

## Notes and News

### SEMINAR ON HYDROLOGIC NETWORKS AND METHODS

An inter-regional Seminar on Hydrologic Networks and Methods, organised jointly by the United Nations Economic Commission for Asia and Far East (ECAFE) and the World Meteorological Organisation (WMO) under the U.N. Technical Assistance Programme, will be held at Bangkok from 14 to 27 July 1959. The subjects to be discussed at the Seminar fall broadly under the titles "Design of basic networks" and "Hydrologic methods to be used in the absence of adequate basic data". Within these two broad divisions it is expected that the specific questions to be dealt with will include the following: adequacy of existing hydrologic data networks; methods of network design; tests of networks effectiveness; estimation of available water, including maximum and minimum flow; the frequency and magnitude of floods and droughts; specific design problems; estimation of water losses by evaporation; computation of the extreme values of precipitation; quantitative forecasts of precipitation. Efforts are being made by the sponsoring organisations to secure the services of some leading hydrologists to deliver lectures on the above subjects. During the course of the Seminar there will be study tour of the major water resources development projects and important hydrologic stations in Thailand.

The sponsoring organisations have invited participants in the Seminar from the following governments and organisations—  
(a) Governments of all member and associate member countries of the ECAFE; (b) Governments of all member countries of Regional Associations II (Asia) and V (Southwest Pacific) of the WMO; (c) Technical

Assistance Administration of the UN; (d) Specialised Agencies of the UN; (e) Recognised international non-governmental organisations.

### SYMPOSIUM ON ATMOSPHERIC OZONE AND RADIATION

A Symposium on Atmospheric Ozone and Radiation will be held at Oxford from 20 to 26 July 1959 under the joint sponsorship of the International Union of Geodesy and Geophysics and the World Meteorological Organisation. The Symposium will be preceded on 17 and 18 July by a meeting of the Working Group on Atmospheric Ozone of the Commission for Aerology and will be followed on 27 and 28 July by a meeting of the Working Group on Radiation measurements of the WMO Commission for Instruments and Methods of Observation. The topics for discussion for the Symposium on Atmospheric Ozone include instrumentation, results of IGY observations, world distribution of ozone, ozone as a tracer in atmospheric circulation, and ozone in synoptic meteorology.

The subjects for discussion for the Symposium on Radiation include evaluation of results of radiation measurements during IGY including measurements at sea and in the Arctic and the Antarctic, and theory and measurement of radiation in the free atmosphere.

### THE FORTYSIXTH SESSION OF THE INDIAN SCIENCE CONGRESS HELD AT DELHI IN JANUARY 1959

The Fortysixth Session of the Indian Science Congress Association was held at the University of Delhi from 21 to 28 January 1959. Over 2500 delegates from all over India and nearly 70 delegates from

twenty foreign countries attended the Session. A noteworthy feature of this year's session was the presence of His Royal Highness The Duke of Edinburgh as the leader of the delegation from the United Kingdom. The session was inaugurated by the Prime Minister of India, Shri Jawaharlal Nehru on the afternoon of the 21st at a colourful function in the campus of the Delhi University. The Presidential address was delivered by Dr. A. Lakshmanaswami Mudaliar, Vice-Chancellor of the Madras University.

The India Meteorological Department was represented by Shri S. Basu, Director General of Observatories and a number of other officers.

As in the previous years, the Science Congress Session was preceded by the Annual meetings of nearly two dozen scientific bodies of India as well as meetings of the Association of Scientific Workers of India and of the National Institute of Sciences.

