

## Weather

### WINTER SEASON (JANUARY & FEBRUARY 1977)

#### CHIEF FEATURES

##### Western disturbances

Eighteen western disturbances, moved across the Western Himalayas and twelve induced lows, moved across the plains of north India. The activity of the western disturbances was pronounced during the last 10 days of January, one of them intensifying into a depression.

##### Cyclonic storms/depressions

A severe cyclonic storm moving north-eastwards lay to the east of Port Blair on 31 December 1976. It weakened into a depression by 2 January 1977 and dissipated over east central Bay and adjoining north Andaman Sea. A track of this storm is shown in Fig. 1.

##### Rainfall

The winter rainfall was normal or in excess in Jammu & Kashmir, Rajasthan, Gujarat State, Gangetic West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura and deficient in Uttar Pradesh, Madhya Pradesh and the rest of northwest and northeast India. The total rain-

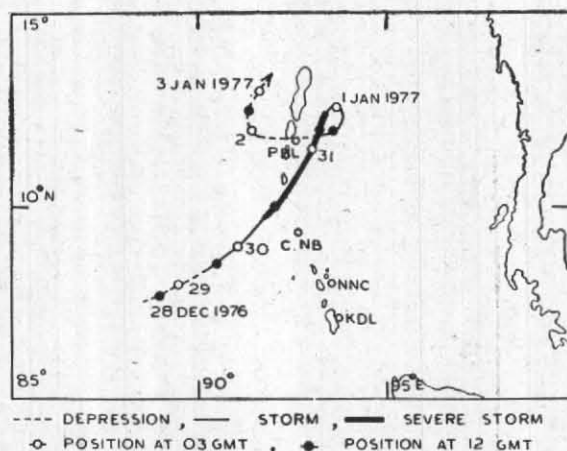


Fig. 1. Track of storm/depression during January-February 1977

fall for the period from 1 January to 28 February 1977 is shown in Fig. 2.

##### Temperature

Moderate to severe cold wave conditions prevailed in many parts of north India and north Peninsula during the last few days of January.

#### SIGNIFICANT MONTHLY WEATHER FEATURES

##### JANUARY

Ten western disturbances, four in the first fortnight and six in the second fortnight, moved eastwards across the Western Himalayas mostly as upper air systems. Six induced lows/cyclonic circulations in the low levels also moved across the plains of north India. In the first half of the month two induced lows moved across northwest India, while in the second half of the month, one moved across northwest India and three moved eastwards from Rajasthan and adjoining Gujarat to northeast India.

In association with the seven western disturbances one of which intensified into a depression on 25th and the six induced lows, rain or snow was fairly widespread in the Western Himalayas on 11th, 12th, 20th and from 24th to 27th and scattered or isolated over this area on seven other days. Rain or thundershowers were fairly widespread in the plains of northwest India and west Uttar Pradesh from 24th to 26th and scattered or isolated in the plains of northwest India, Uttar Pradesh, Madhya Pradesh and many parts of

