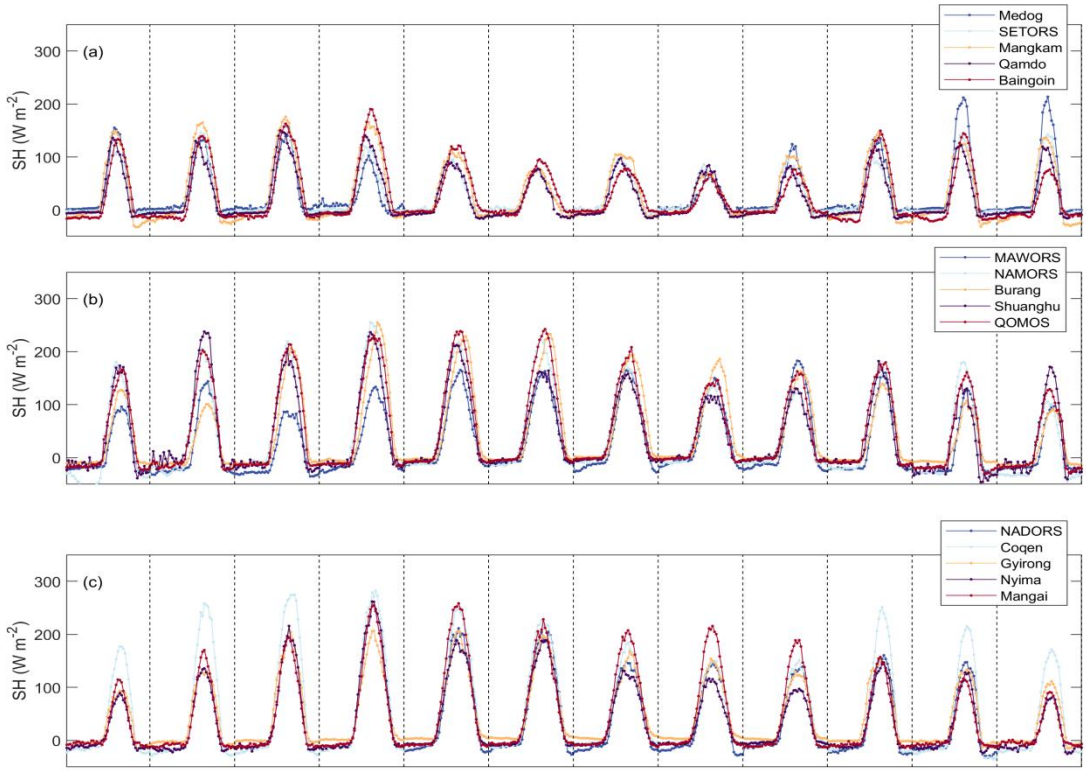

Figure S4. The seasonal variations of averaged *SH* for Medog, SETORS, Mangkam, Qamdo, Baingoin in (a), MAWORS, NAMORS, Burang, Shuanghu, QOMOS in (b), and NADORS, Coqen, Gyirong, Nyima and Mangai in (c).

