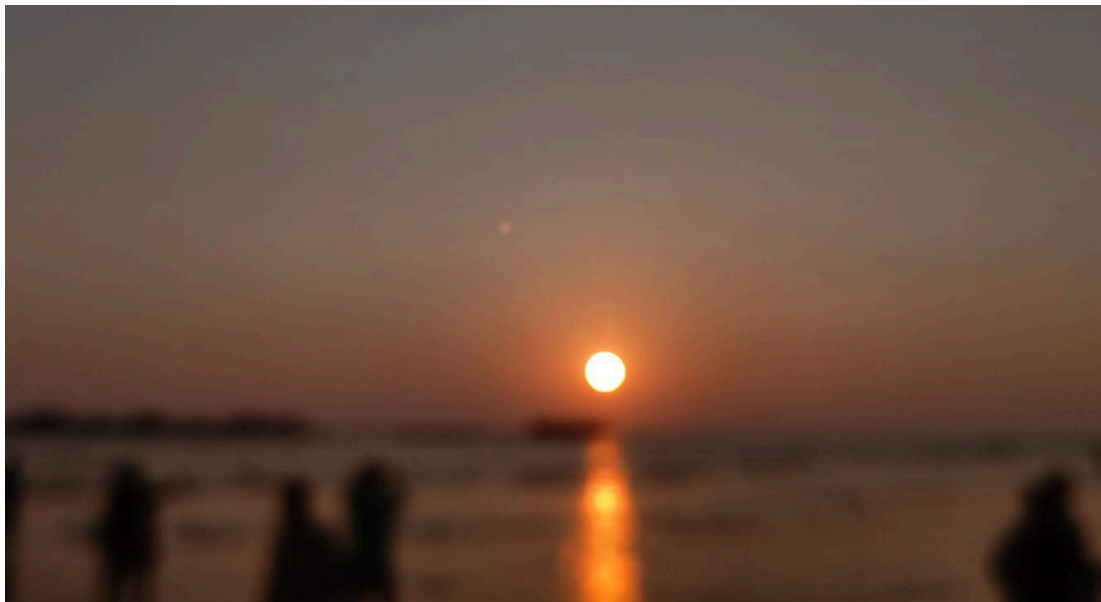


JANUARY–JULY, 2024

<https://www.climate.iitb.ac.in/>

NEWSLETTER

CLIMATE STUDIES



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CONVENER'S MESSAGE



Dear Readers,

I want to congratulate all for our climate family for our promotion from Interdisciplinary Programme in Climate Studies to **Centre for Climate Studies**. I thank to every student, professor and academic and non-academic staff for their contribution for this feat. Centre for Climate Studies is delighted to welcome Prof. Akshaya Nikumbh, its first female core faculty member in this journey. We also welcome our new students joined for PhD this year. The main aim of our Centre is advancement of society through science. Keeping up with our efforts, this year we have launched app-based early warning system for Mumbai flood (details given below), which we are confident will serve the people of Mumbai in their day to day life. Along with that, we have published several research articles for advancement of science and society.

I congratulate Prof. Swatantra Pratap Singh for being selected for the INSA young associates 2024. I am also delighted to share that Prof. Chandra Venkataraman (founding convener) has been awarded with prestigious 'Distinguished Alumni Award' of IIT Delhi, 2024 for her exceptional contribution to research and exemplary leadership. My heartiest congratulation to Prof. Vikram Vishal to receive the 'National Geoscience Award', 2023 from the Ministry of Mines, Govt. of India under Applied Geoscience. Our faculty members have managed to shine through once again with their hard work and perseverance.

I also congratulate the students and professors who presented their research in different seminar and conference, furthering our agenda to improve climate knowledge.

I also request all the readers to listen and go through the podcasts and documentaries featured in our newsletter. I wholeheartedly welcome you all to our latest newsletter and sign off with warm regards.

Prof. Subimal Ghosh
Head
Centre for Climate Studies

MUMBAI FLOOD MONITORING



The banner features logos for Climate Studies, HDFC ERGO, and IIT Bombay. It includes the URL <https://www.mumbaiflood.in/> and a QR code for downloading the app. A list of features is provided: hourly rainfall data from all MCGM AWS, 3-day rainfall forecasts (experimental), water-level monitoring sensors, rainfall Twitter feed, and rainfall local train stations data. A central image shows the app's interface on a laptop and a smartphone, displaying maps and data. A red button at the bottom says 'REPORT FLOOD IN YOUR AREA'.

Hourly rainfall data from all MCGM AWS.
3-day rainfall forecasts (experimental).
Water-level monitoring sensors.
Rainfall Twitter feed.
Rainfall local train stations data.

<https://www.mumbaiflood.in/>

Download now!

MUMBAI FLOOD APP *Experimental*

by Climate Studies, IIT Bombay

REPORT FLOOD IN YOUR AREA



Science,
technology, and
citizen science

As extreme events like floods become more frequent due to climate change, dissemination of accurate forecasting is essential. This allows urban authorities to develop effective mitigation strategies and helps citizens plan their activities safely in advance. Additionally, integrating citizen science is crucial, as it not only generates valuable data and insights from citizens but also helps identify and remove bottlenecks, making the system more resilient. Under HDFC-ERGO funding, a team of professors, students, and staff from Centre for Climate Studies and Department of Civil Engineering at IIT Bombay has developed an experimental Rainfall forecasting and flood monitoring system (Web-portal: <https://www.mumbaiflood.in/> and App: MUMBAI FLOOD APP) to address the challenges of urban flooding in Mumbai, a city frequently impacted by severe monsoon rains. The system provides a user-friendly portal where citizens can access hyperlocal rainfall forecasts for the next three days at 36 locations across Mumbai, monitor live water levels at six flood hotspots in the city, check the levels at three key water bodies responsible for Mumbai's drainage, and receive alerts for stations of local railway, Mumbai's lifeline, based on current rainfall amounts. Moreover, a unique feature of the system is its integration of citizen science, allowing users to report flooding incidents and share on-the-ground conditions by filling out a form, with the hotspot information then displayed live to the people of Mumbai. The system further leverages crowdsourcing by analysing the tweets to gauge public sentiment during these events, providing valuable real-time insights.

MUMBAI FLOOD MONITORING

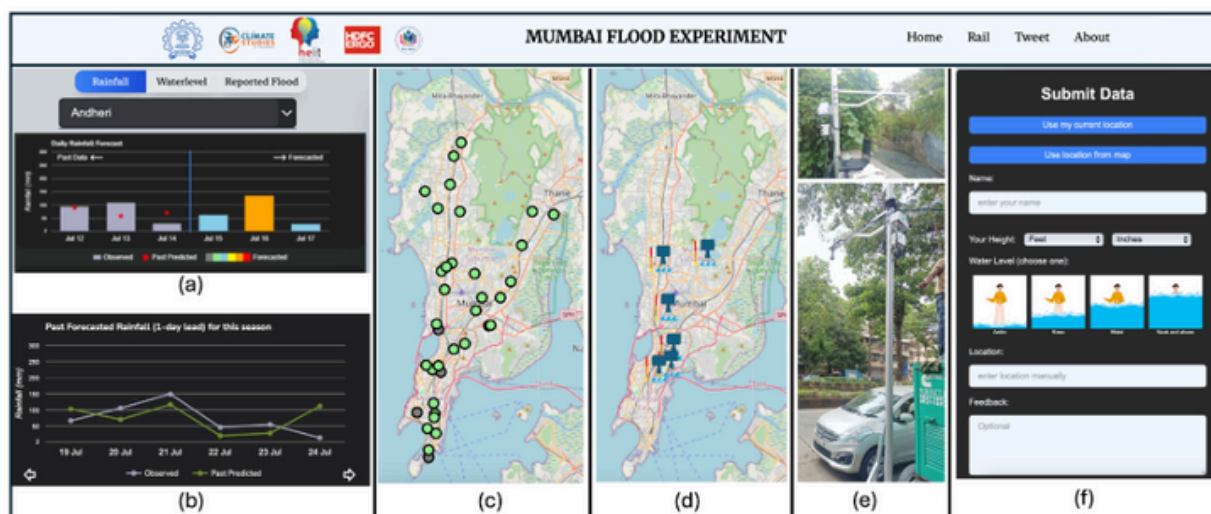
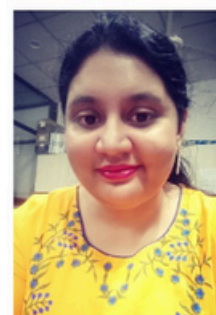


