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Isohyetal Patterns over South India in relation to the locations of various storms / depressions of the Bay striking east peninsular coast during post monsoon season

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ABSTRACT. In this paper, a study has been made of the isohyetal patterns over South India during the post-monsoon season in relation to the position and movement of Bay storms/depressions. The above disturbances have been classified into three categories, viz., A, B and C according to their crossing the coast south of Cuddalore, between Cuddalore and Ongole, and between Ongole and Calingapatnam respectively. The positions of the disturbances in the various 2-degree square in the Bay and the corresponding mean isohyetal patterns over South India during the subsequent 24 hours are shown diagrammatically for all the three categories. These diagrams may be of use to forecasters in issuing heavy rainfall warnings for the next 24 hours in association with the Bay disturbances during the post-monsoon season.

1. Introduction

A major part of the annual rainfall in the eastern districts of peninsular India and also the heavy to very heavy falls in this region are usually associated with the storms and depressions which form in the Bay of Bengal (during the post-monsoon months, October to December). According to statistics based on data for 60 years (1890-1950), as studied by Rai Sircar (1956), about 33 per cent of the storms and depressions and 45 per cent of the storms develop in the Bay during the above three months. These disturbances (storms and depressions) usually form in the south Bay and move west or northwestwards, some of them later recurving towards northeast. Those which form south of latitude 7°N, usually move away westwards without much affecting the south Peninsula. If a disturbance crosses latitude 17° or 18°N in the Bay, it usually recurves towards northeast and no damage is usually caused to the area under study. It is also seen that when a disturbance lies to the east of Long. 86°E, no significant rainfall occurs along the coast due to the large distance. The rainfall distribution and intensity depend not only on the position of the disturbance, but also on its direction of movement. In this paper, a study has been made of the rainfall patterns over the southern States (Madras, Kerala, Mysore and Andhra Pradesh) of India during the next 24 hours with reference to the position and direction of movement of disturbances in the sea area bounded by Lat. 7°N and 19°N, Long. 86°E and the east coastal line. The isohyetal patterns drawn and included in the paper may be of some use to the forecasters in issuing well in time heavy rainfall warnings for the coastal districts when a disturbance is approaching from the Bay.

2. Analysis of data

As mentioned earlier, the rainfall pattern over the coastal districts depends not only on the position of the disturbance, but also on its direction of movement. For the purpose of the study, the disturbances have been classified under A, B and C categories. The category A includes those which crossed the coast south of Cuddalore; the disturbances which crossed the coast between Cuddalore and Ongole belong to B category and those between Ongole and Calingapatnam come under C category. The sea area under study has been sub-divided into 2-degree square as shown in Fig. 1 to indicate the position of disturbances. The rainfall data of 55 India Meteorological Department stations during next 24 hours over the Peninsula corresponding to disturbances of the same category and having their centres in a particular 2-degree square were collected.

The average values stationwise were then plotted and isohyetals drawn. Figs. 2–12 show the monthwise average rainfall distribution during subsequent 24 hours corresponding to the disturbances of A category which lay in the various squares and ultimately crossed the coast south of Cuddalore. Similarly Figs. 13–27 and Figs. 28–39 represent the average isohyetal patterns for the next 24 hours in respect of the other two types of disturbances. For this purpose, the position of disturbances at 0830 IST, as available from storm tracks (India met. Dep. 1964) and rainfall at subsequent 0830

TABLE 1

Frequency distribution of disturbances of various categories in different 2-degree squares in October-December during the period 1901-1960

	Square																	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
										A—Category									
October														1	1				2
November												2	2	5	8	3	1	1	22
December												2	1	2	4	1	2		12
										B-Category									
October							2	1	6	2	4	5	4	3	1				28
November								3	5	4	7	4	4	5		1		1	34
December							1		1			1		1					4
										C-Category									
October		1		2	6	3	3	5	1	3	2		2						28
November		1		1	2	4	2	3	1	3	2								19
December																			nil

IST have been considered. For economy of space,* 18 diagrams relating to squares 4, 7, 10, 13 and 16 are not reproduced here, as these squares are far away from the coastal line. The study refers to the period 1901 to 1960.

Table 1 gives the frequency distribution of different categories of disturbances in different 2-degree squares during October to December.

It may be seen from Table 1 that the A-category storms are more frequent in November while those belonging to B are frequent in both October and November. C-types disturbances occur more in October than in November while they are absent in December.

