

Characteristics of precipitation systems in and around Bangladesh during monsoon

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1. Introduction

The development mechanism and detailed characteristics of precipitation system for heavy rainfall in a region like Bangladesh is very important to understand the global climate change. The size, organization and motion characteristics of the precipitation systems are the key factors that determine whether those produce heavy rainfall. These information are very essential for agriculture depended country like Bangladesh. Unfortunately no long term research work has been carried out in Bangladesh to know the basic characteristics of precipitation systems such as shape, speed, horizontal length and lifetime. Bangladesh Meteorological Department (BMD) radar data is available to study the characteristics of precipitation systems from 2000. In this article preliminary result of 3-year data is analyzed and discussed in details.

2. Data and Methods

An S-band weather radar (wave length ~10 cm, beam width 1.7°, elevation angle 0°) is placed on a building roof of ~60 m height in the vicinity of BMD office in Dhaka that scans 600 km × 600 km area (Fig.1) on a regular scanning scheme i.e. one hour at 'ON' and two hours 'PAUSE'. BMD does not operate radar from 00 to 05 LST. BMD radar provides the Plain Position Indicator (PPI) scan in six statuses. The 50419 PPI scans of the years 2000-2002 (April to September but no data in September for 2000, and April and September for 2001) have been used in this analysis.

Precipitation systems having lifetime ≥ 3 hr and dimension ≥ 100 km (at least in one direction) have been considered for analysis. Classification of the precipitation system has been done on the basis of their shape and speed when it seems to be in mature stage among the available scans. The average speed of the system has been calculated from the movement of the convection line. If the convection line is not detectable then center of gravity has been considered for calculating the speed. In this case, echo intensity of the system having less than status 1 (≤ 4 mm/h) is not considered. The precipitation systems are divided into three categories on the basis of their shape i) Arc, ii) Line and iii) Scattered. The systems are also

categorized on the basis of their speed which are stationary (≤ 2 m/s), slow moving ($2 \text{ m/s} < \text{speed} < 7 \text{ m/s}$) and fast moving ($\geq 7 \text{ m/s}$). The approximate life time of the system is calculated from available scans. The location of the system is calculated from the approximate center of the system.

3. Results

The numbers of Arc, Line and Scattered type systems are found 121, 87 and 157 out of 365 systems during the analysis period. The Arc and Line types are distributed almost throughout the country whereas Scattered type is prevailed in the wet (humid) region (Fig.2).

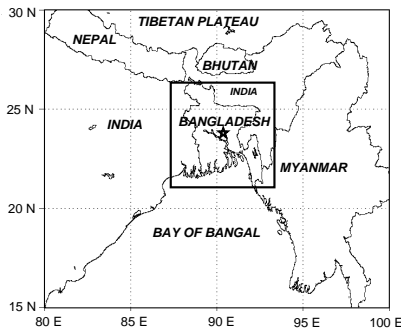


Fig. 1. Regional map showing BMD radar coverage (solid rectangle). The star shows the location of the BMD radar.

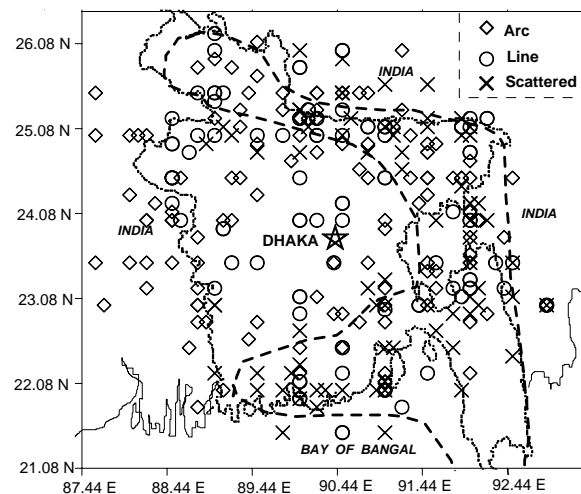


Fig. 2. Spatial distribution of the different types of systems developed (2000-2002) in and around Bangladesh. The dashed line shows the wet region taken from Islam & Uyeda (2006).

The Scattered type system in 2002 is more than that of in 2000 and 2001 (not shown). About 9 % in 2000, 69 % in 2001 and 60 % in 2002 of Scattered type systems were not possible to calculate their speed because it is distributed almost all the radar coverage. The monsoon (June-September) rainfall anomaly (Islam & Uyeda, 2006) is decreased when the Scattered type system is increased.

In monsoon and pre-monsoon the Scattered (no. of systems 128) and Arc (no. of systems 90) type system is dominated respectively, whereas Line type is contributed almost all periods. The average speed of the monsoon and pre-monsoon systems is 5.9 and 10.5 m/s respectively.

The average (from all data) speed, lifetime and length of the Arc, Line and Scattered type are 10.3, 6.4 and 6.2 m/s, and 5.1, 4.8 and 7.8 hr, and 207, 201 and 275 km, respectively.

From the above analysis it is clear that precipitation systems varies from year to year, so we will extend this research work up to 2005.