

A collection of the memories of
Prof. P.V.S. Rama Rao

International Beacon Satellite Symposium (IBSS-2016)
ICTP, Trieste, Italy



Prof. P.V.S. Rama Rao

was born on

24th October, 1940

at Chintalapudi, Andhra Pradesh,
India

Father: Sri. Paluri Brahmanandam

Mother: Smt. Annapurna

Native place: Lutukurru, A.P., India



Education :

- **Prof. P.V.S. Rama Rao had his early education near his village, where he use to walk few miles everyday to go to the school**
- **He completed Intermediate in 1958 at SKBR College, Amalapuram and Graduation (B.Sc) at Sir. C.R.Reddy College, Eluru in 1960**
- **Later, Prof. Rama Rao joined Andhra University as a P.G. student and achieved his Masters in Physics in 1962.**



After Post-Graduation, Prof. Rama Rao continued his academic career at Andhra University as a research scholar and **completed Ph.D. in 1967** in the field of **Meteor studies** under the supervision of **Prof. M. Sri Rama Rao, and Prof. B. Rama Chandra Rao**, who was one of the well known scientists and academicians in India.



Fist Scientific Contributions in 1960's

Prof. Rama Rao worked on the Meteor studies during Ph.D. and his early research career.

MINOR METEOR SHOWERS OF NOVEMBER, DECEMBER, AND JANUARY

By M. SRIRAMA RAO,* P. V. S. RAMA RAO,* and P. RAMESH†

[Manuscript received January 7, 1969]

Summary

Systematic visual observations of 7987 meteors were made during the months November, December, and January in 1961-7. Major shower meteors were identified and the remaining data were analysed for evidence of minor meteor shower activity. By tracing the paths of 894 meteors which appeared to make up 70 groups, common radiant points were found suggesting the existence of minor meteor showers. Two further tests of significance supported this contention. Ten out of the 70 minor meteor showers were found to occur in at least two different years on approximately the same dates and therefore are considered to be established minor meteor showers. The majority of the minor shower radiants were found to lie close to the plane of the ecliptic.

I. INTRODUCTION

Denning (1891), in England, made one of the earliest systematic visual observations of meteors and later prepared a catalogue of 4367 meteor shower radiants (Denning 1899). More recently Nilsson (1964), in Australia, identified about 60 minor shower radiants during a radio survey of meteors. Both these surveys were made from high latitude stations: the former in the northern hemisphere and the latter in the southern hemisphere. The aim of the present investigation was to identify minor meteor showers observed over a low latitude station at Waltair, India.

Systematic visual observations of meteors were made from 1961 to 1967 during the winter months November, December, and January when the sky is clearer than at other times of the year. A total of 7987 meteors were observed. Major shower meteors were eliminated from the general sporadic background and the remaining data for 3158 meteors were examined for evidence of minor meteor shower activity. Day-to-day variation in daily mean hourly rates of occurrence was studied following the method adopted by Srirama Rao and Lokanadham (1967) and Srirama Rao *et al.* (1968).

II. IDENTIFICATION OF MINOR METEOR SHOWERS

The various available meteor paths of the selected 3158 meteors were retraced on appropriate star charts from the original star maps. Those that appeared to have common radiant points were replotted on separate charts for still closer examination.

* Department of Physics, Andhra University, Waltair, India.

† Department of Physics, S.V. University, Tirupati, India.

FREQUENCY DISTRIBUTION OF MAGNITUDES OF VISUAL METEORS OBSERVED DURING NOVEMBER, DECEMBER AND JANUARY 1960-67

M. SRIRAMA RAO, P. V. S. RAMA RAO AND B. LOKANADHAM

Meteor Research Laboratory, Physics Department, Andhra University, Waltair (A.P.)

VISUAL meteors have been systematically observed since November 1960 by the group of workers from the Meteor Research Laboratory, Waltair.¹⁻² A total of 8,326 meteors have been observed during the period November, December and January 1960-67, including 339 during November 1960, 4,106 during November, December and January 1961-64 and 3,881 during November, December and January 1964-67. The aim of the present investigation is to study the frequency distribution of the apparent visual magnitudes of these observed meteors.

The data of 8,326 meteors are classified into groups of different observed apparent visual magnitudes (M). Fig. 1 shows the histogram

Millman worked out a factor 'f' by which the total number of meteors by any group of observers should be multiplied in order to get the value for a standard group of six observers (see Mc Kinley³). Millman believed that his standard team of six observers should see all zero magnitude meteors but less of higher magnitude meteors. He also worked out a factor 'F' by which the observed number should be multiplied to yield the true number of meteors that would be observed if no meteor is missed as above. Thus the true number of meteors 'Q₀' that would be observed by the standard group of six observers per hour may be computed from the observed hourly rate 'q₀' by applying the above two corrections. Thus we have

$$Q_0 = F.f.q_0 \quad (1)$$

In actual practice, the correction factor 'f' is first applied to each period of observation made by any group of observers in order to standardise the data for the group of six observers. Thus we get the data of number of meteors for each apparent visual magnitude (M) corresponding to different periods of observation. By summing up these numbers for each value of M and dividing the total by the number of hours observed in all, we get the mean hourly rate of meteors 'f.q₀' for the standard group of six observers. The values of 'f.q₀' thus computed for the seven-year period are presented in Fig. 2 as curve A. This curve of log f.q₀ vs. M is found to be linear for bright meteors upto the zero magnitude and tends to become more and more curved for fainter meteors. The correction factor 'F' is then applied for the mean hourly rates of meteors 'f.q₀' to obtain the true hourly rates of meteors Q₀ for the standard group of six observers, and the results are presented as curve B in Fig. 2 itself. The plotted points of log Q₀ vs. M are found to be almost linearly displaced, and hence the best fit straight line is drawn passing through these points by the least square method. This straight line may be represented by the equation

$$\log Q_0 = \log Q_0 + M \cdot \log r$$

or

$$Q_0 = r^M \cdot Q_0 \quad (2)$$

where Q₀ is the value of Q₀ at M equal to zero, and log r is the slope of the straight line

