ileaps | Integrated Land Ecosystem - Atmosphere Processes Study

April 2025

Newsletter

www.ileaps.org

Contents

SECTIONS

SCIENCE UPDATES

iLEAPS EVENTS

ACTIVITIES

HONOURS AND RECOGNITIONS

UPCOMING EVENTS

COMMUNITY

COVER PAGE IMAGE COURTESY -

Source: https://media.istockphoto.com/id/91734601/photo/fire-on-the-wheat-field.jpg?

Editor's Note

Dear Readers,

It brings us great pleasure to introduce the April 2025 issue of the iLEAPS Newsletter, a vibrant reflection of our community's continued commitment to advancing Earth system science, climate resilience, and environmental policy integration. This edition comes at a time when the world faces increasingly interconnected environmental and health challenges. In response, our scientific community has continued to push boundaries—both in the field and through modeling, policy dialogue, and transdisciplinary collaborations.

A centerpiece of this issue is the in-depth scientific exploration of crop residue and waste burning and its seasonal impact on air pollution in northern India, under the Aakash Project. The findings present a sobering but essential reminder: that tackling air pollution must go beyond the urban lens and account for complex rural-urban dynamics. The innovative CUPI-G sensor network and its long-term data are informing not just academic understanding but policy conversations, with a call for a national, harmonized air quality monitoring network. Complementing this, the Atmospheric Pollution and Human Health (APHH) project overview demonstrates how international partnerships are essential to unraveling the intricate web of emissions, health impacts, and mitigation strategies. The multi-institutional effort, spanning from Delhi's air chemistry to personal health impacts, presents a blueprint for how science can guide clean-air pathways in megacities. On the events front, the NANO-Extremes Symposium marked a significant step in India's research ecosystem for ultrafine particles and urban climate extremes. This interdisciplinary dialogue, enriched by international collaboration, underlined the need for robust measurement infrastructures, modeling capacities, and AI integration to face future climate-health challenges. We also mark the inauguration of the PAIR Laboratory at IITM Pune. This facility underscores the growing importance of biosphere-atmosphere feedbacks in climate science, and the role of vegetation in shaping air quality and carbon dynamics. Our training and community-building efforts continue through various UKECH capacity-building courses, as well as active involvement of Early Career Scientists (ECS), whose enthusiasm is a driving force for the future of iLEAPS. Special congratulations to our young researchers for their recognized poster presentations at RMC 2025 and IGAC 2024—your achievements inspire us all.

As we look ahead to key events like the EGU General Assembly 2025 and the 11th WMO Scientific Conference on Weather Modification, we encourage continued cross-sectoral collaboration. Advancing predictive capabilities and mechanistic understanding remains essential—not only for academic advancement but for informing policy decisions under rapidly evolving climate and socio-economic conditions.

Notably, the iLEAPS community continues to foster early-career scientist networks and training programs, ensuring continuity and innovation in atmospheric and land-atmosphere studies. Recognition received by young researchers at international platforms such as RMC and IGAC further affirms the rising quality of regional science.

We thank all contributors, particularly Bhagyashri Katre for the meticulous compilation of this edition, and reaffirm our commitment to the iLEAPS mission: integrating land–atmosphere processes to understand and respond to planetary change.

Role of crop residue and other waste burning on the seasonality of air pollution in rural and urban areas of northern India

Dr. Poonam Mangaraj

Poonam is a postdoctoral researcher at the Research Institute for Humanity and Nature (RIHN), Kyoto, Japan. She has received a Ph.D. degree from Utkal University. At RIHN, she works on assessing the impact of crop residue burning on air quality in North India. With expertise in emission inventories, urban air quality monitoring and policy evaluation (more than 20 peer-reviewed publications), she is committed to tackling pressing air pollution challenges. Her research spans developing high-resolution emission databases, conducting large-scale field campaigns, and assessing mitigation strategies to reshape policy decisions. As a passionate environmentalist, she strives to leverage her research to bridge the science and policy for cleaner air and healthier communities.

Prof. Prabir K. Patra

Prabir Patra is a Professor at the Research Institute for Humanity and Nature (RIHN), leading the Aakash Project for 2023-2025, and a Principal Scientist at the Research Institute of Global Change (JAMSTEC) where he works since 2001. He has received Ph.D. from the Gujarat University in 1998 and worked at the IBM India Research Laboratory during 1998-2001. Prabir received the prestigious Horiuchi Award from the Meteorological Society of Japan in 2016, and was a lead author of the IPCC's 6th Assessment Report. Prof. Patra coauthored more than 200 peer-reviewed publications and serves as editorial board member of a few journals. He dreams of co-located measurements of greenhouse gases and key air pollutants at some of the weather stations worldwide, as the chair of the Task Team on G3W Networks at the World Meteorological Organisation (WMO).

Role of crop residue and other waste burning on the seasonality of air pollution in rural and urban areas of northern India

Authors

Poonam Mangaraj1, Prabir K. Patra1,2*, Dilip Ganguly3, Gaurav Govardhan4, Sachin Ghude4, Manish K. Naja5, Yutaka Matsumi6, Mizuo Kajino7, Sachiko Hayashida1, and Aakash Project Team$

Host Institutions

1Research Institute for Humanity and Nature, Kyoto 603 8047, Japan

2Research Institute for Global Change, JAMSTEC, Yokohama 236 0001, Japan

3Center for Atmos. Sciences, Indian Institute of Technology Delhi, New Delhi, 110 016, India

4Indian Institute of Tropical Meteorology, Pune 411 008, India

5Aryabhatta Research Institute of Observational Sciences, Nainital 263 001, India

6Institute for Space-Earth Environmental Research, Nagoya University, Nagoya 464 8601, Japan

7Meteorological Research Institute, Japan Meteorological Agency, Ibaraki 305 0052, Japan

**Corresponding author email:*

prabir@chikyu.ac.jp / prabir@jamstec.go.jp

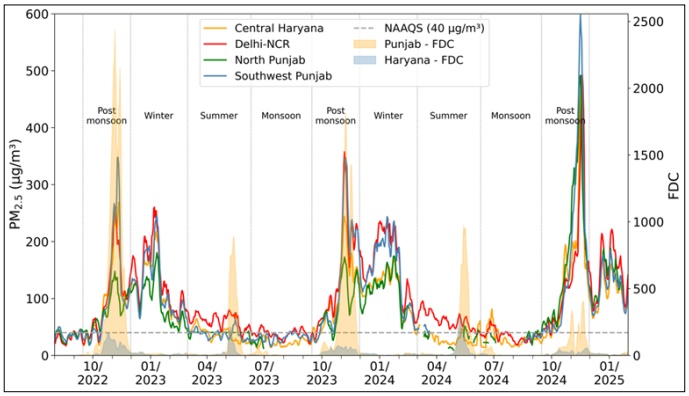
Air pollution – is a critical environmental challenge that impacts human health, ecosystems and climate. Among several sources of air pollution, the 'crop residue burning' (CRB) has emerged as one of the significant contributors to air pollution, especially in the warmer climate regions in the tropics, which allow multiple cropping cycles annually. Despite different terminologies (CRB or stubble/agricultural-waste burning), its impact remains unchanged leading to severe degradation of air quality particularly in northwest India, during the post-monsoon season. However, the spatial extent of CRB emissions on air pollution is not fully understood (e.g., Takigawa et al., 2020). In the regions of Punjab, Haryana and Delhi-NCR (National Capital Region), CRB is widely recognised as a seasonal phenomenon that triggers the rise in the particulate matter ($PM_{2.5}$) levels. Over the years, numerous scientific studies, print and media reports have published articles on how the CRB of Punjab-Haryana adversely impacts the air quality of Delhi-NCR. Yet the discussions continue around the causes of air pollution in Indian cities, predominantly due to limited systematic and continuous measurements covering the rural and farming regions making it an unsolved challenge.

