

VARIATION OF RAINFALL ALONG WEST COAST OF INDIA
DURING SUMMER MONSOON *

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ABSTRACT

The incidence of rainfall along the west coast of India comprising the meteorological sub-divisions of Kerala, coastal Mysore and Konkan during the peak monsoon months of July and August for the four years 1967-70 has been examined. Occasions when monsoon was active over the entire coast have been studied in detail with reference to synoptic situations associated with them.

INTRODUCTION

DURING July and August the west coast of peninsular India gets abundant rainfall. It is well-known that this rainfall activity along the west coast undergoes fluctuations inspace and intensity. Spells of heavy rainfall alternate with spells of light to moderate rainfall. Also while one part of the west coast experiences heavy rains other parts have only light rain.

The daily distribution of rainfall during the 24 hrs ending at 03 GMT over the three meteorological sub-divisions Konkan, Coastal Mysore and Kerala is included in the summary of observations given in the Indian Daily Weather Report. On an examination of this distribution for all the days in July and August in the years 1967 to 1970, it is seen that the west coast gets widespread rainfall on many days during July-August. On some days the monsoon is seen to be "active" over a meteorological sub-division when rainfall over it is $1\frac{1}{2}$ to 4 times the normal rainfall for that area with atleast two neighbouring IMD observatories reporting a minimum of 5 cm. On rare occasions, the monsoon is 'vigorous' over an area when rainfall exceeds 4 times the normal with atleast 8 cm of rain being recorded by two neighbouring IMD stations. We wanted to examine the synoptic situations associated with vigorous/active rainfall all along the west coast. A study has been made by George (1956) on the contribution of off-shore vortices at the surface level towards rainfall along the west coast. He has shown that "isolated small areas of concentrated heavy falls of rain over the coast have been found to be mostly associated with the passage of off-shore vortices". He has also reported that "on occasions when the presence of off-shore vortices at the surface level coincided with the existence of certain upper air conditions favourable for moderate to heavy rain it was found to have resulted in the occurrence of unusually heavy rain over the area". He has, however, not discussed these favourable conditions.

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VARIATION OF RAINFALL ALONG WEST COAST

During the four years 1967-70, all the three meteorological sub-divisions in the west coast experienced simultaneously active to vigorous monsoon conditions only on four days. These are 19.7.68, 9.7.70, 8.8.70 and 9.8.70. The synoptic situations associated with the heavy rainfall all along the west coast on these days have been examined.

19.7.68

During the 24 hr period ending at 03 GMT of 19.7.68, Konkan experienced vigorous monsoon conditions while coastal Mysore and Kerala had active monsoon conditions. In Fig. 1 the actual rainfall distribution during 24 hrs ending 03 GMT of 19.7.68 and the isobaric pattern along the west coast as at 03 GMT on 18.7.68, are given. On 18.7.68 morning a low pressure area was located over northeast Madhya Pradesh with associated upper air cyclonic circulation extending to 5.4 km. A trough of low pressure in southeast Arabian Sea is seen in Fig. 1 off Kerala coast. At 12 GMT of 18.7.68, in the lower troposphere (Fig.2) winds in the peninsula are the normal moderate/strong westerlies. The trough between westerlies and easterlies is progressively shifting to southern latitudes with height. At 5.4 km level the trough is running along 17° N across the peninsula. In the upper troposphere the usual strong easterlies are seen over the peninsula.

9.7.70

On this day all the three divisions experienced active monsoon. In Fig. 3 and 4 are given the rainfall on 9.7.70 and the isobaric pattern and upper winds for the previous day. On 8.7.70 morning a deep depression crossed Orissa coast between Balasore and Contai, and on 9th morning it weakened into a depression over Bihar Plateau. The surface winds along the west coast on 8th morning are all mainly westerlies except along south Kerala. At 500 mb, the trough is along 18° to 20° N over the peninsula. A significant feature at 300 mb level is the trough in the easterlies, running along the west coast.

8.8.70 and 9.8.70.

On 8th, Konkan and coastal Mysore had vigorous monsoon while Kerala had active monsoon. On 9th all the three divisions experienced active monsoon conditions. Figs. 5 to 8 give the corresponding data for these two days. No cyclonic disturbance was located in the Indian area on the surface charts on these two days. On 7th, in the lower troposphere winds are very weak, over the peninsula. A Comparison of 700 mb wind pattern on this day with the 700 mb wind pattern in Figs. 2 and 4 shows the very weak and disorganised flow pattern on 7th. At 500 mb also this is true and no westerlies are seen over the peninsula. On 8th the 700 mb winds over the peninsula are weak and at 500 mb level the trough is seen to run along 17° / 18° N across the peninsula.

