

Weather

MONSOON SEASON (JUNE-SEPTEMBER 1973)

CHIEF FEATURES

Advance of the monsoon

The southwest monsoon advanced into south Andaman Sea and adjoining southeast Bay on 7 May and covered the Andaman Sea by the 14th. It advanced as a feeble current into Comorin-Maldive area and extreme southwest Bay on the 22 May and also into south Kerala and south Arabian Sea upto 10°N on 23 May. It retreated from Kerala by the 27th and revived over Kerala on 4 June and covered most parts of the Peninsula and the Bay and Arabian Sea upto 20°N by 10 June. It commenced advancing into northeast India on the 11th and covered Gujarat State, southeast Rajasthan, Madhya Pradesh and northeast India by the 13 June. There was a lull in the monsoon in the second half of June. The monsoon advanced into Uttar Pradesh and northeast Rajasthan on 3 July and covered the entire country by 6 July. The schedule of advance of the monsoon over the Peninsula and Madhya Pradesh was nearly normal. Its advance into Assam and adjacent States was delayed by about a week, into Uttar Pradesh by 10 to 15 days and into most parts of northwest India by 4 to 5 days.

Activity of the monsoon

The monsoon activity was normal in the country except Punjab, Jammu & Kashmir, Rajasthan, west Madhya Pradesh and Gujarat Region, where active to vigorous monsoon conditions during August led to excess rainfall and floods. The monsoon was weak in the Peninsula, Gujarat State and Madhya Pradesh in the second half of June.

A 'break' in the monsoon prevailed over major part of the country in the last week of July.

Withdrawal of the monsoon

The southwest monsoon withdrew from northwest India between 12 and 28 September. It withdrew from Gujarat State and northwest Madhya Pradesh on 3 October, from Maharashtra State, southwest and northeast Madhya Pradesh and east Uttar Pradesh by 10 October and from the rest of the country outside the Peninsula south of 15°N on 16th. The withdrawal of the monsoon from north India was about 8-10 days later than the normal date. It withdrew from the north Peninsula by about the normal date.

Depressions and Cyclones

Two cyclonic storms and six depressions developed during this period. One cyclonic storm formed in the Bay of Bengal and the other in the Arabian Sea. Out of the six depressions, three formed in the Bay of Bengal and one in the Arabian Sea and the remaining two were land depressions. The tracks of these systems are shown in Fig. 1.

The total rainfall for the period from 1 June 1973 to 30 September 1973, in terms of departures from the normal is shown in Figs. 2(a) and 2(b). The progress of the monsoon over the various subdivisions in India month by month is given in Fig. 3. The important features during the different months are given below.

JUNE

The southwest monsoon advanced into south Andaman Sea and adjoining southeast Bay on 7 May and covered the entire Andaman Sea by the 14th. It advanced into Comorin-Maldive area and part of southwest Bay on 22 May and also into south Kerala as a feeble current on the 23rd. It withdrew from Kerala on the 27th and

its northern limit on 1 June passed through Minicoy, Puttalam and Sandoway. The monsoon revived over Kerala on 4 June and covered most parts of the Peninsula and the Bay and Arabian Sea upto 20°N by 10 June. It commenced advancing into northeast India on the 11th and covered Gujarat State, southeast Rajasthan, Madhya

