551.577.37(548.1)

EXCEPTIONALLY HEAVY RAINFALL OVER MADRAS CITY IN FEBRUARY 1984

1. *Record rainfall over Madras* — There was exceptionally heavy rainfall over Madras on the night of 16-17 February 1984. The Madras (Nungambakkam) observatory recorded 294.0 mm for 24 hours ending 0830 IST on 17th. This is the highest ever recorded rainfall in a day during the month of February since 1813, the year from which rainfall records of this station are being maintained. The previous recorded highest 24-hour rainfall was 132.2 mm on 5 February 1909.

The rainfall on this day is also the second highest rainfall ever recorded in 24 hours in any month; the record being 452.4 mm at Nungambakkam on 25 November 1976. February is the month in which Madras has the lowest normal rainfall and so it is all the more surprising that the 24-hour rainfall of 16/17 February 1984 has attained the second highest ever recorded for Nungambakkam.

During February 1984 Nungambakkam received a total rainfall of 377.6 mm which is also a record and this is 2920 per cent of the normal rainfall which is only 12.5 mm. The previous highest was 162.8 mm recorded in February 1929.

Madras (Meenambakkam) also recorded very heavy rain of 127.7 mm in the 24-hour ending at 0830 IST of 17 February 1984. It recorded a total rainfall of 283.8 mm in February 1984 surpassing previous record of 142.5 mm in 1952, Madras (Meenambakkam was established in 1943). Normal rainfall in February being only 6.8 mm, the percentage departure works out to be 4349%.

During the same period of 24 hours, the lakes around the Madras city also received exceptionally heavy falls — Chembarambakkam 318.4 mm, Cholavaram 297.0 mm, Red Hills 258.4 mm, Tambarambakkam 164.0 mm and Poondi 41.0 mm. Fig. 1 gives the rainfall map of Madras and neighbourhood for 17 February 1984. It can be seen from the map that very heavy rain was fairly widespread in a semicircle of radius of about 30 km from Madras. Only

