

FINAL REPORT

Two-day MHRD-TEQIP-KIT Workshop

ON

OCEAN AND ATMOSPHERIC SCIENCES –CURRENT TRENDS

July 18-19, 2014

**Prof. E. CHANDRASEKHAR
(Convener)**

**Prof. VIKRAM M. GADRE
(National TEQIP Coordinator)**



Indian Institute of Technology BOMBAY

POWAI, MUMBAI – 400 076

September 2014

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Acknowledgements

At the outset, we express our sincere thanks to Prof. Vikram M. Gadre, Head, CDEEP (Centre for Distance Engineering Education Programme) IIT Bombay and also the national TEQIP (Technical Education through Quality Improvement Programme) coordinator, for his timely help and for his keen interest to extend the financial support to the workshop through TEQIP grants, under the Knowledge Incubation under TEQIP (KIT) initiative of Ministry of Human Resources, Govt. of India. I place on record the immense support that we have received from the members of the programme committee in conducting this workshop, who were instrumental in overseeing the overall proceedings of the workshop.

We express our gratitude and sincere thanks to all the invited speakers, who have readily agreed to present their talks and made the workshop, a grand success. Our sincere thanks are also due to all the participants from TEQIP colleges and institutes in Maharashtra, who were very keen to participate the workshop. Particularly, we would like to thank Prof. Mukul Sutaone, COE Pune, who was instrumental in coordinating all the participants from TEQIP colleges.

Without the active and continued cooperation of members of the local organizing committee, particularly, Prof. Anil Kulkarni, Prof. Manas R. Behera, Prof. R. Balaji, Ms. Seema Kumbhar, Mr. D. Ramesh and Mr. Prakash Kharat, this workshop could not have been successfully conducted. Our sincere thanks are also due to the students of Prof. Behera and Prof. Balaji, who actively coordinated the transport and registration arrangements.

The constant cooperation of technical staff of CDEEP, IIT Bombay is worthy of mention. I express my sincere thanks to Ms. Dipti Kulkarni, who is responsible for web design and maintenance of the workshop webpage (<http://www.cdeep.iitb.ac.in/OAS2014/index.php>). The audio and video team of CDEEP is thanked for their continuous monitoring of the workshop proceedings on the both days.

Last, but not the least, I sincerely thank the staff of accounts division, Ms. Sivakami and Mr. Prahlad, for their kind cooperation in maintaining expenditure details of the workshop.

1. Introduction

The subject of oceanic and atmospheric sciences deals with the thorough understanding of the nature of different varieties of geophysical disturbances, their time and duration of occurrence, their structure and evolution, morphology, influence of the Earth on them and how they drive the general circulation of the Earth's atmosphere. Thus, the dynamics of oceans and atmosphere inherently becomes complex and involves transfer of radiation, phase changes between liquid, water, ice and vapor and composite interaction between them on a broad scale in space-time. As a result, the interplay between dynamics of ocean and atmosphere manifests a strong influence on the Earth's climate on regional and global scales. Therefore, it is always important and essential to establish a quantitative understanding of these complex natural processes by generating various oceanic and atmospheric circulation models and their suitable application in effective understanding of the Earth's atmospheric convection, weather systems and climate studies, both on regional and global scales.

One of the important points made in the vision document of Ministry of Earth Sciences (MoES) of 2010 is “.....*Progress from the current status of atmospheric sciences in India cannot be achieved, unless there is a large increase in the number scientists working in these areas in government as well as universities.....*”. Motivated by this observation of MoES, an idea was mooted to explore the possibility of developing a strong research and academic program at IIT Bombay in ocean and atmospheric sciences. IIT Bombay has its core competency in various allied fields of ocean and atmospheric sciences, viz., fluid dynamics, signal processing, electromagnetics, ocean technology & ocean engineering. This is complemented by SAMEER (Society for applied microwave electronics engineering and research), whose core competency is in atmospheric instrumentation and is located within the IITB campus. This whole idea, when presented before all the faculty of IITB through its Institute Faculty Meeting, got an instant encouragement and support. The Director, IITB, also appreciated and encouraged it to be taken to the next level. Subsequently, a group of faculty from IITB and the Head, atmospheric instrumentation division, SAMEER, have decided that a workshop, wherein experts from across the country can deliberate and identify the gap areas in the field of ocean and atmospheric sciences, will be timely and essential.

