NOAA Technical Memorandum EDS ESIC-3

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Data Service

An Annotated Bibliography of Studies on Clouds, Fog, and Visibility in India 1940-1970

ANNIE E. GRIMES

Environmental Science Information Center
ROCKVILLE, MD.
July 1972

NOAA TECHNICAL MEMORANDA

Environmental Data Service, Environmental Science Information Center

The Environmental Science Information Center develops policies and provides editorial and publishing services for NOAA scientific and technical publications; operates a central library system and provides functional guidance to other NOAA libraries; and develops and operates scientific information systems for NOAA and external use.

NOAA Technical Memoranda in the Environmental Data Service Environmental Science Information Center series facilitate rapid distribution of material which may be preliminary in nature and which may be published formally elsewhere at a later date. Publication 1 was issued as a separate number ASL-1, and publication 2 was issued as an ESSA Technical Memorandum ATSTM LIB 2. This present series is a continuation and, beginning with ESIC 1, will be part of the series NOAA Technical Memoranda, Environmental Data Service (EDS).

Publications listed below are available from the National Technical Information Service; U.S. Department of Commerce, Sills Bldg., 5285 Port Royal Road, Springfield, Va. 22151. Price: $3.00 paper copy; $0.95 microfiche. Order by accession number shown in parentheses at end of each entry.

ASL-1	An Annotated Bibliography on Methods of Cloud-Height Measurement 1950-1968. Annie E. Grimes, April 1969. (PB 185 110)
ATSTM LIB 2	An Annotated Bibliography on Methods of Visibility Measurement, 1950-1969. Annie E. Grimes, September 1969. (PB 188 652)

NOAA Technical Memoranda

EDS ESIC-1	An Annotated Bibliography on Weather Modification 1960-1969. Annie E. Grimes, June 1972.
EDS ESIC-2	An Annotated Bibliography on the Biological and Physiological Effects of Silver Iodide Cloud Seeding, 1967-1971. Annie E. Grimes, June 1972.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Data Service

NOAA Technical Memorandum EDS ESIC-3

AN ANNOTATED BIBLIOGRAPHY OF STUDIES ON CLOUDS, FOG, AND VISIBILITY IN INDIA 1940 - 1970

Annie E. Grimes
Atmospheric Sciences Library
Libraries Division

Environmental Science Information Center

ROCKVILLE, MD.
July 1972

UDC 016:551.575:551.576:551.591(540)"1940/1970"

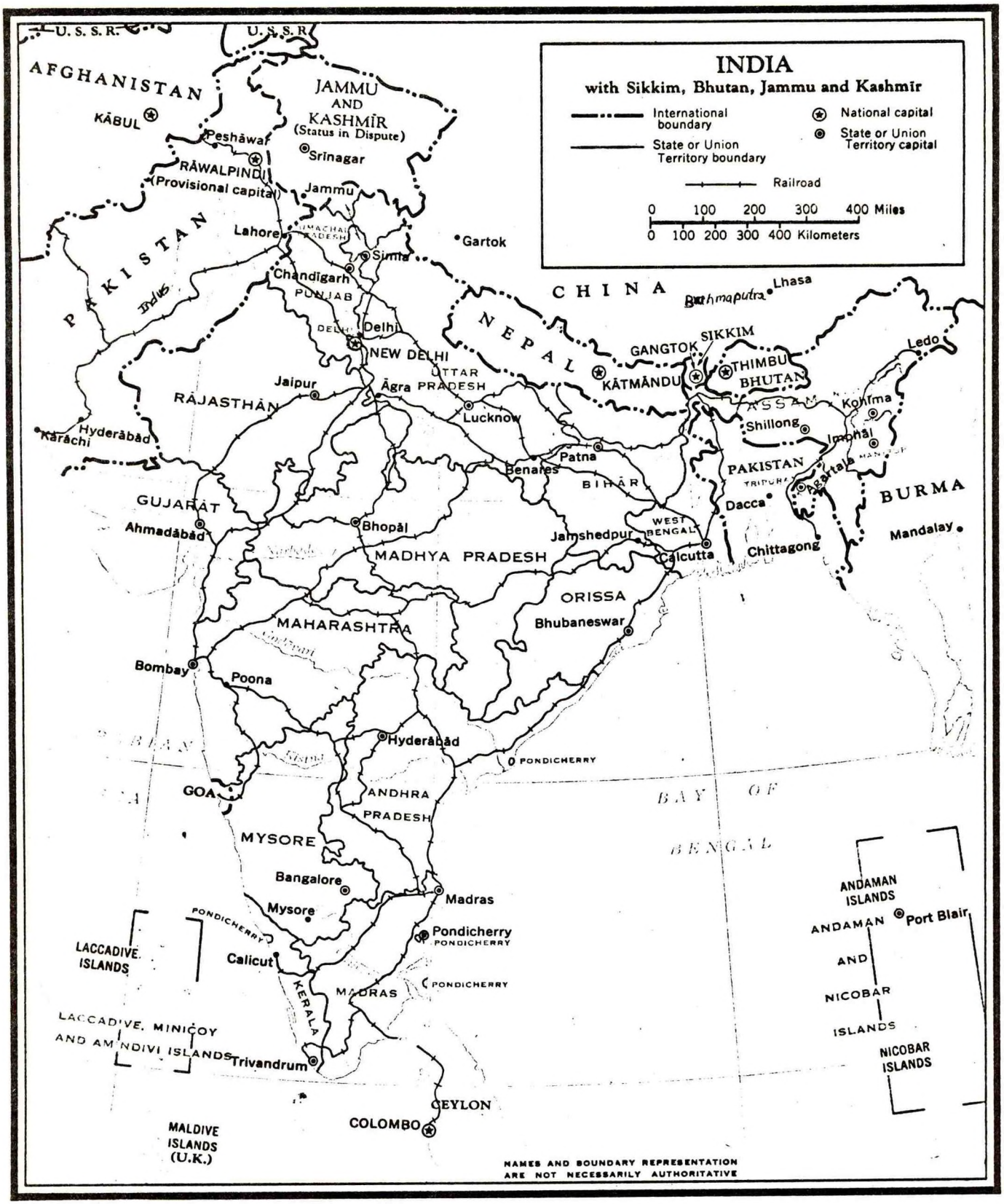
016	Subject bibliographies
551.5	Meteorology
.575	Fog
.576	Clouds
.591	Visibility
(540)	India
"1940/1970"	1940-1970

TABLE OF CONTENTS

INTRODUCTION

This bibliography of studies on clouds, fog, and visibility in India has been compiled from references in the Atmospheric Sciences Library and the Library of Congress. For references in the Atmospheric Sciences Library the call number follows the symbol DAS in the citation; for those only in the Library of Congress the call number follows the symbol DLC. Some sources may be in both libraries, however, the call number is recorded for only one, viz., the Atmospheric Sciences Library.

The symbol MAB appearing at the end of the abstract for reference no. 21 indicates that the abstract was taken from "Meteorological Abstracts and Bibliography" of the American Meteorological Society.


INDIA
with Sikkim, Bhutan, Jammu and Kashmīr
International boundary
State or Union Territory boundary
National capital
State or Union Territory capital
Railroad
0 100 200 300 400 Miles
0 100 200 300 400 Kilometers
U. S. S. R.
U. S. S. R.
AFGHANISTAN
KĀBUL
JAMMU AND KASHMĪR (Status in Dispute)
Peshāwar
Srīnagar
RĀWALPINDI (Provisional capital)
Jammu
PAKISTAN
Lahore
HIMACHAL PRADESH
Gartok
Simla
Chandīgarh
PUNJAB
Indus
CHINA
Brahmaputra
Lhasa
NEPAL
DELHI
Delhi
NEW DELHI
UTTAR PRADESH
GANGTOK
SIKKIM
KĀTMĀNDU
THIMBU
BHUTAN
Ledo
Jaipur
Āgra
RĀJASTHĀN
Lucknow
ASSAM
Kohīma
Shillong
Imphāl
Hyderābād
Karāchi
Patna
Benares
BIHĀR
PAKISTAN
TRIPURA
Agartala
MANIPUR
BURMA
GUJARĀT
Ahmadābād
Bhopāl
Jamshedpur
WEST BENGAL
Dacca
Chittagong
Mandalay
Calcutta
MADHYA PRADESH
ORISSA
Bhubaneswar
MAHARASHTRA
Bombay
Poona
Hyderābād
PONDICHERRY
GOA
ANDHRA PRADESH
BAY OF BENGAL
MYSORE
Bangalore
Madras
Mysore
PONDICHERRY
Pondicherry
PONDICHERRY
LACCADIVE ISLANDS
Calicut
KERALA
MADRAS
PONDICHERRY
ANDAMAN ISLANDS
ANDAMAN AND NICOBAR ISLANDS
Port Blair
NICOBAR ISLANDS
LACCADIVE, MINICOY AND AMINDIVI ISLANDS
Trivandrum
CEYLON
COLOMBO
MALDIVE ISLANDS (U.K.)
NAMES AND BOUNDARY REPRESENTATION ARE NOT NECESSARILY AUTHORITATIVE

AN ANNOTATED BIBLIOGRAPHY OF STUDIES ON CLOUDS, FOG, AND VISIBILITY IN INDIA

1940 - 1970

References and Abstracts

1940

1. Roy, A. K. Determination of visibility at night with the help of Wigand's or Bennett's visibility meter. India Meteorological Department, Scientific Notes, VIII(86): 23-30, 1940. DAS M(055) I39s.

...Gives the results of experiments carried out in 1936 to evolve standard methods of observation suited to conditions in India for the observations of visibility at night.

1941

2. Chiplonkar, M. W. Photographic studies of some cloud forms and their changes with time. India Meteorological Department, Scientific Notes, VIII(94): 113-116, 1941. DAS M(055) I39s.

...In recent years, many laboratory studies have been carried out on the motion generated in shallow unstable layers of fluids producing artificial cloud patterns which greatly resemble the strato-cumulus, alto-cumulus and cirro-cumulus clouds and also those of the böen type. During the last two years, the author has attempted to obtain systematically photographs of some types of natural clouds at short intervals of time in order to study the changes which they undergo. In this paper are reproduced and discussed some of these series of cloud photographs taken at Poona. - Author's abstract.