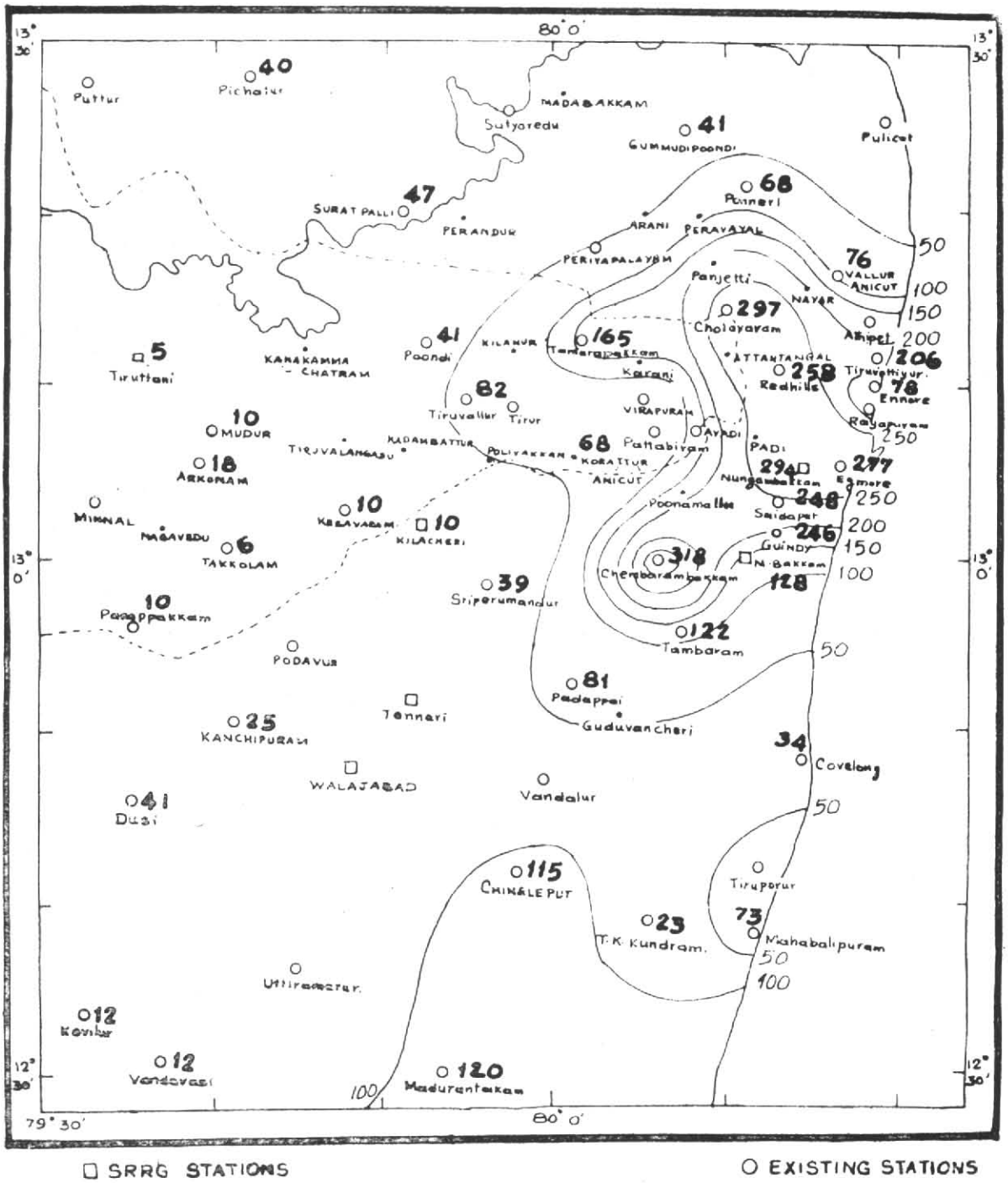

Fig. 1. Rainfall (mm) chart of 17 February 1984 for Madras city and neighbourhood

