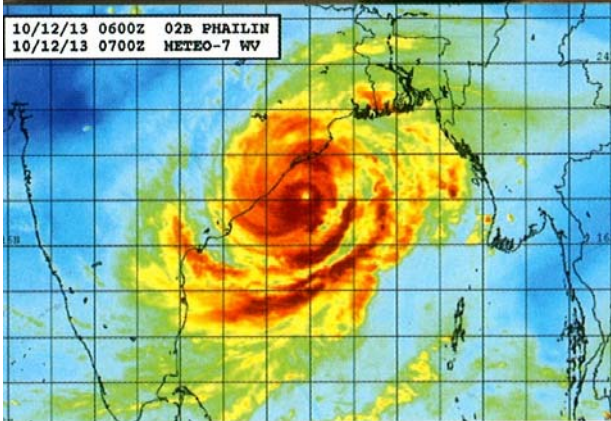
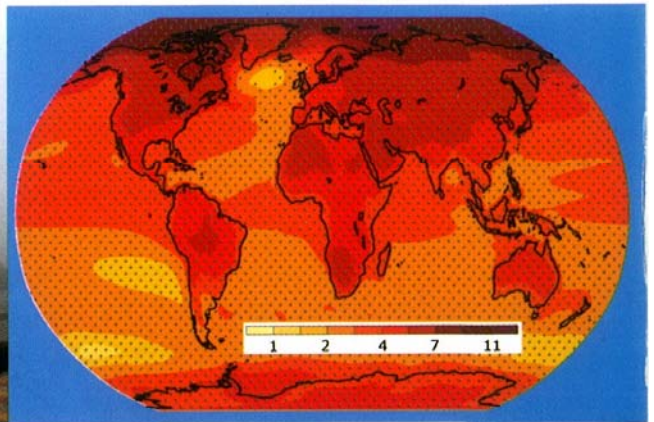




# CENTRE FOR ATMOSPHERIC SCIENCES



**INDIAN INSTITUTE OF TECHNOLOGY DELHI**  
**HAUZ KHAS, NEW DELHI - 110016**

## PREAMBLE

The Centre for Atmospheric Sciences (CAS) was set up at the Indian Institute of Technology Delhi, in the year 1979. Subsequently, the Ministry of Education, Government of India, funded the Centre under the Sixth Five year plan. The Centre was initially co-sponsored by the India Meteorological Department (IMD) for nearly two decades. The Centre has 11 core faculty members and one Sir Gilbert Walker MoES Chair Professor with expertise in diverse disciplines such as meteorology, oceanography, air pollution and climate modeling, and about 50 or more research scientists/assistants/scholars working in various multidisciplinary projects.

The major activities in this Centre are: Research & Development, Teaching and Research Supervision and Continuing Education. Research activities in the Centre are oriented towards advancing our understanding of the fundamentals of the atmospheric and oceanic processes occurring in the tropics with particular emphasis on real-world issues such as weather forecasting, the Indian summer monsoon, tropical cyclones and associated surges, air quality modeling and impacts on health, fog prediction, heat island modeling, measurements and mitigation strategies, renewable energy meteorology, climate model development and climate change impact. The Centre provides one of the best environments in the country for higher studies in the emerging sciences of the Earth System. The M.Tech program in "Atmospheric-Oceanic Science and Technology" of the Centre is supported by the Ministry of Earth Science, Govt. of India.

The Centre's faculty members have received various prestigious awards, chairs and fellowships. Significant among them are: Shanti Swaroop Bhatnagar Prize; Fellow, Indian National Science Academy; Fellow, Indian Academy of Sciences; Fellow, National Academy of Sciences, India; Fellow, Indian Meteorological Society; Fellow, Indian Institute of Environmental Engineers; Member, National Academy of Sciences; Member, National Academy of Agricultural Sciences; Fellow, Indian National Academy of Engineering; JC Bose Fellow, INSA Young Scientist Medal.

