

Weather

MONSOON SEASON (JUNE - SEPTEMBER 1970)

INTRODUCTION

The southwest monsoon set in over south Kerala on 26 of May and advanced over the Peninsula 4 to 5 days ahead of the normal date. Its subsequent advance over the rest of the country was normal, that is, by the beginning of July the entire country was under the grip of the monsoon.

The activity of the southwest monsoon was good and sustained over the country during June, August and September. But, in July, 'break' monsoon conditions prevailed over northwest India, Uttar Pradesh, west Madhya Pradesh and Gujarat State from 12th to 25th. Of the various low pressure systems which sustained the activity of the monsoon, one developed into a cyclonic storm in the Bay of Bengal and six concentrated into depressions. Of these depressions one emerged into the north Arabian Sea and subsequently intensified into a cyclonic storm. Thereafter, it moved away towards the coast of Arabia in the second week of September. In addition to these systems, a cyclonic storm which was lying in east central Arabian Sea towards the end of May, weakened into a depression and moved away towards the coast of Arabia in the first week of June. The tracks of these disturbances are shown in Fig. 1. These systems caused heavy rain resulting in floods in many parts of north India and the northern parts of the Peninsula. The worst affected areas were Gujarat State, south Bengal, Uttar Pradesh and Assam. Gujarat State and Rajasthan had excess of rainfall in this

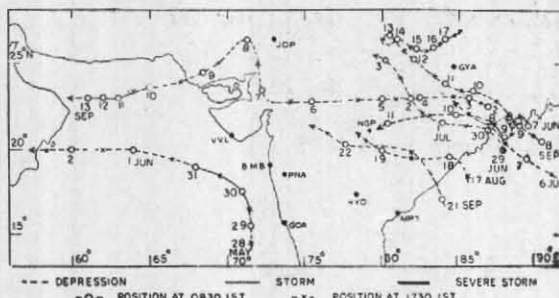


Fig. 1. Tracks of storms/depressions during June - September, 1970

season, which relieved the drought conditions that were prevailing there for some years.

The withdrawal of the monsoon was delayed this year by about 10 to 15 days. It had withdrawn from northwest India only by the end of September.

This year's monsoon rainfall ranged from normal to excess over the whole country, except in south interior Mysore where it was deficient. The total rainfall for the period from 1 June to 30 September 1970, in terms of departure from normal is shown in Figs. 2 (a) and 2 (b).

The progress of the monsoon over the various sub-divisions in India, month by month, is given in Fig. 3. The important features of the weather are given below month by month.

JUNE

The southwest monsoon advanced into south Andaman Sea and the extreme south Bay of Bengal on 15 May, and extended into north Andaman Sea and southwest Bay on 21st. A depression, which formed in northeast Bay on 23rd and crossed East Pakistan coast near Cox's Bazar the same night,

caused the monsoon to advance into east central Bay and southwest Bay by 25th. The monsoon set in over south Kerala and south Arabian Sea upto Lat. 10°N on 26 May, under the influence of a well marked trough of low pressure which developed off Kerala-Mysore-Goa coasts on 25th. In this