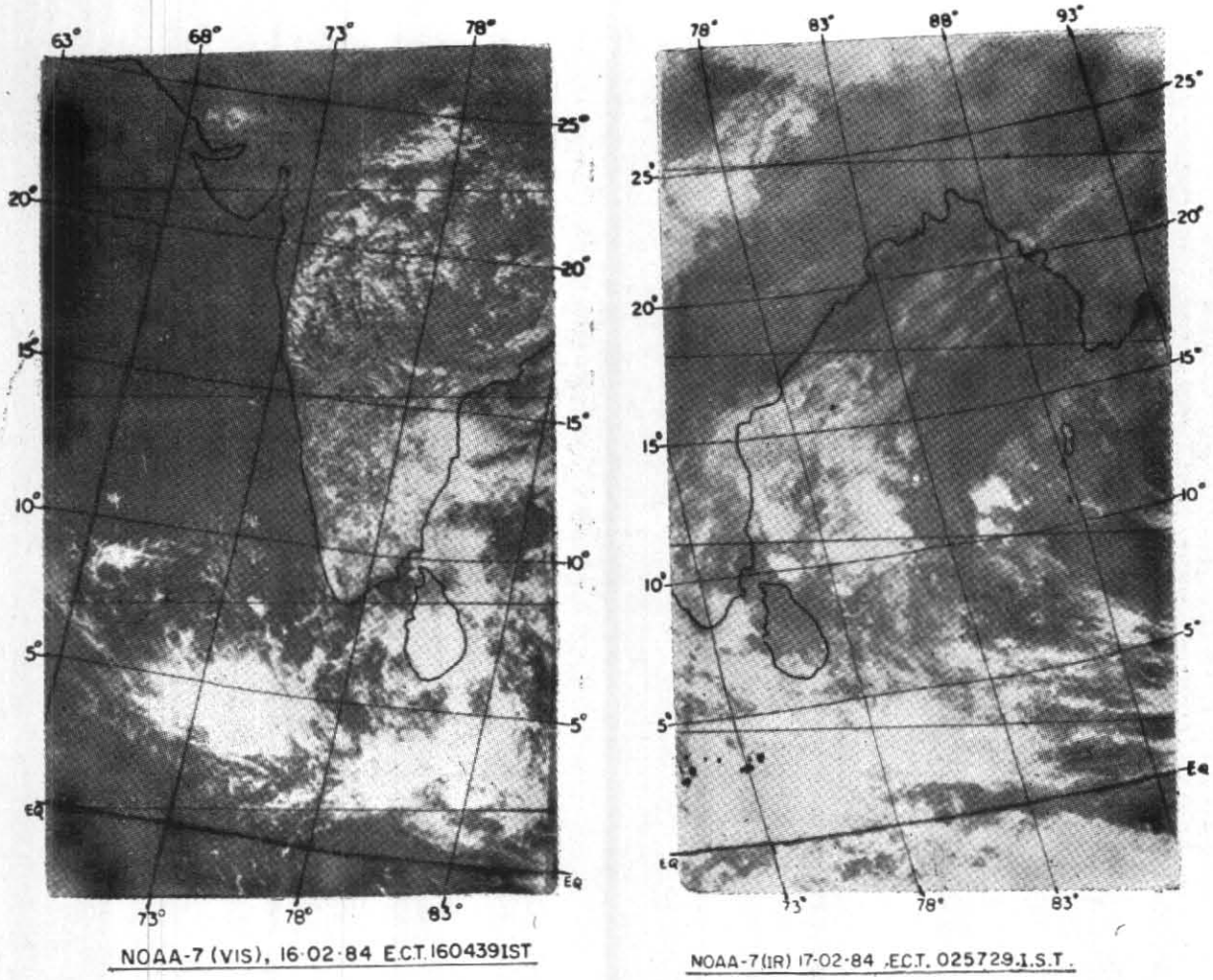

Fig. 2. Satellite pictures of 16th A.N. and 17th early morning of February 1984

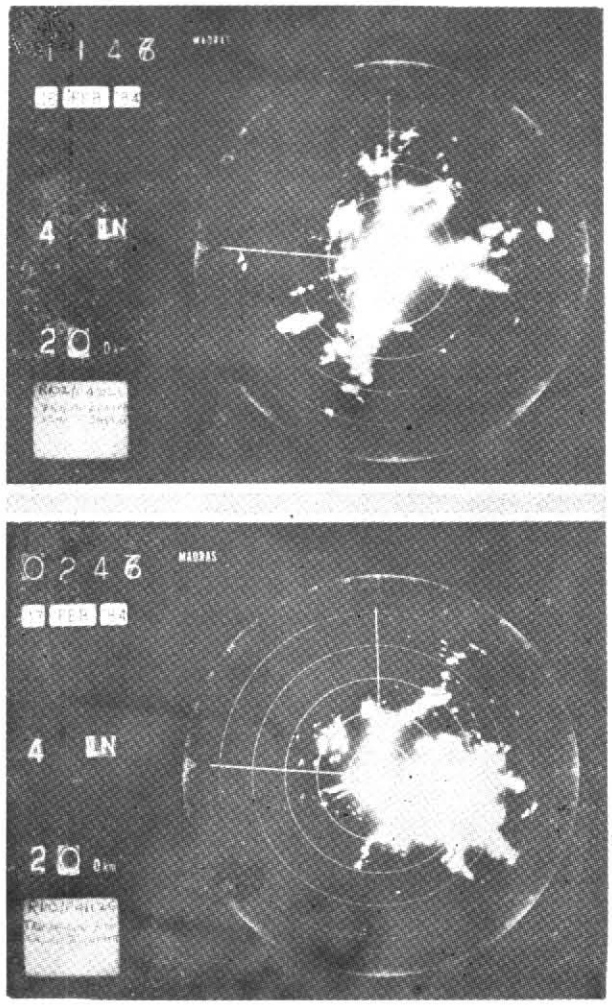

Fig. 3. Madras Cyclone Detection Radar pictures of 16 and 17 February 1984

TABLE 1

Rainfall in mm

Time	Nungam-bakkam	Meenam-bakkam	Tamrai-pakkam
	16 February 1984		
08-09	0.2	0	0
09-10	1.7	0	8.0
10-11	0.1	0	22.0
11-12	0.8	1.9	40.5
12-13	0	0	21.5
13-14	3.4	23.8	4.5
14-15	1.8	7.7	0.1
15-16	0.8	1.7	0.2
16-17	3.7	0	1.3
17-18	24.3	36.7	2.0
18-19	13.5	3.8	2.0
19-20	44.0	10.8	8.0
20-21	30.5	1.3	10.0
21-22	5.9	3.7	12.5
22-23	6.4	2.5	3.5
23-24	19.0	0	0.8
	17 February 1984		
00-01	38.9	1.6	0.8
01-02	18.7	0	4.7
02-03	31.8	0	0
03-04	20.5	0	1.2
04-05	5.5	0.5	0
05-06	7.6	8.3	0
06-07	3.9	1.6	0
07-08	5.5	22.8	0.1
Total	288.5	128.7	143.7
Non-recording raingauge	294.0	127.7	163.8

