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Return Period Analysis of Maximum Daily Rainfall Disasters in the Zagros Mountains, Iran: March (2019)

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This study investigates the return period of heavy rainfall events in the Zagros Mountains of Iran, with a particular focus on the floods that occurred in March 2019. The annual and monthly variation and statistical characteristic of maximum daily rainfall variation were examined over the available data in the Karkheh River Basin, located in western Iran's Zagros Mountain. The return period of the extreme rainfall intensity is estimated using "HyfranPlus"to assess various probability distributions, including Generalized Extreme Value (GEV), log-normal, log-normal Type III, Pearson Type III, Gumbel, and Inverse Gamma.

The result shows in the annual total rainfall did not exhibit a significant trend; however, maximum daily rainfall demonstrated an increasing trend, indicating a rise in heavy rainfall events. While the Gumbel distribution proved most effective for the 72-year record at Khorramabad, the Inverse Gamma distribution provided the best fit for shorter data periods, estimating return periods of 50 to 300 years for extreme rainfall events at different stations. However, at the Pol-Dokhtar and Nurabad stations, which recorded maximum daily rainfall of 139 mm and 101 mm, respectively, in March 2019, the statistical distributions indicated return periods ranging from 70 to 300 years. Notably, the highest daily rainfall over the long term did not occur in March or April.

In March 2019, maximum daily rainfall exceeded the long-term average, a consequence of increased rainfall upstream that led to flooding downstream in the Karkheh basin. While the heavy rainfall events in March and April 2019—potentially linked to climate change—resulted in significant flooding and damage, other factors, such as alterations in land surface structure, particularly along riverbanks, also contributed to the increased human and financial losses. Overall, our research contributes to the understanding of hydrological extremes and informs strategies to mitigate flood-related damages in the Zagros Mountains, ultimately supporting climate resilience efforts in vulnerable regions.

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Session

Precipitation and Hydrological Models: Extreme precipitation events

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