3. Discussion of results

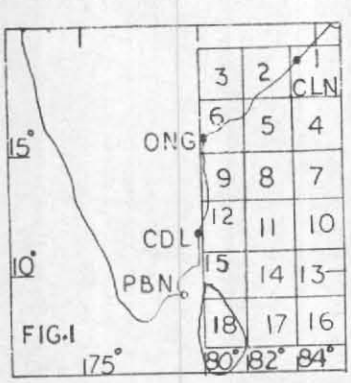
(*a*) *A-type disturbances*—Figs. 2 to 12 give the average rainfall distribution during next 24 hours with reference to different positions of the disturbances crossing coast south of Cuddalore during October, November and December. It will be seen that such disturbances usually cause more rainfall in the month of October. Another noticeable feature during this month is that the northern parts of the Madras State receive more rain from these disturbances and in contrast the southern parts get very little rainfall. Also the heavy rainfall is ordinarily confined to the coastal districts.

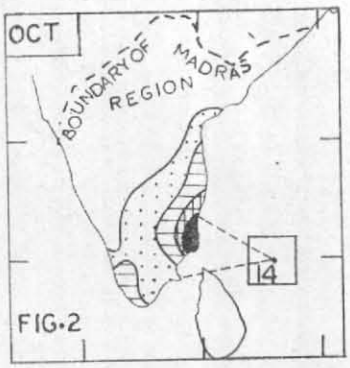
Figs. 5 to 8 represent the rainfall patterns in the month of November in association with A-type disturbances. It will be seen that in this month also more rainfall occurs in the northern parts as in October. Heavy rainfall during this month is experienced when the disturbances are located in squares 12, 14 and 17. Another feature of this month is that unlike as in October, the rainfall extends also to the western parts of the south Peninsula although the amount is not heavy.

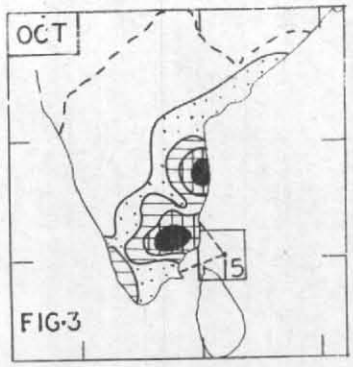
In the month of December (Figs. 9 to 12) the disturbances usually develop in south Andaman Sea and south Bay, follow a more westerly course and move across the south Peninsula. But in this month also, as in the other two previous months, the northern parts of Madras State get more rain. Light rainfall also extends into the western parts of the south Peninsula as in the month of November. Heavy to very heavy rainfall in December can be expected only when a disturbance lies in squares 12, 15 or 17.

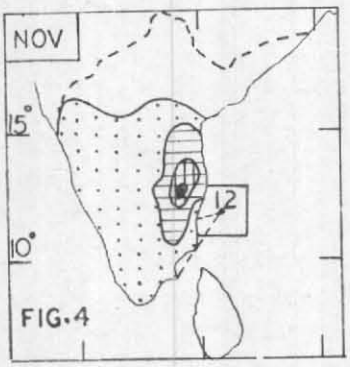
(*b*) *B-type disturbances*—Figs. 13 to 27 represent the rainfall distribution caused by the B-type disturbances, *i.e.*, those crossing the coast between Cuddalore and Ongole. These disturbances also cause more rain in October and in the northern parts as the A-type disturbances. It is seen from Figs. 13 to 18 that in the month of October very heavy rain can be expected within next 24 hours in the southern parts of coastal Andhra Pradesh if a disturbance is located in square 8 or 15. In November, heavy rain over the same area occurs when the disturbance is centred in square

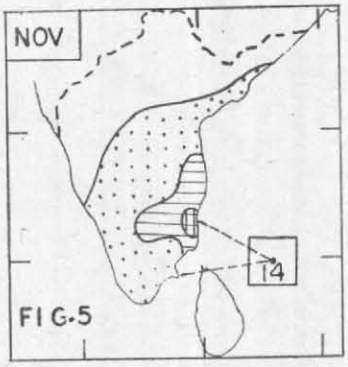
*Pre-published Scientific Report No. 20 (July 1967) of India met. Dep. may be referred to for detailed diagrams.