A two-day workshop on “Ocean and Atmospheric Sciences-Current Trends” (OAS2014), sponsored by MHRD-TEQIP-KIT and organized by CDEEP (Centre for Distance Engineering Education Programme), IIT Bombay was held during July 18-19, 2014. Around 100 participants including faculty and students from various TEQIP colleges and institutes, IITB and other colleges in India, actively participated in the workshop.

The objective of the workshop was to provide a comprehensive understanding of recent advances in oceanic and atmospheric research together with advances in associated instrumentation. It also aimed at identifying future academic and research directions in ocean and atmospheric sciences. Accordingly, experts in the fields of ocean and atmospheric sciences were invited to deliver lectures.

2. About Knowledge Incubation under TEQIP Initiative of MHRD, Govt. of India at IIT Bombay

Under the Knowledge Incubation under TEQIP (KIT) initiative of the Ministry of Human Resources Development (MHRD), Government of India, the Centre for Distance Engineering Education Programme (CDEEP) of IIT Bombay has been planning and conducting several activities pertaining to pedagogy, educational outreach, educational and institutional academic system reform, research and developmental activities of a collective nature involving TEQIP Institutes and other educational institutes of repute in and around Mumbai. CDEEP will be pleased to provide on time information about the endeavours planned and undertaken and the followup planned for the activities undertaken.

While the following details the list of activities and endeavours as we see on this date, it is likely that we shall also initiate other activities in due course, as and when further possibilities arise and ideas occur to us through discussion with stakeholders.

2.1. Completed and Ongoing Activities under MHRD-TEQIP-KIT initiative

- Research Scholars and Alumni Symposium (RSAS - 2014)
- Industry – Academia collaboration at Project Institutes

- Pedagogy/Research training and academic interaction in focused areas of engineering and technology
- Upgradation of research and academic facilities at CDEEP and Interdisciplinary Programme in education technology (IDP-ET) at IIT Bombay
- Revamping the Curricular structure of various institutions
- Student Mentor Programme at TEQIP Institutes and Institutes of repute
- One-day workshop on “Application of Wavelets”
- Workshop on Ocean and Atmospheric Sciences –Current Trends (OAS 2014)
- Conference on Design Development Show (DDS 2014)
- Workshop on Recent Advances in Chemical Engineering Research

2.2. Planned Activities under MHRD-TEQIP-KIT initiative

- Student Mentor Programme at TEQIP Institutes and Institutes of repute
- National Workshop on some Modern Aspects of Control Engineering
- National Communications Conference (NCC-2015)
- Visit of IIT Bombay faculty/students to TEQIP institutes and vice-versa (Exchange programme)

More details about the CDEEP and TEQIP activities can be found at <http://www.cdeep.iitb.ac.in>.

3. Themes of the workshop

1. Recent Trends in Weather Forecasting and Climate Dynamics
2. Ionospheric Studies and Space Weather Effects
3. Role of Novel Signal Analysis Tools in Ocean and Atmospheric Sciences
4. Extreme Events of Ocean and Coastal Processes
5. Instrumentation in Ocean and Atmospheric Studies

