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極端な降雨と極端な対流を伴う降水システムの地域・季節特性
Characteristic differences between the heaviest rainfall and the strongest convection

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Regional and seasonal differences in the rain characteristics between rain-rate and convection extreme events are examined using 11-yr measurements from the Precipitation Radar (PR) onboard the Tropical Rainfall Measuring Mission (TRMM) satellite. After defining a rainfall event as a set of contiguous rainy pixels of TRMM PR measurements, three different types of regional extreme rainfall events are defined, using the maximum values of near-surface rainfall rate (NSR) and 30-dBZ echo top height (ETH30) in rainfall event; Rainfall events of which the maximum NSR is within top 0.1% at a grid but the ETH30 is not are defined as R-only extreme events, those of which the maximum ETH30 is within top 0.1% but the NSR is not are defined as H-only extreme events, and those of which both of the maximum NSR and maximum ETH30 are within top 0.1% are defined as RH extreme events. This is done on a local basis with 2.5 x 2.5 degree horizontal resolution to examine regional extreme events.

It is shown that the fractional occurrence of RH extreme events are less than 30% in most regions, indicating that only a few dozen percent of convection extremes are related to rain rate extremes. There are robust differences in echo profiles, rainfall characteristics, and local environments between R-only and H-only extreme events. These characteristic differences are basically independent on region and season, except for their seasonal occurrence. R-only extreme events exhibit lower echo-top height than H-only extremes, linear downward increase of radar reflectivity (Ze) below freezing level, and sharp upward decrease of Ze in 5-7 km, whereas H-only extreme events exhibit slight downward decrease of Ze below freezing level. R-only extreme events are almost in phase with mean monthly rainfall, while H-only extremes tend to peak slightly out of phase with rainy season. Local environments related to R-only extremes are less convectively unstable, wetter in the low-middle troposphere, and larger moisture flux convergence in the lowermost troposphere, compared with those related to H-only extremes. The features related to R-only extreme events imply a dominance of warm-rain process.

キーワード: 降水, 極端現象, TRMM
Keywords: precipitation, extreme event, TRMM