

Newsletter of the

DIVECHA CENTRE FOR CLIMATE CHANGE

Visit of Mr. Arjun Divecha

Introductory training course on climate change and environment

Open Day 2023

10th Meet of the Mountain States (MoMS)





CONTENTS

From the Chair News and Events:

- 1. Visit of Mr. Arjun Divecha**
- 2. Forward and inverse modeling of glacier and ice-shelf fracture**
- 3. Impact of deepening ecological crisis on survival of species**
- 4. Training program on climate change and health**
- 5. Introductory training course on climate change and environment**
- 6. Open Day 2023**
- 7. International conference on radiation awareness and detection**
- 8. Civil20 integrated holistic health summit**
- 9. 10th Meet of the Mountain States (MoMS)**

10. Research Highlights:

10.1 Role of land-surface vegetation in the march of Indian monsoon onset isochrones in a coupled model

10.2 Beneficial role of diurnal smoothing for grid integration of wind power

Editors: S. K. Satheesh, J. Srinivasan and K. Krishnamoorthy

**Contact: Chair, Divecha Centre for Climate Change,
Indian Institute of Science, Bengaluru-560012**

**Tel: +91-80-22933070, Email: chair.dccc@iisc.ac.in
www.dccc.iisc.ac.in**

FROM THE CHAIR

Greetings!




The year 2023 began with a visit by Mr. Arjun Divecha to our Centre on 6th January. During this visit the Chairman and faculty made presentations on the work being undertaken by the Centre. Mr. Divecha indicated that he was delighted by the work being done at the Centre and the global outreach programs being conducted through the Future Earth initiative. In February, we conducted a training program on climate change and the environment for the scientists and bureaucrats from Africa, Central Asia and southeast Asia. In this program we learnt about the diversity of problems caused by climate change in the developing world.

The Indian Institute of Science had an “open day” on 4th March 2023. A large number of people visited our Centre, and this gave us an opportunity to create awareness about climate change. There were practical demonstrations about the impact of climate change and a quiz contest for children.

Faculty from our Centre were consulted during a technical advisory committee meeting of the Ministry of Environment, Forests and Climate Change (MoEFCC) on the third national communication of India to be submitted to UNFCCC that was held on 29th March 2023. This communication includes the national GHG inventory, mitigation actions, research, systematic observations, impacts, vulnerability, and adaptation. The committee highlighted the need for training scientists on UNFCCC reporting guidelines. Mr. Tanmay Kumar, Additional Secretary, MoEFCC thanked the committee members for their valuable suggestions.

The 10th meeting of the Integrated Mountain Initiative (IMI) was held in Delhi on 23rd and 24th March 2023. Three union ministers and many members of Parliament attended this event. They interacted with the faculty from Divecha Centre. This event discussed the impact of climate change in the ecologically fragile mountain states. The need for legislative action to control plastic pollution was discussed.

In this newsletter two research publications by the faculty are discussed. One of them highlights the impact of vegetation on the onset of the monsoon. The other highlights the spatial variation of diurnal cycle of wind speed. This can be utilized to smoothen the power generated by wind farms in south India.

A handwritten signature in black ink, appearing to read 'S. K. Satheesh'.

S. K. Satheesh

Mr. ARJUN DIVECHA'S VISIT TO DIVECHA CENTRE FOR CLIMATE CHANGE



Mr. Arjun Divecha listening to the presentations by the faculty

Mr. Arjun Divecha visited Indian Institute of Science on 6 January 2023. During this visit he interacted with faculty, students and staff of Divecha Centre for Climate Change.

Prof. S. K. Satheesh, Chairman, Divecha Centre for Climate Change provided an overview of the research, interaction with government and outreach activities at the Centre. This was followed by faculty presentations on the past monsoons, water security, impact of river discharge on climate, climate change on health, ecology of soil carbon,

carbon budget, renewable energy integration, pragmatic climate policy for India, sustainable agriculture and outreach programs conducted under Future Earth. During the presentations Mr. Divecha actively interacted with the faculty, and made several comments and suggestions.

