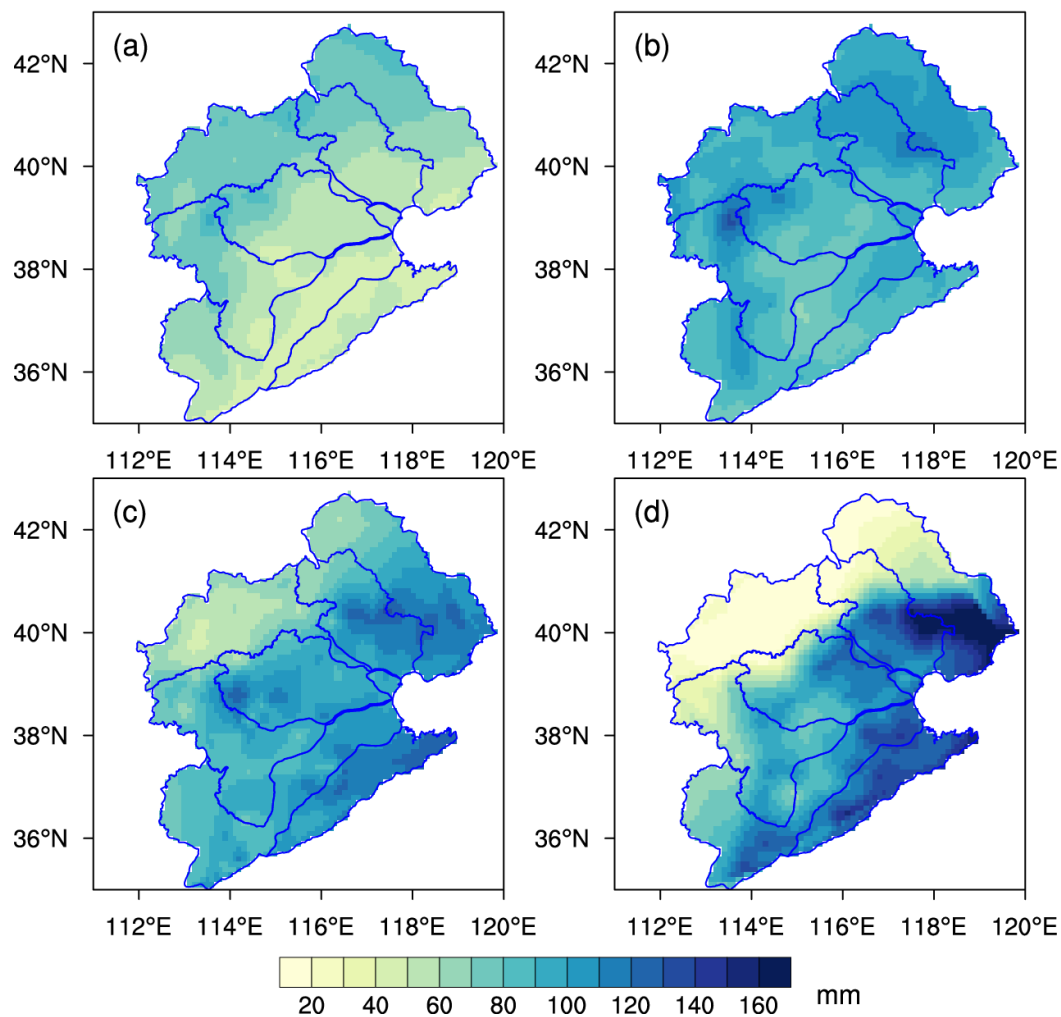# Supplementary Material

Figure S1. Spatial distributions of the summer PA according to the different grades in the Haihe River basin for the period of 1991–2020 (a, light rain; b, moderate rain; c, heavy rain; d, torrential rain).