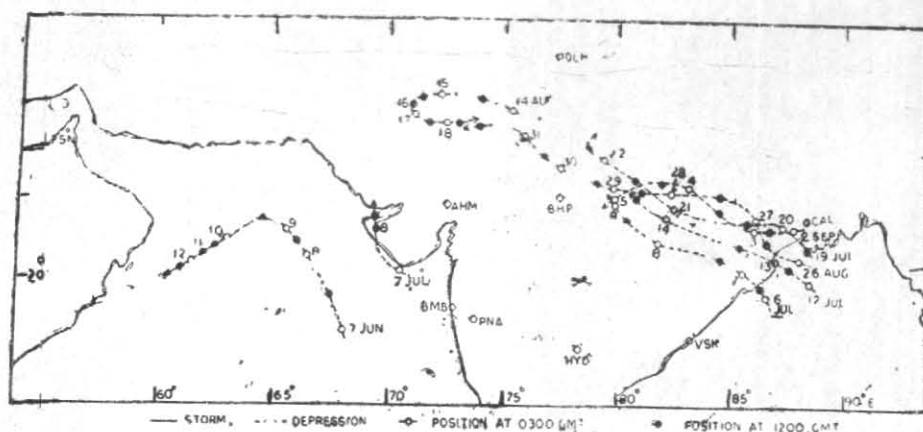


Fig. 1

Tracks of Cyclones and depressions during June-September 1973

Pradesh and northeast India by the 13th. The monsoon did not advance further over the country during the rest of the month. The advance of the monsoon over the Peninsula and Madhya Pradesh was near the normal schedule. Its advance into Assam and adjacent States was delayed by about a week. The advance of the monsoon and its activity over different parts of the country during the month were influenced by the following systems :

(i) Persistence of a trough over Laccadive area off Kerala-Mysore coasts from 21 to 24 May and movement of a cyclonic circulation in the lower and middle troposphere from Sri Lanka and adjoining Comorin to Laccadive area between 21 and 23 May.

(ii) Formation of a low off Kerala coast on 2 June and its northwestward movement and intensification into a cyclonic storm by 10th morning over north Arabian Sea and its subsequent southwestward movement towards Oman coast.

(iii) A trough of low off Maharashtra-Mysore coasts and a cyclonic circulation in the lower and middle troposphere over Gujarat from 11th to 13th.

(iv) Formation of a low over north Bay on the 10th, and its westward movement into Orissa by the next day and its subsequent weakening into a trough over east Madhya Pradesh on 12th.

(v) A feeble trough off Kerala coast on the 17th and 18th.

The monsoon was active in Kerala and coastal Mysore for about 5 days between 6th and 18th. It was vigorous in Vidarbha on 12th and active to vigorous in Konkan and Gujarat Region between 11th and 14th. It was also active in Bihar plains,

sub-Himalayan West Bengal and Assam and adjacent States between 14th and 17th and again in Assam and adjacent States from 26th to 29th. The monsoon was generally weak over Gujarat State, Madhya Pradesh and the Peninsula during the second half of June. According to press reports due to floods in the north Bengal rivers, many parts of Jalpaiguri, Cooch Behar and Darjeeling districts were inundated affecting crops and damaging about 3,000 houses. The floods in Assam and adjacent States were reported to have affected 8 lakh people while the floods in north Bihar affected a population of 15 lakhs and damaged crops over 63,000 hectares.

Nine western disturbances moved across northwest India during this month causing excess of rainfall in Himachal Pradesh, Punjab, Haryana and west Uttar Pradesh and deficient rainfall in Jammu & Kashmir and Rajasthan. Under the influence of a cyclonic circulation upto 900 m a.s.l. over Gangetic West Bengal and neighbourhood and a middle tropospheric trough moving eastwards across northeast India, there was fairly widespread thundershower activity in Assam and adjacent States with a few heavy falls on some days in the first week.

The axis of the seasonal trough which lay close to the foot of the Himalayas in the third week, caused a spell of good rainfall in east Uttar Pradesh during that period.

The principal amounts of very heavy rainfall (20 cm and above) during the month were : Burdwan 20 on 8th; Cherrapunji 24, Goa (Dabolim) 20 and Goa (Panjim) 20 on 12th; Cherrapunji 23 and Nainital 20 on 14th; Cherrapunji 48 and Raxaul 24 on 15th; Cherrapunji 48 on 16th and again 36 on 29th.