Figure 1: The diagram showcasing the different components of the portal mumbai flood.in. (a) The forecast for next three days (right side, coloured bars) and comparison between observed (grey bars) and predicted (star marked) for the previous three days; (b) The comparison of the past forecasts and observed data; (c) Spatial map of 36 hyperlocal automatic weather station (from MCGM) and predicted locations of Mumbai; (d) The location of water level monitoring stations; (e) The water level sensors installed on the Vakola Nalla and RA kidwai road, Wadala of Mumbai; (f) The form for reporting water logging information from the citizens. The maps showing markings of citizen flood hotspot, Rail alerts, and sentiment analysis of tweets are not shown. Please visit mumbai flood.in for more detail.

The project showcases the design and implementation of a comprehensive city-wide system that employs the latest scientific forecasting techniques and engages with the multi-layered structure of urban local bodies (ULBs) to establish a monitoring setup on the city infrastructure. This sets a precedent for future projects of this nature for a city. The forecasting process involves downscaling the Global Forecast System (GFS) to hyperlocal stations using AI/ML, which has outperformed other available forecasting systems. The monitoring setup involves obtaining rigorous permissions from the respective ward officers, safety approval by engineers, securing electrical connections, and getting approval from nearby residents for a metered connection to install water level sensors on streetlights and footpaths. The participatory approach through 'Reported Flood' not only informs citizens and ULBs of hotspots to take proactive measures in real-time but also uncovers previously undetected flood locations, thereby enhancing urban flood modelling. The tweet classification, based on natural language processing, reveals positive sentiments that highlight the enjoyable aspects of Mumbai rains, while negative sentiments reflect the distress associated with flood events. The station alerts are based on high rainfall within a short span, using data from the nearest weather station provided by the disaster wing of the Municipal Corporation of Greater Mumbai (MCGM). The future scope of the project includes downscaling forecasts to hourly intervals and releasing flood forecast maps for Mumbai, providing hyperlocal information on potential flooding. The successful implementation of MUMBAI FLOOD APP paves a way for industry and research institutes to develop a city-scale urban services that can be expanded to other cities.

MUMBAI FLOOD MONITORING

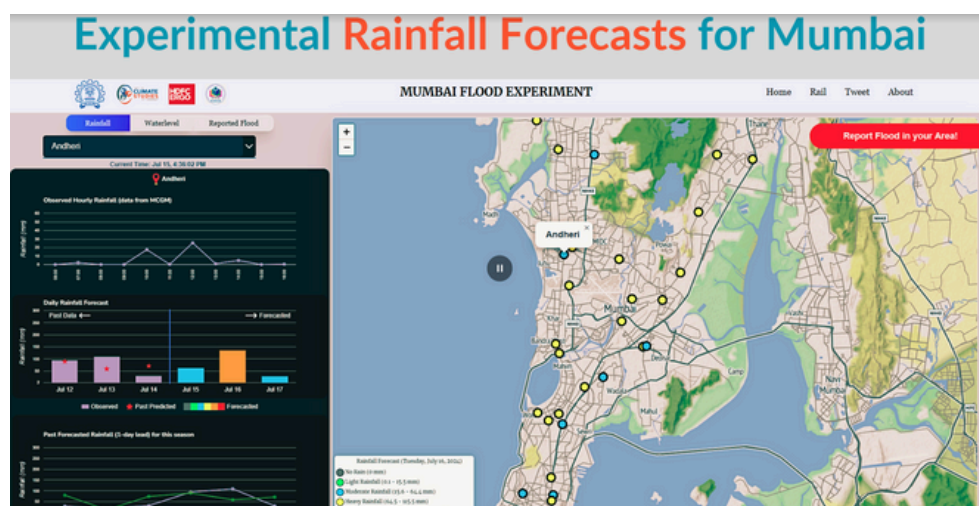


www.mumbaiflood.in



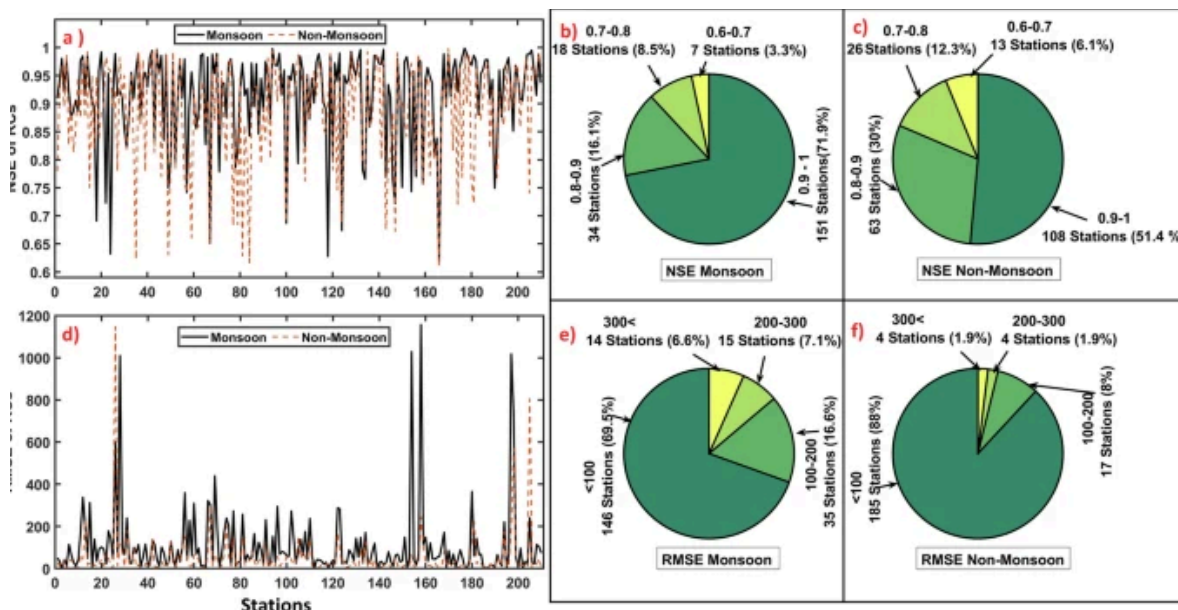
Project team: Prof. Subimal Ghosh, Prof. Raghu Murtugudde, Dr. Mayank Gupta, Dr. Aniket Navalkar, Puja Tripathy, Dr. Sanghita Basu, Deepak Silaych, Gulshan Kumar, Archismita Banerjee, Sheeba Sekharan

