

THE NEWS LETTER OF
INDIAN METEOROLOGICAL SOCIETY
CHENNAI CHAPTER

VOL 1 No 2

JULY -DECEMBER 1998

CONTENTS

MY ENCOUNTER WITH BAROMETER RESEARCH - THE LIGHTER SIDE	-	G. S. GANESAN
	-	S. RENGARAJAN, R. SURESH & P. C. S. RAO
METEOROLOGICAL ANECDOTES	-	S. RAGHAVAN
MAXIMUM TEMPERATURE OVER CHENNAI DURING SUMMER	-	S. SRIDHARTAN & A. MUTHUCHAMI
TORNADO - THE MYSTERIOUS DESTROYER	-	S. BALAMURUGAN & S. K. SUBRAMANIAN
CHENNAI CHAPTER & TROPMET-99 ACTIVITIES	-	Y. E. A. RAJ
UPDATED LIST OF MEMBERS OF IMS CHENNAI CHAPTER		

BREEZE

The news letter of

INDIAN METEOROLOGICAL SOCIETY, CHENNAI CHAPTER

Editor : Dr.Y.E.A.Raj
Editorial Board : Shri S.Raghavan
Shri G.S.Ganesan
Shri P.C:S.Rao
Shri R.G.Subramanian

The second issue of BREEZE, the news letter of IMS Chennai Chapter is in your hands. Suggestions for improvement of BREEZE are always welcome. The quality and readability of this news letter depends substantially on the contributions from the members. Articles for the next issue of BREEZE which will be published during April 1999 may kindly be sent to Dr.Y.E.A.Raj, Regional Meteorological Centre, 50, College Road, Chennai-600006 by 31 March 1999.

This issue of Breeze is supplied to all the members of IMS, Chennai Chapter. Copies are sent to all the Local Secretaries of various chapters of IMS and also to a few other IMS members, who are all requested to circulate BREEZE amongst IMS members of their respective chapters.

- Ed.

MY ENCOUNTER WITH BAROMETER

G. S. GANESAN

Retd Director, IMD, Chennai

Way back years ago, when I joined the Indian Meteorological Service, I was taken to be introduced to Barometer or rather Mr. Barometer. It was a close encounter of the first kind. When I had been in the college I had the dharshan of this holy person - Barometer - but from a respectable distance. I saw it as a thick-set silvery candle - rather longish - imprisoned inside a glassy encasement.

This time, I was near, very near - and unbelievably so - this august personage. A curious tremulous sensation - not dissimilar to the one of discovering a long-lost cousin in a sea of not-so-familiar faces - convulsed my frame. The sense of kinship between me and the barometer was obvious to me, as it doubtless must be so to others. Both of us are empty at the top of our respective anatomies.

It dawned upon me that barometer is incomparably superior. An ideal human being is said to have an infinite capacity for empathy with the environment. Did not one of our celebrated saint-poets declare:

"I too withered,

Whenever I saw the plants which shrivelled! (X)

"Wiser he, whose sympathetic mind

Exults in all the good of all mankind"

(X) (உடைய பயிற்றத் தண்ட போதிதல்லாம் உடையேன்!))

Nobody else can empathize with the environment as our barometer does. The moment the weight of the air in the immediate surroundings is reduced, our barometer shrinks in sympathy. Similarly, the enrichment of air around never fails to cheer up the barometer and it straightens up.

A barometer is not a pretender. For all its capacity for accurate reflection of its surroundings, it is not presumptuous. Like all of us, it has its moods and biorythms. It swings up twice and has low-downs twice - during the course of a day ordinarily.

As I was thinking about barometer, it occurred to me that barometer was indeed a hero. A barometer is a good communicator, for instance. A good communicator sums up a situation most pithily. The entire situation of the atmosphere is summed up in one single indicator by a barometer, the way it raises its head or lowers it! 'Brevity is the soul of wit' as always.

When a sage makes a statement; he not only states what is but there is an implied statement of truth of whichever lies ahead. In disapprovingly shrinking fast at the scene of depleting air masses and hence of deteriorating situation, a barometer is indicative of an impending storm. In telling the present, it foretells the future.