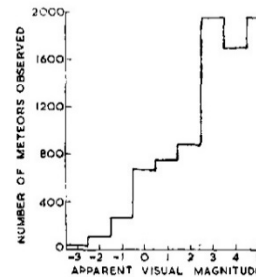


FIG. 1

of variation of the number of meteors in each group versus the corresponding values of M. It may be seen from this histogram that the 3rd, 4th and 5th magnitude meteors are the largest number observed, and that the number falls off steadily for brighter meteors. This is because the naked eye limit is the 5th magnitude, and long before this limit is reached, the observer will begin to miss meteors. Furthermore, the observer's effective field of view for a bright meteor is much greater than for a faint one, and this is one of the major factors contributing to the fall off in numbers with increasing magnitude. An attempt is now made to correct for this effect and obtain the true distribution of meteor magnitudes.

Academic Assignments :

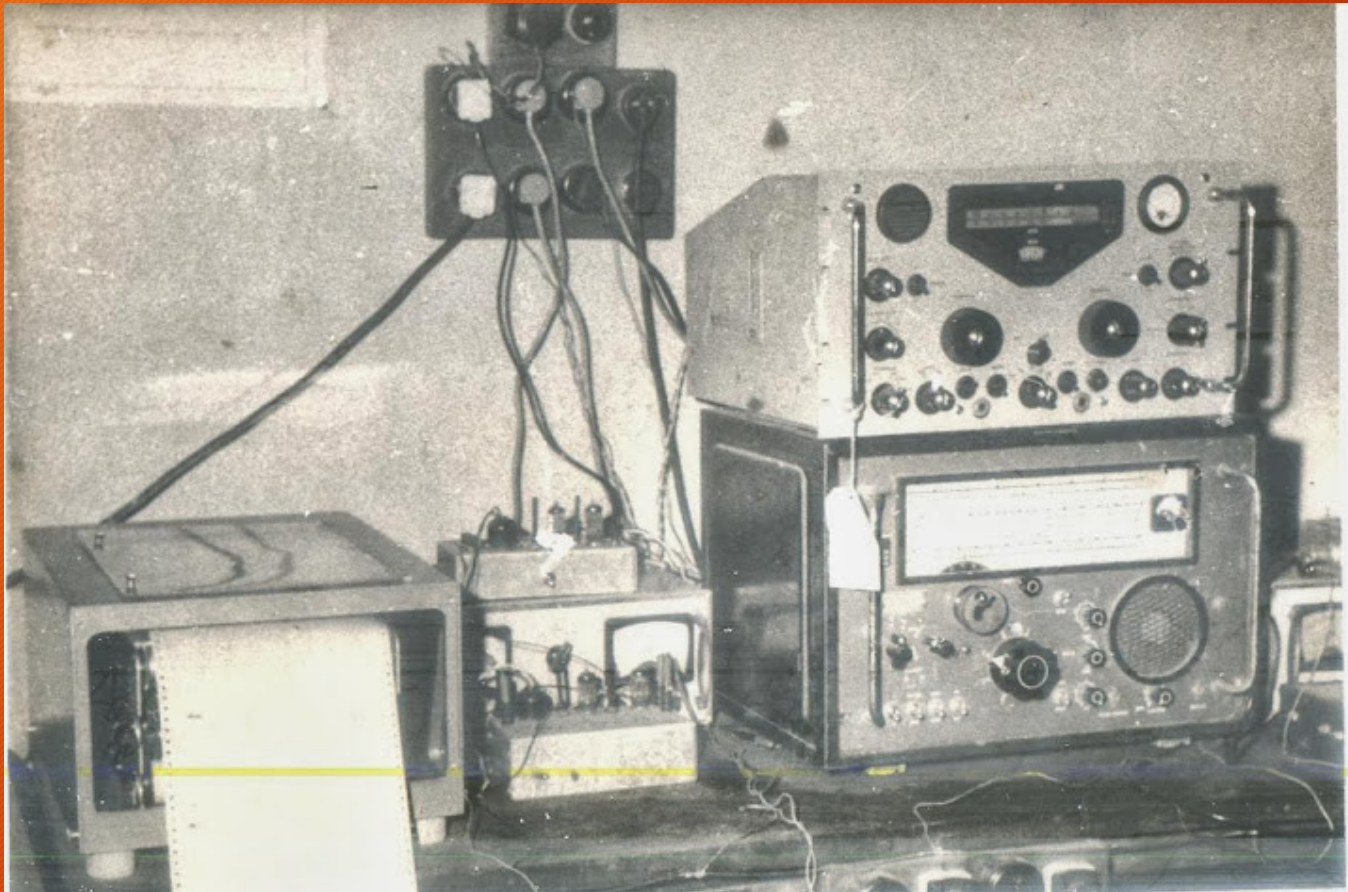
- After completing Ph.D in 1967, Prof. Rama Rao joined REC Warangal as an Associate Lecturer
- In 1969, he moved to the Department of Physics, Andhra University and served till his last breath in different capacities such as **Associate Lecturer, Lecturer, Reader, Professor in Physics and Emeritus Scientist.**
- He taught various courses in Physics and Space Physics for Masters students for a long period of 34 years and became a popular teacher whom all the students admire the most.