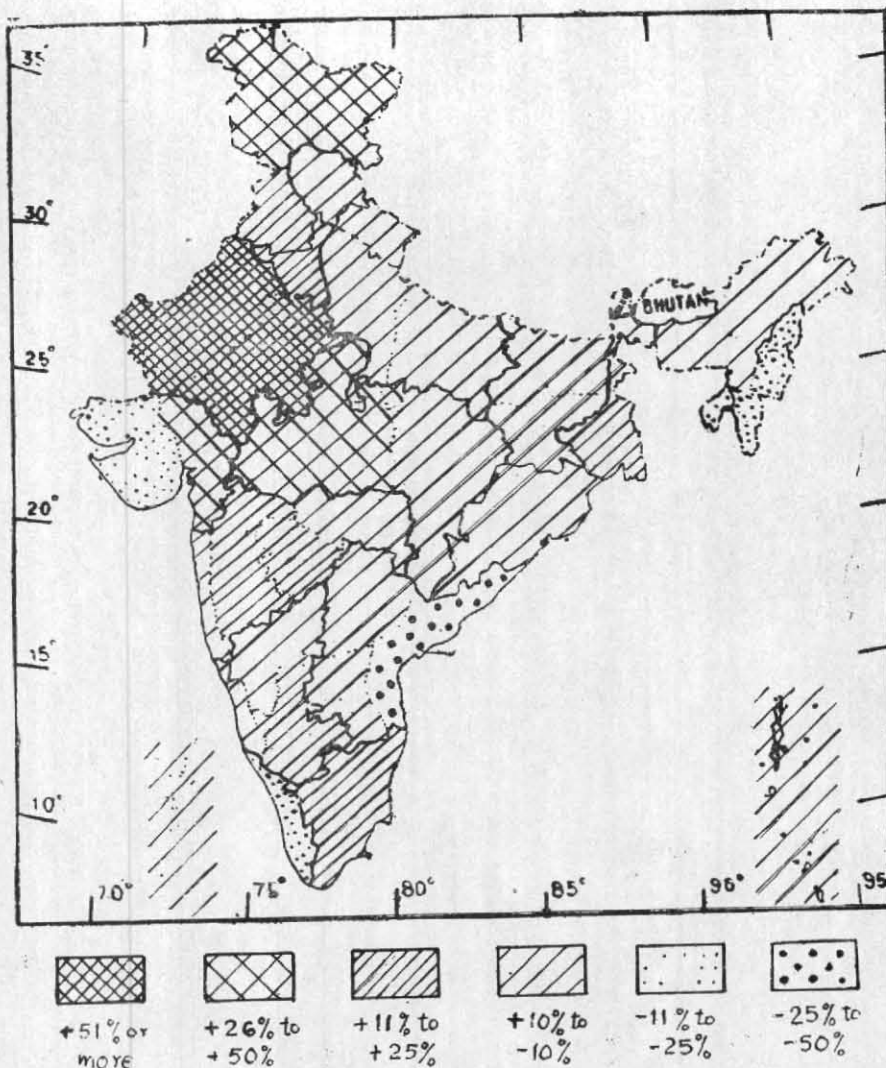


Fig. 2(a)

Rainfall for the period 1 June to 30 September 1973 (Percentage departure from normal)

JULY

The southwest monsoon advanced into Uttar Pradesh and northeast Rajasthan on the 3rd and covered the entire country by the 6th. The advance of the monsoon into Uttar Pradesh was delayed by 10 to 15 days and into most parts of northwest India by 4 to 5 days. There was generally good monsoon activity over major part of the country during the first three weeks under the influence of the following systems.

(i) A trough of low off the west coast extending from Gujarat to Laccadive area on many days between the 1st and 10th.

(ii) Movement of a deep depression from north-west Bay to north Madhya Pradesh between 6th and 9th.

(iii) Movement of a depression from south Gujarat State and adjoining east central Arabian Sea to Kutch on 7th and 8th.

(iv) Movement of a deep depression from north Bay to north Madhya Pradesh between 12th and 14th.

(v) Formation of a cyclonic storm over the head Bay and its movement to north Madhya Pradesh as a depression between 19th and 22nd.

(vi) The western part of the monsoon trough passed through Punjab, Haryana and southwest Uttar Pradesh from 13th to 17th.

(vii) A trough extending to the middle troposphere over south Rajasthan and adjoining Gujarat State from 15th to 17th.