The scientific deliberations of the Congress were held in 13 different sections, *viz.*, (i) Mathematics, (ii) Statistics, (iii) Physics, (iv) Chemistry, (v) Geology and Geography, (vi) Botany, (vii) Zoology and Entomology, (viii) Anthropology and Archaeology, (ix) Medical and Veterinary Sciences, (x) Agricultural Sciences, (xi) Physiology, (xii) Psychology and Educational Sciences, and (xiii) Engineering and Metallurgy. The sectional meetings commenced on the forenoon of the 22nd with the Addresses of the Sectional Presidents, and lasted till the 28th. Besides the presentation of a large number of original papers, symposia on subjects of topical interest were held in all the Sections. Some of the topics which formed the subject matter of symposia were: Ballistics, Magneto-Hydrodynamics, Solid State Physics, Crystal Structure Analysis, Clay Minerals, Carbohydrate Metabolism in Plants, Recent Developments in Plant Diseases and Pest Control, and Propagation of Electromagnetic Waves.

Under the auspices of the Physics Section, a symposium on 'I.G.Y. Data' was held on the afternoon of the 27th at which delegates from a number of institutions gave accounts

of the activities in which they had participated during the I.G.Y. period. Another symposium, which was of interest to meteorologists was on 'Role of Instruments in the Second Five Year Plan,' which was held on the 23rd under the auspices of the All India Instrument Manufacturers and Dealers Associations; some of the officers of the India Meteorological Department participated in this symposium.

A noteworthy feature of the Session was a number of special lectures by visiting scientists. Among these may be mentioned the lecture on the 'Origin of Galaxies' by Academician Ambartsumyan of U.S.S.R. on 'Measurement of light of very low intensity' and a subsequent lecture on 'Time variation of light intensity' by Prof. L. Janessy, the talk on 'Some Reports on Cosmic Rays Underground' by Dr. Y. W. Watase of Japan and the lecture on 'The Analysis of Macromolecular Systems in Biochemistry' by Prof. Arne Tiselius of Sweden. Popular lectures by eminent scientists held on most evenings during the Session were largely attended. Prof. Arne Tiselius spoke on 'The Nobel Foundation and its Activities', Dr. H. J. Bhabha on 'Atomic Power', Prof. P. H. Craig on 'Science and Engineering Education in the U.S.A.', Dr. W. T. J. Morgan on 'Some Chemical Aspects of Blood Group Specificity in Man' and Prof. E. C. Stakman on 'The Obligations and Limitations of Science.'

A Scientific and Technological Exhibition in which over three dozen instrument manufacturing firms of India participated was held during the Science Congress Session. An Exhibition of Scientific Books in Indian languages had also been arranged. Both these Exhibitions attracted a large number of visitors.

Prof. P. Parija, Vice-Chancellor of Utkal University assumed the office of General President of the Association for one year from 1 February 1959. The Forty-seventh Session of the Science Congress will be held at Bombay.

### GOLDEN JUBILEE CELEBRATION OF THE CALCUTTA MATHEMATICAL SOCIETY

The Calcutta Mathematical Society celebrated its Golden Jubilee from 25—27 December 1958.

The inaugural meeting was held at the Senate House, Calcutta University on the 25th. After an address of welcome by Prof. N. K. Sidhanta, Vice-Chancellor of the Calcutta University and Chairman of the Reception Committee, the inaugural address was delivered by the Chief Justice K. C. Dasgupta of the Calcutta High Court, who presided over the function. This was followed by addresses by the Chief-Guest Prof. D. M. Bose of the Bose Research Institute, Prof. S. N. Bose, President of the Calcutta Mathematical Society, and others. Messages of good wishes were received on this occasion from eminent persons in India and abroad.

A large number of mathematicians and representatives from different institutions and departments attended the jubilee celebration.

Two symposia, one on 'A brief survey of Mathematical Researches in India in the last 50 years' and another on 'The Teaching of Mathematics' were held on 26 and 27 December 1958 respectively. And a lecture 'On Astronomy' giving a history of development of modern astronomy was delivered by Prof. A. C. Banerjee on 26 December.

A Special General Meeting of the Society was held at the Calcutta Mathematical Society Hall on 28 December. At this meeting the library of the late Dr. S. C. Kar was formally accepted by the Mathematical Society.