1942

3. Karve, C. S. Diurnal variation of visibility of objects at different altitudes and in different directions during the cold season at Poona and its neighbourhood. India Meteorological Department, Scientific Notes, X(115): 1-10, 1942. DAS M(055) I39s.

...There is a marked diurnal variation in the visibility of objects in and near Poona during the cold season. The visibility is usually fair at sunrise but deteriorates rapidly, becoming very poor generally at some hour between 8 and 10 hrs. (most frequently between 8 and 9 hrs.) and rapidly clearing before 11 hrs. As observed from the

Source No. 3 continued.

tower of the Poona Meteorological Office, the visibility minimum is reached earliest in a direction towards the north-east and latest towards the south-west. This is mainly due to the prevailing north-easterly to south-easterly wind carrying the haze in that direction. Comparing similar objects at nearly the same distance and direction, the deterioration of visibility takes place earlier for lower objects than for higher ones. The improvement of visibility also begins slightly earlier for lower objects, but the change is rapid and the clearing takes place practically simultaneously for lower and higher objects. At the time of lifting fog (a rare phenomenon at Poona) higher objects become visible earlier than the lower one.

The diurnal variation of visibility of objects in winter on days of clear undisturbed weather as seen from Fort Purandhar (4,560 ft. above sea level) is appreciably different from that observed from Poona (1,850 ft. above sea level). The minimum of visibility which takes place in the forenoon occurs two to three hours later at Fort Purandhar, and the time of clearing of haze is also correspondingly delayed to some hours between 12 and 14 hrs. The coefficient of eddy diffusion calculated from the lag in the time of maximum haziness or clearing of haziness comes out to be 8.9×10^4 $cm^2/sec.$ which is in approximate agreement with value deduced by Barkat Ali from the variation of wind with height at Agra for the period February to April. -Author's abstract.

1943

4. India Meteorological Department. Heights of base and thickness of low clouds in the north of the Bay of Bengal and neighbouring land regions. Technical Note No. 5. 2pp. Bombay, 1943. DAS M(055) I39te.

...Presents tabular frequencies of heights of base and thickness of cumuliform (cumulus and cumulonimbus) and stratiform (stratus and stratocumulus) clouds for 3 periods (May - September; June - August; October - December) based on data collected during reconnaissance flights for the period May - December 1942 for an area which consists of west Burma, northeast India, East Pakistan, and the Bay of Bengal.

1944

5. Sreenivasaiah, B. N. Fog, mist and haze at Bangalore. India Meteorological Department, Technical Note No. 12. 8pp. Bombay, 1944. DAS M(055) I39te.

...Analyzes the fog, mist, and haze data at the Central Observatory at Bangalore for the period 1932-1941 to determine the hours and months which have the greatest liability for the occurrence of these phenomena. The tables present monthly and annual mean number of occurrences of fog, mist, and haze; monthly earliest hour of commencement and latest hour of ending of fog, mist, and haze; monthly percentage frequency of commencement of fog, mist, and haze in specified time intervals (0500 or before, 0501-0600, 0601-0700, 0701-0800 and 0801-0900); monthly percentage frequency of specified durations (1 hour or less, 1-1½, 1½-2, 2-3 and > 3 hours) of fog, mist, and haze; remarks for each month about the occurrence of fog, mist, and haze in the period 1932-1941 at the Central Observatory, Bangalore.

1945

6. Elsworth, -. Low cloud over Coimbatore during January, February and March. India Meteorological Department, Technical Note No. 17. 2pp. Bombay, 1945. DAS M(055) I39te.

...Consists of brief notes on the four main weather conditions over Coimbatore and the peculiarities in forecasting cloud data. Graphs show the amount of low cloud over Coimbatore during each month (January-March 1944) and also the air stream associated with the cloud amount.

7. Venkiteshwaran, S. P. Heights of base and thickness of low clouds in the north of the Bay of Bengal and neighbouring land regions. India Meteorological Department, Technical Note No. 14. 6pp. Bombay, 1945. DAS M(055) I39te.

...Presents the frequencies of heights of base and thickness of cumuliform (cumulus and cumulonimbus) and stratiform (stratus and stratocumulus) clouds for 4 periods (January-April; May-September; June-August; October-December) for land areas, sea areas, and land and sea areas combined based on data for the period May 1942 - April 1944; icing reports from reconnaissance flights (May 1942 - April 1944); icing reports from aeroplane ascents at Calcutta (June 1943 - September 1944) and at Chittagong (March 1943 - September 1944).

1946

8. Venkateswara Rao, D. A tornado cloud at Madras. Current Science, Bangalore, 15(3): 71-72, March 1946. DLC Q1 .C78.

...Describes a tornado cloud and the meteorological conditions accompanying it on October 8, 1945. This was seen from the Observatory of Meenambakkam.

1948

9. Chakravortty, K. C. Fog at Calcutta. India Meteorological Department, Scientific Notes, X(124): 133-140, 1948. DAS M(055) I39s.

...Observations of fog at Alipore, Dum Dum and Bally have been analysed and the frequencies of foggy days computed. The foggy days have then been classified according to the type of fog. The distribution of times of onset and duration of fog and their association with sunrise have been discussed. An analysis of wind, cloud and temperature data before the onset of fog has been made to find out the conditions which are most favourable for the formation of fog. The note concludes with a discussion as to how a study of thermograph records of a station for the earlier part of a night may be helpful in the prediction of fog during the next morning.
- Author's abstract.

10. George, P. A. Low stratus clouds over Bangalore. India Meteorological Department, Scientific Notes, X(123): 119-132, 1948. DAS M(055) I39s.

...Is a note on the frequency and formation of low stratus clouds over Bangalore. The author discusses the modes of cooling of the atmosphere, distribution and height of the low stratus cloud, time and frequency of occurrence, relation of stratus with the direction and strength of wind, association with fog and rain, the stratus in relation to the anticyclone of the winter months, use of tephigrams in the forecasting of stratus clouds, and analysis of typical aerological ascents at Bangalore. The tables include monthly mean number of days with stratus clouds based on 7 years of data and monthly total number of days with stratus clouds at specified heights above ground based on 2 observations (0900 and 1800) for each year (1938-1944).

11. Chakravortty, K. C. Aviation weather risks at Delhi. India Meteorological Department, Scientific Notes, X(130): 221-241, 1949. DAS M(055) I39s.

...Analyzes the adverse weather conditions, which are considered to be major aviation risks, at Delhi based on data during the period 1940 to 1946. These weather conditions include bad visibility (< 1100 yards), low cloud base, heavy rain, gale or high winds (force $\geq$ 28 mph), thunderstorms, and duststorms. The tables present summaries over the period (1940-1946) at Willingdon Aerodrome at New Delhi of monthly number of days with bad visibility, duration in hours of bad visibility, bad visibility frequency caused by different weather phenomena (fog, duststorm or dusthaze, and heavy precipitation), hourly frequency (hours per 1000) of bad visibility, number of days with low cloud, duration in hours of low cloud, hourly frequency (hours per 1000) of low clouds, number of days with heavy rain, duration in hours of heavy rain, hourly frequency (hours per 1000) of heavy rain, number of days with high winds or gales, wind direction (8 points) frequency, hourly frequency (hours per 1000) of gales or high winds, number of days with thunder, duration in hours of thundery conditions, hourly frequency (hours per 1000) of thunder, number of days with duststorms, duration in hours of duststorms, hourly frequency of duststorms, number of days with any type of adverse weather conditions, duration in hours of any type of adverse weather conditions, and hourly frequency (hours per 1000) of any type of adverse weather.

12. Chiplonkar, M. W. The life-history of a typical funnel cloud. Current Science, 18(10): 368-370, October 1949. DLC Q1 .C78.

...Records a typical example of a funnel cloud observed at Dum Dum on June 26, 1946. The author describes the cloud and includes photographs.

13. Mukherjee, S. M. On the diurnal variation of condensation nuclei and visibility of Colaba (Bombay), and related changes in the earth's electric field. Journal of Geophysical Research, 54(2); 173-176, June 1949. DAS P.

...Analyzes the hourly observations of condensation nuclei, electrical conductivity, and visibility of the air taken almost simultaneously on a few selected days and nights at Bombay during November-May for 1936-1938 and compares the corresponding values of potential gradient and wind.

14. Shamshad, Khan M. A note on stratus cloud over Jodhpur. Science and Culture, Calcutta, 15(2): 80-81, August 1949. DLC QH1 .S35.

...Studies the stratus cloud over Jodhpur during the monsoon season (July and August). This cloud seems to be a result of turbulence. Tables show the monthly (July and August) number of hours with stratus clouds, frequency of the height of the base of stratus clouds in hours within defined limits (300-599, 600-999 and 1000-1999 ft.), number of days on which stratus formed, and number of times the stratus formed at a particular hour for each year (1945 and 1946).

1950

15. Hariharan, P. S. Visibility of the Nilgiris from Kodaikanal and rainfall in southeast Madras in July. Indian Journal of Meteorology and Geophysics, Delhi, 1(2): 161, April 1950. DAS M(05) I39i.

...Shows the striking relationship between the rainfall in southeast Madras and the visibility of Nilgiris from Kodiakanal in July. This is based on the period 1901-1940.

16. Mukherjee, S. M. and Karve, C. S. Visibility at the Colaba Observatory, Bombay. Indian Journal of Meteorology and Geophysics, Delhi, 1(3): 220-228, July 1950. DAS M(05) I39i.

...Special observations of visibility were taken from the electrometer tower of the Colaba Observatory, about 50 feet from the ground, with a Bennett visibility meter at seven specified hours between sunrise and sunset, almost daily during November 1936 to March 1939. Seven objects situated at different distances in different directions from the observatory were used, and the data from these observations are discussed for monthly variations. For hourly observations on selected days and nights, fourteen objects at different directions and distances and five city lamps towards north, were mainly observed with the Bennett and Wigand meter. Typical hourly observations are discussed and shown diagrammatically. Wind and associated visibility are statistically analysed. - Authors' abstract.

17. Cold wave and extensive dust haze of February, 1950. Indian Journal of Meteorology and Geophysics, Delhi, 1(3): 241-244, July 1950. DAS M(05) I39i.

...Summarizes weather conditions during the second week of February 1950 when a severe cold wave and extensive dust haze swept over north and central India and West Pakistan. A table gives the lowest temperature during this spell with departure from normal for 13 stations in India.

