



IASTA  
e-Bulletin

January 2013

*Coalescing Science, Dispersing Technology*

In This Issue

## Launch of the IASTA e-Bulletin

Aerosols play diverse roles in modulating the Earth's climate and impacting agriculture and human health. Aerosol research in India has grown manifold in the past few decades. Ground-based monitoring network has expanded, while several coordinated field campaigns were carried out, both over the Indian landmass and surrounding oceans, to understand the space-time variability of aerosol microphysical, chemical, optical and radiative properties. Observations by new generation satellites are increasingly used to complement the in-situ measurements. Climate models are being developed to incorporate aerosols for more accurate simulation of the atmospheric circulation and precipitation. New research initiatives are taken in emerging sub-areas such as nanoparticle science & technology and bio-aerosols in the country.

Besides some on-going intense aerosol observational programs, several national research initiatives were taken in the recent years. The "National Carbonaceous Aerosol Programme (NCAP)" was launched under the patronage of Ministry of Environment and Forest, Govt. of India to understand the role of carbonaceous particles in influencing the regional climate, precipitation pattern and Himalayan glaciers. One of the major science

objectives of the "Continental Tropical Convergence Zone (CTCZ)" programme under the auspices of Ministry of Earth Sciences, Govt. of India is to understand the role of aerosols in the variability of Indian monsoon through aerosol-cloud interaction. A national network programme on "Climate Change and Human Health" initiated by DST, Govt. of India identifies "Air Pollution" as one of the key thematic areas.

IASTA has been working towards promotion of aerosol science and technology in the country by way of organising conferences on topical themes, workshops and lectures; and publishing these proceedings as bulletins. To increase the frequency of these bulletins, it was decided by the General Body that the e-format may be adopted. Beginning with this issue, IASTA is launching the web-based version to encourage students, researchers and industry partners to send their contributions for the bulletin and hope that the new design will be reader-friendly.

**Sagnik Dey**  
Editor, IASTA e-Bulletin

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Cover Image: MODIS image of haze over India and Bangladesh on 24th Jan 2013  
Image Courtesy: MODIS Land Rapid Response Team, NASA GSFC

## Foreword

Aerosols are minute particles suspended in the atmosphere and they exist everywhere in the universe. Their significant scientific and technological applications in diverse fields such as atmosphere and ocean science, agriculture, pollution, industry and medicine have been realized (much deeper) many fold in recent years. Aerosol research in India has begun way back in late 1970s around the MONsoon Experiment (MONEX-79). Subsequently, in order to keep pace with the developments all over the world, the Aerosol Science and Technology Association (IASTA) was launched in 1988 by scientists, technologists and entrepreneurs. Since then, all the premier Research Institutions and Universities of both Government and Private Sectors have advanced these activities and now pursuing the new challenges in the field. IASTA is a member of the prestigious International Aerosol Research Assembly (IARA) and has currently over 400 members spreading over scientific, medical, industrial and academic domains. It also has been providing an active liaison between its members in India and those of AAAR (USA), Aerosol Society (UK), GAeF (Germany), JAAST (Japan), NOSA (Norway), COSERA (France) and many more associations.

India being a tropical country, the convective motions and high-altitude thunderstorms, having large vertical wind velocities affects the altitude profiles of aerosols, trace gases and their precursors / bi-products. In recent years, one of the most targeted areas of aerosol science is its potential role in climate and climate change. A variety of studies, some of them for the first time in Asia, have been carried out by the members of IASTA family. Much work needs to be done to bring the field more matured. Some of the major research gaps and the requirements to bridge them include the following:

- Long-term datasets from multi-site, multi-platform direct and remote sensing systems are essential for better quantification, identification

of sources/sinks and modeling of the impacts of aerosols and gases on air pollution / quality, hydrological cycle, weather and climate.

- Besides the stationary systems, new generation, superfine space-time resolution, mobile profilers need to be developed for multi-dimensional mapping of aerosols and gases in different environments. Data from such systems in network-mode will play a vital role in reducing uncertainty in radiative forcing estimations.
- Develop aerosol models (preferably coupled models) such as GCMs in order to delineate aerosol and pre-cursor gas influence on weather and climate through their modulating effects on radiation changes. For this purpose, we need good Parameterization (Super) Schemes and Data Assimilation Techniques. Sensitivity studies should also go on for continuous model improvements. Boundary-layer processes (e.g., entrainment), phase (external versus internal mixing), composition (hydrophilic versus hydrophobic), latent heat release by clouds and complete chemistry (including nitrogen) need to be incorporated in the models.

As the existing research programs are continuing and new proposals coming in, it is hoped that the complex physico-chemical and radiative characteristics of aerosols, trace gas species are better understood, and observing techniques are further improved in the years to come to bring the field fruition.