4. Committees

4.1. Convener

Prof. E. Chandrasekhar, Department of Earth Sciences, IIT Bombay

4.2. Program Committee

Prof. E. Chandrasekhar, Dept. of Earth Sciences, IIT Bombay

Prof. Manas R. Behera, Dept. of Civil Engineering, IIT Bombay

Prof. V. M. Gadre, Dept. of Electrical Engineering, IIT Bombay

Prof. S. V. Kulkarni, Dept. of Electrical Engineering, IIT Bombay

4.3. Local Organizing Committee

Prof. A. Chatterjee, Dept. of Aerospace Engineering, IIT Bombay

Prof. R. Balaji, Dept. of Civil Engineering, IIT Bombay

Prof. Manas R. Behera, Dept. of Civil Engineering, IIT Bombay

Prof. S. Gopalakrishnan, Dept. of Mechanical Engineering, IIT Bombay

Prof. Kausik Bodi, Dept. of Aerospace Engineering, IIT Bombay

Ms. Seema Kumbhar, CDEEP, IIT Bombay

Ms. Dipti S. Kulkarni CDEEP, IIT Bombay

Mr. Ramesh Deshmukh, Dept. of Earth Sciences, IIT Bombay

Mr. Prakash Kharat, Dept. of Earth Sciences, IIT Bombay

5. List of Invited Speakers and titles of their talks

i) Prof. G. S. Bhat, CAOS, IISc, Bangalore

Monsoonal boundary layer characteristics over the Bay of Bengal & Arabian Sea

ii) Prof. A. D. Rao, CAS, IIT Delhi

Storm surges and associated coastal inundation in the climate change scenario

iii) Prof. V. P. Dimri, CSIR-NGRI, Hyderabad

Modelling of tsunami waves from Sumatra and Makran subduction zones

iv) Prof. Archana Bhattacharya, IIGM, Navi Mumbai

Challenges in understanding the variability of Earth's upper atmosphere

v) Prof. Mukul Sutaone, COE, Pune

An Overview of Time Series Modeling and Analysis

vi) Prof. V. Sundar, IIT Madras

Coastal protection and adaptation along the Indian coast

vii) Prof. Vethamony, NIO, Goa

Coastal processes during extreme weather events

viii) Prof. M. V. Ramana Murthy, NIOT, Chennai

Modelling of structures for extreme waves

ix) Prof. B. Mukhopadhyay, IMD, Pune

Current and future trends in atmospheric instrumentation: An overview

x) Prof. Anil Kulkarni, SAMEER, Mumbai

Development of atmospheric instruments and radars at SAMEER

xi) Prof. E. Chandrasekhar, IIT Bombay

Self-induction effect of ocean & its influence on electromagnetic induction response

xii) Prof. R. Balaji, IIT Bombay

Modelling of coastal hydrodynamics

6. Recommendations of the Panelists

6.1. The Panelists

- | | | | |
|---|---|----|---|
| 1 | Prof. G. S. Bhat (former Chairman)
Center for Atmospheric and Ocean Sciences
J.C. Bose National Fellow
Indian Institute of Science, Bangalore | 6 | Dr. M. V. Ramana Murthy
Scientist-G
National Institute of Ocean Technology,
Chennai |
| 2 | Prof. V. P. Dimri , FNA, FNASc, FTWAS
AcSIR Distinguished Professor and INSA Senior
Scientist, CSIR-NGRI, Hyderabad | 7 | Prof. V. M. Gadre
Prof. of Electrical Engineering
Indian Institute of Technology, Bombay |
| 3 | Prof. Archana Bhattacharya , FNA, FNASc, FASc
Emeritus Professor and J. C. Bose National Fellow
Indian Institute of Geomagnetism, Navi Mumbai | 8 | Dr. B. Mukhopadhyay
Deputy Director General
India Meteorological Department, Pune |
| 4 | Prof. A. D. Rao
Prof. and Head, Centre for Atmospheric Studies
Indian Institute of Technology, Delhi | 9 | Dr. Anil Kulkarni
Scientist G and Head of Atmospheric
Instruments Group, SAMEER, Mumbai |
| 5 | Prof. V. Sundar
Professor of Ocean Engineering
Indian Institute of Technology, Madras | 10 | Prof. E. Chandrasekhar
Professor of Geophysics
Indian Institute of Technology Bombay |

6.2. Discussion

Prof. G. S. Bhat appreciated the very idea behind holding this workshop and stressed on the need for improving two major areas in the field of ocean and atmospheric sciences. They are (i) instrumentation and (ii) signal analysis. He believed that these are the two major areas, where enough expertise both in ocean sciences and atmospheric sciences is not available in India. This was supported by Dr. Ramana Murthy. They also expressed their concern on the job prospects of students and research scholars working these fields. However, Prof. Bhat suggested exploring the possibility of tying up with some private companies, which use weather information and develop prediction models, thereby establishing a commercial unit called weather information technology. Touching on this important aspect of job prospects, Dr. Mukhopadhyay identified four important areas to improve/build. They are (i) climate impact assessment, (ii) Developing skills in data analysis techniques, (iii) Improving remote sensing skills and (iv) Standardization of atmospheric and oceanic instrumentation. He suggested that on these issues, India Meteorological Department (IMD) can also provide projects and facilitate internships. Prof. Gadre suggested that it could be possible to look out for students and scientists already employed in various government labs and other research organizations to enroll for higher studies in the field of ocean and atmospheric sciences at IITB for career improvement.