18. Water-spout or tornado cloud? Indian Journal of Meteorology and Geophysics, Delhi, 1(3): 240-241, July 1950. DAS M(05) I39i.

...Describes the water-spout or tornado cloud which occurred at 1700 on July 10, 1949. The note also contains the weather condition at the time of the occurrence of this rare phenomenon.

1951

19. Ananthakrishnan, R. and Sanker Narayan, P. V. Observations of some meteorological phenomena from the Kodaikanal Observatory. Indian Journal of Meteorology and Geophysics, Delhi, 2(4): 265-277, October 1951. DAS M(05) I39i.

...The paper describes observations of haze, clouds and growth of convection over the plains, made from the Kodaikanal Observatory during winter months of 1950. The height above sea level of the top of the haze layer has been evaluated by measuring the angle of dip of the haze line below the horizontal. It is generally found that the top of the haze layer is some 1000 to 2000 ft below the level of the Kodaikanal Observatory, although there are day to day as well as diurnal variations of this height. By measuring the height of top of fair weather cumulus clouds it is estimated that the convection layer grows at an average rate of about 600 ft per hour from 0900 1st till the maximum temperature epoch on a day of fair weather. - Authors' abstract.

20. Roy, A. K. On the incidence of fog during winter in Calcutta and neighbourhood. Indian Journal of Meteorology and Geophysics, Delhi, 2(4): 305-306, October 1951. DAS M(05) I39i.

...Is a brief study on the principal controlling factor of weather causing fog in Calcutta and the surrounding area.

21. Fog at Bombay during February and March 1951. Indian Journal of Meteorology and Geophysics, Delhi, 2(3): 216. July 1951. DAS M(05) I39i.

...Fog generally does not occur more than twice a year on the Santacruz Aerodrome near Bombay. Description of an unusual series of fog days is given. The lowest visibility reached was 10 yds. -MAB 3.11-188.

22. Basu, S. C. Fog forecasting over Calcutta and neighbourhood. Indian Journal of Meteorology and Geophysics, Delhi, 3(4): 281-289, October 1952. DAS M(05) I39i.

...Has as its purpose to find out the local meteorological factors which are favorable for fog formation over Calcutta and neighborhood. The author discusses the type of fog, general rules of fog forecasting, local meteorological factors, location of the station (Calcutta), data used for study, temperature, synoptic situation, surface wind speed, upper winds, boundary cases, dew-point, and fog prediction diagram. Following the discussion he gives conclusions. In addition to the textual information there are graphs, maps, fog prediction diagrams at 1800 and 2200 IST, and a table. The graphs present the following summaries for Calcutta for each month (December-March) based on data for 1944-48 at 1800, 2000, 2200, 2400, 0200, 0400 and 0600 IST: mean temperature on clear and calm nights; dew point on foggy and non-foggy nights. The table contains an annual frequency over the period (1944-48) of wind speed (0-3, 3-5, 5-9, 9-14 mph) on foggy nights at 1600, 1800, 2000, 2200 and 2400 IST.

23. Rangarajan, S. Fog at Santacruz Airport. Indian Journal of Meteorology and Geophysics, Delhi, 3(3): 186-196, July 1952. DAS M(05) I39i.

...Is a study on fogs at Santacruz Airport to find out the conditions favorable for the formation of fog. The discussion includes topographical features of the Santacruz Airfield; available data on fog; frequency of occurrence, duration and intensity, times of commencement and dissipation, and depth of fogs; mode of formation; synoptic situations associated with fog; forecasting of fog; description of fog prediction diagram; the fog prediction diagram applied to the year 1948; forecasting of fog with the aid of upper winds; forecasting of fog from 1730 IST synoptic data; fog at Juhu Airfield; comparison of fogs at Karachi and Santacruz. The tables contain annual total number of days with fogs for each year (1944-1951), monthly total number of days with fog for the period 1944-1951, duration of fog ($<$ 1, 1-2, 2-3, $\geq$ 4 hours) with visibility within limits ($\leq$ 10 yds, 50-200 yds, 200 yds - ½ mile, ½-1 mile) for Santacruz Airport.

24. Balasubramaniam, V. Weather at Ahmedabad and Poona on occasions of 'below minima' conditions at Santacruz. Indian Journal of Meteorology and Geophysics, Delhi, 5(1): 80-82, January 1954. DAS M(05) I39i.

...Studies the weather conditions at Poona and Ahmedabad when weather is below minima (visibility < 1000 yds and cloud base < 800 ft) at Santacruz Airport. The tables based on data for 5 years (1947-1951) present the number of occasions of bad weather at Santacruz according to their duration and the associated conditions at Poona and Ahmedabad; the number of occasions of bad weather at Santacruz of duration more than twelve hours and the associated conditions at Poona and Ahmedabad.

25. Basu, Amal. Frequency of fog at Alipore, Dum Dum and Barrackpore. Indian Journal of Meteorology and Geophysics, Delhi, 5(4): 349-355, October 1954. DAS M(05) I39i.

...Analyzes the formation of fog at Alipore, Dum Dum Airport, and Barrackpore Airport in regard to frequency, commencement, dispersal, and duration. The tables contain monthly (October-December, January-April) number of occasions of fog for each year and over the period during October 1948 - April 1953 at Alipore, Dum Dum, and Barrackpore; monthly (December-March) wind direction (16 points and calm) frequency at 1730 IST for each year (December 1948 - March 1953) at Alipore and Dum Dum; monthly (December-March) mean minimum and mean at 0830 of temperatures for each year (December 1949 - March 1953) at Alipore and Dum Dum; monthly (October-April) and seasonal (October-April) percentage number of occasions of fog commencing at different periods, percentage number of occasions of fog dispersing at different periods, and percentage number of occasions of fog of different durations at Alipore, Dum Dum, and Barrackpore.

26. Roy, S. C. Is the incidence of unusually dusty weather over Delhi in May and June for two consecutive summers of 1952 and 1953 an indication that the Rajasthan Desert is advancing towards Delhi? Indian Journal of Meteorology and Geophysics, Delhi, 5(1): 1-15, January 1954. DAS M(05) I39i.

...Briefly discusses the genesis of the incidence of dust phenomena, keeping in view the synoptic situations which favor the occurrence of dust. This discussion includes information on hot and dry dust-raising winds, dry thunderstorms or duststorms, incidence of high dust-raising winds and duststorms and dust-fog in summer over the Delhi State during the period 1945-53. The tables contain number of hours with visbility ≤ 1100 yds and

Source No. 26 continued.

≤ 1¼ miles due to dust-fog, number of duststorms, and number of hours with high dust-raising winds for the whole day, day time and night time in May and in June at Delhi (Palam Airport) for each year and for the period 1945-1953; frequency of western disturbances during each month (May and June) affecting weather over Delhi State and the adjoining areas of Punjab, Rajputana, and Uttar Pradesh for each year and for the period 1945-53; annual rainfall amount for each year 1845-1953 for Delhi.

1955

27. Biswas, K. R. and Srivastawa, R. C. Size spectrum of cloud particles in monsoon clouds over Khandala on the Western Ghats. Journal of Scientific & Industrial Research, New Delhi, 17A (6): 235-240, June 1955. DAS P.

...The results of measurements made on cloud particle sizes in ground-based monsoon clouds at Khandala on the Western Ghats are presented. In normally raining clouds the size distribution of cloud particles even at a small height above the cloud base is wide enough to initiate cloud droplet growth by collision-cum-coalescence mechanism. On the other hand, shallow and relatively stable clouds are associated with a narrow spectrum. - Authors' abstract.

28. Chakravortty, K. C. Use of tephigrams in the prediction of radiation fog. Indian Journal of Meteorology and Geophysics, Delhi, 6(4): 327-332, October 1955. DAS M(05) I39i.

...Shows how the radiosonde observations at 2030 IST at Calcutta can be utilized to predict the occurrence of fog during the night or the following morning to a greater degree of accuracy than a method suggested in 1948 by this author. In this study he examines the radiosonde data at 2030 IST along with surface temperature and fog data for January 1950 - February 1952, November 1953 - February 1954. He discusses the method of analysis, results of analysis, and potential temperature of the convective condensation level and time of onset of fog.

29. Krisha Rao, P. R. and Ganesan, V. On the formation and physical properties of clouds over Madras. Symposium on Artificial Rain held in February 1953, pp. 19-32. New Delhi, 1955. DAS M09.67 S989.

...Is a study of the formation, structure and physical properties of clouds for the purpose of investigating the possibility of artificially stimulating clouds to yield rainfall. The tables contain for Madras monthly (October-December) summaries over the period (1944-1945) of average heights of base, top, and thickness of

Source No. 29 continued.

cumuliform and alto clouds during the morning and during the afternoon; frequencies of (1) heights of base of low cumuliform clouds, (2) heights of base of alto clouds, (3) thickness of low cumuliform clouds, and (4) thickness of alto clouds for October, November, December, and northeast monsoon season based on data for 1944-1945; frequency of precipitation from cumuliform clouds (CU, CB) during October-December for different height and thickness ranges; mean total cloud amount, mean low cloud amount, and total rainfall for October, November, December, and northeast monsoon season for each year (1946-1948); normal rainfall amount for October, November, December, and northeast monsoon season.

30. Pramanik, S. K. and Koteswaram, P. Heights of tops of low clouds over India. Symposium on Artificial Rain held in February 1953, pp. 104-111. New Delhi, 1955. DAS M09.67 S989.

...Briefly discusses the suitability of rain making experiments in different parts of India in different seasons, taking into consideration the cloud top data and the general climatological conditions. This study is based on 7,285 aircraft reports during the period 1948-1951. A table presents the monthly means of freezing levels in feet over 11 radiosonde stations in India, summarized over the period 1947-1950.

31. Satakopan, V. and Sen, B. K. Distribution of dry cloudy days in India. Symposium on Artificial Rain held in February 1953, pp. 112-120. New Delhi, 1955. DAS M09.67 S989.

...Provides information on seasons and areas of India with abundance of clouds that yield no rain. The tables present (1) stations where the annual number of days with low cloud amount 7-10 tenths is greater than the number of days with rain, (2) stations (with all cloud amount 7-10 tenths) having $\geqslant$ 60 number of dry cloudy days per year, and (3) stations (with all cloud amount 4-10 tenths) having $\geqslant$ 60 number of dry cloudy days per year.