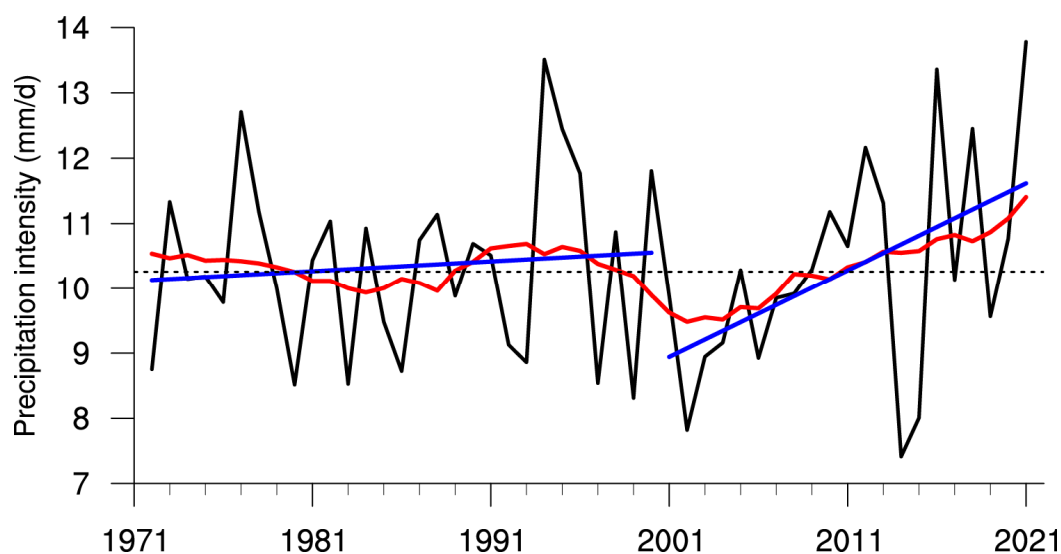
Figure S2. Time series of summer precipitation intensity in the Haihe River basin for the period of 1972–2021 (the red line is the 11-year moving average, and the blue lines are the trend lines for the periods of 1972–2000 and 2001–2021).
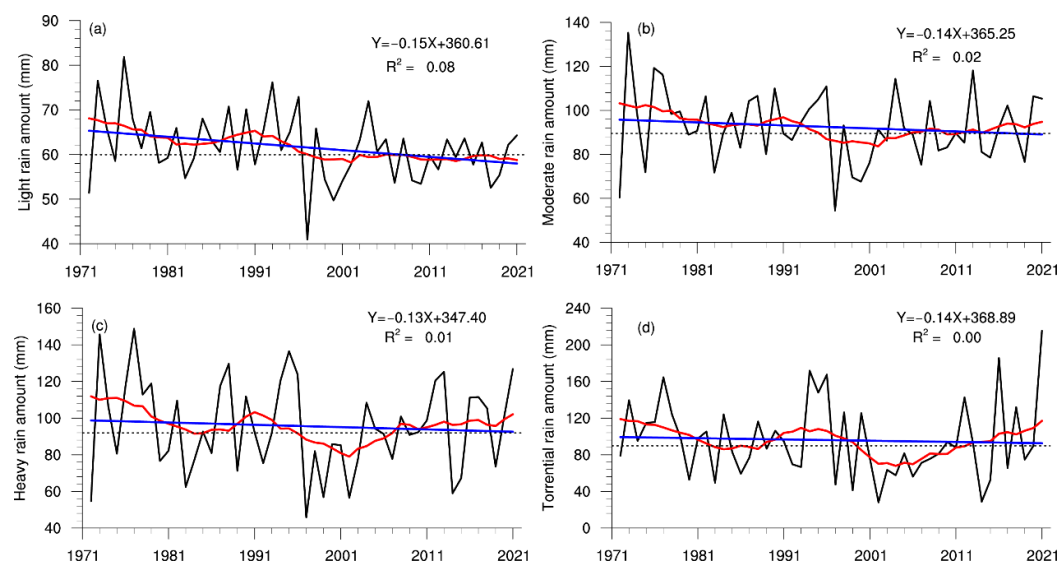
(a) $Y=-0.15X+360.61$ $R^2 = 0.08$

(b) $Y=-0.14X+365.25$ $R^2 = 0.02$

(c) $Y=-0.13X+347.40$ $R^2 = 0.01$

(d) $Y=-0.14X+368.89$ $R^2 = 0.00$

Figure S3. Time series of the summer PA according to the different grades in the Haihe River basin for the period of 1972–2021 (the blue lines are the trend lines, and the red lines are the 11-year moving average).
