

## Temperature rises and extreme rainfall intensity derived from observations and d4PDF in Japan

\*Sayaka Yoshikawa<sup>1,3</sup>, Megumi Watanabe<sup>2</sup>, Shinjiro Kanae<sup>3</sup>

1. Ibaraki university, 2. The university Tokyo, 3. Tokyo institute of technology

The intensification of heavy rainfall in a warmer climate could follow the Clausius-Clapeyron (CC) relationship (7%/°C). Although there are studies which depict the intensification of heavy rainfall based on numerical climate model simulations, analyses based on observed records are limited in terms of whether the intensification eventually follows the CC relationship. In this study, we try to analyze whether the CC scaling can be applied to the intensification of heavy rainfall over Japan using observation data and a large-ensemble climate simulation database, namely d4PDF. We clarified the following three things. First, the intensification rate of sub-daily extremes is higher than that of daily extremes. Second, the intensification rate of rainfall extremes derived from climate models with a multiple ensemble coincides with that derived from observations. Third, the intensification rate of rainfall extremes under huge amounts of simulation results derived from climate models from the past to the future periods are less than those of the CC relationship. Although a large ensemble of climate simulations is a powerful tool for estimating extreme rainfall under climate change in the future, intensification rate of rainfall extremes derived from climate models in the future periods could be underestimated compared with those in the past periods.

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