32. Venkateswara Rao, D. Heights of base and top and thickness of tropical clouds. Indian Journal of Meteorology and Geophysics, Delhi, 6(4): 299-316, October 1955. DAS M(05) I39i.

...Analyzes the heights of base and top of all genera of high and middle clouds and of the thunderclouds from 1215 reports by Comet Jet Airliners over India and neighborhood during 1952 and 1953. These reports represent observations made between Karachi, Bombay, Delhi, Calcutta, Rangoon, Colombo, Singapore, and Bangkok. The author discusses the data used, the results of the study with reference to type of clouds and the seasons of the year, the variation of height of base of high and middle clouds with latitude, and a reclassification of clouds based on the results of this study. The tabular seasonal and annual cloud summaries are for the tropical area.

1956

33. Venkateswara Rao, D. and Marik, R. H. Cloud drift antecedent to nor'westers at Calcutta. Indian Journal of Meteorology and Geophysics, Delhi, 7(1): 84, January 1956. DAS M(05) I39i.

...States that in Calcutta a drift of middle clouds from the NW or W accompanied by a southerly surface wind often precedes a a nor'wester. An illustration of this is shown by tabular cloud and squall data for May 1953.

1957

34. Basu, S. C. Fog over Upper Assam. Indian Journal of Meteorology and Geophysics, Delhi, 8(1): 67-71, January 1957. DAS M(05) I39i.

...Discusses the monthly frequency, hourly distribution, simultaneous occurrence, time of onset, type, and meteorological conditions favorable for the formation of fog based on data observed at Gauhati and Mohanbari airfields and Tezpur and Dibrugarh pilot balloon observatories for the period 1950-1952. The tables present station coordinates; short description of locality of each station; monthly and annual frequencies of fog at Gauhati, Mohanbari, or Dibrugarh and Tezpur; monthly (November-February) hourly (1600-1700, 1701-18,... 0401-0500) distribution of occasions of fog at Gauhati, Mohanbari, and Tezpur; monthly (November-February) frequencies of simultaneous occurrences of fog at all stations (Gauhati, Mohanbari, and Tezpur), at Gauhati and Mohanbari, at Gauhati and Tezpur and at Tezpur and Mohanbari for each hour from 1600 to 0500; frequency of onset of fog at specified hours (1600-1859, 1900-1959, 2000-2059, 2100-2159, 2200-2259, 2300-2359, 0000-0059 and 0100-0200) during the period November-February at Gauhati, Mohanbari, or Dibrugarh and Tezpur. These data are summaries over the period November 1950 - February 1951 and November 1951 - February 1952. The source also contains tabular monthly (November-January) % of occasions of fog in association with western disturbances and % of occasions of fog when area was not affected by any disturbance for each year (1950 and 1951) at Gauhati and Mohanbari.

35. Kundu, T. K. Fog over Safdarjung Airfield. Indian Journal of Meteorology and Geophysics, Delhi, 8(3): 296-302, July 1957. DAS M(05) I39i.

...Deals with the radiation fog which greatly affects the visibility at Safdarjung Airfield. The author discusses the fog in Delhi; sources of data used in this study; frequency, duration, intensity, and time of commencement and dissipation of fog at Safdarjung; occurrence of fog at Safdarjung and neighboring airfields; relation

Source No. 35 continued.

between fog and humidity figures and dew point temperatures; relation between fog and surface wind. The tables present monthly (January, February, and December) number of days with fog summarized for each year and over the period (1951-1955); monthly (January, February, and December) number of occasions with fog at 13 stations in India when Safdarjung was covered with fog; frequency of visibility (30-50, 50-150, 150-300, 300-600, 600-900, and 900-1100 yds) according to duration ($<$ 1, 1-2, 2-3, and $\geq$ 4 hours) at Safdarjung.

36. Majumdar, K. C. Some studies on fog prediction at Dum Dum. Indian Journal of Meteorology and Geophysics, Delhi, 8(3): 309-312, July 1957. DAS M(05) I39i.

...A quantitative analysis of the problem of fog prediction has been carried out by choosing the lowest visibility observed in the morning as the dependent factor in the multiple regression. A forecasting technique based on ideas analogous to statistical decision with a "fog-region" from the plot of points of factors like dew point depression and depth of inversion layer is found to be quite fruitful. The results of regression or "fog-region" when combined with synoptic criteria like High in Head Bay of Bengal in an objective manner are found to improve to a considerable extent. The possibility of forecasting of fog with the help of mean dew point depression for fog days is also discussed. - Author's abstract.

1958

37. Chandiramani, W. G. Incidence of fog and low stratus clouds over Begumpet airport during winter months. Indian Journal of Meteorology and Geophysics, Delhi, 9(4): 345-348, October 1958. DAS M(05) I39i.

...Is a study on the occurrence of fog and low stratus clouds at Begumpet airport. The tables present summaries for each year and over the period (1950-1956) of number of days with fog, number of days with low stratus clouds either in association with fog or occurring independently, and number of days with low stratus clouds occurring independently and not in association with fog for each month (November-February); frequency of fog commencing at different periods (0500-0600, 0600-0700, 0700-0800 and 0800-0900 IST), frequency of fog of specified duration ($<$ ½, ½-1, 1-2, and 2-3 hours), and frequency of occurrence of low stratus clouds occurring independently and not in assocation with fog within specified periods (0500-0600, 0600-0700, 0700-0800, 0800-0900, and 0900-1000 IST) based on data for the period 1950-1956.

38. Savur, S. R. A new method for artificial stimulation of clouds. Proceedings of the Symposium on Meteorological and Hydrological Aspects of Floods and Droughts in India. pp. 109-112. New Delhi, April 18-20, 1958. DAS M79.4 S989pr.

...Records the results of the steam generator for artificially stimulating clouds to yield rain in Waltair (Andhra University), Bombay (Santa Cruz), and New Delhi (Jhansi Ki Rani Marg).

39. Venkateswara Rao, D. and Mukherjee, A. K. The formation and structure of a rare fog at Jodhpur. Indian Journal of Meteorology and Geophysics, Delhi, 9(4): 341-344, October 1958. DAS M(05) I39i.

...Analyzes the meteorological conditions leading to the formation of a rare fog which produced a well-formed lunar corona at Jodhpur on January 18, 1957. The discussion presents information on the phenomenon observed, the synoptic situation, the local weather at Jodhpur, suddenness in development and density of the fog, the behavior of the surface wind in relation to the density of fog, and the structure of the fog.

40. Venkateswara Rao, D. and Sen, Bijay Bhusan. On a destructive pendant cloud at Bamrauli. Indian Journal of Meteorology and Geophysics, Delhi, 9(1): 41-46, January 1958. DAS M(05) I39i.

...The meteorological conditions leading to the appearance of a balloon-shaped pendant cloud at Bamrauli at 1225 IST on 14 September 1956 have been investigated. The nature of the destruction wrought by this cloud is described and discussed. - Authors' abstract.

1959

41. De, A. C. An unusually high nor'wester radar cloud. Indian Journal of Meteorology and Geophysics, Delhi, 10(3): 359-362, July 1959. DAS M(05) I39i.

...Describes the radarscope pictures of the vertical structure of nor'westers and explains the synoptic situation for the day at Dum Dum airport on June 18, 1958. The source also presents some interesting radarscope pictures showing the vertical structure of nor'westers.

42. Mukherjee, Asoke Kumar. A possible role of atmospheric pollution on the frequencies of fog at Alipore, Dum Dum and Barrackpore. Indian Journal of Meteorology and Geophysics, Delhi, 10(1): 103-105, January 1959. DAS M(05) I39i.

...Is a study on the contribution of atmospheric pollution in the formation of fog. The author presents the conclusions Basu reached concerning the formation of fog at Alipore, Dum Dum, and Barrackpore airports; describes the geographical features of the three airports;

Source No. 42 continued.

discusses the general considerations of air pollution and the effect of air pollution.

43. **Natarajan, G. and Banerji, R. C.** Fog over Agartala Airfield. Indian Journal of Meteorology and Geophysics, Delhi, 10(2): 161-168, April 1959. DAS M(05) I39i.

...Presents information on the location of Agartala Airport, fog season, sources of data, frequency of occurrence and times of onset and dissipation of fog at Agartala, occurrence of fog at Agartala and other neighboring airfields, duration and intensity of fog at Agartala, factors responsible for fog, and synoptic situation associated with fog. The source contains the following tabular summaries based on data for the fog season of 1957-58 for Agartala: monthly (September-March) and annual total number of occasions of fog; total number of occasions when fog set in within specified time intervals (0201-0300, 0301-0400, 0401-0500, 0501-0600, 0601-0700, and 0701-0800 IST); total number of occasions when fog dissipated within specified time intervals (0500-0559, 0600-0659, 0700-0759, and 0800-0859); fog duration (hrs) frequency; visibility frequency within specified distance intervals; fog duration ($<$ 1, 1-2, 2-3, 3-4 and $>$ 4 hrs) frequency according to visibility ($<$ 100, 101-200, 201-300, 301-400, 401-500, 501-600, 601-700, 701-800, 801-900, and $>$ 901 m); wind speed (0-2, 3-5, 6-10 knots) frequency on foggy nights at specified hours; wind speed (0-2, 3-5, 6-10, 11-15, and $\geq$ 16 knots) frequency on all nights (October-March) at specified hours. In addition to the above data there are tabular monthly (September-March) and annual summaries for the same period of number of occasions when Dacca and Dum Dum were covered by fog within 2 hours of fog at Agartala.

44. Raghavan, K. The suitability of the Cape Comorin area for testing cloud seeding techniques. Indian Journal of Meteorology and Geophysics, Delhi, 10(3): 291-294, July 1959. DAS M(05) I39i.

...The areal distribution of rainfall in the southwest corner of the Peninsula is studied for the month of July. Suitability of control and target stations for testing seeding techniques in the area of Cape Comorin is discussed, and essential conditions for the test are stipulated. - Author's abstract.

45. Ramamurthi, K. M. 'Below minima' conditions of weather over New Delhi (Palam) and their simultaneity of occurrence at New Delhi (Safdarjung), Agra, Allahabad, Lucknow and Jodhpur. Indian Journal of Meteorology and Geophysics, Delhi, 10(1): 37-46, January 1959. DAS M(05) I39i.