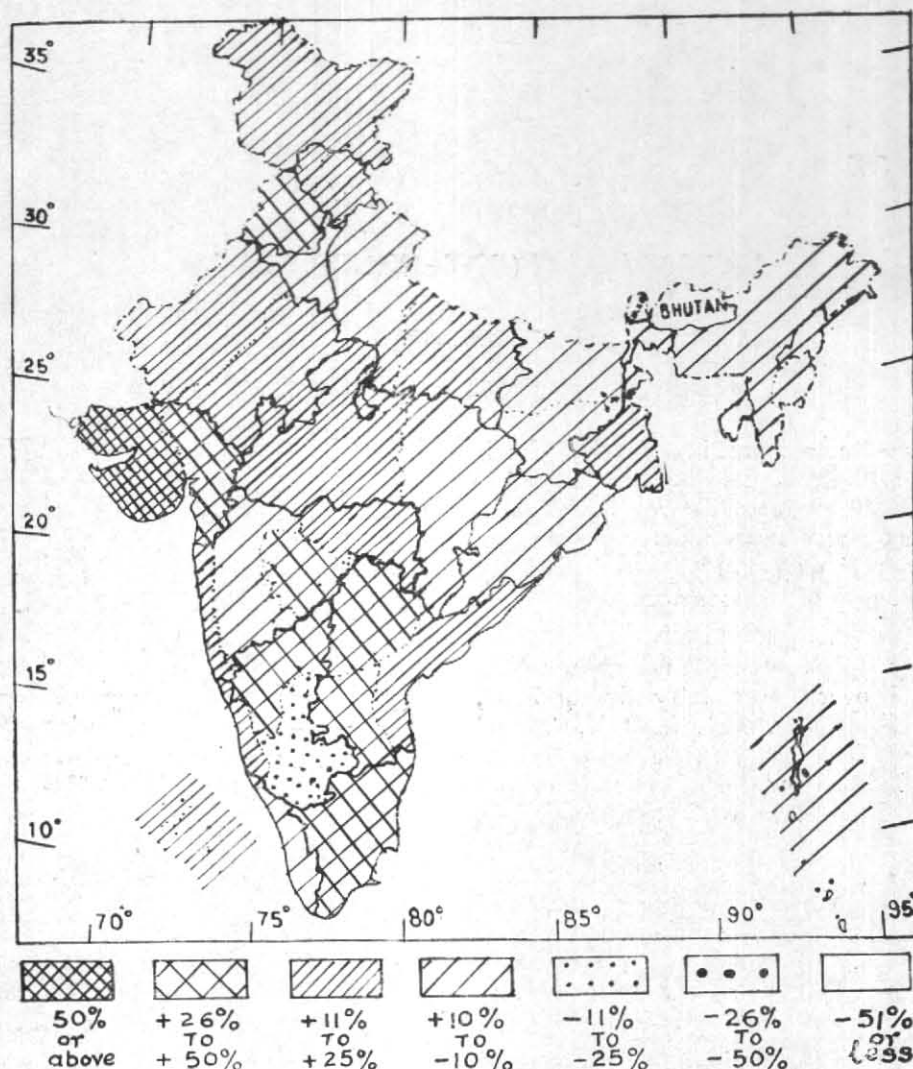


Fig. 2(a). Rainfall for the period 1 June to 30 September 1970
(Percentage departure from normal)

trough, a depression formed off Mysore coast on 28th evening and intensified into a cyclonic storm on 29th. Moving thereafter northwestwards it weakened into a deep depression on 31st over east central Arabian Sea about 500 km west of Bombay. This system ushered in the monsoon over south Konkan and the central Arabian Sea upto Lat. 17°N by 31 May. The monsoon also covered the entire Bay of Bengal outside extreme northwest Bay by the end of May.

On 1 June, the northern limit of the monsoon passed through Ratnagiri, Masulipatam and Chittagong. The monsoon advanced further into the entire Maharashtra State, into southeast Madhya Pradesh, Orissa, West Bengal and Assam by the morning of 4th. A depression formed in north Bay on 7 June, intensified into a cyclonic storm on 9th

morning and crossed north Orissa coast that night. Moving practically westwards, it weakened into a trough of low pressure by 12th evening over east Vidarbha and adjoining central Madhya Pradesh. However, the upper air cyclonic circulation associated with this system moved subsequently to west Madhya Pradesh and adjoining parts of Gujarat region and Maharashtra State. It persisted there upto the 15th and later moved northeastwards to the central parts of Uttar Pradesh by the 17th. Under the influence of this system the monsoon advanced into Bihar State on 9th and covered Madhya Pradesh and Gujarat region by 14th and southeast Rajasthan and central Uttar Pradesh by 16th. The monsoon did not advance further for another 10 days.

The axis of the monsoon trough lay close to the foot of the Himalayas over Uttar Pradesh and