Like any good judge, our barometer remains upright and turns out well - reasoned verdicts on the state of the

atmosphere. Barometer is very modest. It is not conceited to think that barometer controls the weather. It is aware that it is contained in the hands of Cosmic Forces. It goes about its work with quite dignity without making splurges! What heights it scales! It is yet modest but not to the extent of not being self-aware. After all, "there is such a thing as extreme in moderation" It's reflexes are quite but quick.

I guess it is not exhibitionist because it is inspired by a genuine sense of modesty. It is not exhibitionist, but it is not secretive either. It is pretty transparent. Nobody can leave the presence of a barometer without being impressed by its gleaming lily - white transparency.

Our barometer belongs to the order of great martyrs and savants. From time immemorial, it has been the lot of great men who work for the uplift of their fellow men, to be banished to isolated lone cells and not infrequently to be hung in full public view. Look at the habitat of a barometer, especially what they call a standard barometer. It's suffering is redemptive for all of us - the disinherited or otherwise. Hanging by a nail connected to a wooden cross and in an isolated secluded cell! Is this all the reward for serving humanity, come storm or sunshine? My eyes welled up and my soul was astir.

Barometer, like every wise man is innocent to the core. Ignorant it certainly is not. Innocent yes. it is to be patted on the cheeks to blush out it's information. A small blandishment indeed for making it to share with us the secrets of the Universe it ingests. It is said God cannot be everywhere. Therefore, He created mothers. We know barometers are everywhere!

It appeared to me that the barometer is an ultimate Vedantin. According to Savants and Saints, man should live in the world and not the world in him. He should be like a glistening dew drop on a lotus leaf, absorbing the warmth of the young Sun, radiant and reflective but not subsumed by the surface. Though mercury in the barometer - obviously mercurial in its intrinsic properties - is a stickler for norms, this disinterestedness is achieved and activated by not sticking to the glass walls of the container. In this, it is perhaps an ultimate exemplar and a guide to our lives.

When I referred to the emptiness of the topmost parts of our respective anatomies, I perhaps underestimated its importance in the case of a barometer. It should be remembered that in the case of a barometer, it derives its power of perception from the vacuum.

But then there is a gulf of difference between open-mindedness (vacuum of the first kind) and empty-mindedness. (vacuum of the second kind).

The Editorial Committee of BREEZE wishes all the members of
IMS Chennai Chapter a
HAPPY and PROSPEROUS NEW YEAR 1999 !!!

RESEARCH - the lighter side!
(with due apologies to all researchers of the past,
present and future)

S.RENGARAJAN, R.SURESH and P.C.S.RAO
RMC, Chennai

It has become an intellectual obsession for the majority of scientists to look down upon those who have not contributed any research papers as non-entities. In any scientific department, the contribution of any individual is normally judged by the number of papers (meaning quantity not quality) published by him/her in scientific journals. We do not know how many research papers on meteorology published so far have been of any use to the meteorological community especially for the operational forecaster. We are not talking of meteorology alone; the word meteorology can be substituted by any subject in the universe in this context. It may be ironical to publish this article in the news letter of IMS which is expected to promote the science of meteorology! Let us apologise at the outset and say that the whole thing is written in a lighter vein as a contrast to the other serious thought-provoking and intellectual articles appearing in this issue which may turn the destiny of meteorology!. Let us have a temporary and short "BREEZE" atmosphere free from the tension ridden disturbances caused by so many factors, partly natural and mostly man-made !

We hope the following extract from "NEW SCIENTIST" dated 11 April 1998 (p92) will relax and ease the muscles of many researchers!

FEEDBACK

On 7 March we expressed our surprise that the website of the Oriental Institute research Archives only lists "human" authors. What other kind of authors are there, we wondered. Now we learn of a prominent herpetologist who has published a number of papers co-authored with his dog and his chicken.

Consider, for example, "Use of subcaudal scale anomalies as an aid in recognizing individual snakes" by C.Shine, N.Shine, R.Shine and D.Slip, which appeared in 1988 in the Herpetological review (Vol.19,p79) Who would guess that the authors are Cooper Shine (the dog), Nancy Shine (the chicken), Richard Shine (the professor) and David Slip (a masters student)? We are told that Cooper Shine, now sadly deceased, was somewhat moth-eaten and a source of considerable amusement among the learned professor's students. He was, however, quite prolific, and shine (the professor) was fond of telling detractors that the dog's publication record was much better than theirs".

