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Spatiotemporal pattern of precipitation concentration and its possible causes in the Pearl River basin, China

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Spatiotemporal pattern of precipitation concentration is a key factor for hydrological analysis. This paper attempts to explore the spatiotemporal variations and the causes of the variations of precipitation concentration. Firstly, Mann-Kendall statistical test and Sen's slope method are used to detect the temporal patterns of annual precipitation concentration index (ACI), and inverse distance weighted (IDW) interpolation method is used to analyze the spatial change of long period precipitation concentration index (LCI) as well as the temporal variation trend of ACI based on daily precipitation of 42 sites during 1960-2012 in the Pearl River basin. Secondly, possible link between precipitation concentration and elevation is investigated by calculating the correlation coefficient between LCI and elevation. Finally, the random forest algorithm (RF) is applied to identify the contributions on CI among 7 associated circulation influencing factors. The results showed that: 1) The northwest of the Pearl River basin, farther to sea with higher elevation, shows lower LCI. While the southeast part where is closer to sea with lower elevation shows higher LCI, indicating that the extreme precipitation events will occur more frequently in the lower elevation and the nearer sea areas. 2) The interannual variation of ACI in the Pearl River basin is not obvious, the northwest part shows decreasing trend while the southeast part is in increasing trend, the spatial distribution of the ACI changing trend is likely to be affected by the distances from the ocean and elevation. 3) Precipitation concentration is negatively correlated with elevation (with a correlation coefficient of -0.92) at the 99 % confidence level. 4) The significance analysis based on RF shows that the East Asian Summer Monsoon (EASM) is the most significant factor affecting precipitation concentration of the Pearl River basin among 7 associated circulation influencing factors.