



INDIAN INSTITUTE OF TROPICAL METEOROLOGY PUNE, INDIA



1962

A Profile

2001

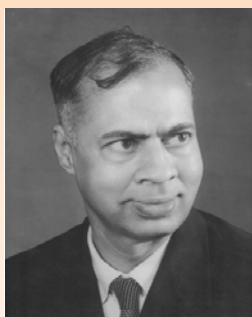


'Ramdurga House' of the IMD, which housed the Institute until its permanent campus was ready in 1988



Institute's Campus at Pashan

THE FORMER DIRECTORS



Prof. P.R. Pisharoty
(1962-67)



Prof. R. Ananthakrishnan
(1968-71)



Dr. K.R. Saha
(1974-76)



Dr. Bh.V. Ramana Murthy
(1978-85)



Shri. D.R. Sikka
(1986-92)




Prof. R.N. Keshavamurthy
(1992-96)

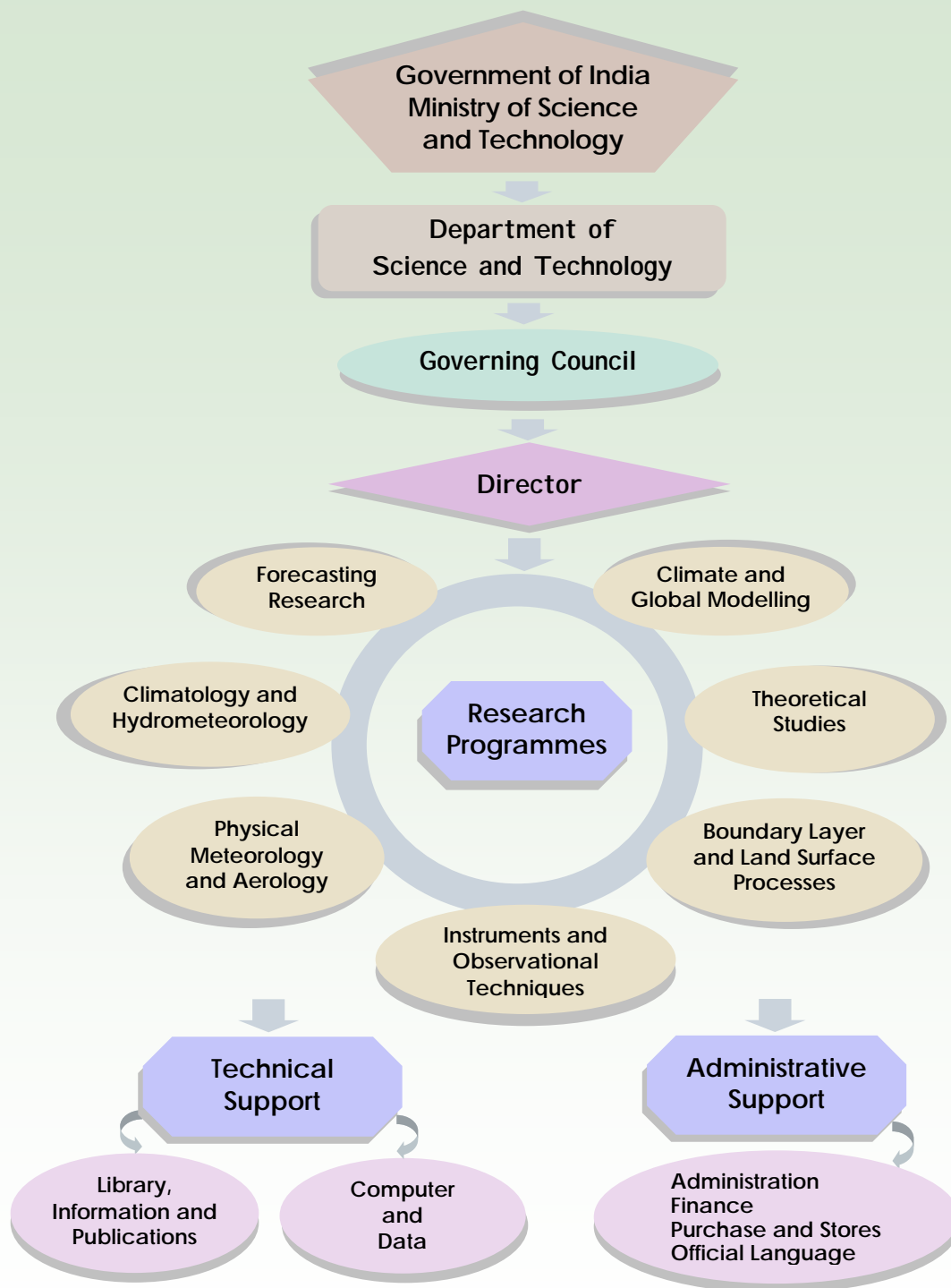
INTRODUCTION



The need to understand the mechanism of monsoon and other weather systems and climate related processes in the tropics took a concrete shape soon after the third World Meteorological Organisation (WMO) Congress in 1959 recommended the creation of meteorological research and training Institutes in the tropical countries. Acting on this recommendation, the Government of India established the Institute of Tropical Meteorology (ITM) on 17 November 1962, at Pune, as a distinct unit of the India

Meteorological Department (IMD). Subsequently, ITM was made an autonomous research organisation and renamed as the Indian Institute of Tropical Meteorology (IITM), on 1 April 1971. The Institute has, since then, grown into a leading research centre of international repute in various aspects of atmospheric sciences, particularly those concerning monsoons and tropical climate. With more than 100 scientists engaged in different research programmes devoted to tropical meteorology, the Institute is widely acclaimed to be one of its kind in the world. The work at the Institute, over the years, has been marked by significant achievements in research as well as physical development of the infrastructure including its campus. Meteorology and atmospheric sciences have seen tremendous research and development activities during the last few decades. The Institute has been making all efforts to keep pace with these developments and making major contributions to bring India into the frontline of atmospheric and monsoon research. It will continue to contribute and play an important role in national and international scientific research programmes in the field of Meteorology and Atmospheric Sciences. While it is difficult to summarise the wide ranging activities of the Institute in a small booklet, an attempt is made in the following pages to give a brief overview.


G.B. Pant
Director
IITM, Pune



Organisational Profile

HISTORICAL BACKGROUND

The need to understand the mechanisms of monsoon related weather and climate systems in the tropics particularly over the monsoon region became acute for India in 50's when the country's post Independence economic development programme was launched. Considering the urgent need to make concerted and organised efforts for the study of the fundamental atmospheric problems in the tropical region the India Meteorological Department submitted a proposal, in 1959, to the Government of India for the establishment of a separate Institute for research in Tropical Meteorology. The proposal was formally approved by the Government of India in February 1962 as one of the schemes under its Third Five Year Plan and finally the Institute was founded on 17 November 1962 as Institute of Tropical Meteorology (ITM) as a distinct unit of the India Meteorological Department. Consequent upon the recommendation of the Committee for Organisation of Scientific Research (COSR) appointed by the Government of India the Institute was transformed into an autonomous organisation on 1 April 1971 under the name **Indian Institute of Tropical Meteorology (IITM)**. Currently, the IITM functions under the Department of Science and Technology, Government of India.