MUMBAI FLOOD APP Promo Video



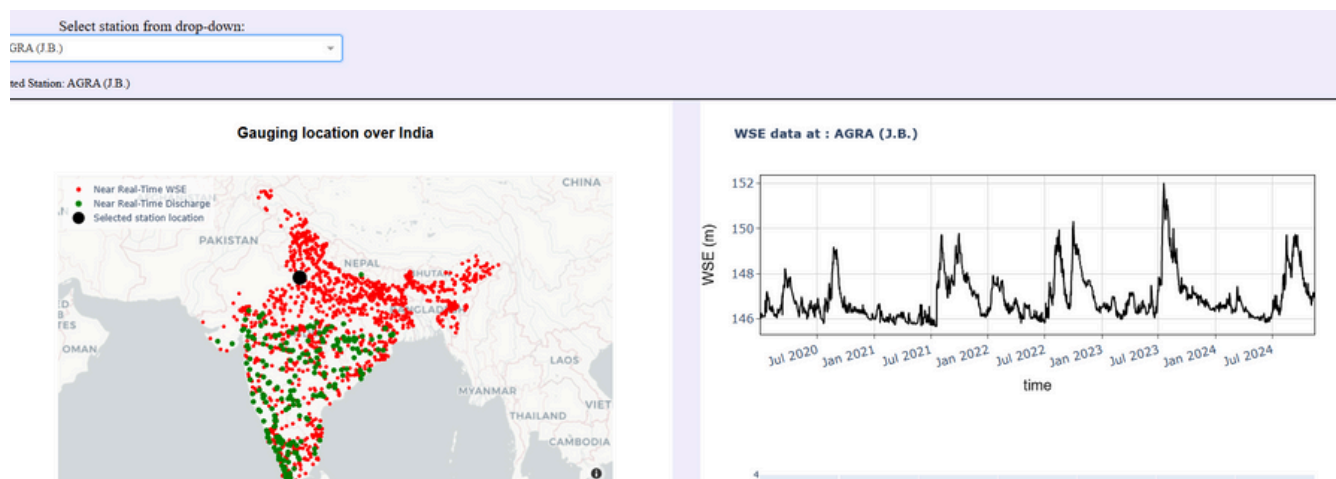
RESEARCH HIGHLIGHTS

Patidar, G., Indu, J., and Karmakar, S., 2024: Extending SUB-Daily River Discharge data over INDia (GUARDIAN). Scientific Data. DOI: 10.1038/s41597-024-03923-8 (In production)



This study extends real-time, sub-daily river discharge monitoring to over 200 stations across India, providing enhanced temporal resolution and coverage for hydrological analysis.

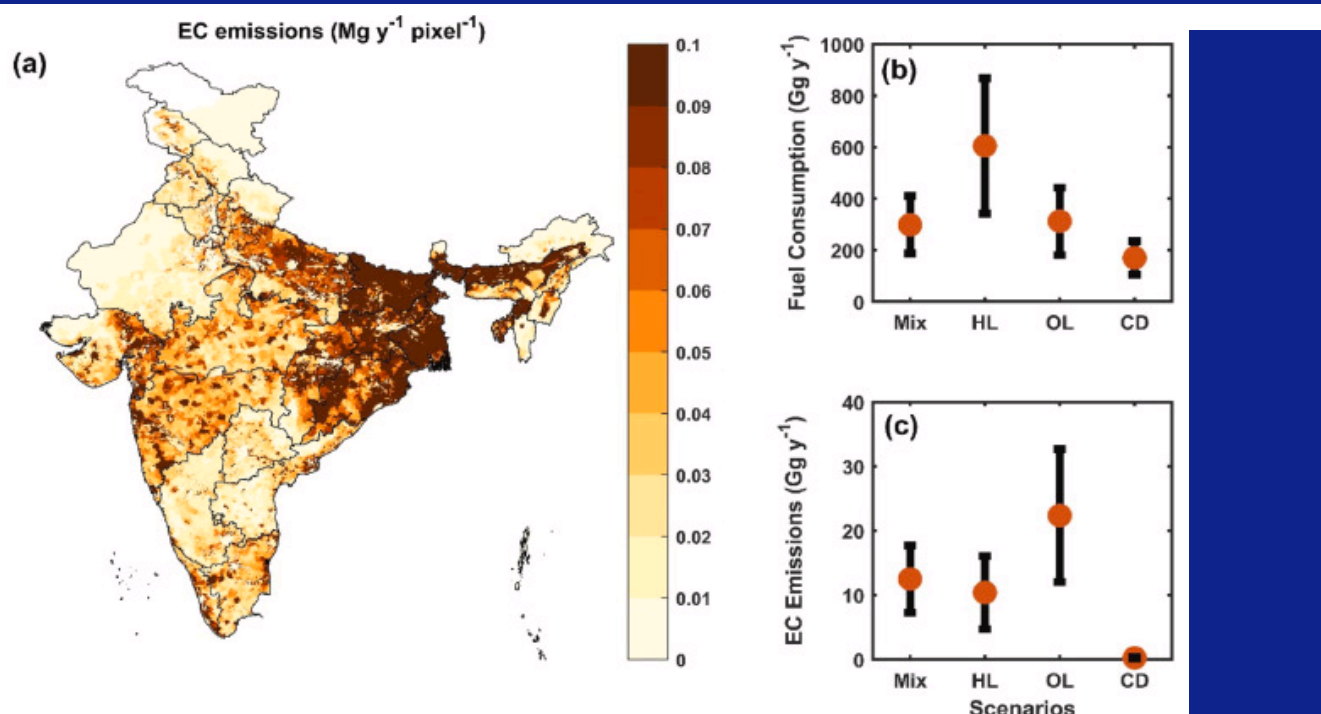
Building on the findings published in Nature Scientific Data, we have developed a unique web portal (<http://indiariverflow.com/>) that allows researchers to visualize and download real-time water surface elevation and discharge data from over 200 stations across India. This type of data availability portal was previously unavailable in India, addressing a significant gap in the country's hydrological research.



Screenshot from the web portal

RESEARCH HIGHLIGHTS

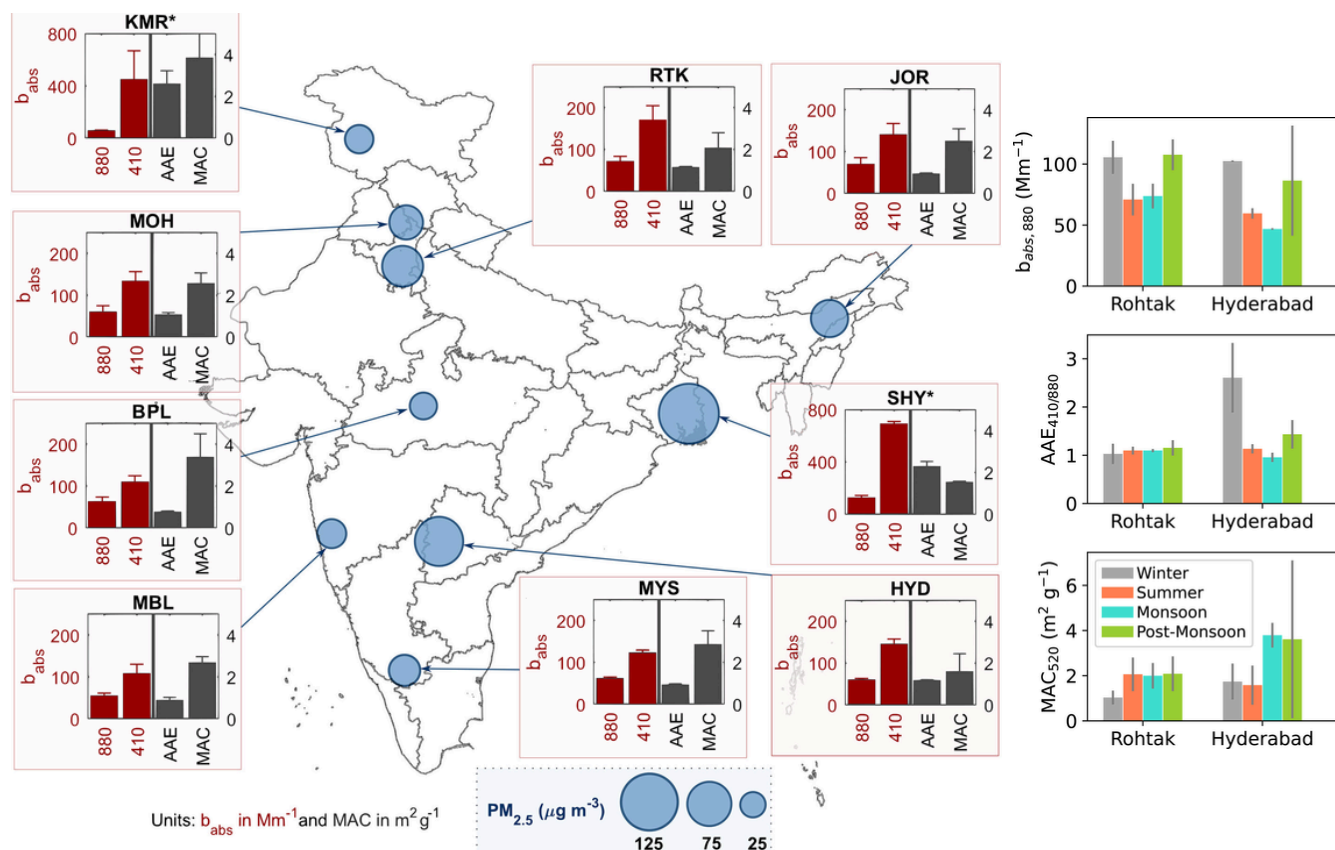
Navinya C., Kapoor T. S., Anurag G., Venkataraman C., Phuleria H. C. (2024): Carbonaceous Aerosol Emissions from Secondary Lighting Sources: Emission Factors and Optical Properties. Atmospheric Pollution Research. <https://doi.org/10.1016/j.apr.2024.102321>