light to moderate rainfall was experienced further inland. Isolated heavy rain was also experienced in other coastal areas of north Tamilnadu (Not shown in the figure).

Most of the rainfall at Nungambakkam occurred between 1715 IST of 16th and 0330 IST of 17th (10 hours) when 25 cm of rain fell. The chart of Self Recording Raingauge, Madras (Nungambakkam) of 16-17 February 1984 indicates that there were 4 separate heavy spells during this 10 hours, each probably being associated with the passage of active convective cell overhead. The hourly rainfall recorded at Nungambakkam, Meenambakkam and Tamaraipakkam between 0800 IST of 16th and 0800 IST of 17th is given in Table 1. It can be seen that there is a wide variation in rainfall between three stations, whereas Nungambakkam and Meenambakkam, which are within a distance of 15 km from each other received most of the rainfall after midday of 16th, the Tamaraipakkam lake, which is about 30 km inland received the bulk of its rainfall during the forenoon of 16th.

It is also interesting to note that the number of rainy days in February 1984 was 9 as against a normal value of 0.8 at Nungambakkam. The corresponding figures at Meenambakkam observatory were 9 and 0.6 days respectively.

2. *Satellite data* — On the morning of 15 February 1984 a broad cloud band extended from north Bay to southwest Bay and Tamilnadu coast. This band was apparently associated with the forward sector of the upper tropospheric trough mentioned earlier. This band gradually shifted eastwards and started dissipating by the morning of 16th when its southern part lay east of Tamilnadu coast. This cloud band did not contribute for any significant rainfall over north Tamilnadu.

However, the afternoon NOAA-7 visible picture showed bright cloud clusters over north Tamilnadu with a very bright patch over Madras and neighbourhood (Fig. 2). It is this cloud cluster which has yielded exceptionally heavy rain over the area. This patch could be seen persisting over Madras till the early hours of 17th (Fig. 2).

3. *Radar data* — The cyclone detection radar situated at Port Office, Madras took a series of observations at close intervals between 1420 IST of 16th and 0635 IST of 17th. The photographs taken during the above period was available for study. They show that fairly bright echoes of rain bearing cloud clusters began appearing after 2 p.m. of 16th above Madras and neighbourhood. By 1730 IST the bright central echoes cover fairly large areas over and around Madras which persisted till the early hours of 17th and later gradually shifted eastwards during the forenoon of 17th (Fig. 3).

4. *Synoptic situation as on 16-17th February* 1984 — On the morning of 16th, a sea level trough of low pressure extended from Srilanka to south Andhra coast (close to Tamilnadu coast). The same evening the trough was seen extending from Comorin area to south Andhra coast across Tamilnadu coast. An upper air cyclonic circulation was seen over extreme south Peninsula upto 1.5 km a.s.l. with a trough extending northwards to Rayalaseema across Tamilnadu. A trough in westerlies at 500 mb level extended from

east Madhya Pradesh to Lakshadweep area across Rayalaseema, north interior Tamilnadu and north Kerala.

By 17th morning an upper air cyclonic circulation was seen over north Tamilnadu and neighbourhood at 1.5 km.

The presence of a trough of low pressure along Tamilnadu coast with the *in situ* development of an upper air cyclonic circulation in the lower troposphere over northern parts of Tamilnadu and the favourable position of the trough in westerlies in the middle troposphere (500 mb level) seem to be the synoptic scale systems favouring the occurrence of the exceptionally heavy rain experienced over Madras city and neighbourhood.

However, each of these systems cover areas much larger than the area, which experienced exceptionally heavy falls that day. So it is inferred that a localised meso-scale system, which could not be detected by the synoptic scale network might have developed over Madras and neighbourhood and gave the record rainfall.

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