

Characteristics of precipitation systems in Bangladesh during 2000-2005

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1. Introduction

Characteristics such as shape, length, speed, lifetime and organization location of the precipitation systems in and around Bangladesh has been analyzed by using Bangladesh Meteorological Department (BMD) radar data for 3 years (Rafiuddin et al. 2007: MSJ spring meeting, Tokyo). In the present article total 6 years data is analyzed and discussed in details including propagation direction of the systems.

2. Data and Methods

The 91673 Plan Position Indicator (PPI) scans of the years 2000-2005 (April to September but no data in April for 2001 and 2005, and August for 2002, and September for 2000, 2001 and 2003) have been used in this analysis. In this analysis we follow the methods as explained by Rafiuddin et al. (2007). The precipitation systems are divided into three types on the basis of their shape i) Arc, ii) Line and iii) Scattered. The systems are also categorized according to their speed, which are stationary (≤ 2 m/s), slow moving ($2 \text{ m/s} < \text{speed} < 7 \text{ m/s}$) and fast moving ($\geq 7 \text{ m/s}$). In addition to these, propagation direction of the system is calculated at the mature stage. To check the environmental wind field NCEP data was used.

3. Results

The numbers of Arc, Line and Scattered type systems are found 230 (29.2 %), 117 (14.8 %) and 442 (56 %) out of 789 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.1). This tendency is same as shown by Rafiuddin et al. (2007).

The highest frequency of the precipitation system of Arc (12.2%), and Line (3.9%) and Scattered (15.6%) type is found in May and June respectively.

Arc and Scattered type system dominated in pre-monsoon (occurrence frequency 20.3%) and monsoon (occurrence frequency 45.9%) respectively. 244 Scattered type systems out of 442 have the areal coverage of almost full radar range. Development of this type of system in pre-monsoon is 3.3% and in monsoon is 96.7%.

The maximum frequency of the small length (100-200 km) system is found in May (12.2%) and very large length (≥ 400 km) in June (10.8%). It is found that the highest speeded Arc and Line type systems have the length within 100-250 km whereas for Scattered type 120-350 km.

The propagation direction of most of the pre-monsoon and monsoon systems are toward southeast, and northeast or northwest respectively (Fig.2). Pre-monsoon systems movement direction is closely related with the average direction of high-level wind (above 700 hPa). Monsoon systems movement direction is closely related with the average direction of low level wind (below 850 hPa).

The stationary, slow and fast moving system is found 54 (9.9 %), 169 (31 %) and 322 (59.1 %) respectively.

Speed is not calculated for the Scattered type system having wide areal coverage. The average speed of the monsoon and pre-monsoon systems is 6.3 m/s and 10.2 m/s respectively.

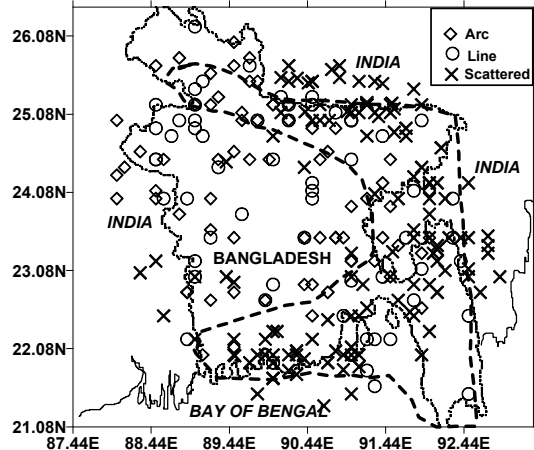


Fig.1. Spatial distribution of the different types of monsoon systems developed (2000-2005) in and around Bangladesh. The dashed line shows the wet region taken from Islam & Uyeda (2007). Scattered type systems with wide areal coverage are not included.

The average speed, approximate lifetime and length of the Arc, Line and Scattered type are 11.0, 7.1 and 5.8 m/s, and 4.3, 4.0 and 4.8 hr, and 185, 184 and 268 km, respectively. The tendency of these results is same as shown by Rafiuddin et al. (2007).

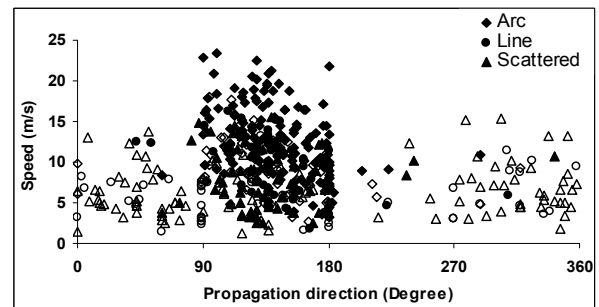


Fig.2. Speed and direction of movement of different types of systems (zero speeded system and Scattered system having wide areal coverage are not included). Solid symbols mean pre-monsoon and open mean monsoon systems.

4. Conclusions

Arc type system dominates in pre-monsoon and Scattered type in monsoon, whereas Line type has almost equal contribution of number in both periods. During monsoon about a half of Scattered type system covers almost full radar coverage and the remaining Scattered type system prevails in humid region.

Most of the fast moving systems are found in pre-monsoon, and slow and stationary systems in monsoon period. During monsoon all the systems move slowly compared to pre-monsoon systems.

Scattered type system of wide areal coverage lasts long time even one day.