**P.C.S. Devara**  
President, IASTA

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## IASTA 2012 Conference (December 11-13, 2012): A Brief Report

IASTA 2012 conference, organized jointly IASTA and Bhabha Atomic Research Centre, Mumbai, recently concluded in Mumbai, India. It brought together researchers, students and technologists to discuss recent advances in various fields of aerosol science and technology over three days. Nearly 200 papers were received, of which 173 were accepted oral presentations. These papers covered seven broad topics, viz. "Aerosol Characterization", "Aerosol Fundamentals", "Aerosol Instrumentation", "Aerosol Remote Sensing", "Aerosol Climatic Effects", "Nuclear and Radioactive Aerosols" and "Aerosols in Health and Agriculture". **The key note address on "Multi-functional nanohybrids for cancer therapy" was delivered by Prof. (Dr.) Dhirendra Bahadur of IITB, Mumbai.** Besides the contributed papers, four invited talks summarized the recent advances and highlighted the future needs in four important sub-disciplines of aerosol research. Dr. M. M. Sarin (PRL, Ahmedabad) focussed on the carbonaceous aerosols, particularly the secondary organics, while Dr. B. K. Sapro (BARC, Mumbai) highlighted some of the critical issues in nanoparticle measurements. Prof. A. Jayaraman (NARL, Gadanki) summarized the state-of-the-art remote sensing techniques to study aerosol characteristics and discussed the future requirement to further advance our understanding of the problem. Dr. Naresh Kumar (University of Miami, USA) provided insights into the influence of sporadic environmental interventions in redistributing pollutants and its possible impacts on regional climate and human health.

The conference attracted large participation from the industry, where several state-of-the-art instruments were exhibited. Alfatech Services representing Grimm Aerosol Technik, GmbH displayed Scanning Mobility Particle Sizer and Optical Particle Counter. TSI Instruments India Pvt. Ltd. representing TSI Incorporated, USA showcased Nano-SMPS, Aerosol Generators, Primary flow calibrators



Shri. K. Doraisamy, Vice-Chairman, AERB giving the Inaugural Address

and Bio-aerosol sizer. Tesscorn Systems India Pvt. Ltd. representing several companies (e.g. Cambustion Ltd., UK; Digitel Elektronik GmbH; Droplet Measurement Technologies, USA; Ecotech Pty Ltd., Australia; MSP Corporation, USA; Palas GmbH; Sunset Laboratory Inc., USA) displayed SMPS, Centrifugal Particle Mass Analyzer, Ecotech's Air quality Monitoring Systems, MOUDI sampler. MK Teknology Pvt. Ltd. representing Palas, GmbH exhibited Fog Generator, while DEKATI Ltd., Finland was represented by Swan Environmental West Pvt. Ltd. Aerosol generating system by Aerodyne Research, USA was displayed by Mars Bioanalytical Pvt. Ltd. Aethalometer and Particle aerodynamic Size Separator (PASS) were showcased by M & G Analyzer Systems representing Magee Scientific, USA and Electronic Enterprises (India) Pvt. Ltd. respectively.

One of the highlights of the conference was award distribution ceremony to encourage participation of young students.

In the "oral presentation" category, Mr. P.M. Shamjad from IIT Kanpur and Ms. Rajeshwari Raut from BARC, Mumbai bagged 1st and 2nd prize, respectively. The 3rd prize was shared by Ms. Poonam Tyagi from JNU, Delhi and Mr. Sushant Das from IIT Delhi. In the "poster presentation" category, 1st prize went to Mr. G. Harikishan from IITM, Pune, while the 2nd and 3rd prizes went to Ms. Aswathy, E.V. from IIT Madras and Mr.V.Ravi Kiran from NARL, Gadanki.



Dignitaries at the inaugural session



Participants viewing the research posters



Dr. B. K. Sapro (Secretary) and Shri. Arshad Khan (Treasurer) presenting mementos to the participants of the Exhibition on behalf of IASTA

More information on IASTA 2012 conference is available online at: <http://www.iasta.org.in/IASTA2012>

## Research News

### 1. Ganges Valley Aerosol Experiment (GVAX)

Our climate is strongly influenced by the manner in which solar radiation is absorbed and scattered in the Earth's atmosphere. Aerosols have a direct impact on the atmosphere as they scatter and absorb solar and infrared radiations and indirectly affect the cloud microphysics. On the other hand solar activity affects the overall dynamics of the atmosphere. Hence, the knowledge of aerosol characteristics is the basic requirement for understanding their impact on our environment. Meanwhile, the knowledge of the atmospheric dynamics and quantification of aerosol concentration is equally important to understand their impact on our climate as a whole. In this context, the Asian region assumes great importance because of its high population density and diverse human activities. Most of these studies focused to either urban/semi-urban landmass or oceans adjacent to densely populated coastal belt. However, such investigations from a remote high altitude and sparsely inhabited location have the importance of providing a sort of background against which the urban impacts can be compared. As Nainital is located geographically in the free troposphere, thus the atmospheric measurements from such a region have the importance for providing a sort of background atmospheric parameters against which the impact of aerosol-loading from far-off low laying regions can be assessed.