With aims to provide realistic perspectives and options for transforming society into one that can respond flexibly to environmental changes caused by human activities, the Aakash Project was initiated at the Research Institute for Humanity and Nature (RIHN). This research focused on pursuing pathways for social change towards cleaner air, improved public health and sustainable agriculture (Patra et al., 2025). In this study, we present a long-term (2022-2024) assessment of seasonal air quality variations influenced by the CRB using our wide-spread low-cost Compact and Useful $PM_{2.5}$ in situ instrument with gas sensors (CUPI-G) measurement network. Earlier studies using the CUPI-G continuous measurements at about 30 sites (intensive campaign mode) during the September-December months of 2022-2024 are available in peer –review

-ed literature (Singh et al., 2023; Mangaraj et al., 2025). About half of our 30 sites were operated in collaborative mode and measurements are collected throughout the year, for understanding various meteorological and emission control regimes of particulate air pollution and estimation of human health exposure.

We find a marked increase in the satellite fire detection counts (FDC) in October, primarily attributed to CRB or open burning during the post-monsoon season, which coincides with the sharp rise in $PM_{2.5}$ concentrations, often exceeding 150 µg/m³ across Punjab, Haryana and Delhi (Fig. 1). However, even during periods of lower FDC after November, the $PM_{2.5}$ concentrations consistently remains high in Delhi and equally in Punjab and Haryana regions surpassing 200 µg/m³ in winter months. This implies a strong influence of additional (urban and rural) localized emission sources in the region, and raises questions about inflow and outflow of the urban air pollutants to the rural areas. The $PM_{2.5}$ levels frequently exceeding the World Health Organization's recommended safe limit of 15 µg/m³ and National Ambient Air Quality Standard (NAAQS) of 40 µg/m³ on daily average. While CRB in the months of May and June appeared to have a less pronounced impact on elevated $PM_{2.5}$ levels but measurable increases are seen locally, keeping air quality above the safe limits. The high planetary boundary layer (PBL), very dry and hot air conditions, and lower stubble waste work favourably to keep the CRB effect low on $PM_{2.5}$ concentration, in contrast to the post-monsoon season. It is reported that farmers in the region, where PUSA-44 rice cultivar is grown predominantly, prefer wheat stubbles over the rice stubbles as ruminant feed. The lowest $PM_{2.5}$ concentration are recorded in the southwest monsoon season (July-September), mainly due to rain washout and stronger winds conditions.

Figure 1: Time series of regional average CUPI-



G PM2.5 vs FDC pentad mean are shown for the period of 01 August 2022 to 31 January 2025. Daily averages are prepared for PM2.5 official release data at 10 minutes time intervals before taking pentad means. The fire detection counts (FDCs) are taken from the National Aeronautics and Space Administration (NASA) Suomi National Polar Satellite's VIIRS. The broken grey line show the NAAQS.

The spatial extent of high PM2.5 concentration is another aspect which our project did not cover owing to limited funding, but is of immense interests for science driven policymaking. We compared the PM2.5 measurement in New Delhi with corresponding data from Kolkata on east side of the Indo-Gangetic Plain (IGP). These measurements are made by the US Embassy under the AirNow (www.airnow.gov) activities at high quality, which have been of tremendous importance for validation of CUPI-G measurements, and analysis of trends in air quality (Sawlani et al., 2019; Dhaka et al., 2020; Mangaraj et al., 2025).). The PM2.5 timesries, alongside FDC for southern West Bengal (south of 24oN),

shows similar behaviour for the same period (Fig. 2). The analysis shows a striking similarity between the PM2.5 seasonal variability in the two cities. The FDCs over West Bengal are non-negligible and show strong correlation with PM2.5 year round, unlike those for Delhi-NCR, Haryana or Punjab. It is very likely that the crop residue and waste in the south Bengal region are more diverse due to diverse cropping patterns compared to Punjab or Haryana. Overall, Kolkata recorded lower PM2.5 levels than Delhi in all seasons but remained greater than the NAAQS for most months in a year. This could be due to its coastal geography, i.e., sea breeze aiding to disperse the pollutants.

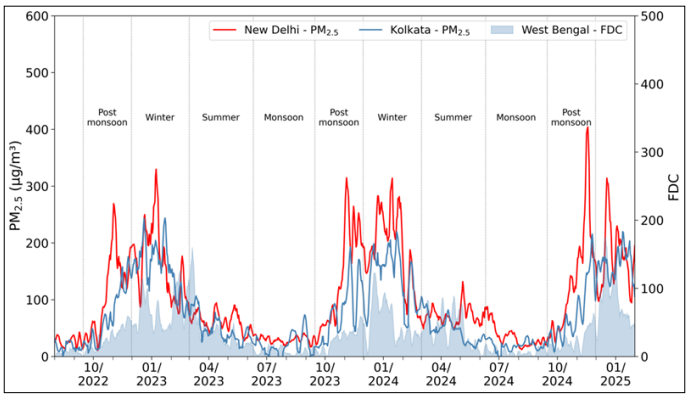


Figure 2: A comparison of PM2.5 concentrations in New Delhi and Kolkata as observed at the US Embassy sites. The FDCs of southern West Bengal (south of 24oN) are shown by the shaded curve.

As Punjab, Haryana and Delhi are geographically in close proximity to each other, they fall within the same general climatic zone where they share many broad meteorological characteristics. We analysed 5-day mean of regional average meteorological parameters, i.e., wind speed (WS), PBL, rainfall (Rain), temperature, and relative humidity (RH), that are relevant to air quality in Punjab, Haryana, and Delhi, spanning from September 2022 to January 2025. The WS indicate that the dispersion potential varies over time, ranging from 1 to 3 m/s. The inverse relationship between temperature and RH is evident which can influence the formation of secondary pollutants, including PM2.5. Figure 3 shows the relationships (correlation coefficients, r) between PM2.5 and weather factors (WS, PBL, Rain, temperature, and RH) where PM2.5 has a strong negative correlation with Temp (r=-0.6) and PBL (r=-0.5), moderate positive correlation with RH (r=0.26) and negative correlations with Rain (r=-0.24). These temporal variation in the meteorological conditions, collectively, establish a complex atmospheric environment influencing the regional air quality dynamics on seasonal time scales. However, the emissions and meteorology has much tighter relationship at synoptic timescales and determines the effectiveness of policy actions, such as the Graded Response Action Plan (GRAP) stages (Mangaraj et al., 2025).