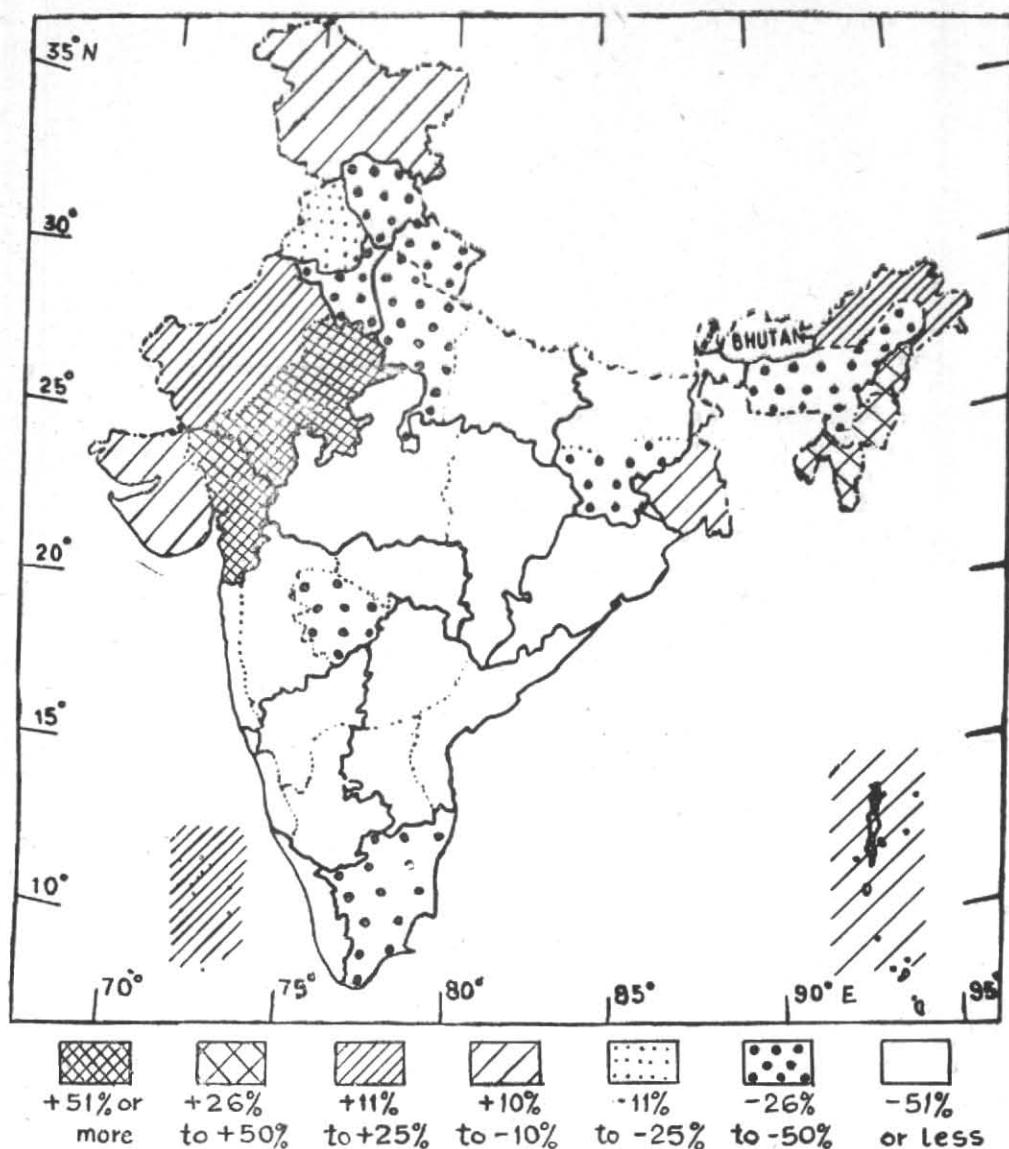


Fig. 2. Rainfall for the period 1 January to 28 February 1977  
(Percentage departure from normal)

northeast India on 4 to 6 days in the month and in Gujarat State on 24th and 25th.

The principal amounts of rainfall (in cm) associated with the western disturbances were : Gulmarg & Quazigund 2 each on 10th; Gulmarg & Quazigund 7 each, Jammu & Dalhousie 3 each, Manali & Bhuntar AP 2 each, Srinagar AP 1 on 11th; Manali & Dalhousie 2 each, Mussoorie 1 on 12th; digboi & Contai 3 each, Kailashahar & Sagar Island 1 each on 17th; Ziro & Orai 2 each, Varanasi, Nowgong & Satna 1 each on 19th; Ranchi AP & Jaspurnagar 3 each, Midnapore, Jamshedpur, Allahabad AP, Mandi & Sidhi 2 each, Keonjharh, Gaya AP, Banda & Quazigund 1 each on 20th; Puri 3, Ziro, Chaparmukh & Tangla 2

each, Pasighat, Gangtok & Gopalpur 1 each on 21st; Ganganagar 1 on 23rd; Dalhousie 6, Reasi 5, Najitad & Tehri 4 each, Moradabad, Dharchula, Phuntar AP & Udairpur 3 each, Deesa 2 on 24th; Udhampur IAF 8, Gurdaspur 7, Adampur & Dharamsala 5 each, Chandigarh, Amritsar AP, Jagraon, Manali & Quazigund 4 each, Ganganagar 2, Bhavnagar AP 1 on 25th; Udhampur IAF 5, New Delhi (Safdarjung) & Jammu AP 2 each, Hardoi, Simla, Dholpur & Bhind 1 each on 26th; Reasi 8, Nainital & Munsyari 3 each, Sidhi 2, Dharamsala, Banihal, & Bharatpur 1 each on 27th; Munsyari 2 on 28th.

The severe cyclonic storm which was centred within 100 km southeast of Port Blair on the morning of 31 December 1976, weakened gradually,

remained within 200 km northeast to east of Port Blair upto the evening of 1 January 1977, moved westwards close to Port Blair as a depression and weakened into a low over east central Bay and adjoining north Andaman Sea by 3 January. In association with this system, Bay Islands received fairly widespread rainfall on 1st and 2nd. Long Island recorded 5 cm of rain and Maya Bandar 3 on 1st and Long Island and Maya Bandar 5 each on 2nd.

A trough of low moved westwards from south Andaman Sea and adjoining southeast Bay to Maldiva-Lakshadweep area from 6th to 11th. Bay Islands received fairly widespread rain or thundershower on 7th and scattered or isolated rainfall on 6th, 8th and 9th. Isolated thundershowers also occurred in Tamil Nadu on 8th and 9th. Long Island recorded 2 cm of rain and Hut Bay 1 on 6th; Port Blair and Kondul 3 each and Long Island 1 on 7th; Hut Bay 1 on 9th.

A trough of low over south Andaman Sea between 21st and 23rd caused scattered or isolated rainfall over Bay Islands on 22nd and 24th. Hut Bay recorded 6 cm of rain on 22nd and Nancowry 2 on 24th.

Three low pressure areas or cyclonic circulations in the low levels moved eastwards across Assam & adjacent States between 6th and 8th, 12th and 14th and 27th and 29th. They caused generally

scattered or isolated rain or thundershowers over Assam & adjacent States during the above periods and in Sub-Himalayan West Bengal & Sikkim on 2 or 3 days. Pasighat, Ziro, North Lakhimpur and Gangtok recorded 1 cm each on 6th; Ziro 5, Digboi, Khonsa & Gohpur 1 each on 7th; North Lakhimpur 1 on 14th; Digboi 3 on 27th; Tezu, Pasighat & Kailashahar 1 each on 28th; Pasighat 2, Imphal & Digboi 1 each on 29th.