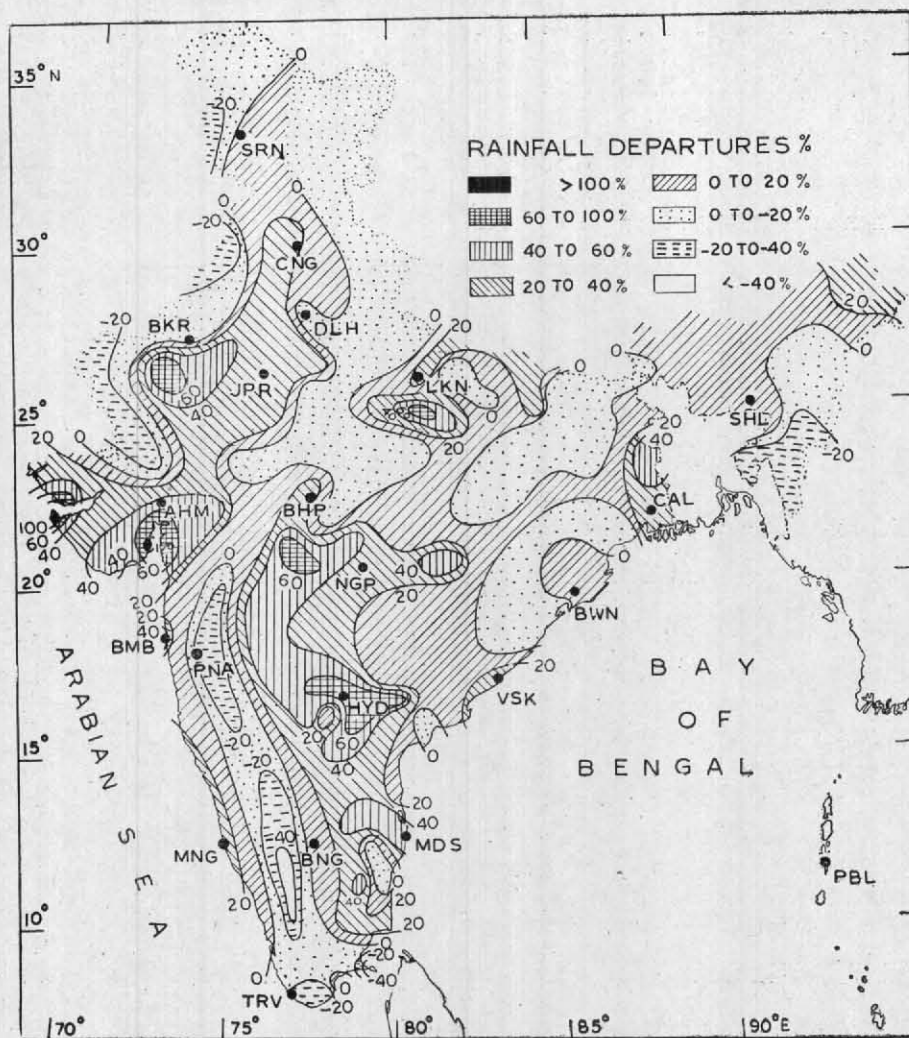


Fig. 2 (b). Percentage departure from normal of rainfall occurred during 1 June to 30 September 1970

northeast India from 17th to 21st. A trough in the middle tropospheric westerlies moved eastward from western Himalayas to Assam between 17th and 22nd. In association with these systems, there was widespread rain on many days, with heavy to very heavy falls on a few days, in eastern Himalayas, sub-Himalayan West Bengal and Assam during the period 17th to 23rd. There were floods in the northern districts of Assam causing damage to houses and crops. The monsoon was generally weak over the central parts of the country from 17th to 26th and in Uttar Pradesh and Bihar State from 19th to 28th. A well marked trough of low pressure developed over northwest and adjoining east central Arabian Sea off Gujarat and north Maharashtra coasts on 27th evening and persisted there till the end of the month, causing incursion of Arabian Sea monsoon air into Gujarat State, northwest India and west Uttar Pradesh. In

association with this system, the monsoon advanced into the rest of Gujarat State and into west Uttar Pradesh and northwest India outside west Rajasthan between the 28th and 30th. The monsoon thus covered the entire country outside west Rajasthan by the end of the month. It also covered the entire Arabian Sea upto Lat. 23°N by that date. In addition to the system mentioned above, three low pressure areas moved from the Bay into Bihar-east Madhya Pradesh areas during the periods 14th to 17th, 21st to 23rd and 25th to 27th and one deep depression from the Bay to north Orissa from 29th to 30th.

Although the monsoon was generally weak over the central parts of the country, Uttar Pradesh and Bihar on many days in the second fortnight, the rainfall in north India during June was generally in excess. In the Peninsula, the activity of the

monsoon was good during the first three weeks and weak in the last week. For the month as a whole, the rainfall was in excess in north Peninsula and nearly normal in south Peninsula. The heavy rains in Maharashtra State in the middle of the month caused many house collapses, and dislocation of road communications in many parts of the

State. Bombay had very heavy rain on 16th and 17th which paralysed city life. Some of the noteworthy amounts of very heavy rainfall during the month were — on 5th, 22 cm at Karwar; on 7th 24 cm at Sandheads; on 15th 22 cm at Rajpur; on 17th, 29 cm at Colaba and on 23rd, 22 cm at Dahanu.

JULY

In association with a low pressure area which developed in northeast Arabian Sea off north Gujarat coast on 1 July and moved into Sind and adjoining southeast Rajasthan on the 2nd evening, the monsoon advanced into west Rajasthan on 3 July, thus covering the entire country by that date. This system also caused good rainfall in Gujarat State and Rajasthan during this period. The heavy rains in Saurashtra caused floods in the local rivers and dislocated road and rail traffic. There was also heavy rain at some places in Jaisalmer district.

