Supplementary Materials for

Declining runoff sensitivity to precipitation following permafrost degradation: Insights from event-scale runoff response in the Yellow River source region

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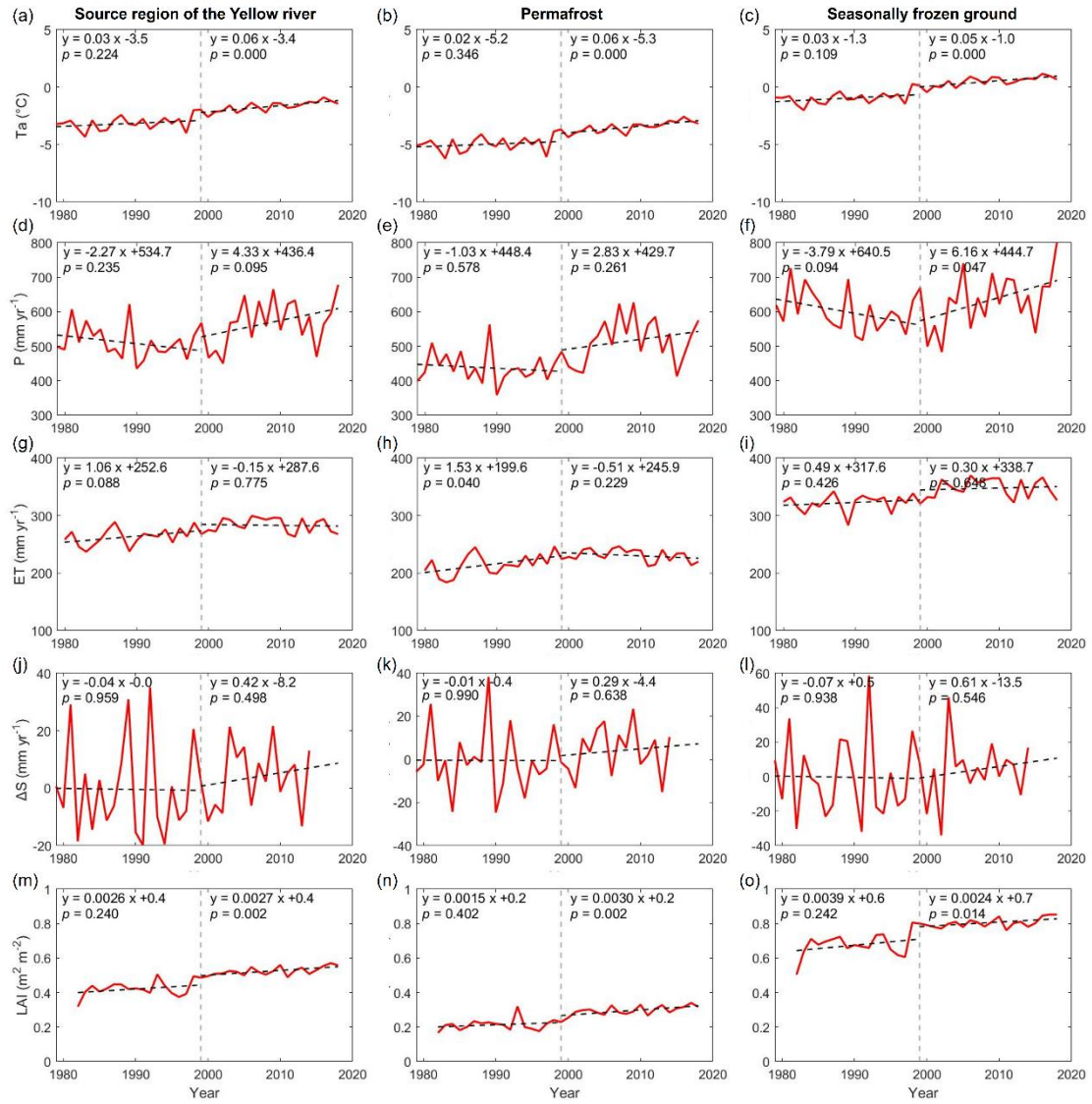
Figure S1. Time series of annual averages for (a–c) air temperature, (d–f) precipitation, (g–i) evapotranspiration, (j–l) the water storage change, and (m–o) leaf area index (LAI) across the entire Source Region of the Yellow River, the permafrost region, and the seasonally frozen ground region. Dashed black lines represent trends for the periods 1979–1998 and 1999–2018.
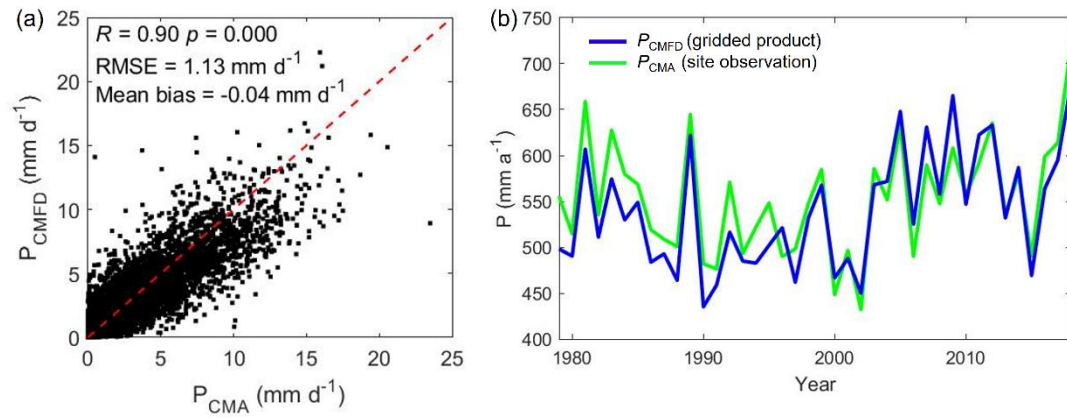
Figure S2. Comparison of (a) daily and (b) annual precipitation values between the mean of 11 meteorological stations (CMA) and the spatial mean precipitation from gridded data (CMFD). The dashed red line represents the 1:1 line.
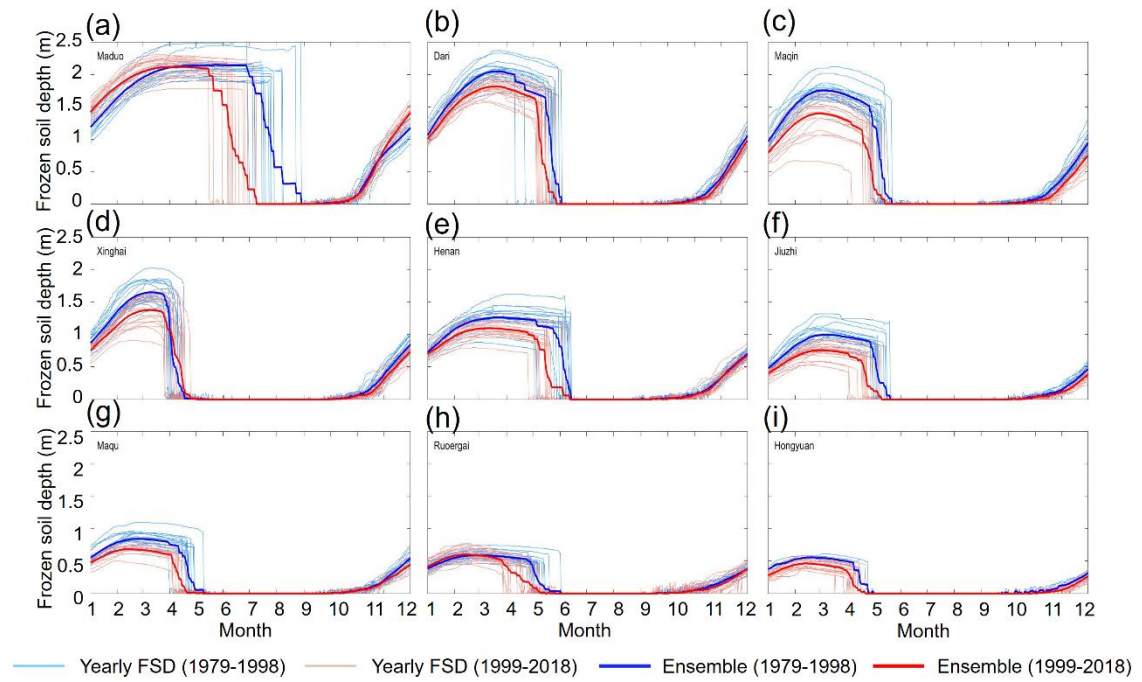
Figure S3. Observed frozen soil depths (FSD) at 9 meteorological stations. Panels (a–d) represent stations Maduo, Dari, Maqin and Xinghai, located in the permafrost region, while panels (e–i) depict stations