Reading of papers received for the Commemoration Volume and special lectures continued on some selected days till the end of January 1959.

### SYMPOSIUM ON EARTHQUAKE ENGINEERING

A symposium on Earthquake Engineering, organised by the University of Roorkee, was held within the University campus from 10 to 12 February 1959. The symposium was inaugurated by Shri M. R. Sachdev, Secretary to the Govt. of India in the Ministry of Works, Housing and Supply. In addition to a large number of Indian delegates representing various institutions, the symposium was attended by a Japanese Seismologist, Dr. N. Nasu, Director of the Earthquake Research Institute of the University of Tokyo and two American Scientists, Dr. G. W. Housner and Dr. D. E. Hudson of the Earthquake Engineering Research Institute, California, U.S.A. The India Meteorological Department was represented by Shri S. Basu, Director General of Observatories, Dr. A. N. Tandon, Seismologist and Shri B. P. Saha, Assistant Meteorologist, Central Seismological Observatory, Shillong.

More than 20 papers discussing the various aspects of the problem of Earthquake Engineering were presented in four sessions which were presided in turn by Dr. D. N. Wadia, General H. Williams, Shri S. Basu and Dr. A. N. Khosla.

The programme of the symposium also included film shows during evenings, exhibiting films from Japan and U.S.A. on Earthquakes.

The University of Roorkee, which has incorporated the subject of Earthquake Engineering for their post graduate course in Structural Engineering, is to publish all the papers presented at the Symposium in a single volume.

### CONFERENCE ON OPERATIONAL RESEARCH

A 3-day conference on Operational Research was held under the auspices of the Research and Development Organisation, Ministry of Defence, in the premises of the National Physical Laboratory, Delhi, from

19 to 21 March 1959. The Conference was inaugurated by the Defence Minister, Shri V. K. Krishna Menon who said that the purpose of operational research was to make activity purposeful and to achieve optimum results from the available resources. The session was presided over by Prof. P. C. Mahalanobis. He said in his address that the country's defence potential was related to the level of the economic development it had attained. He pointed out the close analogy between tactical and strategic decisions of the armed forces with the decisions on short-range and long-range problems in planning of national economy. Dr. D. S. Kothari was in the Chair during the second day's session. The conferences was also addressed by the representatives of the three branches of the armed services.

Papers dealing with the application of method of operational research to various problems arising in connection with the work of the different branches of the Defence Services were presented and discussed.

After the conclusion of the conference, the Indian Operational Research Society held its annual meeting at which it was decided that they should join the International Federation of Operational Research Society.

#### RIVERS COMMISSIONS MEETINGS

Meetings of the Ganga-Brahmaputra Rivers Commission, the Northwest Rivers Commission and the Central India Rivers Commission were held at Dibrugarh, Nangal and Bhubaneswar on 29 November, 6 December and 15 December 1958, respectively. The Meteorological Department was represented at these meetings. Among the points discussed and recommendations made, the following may be mentioned—

(1) The need for compilation and preservation of the rainfall data collected at a large number of stations in the country, which are at present not being published anywhere, was discussed and the Commissions

decided to recommend to the State Governments to take necessary steps for the inclusion of these data in the Rainfall Tables published by them.

(2) The need and urgency of investigating the possibilities of the flood forecasting came for discussion and the Commissions noted that a cell for the purpose was being set up in the Central Water and Power Commission and also that some progress has already been made on this subject in the Meteorological Department.

#### EARTH TEMPERATURE MEASUREMENTS

Records of earth temperature observations for various depths and periods are available for some stations in India other than the Crop Weather Observatories. Some of these date back to 1881 or earlier, for example, Allahabad, Bombay (Colaba), Calcutta, Dehra Dun and Jaipur.

In order to ensure uniformity, and consistent with the recommendations of the WMO Commission for Climatology (Second Session), earth temperature observations at depths, 5, 15, 30, 50 and 100 cm are being recorded from 1 January 1959 at six stations, Bombay, Calcutta, New Delhi, Madras, Bangalore and Nagpur daily at 0700 LMT, 0830 IST, 1400 LMT and 1730 IST in addition to the existing network of stations recording earth temperatures.