Prof. A. D. Rao opined that IIT Bombay will be an ideal place, if it would want to start a new program in ocean and atmospheric sciences. He stressed that IITB, with its faculty specializing in the diverse fields of fluid dynamics (Dept. of Aerospace and Dept. of Mechanical engineering), signal analysis and electromagnetics (Dept. of Electrical engineering and Dept. of Earth Sciences), ocean technology and ocean engineering (Dept. of Civil engineering), and atmospheric instrumentation at SAMEER, can jointly think of developing a new centre for ocean and atmospheric sciences and help realize the nation's mandate in the field of ocean and atmospheric sciences and reduce gaps of instrumentation and signal analysis in this field of research.

Prof. Archana Bhattacharya and Prof. Dimri suggested that in addition to focusing on developing signal analysis techniques and atmospheric instrumentation facilities, remote sensing aspects of ocean and atmospheric sciences could also be looked into. Together with all of the above suggestions, they opined that IIT Bombay could develop a good IDP (inter disciplinary program) in ocean and atmospheric sciences. On the academic front, Prof. Gadre suggested that a 'minor' in ocean and atmospheric sciences can be offered at IITB at undergraduate and postgraduate levels and train students in the gap areas of instrumentation, modelling and signal processing.

Dr. Anil Kulkarni opined that a synergy between the strong R&D in instrumentation from SAMEER and technical and engineering expertise from IITB will definitely form a much needed strong initiative on ocean and atmospheric sciences program at IITB. He also expressed that collaboration between SAMEER and other IITs will also be beneficial for such an initiative.

Prof. Mukul Sutaone of College of Engineering, Pune, expressed that the centre of Excellence established in their college under TEQIP is very keen and excited on pursuing the joint research and studies on various multidisciplinary themes of OAS, exploring possibility of deploying varied algorithms and tools in Signal processing towards prediction, estimation and forecasting issues in OAS.

6.3. Summary and Way Forward

All panelists agreed that it is in our prime interest to first concentrate on capacity building measures with long-term and short-term perspectives. It was also suggested that a continuous seminar series and/or group discussions should be held to update the current advances in ocean and atmospheric research, being carried out nationally and internationally. To start with, a brainstorming session with well-established government organizations (IMD, Indian Navy) and national research labs (NIO, NIOT, SAMEER) and other centers of excellence (IITs, IISc) was suggested to be very important and essential to chart out a comprehensive program that can chiefly address the issues raised in the Government's vision document. All the panelists agreed that IIT Bombay, with its reputed science and engineering faculty, specialized in advanced computational techniques

particularly in fluid dynamics and signal analysis and various allied field of ocean and atmospheric sciences is an ideal place to start a new program on ocean and atmospheric sciences. They also felt that SAMEER, a pioneer in atmospheric instrumentation, being located within the campus of IITB is an added advantage and thus they can jointly develop a strong curriculum addressing the gap areas identified by the experts.