WEATHER



Fig. 2 (b)

Percentage departure from normal rainfall occurred during the period 1 June to 30 September 1973

The monsoon was active in Kerala and Mysore State between 1st and 6th and active to vigorous in Maharashtra State between 1st and 9th and again on 14th and 15th. It was active in Gujarat Region on 3rd, 9th to 12th and 16th to 18th; in Saurashtra & Kutch on 7th, 9th, 10th and 16th; and in Madhya Pradesh on many days upto 23rd; being vigorous in Saurashtra & Kutch on 10th and 16th; and in Madhya Pradesh between 21st and 23rd. The monsoon was also active in Haryana and Punjab between 13th and 16th and in east Rajasthan on 16th and 17th. It was vigorous in east Rajasthan on 22nd and 23rd. Active monsoon conditions also prevailed in Orissa on 5th, 7th, 13th and 14th and again from 19th to 21st; in Gangetic West Bengal on 20th and 21st; in Bihar Plateau on 21st and in east Uttar Pradesh on 20th. The monsoon was weak in Assam and adja-

cent States, sub-Himalayan West Bengal, Bihar Plains and east Uttar Pradesh during the first three weeks.

According to press reports, the floods in the *Narbada* and other rivulets in Madhya Pradesh submerged many parts in that State dislocating vehicular traffic. Hoshangabad town was cut-off from the rest of the State for a few days. Low lying areas of Ujjain city were inundated. Heavy rain in Vidarbha also caused floods and breaches in roads disrupting road communication in that area. Many districts in Orissa were also affected by floods causing damage to standing crops. Jajpur was the worst hit sub-division. In Gujarat State, Perbandar town was cut-off due to very heavy rain and flooding on the 10th. Heavy rain in Bombay caused some house collapses. Parts o

Broach city were submerged due to floods in the *Narbada*. Floods in the *Godavari* entered Bhadrachalam town.

The eastern part of the monsoon trough lay close to the foot of the Eastern Himalayas in the last week of the month. A low pressure area moved from Bangla Desh to northeast Uttar Pradesh and adjoining Bihar Plains from 26th to 30th. In association with these systems, the monsoon was active in Assam and adjacent States and in sub-Himalayan West Bengal on some days from 23rd to 31st and in Bihar Plains from 25th to 29th. It was active to vigorous in east Uttar Pradesh from 28th to 31st. It was also active in Gangetic West Bengal and Bihar Plateau on the 27th. According to press reports, floods were reported from Monghyr district in Bihar and north Lakhimpur district in Assam. The monsoon was generally weak over the Peninsula, Gujarat State, Madhya Pradesh and Rajasthan during the last week.

A trough in the lower troposphere lay close to Sri Lanka-Tamil Nadu-south Andhra coasts during the last week. A cyclonic circulation in the middle troposphere moved westwards across Sri Lanka-Comoria area between 23rd and 25th. A trough also lay over Laccadive area on the last two days. These systems caused scattered to fairly widespread rain in south Peninsula on few days in the last week.

Four western disturbances moved eastwards across the Western Himalayas during the periods 1st to 3rd, 7th to 9th, 21st to 23rd and 26th to 28th. The western part of the monsoon trough lay close to the foot of the Western Himalayas from 18th to 20th and again from 23rd to 31st. In

association with these systems, there was generally widespread rain in the Western Himalayas and the adjoining plains during the above mentioned periods. The monsoon was vigorous in Punjab and active in Haryana and the hills of west Uttar Pradesh on 21st. Active monsoon conditions also prevailed in Punjab, Haryana, Himachal Pradesh and west Uttar Pradesh generally between 24th and 27th and in Jammu & Kashmir on 27th. The monsoon was vigorous in west Uttar Pradesh and Punjab on the 26th. According to press reports, heavy rain in Himachal Pradesh and the hills of west Uttar Pradesh caused floods and landslides, dislocating road and rail traffic in these areas. Simla was cut-off from the rest of the State for a few days. Many parts of Rishikesh, Hardwar and Dehra Dun sections were submerged. Eight villages in Nalagarh sub-division of Solan district in Himachal Pradesh were reported to have been washed away by floods. Six villages in north Punjab were inundated, causing damage to crops. Twelve districts in Uttar Pradesh were affected by floods, resulting in inundation of vast areas of *Kharif* crop.