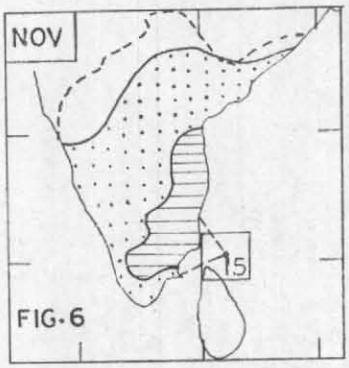


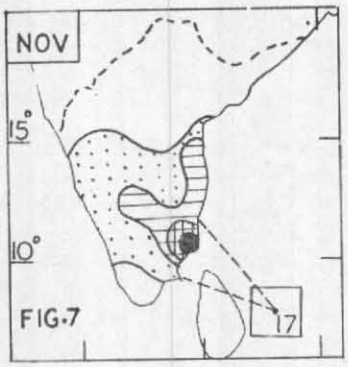


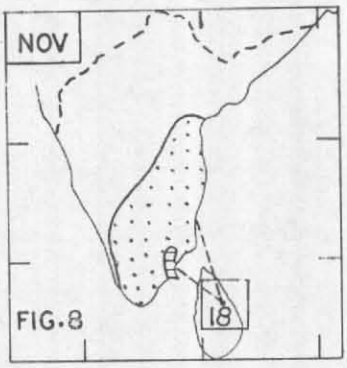


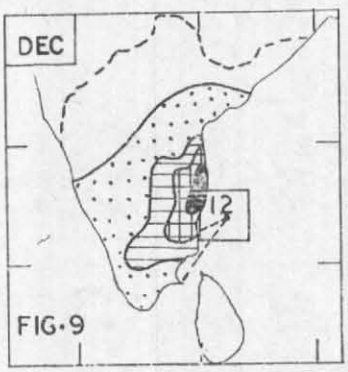


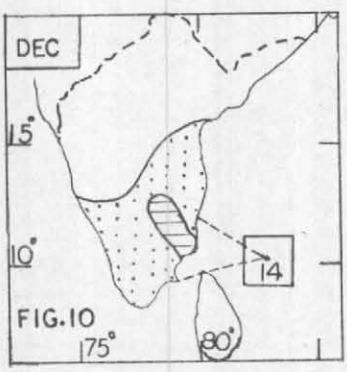