7. Appendix –A

Technical Program Schedule

I. Day 1: Friday, July 18, 2014.		Venue: Lecture Hall # 21; VMCC, 2nd Floor
1. Registration		9:00 am – 9:30 am
2. Inauguration, opening remarks, welcome address, etc.		9:30 am – 10:15 am
3. High Tea		10:15 am – 10:45 am
4. SESSION- I		10:45 am – 1:00 pm
	Chair: Prof. E. Chandrasekhar ; Co-chair: Prof. V. M. Gadre	
G. S. Bhat		10:45 am – 11:30 am
	<i>Monsoonal boundary layer characteristics over the Bay of Bengal and Arabian Sea</i>	
Archana Bhattacharya		11:30 am – 12:15 pm
	<i>Challenges in understanding the variability of Earth's upper atmosphere</i>	
V. P. Dimri		12:15 am – 1:00 pm
	<i>Modelling of tsunami waves from Sumatra and Makran subduction zones</i>	
5. Lunch (3rd floor Banquet Hall, Gulmohar Restaurant)		1:00 pm – 2:30 pm
6. SESSION-II		2:30 pm – 4:00 pm
	Chair: Prof. R. Balaji; Co-chair: Prof. Manasa R. Behera	
M. V. Ramanamurthy		2:30 pm – 3:15 pm
	<i>Modelling of structures for extreme waves</i>	
Vethamony		3:15 pm – 4:00 pm
	<i>Coastal processes during extreme weather events</i>	
7. Tea break		4:00 pm – 4:30 pm
8. Panel Discussion		4:30 pm – 5:30 pm
Members:		
Prof. G. S. Bhat		
Prof. Archana Bhattacharya		
Prof. V. P. Dimri		
Prof. M.V. Ramanamurthy		
Prof. V. M. Gadre		
Prof. E. Chandrasekhar		
9. Workshop Dinner (Gulmohar 3rd floor Banquet Hall)		7:30pm – 9:30 pm

- 1. SESSION-III** **9:30 am – 1:00 pm**
Chair: Prof. A. D. Rao; Co-chair: Prof. V. Sundar
 - A. D. Rao 9:30 am – 10:15 am
Storm surges and associated coastal inundation in the climate change scenario
 - V. Sundar 10:15 pm – 11:00 am
Coastal protection and adaptation along the Indian coast
- 2. Tea break** **11:00 am – 11:30 am**
 - Mukul S. Sutaone 11:30 am – 12:00 pm
An Overview of Time Series Modeling and Analysis
 - B. Mukhopadhyay 12:00 pm – 12:30 pm
Current and future trends in atmospheric instrumentation: An overview
 - Anil Kulkarni 12:30 pm – 1:00 pm
Development of atmospheric instruments and radars at SAMEER
- 3. Lunch (3rd floor Banquet Hall, Gulmohar Restaurant)** **1:00 pm – 2:30 pm**
- 4. SESSION-IV** **2:30 pm – 4:00 pm**
Chair: Prof. S. V. Kulkarni; Co-chair: Prof. S. Gopalakrishnan
 - E. Chandrasekhar 2:30 pm – 3:00 pm
Self-induction effect of ocean and its influence on electromagnetic induction response
 - R. Balaji 3:00 pm – 3:30 pm
Modelling of coastal hydrodynamics
- 5. Tea break** **3:30 pm – 4:00 pm**
- 6. Panel Discussion** **4:00 pm – 5:00 pm**

Members:
 - Prof. A. D. Rao
 - Prof. S. V. Kulkarni
 - Prof. Vethamony
 - Prof. V. Sundar
 - Dr. Anil Kulkarni
 - Prof. R. Balaji
- 7. Concluding Remarks and Closing** **5:00 pm – 5:30 pm**
- 8. Dinner (2nd floor Hall, Gulmohar Restaurant)** **7:30 pm – 9:30 pm**

8. Appendix – B

List of Participants from TEQIP Colleges and Institutes

Participants from VJTI Institute, Mumbai

S.no	Name	S.no	Name
1	Ashwin Kamble	2	Ashish Kodape
3	Ashish Sahare	4	Ashiwini Visave
5	Arpan Shah	6	Ashlesha Kolap
7	Avinash Dhaigude	8	Amol Sapkal
9	Bhaskar Dohare	10	Ganesh Ghule
11	Digambar Puri	12	Devendra Shetye
13	Ganesh Sonar	14	Kranti Kamble
15	Mohit Adgokar	16	Manish Upadhye
17	Nikhil Gaikwad	18	Nitin Jagtap
19	Pooja Tendulkar	20	Pramod Kachare
21	Patel Farhan	22	Renu Bhadresha
23	Prof.Rahul Ingle	24	Rao Yogesh
25	Rohit Piske	26	Smith Khare
27	Shubhrant Jibhkate	28	Sneha Jambhulkar
29	Sushant Chavan	30	Shivraj Rathod
31	Prof. Vikram Kehri	32	Vikrant Shingne
33	Wagh Rameshwar Ashok	34	Prof. Yogesh Wankhede
35	Yogesh Varma	36	Swetha Warade
37	Bhimrao Jadhav	38	Nikhil Chourasia
39	Amey Renge	40	Dipika Tayde