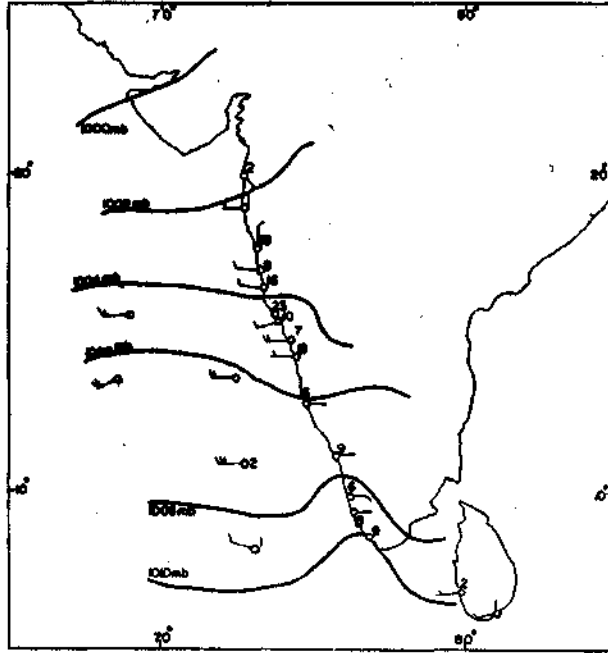


Fig. 1. M. S. L. Isobars 03 GMT 18-7-68 and rainfall for 24 hrs ending 03 GMT 19-7-68.

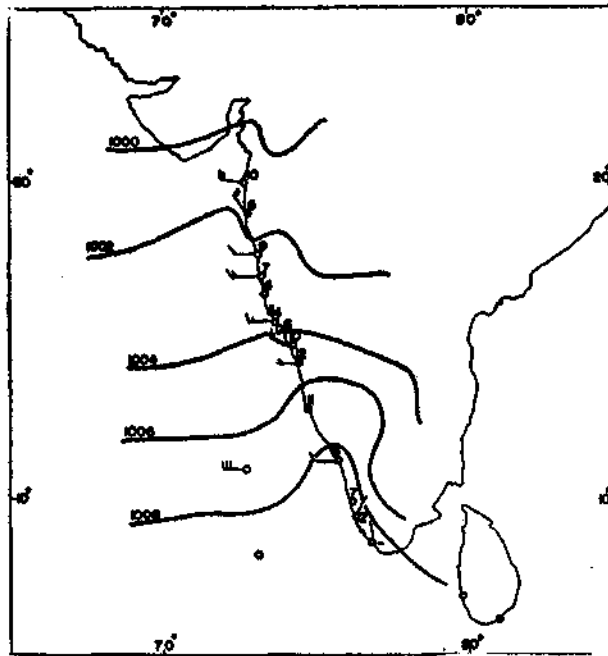


Fig. 3. M. S. L. Isobars 03 GMT 8-7-70 and rainfall for 24 hrs ending 03 GMT 9-7-70.

[3]