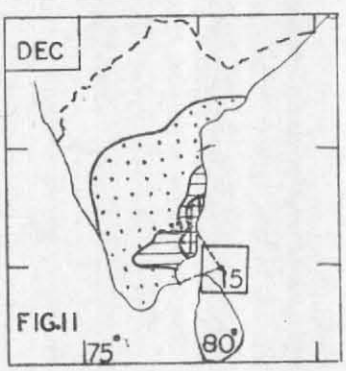












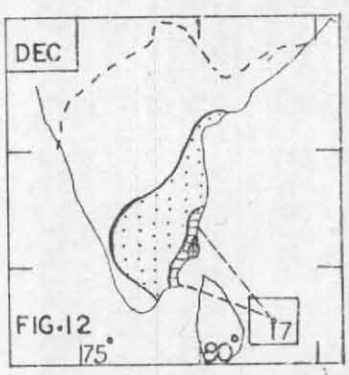
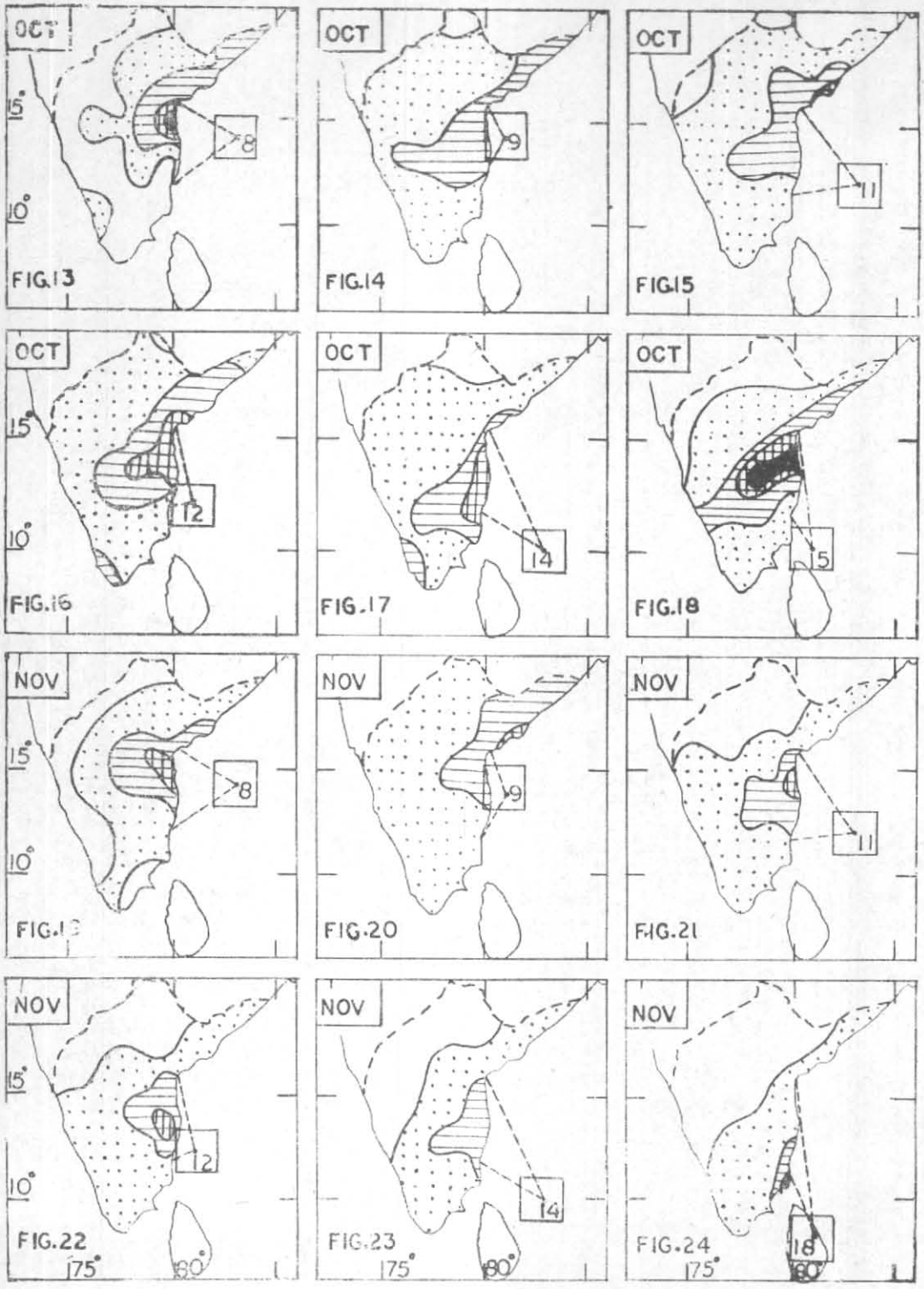
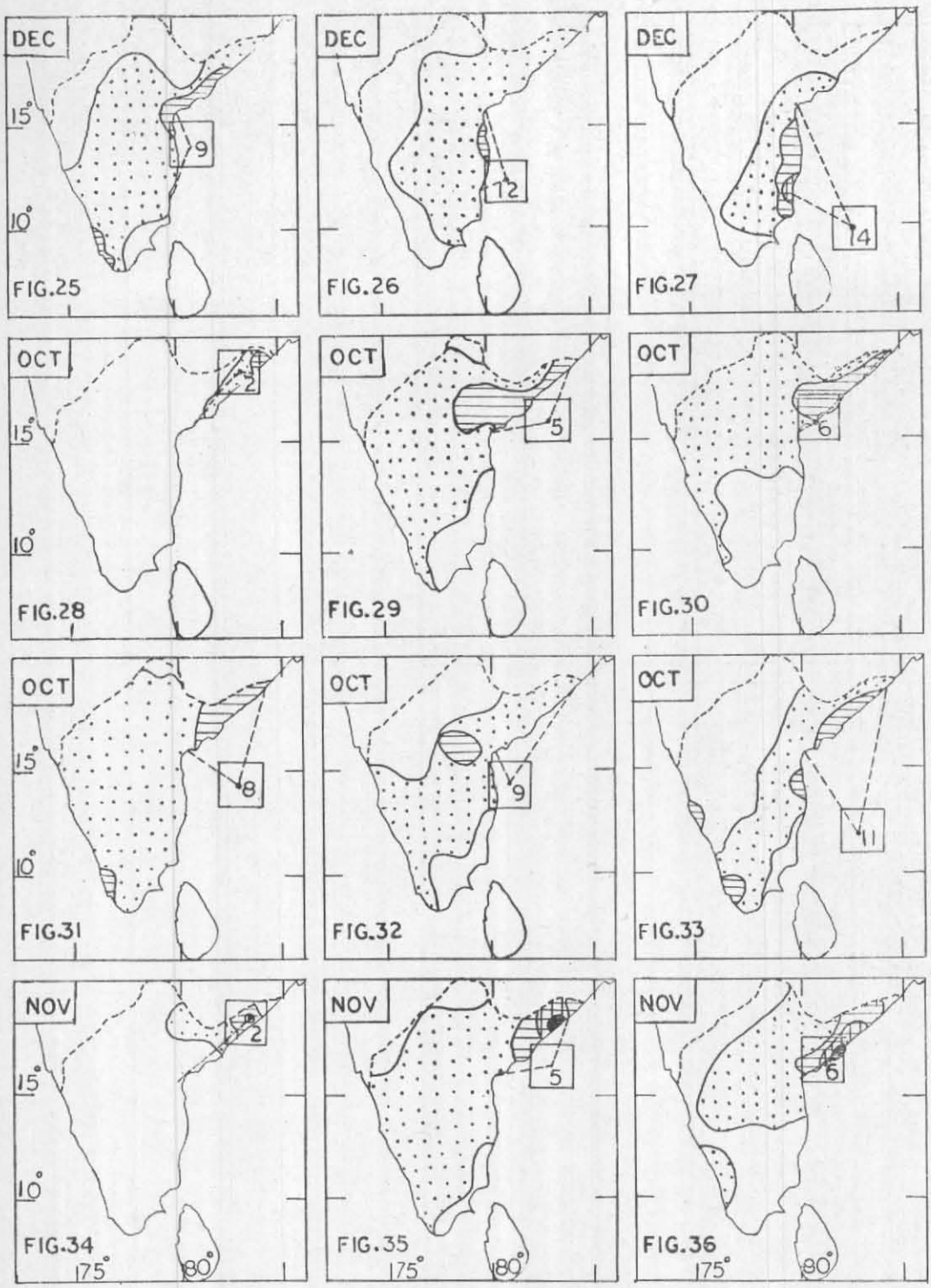