...Analyzes the occurrence and duration of low clouds and visibility at Palam for the period 1949-1953 below some common limits; studies prevailing weather conditions over Safdarjung Aerodrome; shows the simultaneity of the occurrence of below minima weather conditions

Source No. 45 continued.

at Agra, Allahabad, Lucknow, and Jodhpur Aerodromes to assess their suitability for alternates to the Palam Airport at New Delhi. The tables presents for Palam, Safdarjung, Agra, Allahabad, Lucknow, and Jodhpur summaries over the period 1949-1953 of number of occasions of visibility < 1100 yards in association with (1) duststorms and (2) dust-raising winds or dust fog; number of occasions of visibility < 1100 yards for specified periods (< 1, 1-2, and > 2 hours) in association with (1) duststorms and (2) dust-raising winds or dust fog; number of occasions of visibility < 1100 yards within defined periods (< 1, 1-2, and > 2 hours) in association with fog. The source also presents tables with (1) monthly and annual summaries based on the period 1949-1953 showing the visibility < 1100 yards over Palam and simultaneous occurrences of the same or of low clouds with base ≤ 600 feet over the other five aerodromes and (2) monthly summaries of visibility < 1100 yards over Palam in association with duststorms, dust-raising winds, and dust fog, and of their simultaneous occurrence at the other five aerodromes.

1960

46. Antarkar, V. N. A note on vertical visibility. Indian Journal of Meteorology and Geophysics, Delhi, 11(2): 204-205, April 1960. DAS M(05) I39i.

...Describes the meteorological conditions over Jodhpur on the night of May 26-27, 1959. This provides a typical illustration of the four factors often observed at the time there is an improvement in the horizontal visibility and a deterioration in the vertical visibility. These factors are (1) marked atmospheric pollution, (2) temperature inversion aloft, but not on the ground, (3) turbulence at the ground due to strengthening of surface winds, and (4) illumination of the top of the dust cover.

47. Srivastava, R. C. and Kapoor, R. K. Drop size distribution and liquid water in a winter fog at Delhi. Indian Journal of Meteorology and Geophysics, Delhi, 11(2): 157-162, April 1960. DAS M(05) I39i.

...The note presents an account of measurements made of drop size distribution and liquid water in fog at various phases of its development and decay on one winter morning at Delhi. The general features observed are discussed briefly.

48. Venkateswara Rao, D. Cloud heights and turbulence in monsoon season in South Asia. Symposium on Monsoons of the World, New Delhi, February 19-21, 1958. pp. 182-184. Delhi, 1960. DAS M53.21 S989sy.

Source No. 48 continued.

...Analysis of turbulence reported during the period 1952 and 1953 by pilots of Comet Jet Airliner fleet at various meteorological offices in South Asia has been made. Attention has also been drawn to an earlier paper of the author (Rao 1955) about the investigation of all debriefing reports collected from Comet Jet Airliner pilots during the same period on cloud heights and thickness. - Author's abstract.

49. Williams, S. D. Incidence of fog over Bangalore Airfield. Indian Journal of Metoerology and Geophysics, Delhi, 11(4): 405-408, October 1960. DAS M(05) I39i.

...Discusses the frequency and duration of fog at Bangalore Hindusthan Aircraft Ltd. Airfield based on data for the period 1949-1956. The tables present monthly and annual summaries (1949-1956) for Bangalore Airport of number of days with fog, hourly distribution of fog (0300-0400, 0400-0500, 0500-0600, 0600-0700, 0700-0800, 0800-0900, and 0900-1000 IST), distribution of time of commencement of fog (0300-0400, 0400-0500, 0500-0600, 0600-0700, 0700-0800, and 0800-0900 IST), frequencies of commencement of fog (within ½, ½-1, 1-1½, 1½-2, 2-3 hours) before as well as after sunrise, distribution of time of dissipation of fog (0400-0500, 0500-0600, 0600-0700, 0700-0800, 0800-0900, and 0900-1000 IST), distribution of duration (< 1, 1-2, 2-3, 3-4, and 4-5 hours) of fog, and number of simultaneous occurrences of fog over Bangalore Airfield and Bangalore City.

1961

50. De, A. C. and Rakshit, D. K. Radar observations on the formation of cumulus clouds near Calcutta during the monsoon season. Indian Journal of Meteorology and Geophysics, Delhi, 12(2): 289-298, April 1961. DAS M(05) I39i.

...Radar observations on the formation of cumulus clouds near Calcutta during the monsoon season of 1958 have been presented. RHI data on 83 individual cloud cells have been analysed and their rates of growth and decay calculated. It has been suggested that the condensation-coalescence process is responsible for the initiation of precipitation in convective clouds during monsoon season near Calcutta. - Authors' abstract.

51. Deshpande, D. V. Heights of tops of Cb clouds over India. Indian Journal of Meteorology and Geophysics, Delhi, 12(1): 29-32, January 1961. DAS M(05) I39i.

...Discusses the heights of Cb tops and the weather phenomena (turbulence, upper winds, temperatures, and icing) near Cb tops, presents typical synoptic situations associated with Cb development and gives conclusions.

52. Kulshrestha, S. M. Seasonal distribution of echo tops of thunder clouds over North India. Proceedings of the Ninth Weather Radar Conference, Kansas City, Missouri, October 23-26, 1961. pp. 423-427. DAS M01.81 R124pr.

...In India, the only information on heights of cumulonimbus cloud tops, available so far, is based on very limited number of observations either from debriefing reports of aircrafts or from meteorological reconnaissance flights. To gain more exhaustive and complete knowledge of thunder cloud tops over North India, a radar study based on the records of the 469 storms observed during a period of 31 months, was conducted at New Delhi using the CPS-9 radar. The results of the analysis are presented in this paper. - Author's abstract.

53. Mull, S. and Kulshrestha, S. M. A radar study of altocumulus cloud using 3-cm high power radar CPS-9. Indian Journal of Meteorology and Geophysics, Delhi, 12(2): 243-249, April 1961. DAS M(05) I39i.

...Presents some results of a study of altocumulus clouds by high-power radar CPS-9 at New Delhi. There is information on the synoptic situation, present knowledge about the structure of altocumulus clouds of the cloudlet type, observed facts, suitability of a 3-cm radar for study of non-precipitating clouds, and an estimate of the order of magnitude of the smallest droplet size of the cloud.

54. Ramana Murty, Bh. V.; Srivastava, R. C.; Biswas, K. R. On identification of the first radar echo from a convective cloud. Journal of the Institution of Telecommunication Engineers, New Delhi, 7(6): 265-269, November 1961. DLC TK5101 .I55.

...A study attempted at Delhi on the first radar echo from growing cumulus clouds is presented. Despite considerable efforts, it was not possible to locate the echo at a sufficiently early stage when it was less than a kilometre deep. The probable reasons for this are considered. Some of the features brought out by data relating to echo depths as first observed by the radar are discussed. - Authors' abstract.

55. Ramana Murthy, Bh. V. and Biswas, K. R. Vertical growth and decay of convective cloud cells and associated precipitation rates at different levels. Indian Journal of Meteorology and Geophysics, Delhi, 12(1): 87-92, January 1961. DAS M(05) I39i.

...Study, using radar, has been made of history of growth and decay, in the vertical, of convective rain cells around Delhi, and of associated variations in liquid water concentration or rate of precipitation release at different heights as judged from echo intensity measurements. Data relating to three such situations, typifying respectively rain from (a) warm, (b) moderately cold and (c) very tall and highly supercooled (as in a severe thunderstorm)

Source No. 55 continued.

convective cloud are presented in this paper. One common feature noticed, namely, that the rise or fall in precipitation rate at each level, follows closely a similar trend in variation of height of radar cloud top, needs to be given detailed consideration on the basis of suitable model of distribution of vertical currents within such a cell. Some tentative considerations have been given to this aspect of the problem. - Authors' abstract.

56. Roy, A. K. Symposium on physics of cloud & rain in the tropics. Journal of Scientific & Industrial Research, New Delhi, 20A(3): 129-131, March 1961. DAS P.

...Summarizes papers presented at the Symposium on Physics of Cloud and Rain between October 29 and November 1, 1960, with particular reference to prevailing meteorological conditions in tropical countries, such as India. The talks dealt with such subjects as (1) atmospheric nuclei, cloud and raindrop size, and atmospheric chemistry, (2) cloud forms and development, (3) dynamics of cumuliform clouds, thunderstorms, and hailstorms, (4) radar studies of cloud and rain, (5) atmospheric electricity in relation to precipitation - radioactive fallout, and (6) cloud modification.

57. Seshadri, N. Sudden fog over Nagpur Airfield. Indian Journal of Meteorology and Geophysics, Delhi, 12(2): 382, April 1961. DAS M(05) I39i.

...Discusses the weather conditions at Nagpur Airfield associated with a sudden development of fog during the early morning of March 22, 1960. Fog is unusual at this airfield during this season of the year.

58. Swaminathan, D. R. Fog over Nagpur (Sonegaon) Airfield. Indian Journal of Meteorology and Geophysics, Delhi, 12(4): 673-676. October 1961. DAS M(05) I39i.

...Summarizes the characteristics of fog at Sonegaon Airfield at Nagpur during a 14-year period (1946-1959). The tables present the dates of fog, time of commencement and dissipation of fog and lowest visibility during each fog; monthly and annual number of fogs summarized for each year and over the period; annual duration and intensity of fog.

59. Low stratus cloud over river Bheri Karnali. Indian Journal of Meteorology and Geophysics, Delhi, 12(3): 507, July 1961. DAS M(05) I39i.

...Presents notes on a low stratus cloud observed over the Bheri Karnali Valley. At Jajarkot hydrometeorological station on January 5, 1961, the sky was overcast with stratus in the early morning reducing the visibility to nil. With sunrise the low stratus lifted and visibility improved. However the Tatagaon Valley was still covered with low stratus at about 1100 IST.

60. An unusual instance of fog at Bombay. Indian Journal of Meteorology and Geophysics, Delhi, 12(1): 143-144, January 1961. DAS M(05) I39i.

...Describes the synoptic situation associated with the unusual fog at Santacruz Airport, Bombay, on the morning of October 16, 1960.

1962

61. Arunachalam, G. The formation of a line of Cb cells as observed by radar. Indian Journal of Meteorology & Geophysics, Delhi, 13(Spl. No.): 155-158, March 1962. DAS M(05) I39i Special No.

