Investigation on flood event variations at space and time scales in the Huai River Basin of China using flood behavior classification

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April 28, 2020

Abstract

Flood is one of the severest natural disasters in the world and causes huge losses to human life and property. Previous studies usually focus on flood peak and its occurrence at event scale which are insufficient to contain entire behavior characteristics of flood events and their spatio-temporal variations. In our study, 12 behavior metrics in five categories (e.g. magnitude, duration, timing, rating of changes and variability) are adopted to fully describe the flood event. Regional and interannual variations of representative flood classes are investigated based on behavior similarity classification of numerous events by principal component analysis and hierarchical clustering. Contributions of geographical, land use, hydrometeorological and human regulation on these variations are explored by rank analysis method. There are 342 flood events from 2006 to 2015 at 39 stations across the upper and middle Huai River Basin of China selected for our study. Results show that: five representative classes are identified, namely conventional events (Class 1, 61.7% of total), low volume events with multiple peaks (Class 2, 5.3%), low volume events with low ratings of changes (Class 3, 18.1%), low volume events with high ratings of changes (Class 4, 10.8%) and high volume events with long durations (Class 5, 4.1%). Classes 1 and 3 are the major flood events, distributed across the whole region. Class 4 mainly distributes in river sources, while Classes 2 and 5 distribute in middle and down streams. Moreover, the class is the most diverse in normal precipitation years (2006, 2008-2010 and 2015), followed by wet years (2007, 2013-2014), but it is the most homogeneous in dry years (2011 and 2012). All the impact factor categories explain 34.0—84.1% of individual flood class variations. The hydrometeorological category (7.2-56.9%) is the most important, followed by geographical (1.0-6.3%), regulation (1.7-5.1%) and land use (0.9-2.2%) categories. This study could provide new insights into the flood event variations in a comprehensive manner, and provide decision-making basis for flood control and resource utilization at basin scale.

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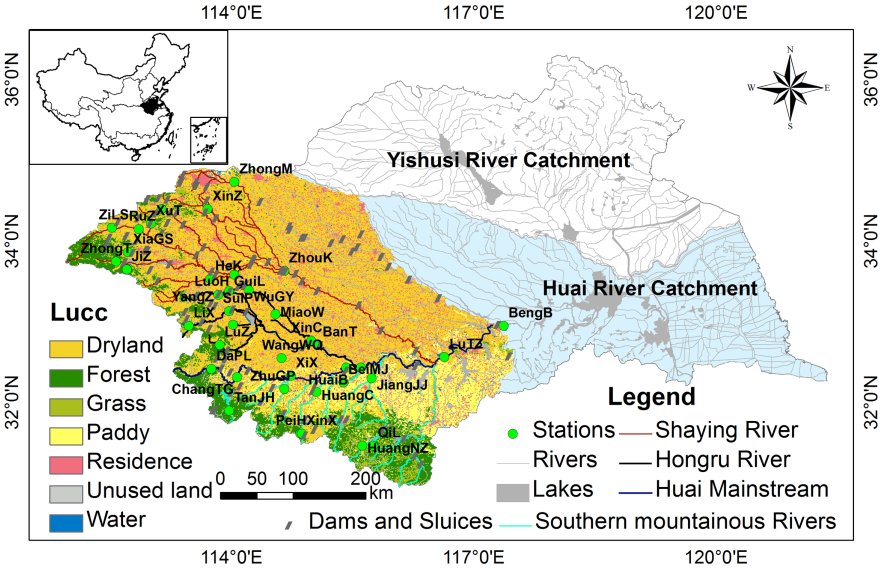