#### WEATHER RADAR AT NAGPUR

One weather radar (Decca type 41) has been installed at Sonagaon Aerodrome, Nagpur. This radar can detect storms within a radius of 150 miles round the station and has a maximum detection range of 250 miles.

The equipment has been set up on the Regional Meteorological Centre building at Nagpur for the time being, but would ultimately be shifted to the terminal building of the Sonagaon Airport, Nagpur as soon as necessary facilities for the same are available there.

Twenty four-hour watch is being maintained since 18 December 1958 and weather information is being supplied to the Forecasting Office and to the Air Traffic Control, Nagpur.

Nagpur is the fourth station where a radar has been installed, others being Dum Dum, New Delhi and Santacruz.

#### AWARDS TO VOLUNTARY OBSERVING SHIPS

The following ships of the voluntary observing fleet of the India Meteorological Department were selected for "Excellent Award" for outstanding meteorological work during the year 1957-58. The awards, which are in the form of books, were sent to Captains, Observing Officers and Radio Officers who have been on the ships concerned for six months or more during the award year. Details of the recipients are given below—

*S. S. Kampala* (British India Steam Navigation Co. Ltd.)—C. L. Broadhurst (Captain), R. Baker (Observing Officer), P. McCarthy and L. H. Lewis (Radio Officers).

*S. S. Jalayamuna* (Scindia Steam Navigation Co. Ltd.)—N. E. Wickham (Captain), J. K. Chaudhury (Observing Officer) and V. Mathias (Radio Officer).

*S. S. State of Bombay* (Eastern Shipping Corporation)—M. S. Patel (Captain), M. M. Tare and J. N. Kapoor (Observing Officers), C. D. Joshi and S. M. Viliat (Radio Officers).

*S. S. Karanja* (British India Steam Navigation Co. Ltd.)—R. Weatherseed (Captain), G. Merchant and R. Ralph (Observing Officers), A. Cockett and R. Lynch (Radio Officers).

*S. S. Indian Exporter* (India Steamship Co. Ltd.)—R. C. Pitt (Captain), D. J. Antia and E. B. Bertelsen (Observing Officers) and P. M. Panthaki (Radio Officer).

*S. S. Sirdhana* (British India Steam Navigation Co. Ltd.)—F. J. Flinders (Captain), A. K. Ambegavkar (Observing Officer), C. Jones and H. Randall (Radio Officers).

*S. S. Islami* (Mogul Line Ltd.)—I. A. H. Glen (Captain), E. G. Dawes, J. N. Correa, A. A. Nazareth and A. D. Divekar (Observing Officers), J. F. Cullen and S. G. Chaudhury (Radio Officers).

#### SCINTILLATION OF CANOPUS

*Vessel* : M. V. Sirdhana

*Captain*: F. J. Flinders

*Voyage* : Bombay to Karachi

*Observer*: R. Sandeman Gay, 3rd Officer

6 April 1958, 1450 GMT. Position—  
Lat. 22°38'N, Long. 68°15'E.

Canopus was observed to scintillate very brightly, showing green, white and red. The altitude of the star was about 8° to 10° and it was bearing SSW. The scintillation increased in brilliance until at about an altitude of 15°. The colour changes were seen quite clearly without the aid of binoculars. Other stars all around horizon were seen to scintillate but colour changes were not easy to see even with binoculars. At an altitude of about 20° to 25° the scintillation ceased.

Sky was clear, wind light and dry bulb 26.1° C.

