



Supplement of

Expanding grassland coverage to maintain ecohydrological sustainability in the agro-pastoral ecotone of northwest China

Yuzuo Zhu and Xuefeng Xu

Correspondence to: Yuzuo Zhu (zhuyz16@lzu.edu.cn)

The copyright of individual parts of the supplement might differ from the article licence.



Figure S1 Spin-up time for the study area.



Figure S2 Model simulations (red line) versus observations (black line) of the daily soil temperature at different depths (0-5, 5-10, 10-15, 15-30, and 30-50 cm) under different land use/cover types in Yanchi, 18, 20, 39 and 42 stations.



Figure S3 Model simulations (red line) versus observations (black line) of monthly evapotranspiration (ET) in Yanchi.



Figure S4 The correlation coefficients of simulations and validation datasets (MODIS, GLASS) in 2000 and 2015.



Figure S5 Intense LUCC region with BL to GRS, GRS to BL, CL to GRS, and GRS to CL.



Figure S6. Seasonal changes in land surface temperature (LST) and evapotranspiration (ET) represented as box plots: (a) differences between grasslands and bare land (Exp_grass-Exp_bare) and (b) differences between grasslands and croplands (Exp_grass-Exp_crop).



Figure S7 Mean seasonal diurnal cycle in summer (Exp_bare & Exp_grass), (a) net radiation, (b) sensible heat fluxes, (c) latent heat fluxes, (d) turbulent heat fluxes, (e) residual heat fluxes (soil heat fluxes), (f) ground temperature, (g) vegetation temperature, (h) land surface temperature (LST).



Figure S8 Mean seasonal diurnal cycle in winter (Exp_bare & Exp_grass), (a)-(e)description same as Figure 10, but (f) for land surface temperature (LST).



Figure S9 Mean seasonal diurnal cycle in summer (Exp_crop & Exp_grass), description





Figure S10 Diurnal cycle for various Yanchi parameters: (a) net radiation, (b) latent heat fluxes, (c) turbulent heat fluxes, (d) residual heat fluxes (soil heat fluxes), (e) land surface temperature (LST), (f) surface albedo, (g) surface roughness, and (h) aerodynamic resistance for Yanchi_crop, Yanchi_grass, Yanchi_laisai, and Yanchi_height.



Figure S11 Dataset of soil properties for land surface modeling over China (upper panel) and default values (lower panel).

Site	Latitude	longitude	Altitude	Underlying
	(°E)	(°N)	(m)	surface type
Yanchi grass	37.9691	107.3851	1333	Grasslands
Yanchi crop	37.9690	107.3853	1333	Croplands
18	38.90	107.44	1222	Grasslands
20	39.17	108.38	1456	Grasslands
39	38.74	109.53	1264	Grasslands
42	38.19	108.97	1206	Croplands

Table S1 Information of in situ sites on the APENC.

	Variable	Product and support resource
	land use/cover downward shortwave longwave radiation near-surface wind speed	Resources and Environment Data Center
Input data Validation data	near-surface temperature near-surface air specific humidity near-surface air pressure precipitation rate sand content	CMFD by National Tibetan Plateau Data Center
	clay content soil organic bulk density	Dataset of soil properties for land surface modeling by Nationa Tibetan Plateau Data Center
	soil temperature ET	In situ observation
	LST	MODIS by NASA
	ET	GLASS by National Earth System Scienc
	net radiation	Data Center

Table S2 List of inputs dataset and validation dataset.

Change type	Mixture	grids	Δ LST(°C)	$\Delta ET(mm yr^{-1})$	$\Delta W(\text{mm yr}^{-1})$
	(grasslands: bare				
	land: croplands)				
BL to GRS	8:2:0 to 10:0:0	8	-0.09	0.01	-2.32
	6:4:0 to 10:0:0	9	-0.26	0.06	-20.51
	6:4:0 to 8:2:0	20	-0.12	0.03	-11.25
	4:4:2 to 6:2:2	5	-0.08	0.04	-16.39
	4:2:4 to 6:0:4	2	-0.06	0.05	-21.32
	0:10:0 to 10:0:0	9	-0.63	0.13	-44.78
	0:10:0 to 8:2:0	3	-0.52	0.07	-22.26
	0:10:0 to 6:4:0	3	-0.46	0.03	-11.41
	2:8:0 to 10:0:0	5	-0.44	-0.01	5.22
	2:8:0 to 8:2:0	6	-0.51	0.08	-24.41
	2:8:0 to 6:4:0	4	-0.30	0.10	-35.12
	2:6:2 to 4:4:2	6	-0.14	0.08	-29.68
	4:6:0 to 10:0:0	6	-0.32	0.06	-19.98
	4:6:0 to 8:2:0	12	-0.30	0.04	-13.42
	4:6:0 to 6:4:0	26	-0.10	0.02	-7.89
	2:4:4 to 4:2:4	1	-0.12	0.07	-26.65
	6:2:2 to 8:2:0	1	0.07	-0.06	23.73
	6:0:4 to 8:0:2	2	0.07	-0.02	1.77
	2:2:6 to 6:2:2	1	0.33	-0.14	53.92
BL to GRS and CL to GRS	2:4:4 to 6:2:2	1	0.13	0.01	-2.58

Table S3 The differences of LST and W as LUCC pattern change between 2000 and 2015 (CN2015 - EXP2000).

Site	Sand/%	Clay/%
Yanchi_grass	88.82	1.92
Yanchi_crop	90.66	1.13
18	87.01	2.30
20	90.59	1.02
39	96.70	0
42	96.89	0.10

Table S4 Soil parameters for different soil layers in the experiment at MOE Key Laboratory of Western China's Environmental System at Lanzhou University.