Supporting Information

Evolution of Wetland Patterns and Key Driving Forces in China's Drylands

Xiaolan Wu [1,2], Hui Zhao [1 *], Meihong Wang [1,2], Quanzhi Yuan [2], Zhaojie Chen [3], Shizhong Jiang [2], Wei Deng [2]

1 Key Laboratory of Mountain Surface Processes and Ecological Regulation, Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, Chengdu 610299, China
2 School of Geography and Resources Science, Sichuan Normal University, Chengdu 610101, China
3 School of Ecology and Environment, Xinjiang University, Urumqi 830046, China

* Correspondence: zhaohui@imde.ac.cn

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Method S1： Methods for mapping spatial dynamics of wetlands

（1） Using the ArcGIS10.6 " Intersect" and " Symmetrical Difference" tools to extract the increasing and shrinking wetlands in China's drylands from 1990-2020;

（2） Construct an 8km×8km grid based on the China's drylands;

（3） Based on the constructed grid, ArcGIS10.6 was used to statistically the proportion of wetland area in each grid using the "Zonal Statistics as Table" tool, and the findings were then spatialized.

Method S2： Statistical analysis of correlation results

（1） The correlation results were reclassified according to R>0, R<0 and the significance results were reclassified according to P>0.05, P<0.05 using ArcGIS;

（2） Afterwards, the reclassification results were summed using a raster calculator, and the results obtained were categorized into:

Significant positive correlation (R > 0, P>0.05),

Significant negative correlation (R<0, P<0.05),

No significant correlation (R>0/R<0, P<0.05).

（3） The results were partitioned and counted, and the results of correlation analysis of each type of wetland were obtained by mask extraction using the spatial distribution of each type of wetland in 2020;

（4） Using the obtained correlation between precipitation and wetland index as well as the correlation between temperature and wetland index the resultant plots were used for image statistics to extract the climatic elements with the highest correlation for each image, and to derive the main climatic influences at this image point;

（5） Compare the correlation between precipitation, temperature, HDI and wetland pattern index in the same way to find out the influencing factors with the highest correlation for each pixel, and add up the pixels with precipitation and climate as the main influencing factors to find out the number of climate factors as the main influencing factors.

（6） The results were counted to obtain the main influencing factors of wetlands in China's dryland, XJ and HCR regions of China. And the spatial distribution of each type of wetland in 2020 was utilized for mask extraction to get the main influencing factors of each type of wetland.