A deep depression, which was lying in north Orissa on the evening of 30 June, moved northwards, gradually weakened into a low pressure area over the central parts of Uttar Pradesh by 4th and merged with the monsoon trough. Another deep depression moved northwestwards, from the Bay to Bihar State during the period 6th to 8th, weakened into a low pressure area on 9th evening over west Bihar and adjoining parts of Madhya Pradesh and Uttar Pradesh. This low pressure area moved north into east Uttar Pradesh and adjoining Bihar Plains on 10th, persisted there till 12th. It then merged with the monsoon trough. A cyclonic circulation in the lower troposphere was lying over Punjab, Haryana and adjoining Rajasthan from 8th to 10th and moved across the hills of west Uttar Pradesh on 11th. In association with these systems, there was good monsoon rain in many parts of north India upto 12th, leading to floods and damage to standing crops in some parts of Madhya Pradesh and Orissa.

The axis of the monsoon trough moved close to the foot of the Himalayas from 12 to 25 July, resulting in 'break' monsoon conditions in north-west India, Gujarat State, Uttar Pradesh and west Madhya Pradesh. Widespread rain with isolated heavy to very heavy falls was recorded in Himachal Pradesh, hills of west Uttar Pradesh, Nepal Himalayas, the catchment areas of the *Brahmaputra*, sub-Himalayan West Bengal and Assam during this period. According to press reports,

there were serious and extensive floods in most districts of Assam, in sub-Himalayan West Bengal and in the northern districts of Bihar. Floods in these areas continued unabated till the end of the month. The heavy rains in the hills of west Uttar Pradesh during the period 14th to 21st caused floods and landslides in Garhwal, Chamoli and Pithoragarh districts. The *Alaknanda* rose in floods on 20th and swept away a large number of pilgrims in Belakuchi and an entire village near Joshimath. Floods in *Kali* river affected Pithoragarh district. Landslides and floods in these districts resulted in heavy loss of property.

The seasonal low pressure area over West Pakistan was well marked from 12th to 16th and caused duststorms in the plains of northwest India during this period. This disrupted road and rail communication in Rajasthan, particularly in Barmer and Jaisalmer districts. Strong dust-raising winds also prevailed over the plains of northwest India and adjoining Madhya Pradesh and Uttar Pradesh during the second and third weeks.

Two low pressure areas moved from the Bay northwestwards to Bihar State and adjoining parts of Uttar Pradesh and Madhya Pradesh and merged with the monsoon trough during the periods 18th to 22nd and 26th to 29th, causing good rainfall in northeast India and east Madhya Pradesh. The rainfall in the Peninsula was generally scanty in the first week, but nearly normal during the remaining three weeks. There was a spell of very heavy rain in the Arabian Sea Islands from 23rd to 25th in association with a trough of low pressure lying over Laccadive area during these days.

Some of the noteworthy amounts of very heavy rainfall during the month were — on 1st, 22 cm at Bolangir, 21 cm at Kanker; on 2nd, 23 cm at Raipur; on 7th, 20 cm at Bhira; on 8th, 23 cm at Bhira; on 13th, 28 cm at Tura; on 19th, 24 cm at Honavar; on 21st, 22 cm at Joshimath and 21 cm at Dhar-chula.

AUGUST

During this month, the monsoon trough was nearly in its normal position on most days of the month. A number of weather systems contributed to good and sustained monsoon activity without a 'break' throughout the month. There was an excess of rainfall over most parts of the country including Rajasthan and Gujarat State, but excluding northeast India, where the rainfall was deficient. The main meteorological systems were as follows —

(i) A cyclonic circulation, extending to the middle troposphere, moved from Bihar Plateau and adjoining Madhya Pradesh to West Pakistan across south Uttar Pradesh and Rajasthan from 1st to 5th. (ii) A low pressure area from south Burma moved to south Orissa across north and adjoining central Bay from 1st to 5th. (iii) A low pressure area moved from west Uttar Pradesh to east Rajasthan during the period 9th to 11th. (iv) A cyclonic circulation extending to the middle troposphere moved from Uttar Pradesh to Kutch and adjoining parts of West Pakistan and Rajasthan from 12th to 15th and persisted there upto the 19th. (v) A low pressure area developed over Gujarat State and adjoining parts of West Pakistan and south Rajasthan on 19th, became well marked on 20th, and moved away westwards to Saudi Arabia by 23rd. (vi) A depression formed in west central and adjoining northwest Bay on 17th, moved westnorthwest across Vidarbha to southwest Madhya Pradesh by 20th morning and after weakening into a low pressure area it merged with the monsoon trough on the same evening. (vii) A low pressure area from Burma moved across the Bay to Orissa and adjoining east Madhya Pradesh from 20th to 22nd and merged with the monsoon trough the next day. (viii) A low pressure area which formed over Bihar Plateau and neighbourhood on 24th persisted there upto 27th, and moved westwards to north Madhya Pradesh and adjoining Uttar Pradesh by 29th morning. It merged with the monsoon trough the same evening. (ix) A cyclonic circulation in the lower and middle troposphere lay over Gujarat State and adjoining Rajasthan from 28th to 31st. (x) The eastern end of

the monsoon trough was north of its normal position over northeast India from 7th to 12th, and passed through north Bihar, north Bengal and Assam. The western end was north of its normal position over northwest India from 24th to 27th and passed through Punjab, Haryana and west Uttar Pradesh.

