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UPPER LEVEL 'LOWS' IN LOW LATITUDES IN THE INDIAN AREA DURING S. W. MONSOON SEASON AND 'BREAKS' IN THE MONSOON.

It is well known that during the Southwest Monsoon period in the Indian Subcontinent, low pressure waves approach from the east into the North Bay of Bengal, where some of them concentrate into depressions or cyclonic storms and strengthen the Monsoon, if it is not strong already. No depressions are formed in latitudes lower than south of lat. 15°N. once the monsoon has set in, *i.e.* roughly during late June, July and August till its withdrawal to the South Bay of Bengal.

It is, however, observed that low pressure waves from the east sometimes approach the South Andaman Sea in upper levels say above 5000 ft., and move in a northwesterly to westerly direction even during the monsoon months. When they move into the Central and North Bay of Bengal they accentuate the monsoon to the south. When they occur to the south of lat. 10°N. and move westwards they appear often to be associated with 'breaks,' in the monsoon to the north of that latitude. As is well known, during a 'break' of the monsoon, there is no complete cessation of rains in the whole country, and copious rainfall may continue to occur in the sub-Himalayan region from the Punjab to Assam and in Bengal though there may be little or no rain elsewhere.

A prolonged break in the S. W. Monsoon occurred during the first fortnight of August 1947. This was associated with the passage of a 'low' at the 700 mb. level from the east which lay successively over the South Andaman Sea on the evening of the 2nd, over the Southwest Bay on the 3rd evening and the Southeast Arabian Sea off Malabar Coast on the 4th. The monsoon revived in South Malabar and the South Bay by the 5th but the 'low' persisted over the Malabar Kanara Coasts till the evening of the 9th. With the approach of another 'low' into the Southwest Bay on the 10th an elongated trough appeared on the 700 mb. chart on the 11th evening extending from the Southwest Bay to the East Central Arabian Sea. The monsoon extended on the West Coast up to Mangalore. The trough persisted till the 14th, when its Bay end formed into a separate cell which shifted into the Central Bay the next day and then moved away northwestwards across Orissa Coast during the succeeding two days. The Arabian Sea Cell also moved away northwestwards and the monsoon strengthened in the wake of these 'lows'.

Another 'break' occurred in the first week of August 1948 after a period of strong monsoon. A low entered the South Andaman Sea in the upper levels on the morning of 30th July. It moved westwards and on the 700 mb. chart it lay off Ceylon on the morning of 1st August and over the Comorin area on the 2nd. Moving northwestwards later it lay off Malabar Coast in the Southeast Arabian Sea on the 4th morning. It then moved away into the Central Arabian Sea and got diffused. 'Break' conditions set in by the 1st of August and the monsoon revived by the 6th. The movement of this low at the 700 mb. level is illustrated in the accompanying charts (Fig. 1).

