

# Scientists explore synergistic effect of weather systems on a flood event in central China

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Pedestrians and vehicles trudged on the flooded street during rainfall in Zhengzhou Henan on July 21, 2021. Credit: Lin Lyuhua

In July 2021, central China's Henan Province experienced an extraordinary event—a prolonged heavy rainfall period marked by record-breaking hourly rain rates and substantial precipitation accumulation.

The event took place in an anomalous synoptic circulation pattern: the coexistence of a northwestward-shifting western Pacific subtropical high (WPSH) and Typhoon In-Fa (2021) over the East China Sea. However, few studies have focused on the synergistic effect of the WPSH and Typhoon In-Fa on this particular [heavy rainfall](#).

A research team led by Prof. Chen Guanghua from the Institute of Atmospheric Physics of the Chinese Academy of Sciences has revealed the physical mechanism responsible for this heavy rainfall event in the summer of 2021 by conducting a series of numerical simulations.

Their findings were published in the *Journal of Geophysical Research: Atmospheres*.

The researchers found that this rainfall event unfolded under the highly favorable WPSH and Typhoon In-Fa circulations and their cooperation. "Notably, the contribution of Typhoon In-Fa is greater in amplifying the rainfall compared to the WPSH," said Prof. Chen, corresponding author of the study.

Additionally, the study identified the critical role played by the expansive and strong nature of the WPSH and Typhoon In-Fa in enhancing the northward and westward moisture transports, respectively. Conversely, weakening of these systems led to a decrease in moisture transport. Moreover, the distribution of equivalent potential temperature and divergence were closely linked to the region of heavy rainfall.

Prof. Chen also emphasized the importance of further exploration in this

field. "This study serves as a preliminary endeavor to comprehend the synergistic effects of weather systems on heavy [rainfall](#). Ongoing research aims to delve into the interactions among multi-scale systems."

As [climate change](#) continues to escalate, the frequency and intensity of extreme weather events are anticipated to rise. Understanding the factors driving these events is important in enhancing preparedness and mitigating their impact.

**More information:** Chenhong Rao et al, Effects of Typhoon In-Fa (2021) and the Western Pacific Subtropical High on an Extreme Heavy Rainfall Event in Central China, *Journal of Geophysical Research: Atmospheres* (2023). [DOI: 10.1029/2022JD037924](https://doi.org/10.1029/2022JD037924)

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