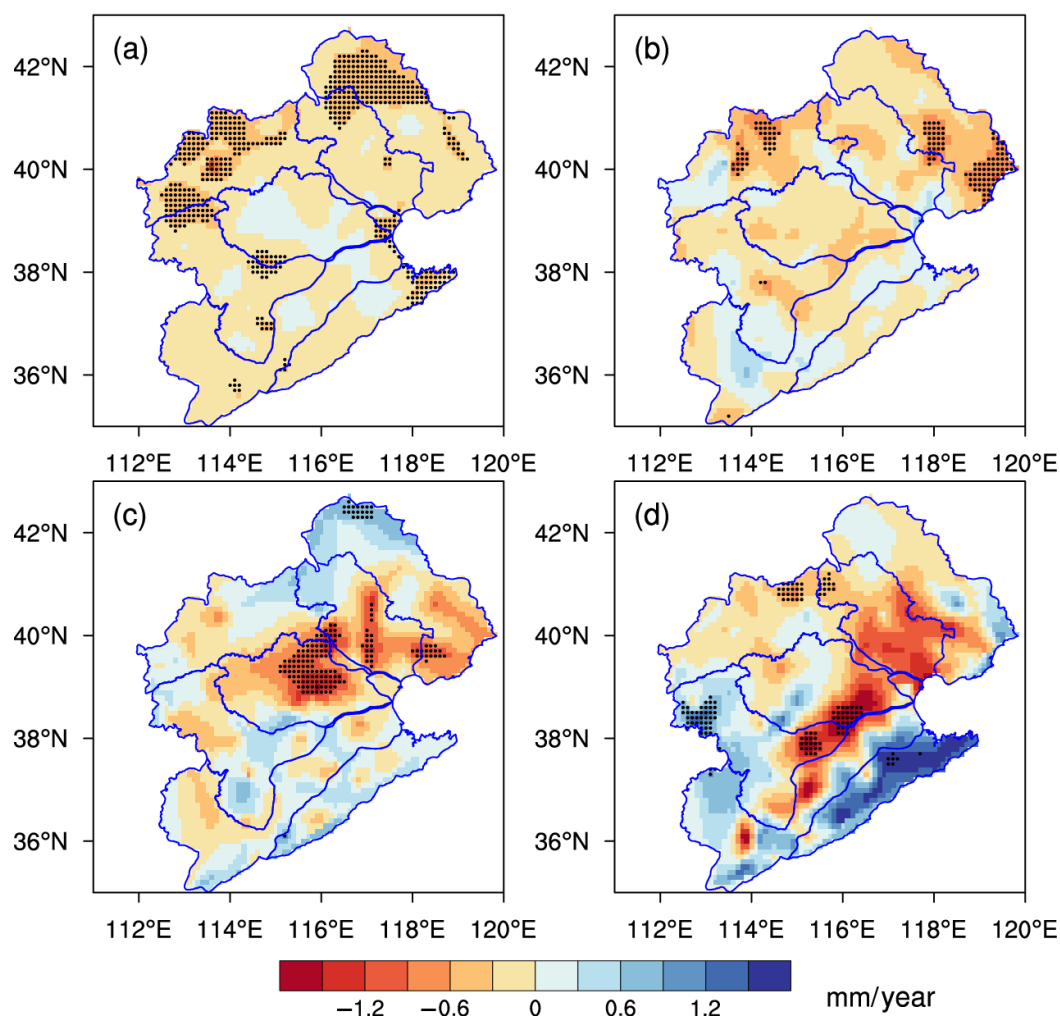
Figure S4. Spatial distributions of trends in the summer PA according to the different grades for the period of 1972–2021 (a, light rain; b, moderate rain; c, heavy rain; d, torrential rain). The dotted areas denote significant trends at the 95% confidence level.