Heavy rainfall associated with the systems mentioned above resulted in floods in north Bihar and north Bengal in the second week and in Gujarat State, Madhya Pradesh, Andhra Pradesh and interior parts of Maharashtra State in the second fortnight. In Andhra Pradesh, the flooded *Kunderu* river inundated many villages in Nandyal and other talukas in Kurnool district and the flooded *Godavari* inundated many parts of Bhadrachalam town and also many villages in Karimnagar, Nizamabad, Khammam, east and west Godavari districts causing damage to paddy crops. Road and rail communications were also disrupted in many parts of Telangana. In many parts of Maharashtra State and Madhya Pradesh, road traffic was dislocated and there was some damage to standing crops in Vidarbha. The heavy rains in Gujarat State dislocated road and rail traffic between Ahmedabad and some parts of Saurashtra. The floods in the *Tista* affected Jalpaiguri district, while the floods in the *Kosi* and other rivers affected Darbhanga and Muzzaffarpur districts. Heavy rains in Sikar district in east Rajasthan caused many house collapses and some loss of life. The flooded *Sabi* river caused some damage to standing crop in Alwar district.

A trough of low pressure lay in the east central Arabian Sea of the west coast on most days between 1st and 12th causing widespread rain along the west coast with active to vigorous monsoon conditions in Konkan and coastal Mysore from 7th to 12th. Some of the noteworthy amounts of very heavy rainfall in this month were — on 8th, 20 cm at Honavar; on 10th, 19 cm at Dabolina (Goa), on 19th, 21 cm at Harnai, 20 cm at Bombay (Colaba); on 25th, 32 cm at Raigarh and on 29th, 29 cm at Rajkot.

SEPTEMBER

During this month the monsoon was active over the country resulting in an excess of rainfall over many parts of the Peninsula, Gujarat State, Rajasthan, West Bengal and Bihar. It was generally normal rainfall over the rest of the country. The principal meteorological systems were as follows:

(i) A deep depression moved westwards from Gangetic West Bengal to north Gujarat State and thence to north Arabian Sea, where it intensified into a cyclonic storm. It later weakened into a low pressure area near coastal Arabia during the course of the first fortnight. (ii) Another deep depression