Moderate cold wave conditions prevailed over some parts of northeast Rajasthan and east Uttar Pradesh on 17th and in some parts of east Uttar Pradesh and adjoining Bihar State on 18th. Moderate cold wave conditions set in over parts of Kutch and southwest Rajasthan on 27th and later intensified and extended to many parts of northwest, central and northeast India and north Peninsula. They began to abate by the end of the month. Near freezing night temperatures were recorded at some places in Punjab, Haryana, north Rajasthan and Kutch on 28th and 29th. Night temperatures were also appreciably below normal in Madhya Pradesh between 1st and 4th, in Telangana and Interior Karnataka between 5th and 7th, in Rajasthan between 15th and 18th, in Uttar Pradesh on 17th and 18th, in west Madhya Pradesh and Rajasthan on 21st and 22nd and in Uttar Pradesh and Haryana on 22nd. Night temperatures were above normal over many parts of northwest India on 10th, 11th and 24th and in Gujarat State on 11th and 24th.

## FEBRUARY

Eight western disturbances, five in the first fortnight and three in the second fortnight, moved eastwards across the Western Himalayas as upper air systems. Six induced lows/cyclonic circulations in the low levels moved eastwards across the plains of north India, two in the first half and four in the second half. Of the six induced lows, two moved eastwards upto northeast India during the periods 3rd to 8th and 19th to 26th, while the other four affected only northwest India.

No precipitation was reported in association with three of the western disturbances and two of the induced lows. The rainfall in association with the other five western disturbances and four induced lows was generally scanty in northwest and central India. Rain or snow was fairly widespread in Jammu & Kashmir on 1st and in the hills of west Uttar Pradesh on 5th and 25th and scattered or isolated in the Western Himalayas on 4 or 5 days during the month. Rain or thundershowers were fairly widespread in Nagaland,

Manipur, Mizoram and Tripura on 7th and in Gangetic West Bengal and Bihar Plateau on 24th and 25th and scattered or isolated in the plains of northwest India, Madhya Pradesh, Uttar Pradesh and some parts of northeast India on some days in the first week and again between 19th and 25th.

The principal amounts of rainfall (in cm) associated with the western disturbances were: Srinagar and Banihal 1 each on 1st; Manna 2, Bahraich Faizabad, Sabour & Cherrapunji 1 each on 5th; Shillong 1 on 6th; Allahabad 2 on 21st; Bhopal 3, Jhansi 2, Umariya, Shajapur, Ujjain, Shivpuri & Neemuch 1 each on 22nd; Bhopal 1 on 23rd; Angul 2, Calcutta, Ranchi AP, Jashpur-nagar, Ambikapur & Rajgarh 1 each on 24th; Uluberia 6, Dum Dum 5, Krishnanagar 3, Dumka, & Malda 2 each, Bareilly IAF, Karnal, Joshimath Askote & Munsyari 1 each on 25th; Banihal & Gulmarg 3 each, Quazigund 2, Manali 1 on 27th; Banihal & Gulmarg 1 each on 28th.

Three troughs in the low level easterlies moved westwards across Comorin-Maldives area and adjoining south Peninsula during the periods 3rd to 7th, 16th to 19th and 19th to 21st. In association with these systems, rain or thundershowers were fairly widespread in Tamil Nadu on 18th and 19th and in Lakshadweep on 19th and 20th and scattered or isolated in Tamil Nadu on 4th, 5th, 17th and 20th, in Lakshadweep on 21st, in Kerala from 4th to 6th and from 18th to 21st and in coastal and south Interior Karnataka on one or two days between 18th and 21st.

A well marked trough of low which moved slowly from south Andaman Sea to southwest Bay from 11th to 16th caused scattered to fairly widespread rain or thundershowers in Bay Islands during this period with isolated heavy falls on 12th.

A wind discontinuity/trough line at 0.9 km a.s.l. with an embedded cyclonic circulation lay over interior parts of Maharashtra State from 20th to 23rd and caused isolated rain or thundershowers there from 21st to 24th.

In association with a low level cyclonic circulation that lay over Assam and adjacent States from 19th to 23rd and a feeble low that moved eastwards across this area between 24th and 26th, thundershowers were scattered to fairly widespread in Assam and adjacent States during these periods.