## COLLABORATIONS

### INTERNATIONAL ORGANIZATIONS

Abdus Salam International Centre for Theoretical Physics, Italy	Centre for Climate Research, Singapore
Delft University of Technology, Netherlands	Geophysical Fluid Dynamics Laboratory (GFDL), USA
Harvard University, USA	Imperial College, UK
Jet Propulsion Lab, NASA, USA	Max Plank Institutes, Germany
National Center for Atmospheric Research (NCAR), USA	National Institute of Resources and Environment, JAPAN
North Carolina State University, USA	Oak Ridge National Laboratory (ORNL), USA
Pacific Northwest National Laboratory, USA	Princeton University, USA
Pukyong National University, South Korea	Sandia National Laboratory, USA
University of Cambridge, UK	University of California Los Angeles, USA
University of Colorado Boulder, USA	University of East Anglia, UK

University of Illinois at Urbana-Champaign, USA	University of Maryland at College Park, USA
University of Reading, UK	University of Edinburgh, UK
University of Leicester, UK	University of Evry, France
New York University	University of Queensland, Australia
Meteorological Research Institute, Japan	University of California Berkeley
King Abdullah University of Science and Technology (KAUST), Saudi Arabia	Japan Agency for Marine Earth Science and Technology (JAMSTEC), Japan

## **NATIONAL ORGANIZATIONS**

Central Pollution Control Board (CPCB)	Centre for Mathematical Modelling and Computer Simulation (C-MMACS)
Indian Air Force (IAF)	Indian Institute of Tropical Meteorology (IITM)
Indian Navy (IN)	Indira Gandhi Centre for Atmospheric Research (IGCAR)
National Centre for Medium Range Weather Forecasting (NCMRWF)	National Environmental Engineering Research Institute (NEERI)
National Centre for Ocean Information Services (INCOIS)	National Institute of Ocean Technology (NIOT)
National Institute of Oceanography (NIO)	Space Applications Centre (SAC)
Indian Institute of Science Education and Research, Pune	Indian Institute of Space Science and Technology, Thiruvananthapuram
India Meteorological Department	

## **RESEARCH AREAS**

### **MESOSCALE MODELLING**

- Numerical Modeling of the Atmosphere
- Tropical Meteorology and Indian Monsoon
- Land-Surface Process Modeling
- Land-Atmosphere Interaction
- Renewable Energy Meteorology
- Renewable Energy Resource Assessment and Forecasting

### **OCEAN MODELLING**

- Ocean Circulation Modeling
- Coastal Ocean Processes
- Simulation of Ocean Surface and Internal Waves
- Storm Surges and Inundation

### **CLIMATE MODELLING**

- Climate Dynamics
- Climate Variability and Changes
- Climate Change Detection & Attribution
- Global and Regional Climate Modeling
- Climate Projections
- Climate Change Impacts on Extreme Events, Health, Agriculture, Water Resources and Energy
- Aerosol-Cloud-Climate Interactions

### **AIR POLLUTION MODELLING**

- Urban Meteorology
- Chemical Transport Modeling

- Health Impact Assessment of Air Pollution
- Heat Island Measurements and Modeling
- Fog Prediction
- Air Pollution Exposure Modeling

## INFRASTRUCTURAL FACILITIES

**The Centre for Atmospheric Science has the following Laboratories:**

Computing Server Lab	Mesoscale Modeling Lab	Climate Modeling Lab
Remote Sensing Lab	Air Quality Modeling Lab	Ocean State Forecasting Lab
Atmospheric Measurement Lab		

The following 2 High-Performance Computing clusters are available for conducting numerical modeling research:

- Chandra, a 15 node FUJITSU Primary CPU cluster located in the Centre's High Performance Computing Laboratory.
- Padum, a 422 node Petaflop-scale High Performance Computing cluster, one of India's fastest supercomputers, located in the IIT Delhi Computer Services Centre.

The computing laboratories at the Centre are equipped with state-of-the-art desktop workstations for data analysis and visualization with softwares such as ERDAS imagine and ArcGIS.

The following equipment are available for atmospheric pollution and related observations:

- Automatic Weather Station
- PM<sub>10</sub>, PM<sub>2.5</sub>, Ozone, CO and NO<sub>x</sub> analysers
- Microtops Radiometer
- Aethalometer
- Albedometer

## TEACHING

### TEACHING PROGRAMMES

- B.Tech Minor Area in Atmospheric Sciences (Only for IIT Delhi Undergrads)
- M.Tech in Atmospheric-Oceanic Science & Technology
- Ph.D. in Atmospheric & Oceanic Science (Ph.D. student's need to complete 6 or more credits depending on their background)

**UNDERGRADUATE COURSES:** UG students opting for Minor Area (total 20 credits) need to complete at least two of the following UG courses. They can choose the remaining courses either from this list or from the list of PG courses.