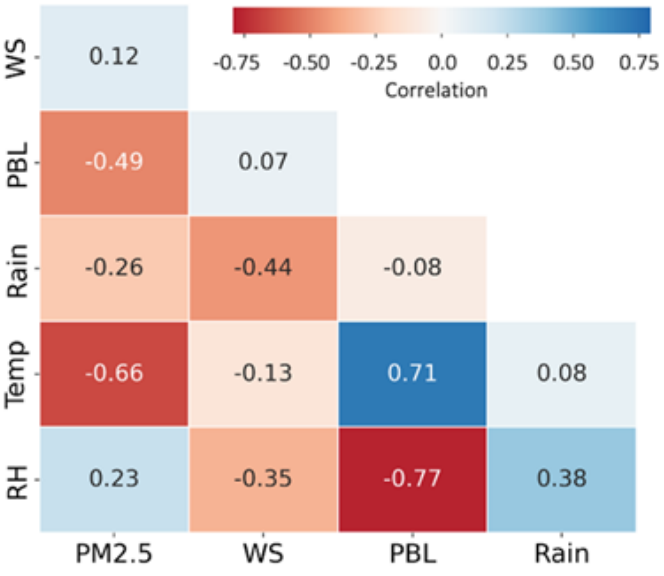


Figure 3: Correlation matrix of PM2.5 and several meteorological variables averaged over Punjab, Haryana and Delhi (column 1).

Interrelations between different meteorological parameters are also seen from the columns 2-4.

The role of emissions on pollutants buildup at local/regional scales are better visualised by analysing daily cycles. For example, PM2.5 exhibit distinct diurnal patterns in PM2.5 concentrations in different seasons within a region (Punjab, Haryana and Delhi) or between the four seasons (Fig. 4). Winter consistently exhibits the highest PM2.5 levels, with concentrations often ranging from 150 µg/m³ to over 500 µg/m³, and pronounced morning and evening peaks, particularly in Delhi under the conditions of high emissions and shallow PBL height. Post-monsoon also shows elevated PM2.5 (100 µg/m³ to over 400 µg/m³), likely influenced by agricultural and other wastes burning, with similar diurnal cycle. In contrast, summer and monsoon seasons show lower concentrations (typically below 200 µg/m³ and 100 µg/m³, respectively), indicating better air quality. The daily mean PBL height ranges between 1000-200 m in the months April-June, which allows fast ventilation of the emissions from the surface layer, while rain washout plays dominating roles in July-September for keeping the PM2.5 concentrations at the moderate level. A common feature across most seasons and locations is the presence of morning and evening peaks in PM2.5 concentrations. These peaks correspond to increased human activities, such as on road traffic, home cooking, and persisting industrial emissions.

Based on the similarities and differences in PM2.5 in the greater IGP region and our experiences from the Aakash Project through the intensive field campaigns during the CRB seasons of 2022-2024 in the Punjab to Delhi-NCR areas, it is highly recommended that a network of well calibrated air pollution measuring sensors are deployed in India. Various measurement networks currently operating in the region are not intercompared for consistency and intercompared for generating improved scientific understanding. Our view of a potentially “new” measurement network must cover the rural and urban area equally well, and provide complementary information to the urban measurements that are ongoing under the national and state pollution control boards, such as the Central Pollution Control Board (CPCB; https://cpcb.nic.in/), System of Air Quality and Weather Forecasting And Research (SAFAR; Yadav et al., 2020). The ultimate goal of expanded and intercalibrated observational system of basic air quality parameters, e.g., PM2.5, ozone (O3), carbon monoxide (CO) and nitrogen oxides (NOx), would be to support the national air quality forecasting system (Ghude et al., 2024).

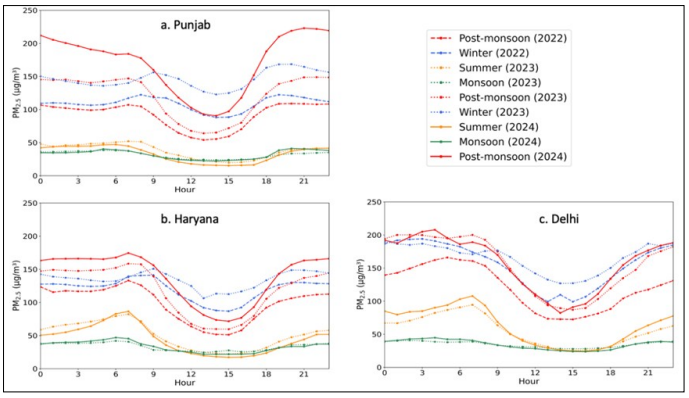


Figure 4: Diurnal variation of PM2.5 across Punjab, Haryana, and Delhi, spanning different seasons from post-monsoon 2022 to post-monsoon 2024. The daily mean PM2.5 are subtracted from hourly values for calculation of the diurnal cycles, before taking the seasonal averages as depicted (the 1-s standard deviations are greater than the

diurnal cycle amplitude and not shown).

Acknowledgements

This research is financially supported by the Research Institute for Humanity and Nature (RIHN: a constituent member of NIHU) Project No. 14200133 (Aakash). The funder played no role in study design, data collection, analysis and interpretation of data, or the writing of this manuscript. Some of the interpretations and proposals in this report are outcomes of the recently concluded “International workshop on air pollution in the northwestern India and future perspectives, Jointly organized by the Research Institute of Humanity and Nature (RIHN) and Indian Institute of Technology (IIT) – Delhi, Hauz Khas, New Delhi, 12-13 March 2025.

References:

Ghude, S.D., et al., Air Quality Warning and Integrated Decision Support System for Emissions (AIRWISE): Enhancing Air Quality Management in Megacities, Bull. Amer. Meteor. Soc., 105, E2525–E2550, 2024. https://doi.org/10.1175/BAMS-D-23-0181.1

Mangaraj, P., et al., Weak coupling of observed surface PM2.5 in Delhi-NCR with rice crop residue burning in Punjab and Haryana, npj Clim Atmos Sci 8, 18 (2025). https://doi.org/10.1038/s41612-025-00901-8

Patra, P. K., et al., Aakash Project: Towards mitigating particulate air pollution for improved public health along with sustainable agriculture in Northwest India, Summary of research outcomes for stakeholder during 2020-2025, pp. 1-52, ISBN 978-4910834-48-1 (online and print), 2025.

Singh, T., et al., Very high particulate pollution over northwest India captured by a high-density in situ sensor network. Sci Rep 13, 13201, 2023. https://doi.org/10.1038/s41598-023-39471-1

Takigawa, M., et al., Can Delhi's Pollution be affected by crop fires in the Punjab region? SOLA, 16, 86-91, 2020. https://doi.org/10.2151/sola.2020-015

Yadav, R. et al., COVID-19 lockdown and air quality of SAFAR-India metro cities, Urban Climate, 34, 100729, 2020. https://doi.org/10.1016/j.uclim.2020.100729.

APHH PROJECT SUMMARY

Mr. Rajanikant Shinde

Rajanikant Shinde is the Data Resource Manager (APHH) at the Indian Institute of Tropical Meteorology (IITM), Pune, where he has been working since 2011. He is responsible for managing observational data and overseeing the website operations for the Air Quality Early Warning System (AQ-EWS), the Decision Support System (DSS), the System of Air Quality & Weather Forecasting and Research (SAFAR), and the Winter Fog Experiment (WiFEX).

Mr. Sujit Maji

Sujit Maji is a scientist at the Indian Institute of Technology, specializing in atmospheric chemistry and pollution. He focuses on measuring volatile organic compounds (VOCs) using Proton Transfer Reaction Mass Spectrometry (PTR-MS). Additionally, he models air pollutants (e.g. Organics/Aerosols) using regional chemical transport models, such as WRF-Chem. Currently, he oversees the Metropolitan Air Quality and Weather Services (MAQWS) project while pursuing a PhD in Climate Sciences. His research emphasizes on the quality assurance of air quality monitoring data, and identifying and addressing key gap areas to aid in managing urban air pollution. He has also contributed to the Atmospheric Pollution and Human Health (APHH) project in collaboration with the Ministry of Earth Sciences (MoES) in India and the Natural Environment Research Council (NERC) in the UK.