FUNCTIONS

Since its inception the IITM has been functioning as the national centre for atmospheric research. Its goals are to enhance knowledge in Atmospheric Sciences by identifying, planning and conducting research programmes on problems of national and international importance. The research programmes are balanced among theoretical studies, field experiments and laboratory work. The IITM has achieved considerable progress in its research and academic activities in the thrust areas of Atmospheric Sciences like Weather Forecasting, Climatology, Monsoon Studies, Climate Modelling, Hydrometeorology, Weather Modification, Atmospheric Chemistry, Atmospheric Electricity, Cloud Physics, Instrumentation for Observational Studies, Theoretical Studies and Studies relating to Land-Surface-Processes.

Research work in the IITM is organised under the following scientific divisions covering the major disciplines in Meteorology and Atmospheric Sciences :

- Forecasting Research
- Climatology and Hydrometeorology
- Physical Meteorology and Aerology
- Instruments and Observational Techniques
- Boundary Layer and Land Surface Processes Studies
- Theoretical Studies
- Climate and Global Modelling

The Computer and Data Archival, the Library, Information and Publications, and the Administration provide necessary support to the research work.

RESEARCH ACTIVITIES

Forecasting Research

Recognising the potential benefit of weather prediction research to agricultural and national economy the following research programmes have been formulated on short-, medium, and long- range weather prediction :

- High resolution numerical modeling for prediction of monsoons and mesoscale systems.
- Sensitivity studies based on Numerical Weather Prediction models to understand the atmospheric processes and interactions involved in monsoon circulation.
- Interannual and longer-term variability of Indian monsoon rainfall (IMR) and its association with El/Nino Southern Oscillation, North Atlantic Oscillation, Eurasian snow cover, etc.
- Connections of IMR variability within the Asian monsoon region and other monsoonal regions of the world.
- Study of regional heat sources in relation to intraseasonal variability of southwest monsoon.
- Monsoon studies based on data collected in special field programmes like Monsoon Experiment (MONEX), Bay of Bengal Monsoon Experiment (BOBMEX), etc.
- Applications of the satellite data in weather forecasting.
- Characteristics of the monsoon trough planetary boundary layer and air-sea interaction in tropical monsoons.

Secondary Data Utilization
Centre (SDUC)



Climatology and Hydrometeorology

Currently there is an enhanced emphasis on the studies of global and regional climatic change, subject to natural variations on all time scales, with possible alterations by human activities. To assess the magnitude and impact of climatic variations and to develop predictive capabilities, a detailed analysis of the climatic records of the recent past, observed as well as proxy, and development of appropriate statistical and dynamical models is essential. Likewise, the analysis of long records of short-duration precipitation data over different river basins of the country is essential for the planning and utilization of water resources of the country. The following are some of the major research objectives addressed in this area :

- To construct the longest available homogeneous time series of regional climatic elements from observed meteorological data, historical records and dendroclimatic reconstructions, and to study their behaviour on interannual, decadal and longer time scales.
- To develop empirical prediction models for the seasonal monthly climate anomalies over the country as a whole and the homogeneous subdivisions of the country.
- To assess the impact of climate anomalies on agriculture, water resources and human health and to devise strategies for practical application of climate information in these areas.
- To assess the numerical simulations of global climate, with particular reference to the simulation of the Indian summer monsoon, by means of model output diagnostics and sensitivity studies using regional climate models.
- To carry out hydrometeorological analysis of sufficiently long series of rainfall data on different time scales over various river basins of the country for planning and design of the water resources management projects.
- To undertake estimation of probable maximum precipitation, depth-area-duration analysis of severe rainstorms and development of quantitative precipitation forecast schemes.



Dendroclimatology Laboratory to reconstruct past climate by analyzing the tree rings

Physical Meteorology and Aerology

Cloud physics, weather modification and environmental physics form the core research programmes in the area of atmospheric sciences. These programmes have practical applications in several sectors of the national economy. Laboratory experiments and observational programmes are also organised to collect the observational data. The research programmes are aimed at promoting better understanding of the atmospheric physical, chemical, dynamical and radiative phenomena relating to the following topics :

- Physics of monsoon clouds, precipitation mechanisms and atmospheric electrical processes.
- Thermodynamics and dynamics of the tropical atmospheric boundary layer.
- Chemistry and dynamics of the middle atmosphere vis-a-vis the troposphere-stratosphere coupling/ monsoon activity.
- Precipitation chemistry, acid rain and physico-chemical properties of atmospheric aerosols.
- Remote sensing of atmospheric aerosols and trace gases using lidar and spectrometric techniques.



Cassegrain telescope and associated optical equipment of the Lidar system



Laser Laboratory



Workstation of Atmospheric Chemistry Modelling Studies

Instruments and Observational Techniques

Advances in atmospheric technology contribute to improvements in observing systems for monitoring and phenomenological studies. Therefore, designing and developing instruments and techniques of observations and to carry out field and laboratory experiments are essential ingredients of atmospheric research. The following research programmes have been the focus of activity in this area :

- Development of instruments/techniques to study the cloud electrification processes.
- Development of simulation techniques to study the microphysical processes in cloud physics under a controlled environment.



Wind tunnel for the simulation technique for cloud physics studies



Atmospheric Ion counter at the Atmospheric Electricity Observatory

Boundary Layer and Land Surface Processes Studies

Exchange of energy and water between the land/ocean surface and atmosphere plays vital role in the development of weather and climate. The main thrust in this area aims at understanding the land/ocean surface-atmosphere interactions through observational and modelling studies. For this purpose, a major part of the efforts is devoted to designing and developing instruments and techniques of observations and carrying out experimental studies in the field as well as laboratory. Some of the important research programmes undertaken in this context are :

- A field campaign, in collaboration with Indira Gandhi Centre for Atomic Research (IGCAR) at Kalpakkam, Tamilnadu to study the coastal atmospheric boundary layer structure.
- Marine atmospheric surface layer measurement onboard ORV Sagar Kanya to study the space-time variations of air-sea fluxes in the Indian Seas.