Fundamentals of Weather and Climate (Credit - 3) – ASL340	Climate Change: Impacts, Adaptation and Mitigation (Credit - 4) – ASL320
Introduction to Oceanography (Credit - 3) – ASL350	The Earth's Atmosphere: Physical Principles (Credit - 3) – ASL360
Indian Monsoon, Global Warming and Climate Change (Credit - 3) –ASL370	Climate Modeling (Credit - 3) – ASL380
B.Tech Mini Area Project (Credit - 5) –ASD390	

**POST-GRADUATE COURSES (M.Tech Only):****CORE COURSES:**

Introduction to Weather, Climate and Air Pollution (Credit - 1) - ASL730	Data Analysis Methods for Atmospheric and Oceanic Sciences (Credit - 2) - ASP731
Mathematical and Computational Methods for Atmospheric and Oceanic Sciences (Credit - 3) - ASL732	Physics of the Atmosphere (Credit - 3) - ASL733
Dynamics of the Atmosphere (Credit - 3) - ASL734	Atmospheric Chemistry and Air Pollution (Credit - 3) - ASL735
Science of Climate Change (Credit - 3) - ASL736	Physical and Dynamical Oceanography (Credit - 3) - ASL737
Numerical Modeling of the Atmosphere and Ocean (Credit - 3) - ASL738	Advanced Data Analysis for Weather and Climate (Credit - 3) - ASP820
Project-I (Credit - 6) - ASD881	

**ELECTIVE COURSES (all courses except Project – II are of 3 Credits)**

Boundary Layer Meteorology - ASL750	Dispersion of Air Pollutants - ASL751
Mesoscale Meteorology - ASL752	Atmospheric Aerosols - ASL753
Cloud Physics - ASL754	Remote Sensing of the Atmosphere and Ocean - ASL755
Synoptic Meteorology - ASL756	Tropical Weather and Climate - ASL757
General Circulation of the Atmosphere - ASL758	Land-Atmosphere Interactions - ASL759
Renewable Energy Meteorology - ASL760	Earth System Modeling - ASL761
Air-Sea Interaction - ASL762	Coastal Ocean and Estuarine Processes - ASL763
Independent Study - ASS800	Advanced Dynamic Meteorology - ASL821
Climate Variability - ASL822	Geophysical Fluid Dynamics - ASL823
Parameterization of Physical Processes - ASL824	Mesoscale Modeling - ASP825
Ocean Modeling - ASL826	Advanced Dynamic Oceanography - ASL827
Special Topics - ASL851 to ASL854	Project-II (Credit - 12) - ASD882

### M.Tech Structure (Total 54 Credits)

Semester	Courses	Total Credits
I	<ul style="list-style-type: none"> <li>• Introduction to Weather, Climate and Air Pollution (ASL730)</li> <li>• Data Analysis Methods for Atmospheric and Oceanic Sciences (ASP731)</li> <li>• Mathematical and Computational Methods for Atmospheric and Oceanic Sciences (ASL732)</li> <li>• Physics of the Atmosphere (ASL733)</li> <li>• Dynamics of the Atmosphere (ASL734)</li> <li>• Atmospheric Chemistry and Air Pollution (ASL735)</li> </ul>	15
II	<ul style="list-style-type: none"> <li>• Science of Climate Change (ASL736)</li> <li>• Physical and Dynamical Oceanography (ASL737)</li> <li>• Numerical Modeling of the Atmosphere and Ocean (ASL738)</li> <li>• Advanced Data Analysis for Weather and Climate (ASP820)</li> <li>• Elective Course 1</li> </ul>	15
III	<p style="text-align: center;">Project I (ASD881)</p> <ul style="list-style-type: none"> <li>• Elective Course 2</li> <li>• Elective Course 3</li> </ul>	12
IV	<p style="text-align: center;">Project II (ASD882) or</p> <ul style="list-style-type: none"> <li>• Elective Course 4</li> <li>• Elective Course 5</li> <li>• Elective Course 6</li> <li>• Elective Course 7</li> </ul>	12