After reading this, atleast, let us treat the "not-interested-in-research" elite also as human beings and not as some creatures who have descended from some other planet!

(PS: All the authors of this article are human beings, it is certified.)

ADMIRAL FITZROY

Rear Admiral Fitzroy was the Head of the Meteorological Department of the Board of Trade in Britain in the mid-19th Century. An experienced mariner, he issued the first storm warning on 6 February 1861. This was followed in August 1861 by regular weather forecasts. The idea of forecasting was new and led to controversy, but the seafarers appreciated their value in 1863, Fitzroy published "The Weather Book: A manual of practical meteorology" (London Longman, Roberts and Green, 464 pp.) (The book is available at Central Observatory, Bangalore).

But there is another interesting side to Fitzroy's personality. He was the Captain of the famous H.M.S. Beagle which took Charles Darwin to the Galapagos islands and other places. These voyages led to the Theory of Evolution, which was of course, much more controversial than weather forecasts! Fitzroy was a religious man who believed the Bible literally. As early as 1839, he had sought to explain the extinction of the larger reptiles by their inability to get through the door of Noah's Ark.

He was, therefore, deeply disturbed by the publication of the Theory of Evolution in 1859. He had contributed, unwittingly though, to Darwin's development of this theory. This led to severe depression and in 1865 he cut his own throat. A sad end to a great personality.

-Based on Weather, 39, 1 January, 1984

MAXIMUM TEMPERATURE OVER CHENNAI (NUNGAMBAKKAM) DURING SUMMER

S. SRIDHARAN AND A. MUTHUCHAMI
RMC CHENNAI

The maximum temperature especially during summer months is one of the most important weather parameters that affects human activities. In the summer months of 1998 due to heat wave conditions, more than one thousand people died in different parts of our country. People generally say during every summer that the maximum temperature this year is higher than in previous years. If we analyse the daily maximum temperature we can arrive at the conclusion whether really days in a particular year are hotter than in previous years or is it because public memory is short. In order to make a comparative study, the daily maximum temperatures of Chennai (Nungambakkam) for the months of May and June for the last 23 years (1976-1998) were critically examined.

In the summer month of May, the normal maximum temperature in Nungambakkam (based on 1951-1980 data) is 36.4° C and that of June is 36.6° C. The highest maximum temperature recorded at Nungambakkam in this century is 45.0° C on 21 May 1910. The next highest temperature recorded is 43.6° C on 23 May 1980.

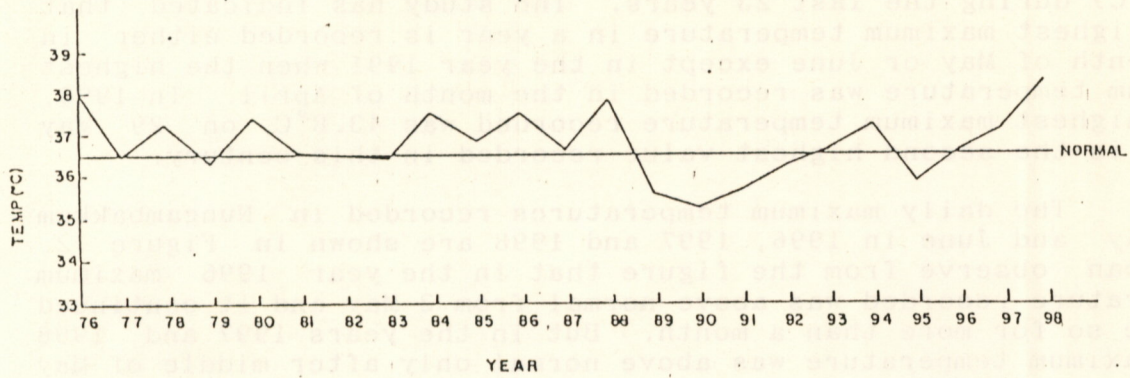


FIG. 1 MEAN MAXIMUM TEMPERATURE OF MAY AND JUNE FOR THE PERIOD 1976 - 1998.