India is shifting towards cleaner residential fuels, but this transition does not fully address household lighting challenges. Power disruptions, especially in rural areas, lead to the use of secondary lighting sources such as kerosene lamps, edible oil lamps, and candles. Our previous work identified kerosene wick and hurricane lamps as major secondary lighting sources in Indian households. This study presents the emission factors (EF) and optical properties of carbonaceous aerosols from five major secondary lighting devices in India, measured using a laboratory extractor hood system. Dominant secondary lighting devices, such as simple wick lamps ($61.4 \pm 9.8 \text{ g kg}^{-1}$) and hurricane lamps ($17.2 \pm 4.8 \text{ g kg}^{-1}$), exhibit higher elemental carbon (EC) EFs than typical residential biomass burning. Sesame oil lamps, primarily used in India during the Diwali festival, also have significant EC emission potential, with an EC EF of $71.6 \pm 16.9 \text{ g kg}^{-1}$. The low absorption Angstrom exponent (AAE) of ~ 1 at near-UV wavelengths indicates a dominance of black carbon (BC) and negligible brown carbon absorption, corroborated by very low organic carbon concentrations. India-wide EC emissions ($12.5 \text{ Gg year}^{-1}$) from residential kerosene lighting show a higher ($\sim 50\%$) contribution from eastern India. Additionally, the use of oil lamps during the Diwali festival could emit $\sim 3 \text{ Gg}$ of EC in two days, with a potential reduction of $\sim 90\%$ if wax-based lamps replace oil lamps. These measured EFs, aerosol optical properties, and estimated emissions will help future studies derive more accurate climate and health impacts from these otherwise overlooked lighting devices.

RESEARCH HIGHLIGHTS

Kapoor T. S. et. al. (2024): Spatial distribution in surface aerosol light absorption across India. Geophysical Research Letters. Volume 51, Issue 18. <https://doi.org/10.1029/2024GL110089>

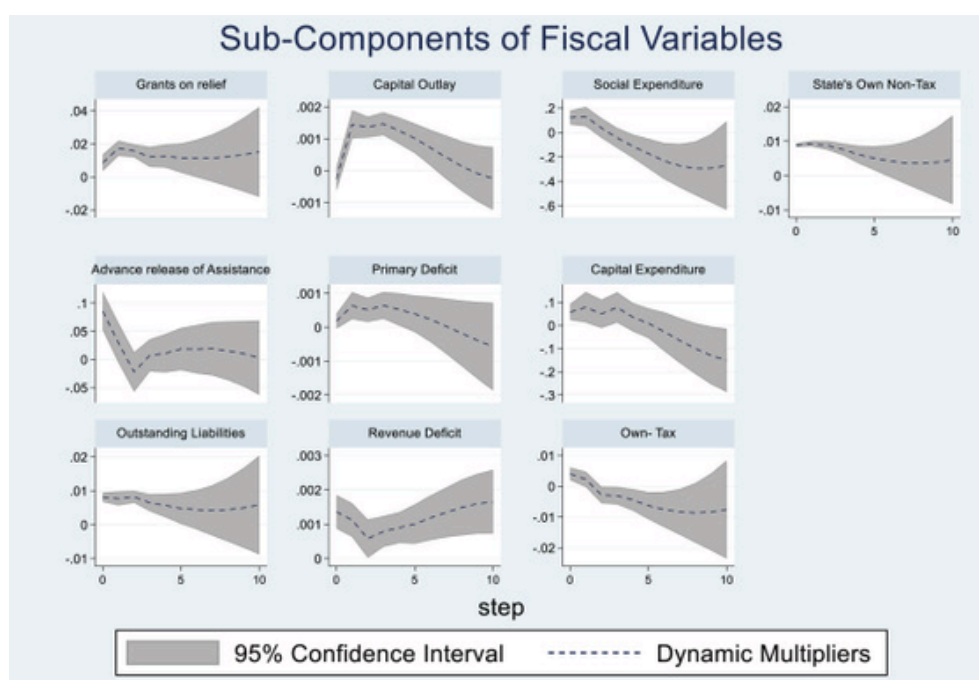


Particulate pollution in the atmosphere scatter and absorb incoming solar energy, thus cooling or warming Earth's atmosphere. In developing countries and especially in India, one of the most polluted regions of the world, the extent to which particles can absorb solar energy and warm the atmosphere is not well understood. Here, for the first time, we measure particle absorption simultaneously at nine ground sites across India, in diverse geographical regions with different levels and types of particulate pollution. We find that organic carbon particles exert large absorption at near-ultraviolet wavelengths, which contain significant solar energy. These light absorbing organic carbon particles, called brown carbon, are emitted in large quantities from biomass burning (e.g., burning crop residue and cooking on wood-fired stoves). Comparing ground measurements of absorption with satellite-retrieved measurements that are representative of the entire atmospheric column, we find that near-surface atmospheric particles can exert significant warming. This study highlights the need to improve climate model simulations of particulate pollution's impact on the climate by incorporating spatiotemporal surface-level absorption measurements, including absorption by brown carbon particles.

Co-Authors: Chimurkar Navinya, Adishree Apte, Nishit J. Shetty, Pradnya Lokhande, Sujit Singh, Sadashiva Murthy B. M., Meena Deswal, Jitender S. Laura, Akila Muthalagu, Asif Qureshi, Ankur Bhardwaj, Ramya Sunder Raman, Yang Lian, G. Pandithurai, Pooja Chaudhary, Baerbel Sinha, Shahadev Rabha, Binoy K. Saikia, Tanveer Ahmad Najjar, Arshid Jehangir, Sauryadeep Mukherjee, Abhijit Chatterjee, Harish C. Phuleria, Rajan K. Chakrabarty, Chandra Venkataraman

RESEARCH HIGHLIGHTS

Suresh, N., Mishra, T. and Parthasarathy, D. (2024) 'The impact of floods and cyclones on fiscal arrangements in India: An empirical investigation at the sub-national level', *International Journal of Disaster Risk Reduction*, 110, p. 104620. doi:10.1016/j.ijdr.2024.104620.



Disasters can inflict severe devastation on communities and territories at all levels of authority. With regard to the connection between floods and cyclones and their financial impact, this study seeks to refocus national and subnational research efforts. The consequences of floods and cyclones on India's budget and economy at the subnational government level are examined in this study. The study creates a physical disaster intensity index to evaluate the impact on fiscal sustainability after disasters, as the estimated damages statistics are unreliable. Between 1995 and 2018, the study integrated disaster intensity index and budgetary data to produce a panel dataset of 25 Indian states. Using Panel Vector Autoregression, the study discovers that a state's overall government expenditure goes up, and its budget deficit worsens when floods and cyclones strike. By further breaking up the fiscal variables, we could pinpoint specific areas where disasters have exerted their influence, especially in terms of decreased own tax revenue, increased social sector expenditure and capital outlay, increased outstanding liability, increased primary deficit, and reduced transfers from the centre over time. It observed that after disasters, states more prone to disasters have higher volatility in revenue generation and expenditure patterns, and a sharp increase in outstanding liabilities. This suggests a greater reliance on borrowing for disaster recovery. Less-prone states, however, show higher utilization rates of disaster relief funds, indicating better resource allocation for disaster response and recovery. The study highlights that state governments rely highly on ex-post Disaster Risk Financing instruments, especially debt financing, as national relief and response funds couldn't manage the increased spending and budget deficit from disasters. This study thus helps policymakers and governments look for more proactive disaster financing instruments and make changes in India's fiscal framework to integrate climate change considerations.