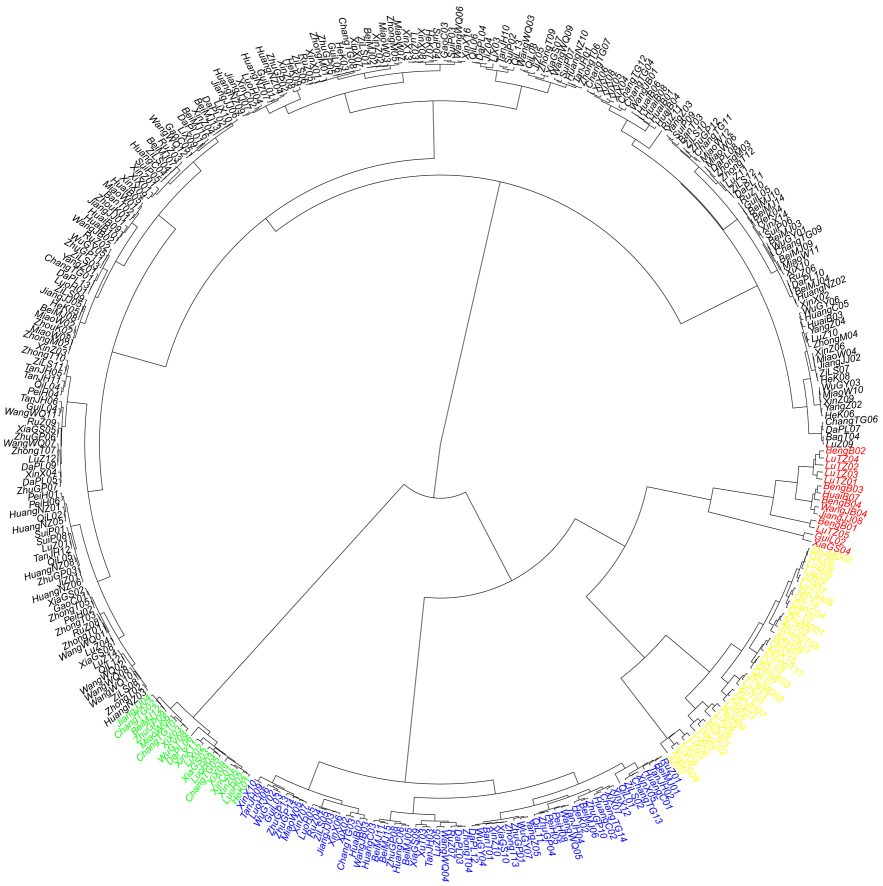

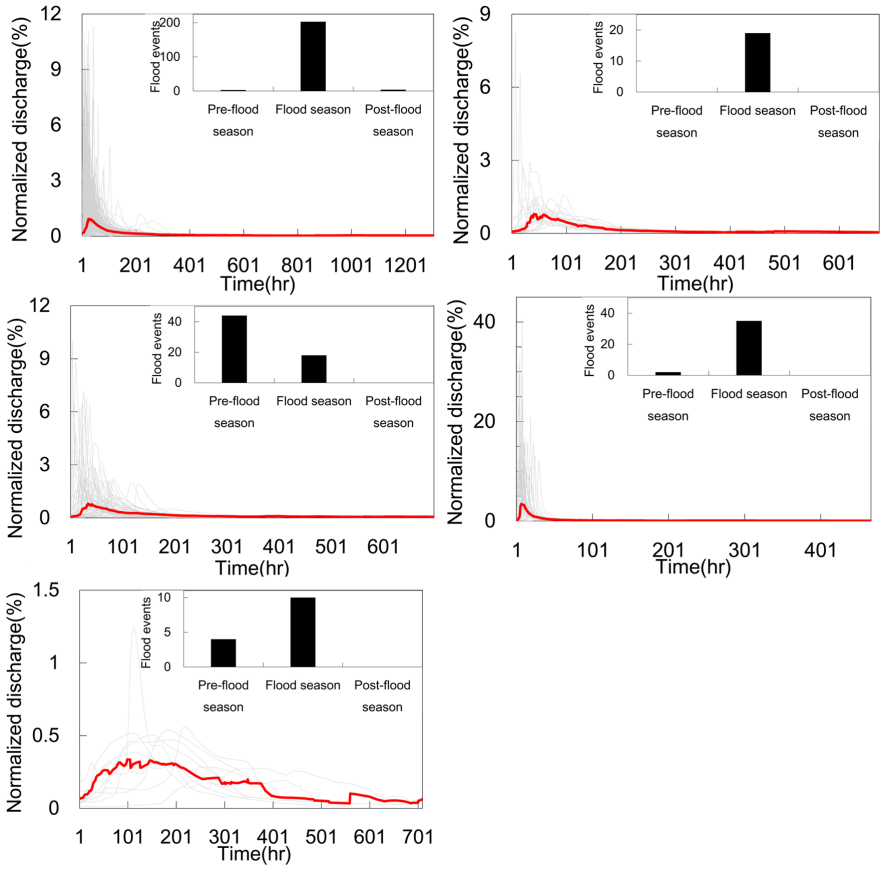