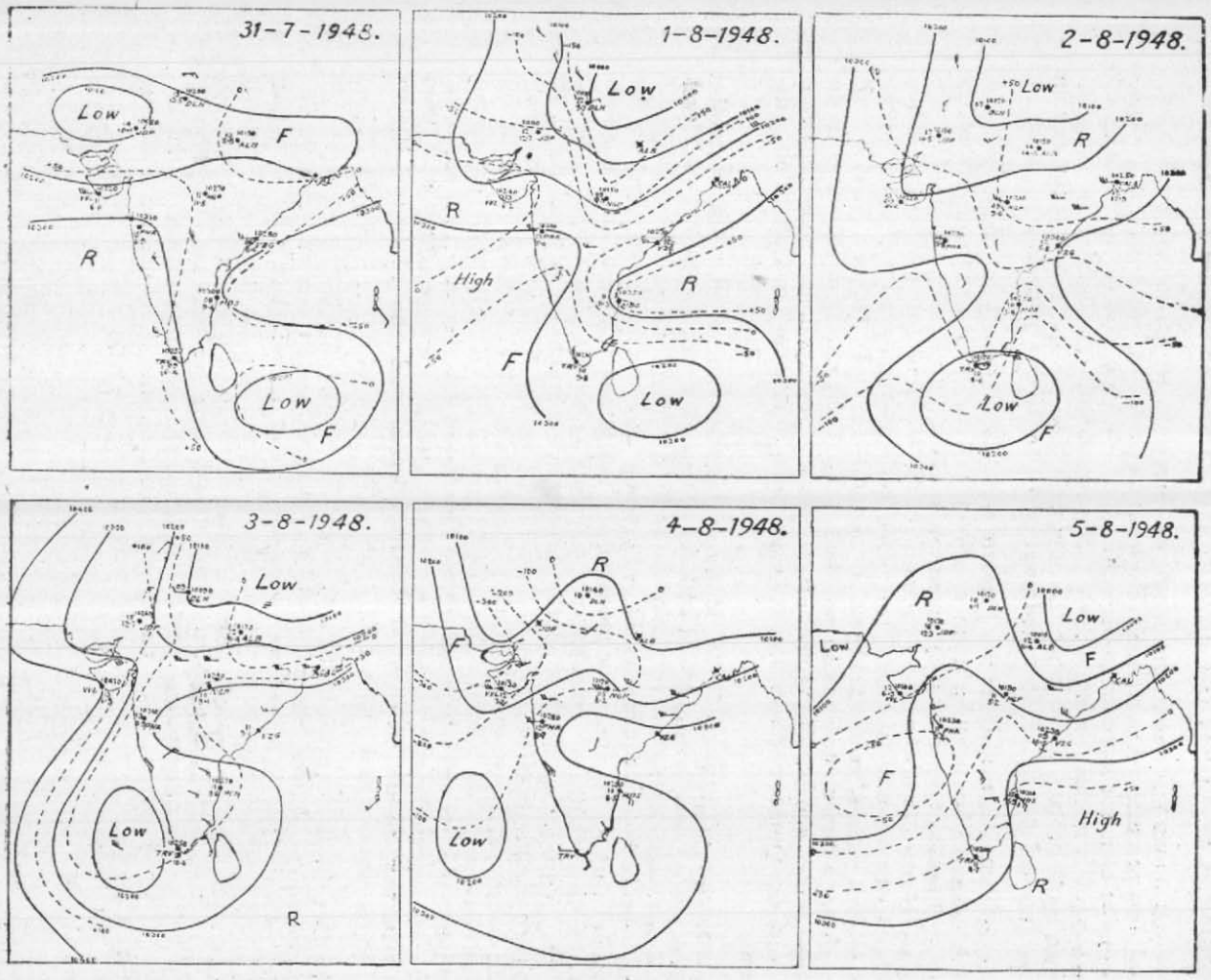

FIG. 1. CONSTANT PRESSURE CHARTS FOR 700 MILLIBARS.

The recent break in the monsoon from 13th to 17th June 1949 occurred after an early onset of the Southwest Monsoon in the Arabian Sea. In this case the upper 'low' could be traced only at 500 mb. level. The 'low' approached the Southwest Bay on the 12th evening and was off Ceylon on the 13th. It moved northwestwards and lay over Southeast Arabian Sea off Malabar Coast on the 16th evening and moved further into the Central Arabian Sea by the 16th. Break conditions set in along West Coast by the 13th and monsoon revived up to lat. 15°N. by the 17th.

From the instances described above, two occurring in the middle of the monsoon season when prior to the passage of the 'low', the monsoon was fully established and the other at the beginning of the monsoon, it appears that the westward movement of the upper 'low' at low latitudes is often associated with a break in the Southwest Monsoon and may be used as a factor for forecasting the same. The gradient of pressure in normal monsoon conditions is always from lower to higher latitudes in the South Peninsula, even up to heights of 20,000 ft. With increase or decrease in pressure gradient, the monsoon strengthens or weakens in the South Peninsula. On the other hand, if the gradient is reversed, thus giving rise to a ridge of high pressure over the Central Peninsula and low pressure over the South at higher levels, the winds to the north of the equator at these levels will tend to be northeasterly to easterly and the flow of the southern hemisphere stream across the equator may be cut off resulting in a 'break' in the monsoon. The movements of these lows into higher latitudes, *e.g*, into the Central Bay of Bengal and Central Arabian Sea would once again establish the normal pressure gradient and create conditions favourable for the strengthening of the monsoon from the south.

Fuller details will be given in a paper to be published later.

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