RESEARCH HIGHLIGHTS

India ranked 26th in Children's Climate Risk: Unicef report highlights urgent action required

Manash Pratim Gohain / TNN / Nov 20, 2024, 21:36 IST

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India ranks 26th on Unicef's list of countries where children face climate change risks. Millions of Indian children may be impacted by extreme flooding and rising temperatures in the coming decades. However, Unicef believes India can overcome these challenges by investing in sustainable infrastructure, education, healthcare, and digital

👑 Heatwaves alone might cost India 4.5 % of its GDP – Trupti Mishra, Professor, IIT Bombay

Trupti Mishra(TM) is Professor at the Shailesh J Mehta School of Management at IIT Bombay. Her area of research is environmental economics, specifically, economics of pollution and climate change.

Climate Change

August 2024 saw 30% more days with extreme rainfall than same period last year

According to IMD the rainfall across the country in September 2024 is expected to be above normal, exceeding 109 per cent of the Long Period Average



FACULTY SPOTLIGHT



Subimal Ghosh wins the 2024 Alexander von Humboldt medal

On 19 April 2024, Prof. Subimal Ghosh brought immense pride to India by receiving the Alexander von Humboldt Medal 2024 at the EGU 2024 General Assembly in Vienna, Austria.

This prestigious award in Geoscience recognizes Ghosh's exceptional work in hydrometeorology, climate services, climate education, and the societal impacts of the South Asian Summer Monsoon System.

He is only the second Indian to win this award.

Ghosh emphasized the need for a bottom-up strategy, working with farmers and local communities to understand their specific needs and challenges. This collaboration would lead to more effective and inclusive solutions

The Indian monsoon: Lifeblood of a nation

Prof. Ghosh explained the basics of the Indian monsoon and its crucial role in India's economy. He emphasized how the monsoon impacts agriculture, which is essential for food security and exports.

He also discussed the common use of the "magic number 10%" for predicting monsoons, which often leads to misleading results because it averages out important local differences. He stressed the need for a more detailed approach that considers these variations.



FACULTY SPOTLIGHT

Heartiest congratulations to Prof. Subimal Ghosh, for receiving the prestigious Alexander von Humboldt Award by EGU. ✨
He is only the second Indian to earn this honor, following his IISc-Bangalore mentor, Prof. PP Mujumdar! 🙌🏆



Alexander von Humboldt Medal Lecture by Subimal Ghosh



FACULTY SPOTLIGHT



Prof. Swatantra Pratap Singh

Many congratulations to Prof. Swatantra Pratap Singh. He has been selected for the **INSA Young Associates 2024** for his insightful research. The **INSA Young Scientist Award** recognizes exceptional contributions to science and technology by promising researchers under the age of 35 in India.

Prof. Chandra Venkataraman

Prof. Chandra Venkataraman (Founding convener of Climate Studies) has been selected for the prestigious **Distinguished Alumni Award of IIT Delhi** for the year 2024 for her unparalleled contributions to research and exemplary leadership.



Prof. Vikram Vishal

Many congratulations to **Prof. Vikram Vishal**. He has received the **NATIONAL GEOSCIENCE AWARD 2023** from the **Ministry of Mines, New Delhi under Applied Geosciences**. The **National Geoscience Award** honors outstanding contributions in the field of geosciences, mining, and allied areas, fostering excellence in Earth science research and applications.

FACULTY SPOTLIGHT



We are proud to share that **Hon'ble President of India, Smt. Droupadi Murmu**, conferred the prestigious **National Geoscience Award 2023** to **Prof. Vikram Vishal** in the field of Applied Geology during a grand ceremony at Rashtrapati Bhavan. This competitive and esteemed award recognizes his significant contributions.

Prof. Vishal is a two-time Fulbright Award and three-time National Award recipient, and he brings deep technical expertise in carbon dioxide capture and storage, significantly shaping India's climate mitigation strategies.

FACULTY SPOTLIGHT

Prof. Raghu Murtugudde and Prof. Subimal Ghosh led electrifying sessions on Climate Science on the 4th day of Tech-Trends 2024 for the students of Filix School, Purulia, West Bengal.



STUDENTS HIGHLIGHTS

Reshma
Sharma



Names of conferences

European Symposium on Computer-Aided Process Engineering and International Symposium on Process Systems Engineering (ESCAPE 34 PSE 24)

Funding

Scholarship received to attend International Summer School Program on Climate Change and Related Risks, organized by Fudan University and WMO at Shanghai

Details of the presentation

Reshma Shinde, Yogendra Shastri, Anand B. Rao (2024), "Climate change adaptation measures for water-stressed thermal power plants in India", ESCAPE 34 – PSE 24, Florence, Italy 2nd – 6th May 2024. <https://doi.org/10.1016/B978-0-443-28824-1.50141-1>

Achanya Lakshmanan



Bibliographic details.....

Lakshmanan, Achanya, Yogendra Shastri, and Riddhi Singh. Climate change impact on wheat yield in India: Study using CERES-wheat model. No. EGU24-18617. Copernicus Meetings, 2024.

Title of the presentation:

Climate change impact on wheat yield in India: Study using CERES-wheat model

It is an interdisciplinary and relatively new field But its foundation is based on the basic principles of the traditional fields. So, it offers a unique opportunity to bring expertise from various fields and work on socially relevant and cutting-edge problems.

STUDENTS HIGHLIGHTS

Conference

"General Assembly 2024 of European Geosciences Union (EGU)"
Poster Presentation

Details of the presentation

Role of soil-vegetation in influencing terrestrial water cycle through natural-human induced processes over the Indian region.

Doi: <https://doi.org/10.5194/egusphere-egu24-14875>



Ajinkya Khandare

Nandini Suresh



Conferences

1. EAERE Conference, Leuven, Belgium.
2. EGU General Assembly. Vienna, Austria
3. INSEE Biennial Conference. Gurgaon, India.

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1. Suresh., N, Mishra, T., and Parthasarathy, D., (2024). Do natural disasters have an impact on fiscal variables in India? An empirical investigation at the sub-national level. In Proceedings of the 29th EAERE Conference, Leuven, Belgium.
2. Suresh., N, Mishra, T., and Parthasarathy, D., (2024). Catastrophic (CAT) Bond as Sustainable Finance Instruments: Understanding from Cross-Country Perspectives. In Proceedings of the EGU General Assembly. Vienna, Austria. <https://doi.org/10.5194/egusphere-egu24-10267>.
3. Suresh., N and Mishra, T., (2024). Examining the Fiscal and Growth Impacts of Floods and Cyclones on the Sub-National Government: Evidence from India. In Proceedings of the 12th INSEE Biennial Conference. Gurgaon, India.

CLIMATE EVENTS

The 3rd Annual CSR Conclave 2024 by IIT Bombay saw ClimateIITB proudly setting up its stall. The event fostered insightful and rewarding student-industry interactions, showcasing innovative research opportunities.



