

Seasonality in the extreme precipitation events linked to temperature over Japan

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The frequency of extreme precipitation events is expected to increase in future warmer climate according to the Clausius-Clapeyron (CC) equation which states that atmosphere can hold more moisture in warmer air temperature (about 7 percent per increase of 1°C). In this study, the extreme precipitation intensities linked to temperature are investigated for different seasons over seven sub-regions of Japan by analyzing the d4PDF dataset at 20 km in present (1951-2010) and future climate (2051-2110). To do this we stratified the precipitation intensities of wet days (defined as excess of 1 mm per day) in different temperature bins at 1°C intervals and computed the 99-percentile of the precipitation intensities from each temperature bin. We find that the extreme precipitation intensities linked to temperature is strongly influenced by the seasons and regions of Japan. The extreme precipitation intensities increase with temperature up to 21°C over northern Japan, while the extreme precipitation intensities over Okinawa increase up to 24°C. Intensities of extreme precipitation events over northern parts of Japan including Hokkaido and Tohoku regions are increased by about 10 mm per day in future warming climate, while over western regions of Japan it is increased by about 20 mm per day. Seasonal analysis indicates a super CC relationship in winter season and a sub CC relationship in summer. Overall results suggest that Japanese regions may experience more extreme precipitations in future warming climate.

Keywords: Extreme Precipitation Events, d4PDF, Clausius-Clapeyron Equation