Prof. Rama Rao with his co-professors and P.G Students at Andhra University

Scientific Achievements :

- In 1970's, Prof. Rama Rao introduced the research programme in Satellite Radio Beacon studies of the Ionosphere at Andhra University which has grown as one of the prominent research labs in India.

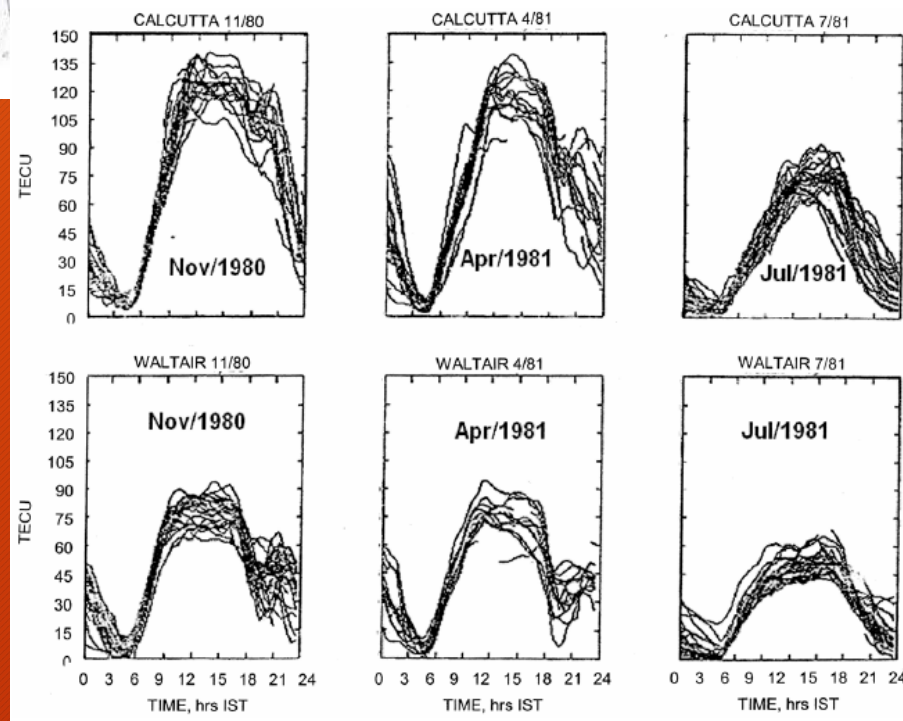
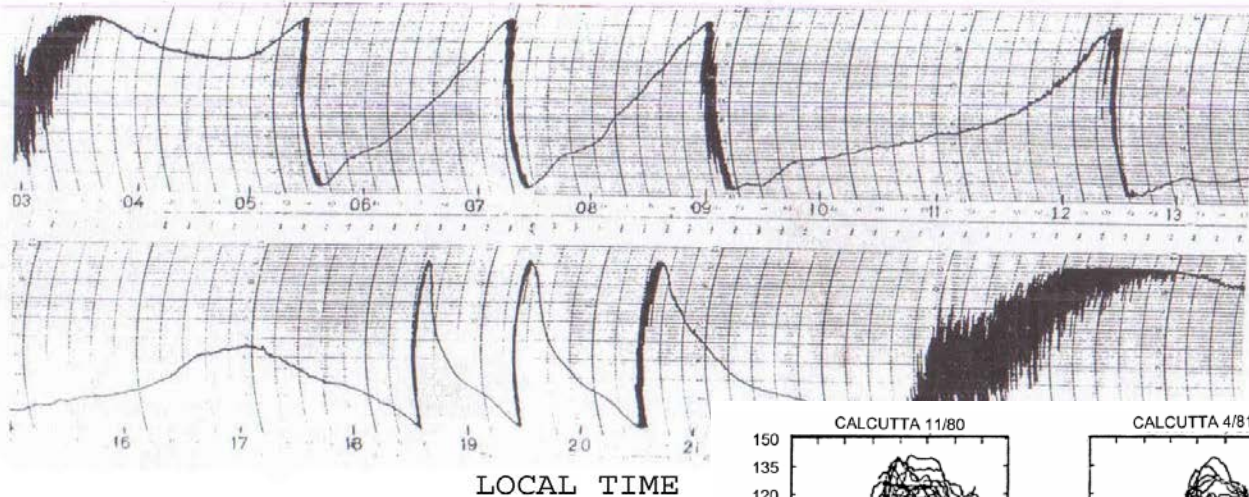


Fist Radio beacon receiver at Andhra University

Faraday Rotation measurements over Waltair

25 JUNE 1984

WALTAIR
SIRIO (136 MHz)



