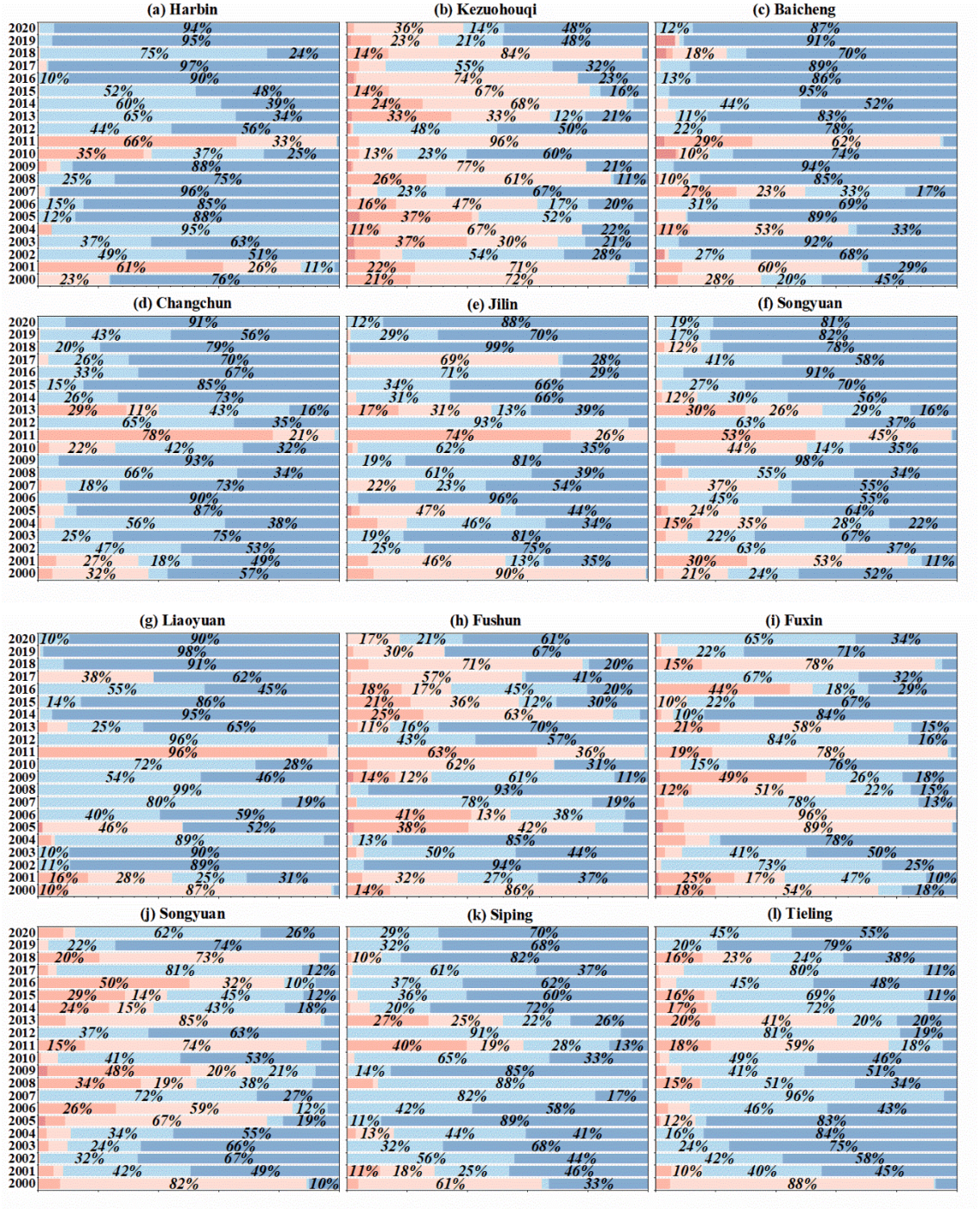
Spatiotemporal Characteristics and Hazard Assessment of Maize (*Zea mays* L.) Drought and Waterlogging: A Case Study in Songliao Plain of China

