

Study on the pre-monsoon rain over Bangladesh and Northeastern India

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The rainfall phenomena during the pre-monsoon period over the northeastern part of Indian subcontinent in 2007 are investigated using OLR and the NCEP/NCAR reanalysis data during the period from March to May in 2007. Moreover, for the purpose of clarifying the atmospheric condition and the structure of the disturbance during the pre-monsoon period, we carried out the upper air observation at Dhaka in Bangladesh during the period from 20 April to 15 May in 2007.

The time series of OLR over Bangladesh (22.5–27.5N, 87.5–92.5E) from March to May in 2007 is calculated. It is well known that an average monsoon onset over Bangladesh occurs in early June [e.g., Ahmed and Karmakar, 1993; Wang and LinHo, 2002]. In March, the convection activity becomes suppressed. During the IOP, we can divide it into 3 spells (A: 20–27 April, B: 28 April – 5 May, C: 6–14 May) by the OLR value indicated the convective activity. During spells A and C, there is comparatively convection activity. On the other hand, and the convection activity become suppressed during spell B. Actually, the mesoscale disturbance activity with a dead person is active in A. Although the convective activity during spell C is active, there was little rainfall by the ground observation. We carried out the composite analysis of OLR about each period in spell A, B, and C. It is shown that the lower OLR region goes southward from the middle latitude in spell A. In addition, the lower OLR region of the southern part of the Indochina Peninsula goes northwestward from spell A to C. It is suggested that the eastward moving and passage of the trough of the upper air along the south slope of the Tibetan plateau brought the rainfall phenomena during the pre-monsoon period. The northeastern part of Indian subcontinent during the pre-monsoon period is affected by the middle latitude.

We carried out the composite analysis of wind field on each period. During spell A, the southwesterly with a moist air in the lower troposphere was dominated. On the other hand, the south (north) component was dominated during the spell A (B) in the upper troposphere. This thing means that Bangladesh was located in the front (rear) side of the upper trough during the spell A (B).

According to the radio sonde observation at Dhaka, the relative humidity decreased at about 4000–5000 m height during spell B. From the characteristic point of the equivalent potential temperature and the wind direction during spell A, the moisture was produced by the strengthening of southerly, so that, it became the air condition of the thermal instability with increase of equivalent potential temperature in the lower troposphere. Moreover it is suggested that the trough passage from west to east because of the decrease of equivalent potential temperature in the middle troposphere from spell A to B. When Bangladesh is located in the front side of the upper trough, it is suggested the strengthening of the uplift flow and southerly in the lower troposphere. From the time series of uplift flow produced by NCEP/NCAR reanalysis data, it is shown that the strengthening of uplift flow during spell A and the downward flow during spell B.

For summary of this study, the one of the reasons of the convective activity during the pre-monsoon is the strengthening of the uplift flow and southwesterly in the lower troposphere in the front of the upper trough. In future, it is needed that the upper air radio observation at multiple stations to clarify the strengthening of uplift flow.