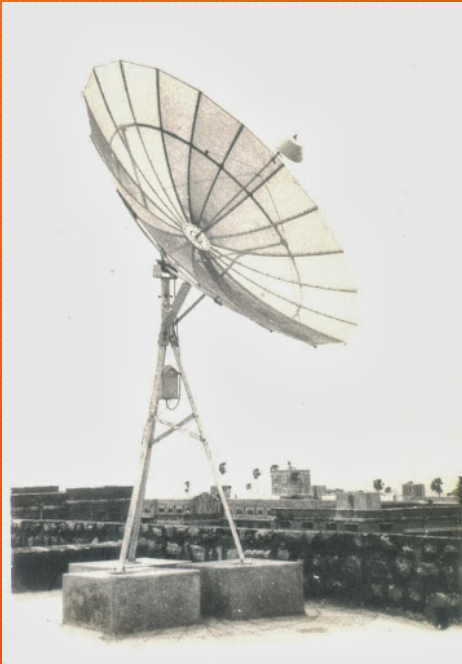
Calcutta
22.6° N

Large
spatial
gradients
10 TECU° Lat

Waltair
17.7° N

Television demonstration

Using the satellite signals, Prof. Rama Rao was demonstrating the Television function to the Visakhapatnam people



ATS-6 Antenna



First visit to USA

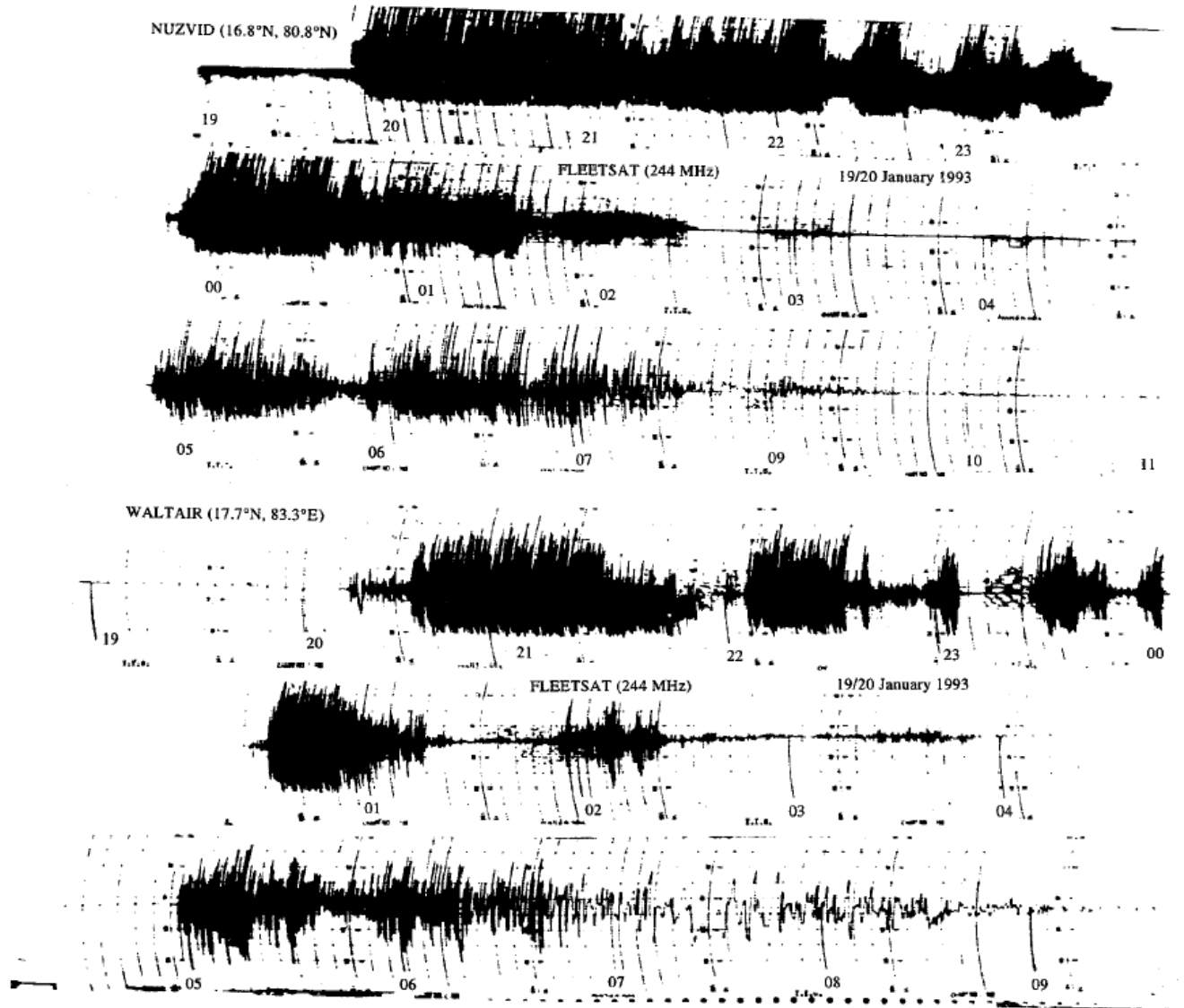
- In 1976, Prof. Rama Rao worked at NOAA, Boulder as a UNESCO/UNDP Fellow for nine months.
- Later, in 1982, he worked as a Senior Research Fellow (UNESCO/UNDP) at AFGL, Boston, USA for six months.



