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# Influence of monsoon on atmospherics level

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**सार** — इस लेख में 1977 से 1979 की अवधि में 10, 20 तथा 30 किलो हर्ट्ज पर वी. एल. एफ. वायु वैद्युत स्तर पर मानसूनी बादलों के प्रभाव का विश्लेषण किया गया है। इस लेख में उसके कुछ दिलचस्प प्रभाव दिए गए हैं, तथा साक्यिता स्रोत की तथा उसमें निहित संचरण की जानकारी से परिणामों की व्याख्या की गई है ।

ABSTRACT. The effect of monsoon clouds in the level of VLF atmospherics at 10, 20 and 30 kHz have been analysed for a period from 1977 to 1979. Some of the interesting results obtained are reported in this paper and the results have been interpreted from a knowledge of source activity and the propagation involved.

## 1. Introduction

In tropical countries, study of the influence of monsoon on atmospherics level has been an interesting subject in recent years. A close connection between atmospherics and cloud phenomena is established, now-a-days, beyond doubt. But since the electrical effect due to nimbostratus clouds (monsoon clouds) is much less intense, less is known about its electrical characteristics than that of cumulonimbus clouds (thunder clouds). A knowledge of the electrical characteristics of nimbostratus clouds, in all aspects is, therefore, important. In the present investigation, the effect of monsoon clouds in the records of integrated field intensity of VLF atmospherics obtained at Calcutta have been examined and their probable explanation have been given from a knowledge of electrical discharges occurring at such times.

## 2. Analyses and results

Records of integrated field intensity of atmospherics (IFIA) at 10, 20 and 30 kHz have been analysed here for a period of three monsoon season (June to September) from 1977 to 1979. The receivers employed for the observations were designed to have a large dynamic range with a view to handling a fairly wide range of field intensities of atmospherics.

### 2.1. *Typical records*

A photograph of some typical records of IFIA is presented in Fig. 1. In the records, the upper one marked (a) reveals all the regular variations of IFIA, *viz.*, the sunrise effect (A), first minimum (B), recovery effect (C), morning minimum (D), afternoon maximum (E), late afternoon minimum (F) and night maximum (G). The three other samples marked (b), (c) and (d) have been chosen to show the nature of IFIA at 30, 20 and 10 kHz on a heavy monsoon day. The records clearly exhibit an atmospherics level with a considerably different pattern as noted in an undisturbed monsoon day. The pattern formed is similar at all the three frequencies but their noise levels are different.

### 2.2. *Variations of median values*

Recorded data of IFIA for both during undisturbed (locally clear) and disturbed (overcast cloud) days have been first separated. The records obtained during the days or part of a day when development of electrically active local clouds occurred have been carefully taken into account in this analysis. The monthly median of the hourly average values of IFIA have been obtained and are plotted in Fig. 2 for the months of June-September. These monthly variations are obtained by considering the data for three monsoon seasons as mentioned earlier.

Important results obtained from this analysis, as presented in Fig. 2, are summarized below :

(*i*) The variation is very systematic and regular for all the curves showing a highest noise level at 10 kHz intermediate at 20 kHz and least at 30 kHz.

(*ii*) Nighttime level is always higher than daytime level. During daytime the level is minimum at the morning hours and becomes maximum at afternoon particularly in the months of June and July. At night hours such a variation is not, however, clearly noticed.

(*iii*) The noise levels during disturbed days are separated unequally from those of undisturbed days at 10, 20 and 30 kHz. This separation is found to be maximum at 20 kHz and least at 10 kHz and this is clearly noticed for all the months of the season.

## 3. Discussion

Usually the monsoon clouds over Calcutta originate from the Bay of Bengal (Sarkar *et al.* 1978). The initial gradual rise of IFIA, as also noted in the typical

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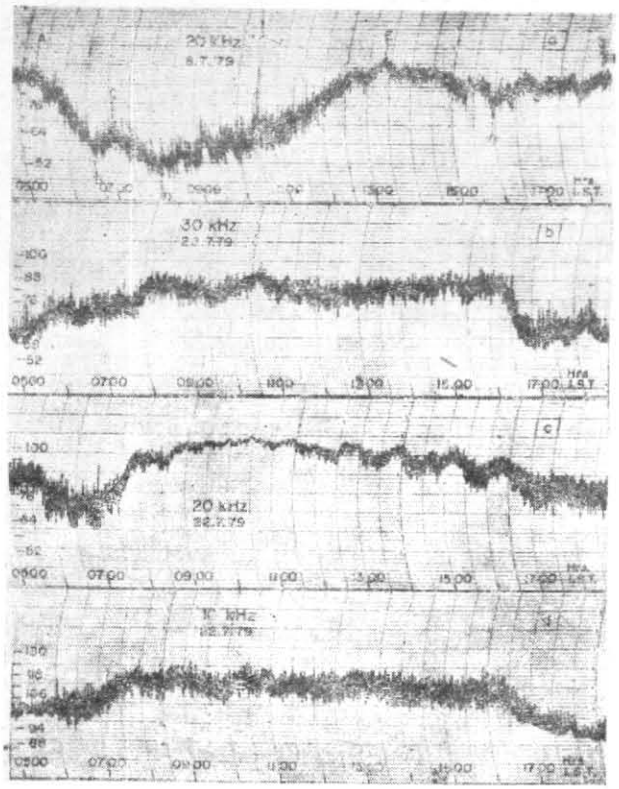


Fig. 1. Typical records of IFIA obtained during monsoon month at 10, 20 and 30 kHz. Ordinates are in dB above 1$\mu$V/m

record, seems to be closely associated with the gradual development of the cloud and also partly to its gradual approach towards the observing station. During the localised cloud activity the noise levels at different frequencies attain a peak value at the end of which when such cloud activity disappears the intensity levels come back to its earlier condition. This is obviously not observed on undisturbed days as evident from the typical record of 8 July 1979.

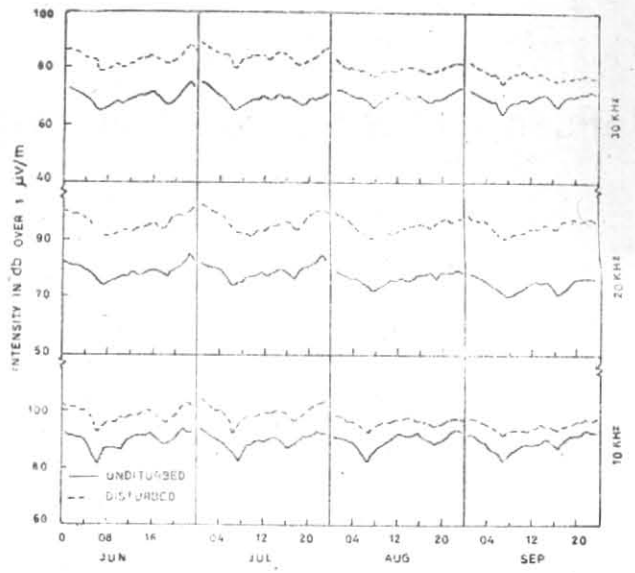


Fig. 2. Variations of IFIA during undisturbed and disturbed days

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**Reference**

Sarkar, S.K., Bhattacharya, A. B. and Sen, A. K., 1978, *Indian J. Radio Sp. Phys.*, 7, pp. 242-247.