#### RAINBOW

*Vessel* : M. V. Jaladharma

*Captain*: W. L. Atkinson

*Voyage* : At anchor off Liverpool

*Observer*: B. K. Das, 3rd Officer

21 June 1958. Position—off Liverpool Docks.

A strange optical phenomenon off Liverpool, England was observed. It was raining and the primary and secondary rainbows were seen. A third rainbow was also observed commencing from the violet edge of the primary rainbow and joining the secondary rainbow at an altitude of approximately 35°. The altitude of the sun was approximately 10°.

Wind was westerly, B<sub>h</sub> F<sub>h</sub> 3 and barometer reading 999.9 mb.

## RAINBOW

*Vessel* : M. V. Jalazad  
*Captain*: A. T. Goodwin  
*Voyage* : Madras to Calcutta  
*Observer*: R. Gangahar, 3rd Officer

4 July 1958, 1815 GMT. Position—  
 Lat. 17°42'N, Long. 84°58'E. Course—042°.

Observed on starboard beam a rainbow of three distinct colours, *viz.*, bluish green, orange and red, making a big arc over the sky very much lower than the low clouds and one end dipping in the sea about 600 ft from the ship.

Wind WSW, temp. 27°C, barometer reading 1000.2 mb, weather overcast and drizzling, clouds *Cb* and *Sc*.

## DISTURBED WATERS

*Vessel* : S. S. Islami  
*Captain*: G. C. Greig  
*Voyage* : Chittagong to Bombay  
*Observer*: A. A. Nazareth, 3rd Officer

16 September 1958, apparent time noon. Position—Lat. 16°38'N, Long. 88° 22'E Course—212°, speed—8 knots.

The vessel passed through an area of disturbed water extending about ten miles in east-west direction and about half a mile north-south. This disturbance was easily visible and appeared like breakers as on beach. It was also checked by radar.

Wind south by west, B.F. 4; sea temp. 29°; waves 3 sec., 4 ft.

## WEATHER—POST MONSOON SEASON (OCTOBER—DECEMBER 1958)

*Chief features*—(1) Three cyclonic storms in the Bay of Bengal and two in the Arabian Sea, (2) Five active western disturbances in December, and (3) Normal or excess rainfall over most parts of the country for the season as a whole.

The important features of weather in the different months are described below—

*October*—A low pressure area developed over the region extending from south Orissa to west Madhya Pradesh on 1 October. It shifted northwards and on the 3rd lay over Uttar Pradesh where it persisted for about two days and became unimportant thereafter. In association with this 'low' pressure area fairly widespread or local rainfall occurred in Orissa and Madhya Pradesh on the 1st and 2nd and in Uttar Pradesh and West Bengal from the 1st to 3rd. Locally heavy to very heavy rain occurred in north Madhya Pradesh and Uttar Pradesh on the 2nd and 3rd. According to newspaper reports, the heavy rains caused breaches in the Ferozepur—Bhatinda section of the Northern Railway and house collapses in many parts of west Uttar Pradesh. The rivers Ganga and Gomati were reported to have been in spate and overshot the danger mark at some places. After the dissipation of the 'low' the monsoon began to withdraw rapidly from the country and by the end of the first week, it withdrew completely from northwest India, Uttar Pradesh, Madhya Pradesh and the northern parts of the Bombay State.

Conditions became unsettled in the south Bay of Bengal on the 5th and by the next morning, a depression formed with its centre near Lat. 10°N and Long. 87°E. It moved westnorthwestwards and intensified into a deep depression by the 7th morning when it was centred about 200 km (125 miles) to the eastsoutheast of Madras. It, however, weakened rapidly by the same evening and lay over south Mysore as a low pressure area on the 8th morning. Under the influence of the depression, fairly widespread rainfall occurred along the east coast and over the southern parts of the Peninsula on the 7th and 8th. Breaches in the railway track between Renigunta and Cuddapah of the Southern Railway were reported to have occurred as a consequence of the heavy rains.