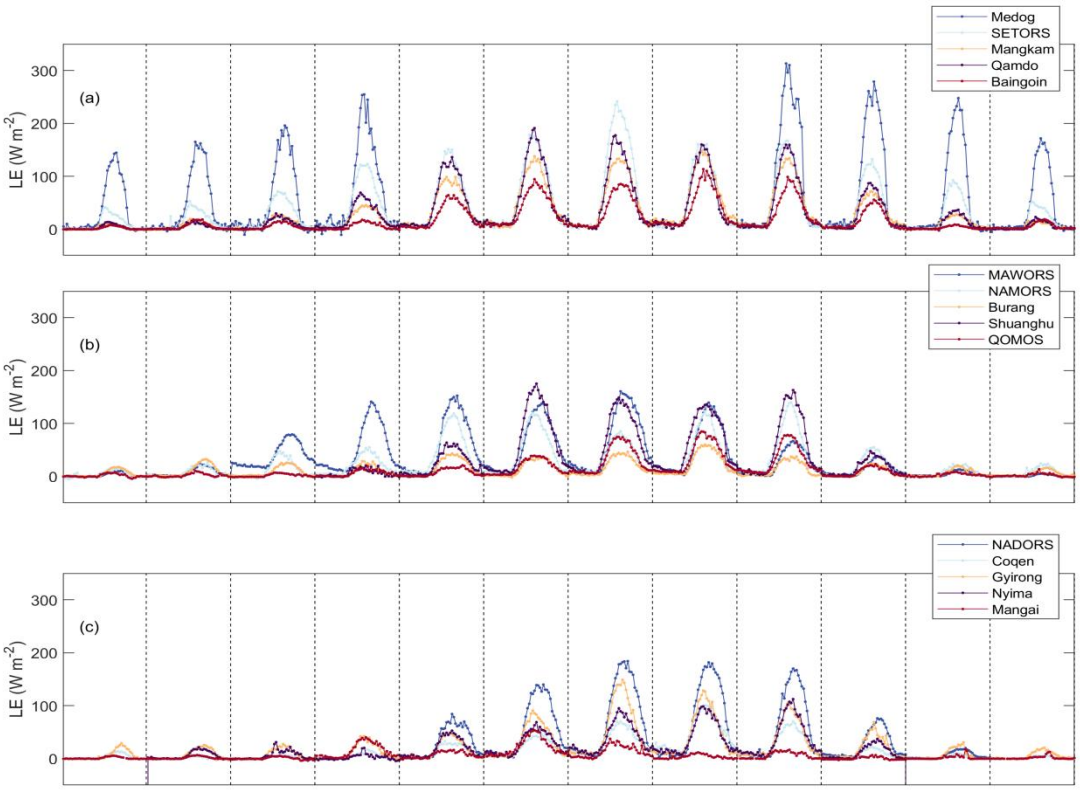

Figure S5. The seasonal variations of averaged *LE* for Medog, SETORS, Mangkam, Qamdo, Baingoin in (a), MAWORS, NAMORS, Burang, Shuanghu, QOMOS in (b), and NADORS, Coqen, Gyirong, Nyima and Mangai in (c).