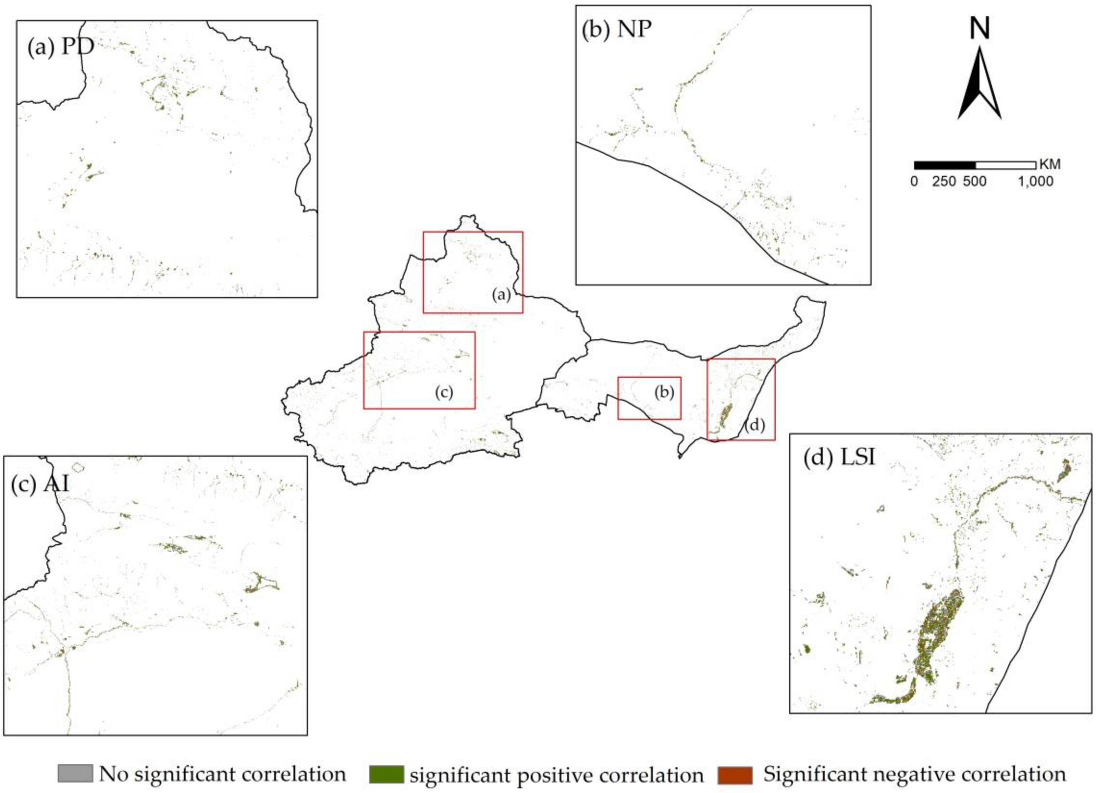

Figure. S1 (a) ~(d)Spatial distribution of wetland pattern index–precipitation correlation in the wetlands in China's dryland.

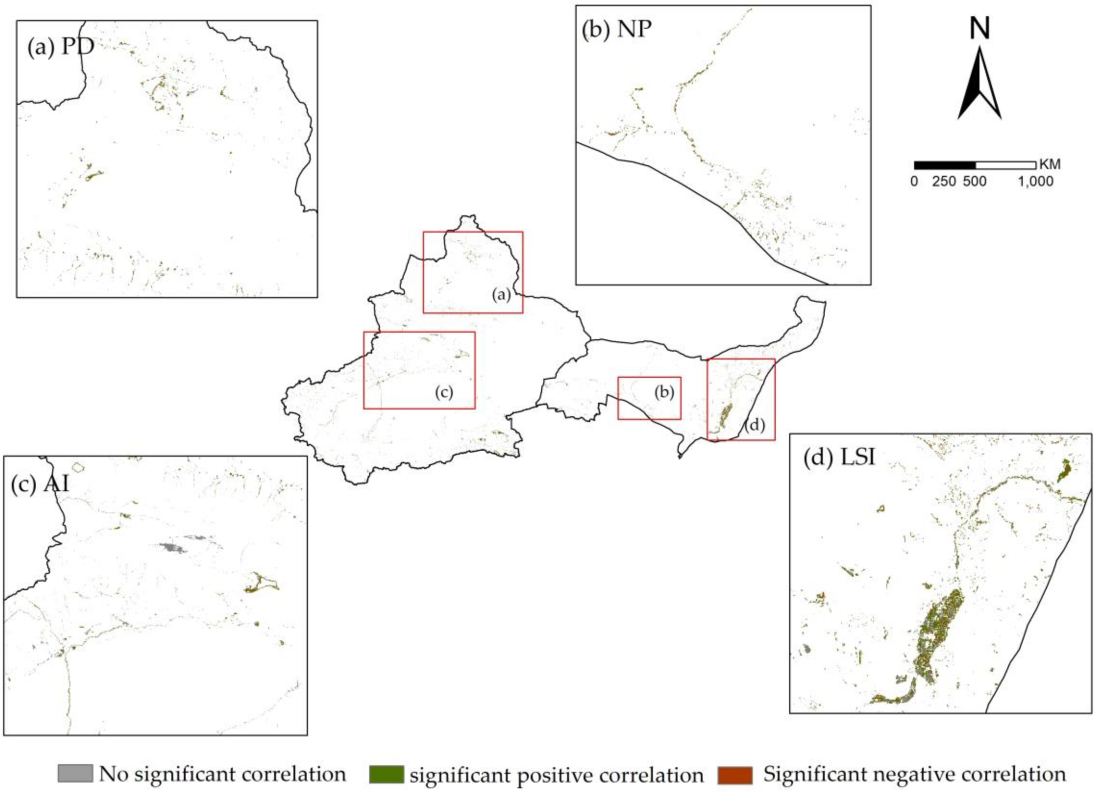

Figure. S2 (a) ~(d)Spatial distribution of wetland pattern index–temperature correlation in the wetlands in China's dryland.

