Spatiotemporal structure of extreme precipitations during landfalling of typhoons over northern Japan

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Typhoons are considered as one of the hazardous weather phenomena in the earth those cause widespread flooding to the landfall regions. Thus to comprehend the severity of such devastating events, many previous studies have focused on the typhoon induced precipitation intensities. In our study, we investigated the spatiotemporal structure of extreme precipitations induced by unusual landfalling of four typhoons in August 2016 over northern Japan. Three typhoons [Typhoon Chanthu (T1607), Typhoon Mindulle (T1609), and Typhoon Kompasu (T1611)] made landfall over Hokkaido region and one typhoon [Typhoon Lionrock (T1610)] made landfall over Tohoku region. The main focus was on to understand the cell sizes and spell durations of these typhoon induced extreme precipitations over northern Japan from the Radar Automated Meteorological Data Acquisition System (Radar-AMeDAS) observed hourly precipitation. To do this, the independent cell sizes and spell durations of extreme precipitations (various percentiles) are stratified into different bins and the frequency in each bin are computed. Our results indicate that the normalized durations of the extreme precipitations induced by three typhoons landfalling over Hokkaido region exhibit similar features, while the typhoon landfalled over Tohoku region shows relatively long-lived extreme precipitation durations. However, all the four typhoons show a robust feature in the normalized extreme precipitation sizes over northern Japan. The occurrence of extremely heavy precipitations (higher than 99th percentile) carried out by all the four typhoons are mostly short-lived and last up to 6-9 hours. We would like to discuss more on this by downscaling these typhoons at 1-km grid resolution in present climate and with pseudo global warming (PGW) conditions by using Weather Research and Forecasting (WRF) model to understand the response of spatiotemporal precipitation structures of these typhoons to climate change.

Keywords: Precipitation characterization, Typhoon, Extreme precipitation

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