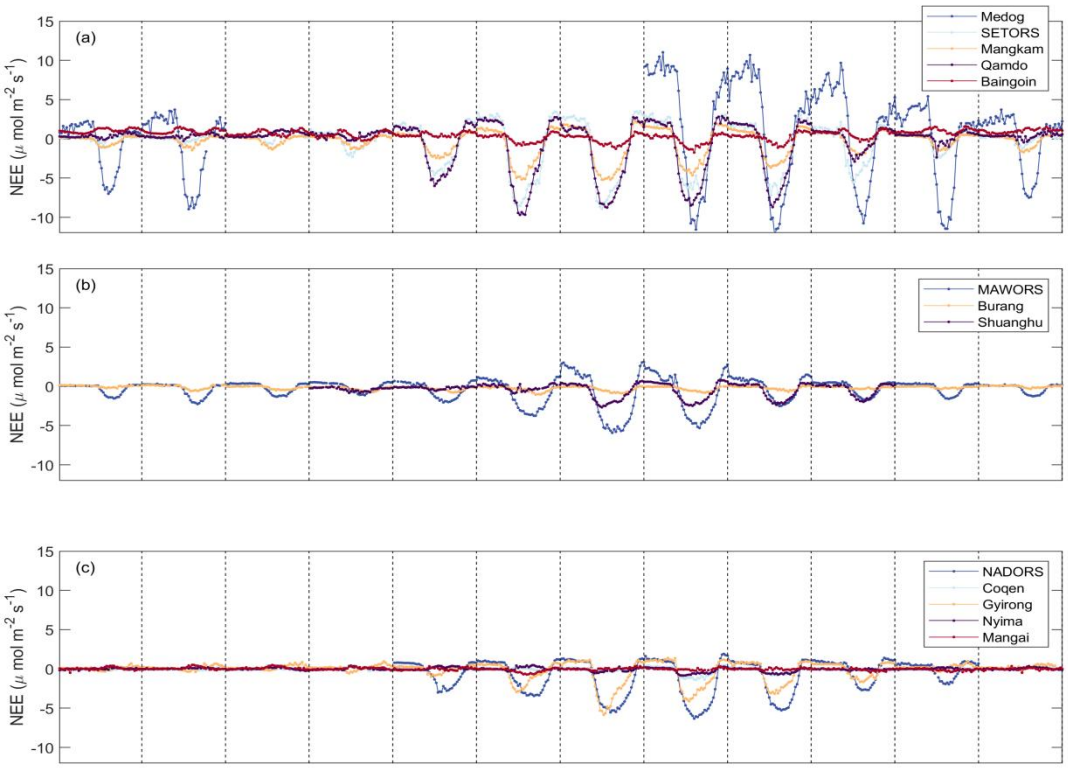

Figure S6. The seasonal variations of averaged *NEE* for Medog, SETORS, Mangkam, Qamdo, Baingoin in (a), MAWORS, Burang, Shuanghu in (b), and NADORS, Coqen, Gyirong, Nyima and Mangai in (c).

Table S1. The duration of observation and the percentage values of meteorological variables and eddy flux at 15 stations.

Sites	Start of the observational data series	End of the observational data series	Meteorological variables	Eddy flux
Medog	2021-04-18	2023-10-16	100%	60%
SETORS	2021-04-10	2023-10-29	100%	86%
Mangkam	2021-05-12	2023-10-16	100%	100%
Qamdo	2021-05-08	2023-10-17	100%	100%
Baingoin	2021-04-10	2023-06-28	100%	100%
NAMORS	2021-05-09	2023-11-01	90%	88%
Shuanghu	2021-04-11	2023-07-01	100%	100%
Gyirong	2021-04-23	2023-07-10	100%	68%
QOMOS	2021-04-18	2023-07-12	88%	77%
Nyima	2021-04-14	2023-03-15	100%	76%
Coqen	2021-05-01	2023-11-01	81%	100%
MAWORS	2021-05-24	2023-07-23	100%	57%
NADORS	2021-04-26	2023-08-06	100%	100%
Burang	2021-04-27	2023-11-08	100%	100%
Mangai	2021-04-12	2023-07-18	58%	47%

Table S2. the seasonal variation of monthly air temperature and its annual mean at the 15 stations