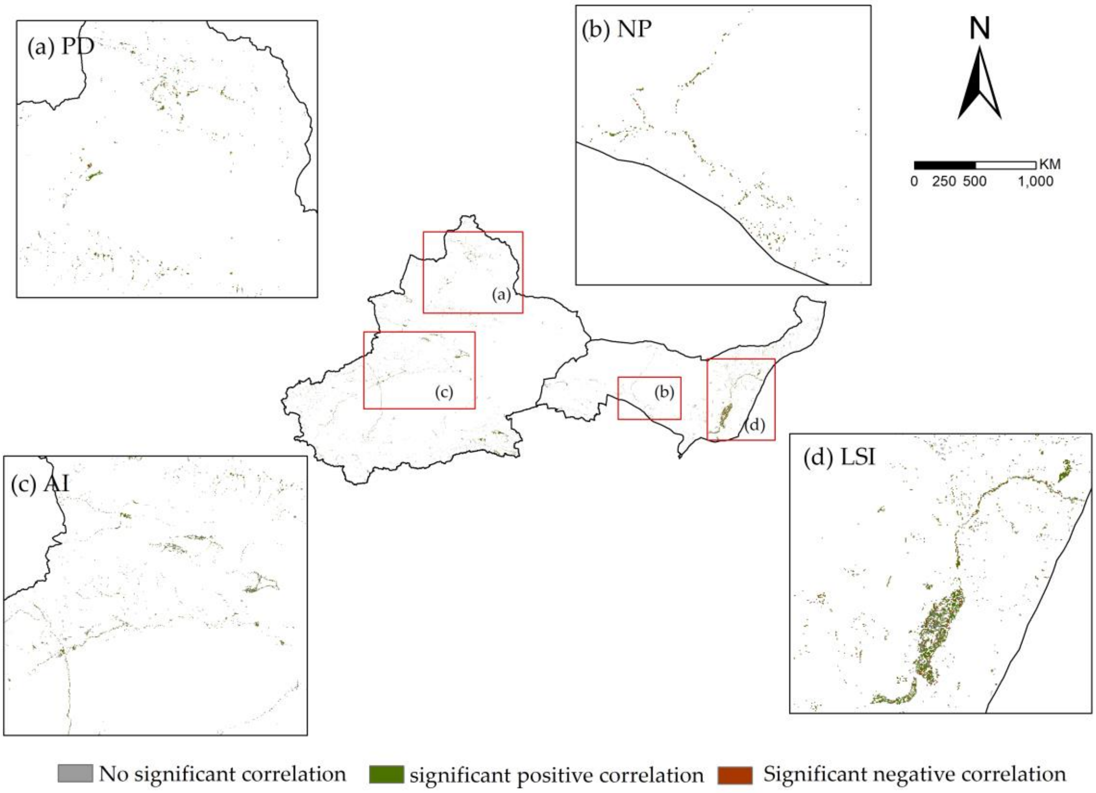

Figure. S3 (a) ~(d)Spatial distribution of wetland pattern index–HDI correlation in the wetlands in China's dryland.

Table. S1 Wetland dynamics in XJ from 1990 to 2020.

The transition of wetlands into other landscape types	Area/km^2	The transition of wetlands from other landscape types	Area/km^2	Changes in wetland area
River-Grassland	466.40	Grassland-River	1052.57	586.17
River-Constructed land	15.74	Constructed land-River	14.99	-0.74
River-Farmland	269.38	Farmland-River.	247.43	-21.94
River-Forest	159.07	Forest-River	228.96	69.89
River-Saline soil	11.62	Saline soil-River	57.61	45.99
Lake-Grassland	354.62	Grassland-Lake	1198.79	844.17
Lake-Constructed land	52.31	Constructed land-Lake	5.61	-46.70
Lake-Farmland	119.79	Farmland-Lake.	18.42	-101.37
Lake-Forest	65.85	Forest-Lake	53.57	-12.27
Lake-Saline soil	127.18	Saline soil-Lake	812.50	685.32
Artificial wetland-Grassland	366.19	Grassland-Artificial wetland	423.85	57.66
Artificial wetland-Constructed land	13.67	Constructed land-Artificial wetland	7.55	-6.12
Artificial wetland Farmland	225.25	Farmland-Artificial wetland	131.05	-94.20
Artificial wetland-Forest	22.14	Forest-Artificial wetland	41.43	19.29
Artificial wetland-Saline soil	1.60	Saline soil-Artificial wetland	215.93	214.33
Marsh-Grassland	1309.20	Grassland-Marsh	1540.45	231.25
Marsh-Constructed land	7.91	Constructed land-Marsh	4.97	-2.94
Marsh-Farmland	507.08	Farmland-Marsh.	126.14	-380.94
Marsh-Forest	162.11	Forest-Marsh	111.96	-50.15
Marsh-Saline soil	184.99	Saline soil-Marsh	250.04	65.05