Rui Wang [1,2,3], Guangzhi Rong [1], Cong Liu [1], Walian Du [1], Jiquan Zhang [1,2,3,*], Zhijun Tong [1], and Xingpeng Liu [1]

[1] School of Environment, Northeast Normal University, Changchun 130024, China
[2] State Environmental Protection Key Laboratory of Wetland Ecology and Vegetation Restoration, Northeast Normal University, Changchun 130024, China
[3] Key Laboratory for Vegetation Ecology, Ministry of Education, Changchun 130024, China
* Correspondence: zhangjq022@nenu.edu.cn; Tel.: +86-135-9608-6467

Figure S1. Percentage of drought and waterlogging types in each region of the Songliao Plain maize growing area from 2000 to 2020 (Ⅰ: From dry to wet; Ⅱ: Continuously getting dry; Ⅲ: From wet to dry; Ⅳ: Continuously getting wet; Ⅴ: Unable to determine).



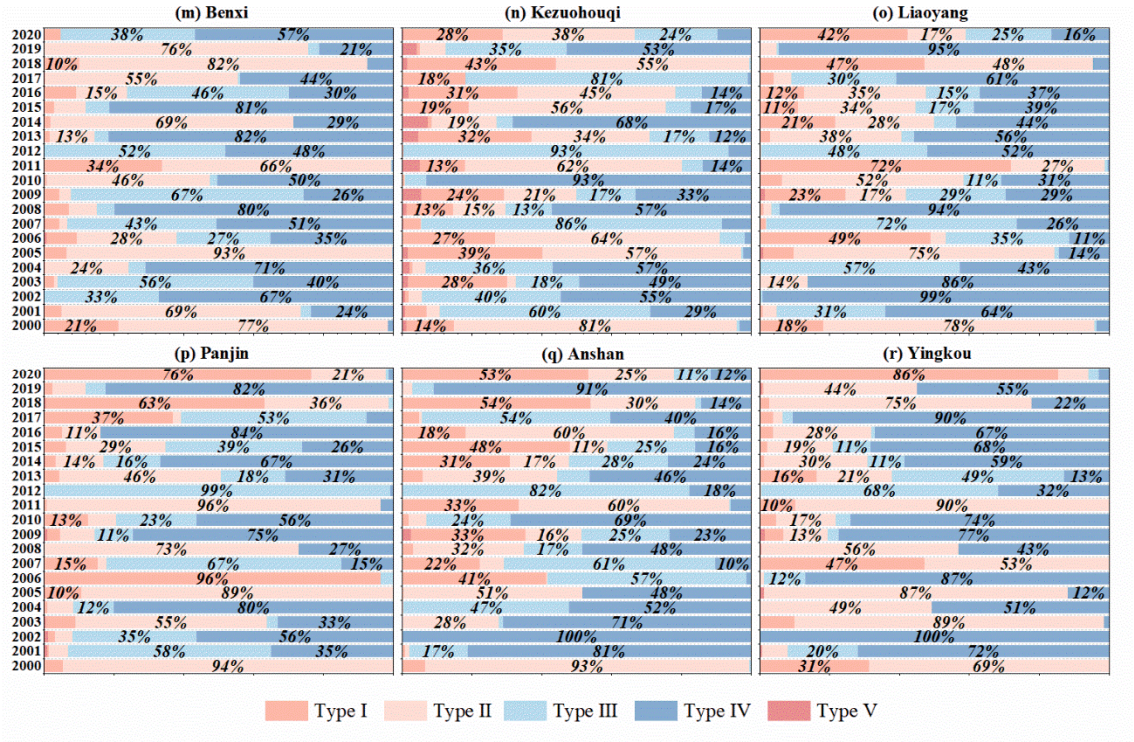

(m) Benxi
(n) Kezuohouqi
(o) Liaoyang
(p) Panjin
(q) Anshan
(r) Yingkou
Type I
Type II
Type III
Type IV
Type V

Figure S2. Spatial correlation between SPI and TVDI.