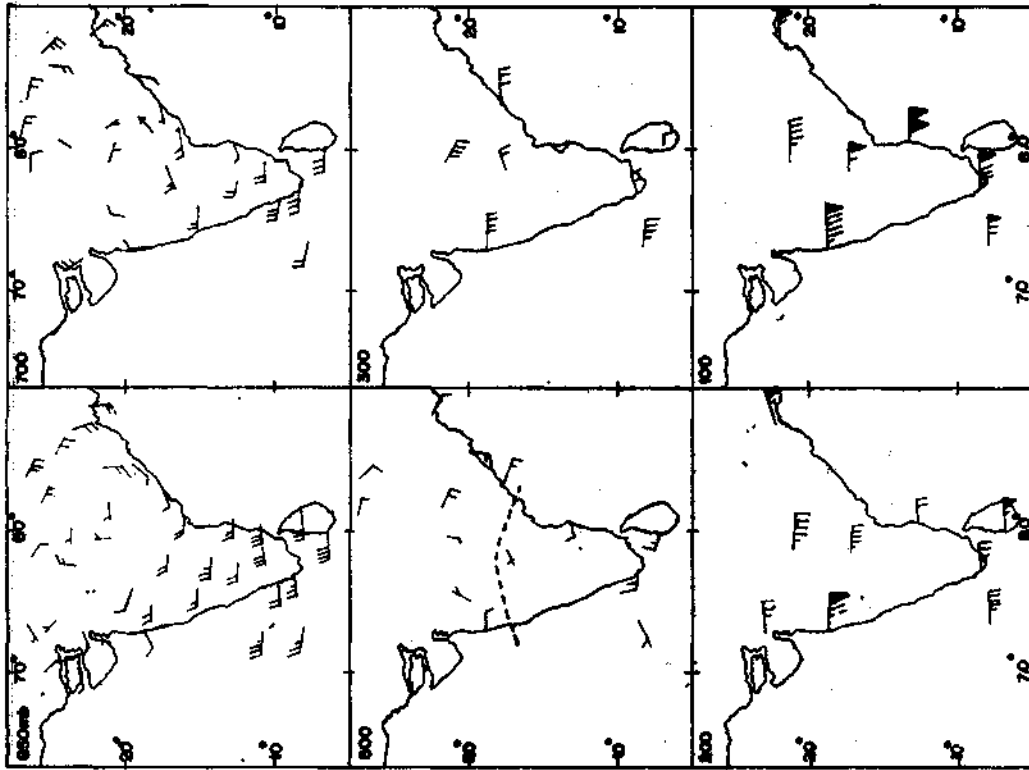


Fig. 2. Upper winds 12 GMT 18-7-68.

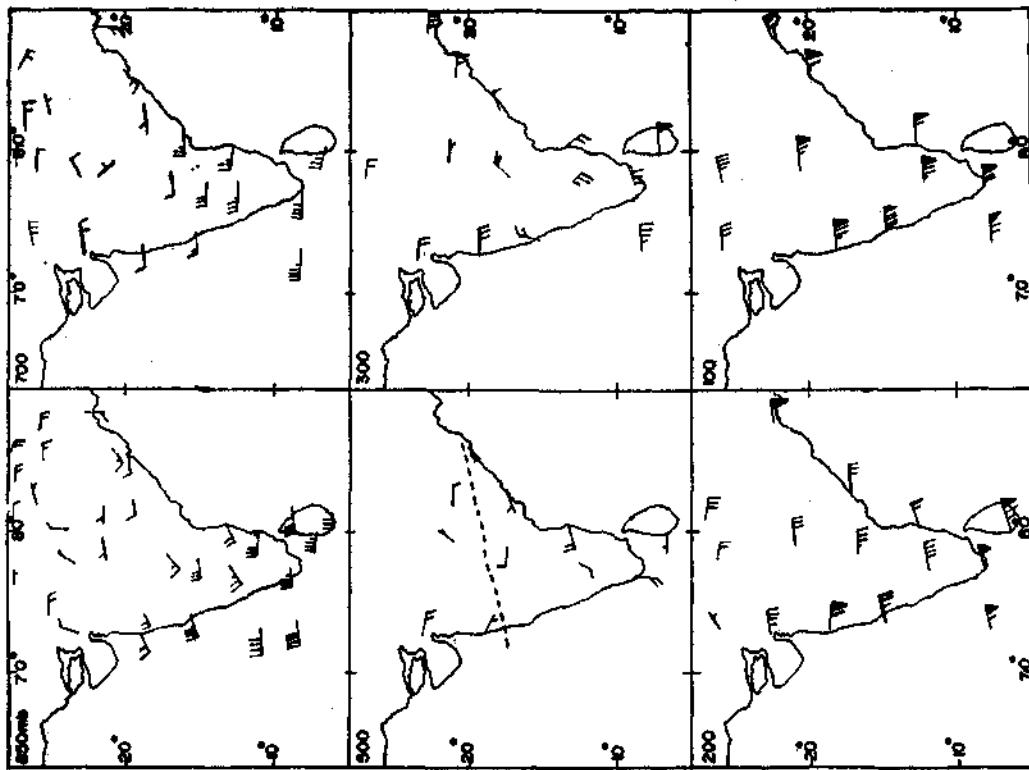


Fig. 4. Upper winds 12 GMT 8-7-70.

