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Statistical analyses on the characteristics of heavy rainfall events

TSUGUTI, Hiroshige[1]* ; KATO, Teruyuki[1]

[1]Meteorological Research Institute

In this study, to clarify general characteristics of heavy rainfall events in Japan, we have conducted various statistical analyses on them.

For the warm seasons (April - November) from 1995 to 2009, we objectively extracted heavy rainfall events occurring in Japan by using Radar-Raingauge analyzed rainfall dataset produced by the Japan Meteorological Agency. As a result, 386 events were extracted. Over 75 % of all events occurred during three months of July, August, and September, and many events were distributed around the coastal areas of the Pacific Ocean in Kyushu, Shikoku, Kinki, and Tokai regions. Synoptic weather conditions causing the heavy rainfall events were clarified, and consequently the pattern associated with typhoons or tropical cyclones was the most predominant, which accounted for 32.4 % of all events. Then, stationary fronts, remote precipitation of typhoons or tropical cyclones, and low depressions accounted for 21.2 %, 17.9 %, and 14.2 %, respectively. The classification for the shape of the precipitation systems causing the heavy rainfall events showed that the most predominant system was "band-shaped", which accounted for 43.5 % of all events.

The environmental fields of heavy rainfall events ($>$130 mm/3hr) were statistically analyzed using the Japanese 55-year reanalysis data (JRA-55). Characteristics of them were elucidated by comparing the environmental fields of moderate rainfall events (10-30 mm/3hr). In July (the late Baiu season) in Kyushu region, the low-level equivalent potential temperature and water vapor flux in the vicinity of Kyushu Island were significantly larger in heavy rainfall events than in moderate ones, and the atmospheric stability became more unstable in heavy rainfall events. Furthermore, to distinguish heavy rainfall events from moderate ones, the combination of two elements of low-level water vapor flux and atmospheric stability was more effective than the unique usage of each element.

Keywords: heavy rainfall, statistical analysis