Table S1. Köppen-Geiger climate classes

1st	2nd	3rd	Description	Criterion
B			Arid	$MAP<10\times P_{threshold}$
	W		- Desert	$MAP<5\times P_{threshold}$
	S		- Steppe	$MAP\geq5\times P_{threshold}$
		k	- Cold	$MAT<18$
D			Cold	Not (B) & $T_{hot}>10$ & $T_{cold}\leq0$
	w		- Dry winter	$P_{wdry}<P_{swet}/10$
	f		- Without dry season	Not (Ds) or (Dw)
		a	- Hot summer	$T_{hot}\geq22$
		b	- Warm summer	Not (a) & $T_{month}\geq4$
		c	- Cold summer	Not (a, b, or d)
E			Polar	Not (B) & $T_{hot}\leq10$
	T		- Tundra	$T_{hot}>0$

MAP = mean annual precipitation (mm/y); MAT = mean annual air temperature (°C); T_{cold} = the air temperature of the coldest month (°C); T_{hot} = the air temperature of the warmest month (°C); T_{month} = the number of months with air temperature >10 °C (unitless); P_{wdry} = precipitation in the driest month in winter (mm/month); P_{swet} = precipitation in the wettest month in summer (mm/month); $P_{threshold}=2\times MAT$ if >70% of precipitation falls in winter, $P_{threshold}=2\times MAT+28$ if >70% of precipitation falls in summer, otherwise $P_{threshold}=2\times MAT+14$. Summer (winter) is the six-month period that is warmer (colder) between April-September and October-March.
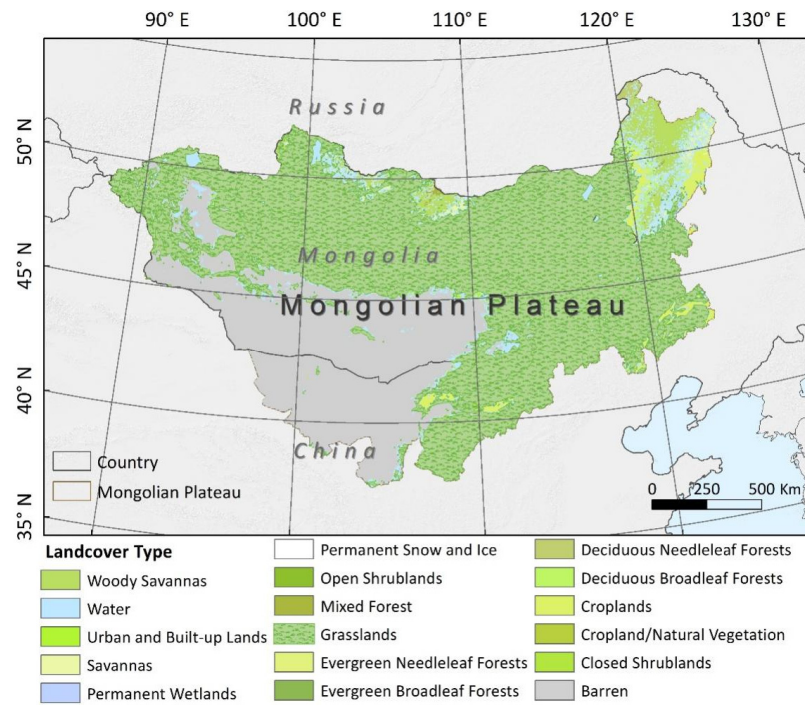
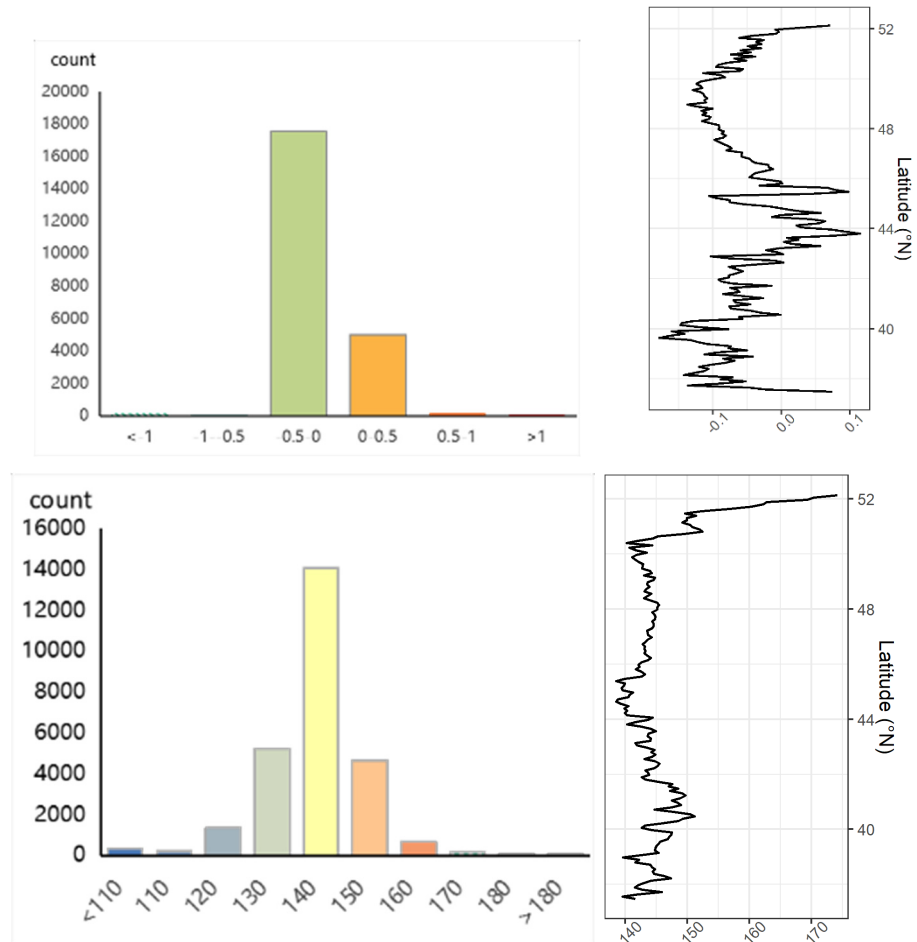**Figure S1.** Landcover types based on MCD12C1 of the Mongolian Plateau.