[4]

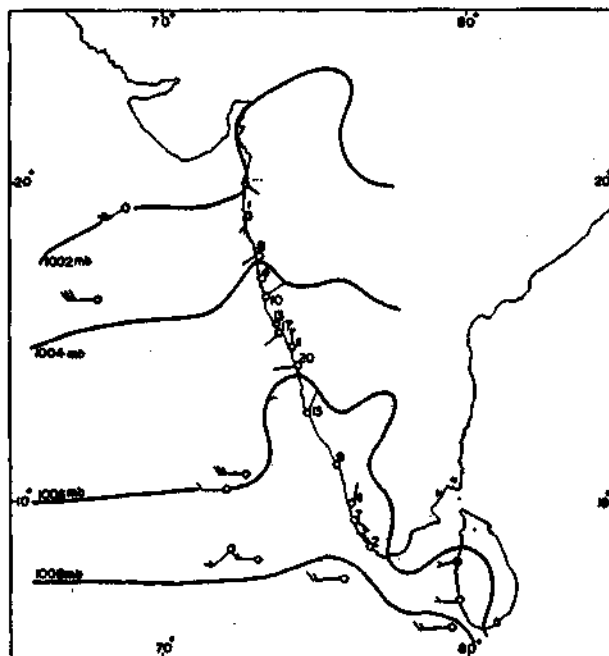


Fig. 5. M. S. L. Isobars 03 GMT 7-8-70 and rainfall for 24 hours ending 03 GMT 8-8-70.

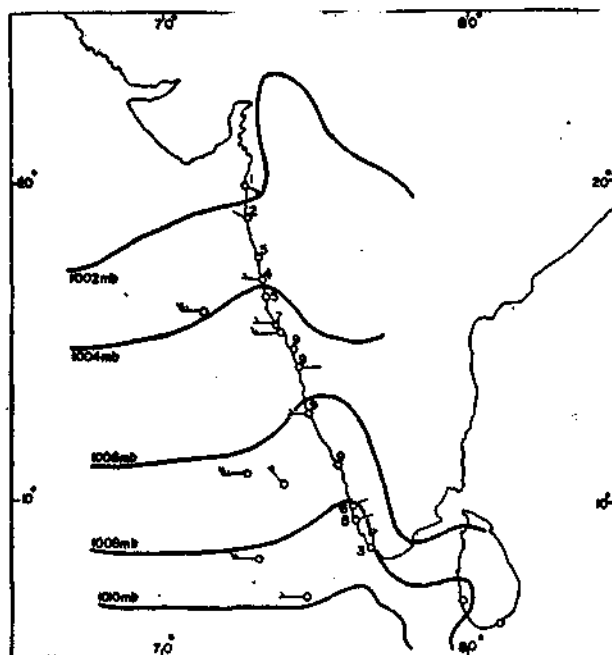


Fig. 7. M. S. L. Isobars 03 GMT 8-8-70 and rainfall for 24 hours ending 03 GMT 9-8-70.

[5]