Meteorological tower of 50 m height at Kalpakkam, Tamilnadu

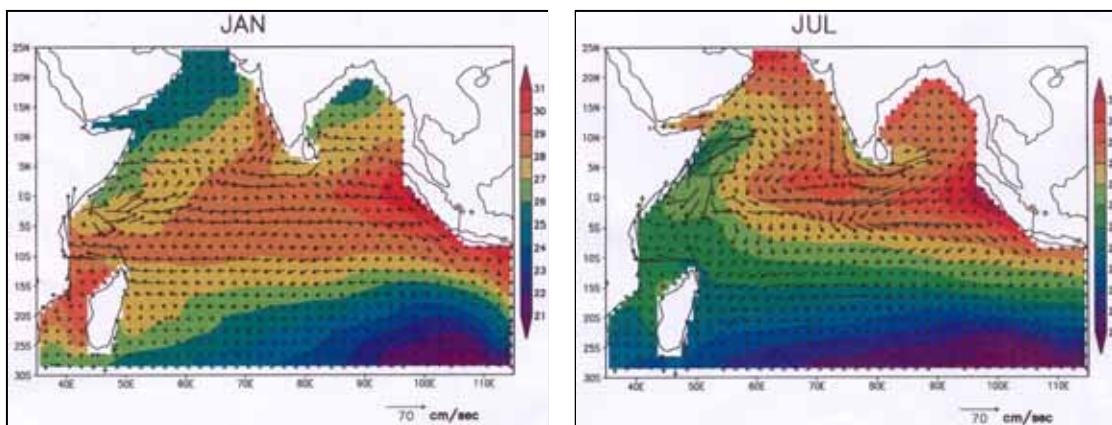


Instrumented mast onboard ORV Sagar Kanya

Theoretical Studies

Numerical modelling of earth's atmosphere is essential for understanding of weather systems. Various theoretical studies have been carried out in respect of understanding monsoon and tropical circulation systems. The research programmes are undertaken for investigating the following :

- Role of barotropic, baroclinic and combined barotropic-baroclinic instability mechanisms in the initial formation, intensification, movement and growth of monsoon disturbances.
- Study of global energetics in the spectral domain, tropical energetics in wave number and frequency domain, and regional energetics in the grid point domain.
- Simulation of significant features of mean monsoon circulation by using five level global spectral model.
- Simulation of the North Indian Ocean (North of 30°S) circulation and SST in different space and time scales, with special emphasis on Indian Seas and coastal regions using basin scale and global ocean models.
- Understanding the oceanic response to moving cyclones in the North Indian Ocean and determining the impact of small islands and coastal geometry on the coastal circulation of different seasons.
- Development of academic programmes to promote atmospheric sciences and co-ordination of M. Tech. (Atmospheric Physics) programme of the University of Pune, Pune.

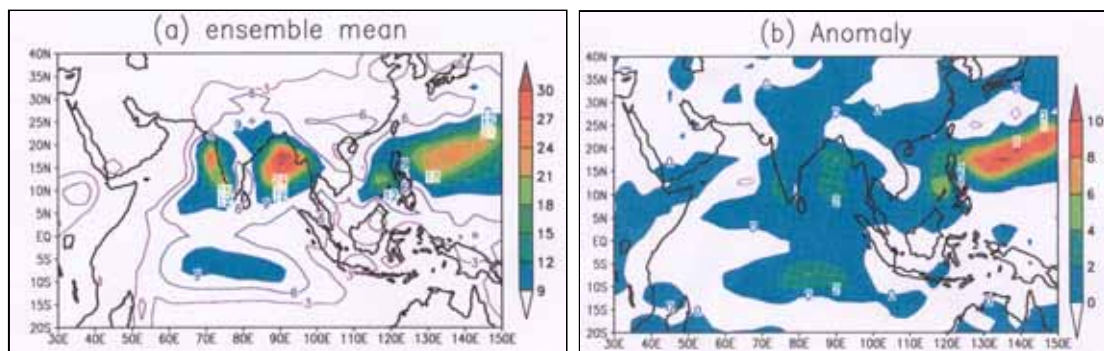


Model simulated circulation and Sea Surface Temperature over North Indian Ocean

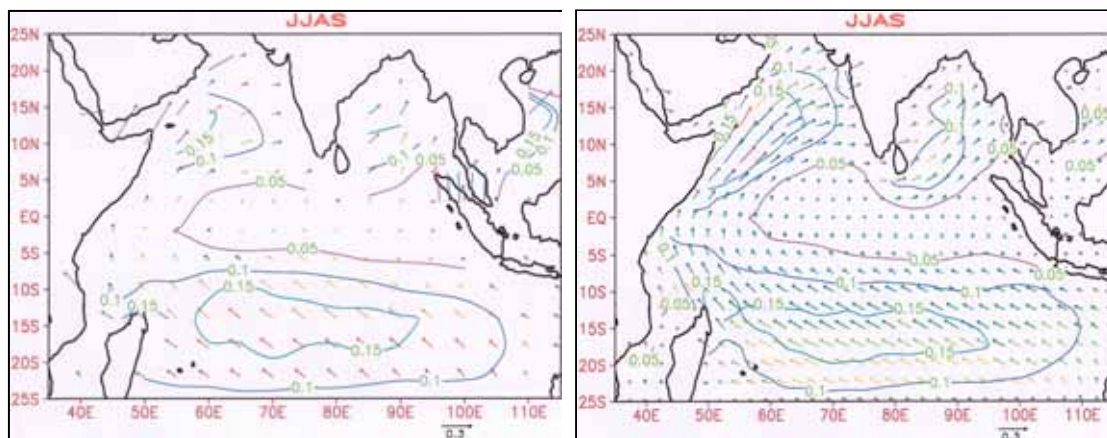
Climate and Global Modelling

A sustained and long term scientific programme based on general circulation models is essential to understand the physical and dynamical processes in the climate system of which the monsoon is an important component. Concerted efforts are being made in this direction, under the following research programmes :

- Comprehensive study of the physical and dynamical processes relating to global and monsoon climate and their variabilities on different time scales.
- Development and improvement of physical and mathematical models capable of simulating climate and climate change due to natural and anthropogenic factors and validation of the results of the climate models.
- Application of general circulation models for seasonal forecasting of monsoon rainfall.



Rainfall (mm/day) forecast for JJAS 2001 by UKMO model



Climatological (based on the period 1982-1994) wind-stress-field over Indian region by (a) COLA AGCM (b) NCEP for monsoon (JJAS) season

INFRASTRUCTURAL SUPPORT

Laboratories



Field Mill system for thunderstorm warning

Well equipped experimental laboratories with data acquisition systems and sophisticated instruments are available for tree ring sample collection and ring width measurements, cloud physics, atmospheric electricity, atmospheric chemistry, remote sensing of atmospheric aerosols and trace gases using lidar and spectrometric techniques, atmospheric boundary layer and land surface processes. A Secondary Data

Utilization Centre (SDUC) to receive daily cloud imageries from INSAT satellite and meteorological data has also been established at the IITM.