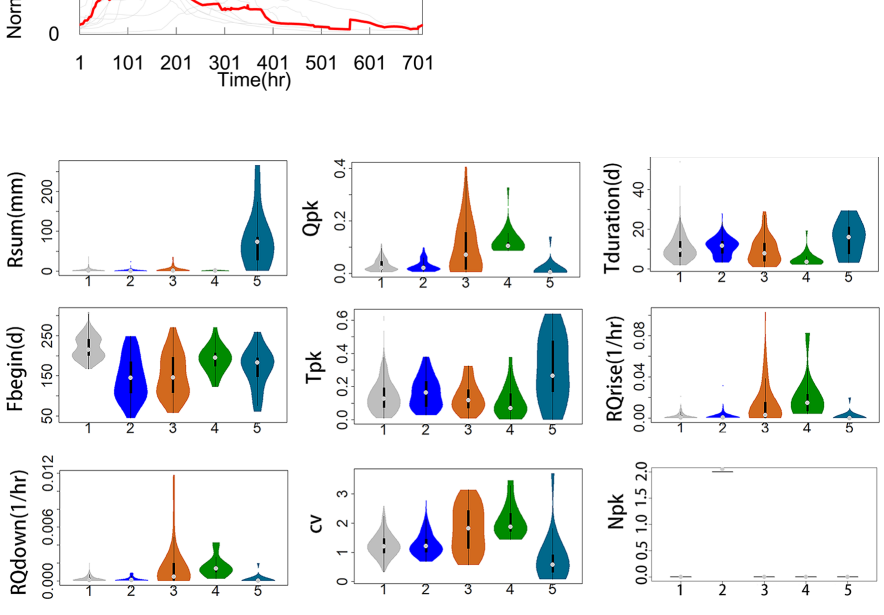

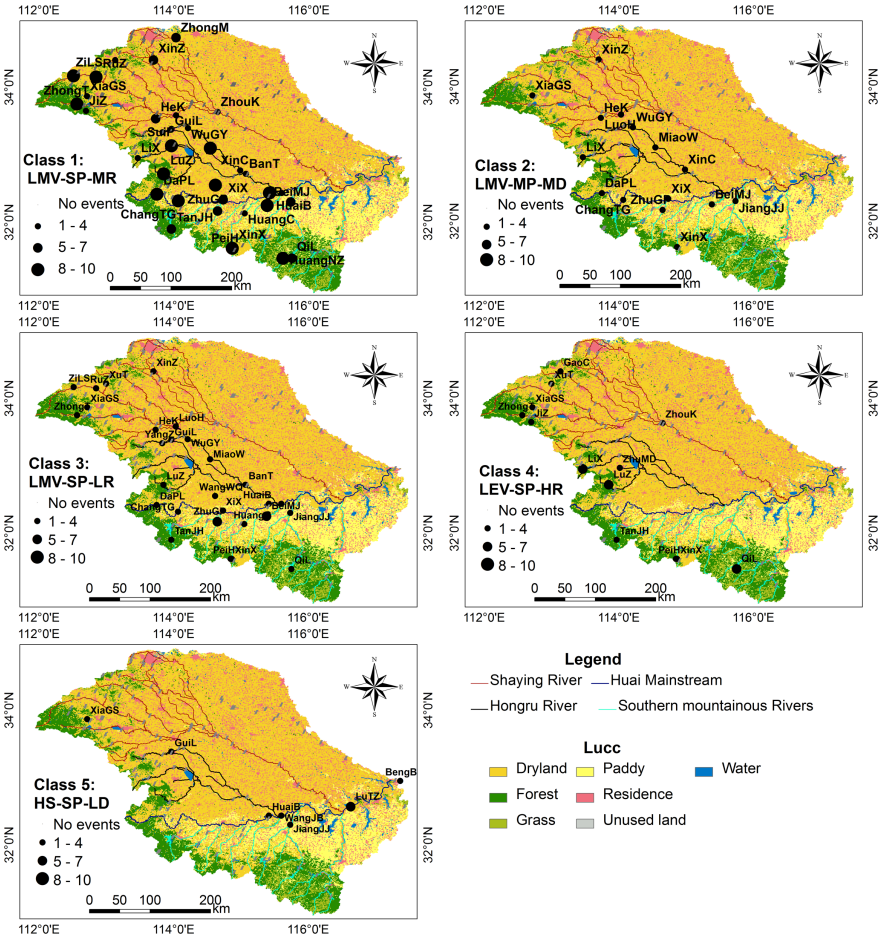