### ADMISSION CRITERIA

<b>M.TECH Full Time (2 Years)</b>	B.Tech. / M.Sc. or equivalent with a CGPA 6.0 on a 10 point scale or 60% marks in aggregate for General / OBC (non-creamy layer) category students (relaxed to 55% or 5.5 in CGPA for SC/ST/PH category students) with GATE score of 300 or qualifying score which is higher (relaxed to 200 for SC/ST/PD category). B.Tech. from IITs with CGPA of 8.0 without GATE are also eligible.
<b>M.TECH Part Time (3 Years)</b>	Qualification is same as M.Tech (Full Time). The Candidate must submit No Objection Certificate from the employer. The Candidates are exempted from Indian national level exams for admission.
<b>M.TECH Sponsored FT/PT</b>	Qualification is same as M.Tech (Full Time). The Candidate must submit Sponsorship Certificate from the employer. The Candidates are exempted from Indian national level exams for admission.
<b>Ph.D. (Full Time)</b>	<p><b>M.Tech/M.Sc:</b> 60% Marks or 6.0 CGPA on a 10 – point scale for general/OBC (non-creamy layer) category students (relaxed to 55% or 5.5 in CGPA for SC/ST/PH category students)</p> <p>If the previous degrees are M.Sc and B.Sc, candidates should have taken both Physics and Mathematics at the undergraduate level.</p> <p>M.Sc candidate should have valid GATE score <math>\geq 350</math> for general and OBC (non-creamy layer) category students (relaxed to 250 for SC/ST/PH category students) or qualifying score whichever is higher, CSIR/UGC-</p>

	net/NBHM/ICAR/ICMR/DST INSPIRE fellowship. Requirement of GATE/National Exam shall be waived off for M.Sc. graduates from IITs or Integrated M.Sc. programmers in CFTIs (Centrally Funded Technical Institutions) with CGPA of 8.0 or above (on a 10 point scale) The discipline should be relevant to CAS Ph.D. program.
<b>Ph.D. (Part Time)</b>	Same as for Ph.D. full time. Minimum experience of 2 years and No Objection Certificate from the employer is required.
<b>Ph.D Sponsored FT/PT</b>	Qualification is same as Ph.D. (Full Time). The Candidate must submit Sponsorship Certificate from employer. National level exam is waived off.

\* Foreign nationals are exempted from Indian national level exams for admission to M.TECH and Ph.D. program. All other criteria remain same.

\*\* Shortlisted Candidates fulfilling the above criteria will be interviewed for final selection.

\*\*\* For latest information, the candidates may kindly check this

URL: [https://ecampus.iitd.ac.in/ILS/help\\_doc/Information\\_Brochure\\_1\\_Sem.pdf](https://ecampus.iitd.ac.in/ILS/help_doc/Information_Brochure_1_Sem.pdf)

\*\*\*\* Higher requirements for the GATE scores may be set.

## ADMISSION SCHEDULE

Degree	Admission	Application Process
M.Tech	July	Starts in March
Ph.D.	July and January	Starts in March for July Admission and in October for January Admission

## FEES

All selected foreign nationals will be required to pay fees as follows:

USD 2,000 (tuition fees) + 7285 (miscellaneous charges in INR) per semester for SAARC countries.

USD 4,000 (tuition fees) + 7285 (miscellaneous charges in INR) per semester for countries other than SAARC countries.

\* Foreign Nationals will get the same fellowship as per the Indian Nationals.

For latest information may kindly check this

URL: <http://www.iitd.ac.in/research/fguide.pdf>

## FACULTY RECRUITMENT

CAS invites applications from well qualified Indian Nationals, Persons of Indian Origins (PIOs), Overseas Citizens of India (OCIs) and Foreign Nationals for the faculty positions at all the levels. Salary structure for foreign nationals is same as Indian nationals at IIT Delhi.

### ASSISTANT PROFESSOR:

Ph.D. with 3 years' experience (excluding the experience gained while pursuing Ph.D.) for Grade I only. For Grade II, no such experience is required, First Class or equivalent grade in preceding degree in respective discipline, with a consistently good academic record, Potential for very good teaching, Maximum age is 35 years for male and 38 years for female candidates to be relaxed by 5 years in case of persons with physical disability, SC and ST and 3 years in case of OBC, and at least 4 refereed conference/journal papers (of which at least 2 should be in reputed journals).

**ASSOCIATE PROFESSOR:**

Ph.D. with 6 years' experience (excluding the experience gained while pursuing Ph.D.) of which at least 3 years should be as Assistant Professor or equivalent, First class or equivalent grade in preceding degree in respective discipline, with a consistently good academic record, should have demonstrated capability for good teaching, at least 10 refereed conference/journal papers (of which at least 4 should be in reputed journals, out of which at least 2 in last 3 years), and completed at least one sponsored R&D or consulting project as a PI, or completed two sponsored R&D or consulting projects as a co-PI.