...Analyzes observations of precipitation echoes from convective clouds and the formation of a line of Cb cells on July 23, 1960 with a Decca 41 type Weather Radar which had been installed at Gauhati Airport in January 1960.

62. Ghosh, S. K. and Gupta, P. K. Some observations on the structure of Cb cells by radiosonde. Indian Journal of Meteorology & Geophysics, Delhi, 13(Spl. No.): 73-76, March 1962. DAS M(05) I39i Special No.

...On two occasions (0200 GMT of 15 May and 0000 GMT of 19 May 1960) at Gauhati, the radiosonde balloon entered Cb cell and underwent upward and downward motion. Magnitudes of up- and down-drafts on 15th were 9 km/hr and 15 km/hr and on 19th 15 km/hr and 8 km/hr respectively. In the first case, the Cb cell was presumably in the final stage of maturity, whereas in the second case the cell was in the initial stage of maturity. These are confirmed by radar observations. It has been shown that the isothermal surface in a Cb cloud is inclined to the horizontal and that the in-cloud temperature is higher than environmental temperature at corresponding altitudes. - Authors' abstract.

63. India. Meteorological Department. Adverse weather conditions at airfields. Parts I and II. New Delhi, 1961 and 1962. DAS M:629.13 I39ad.

...Is a study of the simultaneous occurrence of adverse weather conditions at 45 airfields in India and Nepal and their alternates to determine the most suitable alternates to these airfields. This study was based primarily on five years of data for 1955-1959. The statistical data include monthly and annual summaries for the period (3-5 years within the period 1955-1960) and annual summaries for each year of poor visibility (visibility $\leqslant$ 3.2 km), low cloud (base $\leqslant$ 300 m and amount $>$ 4 oktas), other phenomena (accompanied with poor visibility and/or low cloud ceiling), frequencies of occasions of adverse weather phenomena not associated with poor visibility or low cloud and frequencies of occasions of all types of adverse weather phenomena at each main airfield as well as at alternate airfields.

64. Krishnan, A. Heights of base of low clouds over India. Indian Journal of Meteorology & Geophysics, Delhi, 13(Spl. No.): 31-38, March 1962. DAS M(05) I39i Special No.

...This paper, presented at the Symposium on Physics of Cloud and Rain in the Tropics held at Meteorological Office at Poona on 29 October - 1 November 1960, contains tabular monthly percentage frequency of occurrence of low clouds during morning and afternoon and frequency of occurrence of low clouds covering 6-8 oktas during the morning and afternoon over 25 important aerodrome stations in India based on data collected during pibal ascents from 1937-1955. A table also gives variance ratios of heights of base of low clouds as estimated and as observed during the pilot balloon ascents along with number of observations under each category during morning and afternoon in July and August at 18 stations.

65. Kulshrestha, S. M. Heights of cumulonimbus cloud tops over north India: A radar study. Indian Journal of Meteorology and Geophysics, Delhi, 13(2): 167-172, April 1962. DAS M(05) I39i.

...Briefly describes the earlier studies on heights of cumulonimbus cloud tops and the data used in this study, analyzes the results of radar observations at New Delhi, and gives conclusions. The tables present seasonal frequencies of cumulonimbus cloud types among different height groups (21-30, 31-40, 41-50, and $\geq$ 50 thousands of feet) during the period December 1957 - June 1960 at Delhi.

66. Majumdar, K. C. and Chatterji, A. K. A study of cloud form and associated rainfall in Gomati river basin. Indian Journal of Meteorology & Geophysics, Delhi, 13(Spl. No.): 51-62, March 1962. DAS M(05) I39i Special No.

...Describes the features of the Gomati catchment, the data used in the study, distribution of low clouds and their amounts, distribution of medium clouds and their amounts, distribution of rainfall over the catchment, and clouds on flood-rainy days. Tables present cloud amount frequency within specified limits (T-3, 4-6, 7-8, and total in octas) by low cloud type during the morning and during the afternoon for July, August and September at Bahraich, Bamrauli, Varanasi and Lucknow; cloud amount frequency within specified limits (T-3, 4-6, 7-8 octas) by medium cloud type during the morning and during the afternoon at Bahraich, Bamrauli, Varanasi and Lucknow for the period July-September; catchment rainfall frequency for the period July-September in the Gomati river basin; frequency of low cloud type during morning and afternoon on flood-rainy days for July, August, and September at

Source No. 66 continued.

Bahraich, Bamrauli, Varanasi, and Lucknow; frequency of medium cloud type in the morning and afternoon of days previous to flood-rainy days at Bahraich, Bamrauli, Varanasi, and Lucknow. The above summaries are based on data for the period 1945-1954.

67. Natarajan, K. K. Horizontal convergence as a factor for forecasting fog or stratus. Indian Journal of Meteorology and Geophysics, Delhi, 13(3): 367-370, July 1962. DAS M(05) I39i.

...Influence of horizontal convergence in the surface layers bounded by thermal inversion on formation of radiation fog at Palam, Santacruz and Begumpet during the winter 1960-61 is studied in this note. - Author's abstract.

68. Rao, K. V. and Raman, S. Some investigations relating to cirrus clouds. Indian Journal of Meteorology & Geophysics, Delhi, 13(Spl. No.): 39-50, March 1962. DAS M(05) I39i Special No.

...Reviews briefly studies on cirrus clouds; describes the data used in this study; discusses surface and upper air synoptic features, thickness pattern, vertical velocity charts of India, and cirrus and jet stream; gives conclusions. This paper was presented at the Symposium on Physics of Cloud and Rain in the Tropics held at Meteorological Office, Poona on 29 October - 1 November 1960.

69. Cirrus cloud over Madras. Indian Journal of Meteorology and Geophysics, Delhi, 13(2): 266-267, April 1962. DAS M(05) I39i.

...Describes the movement and change in structure of a high cloud at Meenambakkam Airport on June 15, 1961.

1963

70. Banerjee, A. K.; Sarkar, C. C.; Sen, S. R. An unusual spell of late night and morning fog at Agartala Airfield and some associated features. Indian Journal of Meteorology and Geophysics, Delhi, 14(1): 50-52, January 1963. DAS M(05) I39i.

...The intense spell of fog which occurred at Agartala during the last week of December 1961 has been analysed from different angles and the characteristics presented. The meteorological conditions which led to its formation have been discussed. The diameter of fog particles as calculated from coronal measurements has also been worked out. - Authors' abstract.

71. De, A. C. High radar clouds above 10 km. Indian Journal of Meteorology and Geophysics, Delhi, 14(3): 327-330, July 1963. DAS M(05) I39i.

...Heights of tops of clouds above 10 km determined by the storm detecting radar at Dum Dum airport during the premonsoon months (March-June) of 1961 have been verified on some occasions by means of post-flight reports from high-level flying aircrafts. Occasionally, the radar clouds have been found to penetrate the tropopause and lower stratosphere. Instances of such cases reported by radiometeorologists in other countries have also been mentioned. - Author's abstract.

72. Rai Sircar, N. C. and Sikdar, D. N. On visibility at Bombay airport under different precipitation conditions. Indian Journal of Meteorology and Geophysics, Delhi, 14(4): 480-482, October 1963. DAS M(05) I39i.

...Discusses and analyzes the visibility data at Bombay airport under different precipitation conditions during the monsoon season of 1961. The tables include summaries of mean visibility (km), mean deviation of visibility and maximum and minimum visibilities under specified precipitations intensities (0.50-0.75, 0.76-1.00, 1.01-1.25, 1.26-1.50, 1.51-1.75, 1.76-2.00, 2.01-2.25, 2.26-2.50 inches).

73. Seshadri, N. A radar study of heights of tops of cumulonimbus clouds around New Delhi. Indian Journal of Meteorology and Geophysics, Delhi, 14(1): 46-49, January 1963. DAS M(05) I39i.

...Studies the variations of Cb tops around New Delhi for the period August 1960 to March 1962. This paper presents tables with seasonal (winter, hot weather monsoon and post-monsoon) frequency (no. of occasions and %) of maximum height of Cb tops within specified limits (11,000-20,000, 21,000-30,000, 31,000-40,000, 41,000-50,000 and 11,000-50,000 feet) and seasonal frequency distribution of heights ($\leqslant$ 20,000, 21,000-30,000, 31,000-40,000, and $\geqslant$ 41,000 feet) of Cb tops for specified periods of the day (0000-0600, 0600-1200, 1200-1800, and 1800-2400 IST) around New Delhi (August 1960 - March 1962).

74. Visvanathan, T. R. and Faria, J. F. Fog at Santacruz airport. Indian Journal of Meteorology and Geophysics, Delhi, 14(2): 205-211, April 1963. DAS M(05) I39i.

...Rangarajan (1952) studied fogs that occurred at Santacruz airport during the period 1942 to 1951. In the present study cases of low visibility at Santacruz airport due to thick mist or fog during the period January 1952 to April 1959 have been examined taking into account conditions at the surface as well as in the upper air. An unusual case of fog which occurred on 16 October 1960 has also been examined. - Authors' abstract.

75. Datar, S. V.; Sikdar, D. N.; Rai Sircar, N. C. Radar cloud observations at Bombay during the monsoon season of 1960. Indian Journal of Meteorology & Geophysics, Delhi, 15(3): 453-458, July 1964. DAS M(05) I39i.

...The frequencies of cloud occurrences at different hours in the various sectors around Santacruz aerodrome, as observed by a 3-cm weather radar, have been compiled for the monsoon season of 1960 and presented in this note. The observations indicate certain preferred areas of cloud occurrences at different synoptic hours. The information may be useful to forecaster in connection with the issue of landing forecasts for aviation and particularly in indicating the probability of presence of clouds over the approach sector of the runway in use, causing low ceiling or poor visibility due to precipitation. - Authors' abstract.

76. Deshpande, D. V. Heights of Cb clouds over India during the southwest monsoon season. Indian Journal of Meteorology & Geophysics, Delhi, 15(1): 47-54, January 1964. DAS M(05) I39i.