Scientific Computing

Recognising the vital importance of Scientific computing and software development to atmospheric research, the IITM has laid emphasis on this basic infrastructural facility right from its inception and has been striving to keep pace with the rapid advances in computing technology. At present the IITM has the following computer systems :



Computer Workstations

- HP-9000/735
- SGI Power Challenge XL, 4 No. of MIPS R-8000 SSR CPUs
- Two No. of SUN ULTRA-60 and two No. of SUN Ultra SPARC II
- SGI OCTANE MIPS R-12000
- Three SGI INDY Graphics workstations,
- Two SUN Ultra-10 workstations,
- About 60 Personal Computers
- Compaq Professional Workstation XP 1000-667
- HP Visualize B 2000 Workstation

An INTERNET with 512 KBPS Terrestrial Leased line connectivity with Videsh Sanchar Nigam Ltd. (VSNL) and the Local Area Network (LAN) of the 10/100 MBPS UTP link have been established. About 60 nodes, mainly Pentiums are connected in the LAN for browsing as well as accessing the Workstations. Different kinds of input/output and data storage media are available with the computer systems.

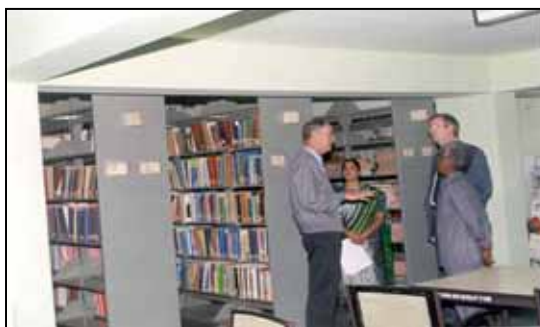
Archival facility for the meteorological observational data collected through different field experiments of the IITM and that received from different organisations is also available at the Institute. The major databases archived include COADS, LASPEX, BOBMEX, FGGE level III-b, MONTBLEX, NCEP reanalysis, TOGA-I, etc. apart from the conventional data acquired from the India Meteorological Department.

Library, Information and Technical Services

The Library, Information and Publications (LIP) Division of the IITM serves as a comprehensive Information System in atmospheric research for the Institute and also extends its service to several national/international centres interested in atmospheric research. The LIP Division provides technical services like library, documentation, information, publication, drawing, drafting, micrography and photography to the scientists of the Institute and facilities for the retrieval and use of information resources. The IITM's library is distinctive and has collection of a vast array of specialised literature relating to Atmospheric Sciences and allied disciplines. It has arrangements for providing information back up through resource sharing among other Libraries and Information Centres. The Library provides Information Dissemination to the scientific community engaged in research in Atmospheric Sciences. The LIP Division also Maintains liaison with Institutions, Universities and Government Agencies and Departments, and brings out plan documents, project proposals and various reports on the activities of the Institute. The Division organises various programmes for popularization of Meteorology amongst the common people and the students.



Library Building



Inner view of the Library

ADMINISTRATIVE SUPPORT

The Administrative support takes care of Personnel Development, Official language implementation, Finance, Purchase, Stores, Capital Works and Maintenance of Buildings. The IITM's sprawling campus in Pashan, Pune houses its Offices, Laboratories, Library, Staff Quarters, Guest House, Hostel, Community Hall and Canteen. The Institute also has a laboratory in New Delhi engaged in Rain and Cloud Physics research.



Guest House



Community Hall

FIELD EXPERIMENTS

The IITM has been vigorously pursuing its Field Experimental Programmes to collect special observational data. The major field experiments in which the IITM participated are (i) International field experiments on monsoons such as IIOE, ISMEX-73, MONSOON-77 and MONEX-79, (ii) Monsoon Trough Boundary Layer Experiment (MONTBLEX), (iii) Gas-well blow-out site observations in Andhra Pradesh, (iv) Regular Oceanic expeditions on Research Vessels, (v) Antarctica expedition, (vi) Land-surface Processes Experiment (LASPEX), (vii) Bay of Bengal Monsoon Experiment (BOBMEX), (viii) Indian Ocean Experiment (INDOEX), (ix) Field campaign, in collaboration with Indira Gandhi Centre for Atomic Research (IGCAR), at Kalpakkam, Tamilnadu. Special field observational programmes are regularly arranged for the study of different environmental conditions and Network of Tree-ring samples for reconstruction of past climates, in the forests and high altitudinal regions of the country. In all these field experiments and expeditions IITM has collected valuable observational data.



Observation at Antarctica Expedition



Gas well blow-out, Andhra Pradesh



Tree-ring sample collection at
Allapalley forest,
Gadchiroli, Maharashtra



Atmospheric monitoring field observations
in the Himalayan region,
Mohal, Kullu

RESEARCH RECOGNITION

The IITM actively participates in the multiagency and multilateral research programmes with the Institutions in India and abroad. The IITM has kept a good mix of fundamental and applied research in its programmes. Its scientists have made important new findings, which have received attention of the national and international scientific community. Several of its scientists have won important awards and fellowships, in recognition of their scientific work. Many scientists of the IITM have served and are serving on international scientific bodies, WMO Experts Panels and Editorial Boards of Journals etc.

TECHNICAL ASSISTANCE AND CONSULTANCY SERVICES

The IITM has developed techniques and expertise in specialised areas of research and provides technical guidance, assistance and support to several scientific organisations, government bodies and service agencies. The studies on hydrometeorological aspects of monsoon rain carried out by the IITM have found wide application by the irrigation and flood control agencies in dams construction and water resources management. The warm cloud modification technique developed by the IITM for increasing the rainfall has been utilised by several State Governments in their cloud seeding operations. The IITM has also been providing technical support to the ISRO for its Polar Orbiting Satellite Observational Programme by organising special lidar and radiometric observations. Technical guidance and assistance in respect of instrumentation has been provided to the Institutions and Universities engaged in the field experiments under various bilateral research programmes with the IITM.

ACADEMIC ACTIVITIES

The IITM is recognised by several Indian Universities for carrying out research work leading to the award of M.Sc., and Ph.D. degrees in Atmospheric Sciences. The IITM has been involved in scientific collaboration with universities and research organisations, both at the national and international levels. The scientists of the IITM contribute to the academic programmes of universities and Institutions by providing their expertise through lectures, guidance, and working as examiners, paper setters and Members of Board of Studies. The IITM has been conducting M.Tech. (Atmospheric Physics) course of the University of Pune, Pune. A memorandum of understanding (MoU) between the University of Pune and the IITM was signed on 26 May 1999 for collaboration in teaching and research in atmospheric physics.

MANPOWER DEVELOPMENT

Keeping the highly specialized nature of atmospheric research in view, the Institute vigorously pursues manpower development by way of providing guidance to post graduate and doctoral students, and by organising specialised training programmes in different areas of Atmospheric Sciences.