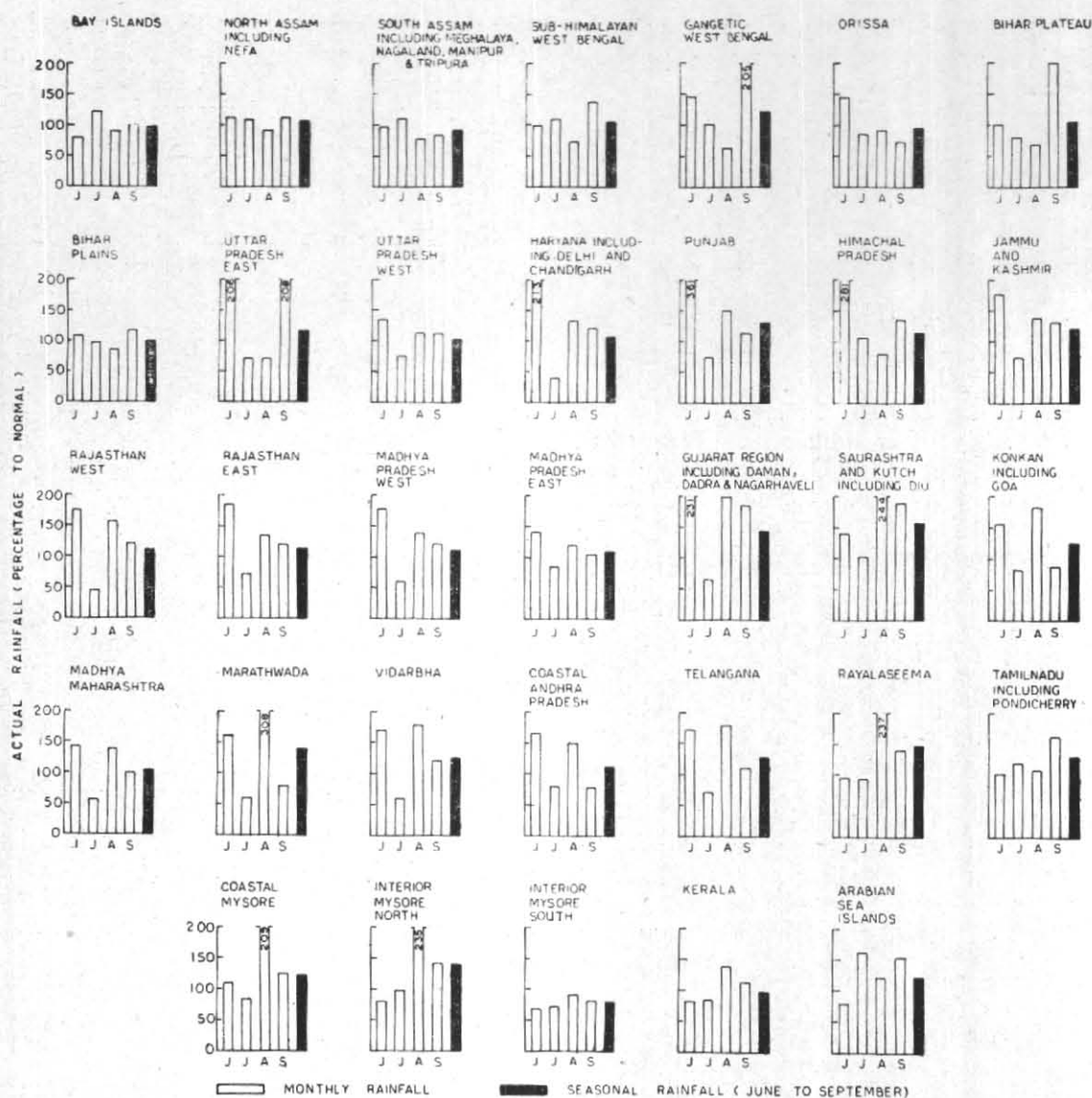


Fig. 3. Progress of monsoon month by month, June to September 1970

moved northwestwards from north Bay to Uttar Pradesh and recurved eastwards towards the Bihar Plains during the second week. (iii) A depression moved from west central Bay to Vidarbha in the 3rd week. (iv) A cyclonic circulation in the lower troposphere moved westwards from south and adjoining central Bay to Laccadive area across the Peninsula, shifted northwards to east central Arabian Sea off the Mysore-Maharashtra coasts during the period 11th to 17th. It became less marked on the 18th. (v) Another cyclonic circulation extending to the middle troposphere moved from Andhra-north Tamil Nadu coast to Maharashtra

State across interior Mysore from the 16th to 18th.

In association with the first two depressions there was heavy rain in West Bengal, Bihar State Madhya Pradesh, Uttar Pradesh and Gujarat State. Disastrous floods were reported in south Bengal and Gujarat State and widespread inundation and house collapses in east Uttar Pradesh. About 500 persons were reported to have died in Gujarat State, about 150 in Uttar Pradesh and about 80 lives were lost in south Bengal. The flooded banks of the *Narmada* and *Tapti* inundated many areas in southwest Madhya Pradesh also. Floods were also reported from Cuttack