INTRODUCTION AND PROJECT OBJECTIVE

Atmospheric Pollution and Human Health in an Indian Megacity was a four-year research programme (2018–2022) jointly funded by the Ministry of Earth Sciences (MoES) and Department of

-technology (DBT) from India, and Natural Environment Research Council (NERC), the Medical Research Council (MRC) from the UK under the Newton–Bhabha Fund. Urban air pollution is a serious problem in India with significant impacts on the economy and the health of the population. This programme, which was organised into four interrelated themes, supported research on the sources and emissions of urban air pollution in New Delhi, India, the processes underlying and impacting on these, and how air pollution then impacts on health. Existing and new findings were combined to understand the cost-effectiveness of potential interventions and thus identify appropriate solutions for the benefit of the economy and population. The four themes were:

1. Emission validation and sources
2. Processes: physical and chemical
3. Exposure assessment and validation and health outcomes
4. Mitigations and interventions

These four themes were highly interrelated and, therefore, there was considerable benefit in the projects working together and integrating activities where possible. India had already progressed significantly in this direction under MoES and developed the SAFAR forecasting system. The overall objectives of the APHH programme were delivered through research partnerships between UK and Indian scientists by implementing five chosen projects so that an integrated framework of air quality forecasting and process research could be further strengthened in the indigenously developed SAFAR framework towards application-oriented work for the benefit to society in India. The ultimate goal was to further improve our understanding on air quality-related aspects, process science, and its impact on health in the existing SAFAR framework so that the Ministry of Earth Sciences could have a robust, independent, and indigenously developed comprehensive air quality monitoring and forecasting framework for the nation which could be further scaled up for other cities in India in the time to come.

APHH SUB -PROJECT TITLES AND PIS

APHH-PROMOTE:

Process analysis, observations and modelling - Integrated solutions for cleaner air for Delhi (PROMOTE)

- Dr. B.S. Murthy, IITM up to Nov 2023, Dr. G. Beig, IITM up to May 2021
- Prof. Ranjeet Sokhi (University of Hertfordshire), UK.

APHH-CADTIME:

Clean Air for Delhi Through Interventions, Mitigations and Engagement (CADTIME)

- Dr .S. M. Shiva Nagendra (Indian Institute of Technology, Madras), India
- Dr. Anil Namdeo (Newcastle University), UK

APHH-ASAP:

An Integrated Study of Air Pollutant Sources in the Delhi NCR (ASAP)

- Prof. Mukesh Khare (Indian Institute of Technology, Delhi), India
- Prof. William Bloss (University of Birmingham), UK.

APHH-DelhiFlux:

Megacity Delhi atmospheric emission quantification, assessment and impacts (DelhiFlux)

- Dr Bhola Gurjar (Indian Institute of Technology, Roorkee), India
- Dr Eiko Nemitz (CEH), UK

APHH-DAPHNE:

Delhi Air Pollution Health and Effects (DAPHNE)

- Dr Kalpana Balakrishnan (Centre for Advanced Research on Environmental Health -ICMR, Chennai), India
- Prof. D. K. Arvind, Edinburgh, UK.

APHH-PROMOTE:

Deals with process science and forecasting model skill development. A revised set of traffic emissions has been produced for use with urban scale air quality models. Modified version of the coupled WRF-Chem-OSCAR models has been developed and runs are made. Analysis and result reporting are In progress. A combined modelling and observational analysis of pre- and post-monsoon periods is revealing new insights into potential mitigation strategies for Delhi. Analysis of global scale CMIP6 models has revealed significant variations in different ozone predictions. The sensitivity model runs are made to understand the magnitude of Delhi PM2.5 mass concentration using the different meteorological regimes for stubble burning. Results are published which indicate that if sowing and harvesting is shifted backward by about 30 days then Delhi may avoid major extreme pollution events. Results will have important policy implications. APHH work provided the answer to this vital question: Why does only Delhi experience far higher reduced visibility during winter, although many cities in Asia have high pollution? A Nature Geoscience paper states that the local emissions of gas phase HCl from industrial metal-, e-waste-, and plastic contained waste-burning forms chlorine rich particulate matters, are responsible for nearly 50% of the reduced visibility in Delhi, under specific meteorological conditions during foggy-smoggy winter episodes. This HCl from above mentioned sources reacts with excess ammonia in the atmosphere to form particulate ammonium chloride. These particles have enhanced ability to take-up water and grow under the favourable low temperature and high relative humidity conditions, which ultimately leads to smog formation and reduced visibility.

APHH-CADTIME:

Deals with Mitigation Pathways. CADTIME aims to understand what is required to deliver significant reductions in levels of air pollution, within the confines of factors which are under our control, through affordable, effective interventions that consider and respond to future changes. In order to achieve the global aim a number of objectives have been identified, to be delivered through an integrated work task structure with quantified impacts. Major objectives are - Identify key emission sources, emission trends and current scenario analysis, Identify key factors controlling urban air quality legislation/policies/standards, Develop and validate an effective and efficient air quality modelling system for assessing hotspot, local and regional pollution problems, Design and quantify impacts of interventions for mitigating air pollution in Indian Megacity Delhi for current, medium-term (2030) and long-term (2050) horizons, Compile a range of potential practical interventions with stakeholders through DELPHI methodology, employing both forecasting and back casting approaches to develop an air pollution management pathway; and create a prioritized shortlist of robust solutions, Evaluate the reduction in pollution achievable by recommended interventions to 2050. Mitigation measures for air pollution from different emission sectors were reviewed for India, US, Europe, China, and some steps were recommended. Some mitigation measures are also recommended e.g. the most effective way to reduce PM and NOx.

levels is to introduce BSVI vehicles. Another effective way to combat particulate matter is to ban diesel buses, while for NOx gasoline passenger cars ~15 years old are banned.

APHH-ASAP:

Deals with Observations and Source Identification. Key focus has been continuation of filter sample analyses. Highlights are the identification of HONO as the key precursor to oxidants in Delhi, impacting upon HOx levels and hence air pollution processing / in situ O3 formation, and first PMF results from PIXE (high time resolution) sampling, quantifying the dominant PM sources. ASAP assessed physical and chemical characterization of aerosol particle along with seasonal variations in two urban backgrounds in Delhi and at urban cluster sites around NCR. NPL had completed analysis of around 150 out of 700. The PM source apportionment and composition characterization are completed in late 2021; Delayed completion of source apportionment has affected model validation (PROMOTE), local air quality simulations of AERMOD and mitigation development (CADTIME) which is now undergoing and hence extension is highly desirable by December 2022.

APHH-DelhiFlux:

Deals with Flux and Emissions. Analysis of the date from the Delhi flux campaigns has progressed well. Several datasets have been finalised and submitted to CEDA.

APHH-DAPHNE:

Deals with air pollution and Health impacts. A new method has been developed for establishing causal relationships between personal PM2.5 exposure and changes in respiratory rate for asthmatic adolescents. This is the first time that short-term health effects have been observed outside the clinical setting based on sensor data. However, this project is badly affected by the COVID-19 as it deals with sample collection directly from the patients which cannot be done during a pandemic. This point is informed by the Indian PIs to DBT which is the funding agency of this project. Both arms of the DAPHNE clinical trials in Delhi, Asthmatic Adolescents Panel (AAP) and Mother Child Cohort (MCC) was suspended since 15/3/20 on account of the COVID-19 pandemic induced field challenges that include subject recruitment and follow up for personal exposure and health assessments which could not be completed till date. Because of the extensive human subjects' involvement, resumption of field activities is dictated by multiple considerations including stipulation of funding agencies on the India and UK sides.

