

Formation factors of the 2015 Kanto-Tohoku heavy rainfall and its correspondences and NWP results of the JMA

*Teruyuki Kato¹, Hiroshige Tsuguti¹, Naoko Kitabatake¹

1.Meteorological Research Institute

In the 2015 Kanto-Tohoku heavy rainfall, 48-hourly accumulated rainfall amounts until 21 JST (= 9 hours + UTC) on 10 Sep. exceeded 500 mm in the northern part of Tochigi Prefecture, and that exceeding 300 mm was also observed in the southern part, which caused the collapse of an embankment of Kinu River in Joso City, Ibaraki Prefecture around 13 JST on 10 Sep. The Japan Meteorological Agency (JMA) alerted emergency warning at 0020JST on 10 Sep. for whole the region of Tochigi Prefecture and at 0745JST for Ibaraki Prefecture. For Kinu River, the information of overflowing occurrence was alerted for Kinu River at 0630JST on 10 Sep. In Tohoku area, 24-hourly accumulated rainfall amounts until 09 JST on 11 Sep. exceeded 300 mm around Ohsaki City, Miyagi Prefecture, which caused the collapse of an embankment of Shibui River around 07 JST on 11 Sep. JMA also alerted emergency warning at 0320JST on 11 Sep. for whole the region of Miyagi Prefecture. In the heavy rainfall in Kanto area, many band-shaped precipitation systems (BPSs) with the width of 20~30 km and the length of about 100 km successively formed to organize a huge rainfall area with the width of 100~200 km that extended over 500 km in a south-north direction. The formation and maintenance factors of the huge extending rainfall area could be that atmospheric conditions favorable for BPS formation (Kato 2015; 2016) maintained over Kanto area. These conditions were produced by the continuous inflow of low-level humid air to Kanto area that was initiated from the surrounding of Typhoon 1517 and was directed northwestward to the low pressure in the Sea of Japan changed from Severe Tropical Storm 1518. It also influenced the conditions that Kanto area was located between a deep pressure trough over western Japan and a sharp pressure ridge around Hokkaido. The heavy rainfall in Miyagi Prefecture was also caused by several BPSs. The maximum 24-hourly accumulated rainfall amount (R24max) of 605 mm was analyzed in northern Kanto until 12 JST on 10 Sep. Here, numerical weather predictions (NWP) are evaluated based on this value. The JMA global model (horizontal resolution: 20 km) with initial conditions at 09 JST on 9 Sep. predicted R24max of 165 mm in northern Kanto, but not any extending rainfall area. On the other hand, the JMA mesoscale model (horizontal resolution: 5km) with initial conditions at 12 JST on 9 Sep. predicted a south-north extending rainfall area in Tochigi Prefecture and R24max of 447 mm close to analyzed rainfall amounts. The location of the extending rainfall area predicted by the mesoscale model moved in northern Kanto for different initial conditions, and the predicted Rmax24 ranged between 300 and 500 mm. The mesoscale model, however, predicted the extended rainfall area between eastern Gunma Prefecture and Tochigi Prefecture before 24 hours (initial: 21 JST on 8 Sep.), and could indicate high potential to BPS formation in northern Kanto before further 12 hours (initial: 12 JST 8 Sep.) that was estimated from atmospheric conditions favorable for BPS formation (Kato 2016).

Keywords: heavy rainfall, band-shaped precipitation system, numerical prediction