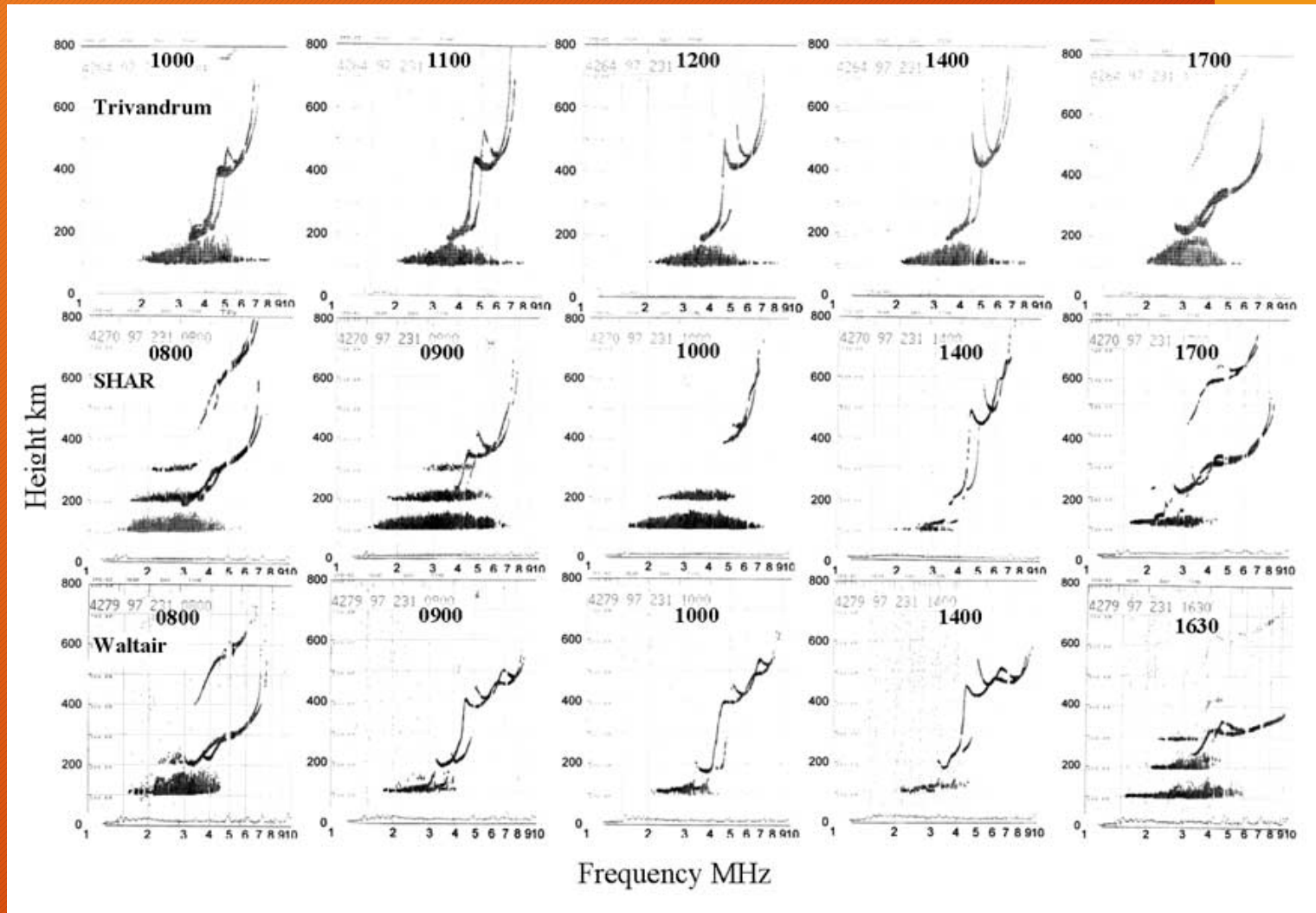
During a farewell meet at Boston in 1982