As the Indo-Gangetic Plain (IGP) region in the Northern India is one of the most populated and polluted regions of the Indian subcontinent and encompasses a variety of anthropogenic and biogenic source of aerosols and pollutants due to rapidly growing industrialization and expanding urbanization in recent years. Recent satellite-based measurements have indicated that the upper Ganges valley has some of the highest persistently observed aerosol optical depth values. However, the ground based observations are very limited to

verify the same. Based on the model study, the vertical lifting of pollutants from this region and the wide spread transport of aerosols and pollutants during the prevailing higher wind speed, hence influencing the radiation budget and thereby climate change over the wide region.

In view of this the first Atmospheric Radiation Measurement mobile facility (AMF1) has been set-up at ARIES, Manora Peak, Nainital (29.4° N, 79.5° E, 1958 m above mean sea level) under the Indo-US collaborative filed programme termed as "Regional Aerosol Warming Experiment (RAWEX) - Ganges Valley Aerosol Experiment (GVAX)". In order to make the measurements of atmospheric radiation, properties of aerosols & clouds and aerosol cloud interaction and their effect on regional climate and monsoon, a number of state-of-art-instruments were deployed at ARIES, during June 2011 to March 2012. The vertical profiling of meteorological parameters was also made using Radiosonde launches at 00, 06, 12, and 18 GMT on the regular basis. The vertical winds were measured using a wind profiler. A Doppler LIDAR and ceilometer were also operational.

**Dr. U. C. Dumka**  
ARIES, Nainital

#### GVAX Participating Scientists and Affiliations

##### ARIES, Nainital

- Dr. U. C. Dumka
- Dr. Manish Naja
- Dr. Narendra Singh
- Dr. D.V. Phanikumar
- Late Dr. P. Pant
- Prof. Ram Sagar

##### IISc, Bangalore

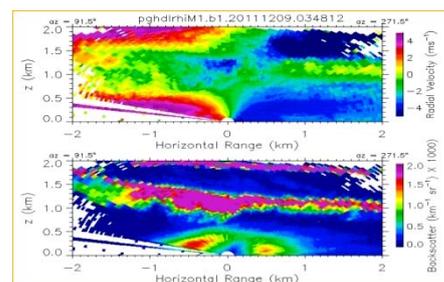
- Prof. S. K. Satheesh

##### SPL, VSSC, Trivandrum

- Dr. K. Krishna Moorthy

##### Argonne National Laboratory, USA

- Dr. V. R. Kotamarthi



LIDAR Data from Nainital



GVAX Research Group at ARIES, Nainital

### 2. Air Pollution and Human Health

Department of Science and Technology (DST), Government of India has recently initiated a network programme on "Climate Change and Human Health". The major science objectives of this programme, coordinated by Prof. S. K. Dash (IIT Delhi) and Dr. P. K. Nag (NIOH, Ahmedabad), are better quantification of the impacts of climate change on human health in India and identify the hotspots. One of the three major thematic areas under this network programme is "Air pollution and Health". Recent studies have highlighted air pollution (indoor and outdoor) as one of the leading factors contributing to burden of disease in India. Various aspects of health impacts of aerosols, projected changes in aerosol concentration in future and associated health risks will be studied under this network coordinated by Dr. D. Behra (PGI, Chandigarh). Participating institutions in this thematic area are IIT Delhi, AIIMS, Delhi; National Physical Laboratory (NPL), Delhi; PGI, Chandigarh and L. R. S. Institute of TB and Respiratory Diseases, New Delhi.

**Dr. Sagnik Dey**  
IITD, New Delhi

## Forthcoming Events

### 1. International Workshop on Changing Chemistry in Changing Climate: Monsoon (C4)

The C4 conference will be held at Indian Institute of Tropical Meteorology, Pune from May 1-3, 2013. The conference has few sessions dedicated current and emerging topics in air pollution and its link to climate and human health. It will be preceded by one day workshop (30th April, 2013) on "Metropolitan air quality forecasting and services". The deadline for "Abstract Submissions" is 25th February, 2013.



More detailed information about this workshop can be found out in the conference website:

<http://www.tropmet.res.in/c4>

### 2. 19th International Conference on Nucleation and Atmospheric Aerosols

The 19th International conference on Nucleation and Atmospheric Aerosols will be held in Colorado State University, USA from June 23-28, 2013. The conference will cover the broad topics such as "nucleation theory", "tropospheric and stratospheric aerosols", "aerosol-climate interactions", "cloud nucleation". The deadline for "Abstract Submissions" is 15th February, 2013.

