551.578(548.2)

Exceptionally heavy Rainfall in south Kerala on 17/18 October 1964

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(Received 28 November 1964)

ABSTRACT. On 17/18 October 1964 exceptionally heavy rainfall occurred in the Trivandrum district of Kerala State. An attempt has been made to analyse the factors contributing towards this unusual phenomenon and its spatial distribution.

1. Introduction

On 17/18 October 1964 heavy rainfall of an unusual intensity occurred in south Kerala State. Although a number of state raingauge stations in the central and southern districts recorded heavy rainfall exceeding 7 cm, two stations in the Trivandrum district, namely, Trivandrum city and Ponmudi recorded exceptionally heavy rainfall exceeding 40 cm. Trivandrum Observatory located at the heart of the city recorded 401·5 mm of rain and Ponmudi 406·4 mm. The rainfall record at the Trivandrum Observatory may be seen at Fig. 1. It may be noted that the 401·5 mm of rain at Trivandrum occurred due to heavy thunderstorm activity between 2228 IST of 17 October and 0830 IST of 18 October 1964, the maximum intensity being about 100 mm/hr in certain periods. This rainfall was unprecedented as far as records go, the previous maximum record of rain in this Observatory being 277·9 mm on 15 May 1926. The downpour caused floods in the low-lying areas of the city bringing down a large number of huts and rendering about 7000 people homeless. Seven people were reported to have lost their lives due to the flooding and house collapses.

2. Discussion

On 17/18 October 1964, the synoptic charts show a depression located over the west central Bay of Bengal. The atmospheric condition over Trivandrum as indicated by the 1200 GMT charts of 17 October 1964 was not favourable for such intense thunderstorm activity. The wind circulation at 0·9 km of 1200 GMT on this day indicates a more or less dry current at lower levels over the area, while the 3-km pattern at the same time shows a comparatively moist layer aloft (Figs. 2 and 3). The weather at Trivandrum in the afternoon and evening of 17th also showed a marked clearance around dusk. Some Cumulonimbus cells that developed around 1430 IST on this day dissipated completely by nightfall. It is believed, therefore, the conditions favourable for intense thunderstorm activity might have set in just before the time of commencement of the phenomenon. Some indication of the change in the upper air conditions which caused the instability may be seen in the 1800 GMT wind circulation charts of 17th given in Figs. 4 and 5. The 0·9-km pattern suggests an incursion of moist air at lower levels extending over south Kerala State and the 3-km pattern indicates the advection of cold dry northerly air aloft over this area in association with a large scale circulation set up by the depression in the Bay. It is unfortunate that a temperature sounding of the atmosphere at this time is not available to verify this. However, this sudden change in the upper air flow pattern over this area, which amounted to differential thermal advection, must have triggered off the severe weather phenomenon. As stated by Petterssen (1956), outbreaks of severe storms are possible with differential thermal advection of this nature. It may also be mentioned that there was a weak wind field in the upper troposphere favouring good vertical development.

The rainfall distribution for the 24 hours ending 0830 IST on 18 October 1964 over south Kerala State is given in Fig. 6. It may be seen that exceptionally heavy rainfall was recorded in two distinct zones — one over Trivandrum and the other over Ponmudi. It is, hence, felt that although the diffrential thermal advection was primarily responsible for the occurrence of precipitation, the rainfall distribution in terms of intensity should have been influenced by local features. It is well-known that when air streams across a coast line as an on-shore wind, the increased frictional drag over land will cause a stationary zone of convergence to occur over the land at some small distance from the coast, irrespective of whether there are mountains or not. It is natural, therefore, to suppose that the very heavy rainfall over Trivandrum could have been caused by a convergence zone developing over this area due to the low-level on-shore winds shown by the 0·9 km flow pattern at 1800 GMT on 17th. Raghavan (1964) has expressed this in a slightly different way by stating that the distance of the

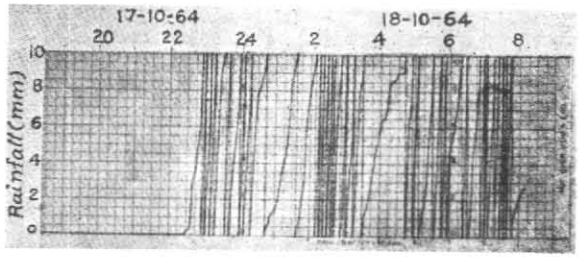

Fig. 1. Rainfall record at Trivandrum Observatory on 17/18 October 1964

(The amount of precipitation recorded above is less than that measured with the ordinary raingauge due, mainly, to the losses during syphoning)