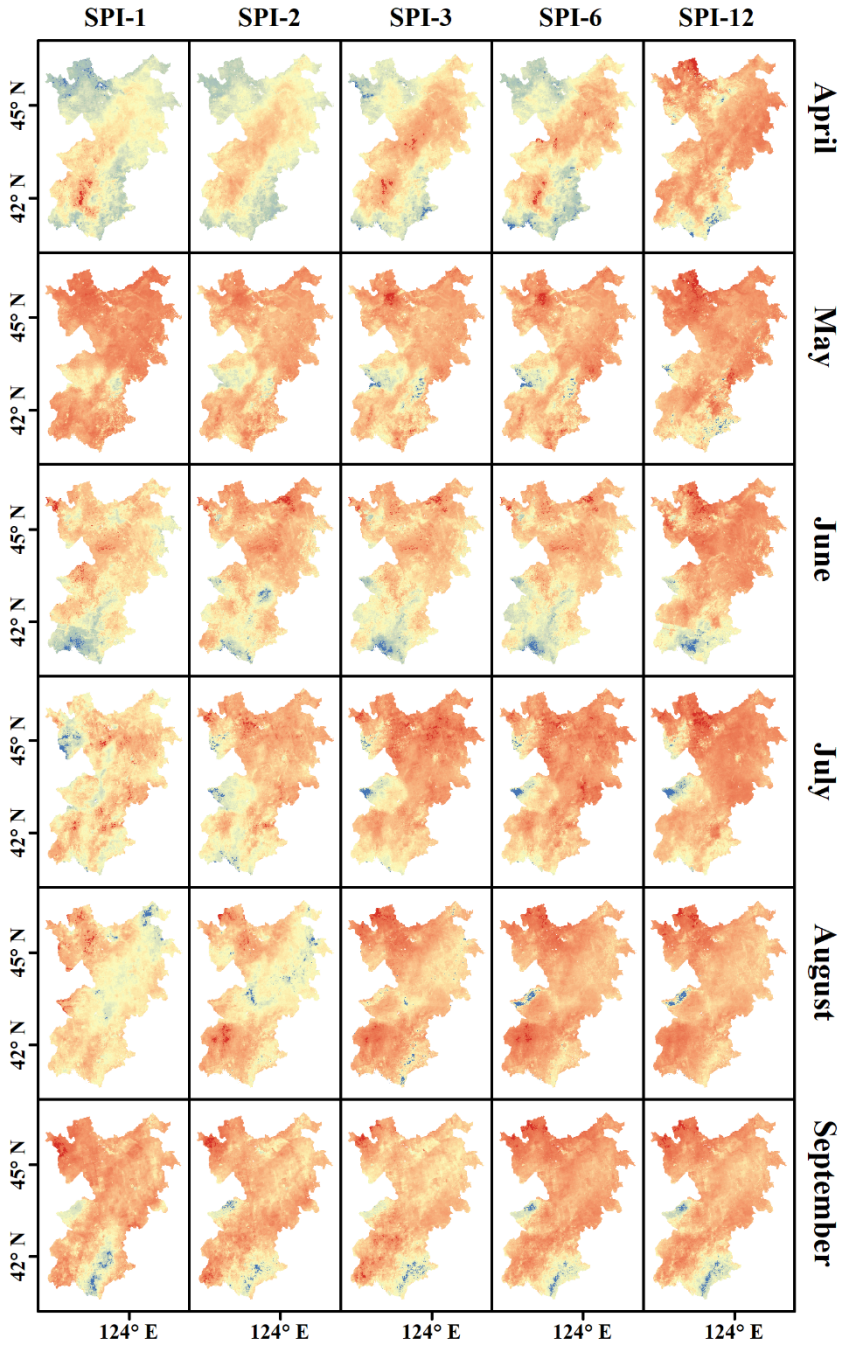


Table S1. Data description table.