Table. S2 Wetland dynamics in HCR from 1990 to 2020.

The transition of wetlands into other landscape types	Area/km²	The transition of wetlands from other landscape types	Area/km²	Changes in wetland area
River-Grassland	150.57	Grassland-River	277.83	127.26
River-Constructed land	20.18	Constructed land-River	18.71	-1.47
River-Farmland	157.56	Farmland-River.	196.93	39.36
River-Forest	14.88	Forest-River	37.46	22.58
River-Saline soil	9.89	Saline soil-River	46.46	36.57
Lake-Grassland	159.75	Grassland-Lake	172.39	12.63
Lake-Constructed land	10.34	Constructed land-Lake	8.02	-2.32
Lake-Farmland	55.75	Farmland-Lake.	59.24	3.49
Lake-Forest	7.57	Forest-Lake	8.09	0.52
Lake-Saline soil	136.42	Saline soil-Lake	109.02	-27.40
Artificial wetland-Grassland	42.08	Grassland-Artificial wetland.	156.78	114.71
Artificial wetland-Constructed land	22.42	Constructed land-Artificial wetland.	9.06	-13.37
Artificial wetland Farmland	92.38	Farmland-Artificial wetland.	154.07	61.69
Artificial wetland-Forest	3.60	Forest-Artificial wetland	14.65	11.05
Artificial wetland-Saline soil	9.11	Saline soil-Artificial wetland	65.36	56.25
Marsh-Grassland	780.25	Grassland-Marsh	648.49	-131.75
Marsh-Constructed land	42.48	Constructed land-Marsh	18.04	-24.44
Marsh-Farmland	134.07	Farmland-Marsh.	107.13	-26.94
Marsh-Forest	10.49	Forest-Marsh	15.55	5.06
Marsh-Saline soil	380.08	Saline soil-Marsh	347.21	-32.87

Table S3 Main factors affecting wetland types in China's drylands

Class	Factors	Index			
		PD	**NP**	**LSI**	**AI**
Lake	Climatic factors	49.59%	41.42%	40.11%	39.48%
	HDI	50.41%	58.59%	59.89%	60.52%
River	Climatic factors	50.65%	49.55%	58.83%	44.53%
	HDI	49.35%	50.44%	41.18%	55.47%
Marsh	Climatic factors	46.15%	42.01%	40.14%	48.24%
	HDI	53.85%	57.98%	59.86%	51.76%
Artificial wetland	Climatic factors	41.20%	49.17%	49.55%	48.79%
	HDI	58.80%	50.82%	50.45%	51.21%

Table S4 Variation trend of large lakes in China's dryland

region	Lakes	time-scale	Change in area /km²	rate of change km²/a	Trends
XJ	Lake Ayakumura [1]	1986-2019	544.50	16.50	expansion
	Lop Nor Potash Pool [1]	2002-2019	215.50	12.70	expansion
	Lake Achikul [1]	1986-2019	270.60	8.20	expansion
	Lake Titmar [1]	1986-2019	163.90	5	expansion
	Bosten Lake[2]	1988-2018	83.85	2.80	expansion
	Ulungur Lake [3]	1977-2017	79.90	2	expansion
	Sayram Lake[4]	2005-2015	4.50	0.45	expansion
	Ebinur [5]	1990-2021	-59.52	-3.5	shrinkage
HCR	Inner Mongolia Yellow River Basin Lakes [6]	1990-2020	-8.30	-0.40	shrinkage
	Dalinor Lake[7]	1976-2015	-28	-0.67	shrinkage
	Wuliangsu Sea [8]	2008-2019	-35.40	-3.20	shrinkage

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