NANO-Extremes: Advancing Aerosol and Urban Climate Observations & Modeling Research in India

The hybrid International Symposium on UltrafiNe Aerosol Processes and Numerical mOdeling of Urban Climate – **Extremes** (**NANO-Extremes**) was hosted by the Indian Institute of Technology Madras, Chennai from 24 - 26 February 2025.

The NANO series

The NANO series began with the International Symposium on "SecoNdary Aerosol FormatioN and GrOwth-**2023** (NANO-2023)" jointly organised by the University of Hyderabad, India and the Finnish Meteorological Institute (FMI), Finland under the MoU signed between the University of Hyderabad and FMI in 2019. This first symposium laid the groundwork for the process-level understanding of the aerosol phenomenon and local processes, nanoparticle measurement techniques and secondary aerosol formation. With the Memorandum of Understanding (MoU) signed in 2022 between the Indian Institute of Technology Madras (IITM) and FMI, the series has grown into an ongoing international collaboration dedicated to tackling the role of aerosols and meteorology in urban climate challenges.

NANO-Extremes

The NANO-Extremes Symposium, part of the ongoing NANO series, jointly organised by IITM, FMI, and the Cyprus Institute (CyI) during 24 - 26 February 2025 at IITM, Chennai, India. The symposium aimed to advance research on the measurement and modelling aspects of ultrafine particles and their role in urban climate extremes. It brought together experts in aerosol science, atmospheric modelling, remote sensing, and artificial intelligence to bridge knowledge gaps. 0

A highlight of the event was the poster presentation session, which provided early-career

researchers was supported through travel grants, and the best posters were given an opportunity for 5-minute lightning presentations and awarded.

Sessions and Discussion Groups

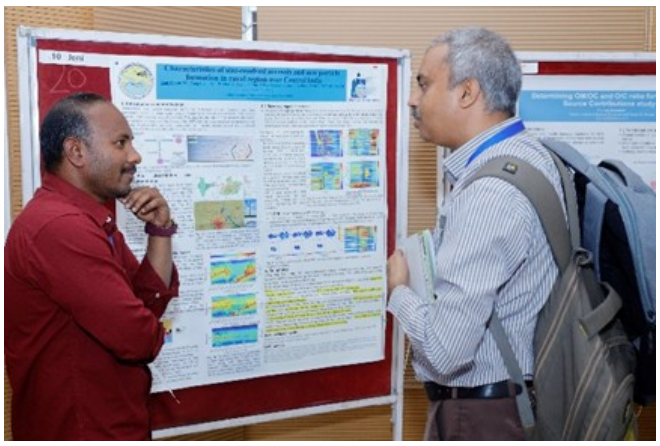
Sessions were organized on fundamental understanding, current advancements, challenges and opportunities in modelling of urban extreme climate and aerosol processes over Megacities. Further, group discussions were held on three key themes: **Measurement, Modeling, and AI/ ML Applications**.

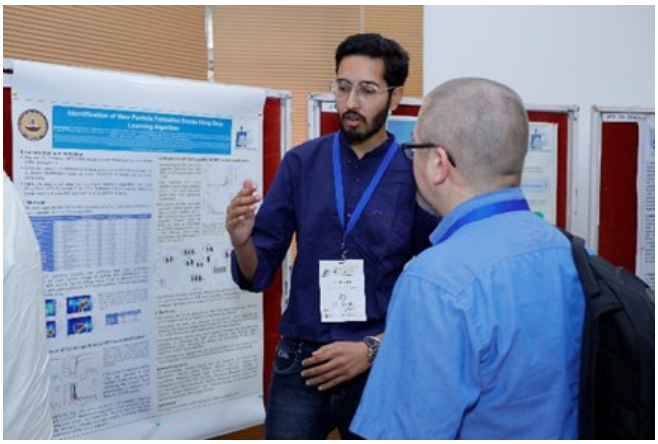
The Measurement Group identified critical gaps such as gas and particle phase chemistry, the need for integrated ground-based and vertical observations of aerosol size distributions, urban atmosphere and cloud optical properties, and a unified data repository for India. The group emphasized the importance of collaborations, capacity-building programs, and a national platform for discussing integrated approaches for ultrafine particles and urban atmosphere research. Recommendations included submitting consortium project proposals with the focussed modelling-measurement partnership.

The Modeling sub-group supported the discussion that the lack of integrated observations of land-atmosphere-aerosol simultaneously over urban regions is essential, and mechanised planning should be started for rural regions too. Moreover, microscale processes like turbulence, cloud condensation nuclei (CCN) budget in urban environments and cloud-to-rain conversion processes are highlighted as the current gaps in process-based models. Further, the group also emphasized the lack of a proper ecosystem for capacity building of climate and aerosol modelers in India. Strengthening capacity building can fast-track progress in process-driven parameterizations, model simulations, and inter-comparison studies, leading to solution-driven climate and air-quality policies.

The AI/ML sub-group highlighted the fact that inconsistencies in measured parameters, and poor generalizability of models across regions is a challenge. Discussions highlighted the need for regional networks of low-cost sensors, advocating for sensor calibration and validation, and promoting in-house development of measurement instruments. The group proposed hackathons, capacity-building workshops, and collaborations with national and international agencies to enhance AI-driven climate modeling.

The symposium will prepare a White Paper summarizing major knowledge gaps, challenges, and actionable recommendations for future studies. Experts emphasized the necessity of a policy framework that connects scientific advancements with governmental decision-making. The white paper will be submitted to the Principal Scientific Adviser office to the Government of India, funding agencies and policymakers to shape future research directions and encourage interdisciplinary collaboration.





The Way Forward

The success of NANO-Extremes has reinforced the importance of multidisciplinary and international collaborations. Moving forward, the initiative will focus on expanding observational networks, curating an ecosystem for modelling awareness in Tier II universities, and bridging the gap between scientific research and policy implementation. With continued support from global partners, the NANO initiative aims to drive actionable solutions for urban climate resilience and air quality improvements. By integrating cutting-edge research with policy-driven initiatives, the NANO series continues to be a driving force in advancing aerosol and climate science in India.

Together, let's continue shaping the future of urban climate resilience and aerosol research!

Kumbh Global summit on Development and Sustainability 21-22 February, Prayagraj, India

iLEAPS Executive Officer, Semeena Valiyaveetil Shamsudheen was invited to be a speaker at the Kumbh Global Summit on Development and Sustainability in Prayagraj from February 21-22, 2025. Attending and speaking at this event was an enlightening experience that seamlessly integrated the profound cultural heritage of the Maha Kumbh Mela with forward-thinking discussions on sustainable development.