T_a	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NADORS	**-11.9**	**-10.1**	**-0.6**	**3.8**	**7.6**	**11.3**	**16.5**	**15.4**	**11.2**	**3.5**	**-3.7**	**-12**	**2.4**
Baingoin	**-12.6**	**-11.8**	**-1.7**	**0.1**	**4.1**	**9.1**	**10.4**	**9.4**	**5.7**	**4.4**	**-4.3**	**-11**	**0.5**
SETORS	**-3.6**	**-3.7**	**2.6**	**5.0**	**8.8**	**12.3**	**13.8**	**12.8**	**10.4**	**8.2**	**2.2**	**-1.8**	**5.7**
Qamdo	**-3.2**	**-1.5**	**6.9**	**7.8**	**12.7**	**16.0**	**17.3**	**16.3**	**13.2**	**12.0**	**3.2**	**-0.2**	**8.6**
Coqen	**-11**	**-10.4**	**-1.7**	**1.9**	**5.0**	**11.1**	**12.3**	**11.5**	**8.2**	**4.4**	**-2.9**	**-8.7**	**1.6**
Gyirong	**-10.7**	**-8.3**	**0.8**	**4.0**	**6.4**	**10.7**	**12.1**	**11.5**	**9.6**	**5.5**	**-1.1**	**-5.6**	**2.9**
Medog	**10.6**	**10.8**	**16.6**	**18.7**	**20.6**	**23.2**	**25.5**	**24.0**	**23.2**	**20.9**	**15.6**	**12.1**	**18.5**
MAWORS	**-9.8**	**-10.1**	**0.4**	**3.6**	**5.9**	**7.6**	**11.4**	**9**	**9.2**	**0.1**	**-6.2**	**-11**	**0.8**
NAMORS	**-6.7**	**-8.7**	**-4.0**	**-1.9**	**4.3**	**8.7**	**10**	**8.8**	**5.8**	**5.3**	**-2.5**	**-4.7**	**1.3**
Burang	**-9.2**	**-9.4**	**-0.6**	**3.8**	**5.7**	**9.8**	**12.9**	**12.2**	**10.2**	**4.3**	**-2.8**	**-8.4**	**2.5**
Shuanghu	**-18.1**	**-16.2**	**-6.2**	**-4.3**	**0.8**	**5.8**	**7.8**	**7.0**	**3.1**	**-0.2**	**-9.6**	**-15.9**	**-3.5**
QOMOS	**-6.7**	**-4.7**	**1.3**	**5.0**	**6.5**	**11.5**	**11.3**	**11.2**	**9.2**	**5.8**	**1.2**	**-3.4**	**3.9**
Nyima	**-19.1**	**-12.2**	**-1.2**	**1.0**	**5.2**	**11.2**	**12.4**	**11.5**	**7.8**	**5.2**	**-3.7**	**-13.8**	**1.3**
Mangai	**-9.5**	**-9.1**	**2.7**	**4.8**	**9.1**	**12.2**	**17.1**	**14.4**	**11.2**	**4.2**	**-5.8**	**-9.9**	**3.5**
Mangkam	**-6.2**	**-5.7**	**2.6**	**3.7**	**9.9**	**12.4**	**12.7**	**12.4**	**9.9**	**8.5**	**0.8**	**-2.2**	**5.2**

Table S3. the seasonal variation of monthly wind speed and its annual mean at the 15 stations

U_{20m}	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NADORS	**2.3**	**3.2**	**3.8**	**4.1**	**4.0**	**3.9**	**4.1**	**3.6**	**3.1**	**3.4**	**2.9**	**1.8**	**3.5**
Baingoin	**3.4**	**4.6**	**4.8**	**4.5**	**3.8**	**4.2**	**3.3**	**3.3**	**3.2**	**4.9**	**4.4**	**3.5**	**4.1**
SETORS	**1.9**	**2.1**	**1.9**	**1.8**	**2.1**	**1.8**	**1.8**	**1.6**	**1.6**	**1.8**	**1.9**	**1.8**	**1.8**
Qamdo	**1.3**	**1.7**	**1.8**	**1.9**	**2.2**	**1.9**	**1.8**	**1.8**	**1.6**	**1.6**	**1.3**	**1.4**	**1.7**
Coqen	**5.6**	**7.4**	**6.4**	**6.1**	**5.3**	**5.4**	**4.3**	**4.0**	**3.8**	**5.7**	**6.8**	**6.2**	**5.6**
Gyirong	**1.4**	**2.5**	**2.9**	**3.4**	**3.5**	**3.6**	**3.0**	**2.8**	**2.6**	**2.7**	**2.1**	**2.2**	**2.8**
Medog	**0.5**	**0.6**	**0.5**	**0.7**	**0.5**	**0.5**	**0.9**	**0.5**	**0.5**	**0.3**	**0.3**	**0.4**	**0.6**
MAWORS	**3.4**	**3.3**	**5.3**	**3.3**	**2.6**	**2.6**	**2.6**	**2.4**	**2.5**	**3.0**	**3.2**	**2.5**	**4.3**
NAMORS	**5.4**	**3.6**	**4.6**	**4.5**	**5.2**	**5.2**	**4.5**	**4.8**	**4.1**	**5.7**	**5.8**	**6.2**	**5.2**
Burang	**4.4**	**4.0**	**3.7**	**4.2**	**5.2**	**5.7**	**5.0**	**5.2**	**4.7**	**4.3**	**3.1**	**4.5**	**4.5**
Shuanghu	**5.0**	**6.7**	**6.8**	**6.0**	**4.8**	**4.7**	**4.3**	**4.1**	**3.9**	**5.6**	**6.3**	**4.6**	**5.3**
QOMOS	**4.3**	**5.4**	**4.3**	**4.4**	**4.4**	**4.5**	**3.7**	**3.7**	**3.5**	**3.6**	**5.1**	**4.7**	**4.3**
Nyima	**1.8**	**4.8**	**5.7**	**5.9**	**5.1**	**5.1**	**4.5**	**4.1**	**3.6**	**5.2**	**5.0**	**3.6**	**4.9**
Mangai	**2.2**	**3.0**	**3.9**	**4.3**	**4.1**	**3.8**	**3.9**	**3.7**	**3.4**	**3.1**	**2.6**	**1.9**	**3.4**
Mangkam	**2.9**	**4.0**	**3.4**	**3.1**	**4.2**	**3.2**	**2.6**	**3.0**	**2.7**	**3.7**	**2.9**	**3.2**	**3.3**

