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Global Floods and Their Connections with the El Niño-Southern Oscillation During the TRMM/GPM Era

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This study is focused on exploring global flood characteristics and variations using the outputs from a hydrological model driven by the high-quality satellite-based precipitation product, the TRMM/TMPA and GPM/IMERG. The possible impact of large-scale climate modes such as the El Nino-Southern Oscillation (ENSO) during the TRMM/GPM period is further examined. Flood events are first defined based on the peaks-over-threshold approach with spatial and temporal properties. Indices representing various aspects of simulated floods are further derived at grids and river basin/sub-basin scales, including flood frequency and duration, intensity, extension, annual maximum flow and annual mean river discharge, etc. Consistency tests among various flood indices are then performed including an examination of their sensitivities to satellite-based precipitation inputs.
Connections between flood events and climate modes specifically the ENSO during the TRMM/GPM period are further explored by estimating correlation relations of these indices with ENSO index at grids and over a variety of large river basins. Specifically, we will focus on investigating whether there are any significant differences in the ENSO responses between flood duration and frequency, and also how different they respond in different river basins. Furthermore, the effects of distinct ENSO phases (warm, cold, and neutral) on flood characteristics including both duration and frequency and annual maximum flow in major river basins will be examined.