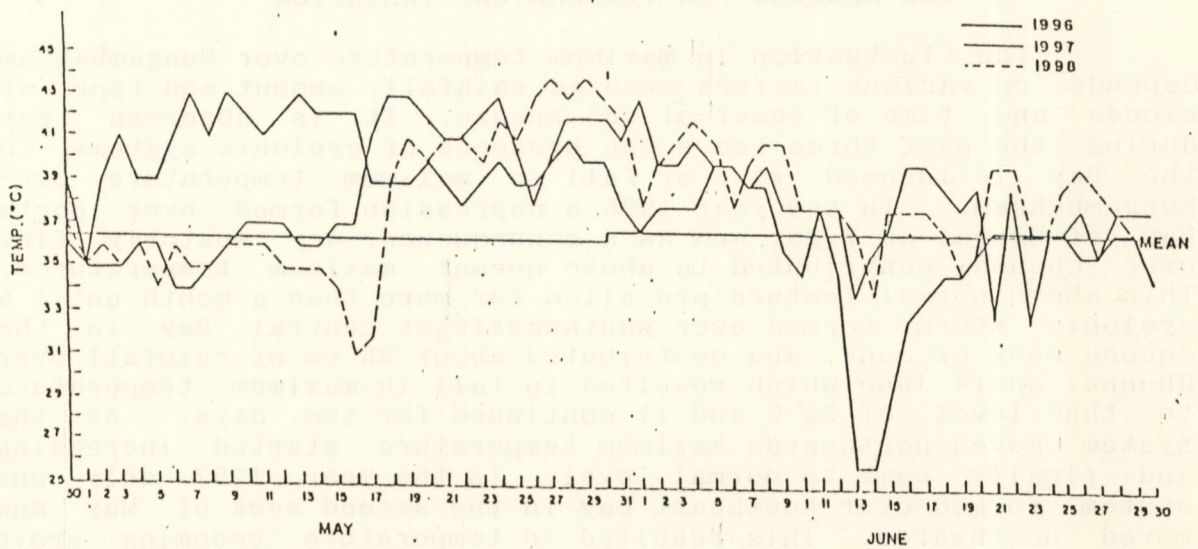


FIG. 2 DAILY MAXIMUM TEMPERATURE OF NUNGAMBAKKAM DURING MAY AND JUNE.

The mean maximum temperature over Nungambakkam for the months May and June taken together for the period 1976-1998 is shown in Fig.1. We can observe from the figure how the mean maximum temperature fluctuates during the past 23 years. It is seen that in 1998 the mean maximum temperature is the highest (38.2°C) during the last 23 years. The study has indicated that the highest maximum temperature in a year is recorded either in the month of May or June except in the year 1991 when the highest maximum temperature was recorded in the month of April. In 1998, the highest maximum temperature recorded was 43.8°C . on 29 May which is the second highest value recorded in this century.

The daily maximum temperatures recorded in Nungambakkam in May and June in 1996, 1997 and 1998 are shown in Figure 2. One can observe from the figure that in the year 1996 maximum temperature recorded was above normal from 2 May and it continued to be so for more than a month. But in the years 1997 and 1998 the maximum temperature was above normal only after middle of May and it continued to be so for about a month. Further, the temperature $> 40^{\circ}\text{C}$. persisted continuously for 8 days in May 1996 and May 1997 and 13 days in May 1998. It is also seen from the figure that the behaviour of maximum temperature during the years 1997 and 1998 is almost similar but the mean maximum temperatures are significantly different. Though in the year 1996 the behaviour of maximum temperature was very much different from that of 1997, the mean value is not very much different. (36.6°C and 37.1°C respectively). The lowest maximum temperature recorded during May and June is 26°C in the year 1996, 34°C in 1997 and 31°C in the year 1998.