The low pressure area which lay over south Mysore on the 8th moved westwards and on emerging into the Arabian Sea concentrated again into a depression by the morning of 9th with its centre about 300 km (190 miles) to the southwest of Ratnagiri. Moving northwestwards, the depression intensified rapidly into a severe cyclonic storm of small extent which was centred on the morning of 10th about 400 km (250 miles) to the west-southwest of Bombay. The severe storm then took a westnorthwesterly course and reached its westernmost position on the 13th morning when its centre was near Lat.  $20^{\circ}\text{N}$  and Long.  $63.5^{\circ}\text{E}$ . Thereafter, it recurved towards northeast and by the morning of the 15th it was centred about 400 km (250 miles) to the westsouthwest of Dwarka. Without any further motion the storm weakened rapidly *in situ* into a low pressure area during the course of the next two days and became unimportant thereafter. In association with the storm, there was a spell of light to moderate rainfall in the Bombay State and Madhya Pradesh from the 8th to 14th.

The monsoon withdrew from Bihar State on the 15th and the seasonal low pressure area over the central Bay of Bengal got established. The low concentrated into a shallow depression in the west central Bay on the 17th morning with its centre about 300 km (190 miles) to the southeast of Masulipatam. It moved slowly in a northnorthwesterly direction and was centred on the morning of 19th about 150 km (90 miles) to the eastsoutheast of Masulipatam. Without any appreciable movement, it weakened into a trough of low pressure over coastal Andhra Pradesh and the adjoining west central Bay on the 21st and became unimportant by the 23rd. In association with the depression, there was widespread rain in coastal Andhra Pradesh from the 17th to 20th with locally heavy to very heavy falls on some days. Visakhapatnam recorded 29 cm and Kakinada 22 cm on the 20th, the former figure being an all-time record for this station. According to newspaper reports, Visakhapatnam experienced unprecedented

floods as a result of which, about 20,000 persons were rendered homeless. Breaches on the railway tracks between Waltair and the various neighbouring towns were also reported to have been caused by the heavy rains.

A well marked trough of low pressure appeared over the east central and adjoining northeast Bay on the 22nd morning and by the same evening, it concentrated into a depression with its centre about 400 km (250 miles) to the southsoutheast of Calcutta. Moving in a northnortheasterly direction, the depression intensified rapidly into a cyclonic storm of small extent by the 23rd morning with its centre about 250 km (150 miles) to the southeast of Calcutta. The storm crossed the Sunderbans coast between Barisal and Noakhali by the same night and weakened rapidly into a shallow depression which lay over lower Assam on the 24th morning. Weakening further, it moved away northeastwards as a low pressure wave across upper Assam by the 26th. The storm was responsible for some heavy falls in East Pakistan on the 24th. According to press reports, railway communication between Dacca and Chittagong was dislocated on account of the gales and heavy rains. With the dissipation of the storm, the monsoon withdrew from Assam, West Bengal and Orissa.

Under the influence of an easterly wave which moved across the south Andaman Sea, a well marked trough of low pressure formed in the southwest Bay on the 30th morning. It concentrated into a shallow depression by the same evening with its centre about 400 km (250 miles) to the eastsoutheast of Nagapattinam. Moving slowly west-northwestwards, it was centred about 300 km (190 miles) to the eastsoutheast of Nagapattinam on the evening of 31st. Thereafter, it weakened into a trough of low pressure over the southwest Bay. The shallow depression was responsible for active monsoon condition over coastal Madras State on the 31st.

*November*—The trough of low pressure which lay over the southwest Bay towards the close of October persisted there till 4 November. Thereafter, it shifted northwards and lay over the west central and adjoining southwest Bay on the 5th morning. It concentrated into a depression by the 6th morning with its centre about 250 km (150 miles) to the southeast of Visakhapatnam. Moving eastnortheastwards, the depression intensified further and became a cyclonic storm of small extent by the 8th morning with its centre about 450 km (280 miles) to the west of Sandoway (in Burma). Thereafter, the storm moved slowly eastwards and was weakening at the same time. It lay as a depression on the 9th morning with its centre about 350 km (220 miles) to the west of Sandoway. By the 10th, it weakened further and lay as a trough of low pressure over the east central and adjoining north Bay of Bengal. In association with the early stages of development of the storm, the northeast monsoon was active in south coastal Andhra Pradesh and north Madras State on the 4th and 5th.