The principal amounts of very heavy rainfall (20 cm and above) during the month were: Mahabaleshwar 22 on 5th; Kuttiyadi (Kerala) 23 on 6th; Mahabaleshwar 32, Mangaon (Konkan) 21, Bhira 20 and Harnai 20 on 7th; Bhira 33, Mahabaleshwar 30 and Brahmपुरi 21 on 8th; Kuttiyadi (Kerala) 22 and Indore 20 on 9th; Okha 28 and Porbandar 25 on 10th; Mahabaleshwar 22 on 15th; Chandbali 25 on 20th; Bhopal 28 on 22nd; Cherrapunji 39 and Rajgarh 30 on 23rd; Cherrapunji 53 on 24th; Najibabad 38 on 26th; and Cherrapunji 26 on 29th.

AUGUST

Active monsoon conditions prevailed over the country during this month leading to normal or excess rainfall over most parts of the country under the influence of the following systems.

(i) A trough of low lay off the west coast on many days during the first fortnight.

(ii) A low moved from Andaman Sea and adjoining southeast Bay to Vidarbha and adjoining west Madhya Pradesh between 2nd and 6th.

(iii) A feeble low formed over west central Bay on 9th, moved westwards and weakened into a trough close to Andhra-Tamil Nadu coasts on the 11th.

(iv) A cyclonic circulation extending to 1.5 km a.s.l. lay over southwest Uttar Pradesh and adjoining northwest Madhya Pradesh from 3rd to 5th.

(v) A low moved from north Madhya Pradesh to southeast Rajasthan between 9th and 11th.

(vi) The eastern part of the monsoon trough passed from east Uttar Pradesh to Assam and Meghalaya on most days from 1st to 10th. It moved southwards and passed from northeast Madhya Pradesh to northwest and adjoining west central Bay by the 15th.

(vii) A well marked low developed off south Orissa-north Andhra coasts on the 16th, moved northwards to Gangetic West Bengal by 18th