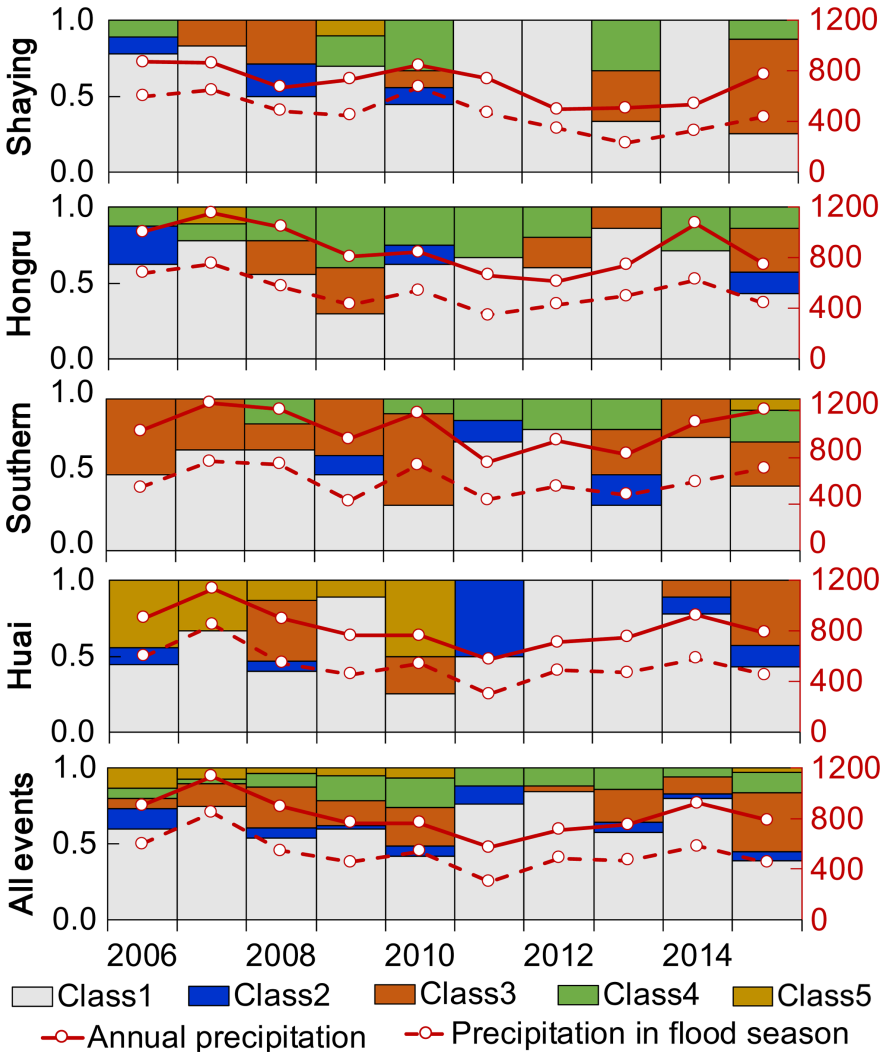

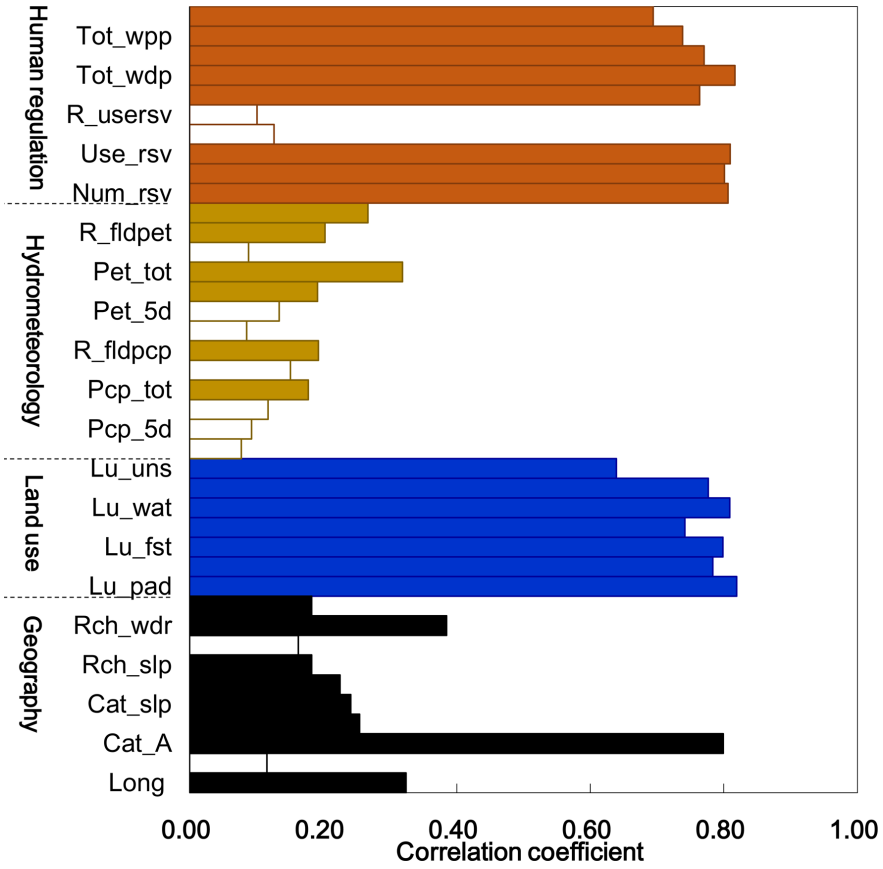