Henan, Jiuzhi, Maqu, Ruoergai and Hongyuan, situated in areas with seasonally frozen ground. Blue lines represent annual FSD during the period 1979–1998, with the bold blue line indicating the mean FSD over these 20 years. Similarly, red lines represent annual FSD during 1999–2018, with the bold red line indicating the corresponding 20-year mean.

Table S1. Basic information for the 11 meteorological stations provided by the China Meteorological Administration (CMA), including station name, geographic coordinates (latitude and longitude), elevation, and frozen ground type.

No	Name	Latitude (°N)	Longitude (°E)	Elevation (m)	Frozen ground type
1	Maduo	34.92	98.22	4272.3	Permafrost
2	Dari	33.75	99.65	3967.5	Permafrost
3	Maqin	34.48	100.23	3719.0	Permafrost
4	Xinghai	35.58	99.98	3323.2	Permafrost
5	Henan	34.73	101.60	3500.0	Seasonally frozen ground
6	Jiuzhi	33.43	101.48	3628.5	Seasonally frozen ground
7	Maqu	34.00	102.08	3471.4	Seasonally frozen ground
8	Ruoergai	33.58	102.97	3441.4	Seasonally frozen ground
9	Hongyuan	32.80	102.55	3491.6	Seasonally frozen ground
10	Tongde	35.25	100.60	3080.0	No frozen soil depth data
11	Zeku	35.03	101.47	3662.8	No frozen soil depth data