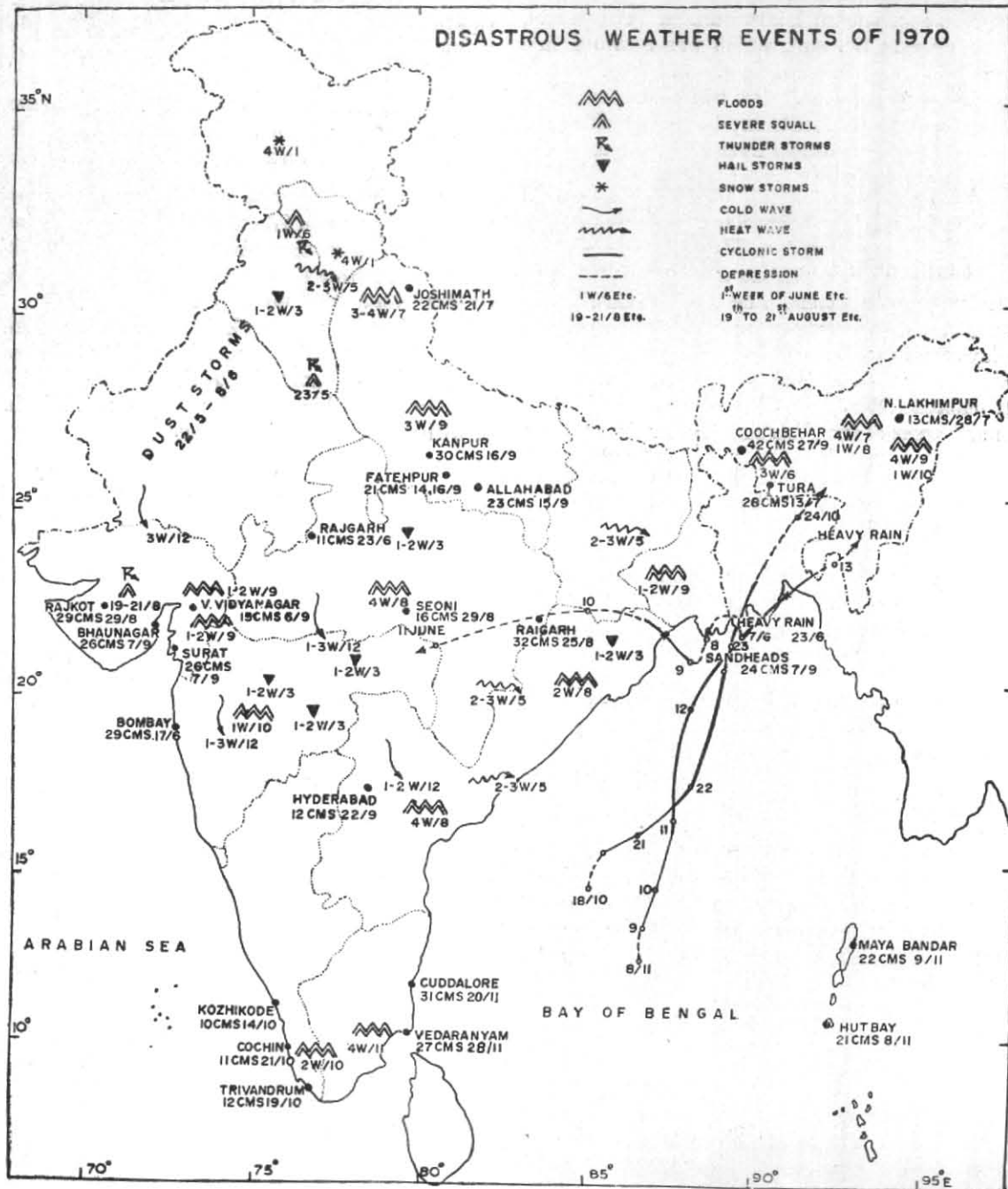
Keonjargarh, Puri and Balasore districts in Orissa, resulting in damage to crops. In north Bihar, Monghyr and Champaran districts were affected by the flood waters of the *Ganga* and the *Gandak*. The third depression, which moved across Vidarbha in the third week, caused heavy rain in Telangana. Very heavy rain (12 cm), which was recorded in Hyderabad during a short interval of about 4 hours, flooded the twin cities of Hyderabad and Secunderabad, and caused many houses to collapse. Approximately, 75 human lives were lost on account of this cloudburst.

The western end of the monsoon trough lay close to the foot of the western Himalayas from 1st to 4th, causing good rain in the western Himalayas and the adjoining plains. The eastern end of the monsoon trough lay close to the foot of the eastern Himalayas from 12th to 18th and again from 24th to 28th. This was responsible for good rainfall in sub-Himalayan West Bengal and Assam and the catchment areas of the *Tista* and the *Brahmaputra*.

The floods in the *Tista* affected Jalpaiguri district, while the floods in the *Brahmaputra* affected some areas in north Assam and NEFA.

Some of the noteworthy amounts of very heavy rainfall during this month were — on 4th, 26 cm at Burdwan, 22 cm at Krishnanagar; on 7th, 26 cm at Bhavnagar and Surat; on 12th, 20 cm at Sidhi; on 14th, 21cm at Fatehpur; on 15th, 23 cm at Allahabad; on 16th, 30 cm at Kanpur (Chakeri), 24 cm at Kanpur, 21cm at Fatehpur; on 25th, 21cm at Akola city and on 27th, 42 cm at Cooch Behar.

The southwest monsoon withdrew from north-west India between 28 and 30 September — about 10-15 days later than the normal date. It withdrew further from Uttar Pradesh, Madhya Pradesh, Gujarat State and north Maharashtra State by 8th October, about a week later than the normal date. Subsequently, it withdrew from northeast India and the Peninsula north of Lat. 15°N by 12th October, which was about the normal date of withdrawal from these areas.