Table S4. the seasonal variation of monthly absolute humidity and its annual mean at the 15 stations

Q	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**
NADORS	**0.7**	**0.6**	**0.6**	**1.0**	**2.3**	**2.4**	**3.9**	**3.3**	**3.3**	**1.3**	**0.6**	**0.9**	**1.88**
Baingoin	**0.7**	**0.7**	**0.6**	**1.1**	**3.2**	**4.5**	**4.5**	**5.8**	**4.2**	**2.1**	**0.7**	**1.0**	**2.38**
SETORS	**2.3**	**2.2**	**3.3**	**4.9**	**6.7**	**8.9**	**8.7**	**9.7**	**7.6**	**6.4**	**3.9**	**2.7**	**5.64**
Qamdo	**1.3**	**1.3**	**2.1**	**4.0**	**5.2**	**7.3**	**7.1**	**8.5**	**6.7**	**4.4**	**2.0**	**1.5**	**4.3**
Coqen	**0.5**	**0.5**	**0.6**	**1.0**	**2.6**	**3.0**	**4.3**	**5.1**	**3.9**	**1.4**	**0.4**	**0.7**	**2.03**
Gyirong	**1.3**	**1.3**	**2.2**	**3.2**	**4.2**	**5.7**	**6.7**	**6.8**	**5.8**	**4.0**	**1.4**	**1.4**	**3.53**
Medog	**8.4**	**8.2**	**11.1**	**13.5**	**15.6**	**18.5**	**19.0**	**19.2**	**18.0**	**16.5**	**11.7**	**9.6**	**14.1**
MAWORS	**0.7**	**0.9**	**1.4**	**2.1**	**3.2**	**3.5**	**4.6**	**4.1**	**2.3**	**1.7**	**1.1**	**0.8**	**2.23**
NAMORS	**0.9**	**0.9**	**1.3**	**1.8**	**3.7**	**4.8**	**4.8**	**5.8**	**4.3**	**2.5**	**1.0**	**1.2**	**2.8**
Burang	**1.1**	**1.1**	**1.5**	**2.4**	**3.7**	**4.7**	**6.4**	**6.3**	**5.5**	**2.9**	**1.1**	**1.1**	**3.12**
Shuanghu	**0.5**	**0.6**	**0.6**	**1.0**	**2.6**	**4.0**	**4.1**	**5.0**	**3.4**	**1.6**	**0.5**	**0.7**	**2.1**
QOMOS	**0.9**	**0.8**	**1.6**	**2.2**	**3.7**	**4.9**	**6.4**	**6.4**	**5.0**	**3.5**	**1.3**	**0.9**	**2.98**
Nyima	**0.7**	**0.7**	**0.6**	**1.1**	**3.0**	**3.8**	**4.5**	**5.7**	**4.1**	**1.6**	**0.5**	**1.0**	**2.28**
Mangai	**0.7**	**0.7**	**1.3**	**1.6**	**1.9**	**4.0**	**4.5**	**3.6**	**2.5**	**1.6**	**0.8**	**0.7**	**1.93**
Mangkam	**1.3**	**1.5**	**2.1**	**3.8**	**4.9**	**6.6**	**6.8**	**7.4**	**6.1**	**4.7**	**2.4**	**1.8**	**4.07**