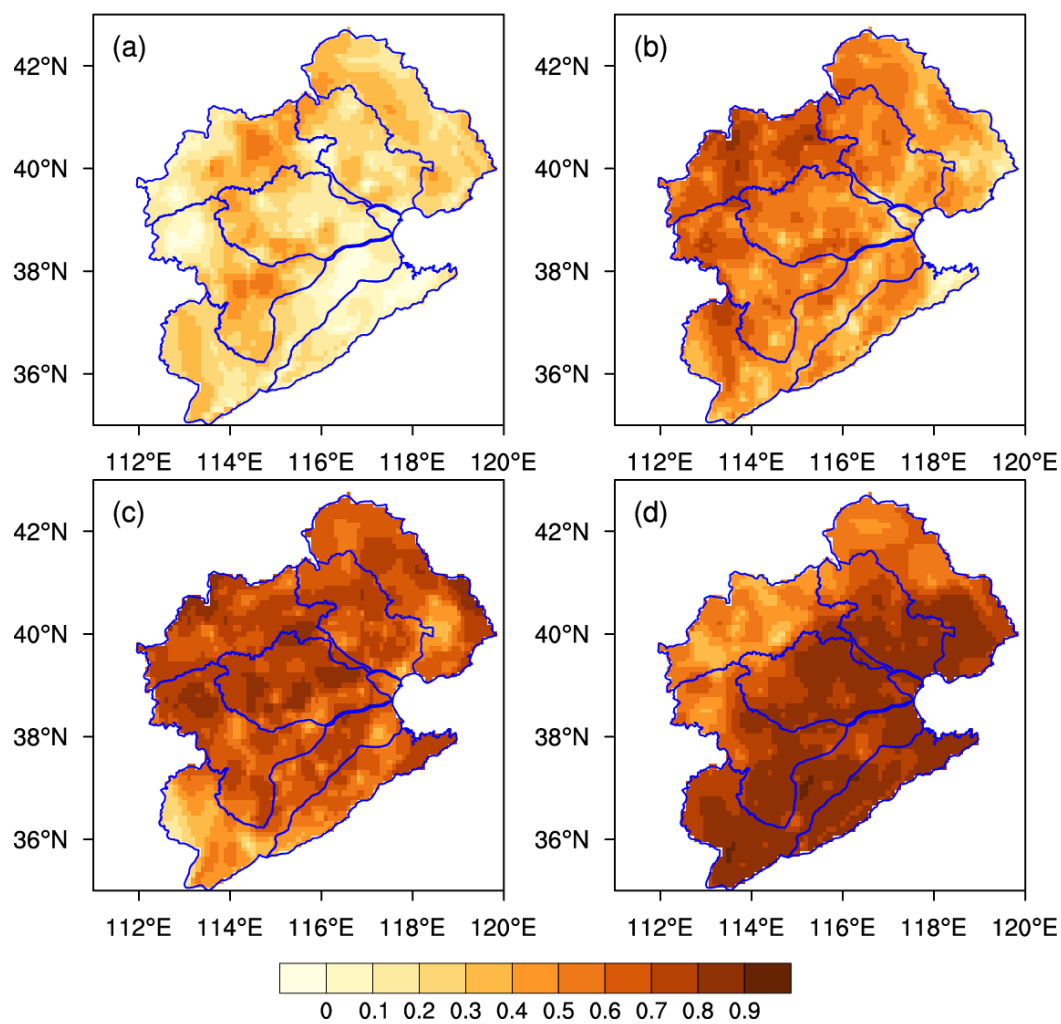
Figure S5. Spatial distributions of correlation coefficients between the summer PA and NRD according to the different grades for the period of 1972–2021 (a, light rain; b, moderate rain; c, heavy rain; d, torrential rain).