A Convergence of Tradition and Progress

Organized by the India Foundation in collaboration with the Government of Uttar Pradesh, the summit convened a diverse assembly of leaders, scholars, and experts to deliberate on pressing issues such as net-zero development, renewable energy, climate change challenges, and the Sustainable Development Goals (SDGs). The event's unique setting amidst the Maha Kumbh Mela provided a symbolic backdrop, emphasizing the harmony between India's rich traditions and its aspirations for a sustainable future. kumbhglobalsummit.indiafoundation.in+1indiafoundation.in+1

Engaging Dialogues and Diverse Perspectives

The summit featured a series of thematic sessions, ministerial addresses, keynote speeches, exhibitions, and panel discussions. These sessions facilitated in-depth explorations of topics and encouraged cross-disciplinary dialogue. As an invited speaker, I had the opportunity to present on the intersection of climate science and policy, emphasizing the critical need for integrating scientific research into actionable strategies to combat climate change. kumbhglobalsummit.indiafoundation.in

Key Themes and Insights

Several pivotal themes emerged during the summit:

- Lifestyle for Environment (LiFE): Discussions underscored the importance of adopting sustainable lifestyles to mitigate environmental impact.
- Renewable Energy: Experts highlighted advancements in non-conventional energy sources and their role in achieving energy neutrality. kumbhglobalsummit.indiafoundation.in
- Sustainable Agriculture and Food Security: Deliberations focused on innovative practices to ensure food security while preserving ecological balance.

These conversations reinforced the interconnectedness of cultural values and sustainable development practices.

Cultural Immersion and Reflection

Beyond the intellectual engagements, the summit offered cultural programs that showcased India's rich heritage through performances, exhibitions,

and demonstrations. Participating in the Maha Kumbh Mela's sacred rituals, such as the Holy Snan (royal bath) at the Triveni

Sangam—the confluence of the Ganges, Yamuna, and the mythical Saraswati—was a profound experience. This confluence symbolizes the merging of diverse streams into a unified whole, mirroring the summit's ethos of integrating varied perspectives for a common sustainable future. kumbhglobalsummit.indiafoundation.inWikipedia+1united.ac.in+1

Looking Ahead

The Kumbh Global Summit exemplified how cultural heritage can serve as a foundation for contemporary discussions on sustainability. It highlighted the necessity of bridging ancient wisdom with modern science to address global challenges. As climate scientists, participating in such interdisciplinary platforms enriches our understanding and enhances our ability to contribute meaningfully to sustainable development dialogues.

In conclusion, the summit was not just an event but a confluence of ideas, traditions, and aspirations, inspiring collective action towards a sustainable and harmonious future.

The 62nd IPCC Session: An Observer Organisation's Perspective

Future Earth had a delegation (Semeena Valiyaveetil Shamsudheen (iLEAPS), Xiuzhen Li (Future Earth Coasts)) at the 62nd IPCC meeting held from February 24 to 28, 2025, in Hangzhou, China. The 58th IPCC session was aimed to finalize the outlines for the three Working Group contributions to the Seventh Assessment Report (AR7) and the Methodology Report on Carbon Dioxide Removal Technologies, Carbon Capture Utilization, and Storage. After extensive discussions, including working 30 hours overtime, the panel approved these outlines, enabling the commencement of the author nomination process for AR7.

→ IISD summary report

Observing these negotiations provides valuable insights on the priorities and countries' different affectedness by climate change. Here are some of the insights from an observer organisation's perspective:

Introduction

The 62nd IPCC meeting in Hangzhou was an intense and deeply engaging experience which brought together approximately 450 participants. This included around 300 delegates from 124 member countries and representatives from 48 observer organizations.

The atmosphere was charged with a sense of urgency, and delegates worked tirelessly—nearly 30 hours overtime—to reach consensus. It was also a powerful reminder of the complexity and importance of global collaboration on climate science. Being present gave us a an opportunity to understand how science and policy intersect at a high level.

One of the central focuses of the 62nd IPCC Session was the approval and adoption of the Synthesis Report for the Sixth Assessment Cycle (AR6). This report consolidates the findings from three working groups and three special reports, providing a comprehensive overview of the current state of climate science. The discussions were marked by a sense of urgency, with policymakers and scientists emphasizing the need for immediate and sustained action to mitigate climate change and adapt to its impacts.

Another key highlight was the emphasis on enhancing collaboration between governments, scientific communities, and observer organisations. The IPCC acknowledged the invaluable role of observer groups in bridging the gap between science and implementation, ensuring that climate policies are grounded in the latest research and informed by diverse perspectives.

The Role of Observer Organisations

As an observer organisation, we had the privilege of witnessing key discussions that will shape future climate policies and scientific assessments. The session underscored the urgency of climate action and the critical role of science in guiding

policy decisions.

We also took note of the growing emphasis on climate finance and technology transfer. Developing nations repeatedly stressed the need for increased financial support and equitable access to clean technologies.

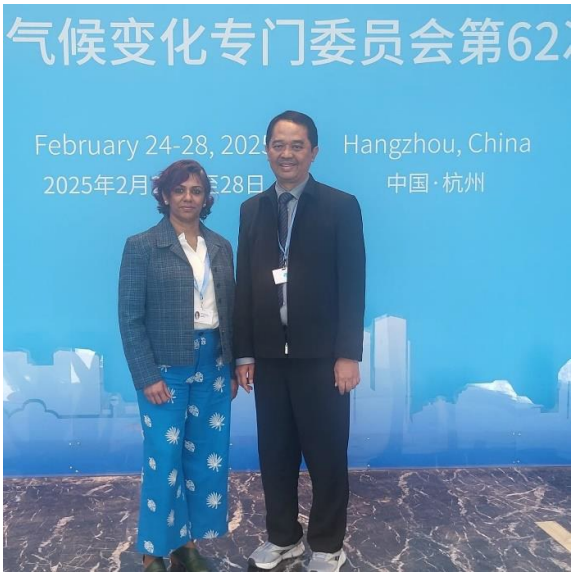
Challenges and Opportunities

Despite the progress made at the 62nd IPCC Session, several challenges remain. Political disagreements occasionally slowed down negotiations, reflecting the ongoing struggle to balance economic interests with environmental imperatives. Perhaps the most striking element was the sheer extent of deliberation—working overtime for 30+ hours highlights both the complexity of the issues and the depth of engagement. The commitment from all parties to find consensus, despite tensions, was impressive. Another interesting development was the strong voice from coastal and low-lying countries, pushing for more emphasis on sea-level rise, climate justice, and adaptation pathways in the Working Group II outline. However, the overwhelming consensus on the need for urgent climate action offers hope that governments will take stronger measures to meet their emission reduction targets.

Conclusion

The 62nd IPCC Session was a testament to the power of scientific collaboration and international dialogue in addressing climate change. With the outlines now approved, the next step is the nomination and selection of authors for the Working Groups and the Methodology Report. This will be followed by scoping meetings and the drafting of the reports themselves. Meanwhile, the scientific community and stakeholders are encouraged to engage with the process, including through expert reviews and contributing author roles. The road to AR7 has officially begun, and it will be a critical report for guiding global action over the next decade.

It is now up to governments, organisations, and individuals to translate these discussions into tangible actions that secure a sustainable future for all.



With Prof. Edwin Aldrian, Vice Chair of Working Group I, IPCC.

https://www.ipcc.ch/people/edvin-aldrian/

Inauguration of Plant-Atmosphere Interaction Research (PAIR) Laboratory

The Plant-Atmosphere Interaction Research (PAIR) Laboratory was officially inaugurated on **4th March 2025** at Indian Institute of Tropical Meteorology, marking a significant step toward advancing research on plant-atmosphere interactions.

The inauguration ceremony was graced by **Dr. Raghavan Krishnan, Director, IITM, Pune**, and **Dr. Shiv Kumar Sharma, National Organizing Secretary, Vijnana Bharati (VIBHA).**

The PAIR Lab is established to conduct photosynthesis field experiments using the LICOR 6800F instrument (Portable Photosynthesis and Chlorophyll Fluorescence System). The lab will facilitate research on how ozone and aerosols impact, plant growth and productivity and CO_2 Exchange contributing to critical insights in the field of environmental science and agriculture.