Table S5. the seasonal variation of monthly net radiation and its annual mean at the 15 stations

R_n	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NADORS	19.4	39.2	61.2	83.3	103.4	129.9	125.4	121.2	95.3	48.2	17.2	6.1	70.8
Baingoin	12.7	26.2	61.6	82.6	110.6	115.1	110.6	92.0	82.9	48.5	12.9	-3.6	62.7
SETORS	56.1	66.3	88.6	108.5	115.7	117.0	134.1	116.1	98.5	78.9	74.5	57.7	92.7
Qamdo	26.4	38.1	65.9	90.4	107.6	130.8	144.8	125.7	108.6	76.0	41.2	25.9	81.8
Coqen	32.2	53.3	92.8	99.5	116.2	119.9	125.2	117.6	95.5	61.7	35.7	21.8	81.0
Gyirong	19.9	68.2	94.9	112.5	133.0	155.2	156.3	153.9	127.5	91.0	49.6	33.1	99.6
Medog	52.0	61.3	74.3	80.2	87.6	109.6	139.6	117.3	110.1	69.7	65.4	55.2	85.2
MAWORS	27.6	48.5	75.5	109.5	131.6	128.5	125.8	113.2	82.8	53.6	28.2	14.4	78.2
NAMORS	NaN	NaN	NaN	117.6	144.2	150.6	132.9	128.1	119.4	72.5	43.0	13.7	76.8
Burang	20.0	45.3	95.4	120.5	138.0	138.8	133.9	126.9	96.1	67.1	37.3	3.2	85.2
Shuanghu	16.0	39.9	69.3	89.0	120.2	135.7	130.1	118.3	97.7	39.7	9.5	6.1	72.6
QOMOS	32.8	59.3	74.8	92.5	106.7	116.1	128.5	118.8	106.2	70.6	34.7	16.2	79.8
Nyima	27.2	47.4	84.7	106.6	122.3	136.1	127.9	108.6	100.4	60.5	29.2	8.4	79.9
Mangai	18.9	37.9	67.7	82.5	105.9	102.5	109.6	82.4	80.9	50.5	28.8	7.2	64.4
Mangkam	30.1	51.6	79.1	98.4	119.9	124.2	136.8	126.6	111.7	78.8	38.6	24.6	85.0

Table S6. the seasonal variation of monthly ground heat flux and its annual mean at the 15 stations.