CLIMATE EVENTS



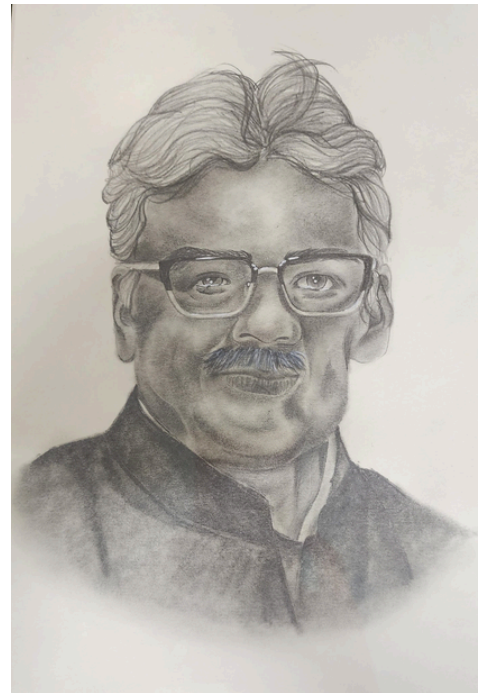
Dr. AKHILESH GUPTA

Anusandhan
National Research
Foundation:
A major step
towards achieving
India's R&D
leadership

Seminar

Organised by IDP in
Climate Studies & Civil
Engineering Association

4 April 2024, 11.00 - 11.45 am
Venue: Seminar Hall, 1st Floor, Civil
Engineering Dept., IIT Bombay



Heartiest congratulations to Dr. AKHILESH GUPTA (ex-Secretary, SERB and ex-Advisor, DST) 🎉

His exceptional contributions to advancing climate research and education in India have been truly inspiring.

Before his superannuation, Dr. Gupta visited our Centre at IIT Bombay, where he played a pivotal role in its establishment and growth. 🙏

His guidance and support have left a lasting impact, and our students continue to look up to him with admiration!



ALUMNI HIGHLIGHTS



“I am certain the IDPCS graduates will pursue independent research wherever they go, I am hopeful of continued collaborations even after the juniors start their career”.

”

Dr. Ankur Srivastava

Scientist D, Indian Institute of Tropical Meteorology, Pune

How was your experience at Climate Studies?

Climate Studies, IITB provided me with a wonderful platform to pursue my research. The pleasant research environment and the flexibility provided by the PhD program here is unparalleled, which let me pursue new ideas.

“I'd tell my juniors to stay curious, keep learning, and be patient. Don't be afraid to take risks or try new things. Networking is also important, so build relationships with people in the field of interest.”

”



Dr. Nitin Umakant Patil

Senior Specialist, HPC & AI, Hewlett Packard Enterprise, Bangalore

How was your experience at Climate Studies?

My time at Climate Studies, IITB was a rewarding experience, where I delved into climate modeling and gained valuable expertise in high-performance computing. I had the privilege of working on stimulating projects and connecting with inspiring individuals. My post-PhD journey has been exhilarating thus far. As a senior HPC & AI specialist at Hewlett Packard Enterprise, I've had the opportunity to expand my knowledge into climate modeling on HPC systems and explore the applications of AI models. I've also had the pleasure of collaborating with HPC and AI professionals from around the globe.

PUBLICATIONS

1. Gupta, M., Murtugudde, R., & Ghosh, S. (2024). Simulating urban surface energy balance of an academic campus and its surroundings in Mumbai, India. **Urban Climate**, 56, 102044. <https://doi.org/10.1016/j.uclim.2024.102044>
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12. Budakoti, S., Pallavi, P. & Horam, C. Assessing the Impact of Various Controlling Factors on Chlorophyll Concentration in the Arabian Sea Using Remotely Sensed Observations. **Thalassas** (2024). <https://doi.org/10.1007/s41208-024-00676-4>
13. Fiedler, S., Naik, V., O'Connor, F.M., Smith, C.J., Griffiths, P., Kramer, R.J., Takemura, T., Allen, R.J., Im, U., Kasoar, M. and Modak, A., 2024. Interactions between atmospheric composition and climate change—progress in understanding and future opportunities from AerChemMIP, PDRMIP, and RFMIP. **Geoscientific Model Development**, 17(6), pp.2387-2417. <https://doi.org/10.5194/gmd-17-2387-2024>

PUBLICATIONS

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FACULTY INTERVIEW

Strife, Life & Scienceing through Life



A little about you and your formative years

I spent most of my childhood in Chandwad, a quiet town surrounded by hills in Nashik, Maharashtra

Some of my fondest memories are watching sunrise through the arc of mountains from our front door, and walking to a nearby hill, and finding shapes in clouds—moments of solitude that unknowingly nurtured my interest in the climate and atmospheric sciences.

Words of Wisdom.....

Work on research problems that interest you the most! Even though, at times, some questions might appear hard, approach them with curiosity and sincerity. Take breaks in between, discuss with peers, and you will eventually find the solution.

In Nobel laureate Syukuro “Suki” Manabe’s simple yet most important words, **“Have great fun!”** while researching/ working.

Science Away! – Tell us a little about your Research

The main focus of my work is understanding physical processes leading to weather extremes, especially precipitation extremes. This requires knowledge of atmospheric convection, i.e., how precipitating systems/clouds ranging from a single thunderstorm cell to mesoscale convective systems that span hundreds of kilometers give different rainfall rates.



Challenges and opportunities in the field of Climate change

It is an interdisciplinary and relatively new field. However, its foundation is based on the basic principles of the traditional fields. So, it offers a unique opportunity to bring expertise from various fields and work on socially relevant and cutting-edge problems.

WELCOME ABOARD NEW STUDENTS



SREYASI BISWAS

Qualification: **M.Sc. in Atmospheric Sciences**
 Supervisor: **Prof. Vishal Dixit**
 Research interest: **Extreme Rainfall Events, Urban meteorology**
 Hobbies: **Sketching, Reading, Collecting music**



KHUSHBOO KUMARI

Qualification: **M.Tech**
 Supervisor: **Prof. Karthekayan Lanka**
 Research interest: **Hyper resolutions land surface modelling**
 Hobbies: **Cooking**



SIDDHI KISHOR ADVANKAR

Qualification: **MA in sociology**
 Supervisor: **Prof. Pradip kalbar**
 Co-supervisor: **prof. Akshaya Nikumbh**
 Research interest: **Extreme weather and law governance**
 Hobbies: **Drama, Bharat natyam**



YASH R. DHAWADE

Qualification: **MCP (Master of City Planning)**
 Supervisor: **Prof. Pradip Kalbar**
 Co-supervisor: **prof. Arpita Mondal**
 Research interest: **Nature-based Solutions, resilience and sustainability in urban water infrastructure**
 Hobbies: **Writing, painting, swimming**



AKASH DEVGAN

Qualification: **M.Sc. in Atmospheric Sciences**
 Supervisor: **Prof. Akshaya Nikumbh**
 Research interest: **Weather Extremes, Climate Change**
 Hobbies: **Football, Gaming, Travelling**



GANESH GUPTA

Qualification : **Msc. Applied Mathematics**
 Supervisor: **Prof. Subimal ghosh**
 Research interest: **Weather Forecasting and Climate Adaptation**
 Hobbies: **Coding and data analysis, translation research, travelling**

WELCOME ABOARD NEW STUDENTS



Md Atif Mustafa Khan

Qualification: **M. Tech in Applied Mathematics**

Supervisor: **Prof. S. Ravichandran**

Research interest: **Geophysical fluid dynamics**

Hobbies: **Creating video games, programming physics engines, building robots, electronics**



Soumili Chakraborty

Qualification: **M.Sc. In Atmospheric Science**

Supervisor: **Prof. Akshaya Nikumbh**

Research interest: **Extreme events, convective aggregation**

Hobbies: **Painting**



Abhinav Sharma

Qualification: **M. Tech. in Atmospheric - Oceanic Science and Engineering**

Supervisor: **Prof. Harish Phuleria**

Co-supervisor: **prof. Chandra Venkataraman**

Research interest: **Meteorology, Air quality, and Climate change**

Hobbies: **World history, Jogging**



Alisha Chandran

Qualification: **MSc in Water and Environmental Engineering**

Supervisor: **Prof. Yogendra Shastri**

Co-supervisor: **prof. Anand B. Rao**

Research interest: **Clean Energy transition, water-energy-climate nexus, climate modelling**

Hobbies: **Reading, dancing, DIY electronics and mechanics, astronomy**

WELCOME ABOARD NEW STUDENTS

Climate Studies extends a warm welcome to its new PhD students! 🎉🌟🌸

Akash Devgan, Abhinav Sharma, Khushboo Kumari, Yash R Dhawade, Soumili Chakraborty, Sreyasi Biswas, Md Atif Mustafa Khan, Ganesh Gupta, Siddhi K Advankar, and Alisha Chandran.