...Is a study on the development of Cb clouds over India during the southwest monsoon (June-September). These clouds constitute a hazard to flying. The author discusses the data used in this study, analyzes the data, presents 3 typical synoptic situations, and gives conclusions. The tables present frequencies of heights of Cb tops over India during the monsoon season and for each month (June-September) summarized over the period 1957-1962; comparative percentage frequency distributions of Cb tops during June-September summarized from aircraft reports (South Asia) during 1952-53, radar study (North India) during 1958-59, and aircraft reports (India) during 1957-62; frequency distribution of Cb tops over India at different periods of the day (0000-0600, 0600-1200, 1200-1800, and 1800-2400 Z); percentage frequency of Cb heights for southern India (south of 20°N), central India (20°-25°N), and northern India (north of 25°N).

77. Kapoor, R. K. and Srivastava, R. C. A mock cloud seeding experiment at Delhi. Indian Journal of Meteorology & Geophysics, Delhi, 15(2): 271-276, April 1964. DAS M(05) I39i.

...The results of what may be called "A mock seeding experiment" at Delhi for a period of 12 years are presented. On the basis of comparisons of target and control sector rainfalls during the period of the mock trial with those during actual seeding experiments at Delhi during five monsoon seasons, 1957 to 1961, certain interesting conclusions are reached about the significance of the seeding results obtained so far. - Authors' abstract.

78. Singh, Gurbachan. Prediction of fog over Safdarjung Aerodrome (Delhi) from local weather conditions of the previous night. Indian Journal of Meteorology & Geophysics, Delhi, 15(4): 657, October 1964. DAS M(05) I39i.

...Is a study to determine the possibility of developing a simple prediction diagram for forecasting fog at Safdarjung Aerodrome.

79. Ceilometer at Palam Airport. Indian Journal of Meteorology & Geophysics, Delhi, 15(1): 127, January 1964. DAS M(05) I39i.

...Announces the installation of a ceilometer at Palam Airport, New Delhi. This was put into operation on October 24, 1963.

1965

80. Chacko, M. C. A radiosonde ascent in thunder clouds at Nagpur. Indian Journal of Meteorology & Geophysics, Delhi, 16(3): 487-488, July 1965. DAS M(05) I39i.

...Describes a radiosonde ascent on July 19, 1964 into a series of cumulonimbus clouds.

81. Deshpande, D. V. Cirriform clouds over India - heights and temperature. Indian Journal of Meteorology and Geophysics, Delhi, 16(4): 635-644, October 1965. DAS M(05) I39i.

...Aviators and meteorologists alike have now-a-days become increasingly concerned with cirriform clouds. Information regarding the characteristics of cirriform clouds over tropical countries is very meagre. All available data of these clouds obtained by high-altitude aircraft flights over India during the last seven years have been analysed. These include reports of the meteorological reconnaissance flights by the I.A.F. aircraft and met. reports by civil jet-aircraft. The mean heights of cirriform clouds, their extremes, thickness and amounts have been computed. The diurnal, regional and seasonal variations are also discussed. Other parameters investigated include turbulence, winds, icing and visibility in and near these clouds. A typical synoptic situation giving rise to extensive cirriform clouds is also presented. - Author's abstract.

82. Thomas, S.I.T. Incidence of fog over the Brahmaputra Valley in Assam. Indian Journal of Meteorology & Geophysics, Delhi, 16(4): 681-682, October 1965. DAS M(05) I39i.

...Describes the two types of fog (radiation and air drainage) experienced in the Brahmaputra Valley in Assam and presents tabular monthly (October-March) and seasonal (October-March) mean number of days with fog at Tezpur, North Lakhimpur, Tangla, Majbat, Jorhat, Gauhati, Mohanbari, Dibrugarh, Sibsagar, and Goalpara.

83. Bhattacharyya, P. and De, A. C. Study of the heights of radar cloud tops in the Gangetic valley of West Bengal. Indian Journal of Meteorology & Geophysics, Delhi, 17(4): 591-596, October 1966. DAS M(05) I39i.

...Results of a study of the heights of radar cloud tops in the Gangetic valley of West Bengal based on hourly radar observations for the premonsoon and monsoon seasons of 1959 to 1962 are reported. Percentage frequency distributions at different height intervals and also during different periods of the day for two seasons under study and on a ten-day period basis have been computed. - Authors' abstract.

84. Rakshit, D. K. and De, A. C. Radar echoes from non-precitating clouds. Indian Journal of Meteorology & Geophysics, Delhi, 17(4): 597-600, October 1966. DAS M(05) I39i.

...An interesting example of radar echoes from non-precipitating altocumulus clouds as detected by a high powered 3-cm radar at Dum Dum Airport, Calcutta on 2 March 1965 has been presented in the paper. The heights at which the altocumulus clouds have been formed and thickness of the clouds have been correlated with the physical conditions of the lower atmosphere as revealed by the radiosonde-rawin observations made at Dum Dum Airport. The lenticular shape of the clouds, ascending air current in the centre of the clouds and descending air at the edges have also been revealed by the study. An estimate of the cloud drop diameter in the tropical latitudes has also been suggested. - Authors' abstract.

85. Rakshit, D. K. Radar study on the preferred areas of convective cloud formation around Calcutta in Gangetic West Bengal. Proceedings, Twelfth Conference on Radar Meteorology, Norman, Oklahoma, October 17-20, 1966. pp. 151-155. DAS M01.81 R124pr.

...Radar observations on the formation of convective clouds around Calcutta in Gangetic West Bengal during different months and seasons have been studied. For this all radarscope data during the period 1958 to 64 have been studied. It has been seen that the formation of radar clouds around Calcutta is different in different sectors and ranges irrespective of any important synoptic situation. That the topography of a place plays an important role in governing the distribution of convective cloud formation has been confirmed. - Author's abstract.

86. Rao, K. N. and Rao, D.R.K. Sunshine, rainfall and cloudiness over Bombay. Indian Journal of Meteorology & Geophysics, Delhi, 17(1): 17-24, January 1966. DAS M(05) I39i.

...The relationship between sunshine over Bombay and the factors (i) cloudiness, (ii) rainfall and (iii) rainy days has been examined for the rainy months, May to November. All the C.Cs. are negative. For cloud the magnitude is 0.8 to 0.9. The C.Cs. are rather low for rainfall in the most intense monsoon months July and August and statistically insignificant. With rainy days the C.C. is generally improved but July continues to be low. Sunshine in any month is not significantly correlated with the other months. - Authors' abstract.

87. Siromani, P. Incidence of low clouds at Bombay airport (Santacruz) with reference to jet landings with the help of the Instrument Landing System (ILS). Indian Journal of Meteorology & Geophysics, Delhi, 17(3): 433-442, July 1966. DAS M(05) I39i.

...Santacruz airport constitutes a high traffic density area, with a substantial number of jet aircraft movements. Aviation hazards at this airport get particularly accentuated during the monsoon season on account of the occurrence of very low clouds, strong gusty winds, and poor visibility conditions in mist or haze, or showers. There are a few important hill features around the airport, not far from the landing area.

The airport is equipped with standard radio navigational aids, namely, very high frequency omnidirectional range (VOR), Instrument Landing System (ILS), the Aerodrome Surveillance Radar (ASR). A precision approach radar (PAR) will become operational at this airport shortly. On the ILS the glide path angle has recently been reduced from 4 degrees to 3.3 degrees above the horizon, necessitating the approach of the aircraft generally at a lower altitude, the altitude above the middle marker being of the order of 561 ft only. The distance of the middle marker from ARP is 2972m (1.6n.m.). Fig 1 is the instrument approach chart for the Bombay airport.

The aviation hazards that may be encountered by the jet aircraft especially in the monsoon season, on the phase of the final approach, have been discussed in this note with reference to climatological statistics and the synoptic climatology of this airport. It is hoped that the results arrived at will be of some practical value to pilots operating jet aircraft and to air traffic controllers. - Author's abstract.

88. Srivastava, R. C. and Ronne, C. Salt particles and haze in the Indian monsoon air. Indian Journal of Meteorology & Geophysics, Delhi, 17(4): 587-590, October 1966. DAS M(05) I39i.

...During the International Indian Ocean Expedition, an extensive series of time-lapse motion pictures of clouds was taken from aircraft over the Arabian Sea. An unusual feature revealed by these pictures is the occurrence, during the monsoon season, of cumulus clouds immersed in a dense haze, which frequently cut down the visibility to less than 10 km. In this paper, an attempt is made to explain the occurrence of haze, over the eastern portions of the Arabian Sea, in terms of condensation of water vapour on sea-salt particles. - Authors' abstract.

89. Swaminathan, D. R. Multicellular thundercloud and interesting surface weather phenomena at Meenambakkam airfield on 15 July 1965. Indian Journal of Meteorology & Geophysics, Delhi, 17(2): 233-236, April 1966. DAS M(05) I39i.

...A good example of the multicellular nature of a thundercloud as revealed by the interesting surface weather features over Meenambakkam airfield on 15 July 1965 is presented in this paper. - Author's abstract.

1967

90. Bhaskara Rao, N. S. and Dekate, M. V. Effect of vertical wind shear on the growth of convective clouds. Royal Meteorological Society, Quarterly Journal, 93(397): 363-367, July 1967. DAS M(055) R888q.

...The relationship between vertical wind shear and the vertical extent of convective clouds is examined. In order to take into consideration the movement of a cloud, a 'Relative Top Shear' (RTS) is defined. Radar data and upper winds at some Indian stations in different seasons have been studied and a comparison made between RTS at different levels and the maximum tops of convective clouds. The results show that deep convective cloud was confined to layers in which RTS did not exceed 10 kt/km. - Authors' abstract.

91. Biswas, K. R.; Kapoor, R. K.; Kanuga, K. K.; Ramana Murty, Bh. V. Cloud seeding experiment using common salt. Journal of Applied Meteorology, Boston, 6(5): 914-923, October 1967. DAS M(05) J86joa.

...An experiment on artificial stimulation of rain using a warm cloud seeding technique was undertaken in three nearby climatologically similar regions, Delhi, Agra and Jaipur in northwest India. Analysis of the data from 18 experiment-seasons has suggested a positive trend of the result, which is found significant by statistical tests. - Authors' abstract.

92. Ghosh, Ashim K. and Day, J. S. The vertical currents in a thundercloud over Gauhati on 20 March 1966. Indian Journal of Meteorology & Geophysics, Delhi, 18(1): 115-118, January 1967. DAS M(05) I39i.

