

Notes and News

2 SATELLITES AND METEOROLOGY

As a result of a decision of the Executive Committee of WMO (Tenth Session 1958) and the Commission for Aerology, Dr. H. Wexler (USA) was appointed as a WMO rapporteur on the subject of the uses of artificial satellites for meteorological purposes. He prepared a report which was found to be of such great interest, that the Third Congress and the Eleventh Session of the Executive Committee of the WMO decided that a sound technical appreciation be made of the report.

According to Dr. Wexler, the various types of observations that are important to meteorology which can be taken from artificial satellites are: (1) Measurement of cloud cover by photoelectric cells, television cameras, and at night by infra-red measurements and (2) Radiation measurements: (i) solar radiation—direct and reflected from earth, clouds and atmosphere; (ii) total infra-red radiation from earth and atmosphere; (iii) special measurements in the infra-red water vapour window (8–11 microns) to yield terrestrial surface temperatures and nocturnal cloud cover; (iv) measurements of water vapour emission in the 6-7 micron band.

Other, more difficult measurements which are conceivable include: (1) Radar measurements of global precipitation and perhaps cloud cover; (2) Approximate vertical temperature profiles; (3) Mass of water vapour, ozone and carbon dioxide in the vertical column and perhaps a rough approximation of their vertical distribution; (4) Atmospheric turbidity; (5) Mass of the atmosphere and thus the surface pressure; (6) Thunderstorm distribution by lightning detection and static discharge (sferics).

Discussing the optimum orbits and heights suitable for meteorological observations he

says that circular orbits about the earth which will eliminate large amount of height corrections are preferable to orbits with large eccentricity. Of the infinite variety of possible circular orbits of the earth satellites it appears that two offer unique advantages to meteorology: the polar orbit and the equatorial orbit.

Regarding the implication of the satellite data for research in meteorology, Dr. Wexler adds that after the immediate use of the observations recorded, the information can be processed for climatological use of far reaching consequence. Then there are important applications in the field of measurements of direct solar, reflected solar and terrestrial out-going radiation. These observations can be used in the study of weather developments and motions of atmospheric disturbances as related to the radiation balance and to compute net radiation gains and losses over the earth.

The U.S. weather satellite Tiros I, launched on 1 April 1960, is busily sending back from hundreds of miles above the earth's surface, clear pictures of the earth's cloud cover. Since the National Aeronautics and Space Administration (NASA) has announced that it will share with other nations the knowledge gained from these pictures, meteorology at large would seem to stand on the threshold of a new era.

Tiros—an acronym for 'television and infra-red observations satellite'—was launched with near-absolute accuracy into a virtually circular orbit some 450 miles above the earth. It is a flying observatory, shaped like hat box, with solar cells on the top and sides to power two television cameras, each of which can produce and store 32 'still' pictures at 30-second intervals. A spinning motion imparted to Tiros at the end of second

rocket stage stabilizes the satellite to permit the cameras looking down to focus on the clouds rather than to wander all over the sky.

Such weather satellites will open up a new era in weather observation, for it inevitably will be followed by orbiting weather stations. From them, scientists hope to gain a new understanding of the incredibly complex processes that make the weather what it is.

Tiros I is now televising cloud formations within a belt several thousand miles wide around the earth to help forecasters locate storms in the making. Eventually, detailed weather data may be distributed throughout the world, probably through the World Meteorological Organization.

THIRD SESSION OF THE COMMISSION FOR MARITIME METEOROLOGY OF WMO

The Third Session of the Commission for Maritime Meteorology of the World Meteorological Organisation will be held at Utrecht (Netherlands). The Session will commence on 16 August 1960 and is scheduled to last about two weeks. The subjects to be discussed at the Session include—Meteorological observations made aboard ship, Networks of observations from ships at sea, Weather bulletins and warnings for shipping, Climatological information for shipping and fishing, Ocean waves, Sea ice, Routing of ships by means of extended weather forecasting, etc. The Commission will also discuss the International Co-operative effort in the Indian Ocean Oceanographic Expedition. During the Session, scientific lectures and discussions on methods of forecasting the state of sea on the basis of meteorological data will also be held.

INTERNATIONAL INDIAN OCEAN EXPEDITION

The Special Committee on Oceanic Research (SCOR) of the International Council of Scientific Unions (ICSU) has recommended an International Co-operative investigation of

the Indian Ocean. The Indian Ocean, what is probably the least investigated ocean, offers unique opportunities for improving our understanding of the basic oceanographic problems both biological and physical. It has several unique characteristics—seasonal reversal of prevailing winds, *i.e.*, southwest and northeast monsoons, evidence of abundant fish populations far from land and unusually high productivity, etc.

The plan is to study basic questions such as, energy exchange between sea and atmosphere, response of the sea surface to winds and pressure changes, currents in the ocean, tides and seiches, chemical oceanography, distribution of marine organisms, sub-marine geology, seismic explorations and magnetic field measurements. There will be intensive coring, dredging and bottom photography. The proposed research will start in late 1960 and may continue up to 1964. The scientific findings are expected to have direct bearing on economic development and human welfare.

EQUATORIAL BALLOON FLIGHTS PROGRAMME

The Atmospheric Circulation Laboratory, Geophysics Research Directorate, Air Force Cambridge Research Center, Massachusetts, U.S.A., has proposed an equatorial balloon flights programme to be operated during the spring of 1961. A series of approximately 20 high altitude balloon flights will be conducted at a South Indian station, probably Hyderabad, as a joint project of the Governments of U.S.A. and India. The Department of Atomic Energy, the Defence Ministry and India Meteorological Department are collaborating on the Indian side. Two visiting American scientists, Messrs. G. W. Chagnon and D. V. Crowe discussed the details of the programme with the Indian Government. At a meeting held on 6 April 1960 under the Chairmanship of Dr. H. J. Bhabha, Secretary, Department of Atomic Energy, a committee was appointed to decide the details of the ascents and instrumentation. This Committee met in Bombay on 18 April 1960.