Figure S2. The mean value (upper) and trend (below) of GUD and its changes along the latitude of the Mongolian Plateau in 1982-2015
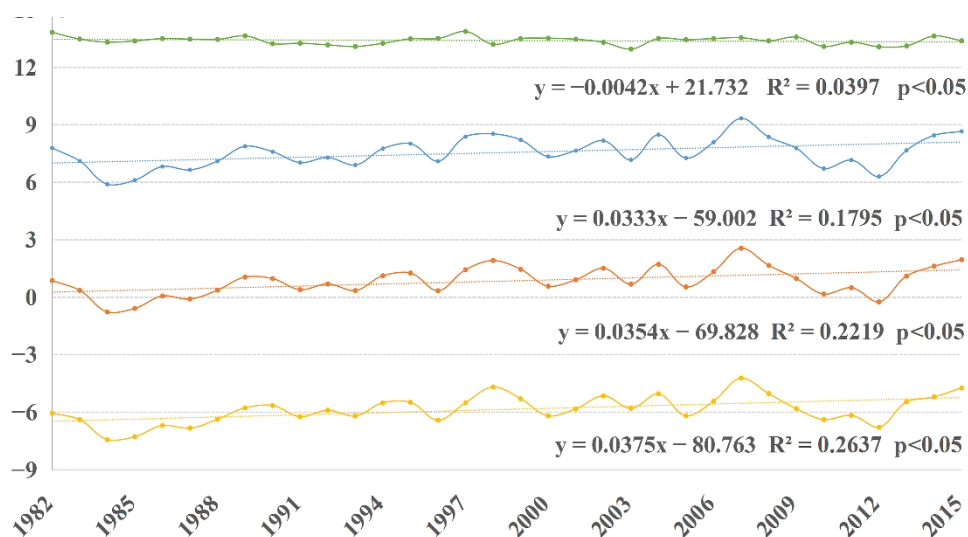
Figure S3. Annual TMP, TMX, TMN, and DTR (b) from 1982 to 2015 in Mongolian Plateau grassland.

Table S2 The percentage of correlation relationship between the GUD and temperature parameters in Mongolian Plateau grassland in each month (%).

month	TMP		TMX		TMN		DTR	
	Postive	Negative	Postive	Negative	Postive	Negative	Postive	Negative
January	77.02	22.98	26.16	73.84	19.12	80.88	72.33	27.67
February	74.23	25.77	73.57	26.43	87.72	12.28	65.58	34.42
March	4.2	95.8	28.85	71.15	46.64	53.16	48.82	51.18
April	43.28	56.72	26.23	73.77	34.69	65.31	51.38	48.62
May	80.24	19.76	85.21	14.79	70.34	29.66	79.11	20.89
June	97.96	2.04	98.02	1.98	96.72	3.28	70.05	29.95