Data Type	Data contents	Resolution	Time span	Advantages	Limitations	Data sources
Satellite remote sensing data	8-day EVI, MOD09A1	250m × 250m	2000–2020	Excellent temporal and spatial resolution	Image quality is influenced by clouds	National Aeronautics and Space Administration (https://ladsweb.modaps.eosdis.nasa.gov/, accessed on 10 May 2022)
	8-day LST, MOD11A2	1km × 1km	2000, 2001	Long time series		
	8-day GPP, MOD17A2HGF	500m × 500m	2018-2020	Excellent temporal and spatial resolution		
	1-day LST	1km × 1km	2002-2020	Seamless in space		A global seamless 1 km resolution daily land surface temperature dataset (2003-2020) (https://doi.org/10.25380/iastate.c.5078492, accessed on 10 May 2022)
	8 day GPP	0.05° ×0.05°	2000-2017	Good performance in modelling the spatial, seasonal and interannual variability of global GPP		Improved estimate of global gross primary production for reproducing its long-term variation, 1982-2017 (https://doi.org/10.6084/m9.figshare.8942336.v3, accessed on 10 May 2022)
Planting mapping data	Maize Planting Mapping	1km × 1km	2000-2015	Long time series and high spatial resolution		Identifying the Spatiotemporal Changes of Annual Harvesting Areas for Three Staple Crops in China by Integrating Multi-Data Sources (http://dx.doi.org/10.17632/jbs44b2hrk.2, accessed on 10 May 2022)

Historical disaster data	Drought and waterlogging disaster data	Provinces in Songliao Plain	2006-2020 2000-2020	A detailed account of the disaster as it happened	Lack of data on the spatial location of disaster sites	The China Waterlogging and Drought Disaster Bulletin of the Ministry of water resources of China (http://www.mwr.gov.cn/, accessed on 23 May 2022) The China Meteorological Disaster Yearbook of the China Meteorological Administra-tion
Yield data	Maize yield and area	Cities in Songliao Plain	2000-2020		Low spatial resolution	National Bureau of Statistics of China (https://data.stats.gov.cn/, accessed on 20 May 2022)
Meteorological data	Daily precipitation	17 weather stations in NEC	1990-2020	Precise measured data	Low spatial resolution	Meteorological Data Center of China Meteorological Administration (http://data.cma.cn/, accessed on 20 May 2022)
Other data	Maize varieties		1999-2016			China Seed Industry Big Data Platform (http://seedchina.com.cn/, accessed on 20 December 2022)

Table S2. Description of precipitation data.

Name of meteorological station	Time span	Name of meteorological station	Time span
Baicheng	1990-2020	Siping-Shuangliao	1990-2020
Songyuan-Qianan	1990-2020	Jilin-Yongji	1990-2020
Harbin	1990-2020	Fuxin-Zhangwu	1990-2020
Changchun-Nongan	1990-2020	Jinzhou-Yixian	1990-2017
Tieling-Changtu	1990-2020	Anshan	1990-2018
Liaoyuan	1990-2020	Fushun	1990-2020
Jilin-Panshi	1990-2020	Jinzhou-Dawa	1990-2020
Shengyang-Xinmin	1990-2020	Tieling-Benxi	1990-2020
Tongliao	1990-2020		

Table S4. Maize phenological information.

Month	Ten days	Maize
April	Early	Sowing
	Middle	Sowing
	Late	Sowing - Emergence (VE)
May	Early	Sowing - Emergence (VE)
	Middle	Sowing - Emergence (VE)
	Late	Sowing - Three leaf (V3)
June	Early	Third leaf (V3) – Seven leaf (V7)
	Middle	Third leaf (V3) – Seven leaf (V7)
	Late	Seven leaf (V7) - Elongation stage
July	Early	Elongation stage
	Middle	Elongation stage – Silking (R1)
	Late	Elongation stage – Silking (R1)
August	Early	Silking (R1)
	Middle	Silking (R1) – Milk (R3)
	Late	Milk (R3)
September	Early	Milk (R3)
	Middle	Milk (R3) - Physiological maturity (R6)
	Late	Milk (R3) - Physiological maturity (R6)