The objective of the project is to collect stratospheric particulate material and other pertinent data for the study of—(a) Stratospheric distribution of particulate aerosols and environmental radio-activities of natural and artificial origin and (b) Inter-hemispherical and troposphere-stratosphere mixing and circulations. The project is global in character and is essentially an extension of similar experiments carried out at temperate latitudes over the United States, the results of which have been published in various journals.

PHYSICAL RESEARCH COMMITTEE

A meeting of the Physical Research Committee of the Council of Scientific and Industrial Research was held at New Delhi on 3 April 1960. Shri P. R. Krishna Rao, Director General of Observatories, attended this meeting on behalf of the India Meteorological Department. The Committee considered its proposals for the Third Five Year Plan, particularly regarding the requirements of physicists during the plan period and facilities to be provided for their training.

INDIA METEOROLOGICAL DEPARTMENT FORECASTING OFFICERS' CONFERENCE

The Third Conference of Forecasting Officers of the India Meteorological Department was held in the Meteorological Office, Poona from 22 to 29 April 1960. The Conference was inaugurated by Shri P. R. Krishna Rao, Director General of Observatories. Shri C. Ramaswamy, Deputy Director General of Observatories (Forecasting) was the Chairman.

The Conference was attended by Forecasting officers from all the Regional Centres of the Department, the Headquarters Office, New Delhi and the meteorological branches of Air Headquarters, India and the Indian Navy.

Among the important subjects discussed were—Criteria for location and tracing of western disturbances, Criteria for declaration

of onset and withdrawal of monsoon over land areas, Storm warning procedures, Specifications for 'J' charts for turbo-jet operations and Vertical time section charts.

A map discussion led by Shri C. Ramaswamy, Deputy Director General of Observatories (Forecasting) on the influence of middle latitude systems on weather development over the Indian region was held on the afternoon of 22 April. Weather charts covering extensive areas utilising Russian and Chinese data were used during the discussion. Colloquia on a number of scientific subjects was organised during the Conference.

VISIT OF U.S. NAVY'S AEROMAGNETIC SURVEY PLANE

A U. S. Navy's Aeromagnetic Survey Plane arrived in Bombay on 9 February 1960. The plane is collecting data on a global basis for the preparation of World Magnetic charts to be published by U.S. Hydrographic Survey. Besides other equipment, the plane is also equipped with Flux-Gate Magnetometer for recording small magnetic variations. The plane made a flight from Bombay to Calcutta on 11 February 1960. On invitation from U.S. Commander of the plane Dr. P.R. Pisharoty, Director, Colaba and Alibag Observatories and Dr. V. V. Agashe of the Naval Chemical and Metallurgical Laboratory, Bombay, accompanied him on both the flights. Earlier, on 10 February 1960, the plane flew over Bombay and the Alibag Magnetic Observatory, when special observations were arranged for the calibration of instruments on board.

SYMPOSIUM ON COSMIC RAYS

A Symposium on 'Cosmic Rays' was organised by the Department of Atomic Energy at the Physical Research Laboratory, Ahmedabad between 16 and 19 March 1960. Dr. P.R. Pisharoty, Director, Colaba and Alibag Observatories, participated in this Symposium on behalf of the India Meteorological Department. Prof. P. Morrison of Cornell University, U.S.A. delivered the inaugural

address on 'Origin of Cosmic Rays'. A number of papers dealing with problems under Primary Cosmic Rays, Instrumentation and Experimental techniques, Time variations, Cosmic ray intensity, Solar terrestrial relationships and High Energy nuclear interactions were discussed. Prof. Morrison also delivered a popular lecture on 'New Channels in Astronomy' bringing out various aspects of visual, photographic and radio astronomy.

SYMPOSIUM ON NUMERICAL WEATHER PREDICTION

An International Symposium on 'Numerical Weather Prediction' is planned to take place in Tokyo from 7 to 13 November 1960, under the auspices of the Meteorological Society of Japan, in co-operation with the International Union of Geodesy and Geophysics, the Japan Meteorological Agency and the Science Council of Japan. The chief topics to be discussed will be Dynamic Meteorology and Numerical Weather Prediction including basic research, short and long-range forecasting, precipitation forecasting, forecasting of tropical cyclones and numerical model research, etc.

INDIAN METEOROLOGICAL SOCIETY

Under the auspices of the Indian Meteorological Society Dr. P. Koteswaram, Director,

Aviation Services, India Meteorological Department, gave a talk on 'Satellites and Meteorology' on 16 April 1960. Explaining the importance of weather satellites, Dr. Koteswaram said that a new era in weather observations is likely to be opened if three or four weather observing satellites are put in orbit. He said that the meteorological satellites would provide continuous observations of the world's weather including those regions which are at present blank on the weather maps and help in the understanding of complex weather processes. The weather data obtained by these satellites could be distributed throughout the world for global synoptic analysis.

BURMESE SEISMOLOGIST ON TRAINING IN INDIA

Mr. U. Sein Shwe U of the Burma Meteorological Service arrived in India in March 1960 for 22 weeks' training in Seismology under the Colombo Plan. He is at present undergoing training at the Central Seismological Observatory, Shillong, in theoretical and practical aspects of seismology. Visits to Meteorological Office, New Delhi, the headquarters of the Seismological Organisation in India, and observational tours to seismological observatories at Bhakra, Bombay, Poona and Madras are also included in his training programme.