The principal amounts of rainfall (in cm) associated with the above systems during the month were: Kodaikanal, Palayankottai & Punalur 1 each on 4th; Palayankottai 5 on 5th; Mannarghat 2 on 6th; Kondul 4 on 11th; Nancowry 11 on 12th; Nancowry 6, Car Nicobar 3

and Kondul 2 on 13th; Car Nicobar 3 on 14th; Car Nicobar & Hut Bay 3 each on 15th; Palayankottai 4, Thanjavur 3, Nagapattinam, Karaikal & Karaikudi 2 each and Trivandrum AP 1 on 18th; Coonoor 7, Madurai city, Satyamangalam and Srivilliputtur 4 each, Kodaikanal 3, Quilon and Ziro 2 each and Minicoy 1 on 19th; Mananathody 8, Ammini 6, Agathi 5, Ziro and Pasighat 3 each, Kanyakumari 2, Minicoy 1 on 20th; Silchar AP & Mavelikara 3 each, Pasighat, Cherrapunji, Dibrugarh & Alleppey 2 each and Minicoy 1 on 21st; Kailashahar & Bir 3 each, Teju & Chaparmukh 2 each, Parbhani 1 on 22nd; Digboi 3, Khonsa 2, Kailashahar 1 on 24th; Tezu & Kailashahar 4 each, Dibrugarh 3 on 25th; Kailashahar 3, Silchar & Digboi 2 each, Tezu and Imphal 1 each on 26th.

Night temperatures were generally below normal over north and central parts of the country in the first fortnight, being appreciably so over many parts of Uttar Pradesh, Madhya Pradesh, Rajasthan and Kutch between 5th and 9th and over many parts of northeast India on 8th and 9th. Moderate cold wave conditions prevailed over some parts of Kutch, west Rajasthan, east Madhya Pradesh, Jammu & Kashmir, Himachal Pradesh, Bihar and Gangetic West Bengal on one or two days between 5th and 9th.

Night temperatures were appreciably to markedly above normal over most parts of Rajasthan, Madhya Pradesh, Gujarat and Interior Maharashtra State between 13th and 25th and in Gangetic West Bengal, Orissa, Bihar Plateau and plains of Uttar Pradesh between 21st and 23rd.

### Disastrous Weather Events of 1976

The major weather events that cause disasters are cyclonic storms, floods and droughts, dust-storms, heavy rains or snowfall, severe thunderstorms, hailstorms, heat and cold waves. The following summary supported by a map based on the observations by the India Meteorological Department and the press describe the more important events of 1976.

#### Heavy Snow

Srinagar experienced a moderate snowstorm on 16 January when 5 persons died under an avalanche between Gulmarg and Khilanmarg. Kashmir and Kulu valleys and Garhwal hills were in the grip of heavy snowfall on 27 January, Gulmarg recorded 1.5 metres of snow. Air services, road traffic, power and water supply were disrupted due to landslides and avalanches. Traffic and communications from Simla to the interior were affected.

Moderate to heavy snowfall occurred in (i) Kangra district on 1 and 31 Jan, (ii) Kashmir valley on 5, 25 and 26 Feb, (iii) Kalpa valley and Kinnaur district on 14 Feb and (iv) Kalpa, Pangi and Lahaul Spiti valleys on 16 and 17 March.

#### Cold Waves

Jammu & Kashmir was under the grip of a moderate to severe cold wave in the 4th week of Feb. Moderate cold wave conditions also prevailed during this period in southwest Rajasthan, Himachal Pradesh and Punjab. Telangana experienced moderate cold wave conditions in the 3rd week of January and in the 1st week of February. Moderate cold wave conditions also prevailed over Bihar State during the last 3 weeks of December when 10 deaths were reported from Chapra, Hazaribagh, Patna and Nawadah.

#### Heat Waves

Moderate to severe heat wave conditions prevailed over coastal Andhra Pradesh and Telangana in the first 2 weeks and the 3rd week of May respectively. The casualty due to sunstroke was 10 in Khammam district and 2 in Penugonda and Tanuku taluk of West Godavari district. Moderate heat wave conditions prevailed in the first week of May over (a) coastal districts of Tamil Nadu, (b) some parts of north Bihar resulting in the death of 1 person in Shamganj (Nawadah), 4 in Mokameh and 3 in Deogarh and (c) 3 persons died in Akola district in the 3rd week of May. Dholpur district in Rajasthan was in the grip of heat wave on 4 June where 4 deaths were reported. 21 persons died in Bihar in June due to a heat

wave that prevailed over Hazaribagh, Nawadah, Mokameh, Barauni industrial belt and Deogarh. Parts of Punjab, Haryana and Himachal Pradesh experienced moderate heat wave conditions in the first week of July.

#### Drought

Drought conditions prevailed in eight districts of Kerala during the first half of June due to late monsoon rains. Water level in Malampuzha reservoir, Meenkara, Chulliar, Valayar, Pothundi dams were very low in the first week of July. Withering of tender coconut flowers, falling of nuts had been reported. Cultivation of paddy, tapioca and plantain crops were also affected.

Nearly 120 out of 170 taluks in Karnataka were affected by drought. Hansur in Mysore district was in the grip of a drought in the 3rd week of June. Drought conditions prevailed in Mysore, Mandya, Hassan, Chickmagalur and Coorg districts during 3rd week of July. Rs. 1.5 crores worth of tobacco production was lost.

During southwest monsoon the storage position in Papanasam and Manimuthar reservoirs in Tirunelveli district was very low and the *Tamparaparani* river dried up in June.

#### Duststorms, Hailstorms, Squalls, Thunderstorms and Lightning

Duststorms hit Jammu (112 kmph, 28 Apr), Chandigarh (93 kmph, 17 May), Delhi (74 kmph, 20 May), Alwar, Kotputli, Nagaur, Jhunjhunu and Sojanganh in Rajasthan (20 May), Bharatpur (21 May), Jammu, 120 kmph, 4 Jul), Jullundur (4 Jul) and Ferozepur (3 Oct) uprooting trees and disrupting power supply and communications.

