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Analysis of Hydrological Characteristics of the Haihe River Basin from 2012 to 2023

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Abstract: Based on remote sensing observation data from 2012 to 2023, this study systematically analyzed the effects of rainfall and the moisture content of the 0-10 cm surface soil on the variability of evaporation in bare soil. The Mann-Kendall (M-K) mutation test method was adopted in the study to conduct an in-depth discussion on the annual average distribution of rainfall, surface soil moisture content and bare soil evaporation, as well as the monthly mutation characteristics. The results show that the precipitation and bare soil evaporation in the Haihe River Basin reach their maximum values in July and June respectively, and the surface soil moisture content reaches its maximum value in August. However, the influence of rainfall shows obvious lag and seasonal dependence, and it is found that there are significant differences in the three variables on both sides of the Yanshan Mountains. The M-K mutation test further revealed that the mutation points of the three in the annual distribution were mainly concentrated in late spring and early summer and autumn. The rainfall increased sharply in June, the surface soil moisture content increased sharply in May, and the evaporation of bare soil generally decreased sharply in November, suggesting that the climate seasonal transition and precipitation events play a key regulatory role in the evaporation process. This study provides data support and theoretical basis for understanding the surface water heat exchange mechanism in arid and

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semi-arid regions and improving the parameterization scheme of bare soil evaporation in land surface process models.

Keywords: Remote sensing; Spatio-temporal variability; Mann-Kendall test



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