MAJOR RESEARCH PROJECTS

- Numerical weather prediction and mesoscale modelling
- Extended range weather prediction research
- Studies on monsoons and other tropical weather systems
- Satellite meteorology and application of satellite data in weather forecasting
- Air-sea interaction in tropical monsoons
- Regional aspects of global climate change and variability
- Climate applications in agriculture, water resources and public health
- Hydrometeorological studies of river basins for applications in water and power resources projects
- Changes in rainfall patterns and hydrologic regimes over India and their relationship to global warming
- Physics and dynamics of tropical clouds
- Remote sensing of the atmosphere using lidar, radiometric and other ground based techniques
- Studies in air pollution and precipitation chemistry
- Atmospheric chemistry: modeling and dynamics
- Measurement and monitoring of atmospheric minor constituents
- Simulation techniques in cloud physics
- Surface observations of atmospheric electricity and electric properties of clouds
- Studies on dynamical ocean modelling
- Human resource development and training programme in atmospheric sciences
- Studies on atmospheric energetics in wave number and frequency domain
- Studies on global and regional climate, variability and change using general circulation models
- Climate modelling studies including the parallel processing techniques
- Diagnostics and modelling studies of long term trends and variability of climate over the Indian, Asia Pacific region
- General circulation model systematic error correction and seasonal prediction
- Investigation and modelling of land surface processes in the atmospheric boundary layer
- Experimental study of exchange processes in the atmospheric boundary layer over continental and marine environment

SPONSORED RESEARCH PROJECTS

INTERNATIONAL COLLABORATIONS

Department of Science and Technology/National Science Foundation (USA)

- Investigations of the signature of land-surface processes in the atmospheric boundary layer, Dr. S.S. Parasnis, 1999-2001, Rs. 4.60 lakhs
- Studies on Mesoscale (Beta and gamma) Systems over Indian Region using Regional Atmospheric Modelling Systems of Colorado State University, Dr. S.S. Singh, 1999-2002, Rs. 1.734 lakhs
- Aerosol Optical Characterization and Investigation of Aerosol Radiative Forcing at the Surface and Top of the Atmosphere, Dr. G. Pandithurai, 2001-2003, Rs. 8.92 lakhs
- Investigations of Atmospheric Chemistry : Aerosols-Climate Interactions (US-India Collaborative Research), Dr. P.C.S. Devara, 1997-2000, Rs. 4.00 lakhs

Department of Science and Technology/Science and Technology Agency (STA), Japan

- Dendroclimatological Reconstruction and Estimation of Global Environmental Changes in Monsoon Asia (Indo-Japan), Dr.G.B. Pant, 1999-2001, Rs. 3.10 lakhs

Global Change System for Analysis, Research and Training/Asia Pacific Network (START/APN)

- Management Responses to Seasonal Climate Forecasts In Mixed Cropping System of Southern India's Semi-arid Tropics, Dr. K.Krishna Kumar (Collaborator), 2000-2001, Rs. 1.20 lakhs,

Indo-French Centre for Promotion of Advanced Research

- Sensitivity of the Indian Summer Monsoon to Anthropogenic Climate Change, Dr. K. Rupa Kumar, 2001-2004, Rs. 6.20 lakhs,

Ministry of Environment & Forests, Govt. of India/Dept. of Environment, Transport and the Regions, Govt. of U.K.

- Impact of Climate Change on Water Resources, Dr. G.B. Pant, 2001-2004, Rs. 29.50 lakhs,
- Indian Climate Change Scenario for impact assessment, Dr. K. Rupa Kumar, 2001-2004, Rs. 48.50 lakhs

Department of Meteorology, Stockholm University, Sweden

- Composition of Acid Deposition (CAD), Dr. P.S.P. Rao, 2001-2004

NATIONAL

Department of Science and Technology, Government of India

- Impact of Anthropogenic and Natural Activities on Atmospheric Chemistry and Climate Forcing Factors with their Variability, Dr.G. Beig, 1999-2002, Rs. 15.70 lakhs
- Climate Modelling using PARAM-10000, Dr.V. Satyan, 2000-2001, Rs. 7.37 lakhs
- Differential Absorption Lidar Sensing of Ozone, Dr.P.C.S. Devara, 2000-2003, Rs. 29.94 lakhs
- ENSO-Snow-Monsoon Interactions: Understanding and Predicting Monsoon Variability, Dr. R.H. Kripalani, 2000-2003, Rs. 7.38 lakhs
- Convective Boundary layer During the Summer Monsoon over Bay of Bengal, Dr. (Smt.) S.B. Morwal, 2000-2003, Rs. 3.27 lakhs
- Experimental and Theoretical Studies of Secondary Pollutants and Ozone for Chemical Forecasting, Dr. D.B. Jadhav, 2001-2004, Rs. 29.65 lakhs
- Studies on evolution of Atmospheric Boundary layer Through Land Surface Interactions at Anand, Dr. S.S. Parasnis, 2000-2003, Rs. 3.96 lakhs
- National Information Facility for Climate Research, Smt. A.A. Shiralkar, 2000-2003, Rs. 4.24 lakhs
- Studies of Mesoscale System over Indian Region, Smt. S.S. Vaidya, 2001-2004, Rs. 15.324 lakhs
- Monsoon variability in relation to NAO and ENSO and its Use for Predicting Monsoon Rainfall over Smaller Spatial and Temporal Scale, Shri S.S. Dugam, 2001-2004, Rs. 4.56 lakhs
- Heat Sources over India during South-West Monsoon Season, Smt. U.V. Bhide, 2001-2004, Rs. 4.20 lakhs
- Non-linear scale interactions in the energetics of monsoon in wavenumber/ frequency domain, Shri D.R. Chakraborty, 2001-2004, Rs. 6.445 lakhs
- Numerical modeling of the upper ocean mixed layer over Indian Ocean region using satellite data, Dr. C. Gnanaseelan, 2001-2004, Rs. 6.972 lakhs
- Study of vertical velocity in the troposphere and stratosphere using Indian MST radar and lower atmospheric wind profiler, Dr. Y. Jaya Rao, 2001-2003, Rs. 9.66 lakhs
- Studies of atmospheric aerosols, trace gases and precipitation chemistry in different environments, Dr. P.S.P. Rao, 2001-2004, Rs. 16.57 lakhs
- Atlas of Spatial Features of Moisture Regions and Rainfall of India during 19th and 20th Centuries, Dr. N. Singh, 2001-2004, Rs. 20.712 lakhs
- Observational study of direct radiative forcings of atmospheric aerosols on the surface reaching solar flux, Dr. R.S. Mahes Kumar, 2001-2004, Rs. 9.36 lakhs
(Fast Track Scheme for Young Scientists)

Department of Ocean Development, Government of India

- Variability of North Indian Ocean and its Impact on Global Ocean and Under-standing the Mechanism of Coastal Circulation Around India, Dr. (Smt.) P.S. Salvekar, 1997-2002, Rs. 34.25 lakhs,
- Simulation of Surface Wind Stress on Monthly and Seasonal Time Scales using Coupled Atmospheric Ocean Model (CAOM) to Provide Forcing for Driving an (Ocean General Circulation Model (OGCM), Dr. V. Satyan, 1997-2002, Rs. 34.25 lakhs,