Multi-station VHF Scintillation studies using geostationary satellite signals

P. V. S. Rama Rao *et al.*: Multistation VHF scintillation studies

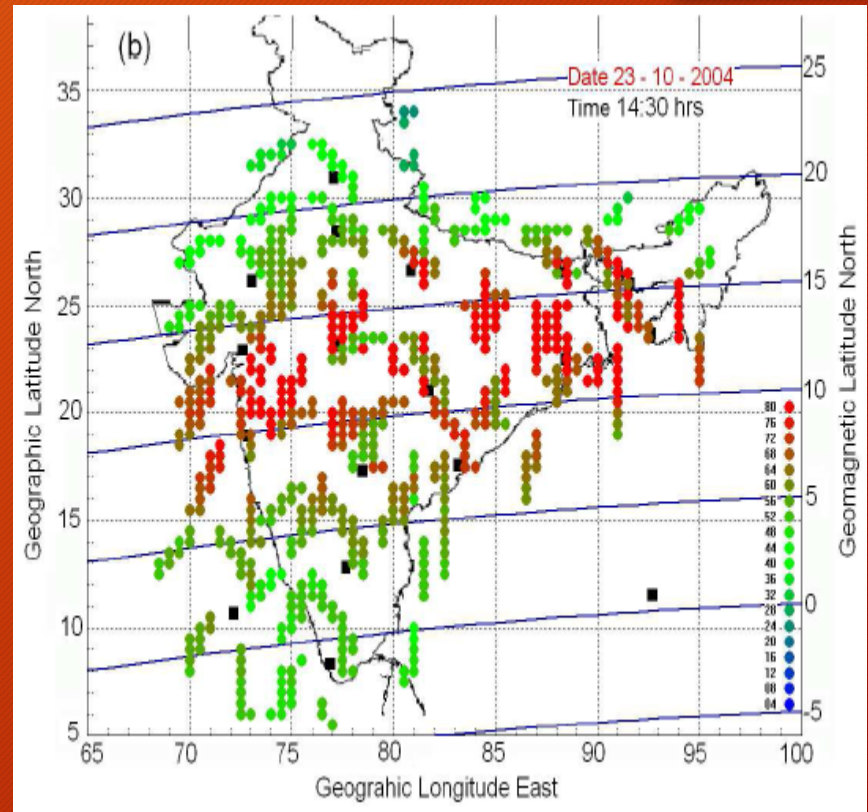
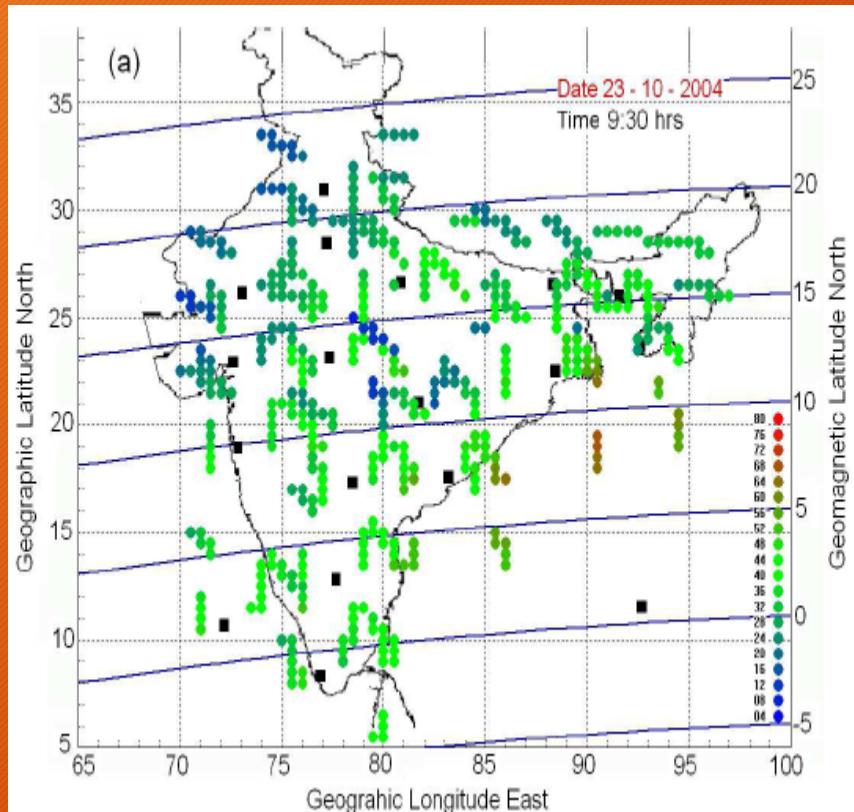


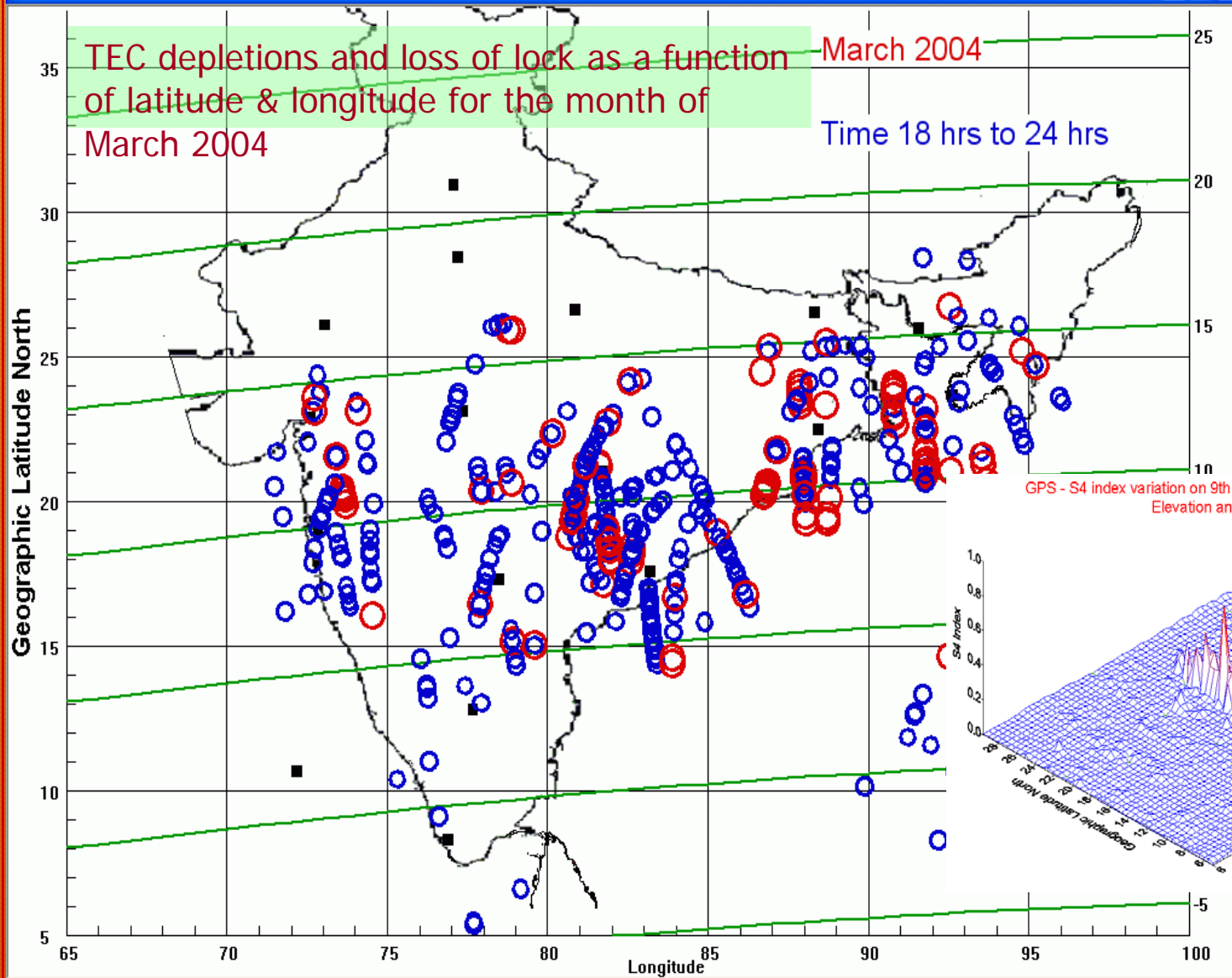
F3-Occurrence characteristics with Solar Activity