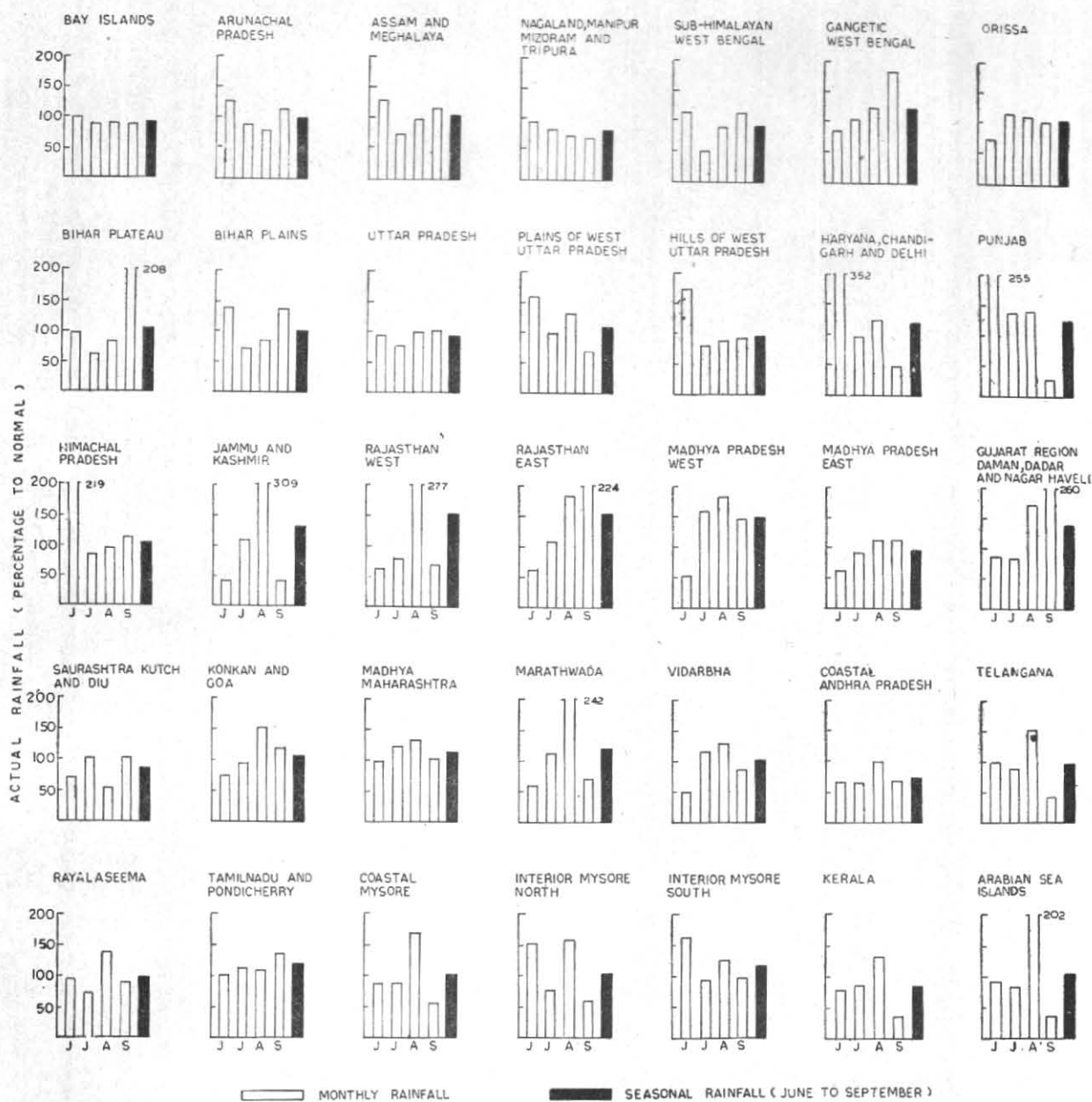


Fig. 3

Progress of monsoon month by month, June to September 1973

and subsequently moved westwards to northeast Madhya Pradesh by 20th evening and merged with the monsoon trough on 21st.

(viii) A low moved from central Uttar Pradesh to central Rajasthan from 12th to 14th and concentrated into a depression on 14th morning near Jaipur. It persisted over west Rajasthan on 15th and 16th, moved slowly eastwards, became deep on 18th over south Rajasthan and weakened into a low over east Rajasthan on 19th. It merged with the monsoon trough on the 20th.

(ix) A low moved from north coastal Orissa to north Madhya Pradesh and another from central Madhya Pradesh to northwest Madhya Pradesh between 21st and 24th.

(x) A low formed over north Bay on the 24th and concentrated into a depression near Sandheads on 26th, crossed coast near Balasore the same evening, became deep, moved westnorthwest to south Rajasthan by 31st evening and weakened into a low on 1 September.

(xi) A well marked low formed over north Bay on 30th morning and moved to Gangetic West Bengal and adjoining Bangla Desh by 1 September.

The monsoon was active or vigorous in Assam and Meghalaya on many days in the first week; in sub-Himalayan West Bengal on 1st, 3rd and 11th; in Gangetic West Bengal on 1st, 2nd, 11th to 13th, 18th, 19th, 27th, 28th and 31st; in Orissa on 12th, 13th, 18th, 19th, 26th and 27th; in Bihar State on 2nd, 11th to 13th, 18th, 19th and 28th; in the plains of Uttar Pradesh on 1st, 2nd, 6th, 8th, 9th, 12th, 14th and 19th; in Haryana on 2nd, 12th and 13th; in Rajasthan from 5th to 9th, 12th to 19th and 27th to 31st; in west Madhya Pradesh on 5th, 9th, 10th, 12th to 14th, 21st to 24th and 26th to 31st; in east Madhya Pradesh from 12th to 14th, 18th to 23rd and 26th to 29th; in Gujarat Region on 9th, 10th, 16th, 23rd, 24th and from 29th to 31st; in Konkan on 2nd, 3rd, 7th to 13th and on 23rd; in interior Maharashtra on 2nd, 3rd, 5th, 6th, 9th, 17th, 22nd, 23rd, 26th and 27th; in coastal Andhra Pradesh and Telangana between 6th and 9th and between 13th and 17th; in Mysore State on 2nd, between 4th and 9th and between 13th and 16th and in Kerala on 2nd, 6th, 13th, 15th, 16th, 23rd and 27th.