More detailed information about this workshop can be found out in the conference website:

<http://chem.atmos.colostate.edu/icnaa>

### 3. 2013 European Aerosol Conference (EAC 2013)

The 2013 European Aerosol Conference will be held in Prague, Czech Republic from September 1-6, 2013. The conference will cover the broad themes such as "aerosol nanotechnology", "aerosol chemistry", "aerosol modelling", "combustion aerosols", "Indoor aerosols", "Instrumentations" etc. The deadline for "Abstract Submissions" is 15th February, 2013.



More detailed information about this workshop can be found out in the conference website:

<http://eac2013.cz>

### 4. 128th FEA International Aerosol Congress and 17th Exhibition

The 28th FEA International Aerosol Congress & 17th Exhibition will be held in Madrid, Spain from September 24-26, 2013. The deadline for "early-bird registration" is 15th February, 2013.



More detailed information about this workshop can be found out in the conference website:

<http://www.aerosolmadrid2013.com/index.php/en>

## Obituary

K. V. S. Badarinath, an internationally renowned Physicist, who made significant research contributions in remote sensing, aerosols, and climate change studies, died on Jan. 20th, Friday, 2012 at 9:15a.m due to heart attack. He was 53 and survived by his wife Mythili and two daughters Aditi and Aishwarya.

Born on the 18th May, 1959, Badarinath received his bachelor's degree in Physics, Chemistry and Mathematics (1977), Masters Degree in Physics with Electronics specialization from Andhra University, Visakhapatnam during (1979), and Ph. D degree in Experimental Solid State Physics from Indian Institute of Technology, Madras (1984).

During 1986 till May 2011, he worked as a scientist in different levels at the National Remote Sensing Agency, (Department of Space-Government of India), Hyderabad, India. During his career, he received numerous awards. He received the International START visiting scientist award to work at National Resources Ecology Laboratory, Colorado State University, Colorado, USA, during 1996-1997. He also worked as a visiting Professor at the Centre for Climate System Research headed by Prof. Nakajima, University of Tokyo, Japan, during July, 2010 to October, 2010. For several years, he also served as an expert on the Fire related issues from the India side and as an implementation team member for the international GOFC-GOLD program.

Dr. Badarinath supervised 9 PhD students and more than 50 M. Tech and B. Tech project studies on Digital Image Processing, Atmospheric sciences, Land surface temperature estimation studies, Environmental Monitoring and modeling, Mesoscale Model studies for dust prediction, cyclone track prediction and heat wave conditions. He had an excellent publication record, International Journals: 120; National Journals: 73; Total Publications: 193. He served as an editorial member for five different journals. Under his

supervision, several of his students received various awards including IGBP-START Young Scientist Award, Indian science congress Indian Science Congress Young Scientist Award, ISCA Young Scientist Award, ISRS-OPTOMECH Award, Kalpana Chawla Memorial Award and others.

Dr. Badarinath's contributions to science were exemplary. Several of his publications are replete with examples of outstanding contributions to remote sensing and atmospheric science. His research focused on integrating bottom-up ground based measurements with top-down remote sensing methodologies to address scientific questions in atmospheric science. His work produced huge amounts of aerosol and greenhouse gas emissions data over the Indian region that was not previously available such as from instruments – Multi-wavelength Radiometer for Aerosol Optical Depth, MFRSR, UV-MFRSR, MICROTOPS-II, QCM/GRIMM Aerosol particle analyzer, PREDE Skyradiometer, Nephelometer, LIDAR, different gas analyzers-CO/CO<sub>2</sub>/NO<sub>x</sub>/O<sub>3</sub>/SO<sub>2</sub>, etc.

He was extremely creative, unusually prolific and highly elegant in his choice of research topics. He was fully committed to science. As a mentor, he made things simple with great enthusiasm and caring empathy. He had infinite patience. He was gifted with the ability to recognize and clarify the key concepts that are ambiguous. He was also in constant demand as an invited lecturer and journal article reviewer. Most of his students recognized for undergoing rigorous training in fundamentals under his able guidance, have been sought after by reputed labs and have been pursuing successful careers in academia and industry.

Dr. Badarinath earned wide respect as a great scientist and modest and congenial person. He will be remembered for his deep wisdom, quiet grace and dignity, subtle wit and passion for science. He continued to support his students throughout their careers. He was a source of inspiration to colleagues.

Dr. Badarinath is survived by his wife Mythili, their two daughters Adithi and Aishwarya. Adithi completed her bachelor's degree in Engineering and is currently working as a software Engineer in a private firm. Aishwarya completed her secondary school and currently preparing for competitive exams to enter professional courses.

May his soul rest in peace.



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