Council for Scientific and Industrial Research

- 2D-Chemical Modelling of Global Changes Induced Perturbations in Atmospheric Minor Constituents and Ionizations of the Lower and Middle Atmosphere, Dr.G. Beig, 1997-2001, Rs. 3.50 lakhs
- Mesoscale Modelling For Monsoon Related Predictions (NMITLI Project), Dr. S.S. Singh, 2001-2004, Rs. 26.25 lakhs

Indian Space Research Organisation

- Atmospheric Aerosol Loading Over Land from IRS-P3 MOS Sensors Data,Dr. P.C.S. Devara, 1997-2001, Rs. 5.54 lakhs
- Development of Field Mill Network System at SHAR for Thunderstorm Warning and to Study the Dynamical Properties of Thunderstorm for Forecasting the Warning Levels, Dr. D.B. Jadhav, 2000-2003, Rs. 26.28 lakhs
- Development of Regional Tree-ring Data Network to Study the Past Climate Variations on Decadal to Century Time Scale over Asia, Dr. K. Rupa Kumar, 2001-2004, Rs. 7.25 lakhs, (IGBP)
- Study of coupling between lidar/radiometer measured aerosol and radar sensed winds, Dr. Y. Jaya Rao, 2001-2004, Rs. 6.35 lakhs
- Numerical Modelling of the Dynamics of the Ocean Circulation, Dr. (Smt.) P.S. Salvekar, 1999-2001, Rs. 7.50 lakhs
- Investigation of Features of Monsoon Depressions and Tropical Cyclones by IRS-P4 MSMR Data, Dr. P.N. Mahajan, 2001-2003, Rs. 9.09 lakhs

National Hydroelectric Power Corporation

- Hydrometeorological Study of Subansiri and Siang Basin of the Brahmaputra River, Dr. A.K. Kulkarni, 2001, Rs. 4.95 lakhs,

Safety Research Institute, Kalpakamm

- Experimental study of coastal boundary layer structure, Dr. S. Sivaramakrishnan, June-December 2001, Rs. 3.00 lakhs

Snow and Avalanche Studies Establishment

- Surface climatology of Western Himalaya, Dr. K.Rupa Kumar, 2001-2003, Rs. 9.90 lakhs, (Work order of Defence Research and Development Organisation)

SIGNIFICANT RESEARCH ACHIEVEMENTS

- Identified several global and regional predictors and developed different statistical techniques for seasonal forecasting of all India monsoon rainfall.
- Incorporated successfully the Betts-Miller-Janjic scheme of convection in the Limited Area Model and achieved the significant improvement in prediction of rainfall associated with monsoon depressions.
- Utilized successfully a very high resolution mesoscale model (MM5) to simulate the track, horizontal and vertical structure of the Super Cyclonic Storm of Orissa.
- Developed an integrated approach using satellite data for proper depiction of monsoon depressions and tropical cyclones over the Indian region.
- Modulated the Impact of ENSO events on Indian Monsoon Rainfall (IMR) by the decadal variability of IMR. The impact of El Nino (La Nina) is found to be more during the below (above) normal epochs.
- Established the negative (positive) relationship of the winter-time snow depth over western (eastern) Eurasia with subsequent IMR.
- Investigated the impact of factors like onset dates of cloudiness and sunshine on pre-estimation of the yield of crops in different parts of India.
- Presented evidence for the first time showing the impact of El Nino on monsoon variability.
- Constructed longest available homogeneous time series of regional climate elements from the observed meteorological data and brought out their spatio-temporal variability.
- Examined the aspects of global warming in rainfall and temperature variability over India.
- Established the dendroclimatic potential of several species in the Indian forest and reconstructed the climatic conditions over Western Himalaya during pre-instrumental period.
- Established relationship of the double sunspot cycle with occurrence of major flood years over India.
- Analysed long series rainfall data on different time scales over various river basins in India and computed hydrometeorological elements for the use of river valley projects, water management authorities, and irrigation and flood control agencies.
- Published an Atlas containing generalised Probable Maximum Precipitation (PMP) Charts for different parts of India.
- Carried out Depth Area Duration (DAD) analysis of severe storms occurred over different river catchments in India during the past 100 years and published an Atlas of the Rainstorms.

- Developed a technique for increasing rainfall by aerial warm cloud seeding, and provided technical assistance and guidance to State Governments in their operational rainfall enhancement experiments. The experiments conducted by the institute for 11 seasons from 1973 perhaps the only long series in the world of seeding warm clouds.
- Investigated interactions of the micro-physical, dynamical and electrical properties of thunder clouds.
- Investigated association between the Indian summer monsoon activity and the thunderstorm activity by using monthly data of the number of thunderstorm days recorded at the network of Indian stations.
- Made significant contribution to the Indian Middle Atmospheric programme (IMAP) for studying the dynamics of the middle atmosphere and identified association of the quasi-biennial oscillation (QBO) in the stratospheric zonal winds with the performance of monsoon rains.
- Developed a cell-dynamical model for atmospheric flow by application of chaos theory.
- Participated actively in the national and international field experiments on monsoon viz. IIOE, ISMEX-73, MONSOON-77, MONEX-79, and other ocean expeditions such as INDOEX and BOBMEX, and regular cruises of the Research Vessels of the National Institute of Oceanography. Collected specialised observational data during these expeditions for the study of different aspects of the atmospheric sciences.
- Collected precipitation measurements and samples in different environmental conditions during the field experiments organised at different places of the country. Analysis indicated nonexistence of the acid rain in India on a large scale due to the presence of alkaline aerosols of soil origin in the atmosphere.
- Organised field experiments to study the response of the atmosphere to total solar eclipse.
- Carried out onboard observations through participation in oceanographic cruises in the Arabian Sea, Indian Ocean and Bay of Bengal for various studies in boundary layer, atmospheric aerosols, chemistry and electricity.
- Developed the lidar and radiometric techniques for remote sensing of atmospheric aerosols and trace gas characteristics.
- Analysed the lidar aerosol observations made at Pune over the period of fourteen years (1986-2000). The results indicated an increasing trend in the aerosol column content which was attributed to the influence of urban and industrial activities in the region.
- Investigated the radiative effects of aerosols over Pune using the High-Resolution Radiative Transfer Model of GFDL/NOAA, USA.
- Analysed the continuous record of surface ozone carried out over a period of six years (1991-1997) at Pune. The increasing trend in ozone concentration was found to be attributed to the increase in anthropogenic activities around the observational sites.