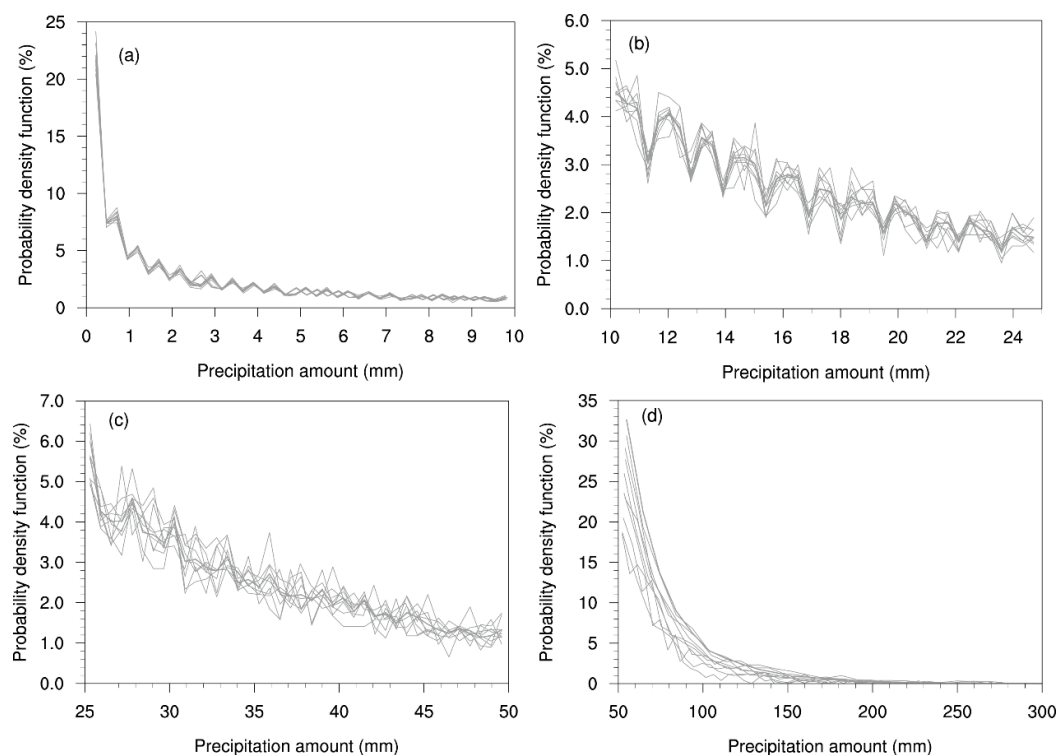
Figure S6. Probability density function distributions of the PA according to the different grades for different levels of drought and flooding (a, light rain; b, moderate rain; c, heavy rain; d, torrential rain).
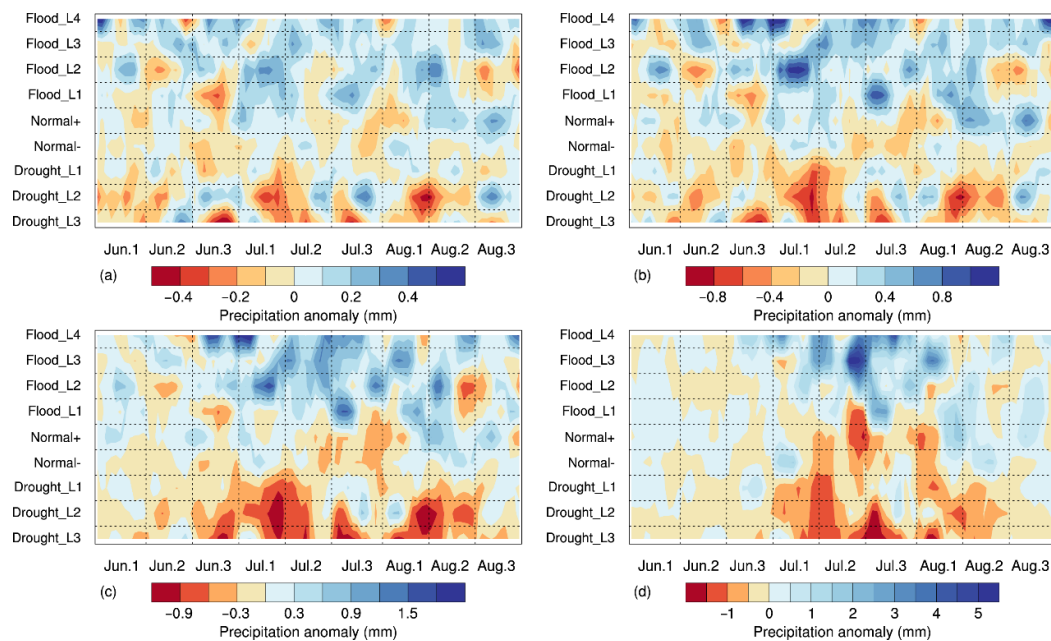

Figure S7. Daily precipitation anomalies in summer according to the different grades relative to the period of 1991–2020 for different levels of drought and flooding (a, light rain; b, moderate rain; c, heavy rain; d, torrential rain). Jun.1 means the first ten days of June, etc.