Moderate to severe hailstorms hit Jaipur (15 Feb, 19 May), Nainital (16 Feb, 10 May), Hoshiarpur district (19 Feb), Jammu and neighbourhood (19 Feb), Bhind district (27 Feb), Jalgaon (30, 31 Mar), Ludhiana and Ferozpur districts (9 Apr) and damaged crops extensively. Hailstorms also hit Allahabad district (3 Apr), Srinagar district (10 Apr and 17 May), Wardha (11 Apr), Agartala (11, 19 and 20 Apr), Medak district (22, 23 Apr), Karimnagar and Nizamabad district (22 Apr), Warangal and Kolhapur district (23 Apr), Baripada (24 Apr), Anantnag (18 May, 21 Jun, 9 Jul and 30 Sep), Simla (22 May), Chamba (6 Jun) causing damage to crops, fruit gardens, houses and death to cattle and human beings.

Thundersqualls swept through Tezpur and its neighbourhood on 21 Apr, where a girl was killed and crops were damaged. Gauhati and Manipur

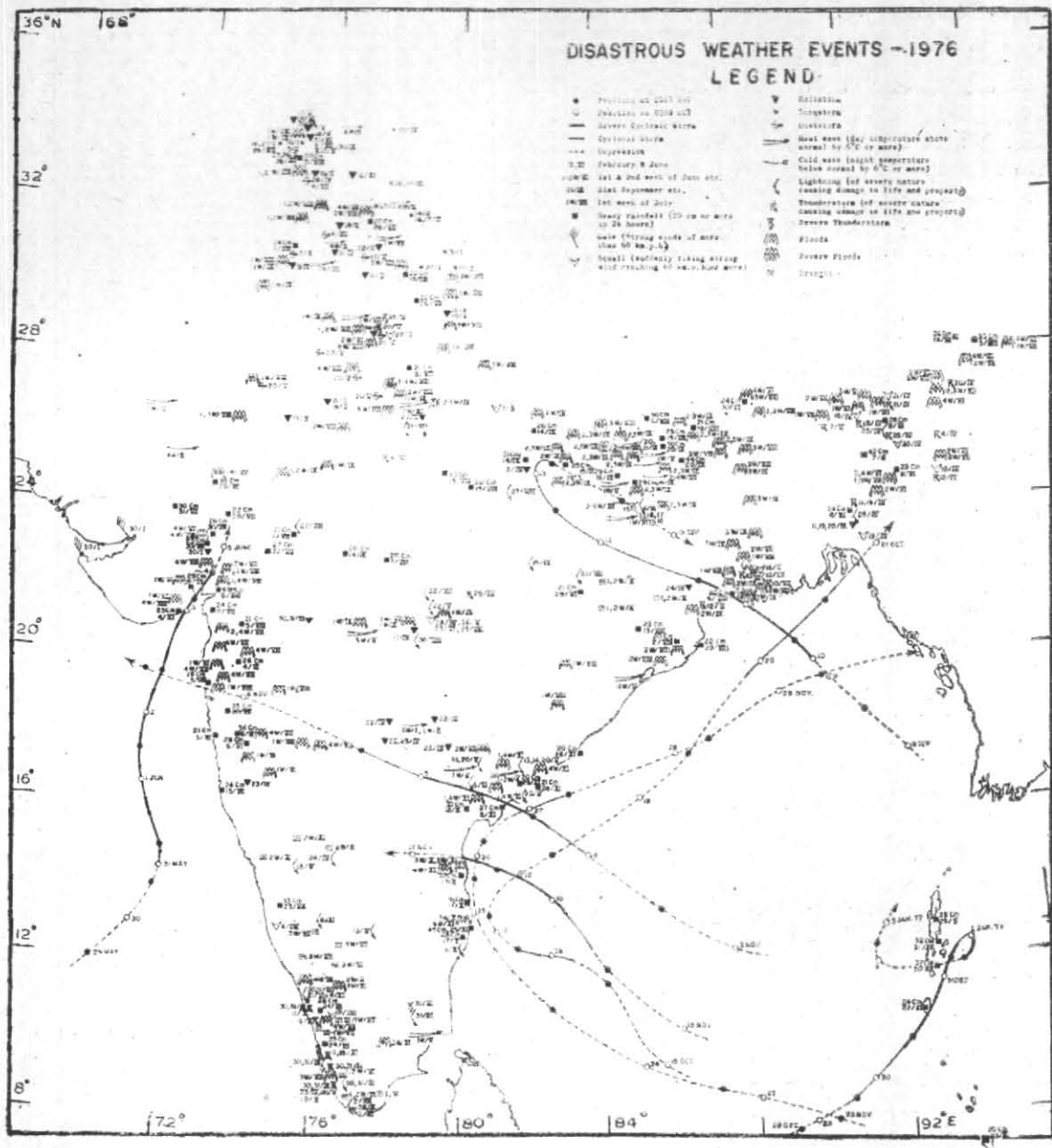


Fig. 3. Map showing the disastrous weather events during 1976

reported thundersquall on 18 Apr and Chaparmukh on 25 April. Squalls were experienced at Nagpur Airport on 24 Apr, 26 May, 23 Jun and 25 Aug. A severe Nor'wester with a squall swept across Gangetic West Bengal and killed 1 person and injured 15 others in 24 Parganas, where a boat capsized in *Hooghly* river on 18 May. 100 houses collapsed and many trees were uprooted by the squall that swept across many villages of Ponnani district in Kerala on 2 Aug. Squalls also affected Sullia taluk of South Kanara district on 4 Aug and Lucknow on 7 October, causing death to human lives and damage to property. Agartala experienced

