Introduction

The monsoon seasonal transition from southwesterlies to easterlies greatly affects the Indian Peninsula, it leads heavy rainfall, flood, and also drought. To reveal the relationship between heavy rainfall and atmospheric circulation condition, it is crucial to understand the monsoon seasonal transition and the seasonal march of monsoon rainfall. The main objective of this study is to document the relationship between heavy rainfall and atmospheric circulation condition before and after the monsoon onset and withdrawal in Bangladesh. The monsoon onset date is crucial for a tropical monsoon country such as Bangladesh. Hence, accurate prediction of the dates of monsoon onset and withdrawal would assist farming enterprises in Bangladesh.

Data

This study used climatological pentad mean data of horizontal wind at 850 hPa, precipitable water, and total column water vapor flux over a 25-year period from 1979 to 2003. These data were provided by the Japan Meteorological Agency (JMA) and the Central Research Institute of Electric Power Industry (http://jra.kishou.go.jp/). Daily rainfall data at 35 stations in Bangladesh were provided by the Bangladesh Meteorological Department (BMD).

Results and discussion

In Pentad15-18, perhaps the first prominent feature when all atmospheric variables are sharply increasing; this clearly indicates the start of the pre-monsoon rainfall. Notable changes occur in P24-27, when the horizontal wind at 850 hPa levels and the water vapor flux greatly increased over the Bay of Bengal, and direction of the wind and the water vapor flux is found toward Bangladesh.

Remarkable changes occur before and after the monsoon onset between periods P28-31 and P32-35. It is notable that, at this time southerly wind is very strong in the interior of Bangladesh. This is symbolizing that the summer monsoon onset over Bangladesh. At this time, the amount of the precipitable water also greatly increases and the rainfall distribution maps illustrate the abrupt increase in rainfall over Bangladesh. It has been observed that all atmospheric variables greatly increase in P32-35. It is clear that summer monsoon onset differs from the early raining event discussed by Matsumoto (1997), which is primarily caused by the strengthening of sub-tropical westerly.

Significant changes also occur before and after the monsoon withdrawal between P53-56 and P57-60. In P53-56, strong moisture and southwesterly wind is continuously flowing over the Bay of Bengal and their direction is toward interior of Bangladesh. In P57-60, the moisture and southwesterly wind flow has disappeared over the Bay of Bengal after the withdrawal.

Ahmed and Karmakar (1993) did not systematically mentioned wind conditions over Bangladesh. They have only showed wind vector at Cox’s Bazar in June and October in 1958. Therefore, this study has concluded that the main cause of heavy rainfall during monsoon in Bangladesh is the atmospheric circulation conditions which are found very strong for the development of orographic rainfall process compared with those in post-monsoon period. During post-monsoon period rainfall gradually decrease, this is caused by both the effect of decreasing wind speed and amount of precipitable water.

Reference