...The evening radiosonde balloon of 20 March 1966 at Gauhati, entering a thundercloud which gave hail, was under the influence of a strong downdraft for about 8.5 minutes. The maximum downdraft was found to be 17 m/sec. From the dimension of hail, the magnitude of the updraft has also been computed and found to be 15.3 m/sec. The detailed synoptic situation of the day has also been given. - Authors' abstract.

93. Ghosh, B. P. A radar study on thunderstorms and convective clouds around New Delhi during southwest monsoon season. Indian Journal of Meteorology & Geophysics, Delhi, 18(3): 391-396, July 1967. DAS M(05) I39i.

...Data collected during the monsoon season of 1959 with an AN/CPS-9 radar located at New Delhi have been used to study and distinguish the echoes from thunderstorms with that from convective clouds. It is shown that for an echo whose top is colder than -25.5°C there is 85 per cent probability that it is or will shortly become a thunderstorm. Convective echoes which do not grow above this level are less likely to produce thunderstorms. It is also shown that from the knowledge of the height of the echo tops and the height of the 0°C isotherm from radar and radiosonde observation, one can ascertain with 85 per cent probability whether the clouds still remain convective or have culminated into thunderstorm. From the point of view of aviation weather warning, this simple method would be of considerable practical utility. - Author's abstract.

94. Joarder, H. N. and De, A. C. Unusual and prolonged fog and stratus cloud over Agartala airfield on 13-14 December 1966. Indian Journal of Meteorology and Geophysics, Delhi, 18(4): 543-544, October 1967. DAS M(05) I39i.

...Describes the weather conditions at Agartala airfield and neighborhood prior to and during the rare instance of sudden development of fog followed by low stratus clouds over Agartala airfield during early night of December 13 which continued to afternoon of December 14, 1966.

95. Tenpe, K. D. Fog at Bairagarh. Indian Journal of Meteorology & Geophysics, Delhi, 18(4): 505-510, October 1967. DAS M(05) I39i.

...Presents the results of the investigation regarding the occurrence of fog at Bairagarh (Bhopal) based on data for 12 years from 1954 to 1965. The discussion includes information on the frequency of occurrence of fog, duration and intensity of fog, visibility, synoptic situations associated with fog, times of commencement and dissipation

Source No. 95 continued.

of fog, minimum temperatures, situations associated with fog on January 2, 1961 and on November 23, 1963, influence of topography, and simultaneous occurrence of fog at other airfields. The tables contain the following summaries for Bairagarh: monthly and annual frequencies of fog for each year and over the period (1954-1965); frequency of duration of fog when visibility is $\leqslant$ 500m and 501-1000m for the period 1954-1965; frequency of duration of visibility at specified ranges for the period 1954-1965; frequency of time of commencement and dissipation of fog based on data for the period 1954-1965.

1968

96. Deshpande, D. V. Estimation of cloud heights at sunrise/sunset. Indian Journal of Meteorology & Geophysics, Delhi, 19(3): 345-347, July 1968. DAS M(05) I39i.

...A method for visual estimation of cloud heights at sunrise/sunset is presented. Graphs providing correction to tabular times of sunrise and sunset at ground level for various declinations and depressions of the sun below the horizon at different latitudes are available. Calculated values for each day of the year of duration of sunlight with increasing height over Indian latitudes can be ascertained from these graphs. On the graph of appropriate latitude, the height corresponding to the date (abscissa) and the time interval (ordinate) will be the height of the cloud. The three limitations to this method are (1) civil twilight (2) intervening cloud layers or poor visibility, and (3) estimation can be made only twice a day.

1969

97. Sadler, James C. Mean circulation and cloudiness during the development of the southwest monsoon over Indian and southeast Asia. Conference on the Summer Monsoon of Southeast Asia conducted 7-9 April 1969 at Department of Geosciences, University of Hawaii, Proceedings. Edited by Colin S. Ramage. Navy Weather Research Facility, Norfolk, Virginia, September 1969. pp. 13-19. DAS M53.21 C784pr.

...For the months of April, May, June, and July, updated long term monthly mean wind climatology at standard pressure levels is discussed in relation to detailed cloud climatology prepared from 3 years of satellite data. A deep tropical southwesterly current flows into southern Burma in May and brings the monsoon rains to Rangoon a month earlier than at the same latitude on the west coast of India which in May is still dominated by a strong anticyclonic cell in the subtropical ridge. The rains over

Source No. 97 continued.

southern South Vietnam, which are persistent from the first of May, occur within a mean May southeasterly flow such that the onset of the southwesterly monsoon over Saigon cannot be determined from a rainfall analysis alone. - Author's abstract.

98. Vaidyanathan, M. An unusual type of dust haze over Jodhpur airfield and neighbourhood on 13 May 1963. Indian Journal of Meteorology & Geophysics, Delhi, 20(1): 56-57, January 1969. DAS M(05) I39i.

...Attempts have been made to study conditions favorable for the occurrence of the unusual type of dust haze which prevailed over Jodhpur airfield and neighborhood on May 13, 1963. From an analysis of the synoptic and upper air charts of May 12-13, 1963, a zone of convergence to the N/NW in the afternoon of May 12 was revealed, which might have produced dust/thunderstorm.

1970

99. Ananthakrishnan, R. and Mishra, B. M. Photogrammetric study of post-monsoon convective clouds over Poona. Symposium on Tropical Meteorology, June 2-11, 1970, University of Hawaii, Honolulu, Proceedings. pp. D VIII-1 to D VIII-4. Editorial Branch of the Hawaii Institute of Geophysics, August 1970. DAS M S989pr.

...This paper presents some results of study on post-monsoon convective clouds in October 1969 at Poona. The topics discussed include weather at Poona in October, cloud development and inversion level, and cloud movement and wind speed.

100. Kumar, Shravan and Sensarma, A. K. Visual and radarscope observations of a funnel cloud. Indian Journal of Meteorology & Geophysics, Delhi, 21(3): 495-496, July 1970. DAS M(05) I39i.

...The funnel cloud at Agartala Airport is quite unexpected in the late monsoon and early post monsoon period. In 1968 a funnel cloud was observed for about three minutes on September 23. A second funnel cloud was observed on October 29 about five miles from station and persisted for about 20 minutes. Various stages of the cloud have been described and illustrated with sketches.

101. Kumar, Surendra. Forecasting of cirriform clouds over northern India, Pakistan and Afghanistan from constant pressure charts. Indian Journal of Meteorology & Geophysics, Delhi, 21(3): 433-436, July 1970. DAS M(05) I39i.

Source No. 101 continued.

...Advection of vorticity at an upper air level below tropopause is indicative of the vertical motions in the upper troposphere. It has been shown that the regions of positive advection of vorticity at 300mb are most probable regions for the occurrence of high clouds in winter. The forecasting value of this relationship has also been briefly discussed. - Author's abstract.

102. Kundu, M. M. A study of isolated radar echoes of rain clouds around Agartala airport and its neighbourhood. Indian Journal of Meteorology & Geophysics, Delhi, 21(3): 463-468, July 1970. DAS M(05) I39i.

...Studies have been made of isolated radar echoes of rain clouds observed during different seasons of 1964 and 1965, in the neighbourhood of Agartala Airport (Tripura). The vertical decay rate of echo tops has been found to be greater than their growth rate in all the seasons and the movement of isolated cells closely related to the winds from 2.1 to 3.0-km level. The heights of the radar echoes at initial detection show that the precipitation generating levels in these clouds vary, though in most of the cases, the initial heights of the tops of radar echoes is below the freezing level. This suggests that the condensation-coalescence is the dominant precipitation mechanism over the region. - Author's abstract.

103. Narayanan, V. Diurnal variation of monsoon-low cloud ceiling over Bombay Aerodrome (Santacruz). Indian Journal of Meteorology & Geophysics, Delhi, 21(1): 128-130, January 1970. DAS M(05) I39i.

...Analyzes the cloud records obtained by a fixed beam ceilometer at Bombay Airport (Santacruz) during the monsoon period of 1962-1965 to study the diurnal variation of the low cloud ceiling. This analysis shows for each year a maximum frequency of diurnal variation of ceiling height in the morning, minimum frequency at noon, and toward evening an increase in frequency. Results for each monsoon month are presented.

104. Narayanan, V. A radar analysis of equatorial precipitating clouds at Thumba. Indian Journal of Meteorology & Geophysics, 21(4): 647-650, October 1970. DAS M(05) I39i.

...The precipitating cloud echoes detected by a 10 cm radar (S-band) at Thumba (Lat. 08° 32'N, Long. 76°52'E) have been analysed to find out the main characteristics of the equatorial cloud system - horizontal and vertical dimensions, extent and nature of line formation, distance between individual cloud cells and line echoes, structure, development and movement.

Assuming the precipitating system to be circular and moving with uniform speed, the horizontal dimension of a cloud system which passed through a close triangular network of meteorological stations

Source No. 104 continued.

in Trivandrum was calculated and compared with the nearest available radar observations. The cloud dimension and movement were found to be in good agreement with radar observations. - Author's abstract.

105. Roy, A. K. Nucleus richness of cloud air and rainability of clouds. Indian Journal of Meteorology & Geophysics, Delhi, 2(21): 231-236, April 1970. DAS M(05) I39i.

...Considered theoretically, convective clouds formed in highly polluted air and, as such, in air over-rich in its condensation nuclei content, are less liable to precipitate than similar clouds forming in normally clean air. This aspect of relative raininess of clouds formed under differing nucleus state of air has been examined by comparative study of precipitation behaviour of thunder clouds during pre-monsoon months over Calcutta, grouped under three classes as discussed in the paper. - Author's abstract.

106. Significant satellite cloud picture over India in May 1970. Indian Journal of Meteorology & Geophysics, Delhi, 21(3): 506, July 1970. DAS M(05) I39i.

...A well-organized pattern of convective cumulus cloud lines over Bay of Bengal and open cellular pattern cumuliform clouds over Aravali and Vindhya ranges are shown in the ESSA composite picture of India and adjoining sea area of May 10, 1970, at 0910-0915 GMT. The vortices noted in the area do not appear to have been revealed before.

AUTHOR INDEX

AUTHOR INDEX

AUTHOR INDEX

AUTHOR INDEX

SUBJECT HEADING INDEX

SUBJECT HEADING INDEX

SUBJECT HEADING INDEX

SUBJECT HEADING INDEX