A well marked trough of low pressure developed over the southeast Bay and the adjoining areas of Andaman Sea on the 18th morning and by the same evening, it concentrated into a depression with centre near Lat.  $7.5^{\circ}\text{N}$  and Long.  $91.0^{\circ}\text{E}$ . Moving rapidly westnorthwestwards, it became deep by the morning of 19th and was centred near Lat.  $9.5^{\circ}\text{N}$  and Long.  $87.5^{\circ}\text{E}$ . By the next morning, it intensified further into a cyclonic storm of small extent with centre about 400 km (250 miles) to the southeast of Madras. Moving north-westwards, it weakened and lay as a deep depression close to the coast with its centre about 65 km (40 miles) north of Madras on the 21st morning. Weakening thereafter, it passed inland during the afternoon and lay as a depression over south Mysore on the 22nd morning. In association with the storm, the northeast monsoon was strong over the southern parts of the Peninsula

from the 20th to 24th when heavy to very heavy falls were reported from some places. The heavy rains in the city of Madras are reported to have caused floods in the low lying areas and rendered about 5000 families homeless.

The depression which lay over south Mysore on the 22nd morning continued its westward movement and emerged into the east Arabian Sea across the Kanara coast during the course of the same night. It was centred about 150 km (90 miles) to the northwest of Mangalore on the morning of 23rd. Moving in a westnorthwesterly direction, it became deep by the 25th and lay on the 26th morning with its centre near Lat.  $15.0^{\circ}\text{N}$  and Long.  $66.5^{\circ}\text{E}$ . It intensified further into a cyclonic storm of small extent by the 27th morning when it was centred near Lat.  $19.0^{\circ}\text{N}$  and Long.  $64.0^{\circ}\text{E}$ . Thereafter, the storm recurved to the northeast and weakened into a deep depression by the morning of 28th with its centre near Lat.  $21^{\circ}\text{N}$  and Long.  $65^{\circ}\text{E}$ . Weakening further, it lay as a trough of low pressure over the northeast Arabian Sea off the Kathiawar coast on the 29th morning and became unimportant by the 30th. The storm was responsible for a spell of thunder-rain in many parts of Bombay State and in west Madhya Pradesh during the last week of the month. Fairly widespread or local thundershowers also occurred in Rajasthan on the 28th and 29th.

Four western disturbances moved across the extreme north of the country during the month and only two of them caused local rain or snow in Kashmir on the 12th and 18th and scattered rain or snow on the 13th and the 19th.

During the month, night temperature were generally normal or above normal over most parts of the country. They were appreciably to markedly above normal in Orissa, the Bombay State, Madhya Pradesh and Telangana during the last six days of month.