Details of the disastrous weather events during 1970

Disastrous Weather Events of 1970

Every year some part of the country or the other experiences spells of unusually adverse weather which bring disaster and misery to large sections of the community and affect normal life and economy. Cyclonic storms striking the coastal areas, severe thunder or hailstorms, duststorms, heavy rain or snowfall, floods and droughts, heat and cold waves are some of the phenomena that come under this category.

The map presents in pictorial form, the areas and time of occurrence of such disastrous weather events during the year 1970.

Details of disastrous weather events are as follows —

Thundersqualls

Several parts of Gujarat State were affected by thundersqualls during the period 19 to 21 August. Trees were uprooted, traffic paralysed and communication lines disrupted due to the squalls. A few people were reported to have lost their lives due to lightning strikes.

Severe thundersqualls affecting some parts of Himachal Pradesh in the first week of June caused loss of human life and property in the Una and Hamirpur sub-divisions.

Traffic was dislocated at Delhi on the 23rd of May due to heavy thundershower and gale. Two persons were reported killed.

Hailstorms

During the first and second weeks of March, hailstorms affected several districts of Madhya Pradesh, Orissa, Haryana, Vidarbha, Marathwada and Madhya Maharashtra. Eight persons were reported killed and crops and property worth Rs. 90 lakhs were damaged.

Duststorms

Between 22 May and 8 June several parts of northwest India were affected by duststorms causing disruption of traffic and communications and loss of life. In the Ganganagar area of Rajasthan crops in thousands of acres of fertile land were reported to have been damaged.

Snowstorms

In the last week of January snowstorms affected the Kumaon hills and Jammu & Kashmir disrupting normal traffic and causing some loss of life.

Cyclonic storms

A depression which formed in the north Bay of Bengal on 7 June intensified into a cyclonic storm and crossed the north Orissa coast on 9 June causing heavy rain in the neighbouring areas. Sandheads recorded 24 cm of rain on 7 June.

A depression which formed in the Bay of Bengal on 18 October intensified into a severe cyclonic storm and crossed coast near West Bengal—East Pakistan border on the 23rd causing damage to houses and crops in the coastal districts of West Bengal. The life in Calcutta city was paralysed on 23rd.

A depression which formed in the south central Bay of Bengal on 8 November intensified into severe cyclonic storm on the 11th. It crossed East Pakistan coast on the 12th night and brought unprecedented havoc in East Pakistan. It also caused very heavy rain in the Bay Islands and consequent damage to property in these islands. There was also considerable damage to houses and crops in the Mizo hills district of south Assam.

Floods

In the third week of June, heavy rains in Assam caused floods in *Brahmaputra* and its tributaries and inundated vast areas of Jute crops and Paddy fields in the northern districts.

In the third to fourth week of July the flooding of the *Alakananda* river caused considerable loss of life among pilgrims. A number of bridges, houses and even an entire village in the Joshimath area were washed away.

In the *Brahmaputra* floods in the last week of July, first week of August and last week of September and first week of October there was heavy loss of life, property and standing crops.

Floods occurred in Andhra Pradesh, and Madhya Pradesh in the last week of August and in Orissa in the second week.

Torrential rain in Gujarat and adjoining areas in the first two weeks of September caused considerable damage to railway track and breaches that disrupted traffic over wide areas. The *Narmada* and *Tapti* were in spate resulting in loss of life estimated over a thousand and extensive damage to standing crop and property.

Heavy rains in Gangetic West Bengal in the first fortnight of September flooded vast areas in the

West Bengal resulting in the death of some 80 persons and rendering several thousands homeless. There was also considerable damage to crops and houses in Gangetic West Bengal during this period.

Floods, landslides and house collapses in the districts of Uttar Pradesh in late September reportedly took a toll of 223 human lives. Crops and property damage have been estimated to run into several crores.

Floods in Aurangabad district in the beginning of October were reported to have rendered over 8,000 people homeless. Damaged crops were estimated to be worth about 2 crores.

Heavy rains in Kerala in the middle of October disrupted normal life, flooding low-lying areas and affecting communications.

A spell of torrential rain on 22 September over the twin cities of Hyderabad and Secunderabad reportedly caused the death of 100 people. Stored grains worth lakhs of rupees were washed away and it was reported that 40,000 people were rendered homeless.

Heavy rains and floods affected Tamil Nadu in the last week of November.

Heat and cold waves

Moderate to severe heat wave conditions in many parts of north India and in coastal Andhra Pradesh during the second and third weeks of May took a toll of over 500 human lives.

Moderate cold wave conditions prevailed over Madhya Maharashtra and some parts of Central India during the first two to three weeks of December causing a few deaths due to exposure.