THE REASONS FOR TEMPERATURE VARIATION

The fluctuation in maximum temperature over Nungambakkam depends on various factors such as rainfall, amount and type of clouds and time of onset of sea breeze. It is observed that during the past three years the presence of cyclonic systems in the Bay influenced rise or fall in maximum temperature over Nungambakkam. In the year 1996 a depression formed over north Bay of Bengal on 7 May and as a consequence, dry westerly flow over Chennai contributed to above normal maximum temperatures. This above normal feature prevailed for more than a month until a cyclonic storm formed over southwest/west central Bay in the second week of June, and contributed about 35 cm of rainfall over Chennai on 14 June which resulted in fall in maximum temperature to the level of 26°C and it continued for two days. As the system moved northwards maximum temperature started increasing and finally came to normal level. In the year 1997 only one system formed over southeast Bay in the second week of May and moved northwards. This resulted in temperature becoming above normal over Chennai in the middle of May. The fall in temperature in the later half of June is due to the occurrence of moderate rainfall over Chennai on 21st and 23rd. In the year 1998 due to the presence of a low pressure system over southwest Bay in second/third week of May and consequent light/moderate rainfall over Chennai the temperature fell at Chennai on 16 May. As the system intensified and moved northward the maximum temperature rose and continued to be above normal till the end of June 98 except on one or two days in between.

It is seen that as the weather system approaches the station resulting in increased cloudiness and associated rainfall, the station experiences fall in maximum temperature. If the system is away from the coast or forms in the Bay and moves north of the station, the station records above normal maximum temperature.

TORNADO - THE MYSTERIOUS DESTROYER

S. BALAMURUGAN and S. K. SUBRAMANIAN
Regional Meteorological Centre, Chennai

Probably most of us might have seen the film "TWISTER". What a great destruction a column of air moving like a tube connecting the cloud and the ground can cause? Weathermen call this great destroyer a TORNADO.

A tornado is a funnel-shaped mass of air that whirls rapidly, hanging from a thundercloud. It is made visible by clouds or by dust/debris sucked into the system. Many believe that tornadoes and tropical cyclones are similar weather systems because of their potential to cause severe damage and destruction. Actually they are of different scales. Tornadoes are mesoscale systems, short-lived and occur over preferred localities over land generally at middle latitudes whereas hurricanes are much larger synoptic scale systems and have long life history over tropical oceans.

The track of a weak tornado normally covers a distance of less than 1-1.5 km, is about 100 m wide and has a life cycle 1-3 minutes. In extreme cases tornadoes have tracks extending to about 150 km, hundreds of meters wide and persist for a few hours. They usually form and travel with severe thunderstorm cells. As they alternately touch down and lift off the ground, the pattern of destruction along the path is not as uniform as in tropical cyclones. The average speed of movement is about 50 kmph though cases of tornadoes racing at speeds exceeding 200 kmph have also been reported.

Maximum winds in violent tornadoes have been estimated to approach 500 kmph. In an intense tornado the updraft near the centre may exceed 150 kmph, strong enough to lift a house off its foundation. Horizontal pressure gradient is very steep near the core. The pressure may drop by about ten percent over a distance of 100 m from the centre.

Prof. Fujita of the University of Chicago has devised a six point intensity scale for evaluating the intensity of tornadoes popularly known as Fujita - Pearson scale (FPP-scale). Tornadoes have been classified to fall under the category of weak, strong and violent types. Fortunately violent tornadoes are very rare (about 1-2% of total occurrence). But when one does occur, the damage can be catastrophic. A ten-point scale developed in UK during early 1970s - TORRO scale - is also used to rate tornadoes affecting British isles.

Tornadoes occurring over oceans or large lakes are called 'Waterspouts' which are relatively smaller, short-lived and usually less energetic when compared to their counterparts over land.

Central parts of United States and parts of Australia have ideal conditions for tornado development. Tornadoes do not occur frequently in India. Northeast India and neighbourhood are more prone to tornado-genesis compared to other parts of India. Tornadoes also occur over North Indian belt extending from Punjab to East UP but with less frequency.

Recently a tornado-affected parts of Balasore and Midnapore districts on 24 March 1998 between 1500-1600 hrs IST. As per government sources, 48 people lost their lives. Following interesting eyewitness accounts of this tornado appeared in the dailies:

"A three-tonner truck full with sand was lifted up to about 8 - 10 m from the river bed, rotated a few times and dumped aside about 15 m away causing severe damage to the chassis"

"The tornado sucked up water from a pond and fishes were scatered all over".