thundershowers accompanied by squall and hail on 19 April damaging property worth Rs. 1500. Delhi experienced a severe thunderstorm accompanied by a number of squalls on the night of 23 May with maximum speed reaching 152 kmph. Many trees were uprooted, power supply was disrupted in some areas and four aircrafts at Safdarjung airport hanger were damaged.

Tiruchirapalli experienced a severe thunderstorm accompanied by heavy rains on 31 March damaging plantain and banana crops. Thunderstorm also affected Quilon, Alleppey and Calicut

districts on 13, and 31 March causing loss of human lives and damage to property. A thunderstorm hit Kohima (4 Apr), Agartala (19 Apr), Sibsagar district (20 Apr), Tezpur (21 Apr), Quilon (23 Apr and 26 May), Balaghat (25 Apr), Goalpara district (7 May), Srinagar (17 May), New Delhi (23 May), Shivapuri (4 Jun). A tornado swept through Balasore district on 12 May affecting 7 villages causing loss of human and animal lives and damaging property. 155 heads of cattle perished in Calcutta, Howrah and north 24 Parganas on 10 July. Thunderstorms also affected Trichur (9 Oct), Quilon (10 Oct), Calicut (11 Oct) and Trivandrum (28 Oct and 2 Nov). Damage to houses and crops, telecommunication channels and power supply was reported from these places.

Gale speeds reaching 90 kmph lashed Dwarka and New Kandla on 30 Jan. Lightning took a toll of life in many places from March to December.

#### *Cyclonic Storms*

7 out of 10 cyclonic storms which developed over the Indian seas were disastrous and they are detailed below.

##### *(i) Severe cyclonic storm : 29 May-5 June*

The storm crossed Saurashtra coast on the morning of 3 June. 4 barges each costing Rs. 5 lakhs and 6 fishing boats were swept away. Heavy rains and gales lashed Palitana, Bhavnagar, Kaira, Panchmahal, Rajkot and Broach districts affecting 2500 villages. About 25,000 houses were damaged, 70 persons lost their lives and 4500 heads of cattle perished. The total damage was estimated at Rs. 3 crores.

Heavy rains in interior Maharashtra caused floods in the river Krishna affecting Satara, Kolhapur and Sangli districts. 6 villages in Satara district were evacuated. The Masawan dam in Thane district was completely washed out. The vehicular traffic between Bombay and Bangalore was paralysed and large areas of cultivable land were inundated. 135 heads of cattle were washed away. About 6,000 people in 51 villages in Sangli district were affected. 17 fishermen from Bombay lost their lives.

##### *(ii) Severe cyclonic storm : 8-18 September*

The storm crossed coast near Contai around noon on 11 September. Heavy rains, gales and tidal waves of 2 to 3 metres caused large scale devastation in the coastal areas of Midnapur, 24 Parganas, Sunderbans and northern parts of Balasore districts. Sagar Island reported a maximum wind of 160 kmph in gusts. Trees,

electric and telephone poles were uprooted. The rivers Kangsabati, Silabati and Keleghai were in spate. Large tracts of green fields with crops were inundated by saline water damaging crop in about 1 lakh acres. 30,000 mud and thatched huts were razed to the ground. Several thousands of people were marooned and rendered homeless taking a death toll of 40 lives. 4,000 heads of cattle perished. The fishery department reported a loss of about Rs. 1 lakh.

##### *(iii) Cyclonic storm : 15-21 October*

The storm caused heavy to very heavy rains in Tamilnadu on 16 and 17 October. Low lying areas in Madras city and suburbs were waterlogged. 20,000 people were rendered homeless. Transport services and port operations were paralysed.

Heavy rains lashed Nellore district affecting 60 villages. The flood waters of Kalangi river entered Sulerpet. The rivers Pennar and Swarnamukhi were also in spate. Rail and road traffic between Madras and south Andhra Pradesh were disrupted. 12,000 acres of paddy fields were submerged and 1,000 acres were sandcast. 14,000 houses were collapsed. One village was completely washed out. 1,000 heads of cattle and 4,000 sheep were washed away. 5 persons lost their lives. Total loss was estimated at Rs. 2 crores.

##### *(iv) Severe cyclonic storm : 3-6 November*

The storm crossed Andhra coast, near Masulipatnam on the night of 4 Nov and caused considerable damage to paddy, sugarcane, cotton, banana, turmeric, betel vines and tobacco crops in Krishna, Guntur and West Godavari districts. 25,000 huts were damaged. Electric and telephone poles were bent at many places. 9 persons were injured, 13 fishermen were missing and 25 persons were killed. The port town of Masulipatnam was hit by gale. The damage was to the extent of Rs. 5 lakhs.