Six western disturbances moved eastwards across extreme northwest India as troughs in the lower troposphere during the month, causing good rainfall in the Western Himalayas and the plains of northwest India. Heavy to very heavy rain occurred in the Western Himalayas and Punjab between 4th and 13th. The monsoon was active to vigorous in Punjab from 5th to 10th and in Jammu & Kashmir from 8th to 10th and active in Haryana from 5th to 10th and in Himachal Pradesh on 10th. It was also active in Haryana on 19th, in Punjab on 16th and 19th; in Himachal Pradesh on 13th and 27th;

in Jammu & Kashmir on 28th; and vigorous in Haryana on 27th.

According to press reports, floods in Assam affected crops over an area of 17,000 hectares and a population of 3 lakhs, particularly in Nowgong, Golaghat and Dibrugarh areas. Floods in Bihar were reported to have damaged crops over an area of about one lakh hectares. Heavy floods occurred in Jammu & Kashmir and Punjab. The floods in Jammu & Kashmir were reported as unprecedented. About 75 persons lost their lives, and 10,000 cattle heads were lost. Crops worth Rs. 5 crores in about 900 villages were damaged in that State. In Punjab, Ludhiana was the worst affected district. About 30 persons were reported to have lost their lives. About 8,000 houses and crops in 7 lakh hectares were damaged. Very heavy rain in Rajasthan caused serious floods in the southern districts of that State. About 20 persons were reported to have died and 20,000 houses damaged. 400 villages were inundated. Many districts in west Madhya Pradesh and Gujarat Region were also seriously affected by floods leading to heavy damage to roads, bridges, houses and standing crops and paralysing road and rail communications. The cities of Bhopal, Hoshangabad, Ujjain, Ahmadabad and Broach, were inundated by flood waters. The flood waters of the *Godavari* entered low lying areas of Nander town and Purna village in Marathwada and Bhadrachalam town in Andhra Pradesh.

The principal amounts of very heavy rainfall (20 cm and more) during the month were: Cooch Behar 21 on 4th; Cherrapunji 20 on 5th; Reasi 21 on 9th; Jalpaiguri 21 on 11th; Tonk 24 on 14th; Jaisalmer 20 on 16th; Barmer 23 on 18th; Nander 20 on 23rd; Vidisha 20 on 29th; Jabalpur 20 on 29th; Bhopal 28, Pachmari 24 and Shajapur 21 on 30th; Abu 27, Ratlam 26, Ujjain 22 and Dhar 20 on 31st.

SEPTEMBER

Active monsoon conditions prevailed in many parts of northeast India, Uttar Pradesh and the central parts of the country. Rainfall was generally deficient in south Peninsula and northwest India. The following systems influenced the weather during the month.

(i) A depression which formed near Contai in coastal West Bengal on 2 September moved westwards and weakened into a low over central Madhya Pradesh on 6th. The low moved to

east Rajasthan and merged with the monsoon trough on 9th.

(ii) Persistence of a well-marked low over south Rajasthan as a remnant of last month's depression, between 1st and 3rd.

(iii) A cyclonic circulation in the lower troposphere moved from Gangetic West Bengal and adjoining Bihar to central Uttar Pradesh between 7th and 12th.

(iv) A trough/wind discontinuity in the lower troposphere passed from east Uttar Pradesh and adjoining Bihar plains to Assam and adjacent States from 6th to 19th.

(v) A low with associated cyclonic circulation in the lower troposphere moved eastwards from east Uttar Pradesh and adjoining Bihar to Bangla Desh between 13th and 18th.