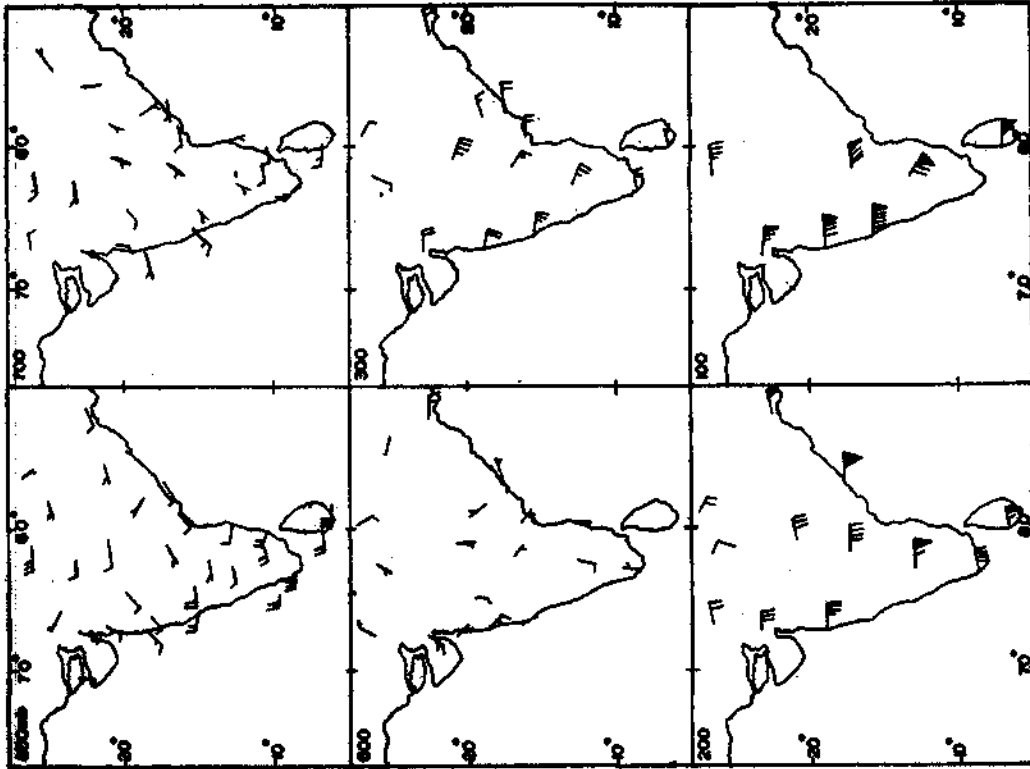


Fig. 6. Upper winds 12 GMT 7-8-70.

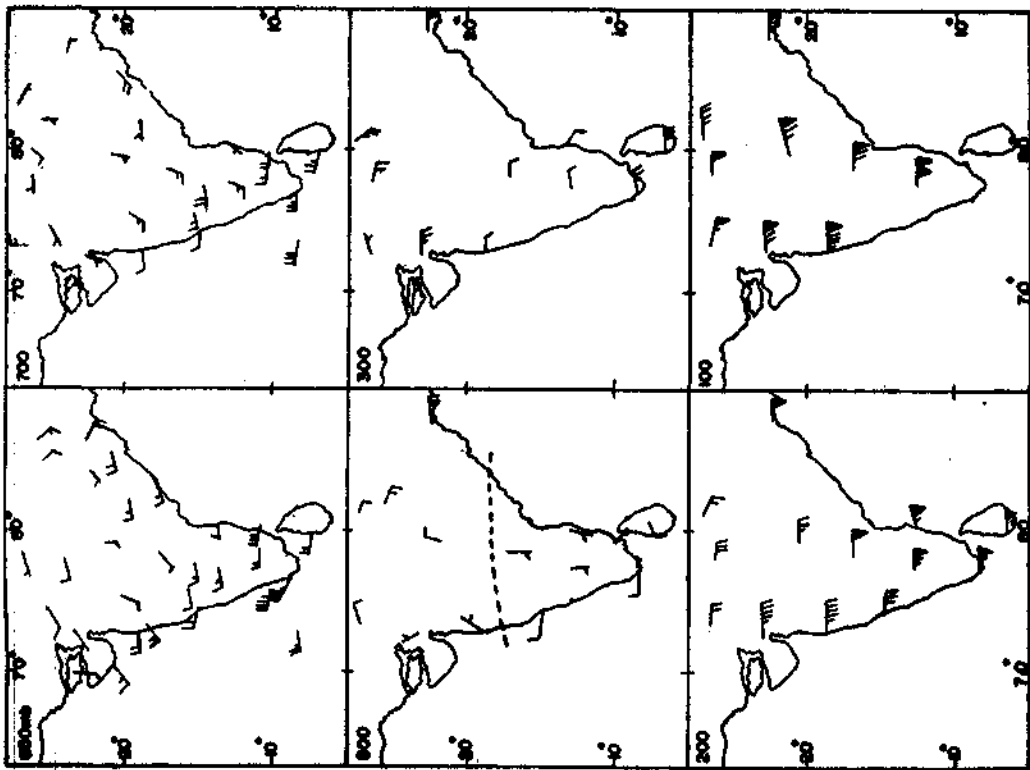


Fig. 8. Upper winds 12 GMT 8-8-70.

[6]

CONCLUSION

It is thus seen that the synoptic situations associated with active / vigorous monsoon conditions all along the west coast vary widely. In two cases, a low pressure area / a depression was located over Madhya Pradesh/Orissa with associated upper air cyclonic circulation extending to middle troposphere. The winds over the peninsula in the lower troposphere were moderate to strong westerlies.

In the other two cases the lower tropospheric flow particularly at 700 to 500 mb level was weak and disorganised. No well-formed cyclonic disturbance was located at the surface. In all these cases, the upper tropospheric easterlies as seen at 100 mb level had maximum speed of 90 to 100 kts. Also at 500 mb level the trough was running along 17° to 18° N across the peninsula.

Ramakrishnan (1969) has studied the synoptic situations associated with incidence of heavy and sub-normal rainfall along the west coast in the southwest monsoon season of 1969 and has found that location of the trough at 500 mb level in a southerly latitude of about $15N^{\circ}$ or so is favourable for well-distributed moderate to heavy rainfall along the west coast.

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