

# Identification and Estimation of Extreme Rainfalls of Southern Coast of the Caspian Sea Using Extreme Value Analysis Theory

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## Abstract

Extreme rainfalls of 13 synoptic stations located in the southern coast of the Caspian Sea were investigated using two approaches of Extreme Value Analysis Theory, including Generalized Extreme Value Distribution (GEVD) and Generalized Pareto Distribution (GPD) during the period of 1957-2016. The distribution parameters were calculated using maximum likelihood and generalized maximum likelihood estimation. Return level of extreme precipitation were calculated in each station at 95% confidence level based on the return periods of 2, 5, 10, 20 and 100 years. The stationarity of the extreme values at each station was examined using the Mann-Kendall trend test before estimating the return levels. Results of the trend test showed that extreme rainfall of Anzali synoptic station according to the Block Maxima approach, as well as Ramsar and Maraveh-Tappeh stations based on the Peak over threshold approach, were considered to be non-stationary with P-values of 0.04, 0.03 and 0.03 respectively. The models comparison performed using graphical methods as well as the Akaike information criterion (AIC). It was found that the block maxima approach based on the maximum likelihood estimation was more suitable for most of the stations in the region. Rasht, Anzali, Astara, Noshahr, Ramsar and Gorgan stations provided better results with a longer time series, especially based on graphical tests. Results showed that, despite the uncertainty, the extreme rainfalls at the stations of Anzali, Ramsar and Babolsar would increase at a higher rate than other stations in the region. This trend in Rasht, Sari and Manjil stations would likely increase in the future, although at a slower rate.

Keywords: *Extreme rainfall, Extreme Value Analysis Theory, Blocks Maxima, Peak over Thresholds, Southern coast of the Caspian Sea.*

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