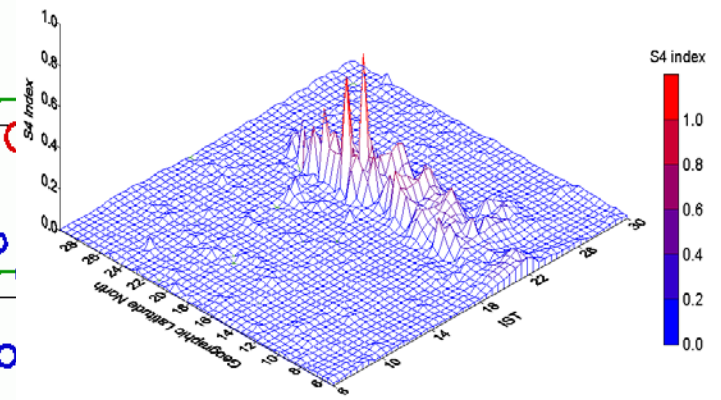
Sequence of ionograms at (top row) Trivandrum, (middle row) SHAR, and (bottom row) Waltair for 19 August 1997 showing a well-developed F₃ at Waltair, weak F₃ at SHAR, and no F₃ at Trivandrum. The four digit numbers on the ionograms indicate IST (Rama Rao et al., 2005).

First results using the Indian GAGAN GPS-TEC measurements





GPS - S4 index variation on 9th March 2004 over all Indian stations
Elevation angles > 40 deg



Active in the International Bodies

- Co-Chair of the Beacon Satellite Studies group (1996 to 2014)
- Co-Chairman, ISTEP, WG-3 group



Delegates of the International Beacon Satellite Symposium (IBSS-2007) held at Boston College, USA during 10-15 June 2007



Prof. Rama Rao visited over 40 countries & took active role in various conferences/workshops

*USA,
UK,
Germany,
Japan,
Australia,
Italy,
Spain,*

*Brazil,
Argentina,
Finland,
Poland,
Singapore,
China,
Canada,*

*Indonesia,
Bangkok,
Taiwan,
Austria,
Hungary,
Turkey,
Ethiopia etc.*



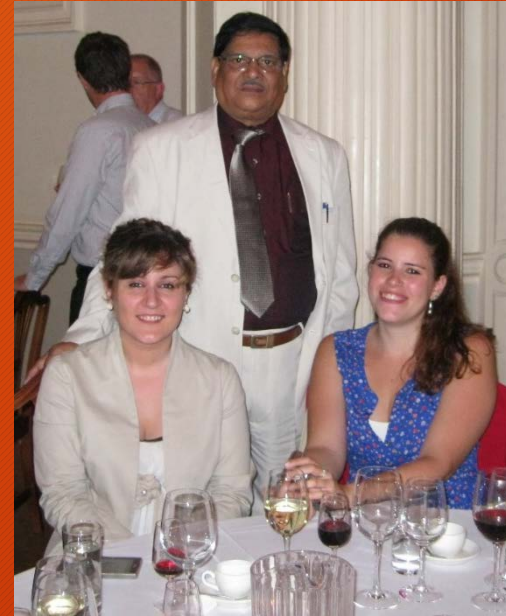
A close friend to the international and national colleagues



A close friend to the international and national colleagues



Always encouraged the students and new generation with love and affection



Administrative Assignments

During the period of his career at Andhra University for more than four decades, with his dynamic personality, academic and administrative excellence, **Prof. Rama Rao got elevated to the position of the Registrar** of Andhra University during 1990-1994.



- ✓ During his services as Registrar at Andhra University, Prof. Rama Rao got recognized as a dynamic and staff friendly administrator.
- ✓ He was so successful that even today after two decades, the University staff quotes his dynamic decisions which went a long way in keeping the university at greater heights.



