

New-record theory of annual maximum precipitation associated with the temperature trend among 58 stations and database for Policy Decision making for Future climate change (d4PDF), Japan

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There is a question whether the number of new records of extreme precipitation has increased relatively due to the rising temperature. The fact of how saturated vapor change by Clausius Clapeyron relation can be accountable to identify how the number of record-breaking of extreme rainfall event changes relatively with the temperature trend. This study begins with a new-record theory without the temperature trend when the precipitation occurrences are assumed as independent identical distribution random variable under the stationary climate in time series. Using the Clausius Clapeyron relation, the new-record theory is then demonstrated with an input of the temperature with trend which identifies the variation of water vapor change combine with the stochastic variation without trend of observed precipitation. The new-record theory associated with the temperature trend shows the mean record number increase when the temperature gradient is increased. An analysis is conducted on the past dataset from 1901 to 2018 among 58 stations around Japan from Automated Meteorological Data Acquisition System (AMeDAS). Apparently, the mean number of record-breaking among all observatories are higher compared to that of the theory without temperature trend. From the dataset, the two cases of daily and 3-day annual maximum rainfall scenarios response to the same conditions. However, when analyzing the past dataset of d4PDF 5 km resolution in Ishikari, Tokachi, and Tokoro river catchment, the result shows that the number of new-record distribution is higher among the mountainous region. This result is even more fascinating on how the topographic effect on the record-breaking event, and how to cooperate the topographic change in the new-record theory of extreme precipitation.