##### *(v) Severe cyclonic storm : 15-17 November*

The storm crossed south Andhra coast near Kavali on the night of 16 November. The high winds associated with it caused extensive damage to tobacco, betel vine, banana and mango gardens in Nellore, Kavali, Kovur taluks in the Nellore district. Corrugated roofs, tiles of many houses, tobacco barns were blown off. Large number of telephone/telegraph/electric poles were bent out of shape. 24 country boats and 10,000 houses were damaged. 30 persons died due to house collapses. Total loss of property was estimated at Rs. 3.9 crores.

*(vi) Cyclonic storm : 22-29 November*

In association with this storm, a giant cloud burst released millions of tons of water over Madras city on 24, 25 Nov, submerging vast areas. Madras city reported a record rainfall of 45 cm on 25 Nov. The *Adayar* and *Cooum* rivers had overflowed their banks and caused extensive inundation in low lying areas and washed away several huts affecting 3 lakh people in slum areas. A large number of industries and electrical installations were affected and estimated loss was more than Rs. 7 crores. The floods took a toll of 50 lives due to house collapses/electrocution.

Very heavy rains affected Nellore, Prakasam, Chittoor, Guntur, Krishna East and West Godavari districts in Andhra Pradesh. Paddy crops in many acres were washed out. The river *Kalandi*, *Swarnamukhi* and *Pennar* were in spate inundating vast areas. The rail tracks at many places were washed away. 35,000 huts had collapsed. Loss of cattle and damage to irrigation sources was very heavy. The death toll in Nellore district was 45.

*(vii) Severe cyclonic storm : 29 December-3 January*

The storm passed near Port Blair on 31 Dec causing widespread damage due to very heavy rain and gale force winds in Bay Islands. Port Blair had a record rainfall of 37 cm and Long Island 32 cm on 31 Dec. A large number of trees were uprooted and about 600 houses were damaged in these islands. Considerable damage to standing crops; fruit orchards and vegetable gardens and loss of few lives were reported. Loss to government property was estimated at about Rs. 23 lakhs.

*Floods and Heavy Rains*

During 2nd week of June, heavy rains flooded most of the riverine areas in Assam, Manipur, Tripura and Arunachal Pradesh. Swirling flood waters of river *Barak* submerged vast areas in Cachar district. Silchar, Patharkandi, Karimganj and Kailashahar in Tripura were worst affected.

During first three weeks of July, Cachar, Goalpara, Kamrup, Sibsagar, Lakhimpur districts in Assam, Manipur, Darrang and Tezu districts in Arunachal Pradesh were affected by floods. Vast areas of land in these districts were submerged. Several thousand people were rendered homeless. Crops worth Rs. 6-7 crores, 36,000 houses and 500 heads of cattle were damaged or lost. The death toll rose to 44 in Cachar district in the two successive floods.

In the last week of June, *Teesta* and *Mahananda* rivers in Darjeeling district in West Bengal were in spate causing heavy landslides. 3 members of a family were buried alive when a hillock caved in.

During first week of August the rivers *Kangsabati*, *Subarnarekha* and *Parang* were in spate inundating vast areas in Midnapur sub-division. Heavy rains in North Bengal had flooded the rivers *Teesta*, *Jaldhaka*, *Torsa* and *Diana*, causing landslides, disruption to rail and road traffic.

In the 3rd week of August heavy rain in Darjeeling district flooded the rivers *Teesta*, *Mahananda*, *Ranji* and *Mechi*. About 200 families and 515 acres of 'Aman' crop were affected.

Heavy rain occurred in catchments of *Tangon* and *Suri* during the period, flooding three sub-divisions in west Dinajpur district. 2 lakh acres of crop land and 2 lakh people were affected.

*Damodar* river was flooded in the 3rd week of September. Vast areas in Arambagh division of Hooghly district were inundated. About 450 houses had collapsed. Over 3 lakhs of people in different parts of Murshidabad district were affected. Burdwan and Nadia districts were also affected by floods.

The floods in *Kathjuri* and its tributaries had badly hit 45 villages in Puri district in the 2nd week of August. 18,000 acres of paddy lands were submerged. 12 villages in Cuttack district had been marooned and 6000 persons were affected by flood waters of *Kharsun* river.

Heavy rains disrupted life almost throughout Bihar in the 2nd and 3rd weeks of September. Several rivers had crossed the danger mark inundating a large number of villages near Danapur, 10 km from Patna. Muzaffarpur and Chapra districts were badly hit. 300 villages in Bhojpur district were submerged by flood waters of *Ganga*. Parts of Arrah-Patna, Arrah-Chandi roads were washed away. The turbulent *Poonpoon* river breached its embankments and flooded low level areas of Patna city. The surging waters of *Ganga* entered the entire areas of Begusarai, after breaching the Gupta-Lakminia bund and also advanced towards the Barauni industrial complex. Five units of thermal power stations at Barauni were shutdown as a result. 10 miners were drowned when flood waters of swollen *Mankari* river inundated a coal mine in Hazaribagh. 14 districts of Bihar were in the grip of floods, the worst affected being Patna district. Paddy in parts of several districts covering 1.12 million hectares of land had been submerged. The unprecedented floods of Bihar had caused damage worth Rs 100 crores to public utility services, according to press reports.



