



Climatological features of precipitation characteristics and large-scale atmospheric fields on the heavy rainfall days in the eastern part of Japan during the mature stage of the Baiu season

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In East Asia a remarkable rainy season called the “Baiu (in Japan)/Meiyu (in China)” appears in early summer affected by the quasi-stationary subtropical frontal zone, the Baiu frontal zone. Especially around the western Japan to the Changjiang River Basin, the frequent heavy rainfall events on the front by the organized deep convective clouds result in the huge total rainfall there. Furthermore, the rainfall features in the eastern Japan are rather different from those in the western part, i.e. the contribution of the “heavy rainfall days” (events with more than 50 mm/day) to the total climatological rainfall amount in the eastern Japan is rather smaller than in the western part. However, the total rainfall even in the eastern Japan in early summer is considerably large than that in Europe such as Germany and Austria. Thus in order to understand the regional climate change in summer in East Asia associated with the large-scale factors such as global warming, it would be also necessary to accumulate the fundamental knowledge on the difference of rainfall characteristics on the “heavy rainfall days” in the Baiu season between the western and the eastern parts of the Japan Islands for the “present climate.” Since many studies for the western Japan have been made so far, the present study will examine rainfall characteristics and large-scale atmospheric fields on the “heavy rainfall days” in the mature stage of the Baiu season (16 June ~ 15 July) at Tokyo in the eastern part of the Japan Island, based on the daily and the hourly precipitation data from 1971 to 2010.

Appearance frequency of the “heavy rainfall days” at Tokyo attained only about 1/3 of that at Nagasaki in the western Japan. Furthermore, it is noted that about half of the “heavy rainfall days” at Tokyo were related to the typhoon. In detail, about half of the typhoon cases were associated with the direct approach of a typhoon (referred to as Pattern A, hereafter), the other half corresponded to the situation when the Baiu front also stagnated around Kanto District with a typhoon to the southwest of Kanto (Pattern B). Although the contribution of the intense rainfall with more than 10 mm/h to the total precipitation was large in Pattern A, that with less than 10 mm/h was dominant in Patterns B and C (Pattern C: meso- α -scale cyclone on the Baiu front approaching to the Kanto District). It is noted that about half of the “heavy rainfall days” corresponded to these two pattern. In other words, unlike the localized torrential rain in western Japan, the “heavy rainfall days” due to the persistent “not-so-intense-rain” appeared rather frequently in the eastern part of Japan even in the Baiu season. It is interesting that such type of the heavy rainfall events occur under the relatively strong low-level southerly wind to the east of the disturbance (a typhoon or a meso- α -scale cyclone) passing through the baroclinic zone as the southwestern edge of the cool Okhotsk air mass.