- Prof. Rama Rao served in various other administrative positions such as Board of Studies Chairman in Physics, Head of the Department, Director of School of Physics, Chairman of Faculty of Sciences, Principal (I/n) of A.U College of Science and Technology.
- He also served as a member of the Executive Counsel of the Adikavi Nannaya Univ., India.
- Member, High power committee of Andhra Pradesh State Council of Higher Education on the formulation of uniform Ph.D. regulations in the Universities of Andhra Pradesh



National Conferences Conducted:

- Convener of the symposium on Ionospheric thermospheric systems held at Andhra University during October 1988.
- Convener of the AICPITS-STEP workshop held at Andhra University during January 1990.
- Co-convener and Scientific advisory member of many other conferences and symposia



Active part in the National Bodies

- Fellow, IETE (Chairman from 1995-97)
- Fellow, Andhra Pradesh Akademi of Sciences
- Member, Scientific Advisory Committee, Space Physics Labs VSSC, Indian Space Research Organization (ISRO)
- Member, Programme Advisory Committee (PAC) DST, Delhi.



Research Achievements

- Prof. Rama Rao had a long lasting Research career for more than 45 years.
- He published about 140 research articles in various international and national journals.
- He guided 15 students for Ph.D. and 6 students for M.Phil
- Prof. Rama Rao under took various scientific projects from different national funding agencies namely,
 - ✓ University Grants Commission (UGC)
 - ✓ Department of Science and Technology (DST)
 - ✓ Indian Space Research Organization (ISRO)
 - ✓ Council of Scientific and Industrial Research (CSIR)



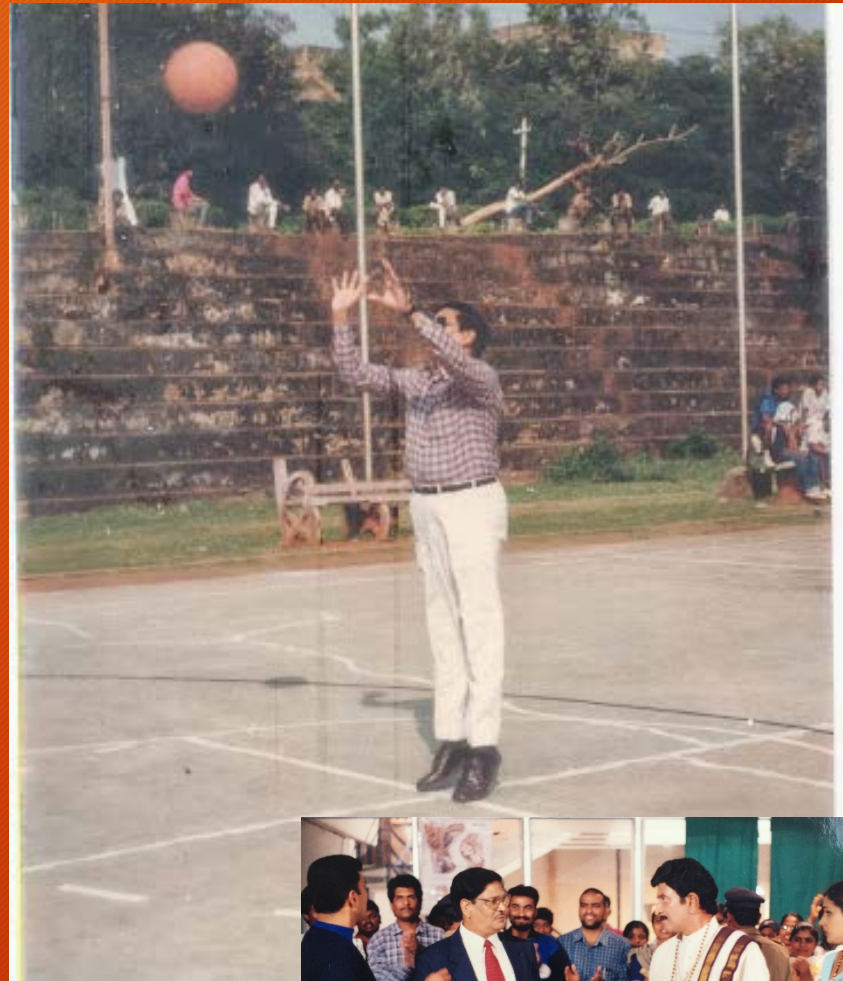
Awards

- **UGADI Puraskar Award-1994**, Madras Telugu Academy for dedicated services in the field of Education.
- **Best Researcher Award-1995** by Andhra University
- **Five Best Ph.D. Theses awards** of AU under his supervision
- **Prapancha Telugu Vaibhava Puraskaram - 97** for the outstanding contribution in the field of Physics - awarded by World Telugu Federation U.S.A.
- **Visista Purskar Award-2012** in the field of education by NRI's of U.S.A. NJ, U.S.A.
- **UNESCO/UNDP Research Fellowship** to work at NOAA, Boulder, Colorado USA for nine months during 1976-77
- **UNESCO/UNDP Senior Research Fellowship** to work at AFGL, Boston, USA for six months during 1982



Extra-curricular Assignments

- Secretary & Treasurer of Andhra University Teacher's association for two terms.
- Honorary Director, University Security in the Horticultural services.
- Past master of Masonic Lodge (Lodge University 142 GLI).
- Represented the University Faculty club in state level tennis tournaments.
- President, Andhra University Alumni Association.



A Caring Husband

Prof. Rama Rao had a long journey of married life for 51 years.



He got Married to
Smt. Vijaya Lakshmi
on 19th May, 1962



During Shashtipurthi
(Superannuation) in 2000

A Noble Father and Grand Father

(He has two sons, one daughter and six grand children)



We miss the warm presence and counsel of
Prof. P.V.S. Rama Rao forever