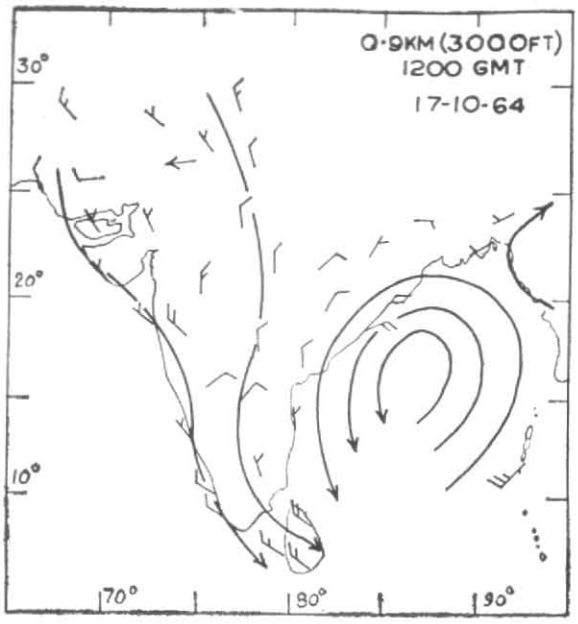

Fig. 2

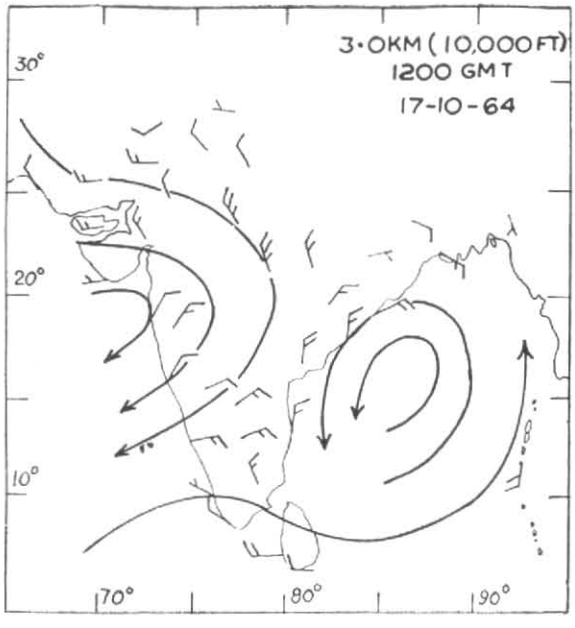

Fig. 3

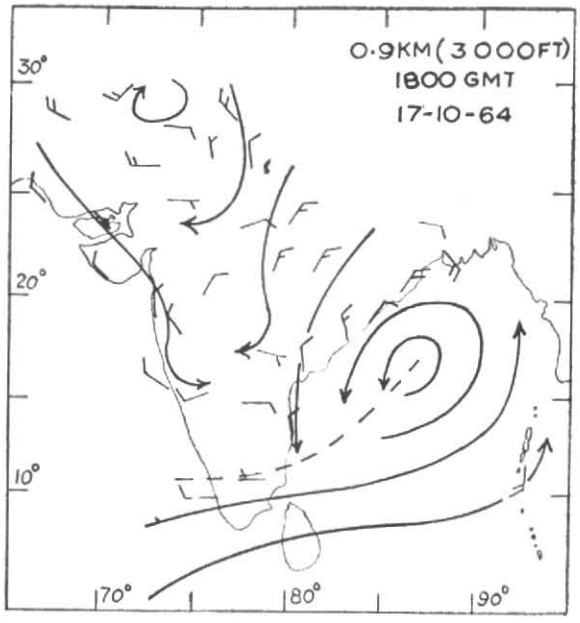

Fig. 4

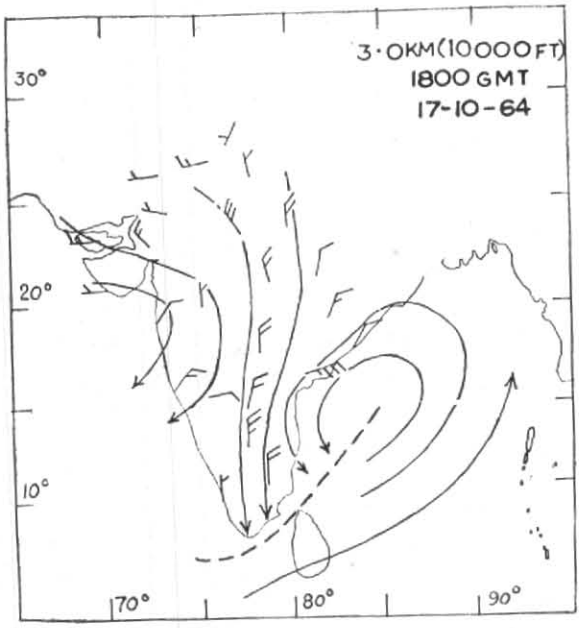

Fig. 5

Fig. 6. Isohyets (mm of rain) for south Kerala 0830 IST on 18 October 1964

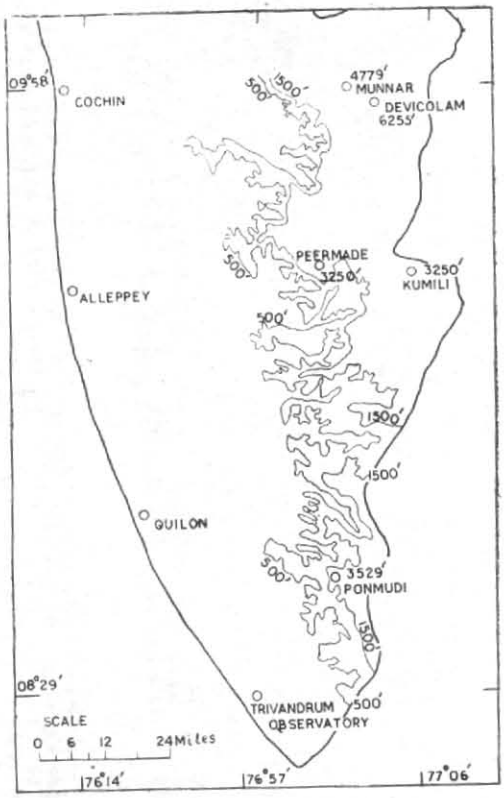

Fig. 7. General contour pattern for south Kerala State

150 m contour from the coast appears to bear a significant correlation with the rainfall along most of the west coastal belt during the southwest monsoon season when the winds are mainly onshore. He suggests that the rainfalls at the coast generally tend to decrease with increasing distance of this contour from the coast and *vice-versa*. From Fig. 7 it may be seen that the 500-ft (150m) contour is close to the coast in the neighbourhood of Trivandrum. With the westerly flow at lower levels, this 'ruggedness' near the coast could have enhanced the frictional effects and created the required convergence for producing the very heavy rainfall over Trivandrum on this day.

The second zone of very heavy rainfall, namely, the area surrounding Ponmudi (elevation 3529 ft/ 1076m) was obviously caused by orography. With the low level westerly moist feed, a permanent zone of uprising air over the steep slopes of Ponmudi could have easily existed during this period causing another area of very heavy precipitation.

A remarkable feature of the observed weather over Trivandrum during this exceptionally heavy downpour was the long duration of the thundery activity and the absence of strong surface winds or squalls. The average wind speed was 10 knots or less during the entire period. It is felt that the growth of thunderstorm cells and their decay must have been occurring in succession, the activity stagnating over the zones of convergence and being helped by the continuous flow of moisture at lower levels. The weak wind field in the upper troposphere over the area was also a major contributory factor for the stagnation.

There is no reason to believe that such exceptionally heavy thunderstorms are very rare in Kerala. It might even be that almost comparable phenomena do occur once in a while over the hilly tracks of the State during the months of May and October, primarily. They might, however, go unnoticed due to the lack of observations from these areas. It was its occurrence over a populated city that made its effects so noticeably felt, in this case.

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