"It was like a thick fat column, a chimney stretching from the ground to the sky. The trunk was reddish brown and blackened towards the top and it was racing against the paddy fields faster than anything ever seen" etc.

Post-disaster survey conducted by RMC Calcutta has indicated that the width of the damage track varied between 50-150 m and the length of the track was about 50 kms. The tornado lasted for about an hour. The trees seemed to have got chopped off at a height of 5-6 m showing the extent upto which the pendant might have descended from the cloud. Maximum windspeed is estimated to have exceeded 250 kmph. These details support the classification of this tornado as a strong one as per FPP scale.

Activities of IMS Chennai Chapter during the period April-December 1998:

1. During the above period 4 scientific talks were held as per details given below:

i) "Some aspects related to Earthquake Disaster, Mitigation and Management" by Prof.S.Rajarathnam, Asst. Professor, Anna University, Chennai-25 on 23.6.1998

ii) "Cyclone damage to building and structures" by Shri J.Shanmugasundaram, Asst. Director, Structural Engineering Research Centre, Chennai on 3.9.1998.

iii) "Time, Stress and crisis management" by Dr.J.N.Reddy, Director, Madras Academy for Excellence, on 5.10.1998.

iv) "Some aspects of Climate Dynamics and Variability" by Prof Y.Ramanathan, New Delhi on 2.12.1998.

2. Nearly 20 new members have enrolled during the above period. Strength of Chennai Chapter is now 132 members including 17 Life members.

3. The Annual General Body meeting of IMS Chennai Chapter was held on 13.5.1998.

Tropmet-99 activities:

1. The Tropmet-99, the seventh in the series of TropMet symposia will be held in Chennai at the Regional Meteorological Centre during 16-19 February 1999. The theme for the symposium is "METEOROLOGY BEYOND 2000".

2. The IMS has already constituted the National and Local organising committees of Tropmet-99. These are headed respectively by Prof.M.S.Swaminathan of Swaminathan Research Foundation, Chennai and Shri A.K.Bhatnagar, D.D.G.M., Regional Meteorological Centre, Chennai respectively. The LOC of Tropmet-99 has so far met thrice on 9-6-98, 25-8-98 and 10-11-98.

3. Several sub-committees of LOC have been constituted by Chairman, LOC to attend to the various type of activities pertaining to Tropmet-99 such as Funding, Scientific Programme, Accommodation, Transportation, Catering, Logistics etc

4. A total of 235 abstracts of research papers have since been received for consideration for presentation at Tropmet-99. and 213 of these have been accepted for presentation. Letters of acceptance have since been despatched to the authors. The scientific programme has also been finalised.

Y. E. A. Raj, Secretary

Letters to the Editor

Sir,

Kudos to the editorial team for bringing out the maiden issue of IMS newsletter of Chennai chapter in an excellent manner. All the articles were crisp, interesting and informative. It was quite refreshing indeed to come across articles containing anecdotes, puzzles and interesting extracts from the media. We wish IMS, Chennai chapter all success. May it grow from strength to strength. Keep it up.

Madras
31-7-1998

R. Suresh & S. Rengarajan

Payment of subscription

Nearly 15 members of IMS Chennai Chapter are still to pay the subscription of Rs 50/- for the year 1998-99. Individual letters are being sent to all such members who are requested to pay up by 31 January 1999. Members also could make a one time payment of Rs 500 /- and enroll as Life Members thus avoiding the hassle of yearly payment besides protecting themselves from any future increase in the subscription rates. - Secretary.

LIST OF MEMBERS OF INDIAN METEOROLOGICAL SOCIETY, CHENNAI CHAPTER
AS ON 1-2-1999 (along with membership no and YEAR of joining IMS)