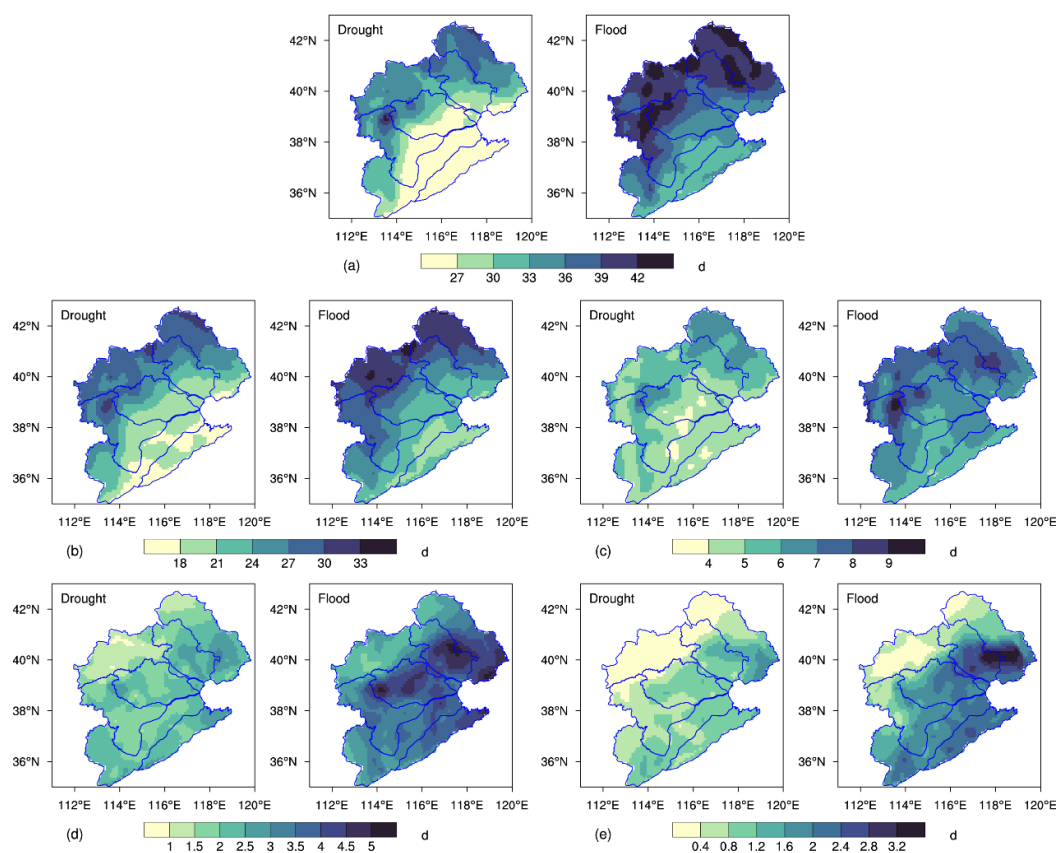
Figure S8. Spatial distributions of the summer NRD according to the different precipitation grades in the drought and flooding scenarios (a, total precipitation; b, light rain; c, moderate rain; d, heavy rain; e, torrential rain).