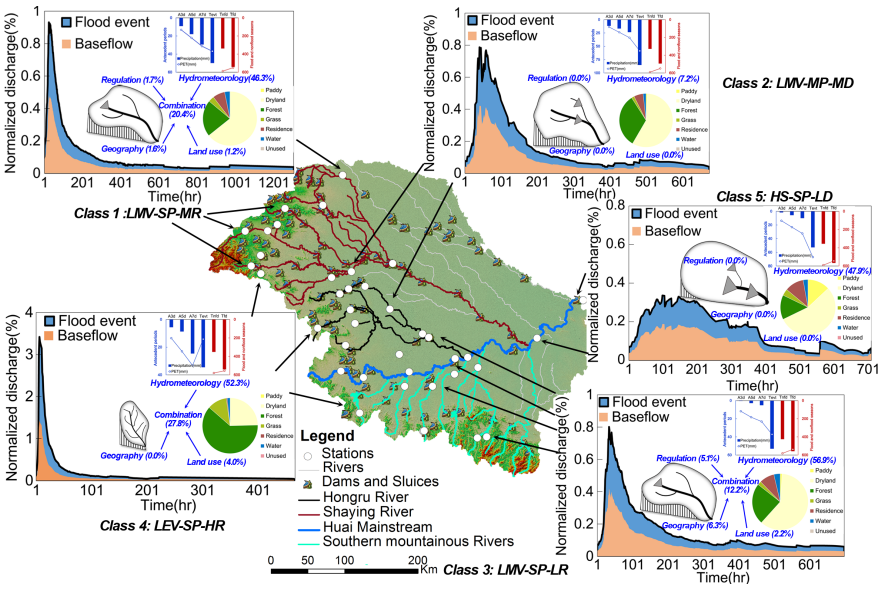

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