Wishing you all an enriching and successful research journey at IITB!



Welcome



CLIMATE SEMINAR SERIES

DR. RAJENDRA JENAMANI

'Reducing losses from Extreme Weather Event by improving Early Warning System (EWS) (Risk analysis and Hazard Models in India and Globe)'

Organized by Interdisciplinary Programme in Climate Studies, IIT Bombay



Dr. Rajendra Kumar Jenamani

Scientist - G, NWFC and Head
RSMC New Delhi, India
Meteorological Department

SPEAKER'S BIO

Dr. Jenamani has Master and PhD in Math. Joined in IMD as Meteorologist (weather forecast services) in 1992. Dr. Jenamani has Operation work experiences of 30-years (1992-2022) at IMD, in Weather and climate services of India and South Asia. Worked as Head of the Services of various Divisions of IMD Pune and Delhi. Out of 30-years in IMD, 16 years in public weather services (PWS) for all India and 14-years Head Aviation Met services of north India and IGI Airport New Delhi. Presently working as Head of Operational Services, National weather forecasting centre (NWFC) and RSMC (WMO-NIO Centre for Cyclone) at IMD New Delhi. Carried out R & D works and developed expertise in Analysis, monitoring and prediction of various Extreme Weather events covering Monsoonal systems and its heavy rainfall events, extreme temperature spells, WDI, Fog, and tropical cyclone related hazards using synoptic data, NWP, satellite and RADAR products with focus on improvement of India's Multi-hazard early warning system and impact based forecast.

ABSTRACT

Meteorological hazards over Indian region which causes severe impacts and damages to various sectors are mainly caused by Cyclones, monsoonal heavy rainfall, persistent spells of heat wave, cold wave and dense fog, if lasting for longer periods and from Meso-Scale locally triggered Convective systems such as severe thunderstorm & Dust storms and Tornado. Due to impact of climate change and global warming, frequencies and also severity for some of the severe weather events have also been increased. Numerous studies and discussions in various IPCC Reports, WMO and IPCC reports and ODP meetings have deliberated upon this important issue "How increase of severity of various severe weather events and their associated hazards severity have been impacting us". These days "extremes have become new normal and we hear regular breaking of severe weather records". Multi-hazard early warning systems (MHEWS) are essential tools for that enable individuals, communities, governments, business and others to take timely action to reduce disaster risks in advance of hazardous events. In IMD, MHEWS system has been improved significantly with inclusion of impact based weather forecast and warnings (IBFW) at real time 1st time in Aug 2019 for monsoonal heavy and since then tremendous progress has been made by IMD in the field of IBFW across all severe weather events and related hazards. Computation of Objective based impacts and risk matrix using HIVE at district levels were carried out (WMO 2015 and 2022) along with Overlaying of various forecasts from suit of multiple NWP products e.g. Deterministic, MME, EPS and ET products have been carried out at real time It adds Risk and impact matrix available at district-wise for major severe weather events like heavy rainfall, heat wave etc. Flood Hazard impact modelling at district to sub-urban scale for heavy rainfall events e.g. I-FLOWS, C-FLOWS, JASMINE) have been in place. For tropical Cyclone, a web-based Dynamic Composite Risk Atlas - Decision Support (WEB-DCRA-DSS) system is operational real time among various stakeholders to determine likely risk and impact forecasts at village levels for all coastal districts. In the present presentation, developmental works and progress made to improve real time MHEWS across its all four pillars, for various severe weather events and their respective hazards in IMD have been discussed.

3rd Jan
10 am-11 am



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seminar hall



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DR. AUROOP GANGULY

What happens at the confluence as statistical methods and parameterized models in water and climate science and engineering confront machine learning and Artificial Intelligence?

Organized by Interdisciplinary Programme in Climate Studies, IIT Bombay

ABSTRACT

The presentation explores the interfaces between machine learning and data-driven sciences with state-of-the-art methods and models prevalent in the earth systems sciences and engineering. The latter include stochastic hydrology and climate statistics, as well as parameterized processes within numerical models of land surface and earth systems, in addition to network science methods for engineering resilience. The presentation discusses case studies in the integration of process knowledge and data-driven sciences, including knowledge-guided machine learning, Artificial Intelligence (AI) for improved parameterization within physics-based models, engineering principles driven network resilience, physics-guided uncertainty characterizations, and nonlinear dynamics for internal variability. The interactive parts of the presentation will discuss the potential value addition from relatively new methods and concepts in AI and data-driven sciences and how current human knowledge, such as in physics or biogeochemistry, and the insights embedded in the minds of human decision-makers, can be best combined with AI-based systems.

Civil Dept 1st floor
seminar hall

10 Jan
3.30-4.30PM



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CLIMATE SEMINAR SERIES

DR. LOKAHITH AGASTHYA

'Insights into Radiation impact on moist convection from idealised modelling'

Organized by Interdisciplinary Programme in Climate Studies, IIT Bombay



Dr Lokahith Agasthya

Postdoctoral researcher at Institute of Science and Technology, Austria

SPEAKER'S BIO

Dr Lokahith Agasthya has a PhD in Physics (Fluid Dynamics) from the University of Rome "Tor Vergata". He is currently a postdoctoral researcher at Institute of Science and Technology Austria working on aspects of moist convection in the atmosphere.

He is interested in thermal convective flows (moist and dry), geophysical fluid dynamics and climate modelling.

ABSTRACT

Idealised models of convection such as Rayleigh-Benard convection, horizontal convection etc. have been widely used to study the behaviour of natural fluid systems including but not limited to the atmosphere, the oceans and the flow of lava in the earth's core in a simplified setting. While such idealised models include only a small subset of the physical processes occurring in nature, their simplified dynamics allows for easier interpretation and study of the interactions of individual physical processes. In this study, we study the impact of uniformly applied radiative cooling on an idealised model of moist convection. The models include a vertical temperature lapse-rate and the release of latent heat due to condensation of water without any parametrisations. It follows recent studies which have used similar idealised scenarios to understand atmospheric convection. In particular, we find that with changing the magnitude of bulk radiative cooling, our idealised model recovers scalings previously observed in Cloud Resolving Models. Further we argue that the upward velocity within clouds is set by small-scale convective processes and is independent of the dynamics of subsiding, clear-sky regions.



2nd May
11 am-12 pm



Civil Dept 1st floor
Seminar Hall



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DR. AMBARISH KARMALKAR

'Climate projections using imperfect climate models'

Organized by Interdisciplinary Programme in Climate Studies (IDPCS), IIT Bombay



Dr. Ambarish Karmalkar

Assistant Professor,
Department of Geosciences,
University of Rhode Island

SPEAKER'S BIO

Dr. Ambarish Karmalkar is an assistant professor in the Department of Geosciences at the University of Rhode Island. As a physical climate scientist, Ambarish investigates the factors driving regional climate variability and change. He uses observations and climate models to study climate dynamics across various regions, from the Arctic to Antarctica. Additionally, he employs regional and global climate model ensembles to explore and quantify uncertainties in climate projections. To make his research accessible and actionable, Ambarish also collaborates with a diverse range of professionals, including ecologists, hydrologists, state officials, and managers, to analyze the impacts of climate change on both human and natural resources.

ABSTRACT

Despite significant advances in climate modeling, future climate projections remain highly uncertain, especially at fine spatial scales. Ensemble techniques are therefore required to systematically explore and quantify uncertainties in climate modeling, to understand model behavior, and to constrain future climate change projections at regional scales. I will describe my ongoing and past research, based on the use of process-based analyses and multi-model and perturbed parameter ensembles, to generate reliable regional projections.