Participants from COEP Institute, Pune

S.no	Name	S.no	Name
41	Dr. Mrs.Aruna Thube	42	Avinash Gawade
43	Aditya Patil	44	Dr.Mrs.Kavitha Suranje
45	Dr.Mahesh Shindikar	46	Prof. M. S. Sutaone
47	Prasad Kulkarni	48	Pravin Pawar
49	Dr. PP Bartakke	50	Ms. Rashmi More
51	Sachchidanand Shinde	52	Dr. Mrs. V.S. Vyas
53	Yogesh Deshpande		

Participants from other institutes

54	Mr.Pandurang Shaji Londhe (GGSJET)	55	Alok Ranjan (NIT Nagaland)
56	Dr. G. Vivekanandan (Tamilnadu)	57	Avinash Phirke, Watumull Institute,Mumbai
58	Mahesh, Fishery survey of India, Mumbai	59	Mandar Prabhakar Gurav
60	Sachin Shende (SGGSE&T)		

Participants from IIT Bombay

70	Prof.E.Chandrasekhar	71	Prof. Manasa Ranjan Behera
72	Prof. V. M. Gadre	73	Prof. S.V.Kulkarni
74	Prof.A.Chatterjee	75	Prof. R. Balaji
76	Prof. S. Gopalakrishnan	77	Prof. Kowsik Bodi
78	Deshmukh Ramesh	79	Prakash Kharat
80	Sathish Kumar	81	Vivek Francis
82	T.Megashyam	83	Siva Naik
84	Arvind patil	85	Arun Kalwankar
86	Sahana Murthy	87	Seema Kumbhar
88	Tarun negi	89	Sandeep jadhav
90	Ranjeet solanki	91	Kishore bhamble
92	Kishore bhamble	93	Vidya Mhaske
94	Pallavi Gaikwad	95	Nisha waje
96	Dipti Kulkarni	97	Mahesh ghadi
98	Sugandh sawant	99	Swapnil More
100	B.Mhatre	101	Prakash solanki
102	Laxman vemula	103	Krupa
104	Ashfaq	105	Subakar
106	Prashnt Salunkhe(IRCC)	107	Ankita Misra(CIVIL)
108	Suresh Kumar (SAMEER)	109	Bharati Shende (SAMEER)
110	Ajay Khandare(SAMEER)	111	B Sairam
112	Dwiya Nayak	113	Mehak
114	Rajshekhar (SAMEER)	115	Dr Ajay singh
116	Salewi Jeyasekharan (civil)	117	Agleema Shah (civil)
118	Aditi Pande	119	Pol mukul (civil)
120	Rajendra Kumar (civil)	121	P krishnendu (civil)
122	Roshan E (civil)	123	Visvikar Kushwaha
124	Mahadev Patil	125	Neethu Pradup
126	Swathy Smelen	127	Jathin Chugh
128	Karan Gupta	129	Remsiya V. R.(civil)
130	Madhusudan (Civil)	131	Sampad Panda
132	Goutam	133	Jayasankar
134	Ritesh Gautam(CSRE)	135	Santosh Honyallcar (VMCC)
136	Anand Kakade(VMCC)	137	Yashashve Kulha (SAMEER)

9. Appendix – C

Glimpses of the OAS2014 workshop



Prof. E. Chandrasekhar (Convener, OAS2014), addressing the audience on inauguration day.



Prof. G. S. Bhat speaking on the inauguration day. On the Dias (from Left): Prof. E. Chandrasekhar, Prof. V. P. Dimri, Prof. Archana Bhattacharya, Dr. M. V. Ramana Murthy and Prof. S. V. Kulkarni



Participants at the Workshop



Panel Discussion: Day – I.



Prof. V. M. Gadre explaining the audience about the TEQIP-KIT initiative of MHRD, Govt. of India.



Members of the local organizing committee along with the Panelists on Day-II.



Participants from COE, Pune.



Participants from IIT Bombay and other institutes.



Participants from TEQIP college, VJTI, Mumbai.



Participants from TEQIP college, Nanded, Maharashtra