G	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NADORS	-5.9	-3.0	3.4	7.2	13.6	14.7	10.3	2.9	2.4	-2.1	-5.6	-9.2	2.39
Baingoin	-6.6	-3.8	4.0	6.2	7.6	8.3	5.0	-0.1	-1	-2.8	-6.9	-7.9	0.17
SETORS	-3.6	-2.2	0.2	0.9	3.5	5.6	5.3	0.7	-0.5	-1.7	-3.4	-4.6	0.02
Qamdo	-4.4	-0.7	2.2	1.0	2.0	3.9	6.0	1.7	-1.0	-1.8	-4.3	-4.7	-0.01
Coqen	-3.0	-1.8	3.9	3.3	6.9	9.1	5.6	2.7	0.4	-1.6	-3.9	-4.2	1.45
Gyirong	-3.8	-0.8	2.3	2.2	6.4	6.2	3.6	2.2	0.5	-0.6	-3.1	-3.8	0.94
Medog	-1.7	-0.8	1.4	3.0	2.6	1.9	3.0	0.7	0.9	-1.3	-2.6	-3.1	0.33
MAWORS	-2.3	-2.0	2.9	5.2	6.2	9.1	5.3	1.8	1.0	-3.0	-3.7	-4.2	1.36
NAMORS	-2.0	-2.0	2.0	3.9	5.6	7.4	3.7	1.6	-0.5	-0.6	-3.7	-4.3	0.93
Burang	-3.4	-2.6	3.4	3.3	5.6	6.5	5.1	1.5	0.5	-0.9	-3.1	-5.5	0.87
Shuanghu	-4.4	-2.6	1.3	3.7	7.8	10.3	9.0	2.8	0.9	-1.3	-4.8	-5.1	1.47
QOMOS	-2.1	-0.2	3.6	3.1	4.9	6.2	3.8	2.5	2.4	-0.8	-2.2	-3.3	1.49
Nyima	-2.8	-0.6	4.2	4.8	6.7	9.8	4.7	1.4	-0.4	-2.0	-4.1	-4.4	1.44
Mangai	-2.6	-0.7	3.3	5.5	4.9	4.0	5.1	3.1	0.9	-2.0	-4.0	-4.5	1.08
Mangkam	-2.1	-0.4	2.3	1.5	7.5	7.5	6.3	2.5	1.6	1.1	-2.2	-1.1	2.04

Table S7. The correlation coefficients (R) between SH (LE) and related meteorological and environmental variables.

R	$SH \sim \Delta T$	$SH \sim U$	$SH \sim SM10$	$SH \sim SM80$	$SH \sim T_s$	$SH \sim R_n$	$LE \sim \Delta E$	$LE \sim U$	$LE \sim SM10$	$LE \sim SM80$	$LE \sim T_s$	$LE \sim R_n$
Medog	0.568	0.554	-0.567	-0.455	0.596	0.670	0.678	0.539	-0.436	-0.388	0.599	0.760
SETORS	0.092	-0.026	-0.055	-0.074	-0.125	0.483	0.783	-0.008	0.227	0.503	0.782	0.936
Mangkam	0.483	0.227	-0.323	-0.079	0.062	0.297	0.208	-0.161	0.648	-0.038	0.673	0.789
Qamdo	0.150	-0.064	-0.270	0.005	0.006	0.184	0.399	0.020	0.541	0.453	0.767	0.884
Baingoin	0.630	0.199	-0.319	-0.380	0.122	0.402	0.216	0.038	0.752	0.627	0.395	0.541
NAMORS	0.853	-0.141	0.052	-0.204	0.701	0.730	-0.005	-0.069	0.556	-0.106	0.436	0.699
Shuanghu	0.545	0.144	-0.026	0.046	0.222	0.445	0.329	-0.276	0.694	0.696	0.727	0.734
Gyirong	0.670	-0.05	-0.192	-0.341	0.568	0.403	0.271	-0.289	0.571	0.610	0.327	0.470
QOMOS	0.731	-0.071	-0.155	-0.088	0.404	0.591	0.150	-0.117	0.830	0.354	0.502	0.556
Nyima	0.690	-0.112	0.058	0.088	0.564	0.734	0.161	-0.168	0.654	0.399	0.448	0.477
Coqen	0.518	0.369	-0.167	0.124	0.316	0.423	-0.007	-0.394	0.542	0.168	0.411	0.439
MAWORS	0.512	0.498	-0.383	0.206	0.324	0.742	-0.024	-0.106	0.444	-0.132	0.188	0.197
NADORS	0.610	0.228	0.294	0.119	0.340	0.590	0.769	0.168	0.729	0.721	0.843	0.809
Burang	0.706	0.060	0.364	0.121	0.681	0.840	0.012	0.099	0.486	0.455	0.093	0.284
Mangai	0.766	0.145	0.101	-0.184	0.325	0.710	-0.556	-0.004	-0.318	-0.323	-0.479	-0.120