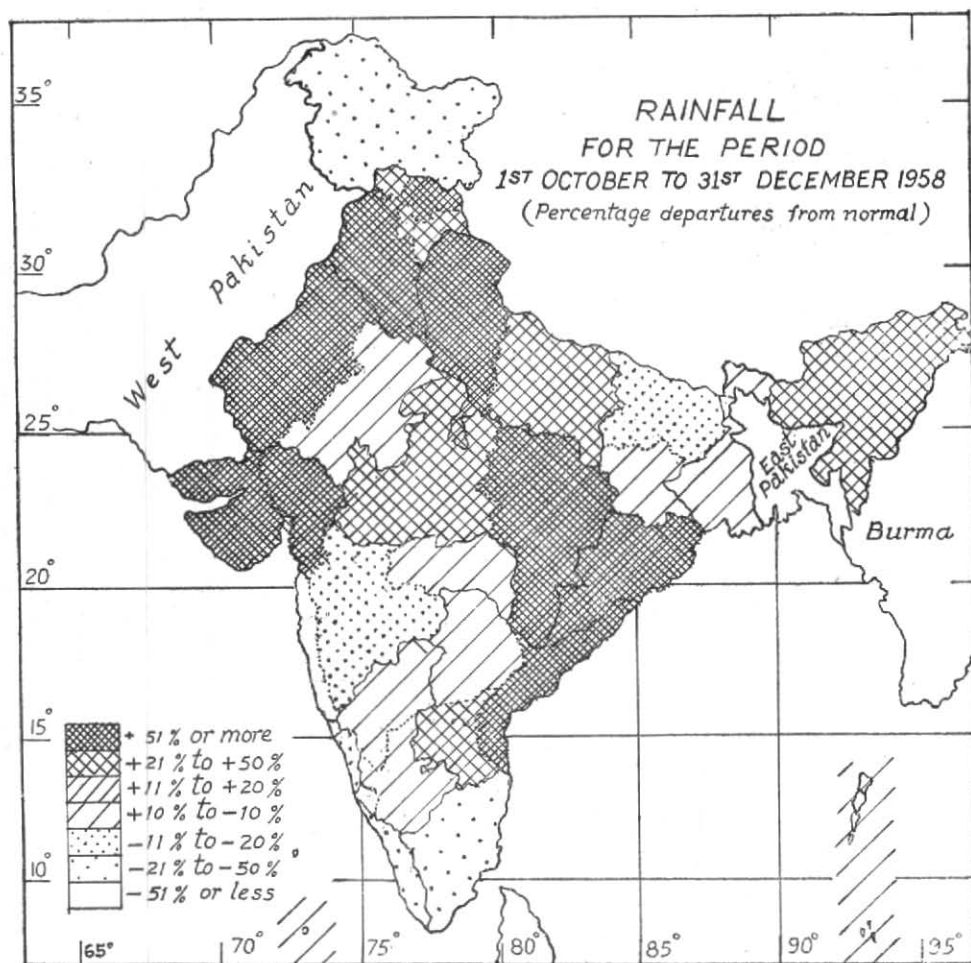


Fig. 1

*December*—Ten western disturbances moved across the northern parts of the country during the month; of these only five were active. The first three of the active disturbances moved in quick succession between the 12th and 15th, causing fairly widespread rain or snow in Jammu and Kashmir between the 13th and 15th and in Himachal Pradesh on the 14th and 15th. Local showers were also reported from the Punjab (I) on the 15th. In association with another active western disturbance which moved across northwest India on the 21st and 22nd, fairly widespread or

local rain was reported from west Rajasthan on the 21st, from the Punjab (I) on the 21st and 22nd, from Uttar Pradesh on the 22nd and from Himachal Pradesh on the 22nd and 23rd. Fairly widespread rain or snow was also reported from Jammu and Kashmir on the 22nd. According to press reports, the heavy snowfall in the valley of Kashmir caused a temporary dislocation of communications there. The last active western disturbance of the month together with a trough of low pressure induced by it, caused fairly widespread rain or snow in Himachal Pradesh on the 27th and fairly widespread

or local rain in west Rajasthan on the 27th, the Punjab (I) on the 27th and 28th, in Himachal Pradesh, Jammu and Kashmir and west Uttar Pradesh on the 28th.

The northeast monsoon was generally weak over the south Peninsula except during the first week of the month. Under the influence of an easterly wave, fairly widespread or local rainfall occurred in Rayalseema and the Madras State on the 4th and 5th and in Kerala and south Mysore on the 5th.

Weather was dry in northeast India during the month except for scattered showers in Sub-Himalayan West Bengal and upper Assam on a few days.

Night temperatures were generally normal or above normal in most parts. They were appreciably above normal in Gangetic West Bengal, Uttar Pradesh and the Punjab (I) on many days during the first three weeks of the month.

Fig. 1 shows the departure of the season's total rainfall from normal for the various sub-divisions of India.