**PROFESSOR:**

Ph.D. with 10 years' experience (excluding the experience gained while pursuing Ph.D.) of which either. At least 4 years should be as Associate Professor or equivalent, or At least 8 years should be as Assistant Professor or equivalent (in case of Institutions where the post of Associate Professor or equivalent does not exist), First class or equivalent grade in preceding degree in respective discipline, with a consistently good academic record, Should have demonstrated excellence in teaching. At least 20 refereed conference /journal papers (of which at least 8 should be in reputed journals, out of which at least 3 in last 4 years), should have guided independently at least one Ph.D. student, or have guided at least two Ph.D. students jointly with other faculty/researchers, and Completed: One sponsored R&D or consulting project as a PI, and one more sponsored R&D or consulting project as a PI, or two sponsored R&D or consulting projects as a co-PI.

**POST DOCTORAL FELLOWS**

Ph.D. with First class or equivalent grade in preceding degree in respective discipline, with a consistently good academic record. Maximum age is 32 years for male and 35 years for female candidates (to be relaxed by 5 years in case of persons with physical disability, SC and ST and 3 years in case of OBC-NCL). At least 2 referred conference/journal papers (of which at least 1 should be in reputed journals).

<b>FACULTY</b>
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	<p><b>Mohan, Manju — Professor &amp; Head</b>  Ph. D. (Indian Institute of Technology Delhi)  Numerical Modeling of the Atmospheric Boundary Layer, Chemical Transport Modeling and Atmospheric Pollution Studies, Heat Island Measurements and Modeling, Urban Climate, Science of Extreme Weather</p> <p>Tel: +91- 11-2659 1301, 1313 (O), Fax: +91-11-2659 1386  Email: hodcas@admin.iitd.ac.in ; <a href="mailto:mmanju@cas.iitd.ac.in">mmanju@cas.iitd.ac.in</a>; Webpage: web.iitd.ac.in/~mmanju</p>
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	<p><b>Dey, Sagnik</b> — Associate Professor  Ph. D. (Indian Institute of Technology Kanpur)  Air Quality, Climate Change and Human Health; Aerosol-Cloud-Climate Interaction; Remote Sensing of the Earth's Climate System</p> <p>Tel: +91-11-2659 1315 (O), Email: <a href="mailto:sagnik@cas.iitd.ac.in">sagnik@cas.iitd.ac.in</a>; Webpage: <a href="http://web.iitd.ac.in/~sagnik">web.iitd.ac.in/~sagnik</a></p>
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	<p><b>Pant, Vimlesh</b> — Associate Professor  Ph. D. (University of Pune)  Physical Oceanography, Ocean Modeling, Air-sea interaction, Atmospheric Aerosols, Meteorological and Oceanographic Observations</p> <p>Tel: +91-11-2659 1319(O), Email: <a href="mailto:vimlesh@cas.iitd.ac.in">vimlesh@cas.iitd.ac.in</a>;  Webpage: <a href="http://web.iitd.ac.in/~vimlesh">web.iitd.ac.in/~vimlesh</a></p>
	<p><b>Ganguly, Dilip</b> — Assistant Professor  Ph.D. (Physical Research Laboratory, Ahmedabad)  Aerosol-Cloud-Precipitation Interactions, Cloud Parameterizations, Radiative Forcing and Climate Change, Climate Sensitivity and Feedback Processes, Climate Diagnostics, Monsoon Dynamics</p> <p>Tel: +91-11-2659 6401(O), Email: <a href="mailto:dilipganguly@cas.iitd.ac.in">dilipganguly@cas.iitd.ac.in</a>;  Webpage: <a href="http://web.iitd.ac.in/~dilipganguly">web.iitd.ac.in/~dilipganguly</a></p>

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	<p><b>Maithili Sharan</b>— Emeritus Professor  Ph. D. (Indian Institute of Technology Delhi)  Air Pollution Modeling, Atmospheric Boundary Layer,  Computational and Mathematical Methods, Physiological Fluid  Dynamics</p> <p>Tel: +91-11-2659 1312 (O), Email: <a href="mailto:mathilis@cas.iitd.ac.in">mathilis@cas.iitd.ac.in</a>;  Webpage: <a href="http://web.iitd.ac.in/~mathilis">web.iitd.ac.in/~mathilis</a></p>

## CONTACT

### Head, Centre for Atmospheric Science

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Cover Image, Colckwise from top left: IIT Delhi under heavy fog, warming (°C) predicted for the end of 21<sup>th</sup> Century by climate models; emissions from industrial smokestacks; satellite image of Cylone Phailin.