19 June 2024

3.30 PM - 4.30 PM

**1st floor, Seminar Hall,
Civil Engineering Dept.**



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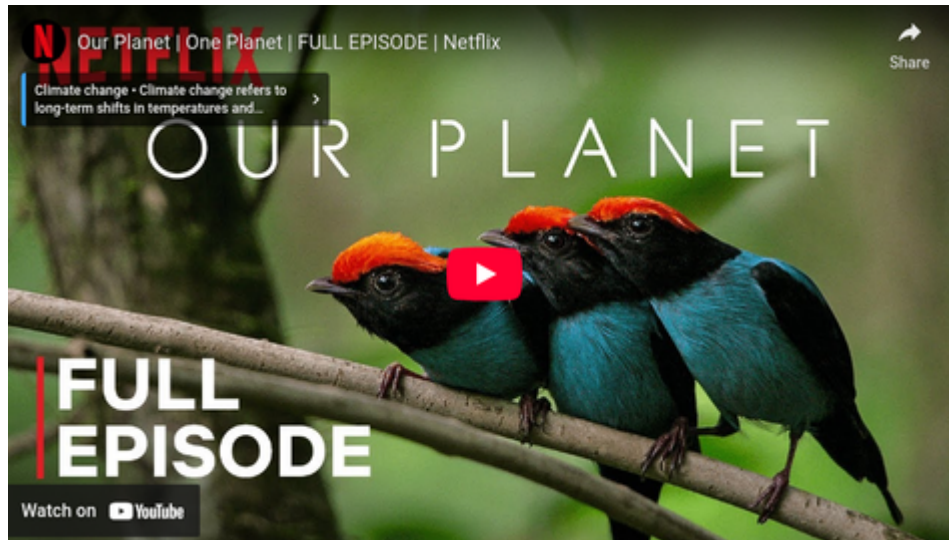
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Don't miss Prof. Raghu's exciting climate series for kids, 'A Ride Around the Solar System in the Magic School Bus,' and many more such climate education videos for children on his YouTube channel: Murtugudde Climate Academy II.

DOCUMENTARY AND PODCASTS ON CLIMATE CHANGE



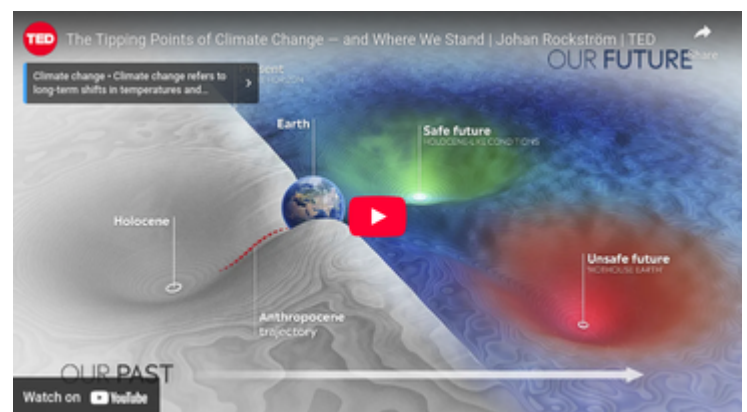
Our Planet | One Planet | FULL
EPISODE | Netflix

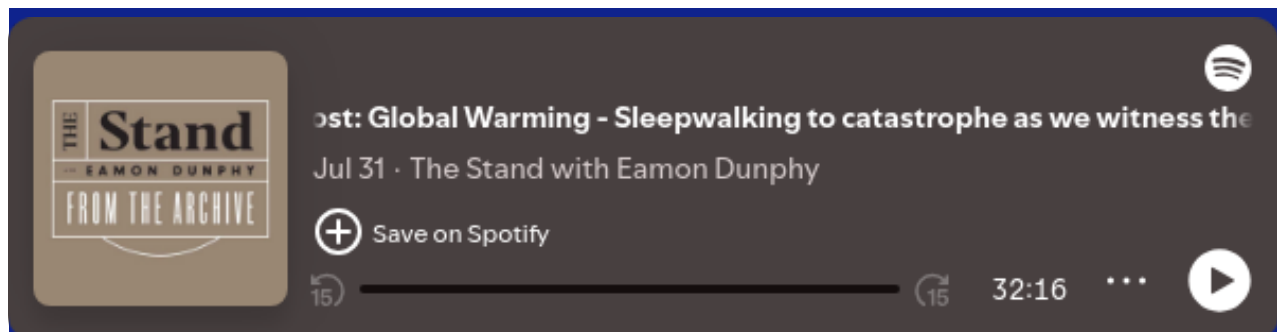
Climate change impact on our planet

LExperience our planet's natural beauty and examine how climate change impacts all living creatures in this ambitious documentary of spectacular scope. In this episode: Witness the planet's breathtaking diversity -- from seabirds carpet-bombing the ocean to wildebeests eluding the wild dogs of the Serengeti.

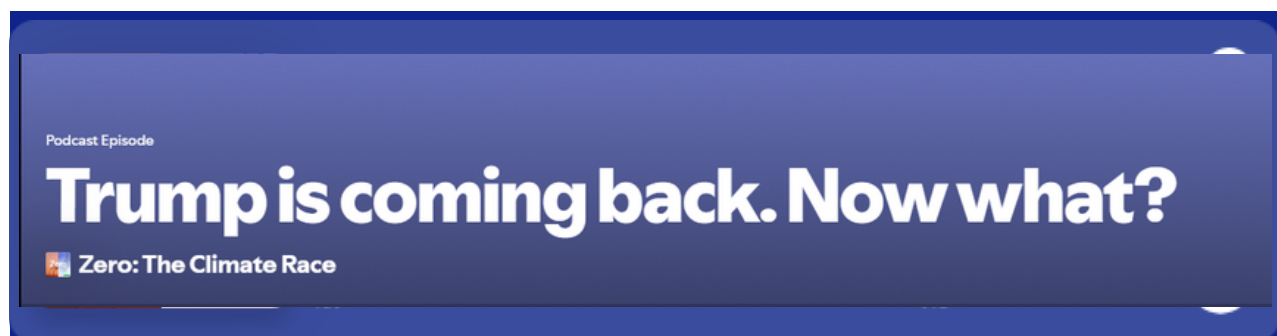
The Tipping Points of Climate Change — and Where We Stand | Johan Rockström | TED

We're nearly halfway through the 2020s, dubbed the most decisive decade for action on climate change. Where exactly do things stand? Climate impact scholar Johan Rockström offers the most up-to-date scientific assessment of the state of the planet and explains what must be done to preserve Earth's resilience to human pressure.





John Gibbons talks to Eamon about the growing impact of global warming and the effect it will have on all our lives. John Gibbons is a campaigning journalist on climate and the environment.



Donald Trump's re-election as the US president drastically changes the climate and energy equation—in the US and around the world. This week, Akshat Rathi speaks with California Democratic Congressman Ro Khanna about what Americans can do to sustain action on climate and clean energy. He also talks to Columbia University's Jason Bordoff about how much Trump could boost fossil fuels.

WMO REPORTS ON CLIMATE CHANGE



WMO e-Library

Hydromet Gap Report 2024

library.wmo.int

The Hydromet Gap Report 2024 presents an analysis based on Country Hydromet Diagnostics (CHD) conducted in 20 least-developed countries and small island developing States.



State of the Climate in Asia 2023

Asia remained the world's most disaster-hit region from weather, climate and water-related hazards in 2023. Floods and storms caused the highest number of reported casualties and economic losses, whilst the impact o...

 World Meteorological Organization

Asia remained the world's most disaster-hit region from weather, climate and water-related hazards in 2023. Floods and storms caused the highest number of reported casualties and economic losses, whilst the impact of heatwaves became more severe, according to the report from the World Meteorological Organization (WMO).



DESIGN

MANSI GOEL
MOHAN SARKAR

EDITORS

MANSI GOEL
MOHAN SARKAR
TANNU KAUSHIK
SHEEBA SEKCHARAN
ARCHISMITA BANERJEE

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Short Video



Newsletters