In the third week of August, 200 villages of Rampur and Deoria districts in Uttar Pradesh were affected by floods. Hundreds of villages in Mathura districts were submerged under 3 to 5 ft of water following a 150 ft breach in Govardhan drain.

The flood situation in eastern Uttar Pradesh had worsened in the 2nd and 3rd weeks of September. The flood waters of *Gomti* had entered Jaunpur. The *Ganga* had flooded 100 villages in Mirzapur district and inundated vast areas in Varanasi district. Several villages in Faizabad and Azamgarh district were also flooded. Ballia was the worst affected district where *Ganga* was flowing 67 cm above the danger mark. The rising *Yamuna* flooded Etawah district. The loss of property and crops caused by floods in Uttar Pradesh were assessed to be about Rs. 130 crores. The death toll in the current UP floods mounted to 228.

11 people were killed due to incessant rains in New Delhi on 18 August.

During the first two weeks of August and 1st week of September, the floods took a toll of 85 people in Punjab. 425 cattle had been perished. Gurdaspur, Ferozpur and Amritsar districts had been severely hit. 2498 villages had been badly affected. During the same period Haryana was also affected by floods. One million acres of standing crops of maize, sugarcane and coarse grains had been destroyed. 300 villages of Rohtak and Hissar districts were affected.

During the first week of August 144 villages in Srinagar and Anantnag districts were affected by floods in *Jhelum*. 2 lakh people were adversely affected and fields to an extent of one lakh acres were submerged. 1800 pilgrims to Amarnath were stranded. The flood situation in most parts of Jammu region continued in the 2nd week of August. The water level of *Chenab* and *Ravi* was over 10 ft above their danger mark. About 15 villages had been evacuated. 1400 houses collapsed and 3000 acres of land eroded. The death toll rose to 68.

During August, Mount Abu, Jodhpur, Nagaur, Sawai Madhopur, Jaipur, Dholpur and Alwar districts in Rajasthan experienced heavy rains.

Kota, Ganganagar, Chittorgarh districts in Rajasthan experienced heavy rainfall in the first week of September. Due to floods in *Ghaggar* river 2 villages were inundated. Rail and road traffic and 4000 people were affected.

During the 2nd week of July heavy rains caused floods in Baroda and Bulsar districts. The floods in the river *Viswamitri* inundated vast areas in Baroda. More than a thousand hutments were washed away. The loss to property was estimated at Rs. 2.5 lakhs.

Torrential rain and heavy floods on 31st July hit Bulsar district, causing extensive damage to property and snapping rail and telecommunication links. The swollen *Damanganga* river washed away 900 ft long bridge near Vapi and all the Delhi bound trains from Bombay were suspended. 15 people lost their lives and hundreds of people were rendered homeless. The Union territory of Dadra and Nagar Haveli were also affected by unprecedented floods in *Damanganga* river.

*Narmada* crossed the danger mark in the 1st week of August and flood waters entered Broach town. *Viswamitri* in Baroda also crossed the danger mark. 10 villages in Baroda were affected.

Under the influence of a storm centred near Naliya, exceptionally heavy rain affected Ahmedabad, Nadiad, Godhra in the last week of August.

The flooded *Narmada* entered low lying areas of Broach town. 10 lives were lost in the State.

Several villages in Vidarbha region were also inundated on account of heavy rains in the 3rd week of July.

Unprecedented heavy rains in association with the storm that affected south Gujarat coast on 31st July, caused floods in Pune, Sholapur, Nasik and Thane districts. Bombay city was lashed by torrential rains. Three people lost their lives due to wall collapses/electrocution. The flood waters of *Bhima* entered the holy town of Pandharpur in Sholapur district. About 10,000 residents were evacuated to safer places. Paddy crops in 10,000 acres were washed away in Thane district. Considerable damage to groundnut, sugarcane and jowar in Sholapur district and loss of Kharif and fruit gardens estimated at Rs. 90 lakhs were caused.

Heavy rains lashed Vidarbha region in the 1st week of September causing floods which disrupted road traffic in Akola district.

The flash floods in the mighty river *Godwari* had isolated the temple town of Bhadrachalam and inundated 79 villages in Khammam district in the 3rd week of July. 15 heads of cattle and 2,000 sheep were washed away. 10,000 acres of standing paddy crop in West Godavari district were submerged.

In the last week of July, some areas in Trivandrum, Kottayam, Ernakulam, Kozhikode and Trichur districts in Kerala were flooded due to heavy rains damaging crops worth Rs. 15 lakhs. Heavy landslides occurred killing 20 people in Trichur and Idukki districts.

Heavy rain of 10 cm in about an hour had damaged houses, potato crops and washed out some heads of cattle at Ootacamund in Tamilnadu on

11 May. In the 2nd and 3rd weeks of October Chingelput, Nilgiris and Coimbatore districts were affected by floods. 2 children were washed away in wild streams. Several parts of Coimbatore district were severely hit by heavy rains and floods in 3rd week of November. 600 huts were damaged and 2000 persons were rendered homeless. 5 lives were lost. Floods in *Vaigai* river in Madurai district rendered 100 families homeless.