- Developed an automatic rotating slit scanning spectrometer for monitoring stratospheric and tropospheric trace gases and developed spectral techniques for obtaining their slant column densities using absorption spectroscopy.
- Developed the state of the art atmospheric chemistry model, which treats radiation, dynamics and chemistry interactively to study the long-term changes and trends in the atmosphere from surface to 100 km under the new concept of global change.
- Simulated the middle atmospheric vertical distribution of thermal structure and chemical composition with a special reference to ozone and its precursors from the palaeo-periods to the future time frames and quantified the relative impacts due to natural activity (solar, volcanic, etc) and human induced forcing
- Brought in the concept of possible greenhouse effect on ionization components and investigated the anthropogenic effects on the atmospheric ion chemistry
- As a part of the IITM-SAC Scientific Collaboration project arranged special observations of atmospheric aerosols using the ground-based lidar and radiometer at the Institute, and Khadakwasla and Mulshi dam sites on the days when the satellite overhead passes were available.
- Designed and developed instruments for measurements of various atmospheric electric parameters and carried out observations under a variety of environmental conditions for the study of atmospheric electricity and of different micrometeorological parameters in the atmospheric boundary layer.
- Developed simulation technique for scavenging of atmospheric aerosol particles by charged and uncharged water drops in the absence and presence of electric field.
- Investigated the effect of electrical forces from the shape, stability, breakup and evaporation of water drops suspended in a wind tunnel.
- Developed a suitable rocket payload indigenously for temperature and wind measurement up to about 30 km (10 hPa) in the vertical. The observations on temperature showed good agreement with that of Russian sensors.
- Participated in the XVI Indian Scientific Expedition to Antarctica and carried out measurements of atmospheric electric conductivity and aerosol size distribution onboard the ship MV Polar Bird and at the Antarctica.
- Studied the physical properties of atmospheric ions and their correlations with electric conductivity.
- IITM played a leading role in the multi-institutional national field programme 'Monsoon Trough Boundary Layer Experiment (MONTBLEX)' during 1989-90 and carried out several important studies of the atmospheric boundary layer by using the MONTBLEX data.
- Under the DST sponsored project 'Land Surface Processes Studies' organised an observational field experiment in the Sabarmati region of Gujarat to understand the land surface processes and its related problems over the land-air interface.

- Developed multi-level dynamic instability models. The genesis of monsoon depression has been explained as a barotropic-baroclinic instability mechanism. Ekman boundary layer friction plays an important role in zonal scale selection of monsoon depression.
- Developed five-level global spectral model with various physical sub-grid scale and land surface processes for numerical studies on the general circulation of the atmosphere
- Developed diagnostic models for the study of global energetics in the spectral domain, tropical belt energetics in the wave number and frequency domain, and regional energetics in the grid point domain.
- Developed 4-dimensional energy package consisting of 16 entities viz., basic and eddy energies, conversions, generations, dissipations and boundary fluxes and successfully applied for various cases of monsoon disturbances.
- Developed simple reduced gravity and thermodynamic ocean models and studied the dynamics of the North Indian Ocean circulation.
- Determined the role of small islands and effect of local and remote forcings on the upper layer circulation and Studied the impact of different wind forcings on upper and lower layer circulation and SST as well as on mixed layer depth.
- Simulated the dipole structure in the SST anomaly fields that was observed during 1994 in the tropical Indian Ocean around 10°S and also studied the sensitivity of the dipole structure with respect to different wind forcings.
- Studied the oceanic response to moving cyclones in the Indian Seas. Cooling of sea surface in the right of storm track and right bias in the current fields have been noticed only for those cyclones having northward components.
- Studied the role of Indian Ocean SST forcing in affecting the summer monsoon convection using detailed data analysis and GCM experiments. The intraseasonal fluctuations of regional convection are found to be significantly altered in the presence of warm Indian Ocean SST anomalies.
- Simulated the wind stresses using COLA and UKMO AGCMs over the Indian Oceanic region bounded by 30°-25°N, 40°-100°E, for the period 1982-1994. The monthly mean stresses computed from these simulations have been used to drive MaCreary Ocean model for simulation of SSTs in the Indian Ocean region.

FUTURE PLANS

The IITM has kept a good balance in its research programmes between the application oriented and the fundamental aspects of Atmospheric Sciences. Considering the increased concern among Government and general public about a variety of environmental issues, IITM will plan its research programmes to meet the critical national needs for providing information relating to various aspects of the atmosphere and will contribute its intellectual resources to the national and international efforts for research in the emerging thrust areas in Atmospheric Sciences.

AWARDS

Dr.B.N.Desai Award, R.N. Keshavamurty ,	1968
Indian Journal of Meteorology and Geophysics Award, R.V. Godbole and R.R.Kelkar ,	1969
WMO Research Award for encouragement of Young Scientists, B.M.Mishra ,	1974
WMO Research Award for encouragement of Young Scientists, A.K.Kamra ,	1976
Shri Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award, A.S.R.Murty ,	1976
Third Prize (Students' Technical Session) The Institution of Engineers (India), S.K.Sharma ,	1977
Second Prize (Students' Technical Session) The Institution of Engineers (India), S.K.Sharma ,	1980
Young Scientist Award by the Andhra Pradesh Academy of Sciences, Hyderabad, P.C.S.Devara ,	1980
WMO Research Award for encouragement of Young Scientists, S.K.Mishra and P.S.Salvekar ,	1981
Dr. B.N. Desai Award, D.R. Sikka ,	1981
Prof.P.T.Rao Shastiabadhipoorthy Prize in Physics, Andhra University, Waltair, P.E.Raj ,	1983
B.P.Kapadia Memorial Prize Eighth All India Students Seminar, The Institution of Engineers (India), S.K.Sharma ,	1984
13th Mausam Award, S. Rajamani ,	1984-85
2nd SAARC Award, S.K.Mishra , M.D.Patwardhan and L.George ,	1985
14th Mausam Award, P.S. Salvekar and S.K. Mishra ,	1986-87
Best Paper Award of the NSSS-87, Ahmedabad, R.K.Verma ,	1987
1st IITM Silver Jubilee Research Award, K.D.Prasad and S.V.Singh ,	1988
Young Scientist Award for Best Presentation of Paper at the Seminar on Geophysics in National Development, Banaras Hindu University, Varanasi, K.Indira ,	1990
J. Das Gupta Award for 1987-88, K.G.Vernekar , S.Sivaramakrishnan , Brij Mohan and S.Saxena ,	1990
6th SAARC Award for 1987, S.V. Singh and R.H. Kripalani ,	1991