I. Regional Meteorological Centre , MADRAS-6

1	Shri.K.S.	Achari	A-93	1998-99
2	Kum. B.	Amudha	A-59	
3	Kum.S.	Anila	A-94	1998-99
4	Shri.V.	Anandan	A-91	1997-98
5	Shri.A.C.	Aruljothi	A-90	1997-98
6	Shri.P.P.	Baburaj	B-197	1998-99
7	Shri.S.	Balamurugane	B-199	1998-99
8	Kum.M.G.	Bharathi	B-198	1998-99
9	Shri.M.	Bharathiar	B-192	1997-98
10	Shri.A.K.	Bhatnagar	B-179	
11	Shri.R.	Dasasatyan	D-139	1997-98
12	Shri.V.	Elango	E-3	1995-96
13	Shri.D.	Gajapathy	G-113	1997-98
14	Smt.B.	Geetha	G-107	1995-96
15	Shri.T.	Govindaraju	R-256	1998-99
16	Shri.M.V.	Guhan	G-112	1997-98
17	Shri.R.C.	Gupta		
18	Shri.A.A.	Iqbal	I-10	1998-99
19	Smt.S.	Jagannathan	J-75	1998-99
20	Shri.V.P.	Jayachandran	S-107	1997-98
21	Smt.J.	Jayapal	J-64	1995-96
22	Shri.J.	Joseph	J-53	
23	Shri.P.	Karthikeyan	K-161	1998-99
24	Shri.G.V.	Kumar	K-132	1996-97
25	Shri.A	Kumararaja	R-254	1998-99
26	Shri.R.	Madhavan	M-178	1997-98
27	Smt.G.C.	Meenakshi	C-67	1998-99
28	Kum.A.J.	Murikan	M-136	1994-95
29	Shri.A.	Muthuchami	M-74	
30	Shri.P.	Muthukrishnan	K-162	1998-99
31	Smt.P.	Nageshwari	N-35	
32	Shri.R.	Nallasamy	N-27	
33	Shri.P.A.V.	Namboodhri	N-41	1997-98
34	Smt.O.M.M.	Nandakumar		1995-96
35	Shri.S.	Natarajan	N-69	1997-98
36	Shri.V.	Natarajan	N-71	1997-98
37	Kum.P.J.	Nirmala	N-65	
38	Shri.K.	Perumal	P-162	1997-98
39	Shri.P	Perumal	P-142	1995-96
40	Shri.A.S.	Ponnuswamy	P-61	
41	Shri.S.W.	Premkumar	P-36	
42	Shri.K.S.	Radhakrishnan	R-251	1997-98
43	Smt.V.	Radhika rani	R-272	1998-99
44	Dr.Y.E.A.	Raj	R-69	1981-82
45	Shri.K.	Rajarajan	R-258	1998-99

46	Shri.K.	Rajendran	R-208	
47	Shri.B.	Ramakrishnan	R-121	1996-97
48	Shri.V.K.	Raman	R-72	
49	Shri.K.	Ramesh	R-255	
50	Shri.M.S.	Ranganathan	R-71	1998-99
51	Shri.P.C.S.	Rao	P-127	
52	Smt.M.	Revathi	R-241	
53	Shri.P.V.	Revikumar	R-119	1995-96
54	Shri.S.	Rengarajan	R-82	
55	Shri.P.V.	Sankaran	S-243	
56	Shri.H.V.	Satur	S-107	
57	Shri.N.	Selvam	S-393	1997-98
58	Shri.K.	Sekar	S-407	1998-99
59	Shri.S.	Sridharan	S-106	
60	Smt.P.A.	Subhadra	S-359	1995-96
61	Shri.S.K.	Subramanian	S-203	
62	Shri.I.P.	Sudhir	S-383	
63	Shri.E.R.	Sukumar	S-205	
64	Shri.R.	Suresh	LM-498	
65	Shri.V.N.	Thankappan	T-19	1992-93
66	Kum.B.	Umarani	R-257	1998-99
67	Shri.K.	Vijayaraghavn	V-57	1994-95

II. Air Port Met Office, MADRAS-27

68	Shri.M.	Augustine	S-405	
69	Shri.P.	Ajaykumar	A-92	1998-99
70	Shri.R.	Asokan	A-47	1997-98
71	Shri.S.	Bhagavathsingh	B-193	
72	Shri.M.	Duraisamy	D-140	1997-98
73	Shri.S.	Govindachari	G-37	1997-98
74	Shri.S.	Jagadeesan	J-65	
75	Smt.N.	Jayanthi	J-12	1995-96
76	Shri.S.R.	Ramanan	R-141	
77	Shri.EKNK.	Nair	N-55	1996-97
78	Shri.A.K.	Selvakumar	S-358	1995-96
79	Shri.K.	Selvarajan	S-406	1997-98
80	Shri.R.	Venkatesan		1998-99