Fig. 1. Reference map

Figs. 2—12. Rainfall distribution corresponding to A-type disturbances



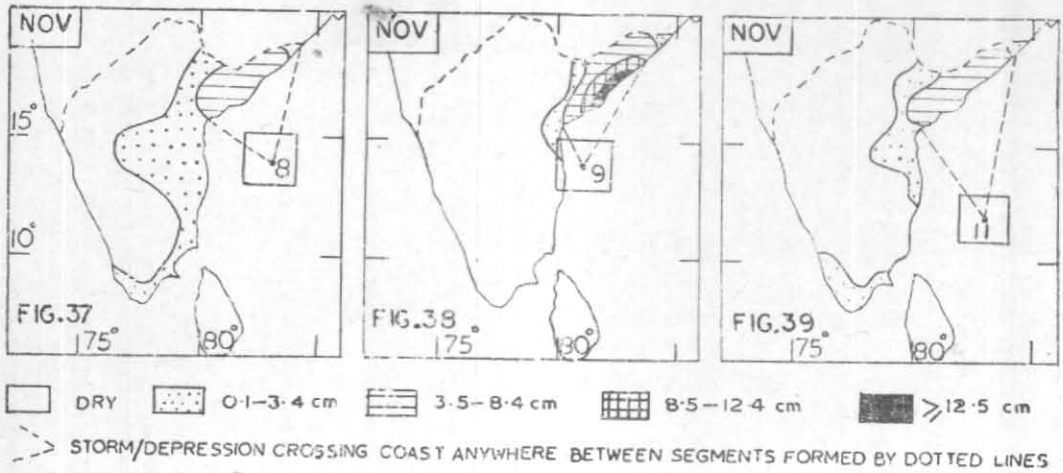
Figs. 13—24. 24-hr average rainfall distribution corresponding to B-type disturbances



24-hr average rainfall distribution corresponding to —

Figs. 25—27. B-type disturbances

Figs. 28—36. C-type disturbances



Figs. 37-39. 24-hr average rainfall distribution corresponding to C-type disturbances

8, 9, 12 or 13. In December, the rainfall caused by this type of disturbance in the Peninsula is relatively small. However, heavy rain in this month occurs over the southern parts of north coastal Madras State when a disturbance is located in the square 14.

(*c*) *C-type disturbance* — This type of disturbances namely those crossing the coast between Ongole and Calingapatnam is absent in the month of December. Unlike the previous two types, a C-type disturbance, gives on the average, more rainfall in the month of November than in October. In November if a disturbance is located in square 2, 4, 5, 6, 7 or 9, heavy to very heavy rain can be expected in north coastal Andhra Pradesh in next 24 hours. It is further seen that these disturbances also cause more rainfall in the northern portions of the area affected. The States of Madras, Mysore and Kerala get only small or no rainfall from this type of disturbances.

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