2nd IITM Silver Jubilee Award for 1989, A.K. Kamra and D.V. Ahire ,	1991
3rd IITM Silver Jubilee Award for 1990, S.S.Parasnis and S.B.Morwal ,	1991
7th SAARC Award for 1988, M.K.Tandon ,	1991
Dr. B.N.Desai Award, S. Rajamani ,	1992
4th IITM Silver Jubilee Award for 1991, P.N. Mahajan and S.P. Ghanekar ,	1993
5th IITM Silver Jubilee Award for 1992, S.S. Dhanorkar and A.K. Kamra ,	1993
10th SAARC Award for 1992, M.K. Soman and K. Krishna Kumar ,	1994
Best Research Paper Award at the NSSS-96, Hyderabad, Dr.R. Kharul , S.S. Parasnis and M.G.Takawale ,	1996
6th IITM Silver Jubilee Award for 1993, P.E. Raj , S. Sharma , P.C.S. Devara and G. Pandithurai ,	1996
7th IITM Silver Jubilee Award for 1994, S. Sharma , P.C.S. Devara , P.E. Raj and G. Pandithurai ,	1997
8th IITM Silver Jubilee Award for 1995, A.M. Selvam and R.R. Joshi ,	1997
9th IITM Silver Jubilee Award for 1996, H.P. Borgaonkar , G.B.Pant and K.Rupa Kumar ,	1997
13th SAARC Award for 1993-1994, N. Singh	1998
10th IITM Silver Jubilee Award for 1997, R.H. Kripalani and A.A. Kulkarni ,	1999
J. Das Gupta Award for 1995-96, P.C.S. Devara , P.E. Raj , G. Pandithurai and S. Sharma ,	1999
11th IITM Silver Jubilee Award for 1998, R. Krishnan , C. Venkatesan and R.N.Keshvamurty	2000
12 th IITM Silver Jubilee Award for 1999, G.K. Manohar , S.S.Kandalgaokar , and M.I.R. Tinmaker	2001
National Young Scientist Award in the Physical Sciences Category for 1999-2000, Muslim Association for Advancement in Science and Centre for Studies on Science, Aligarh, Dr. G. Beig	2001
Dr. Vikram Sarabhai Memorial Lecture and Cash Award Instituted by the Indian Remote Sensing Society, Dr. G.B. Pant	2001
Prof. K.R. Ramanathan Memorial Lecture and Gold Medal Instituted by the Indian Geophysical Union, Dr. G.B. Pant	2001

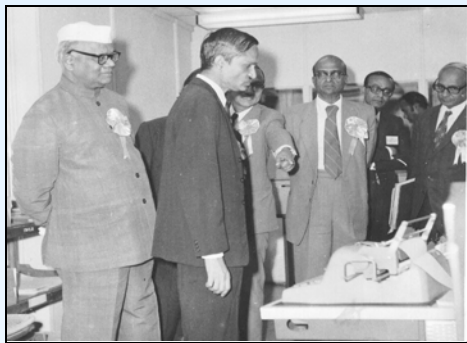
Visit of Eminent Personalities to the Institute



Prof. C.V. Raman



Dr. Karan Singh
Minister of Tourism and Civil Aviation



Shri. Raj Bahadur
Minister of Tourism and Civil Aviation



Shri. P.L. Kaushik
Minister of Tourism and Civil Aviation



Shri. S.N.L. Bhatnagar, Secretary, Minister of Tourism and Civil Aviation,
Government of India, laying the Foundation Stone of the Institute on 3 April 1979



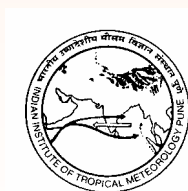
Prof. G.O.P. Obasi, Secretary General, WMO



Dr. A.P.J. Abdul Kalam



creating pathways to atmospheric research



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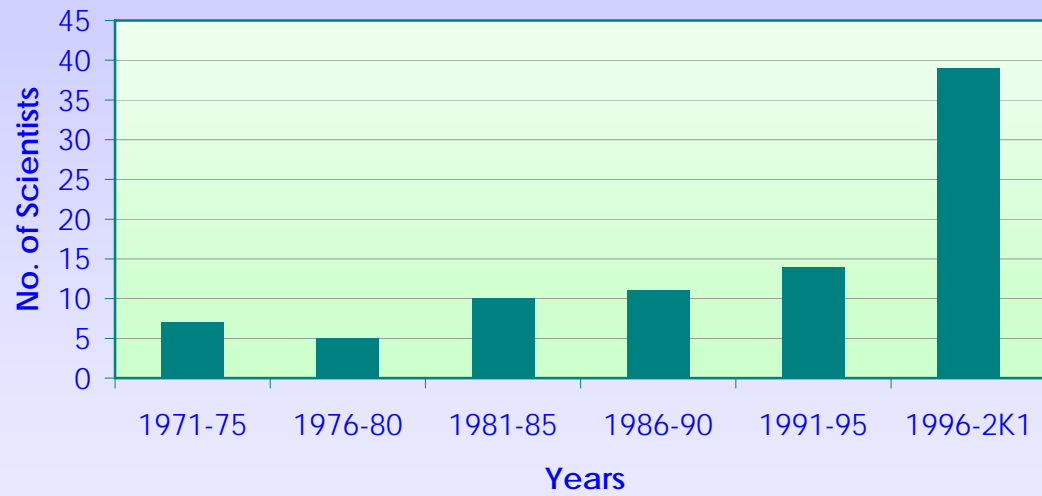
E-mail : lip@tropmet.res.in

Phone : 91-020-5893600

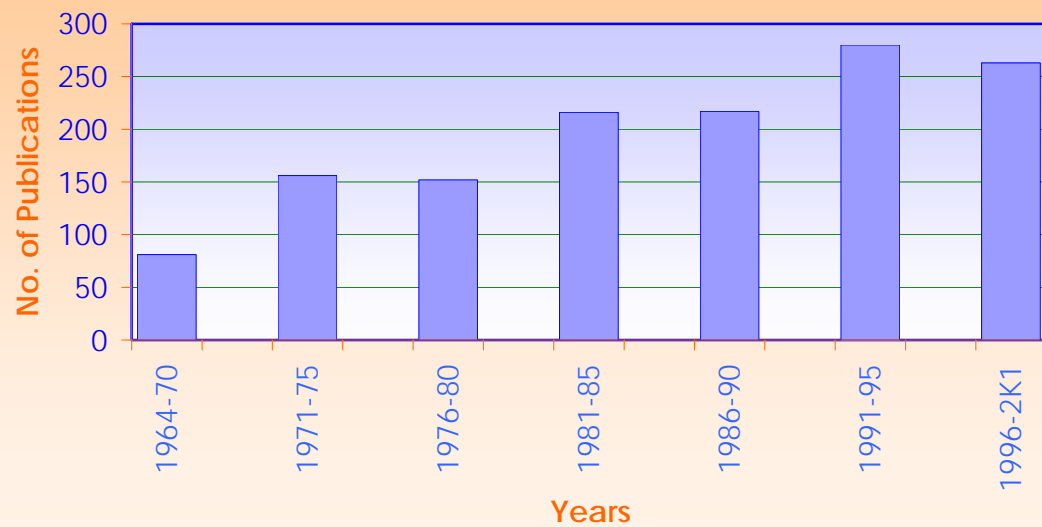
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Ph.D. Awards



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