FGD on Waste Imports: Strengthening Policies for a Sustainable Future

A crucial Focus Group Discussion (FGD) took place on 16th January 2025, in Putrajaya, Malaysia bringing together key stakeholders to address the impact of imported plastic waste on the environment and public health in Kuala Langat, Selangor. This effort, supported by the Environmental and Occupational Health Society (EOHS) and funded by the Break Free from Plastic Movement (BFFP) through the Global Alliance for Incinerator Alternative (GAIA) Philippines, aimed to assess pollution from waste processing and empower communities to take action.

The session was highly engaging and built upon the discussions from last September's iLEAPS side event at the IGAC Kuala Lumpur conference, which focused on global plastic waste imports and microplastic pollution. The FGD gathered representatives from government agencies, NGOs, researchers, industry players, and local communities, creating a platform for open dialogue and collaborative solutions.

Dr. Eliani Ezani, an iLEAPS Scientific Committee member, was involved in and conducted the study on air pollution assessments, highlighting the severe impact of plastic waste pollution. She also chaired the FGD discussion and the subtheme discussion on the environmental consequences of plastic waste importation. The results of the research were presented by Assoc. Prof. Dr. Sharifah Norkhadijah Syed Ismail, the principal investigator for this project.

Participants from the Ministry of Investment, Trade and Industry (MITI), the Ministry of Natural Resources and Environment (NRES), the Department of Environment, the Department of Immigration and Customs, and local councils joined NGOs like Greenpeace, Basel Action Network, and the Turtle Conservation Society Malaysia, along with experts from Malaysian universities specializing in environmental health and waste management.

The discussion was structured around five key themes:

- Policy, Governance, and Public Awareness on Plastic Waste Import
- Economic and Social Impact of Plastic Waste Imports
- Environmental Consequences of Plastic Waste Importation
- Health Implications of Imported Plastic Waste
- Challenges in Waste Management and Recycling Systems

A major focus was the importance of shifting towards a circular economy and implementing Extended Producer Responsibility (EPR). These approaches emphasize reducing waste at the source, promoting sustainable product designs, and ensuring manufacturers take accountability for their products throughout their lifecycle. The discussion also covered stricter enforcement of waste import regulations and the need for better waste management infrastructure. Another major concern raised during the session was the proliferation of illegal e-waste processing facilities

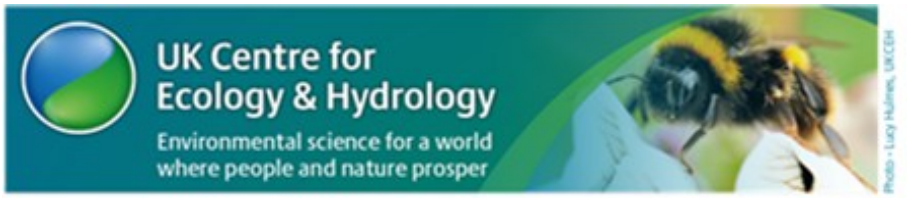
across Malaysia and their expansion into other facilities across Malaysia and their expansion into other Southeast Asian countries. Based on the discussions and presentations from each subtheme group, the findings will be compiled into a final report.

One of the key takeaways was the need for stronger collaboration between communities, authorities, and industries The findings from this study will be compiled into a report and shared with relevant authorities and stakeholders to push for stronger regulations and sustainable waste management practices. This report will be shared with all agencies that participated in the FGD, serving as a reference to support policy improvements and strengthen regulatory authority. This initiative reinforces iLEAPS' commitment to addressing pollution and supporting community-driven environmental advocacy while exploring the growing global problem of plastic waste, especially in the Global South countries.

By : Eliani Ezani

Department of Environmental and Occupational Health

Universiti Putra Malaysia (UPM)



UKECH Training Courses

Train the Trainer (11-12 June 2025)

https://www.ceh.ac.uk/training/train-trainer

Climate data analysis with python - on demand (immediate access for 4 weeks; free for learners from low income ODA countries!)

https://www.ceh.ac.uk/training/climate-data-analysis-python**

Using drones to map habitats - on demand (immediate access for 4 weeks)

https://www.ceh.ac.uk/training/using-drones-map-habitats-demand

Hands-On Machine Learning with Python for Environmental Solutions (17-20 June)

https://www.ceh.ac.uk/training/environmental-insights-machine-learning-theory-and-application

UKECH Training Courses

Freshwater phytoplankton identification (7-11 July 2025)

https://www.ceh.ac.uk/training/freshwater-phytoplankton-identification

Mastering Environmental Data with R: (23-25 September 2025)

https://www.ceh.ac.uk/training/transforming-environmental-data-r

Ozone and tropical agriculture - on demand (immediate access for 4 weeks; free for learners from low income ODA countries)

https://www.ceh.ac.uk/training/ozone-and-tropical-agriculture**

Radioecology for Environmental Protection (3 -20 June 2025)

https://www.ceh.ac.uk/training/radioecology

UKECH Training Courses

Train the online trainer - on demand (immediate access for 4 weeks)

https://www.ceh.ac.uk/training/train-online-trainer-demand

Evidence Synthesis - on demand (immediate access for 4 weeks))

https://www.ceh.ac.uk/training/evidence-synthesis-demand

Honours and Recognitions

Best Student Award – IGAC 2024

16th iCACGP Symposium & 18th IGAC Science Conference · Sep 2024

Honored to receive the Best Student Award at iCACGP-IGAC 2024 in Kuala Lumpur, Malaysia, for research on the **"Chemical Characterization of Ambient Fine Particulate Matter During Winter Fog Events in Delhi, India: Insights from High-Resolution Measurements"** contributing to atmospheric chemistry and air quality research.

2nd Prize – Best Poster Presentation – RMC 2025

31st Raman Memorial Conference, Savitribai Phule Pune University · Feb 2025

Prasanna Lonkar awarded 2nd for our research on **"Contrasting Features of Haze and Dense Fog in Different Regions over the Indo-Gangetic Plain"** contributing to atmospheric science and air quality research.

3rd Prize – Best Poster Presentation – RMC 2025

31st Raman Memorial Conference, Savitribai Phule Pune University · Feb 2025

Akash Vispute awarded 3rd Prize for our research on **"Detection and Characterization of Biomass Burning Aerosols using High-Resolution Time-of-Flight Aerosol Mass Spectrometer: A Mass Spectrometric Approach"** contributing to atmospheric science and air quality research.

Upcoming Events

EGU General Assembly

1. Fog and Dew: Advancing Our Understanding for Better Warning Systems

The Indian Institute of Tropical Meteorology (IITM), Pune, India, in collaboration with iLEAPS and the International Fog and Dew Association (IFDA), is organizing a special session on Fog and Dew at the EGU General Assembly 2025 – "Fog and Dew: Advancing Our Understanding for Better Warning Systems". The session aims to explore the scientific processes governing fog and dew formation, interaction, and environ-mental impact. It will showcase cutting-edge research across disciplines. A special issue in the Atmospheric Chemistry and Physics (ACP) Journal is also being organized for studies sub-mitted to the Fog and Dew Session.