(vi) The subsequent movement of the above low westwards to Gujarat Region by 22nd and weakening into a trough over Gujarat Region and the adjoining parts of west Madhya Pradesh and north Maharashtra on 23rd and its persistence there till the end of the month.

(vii) A low moved northwestwards from west central and adjoining northwest Bay to south central Uttar Pradesh between 21st and 26th and weakened into a trough over east Uttar Pradesh and adjoining Bihar on 28th.

(viii) A trough extending to about 2.1 km a.s.l. lay over Tamil Nadu-Andhra coasts from 13th to 18th. A low with associated cyclonic circulation extending to about 4.5 km a.s.l. moved westwards from Andaman Sea to southwest and adjoining west central Bay between 13th and 16th and merged with the trough over the east coast on 17th.

The monsoon was active or vigorous in Arunachal Pradesh on 14th, 15th and 26th; Assam and Meghalaya on 10th, 11th, 14th, 15th, 17th and 23rd; in sub-Himalayan West Bengal from 14th to 16th; in Gangetic West Bengal on 1st, 7th, 8th, 19th, 22nd to 24th; in Orissa on 3rd and between 20th and 24th; in Bihar Plateau on 3rd, 12th, 14th to 16th, 20th and 23rd to 25th; in Bihar Plains on 3rd, 14th, 15th and from 24th to 26th; in the plains of Uttar Pradesh on 12th and 13th and in east Uttar Pradesh on 26th; in Haryana on 13th, in east Rajasthan from 1st to 4th, on 8th and 12th; in west Madhya Pradesh from 5th to 7th, on 21st and 27th; in east Madhya Pradesh from 3rd to 5th, on 20th and 23rd to 25th; in Gujarat Region from 1st to 5th, 7th, 8th and 23rd to 26th; in Konkan from 23rd to 26th; in Madhya Maharashtra from 20th to 22nd, in Marathwada from 19th to 21st, in Vidarbha on 5th, 20th, 21st

and 25th; in coastal Andhra Pradesh on 21st; Telangana on 20th and 21st; in Kaya-aseem from 15th to 18th; in Tamil Nadu on 16th; in north Interior Mysore on 18th and 21st and in south Interior Mysore from 16th to 18th.

Six western disturbances moved eastwards across the Western Himalayas during the month, the first two during the periods 31 August to 3 September and 10 to 12 September and the remaining four in quick succession between 15th and 26th. These systems caused generally scattered to fairly widespread rain in the Western Himalayas and the adjoining plains. The monsoon was active in Himachal Pradesh on 1st and in the hills of west Uttar Pradesh on 12th and 13th.

Floods were reported from Bankura and Midnapore districts of West Bengal and Mayurbhanj district of Orissa resulting in damage to crops. Heavy to very heavy rain in west Madhya Pradesh, Gujarat Region and south Rajasthan was reported to have worsened the flood situation which prevailed in these areas towards the end of August.

The principal amounts of very heavy rainfall (20 cm and more) during the month were: Abu 56 and Erinpura 25 on 1st; Abu 42 and Erinpura 36 on 2nd; Samalpur 27 on 3rd; Sojat 23 on 4th; Jhandla 22 and Jhabua 20 on 7th; Cherrapunji 32 on 14th; Passighat 20 and Balurghat 20 on 15th; Balurghat 25 on 16th; Dhanbad 20 on 23rd; Jashpurnagar 20 on 24th; Surat 20 on 25th and Dharampur (Gujarat) 21 on 26th.

The southwest monsoon withdrew from west Rajasthan on 12 September, from Jammu & Kashmir on 14th; from Haryana, Punjab, Himachal Pradesh and northeast Rajasthan on 27th; from southeast Rajasthan and west Uttar Pradesh on 28th; from Gujarat State and northwest Madhya Pradesh on 3 October; from Maharashtra State, southwest and northeast Madhya Pradesh and east Uttar Pradesh by 10 October; from Bihar State, north Bengal and southeast Madhya Pradesh on 15th; and from the rest of the country outside the Peninsula south of 15°N on 16 October.