III. CDR, MADRAS-2

81	Shri.K.V.	Balasubramanian	B-90	
82	Shri.S.	Kalyanasundaram	K-81	

(contd outside back cover)

IV. OTHER MEMBERS

83	Wg Cdr S.S. Agarwal			IAF, Tambaram	1998-99
84	Shri. S.A.H. Albeez	A-40		MS-41	
85	Shri. B.V. Appa Rao	A-78		SHAR	1996-97
86	Prof. P.A. Aswathanarayana	N-23		IIT, MS-36	
87	Prof. M. Balakrishnan	B-84		IIT, MS-36	
88	Dr. T.N. Balasubramanian	B-180		TNAU, CMB	
89	Shri. G.S. Ganesan	G-6		MS-20	
90	Dr. V. Geethalakshmi	G-107		TNAU, CMB	1998-99
91	Wg Cdr D. Hariharan			IAF Tambaram	1998-99
92	Dr. A.R. Jain	J-56		MST Radar	1994-95
93	Dr. K. Kannappan	K-168		Tiruchi	1998-99
94	Dr. P. Kalaiselvan	S-419		Viridhachalam	1998-99
95	Dr. (Smt). G. Latha	LM-627		NIOT	1998-99
96	Shri. G. Mohanan	M-32		MS-40	
97	Wg Cdr J.K. Mukherjee			AFAC, CMB	1998-99
98	Dr. D. Narayanarao	LM-665		TIRUPATI UTY	1994-95
99	Shri. K.V.S. Namboodhiri	N-70		SHAR	
100	Shri. G.B. Nilakantan			MS-32	1998-99
101	Smt. T.V. Prabha	LM-?		IGCAR	1998-99
102	Shri. K. Prakasam	N-76		SHAR	
103	Shri. Prakashrao			SHAR	
104	Shri. K. Premkumar	LM-626		NIOT, MS-36	1998-99
105	Shri. K. Rajagopalan	R-207			1996-97
106	Dr. S. Rajaratnam	LM-664		ANNA Uty	1998-99
107	Wg Cdr J. Ramani			IAF, Tambaram	1998-99
108	Dr. R. Rangaswamy	LM-?		TNAU, CMB	1998-99
109	Shri. M. Ravichandran	LM-628		NIOT, MS-36	1998-99
110	Shri. S. Raghavan	LM-387		MS-41	
111	Shri. G.V. Rama			SHAR	
112	Shri. Y.R. Rao	LM-386		NIOT, MS-36	
113	Shri. S. Ramanathan	LM-426		MS-40	1994-95
114	Shri. C. Ranganathan	R-139		TIRUCHI	
115	Shri. S.M.G. Rao	R-190		Perala	
116	Shri. T.J. Samuelraj	LM-629		MS-84	1998-99
117	Shri. K.S. Sankaran	S-93		MS-41	
118	Dr. R. Selvaraju	S-421		TNAU, CMB	1998-99
119	Shri. R.N. Seshagiri	S-360		MS-23	1995-96
120	Shri. J. Shanmugasundaram	S-420		SERC	1998-99
121	Dr. N. Sivagnanam	LM-?		MADRAS UTY, MS-5	1998-99
122	Dr. S. Sivarajasingham	S-206		MS-40	1995-96
123	Dr. T.R. Sivaramakrishnan	LM-?			1998-99
124	Shri. K.M. Somayaji			IGCAR	1998-99
125	Shri. D.V. Subramanian	S-357		MS-18	1995-96
126	Shri. R.G. Subramanian	S-108		MS-91	1994-95
127	Shri. S.I.T. Thomas	LM-72		MS-10	
128	GpCapt. K.I. Trivedi	LM-?		IAF. Bng	
129	Shri. T.V. Vaidyanathan	V-16		MS-87	
130	Shri. R. Venkatesan	LM-?		IGCAR	1995-96
131	Dr. T.R. Visvanathan	LM-663		MS-62	1998-99