More details at: https://meetingorganizer.copernicus.org/EGU25/session/53503

2. Ecosystem Services and Climate Extremes in Anthropocene: Interactions and Research Gaps iLEAPS is also organising the following session at EGU2025 that aim to: i) Enhance our knowledge of how climate extremes, in combination with other global change drivers like land-use change and climate warming, impact ecosystem services and biodiversity. ii) Identify methods to mitigate the decline in ecosystem services and functioning caused by climate ex-tremes. iii) Address research gaps in understanding the full feedback loops between biodiversity loss, changes in ecosystem services, and climate extremes. iv) Explore strategies to mitigate the impacts of climate extremes, strengthen ecosystem resilience, and enhance ecosystem services. This session also emphasizes the importance of implementing innovative policy tools and nature-based climate solutions that can improve biodiversity and, in turn, bolster ecosystem services.

More details at: https://meetingorganizer.copernicus.org/EGU25/session/52270.

The 2025 EGU General Assembly will be held both on-site in Vienna, Austria, and virtually from 27 April to 2 May 2025.

Important Dates

Abstract Submission is Open on 04 Nov 2024.

The abstract submission deadline is 15 January 2025, 13:00 CET.

iLEAPS SSC Meeting, 9-10 June, Bali, Indonesia.

iLEAPS will hold its Scientific Steering Committee (SSC) meeting in June 2025, with this year's meeting taking place in person. The meeting will be organised in conjunction with the ACAM Workshop, and is scheduled for 9–10 June 2025, immediately prior to the ACAM Workshop taking place from 11–13 June. This co-location provides an excellent opportunity to strengthen collaboration and visibility across networks.

As part of the programme, SSC members will also be contributing to the ACAM Workshop, presenting their current research and engaging in discussions around key themes such as air quality, greenhouse gas emissions, aerosol - asian monsoon interactions and pollution transport to upper and lower troposphere. In addition to the iLEAPS SSC and ACAM communities, we will also be extending invitations to representatives from other Global Research Networks (GRNs).

This will create space for meaningful dialogue on shared research priorities and future collaborative initiatives, supporting the wider Future Earth mission.

Sustainability Research and Innovation Congress (SRI2025)

iLEAPS is pleased to be contributing to the fifth Sustainability Research & Innovation Congress (SRI2025), which will take place from 16–19 June 2025 at the Sheraton Grand Chicago Riverwalk and online. With its emphasis on interdisciplinary collaboration, inclusivity, and impact, the event provides an ideal platform for advancing the mission of iLEAPS and its partners.

At SRI2025, iLEAPS will be leading two sessions. The first, titled *"Global Plastic Waste and Microplastic Pollution: Addressing Transboundary Challenges,"* will be held online. This session will explore the growing global crisis of plastic and microplastic pollution, particularly the need for coordinated transboundary responses. It will bring together researchers, practitioners, and policymakers to discuss scientific advances, data gaps, and the governance mechanisms needed to address this multifaceted issue. Speakers will include experts from across disciplines and regions, with a focus on promoting equitable and science-informed policy solutions.

The second session, led by the Global Land Programme (GLP) in partnership with iLEAPS and other Global Research Networks (GRNs), is titled *"Mapping Global Research Networks to Build Effective Knowledge-Action Systems for Sustainable Futures."* This on-site session will highlight the importance of connecting research networks to enhance collective impact, facilitate systems thinking, and promote more effective engagement with decision-makers and communities. It is designed as a cross-disciplinary dialogue, where representatives from multiple GRNs will share experiences and explore how collaborative approaches can better support sustainability transitions at local, regional, and global levels.

World Meteorological Organization

11th WMO Scientific Conference on Weather Modification (Pune, India, 3-7 November 2025)

The Eleventh WMO Scientific Conference on Weather Modification will be held at IITM Pune, India during 3 -7 November 2025.

The Conference is being organized in the following main areas:

a) Weather Modification Research and the study of cloud and precipitation processes
b) Operational weather modification projects, methods, outcome, and their scientific assessments
c) Weather Modification, and the physical and socio-economic environment aspects

Specific sessions will be conducted for

* Observational studies
* Field measurements

- Laboratory Studies
- Modelling studies
- Emerging Technologies for weather modification/ weather forecasting
- Decision support systems and nowcasting towards Weather management
- Advanced statistical methods, including data-driven models, AI/ML
- Physical, environmental, and socio-economic aspects, ethical aspects
- Operational cloud seeding
- Climate Intervention Research, Stakeholders /policymakers perception and demands

Online submission of abstracts will be available through the IITM website.

Community

International Project Office (IPO) of iLEAPS

Maclean Building, Wallingford

OX10 8BB, United Kingdom

ipo@ileaps.org/ileaps@ceh.ac.uk

Dr. Garry Hayman

IPO Science Officer

UK Centre for Ecology & Hydrology

garr@ceh.ac.uk

Dr. Semeena V Shamsudheen

IPO Executive Officer

UK Centre for Ecology & Hydrology

semval@ceh.ac.uk

iLEAPS SSC Members

Dr. Ben Poulter (Co-Chair)

NASA Goddard Space Flight Center Maryland, USA

benjamin.poulter@nasa.gov

Dr. Sachin D Ghude (Co-Chair)

Indian Institute of Tropical Meteorology Pune, India

sachinghude@tropmet.res.in

Dr. Xianhong Meng

Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science

mxh@lzb.ac.cn

Dr. Hisashi Sato

Japan Agency for Marine-Earth Sciences and Technology (JAMSTEC)

hsatoscb@gmail.com

Dr. Pallavi Saxena

Department of Environmental Sciences, Hindu College, University of Delhi, Delhi, India.

pallavienvironment@gmail.com

Dr. Gemma Purser

The University of Arizona, Tucson, United States

gepurse25@ceh.ac.uk

Dr. Jiming Jin

Yangtze University.

jimingjin99@gmail.com

Dr. Gregor Feig

South African Research Infrastructure Roadmap (SARIR) program,, SAEON

gt.feig@saeon.nrf.ac.za

Dr. Stefan Wolff

ATTO project (Amazon Tall Tower Observatory)

stefan.wolff@mpic.de

Dr. Masayuki Konto

IDEC Institute, Hiroshima University

redmk92@gmail.com

Dr. Qiaoyun Xie

School of Engineering, The University of Western Australia

qiaoyun.xie@uwa.edu.au

Dr. Eliani Ezani

Department of Environmental and Occupational Health, Faculty of Medicine and Health Sciences Universiti Putra Malaysia (UPM).

elianiezani@upm.edu.my

Dr. Hu Jia

School of Natural Resources and Environment at the University of Arizona (UA)

jiahu@arizona.edu

iLEAPS Early Career Scientist Network

Dr. Kerneels Jaars (Head of South Africa Network)

School of Physical and Chemical Sciences at North-West University, Mahikeng, South Africa.

Dr. Saurabh Sonwani (Head of South Asia & Middle East Network)

Department of Environmental Studies ZHDC, University of Delhi, New Delhi, India

Dr. Sahil Bhandari (Head of North America Network)

University of British Columbia, Canada

Dr. Gemma Purser (Head of Europe & Mediterranean Network)

The University of Arizona, Tucson, United States

José Morán (Head of Latin America Network)

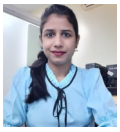
Institute National des sciences appliquees INSA of rouen, France

Tihomir Simin (Head of European Region)

University of Copenhagen, Denmark

Jhonathan R Gamboa (Head of Australia & New Zealand Region)

University of Wollongong, Australia



Newsletter Prepared By
Bhagyashri Katre
IITM,Pune