Mr. Arjun Divecha appreciated the excellent work being done by the Centre to understand the impact of climate change and to create awareness. He lauded the outreach program being done through the Future Earth initiative. He commented about the need for



Mr. Arjun Divecha, addressing the faculty, staff, and students of DCCC

large energy storage if the primary energy sources are wind and solar. He wondered if sufficient Lithium was available to meet the soaring demand for Lithium-ion batteries. He stressed the need for more

development work to find new battery technologies that are not dependent on minerals that are scarce.



The DCCC family

FORWARD AND INVERSE MODELING OF GLACIER AND ICE-SHELF FRACTURE



Dr. Ravindra Duddu, making his presentation at DCCC auditorium on 23 January 2023

Divecha Centre for Climate Change organized a seminar on "Forward and Inverse Modeling of Glacier and Ice-shelf Fracture" on 23 January 2023 by Dr. Ravindra Duddu, Associate Professor of Civil and Environmental Engineering, Vanderbilt University, Nashville,

Tennessee, USA

The fracture and detachment of icebergs from the edge of a glacier or an ice shelf, is known as calving. The existing calving schemes in numerical ice sheet models are too simple. In his presentation, Dr. Ravindra discussed new modeling approaches for simulating the iceberg calving process. He showed the simulation for idealized marine ice sheet and Larsen C ice shelf calving. He concluded his talk with some remarks on the data needs and limitations of these models and how the representation of calving in ice sheet models can be improved.



Participants at the seminar

IMPACT OF DEEPENING ECOLOGICAL CRISIS ON SURVIVAL OF SPECIES INCLUDING HUMANS



Dr. H. Paramesh being felicitated at Bharathidasan University, Tiruchirappalli, Tamil Nadu

Dr. H. Paramesh, Visiting Prof., Divecha Centre for Climate Change IISc, was invited as a special guest to give a talk on "Impact of Deepening Ecological Crisis on Survival of Species Including Humans" at Bharathidasan University, Tiruchirappalli, Tamil Nadu held during 27-31 January 2023.

In his talk, Dr. Paramesh highlighted the fact that climate change has a direct effect on human health and an indirect effect on the yield of agricultural crops, reduction in availability of water, increase in coastal erosion and loss of biodiversity. Nearly

54% of land and sea species are threatened, 75% of freshwater fishes will be reduced by 2075, 59% loss of green turtles and 70-90% of coral reefs are projected to die.

Air pollution is an invisible killer. Children who are born with small airway passage suffer persistent asthma leading to Chronic obstructive pulmonary disease (COPD) later. On account of exposure to air pollution, 43% of the people have chronic lung disease, 29% have lung cancer, 25% have heart disease and 24% have strokes in later lives.

TRAINING PROGRAM ON CLIMATE CHANGE AND HEALTH



Dr. H. Paramesh, Visiting Prof. DCCC, IISc, delivering his talk on 3 Feb 2023

Divecha Centre for Climate Change organized a comprehensive two-day training program for health professionals entitled “Health in a changing climate: empowering health professionals” on the 3-4 February 2023. This program was designed to equip health professionals and educators with the knowledge and skills necessary to make a positive impact on their communities. The first day of the program was dedicated to lectures on four critical themes related to the impact of climate change on health: air quality, water contaminants, soil, and plastic

contaminants, and the impact of natural disasters.

The second day of the program was dedicated to short talks followed by workshops where participants had the opportunity to delve deeper into specific areas of interest. These talks were given on topics such as innovative solutions to air pollution, the impact of climate change on indigenous health and oral health, a note on planetary health. This was followed by workshops focused on the four themes covered on day one. Participants were divided into groups based

on their areas of interest, and each group was given a case-based activity to complete, which they presented at the end of the workshop.

The program concluded with a communication activity designed to empower participants to effectively communicate their newfound knowledge to a variety of audiences, including urban and rural communities and indigenous populations. The goal was to equip participants with the skills and confidence to share the information they had learned and to help educate others about the importance of taking action to address the impact of climate change on health.

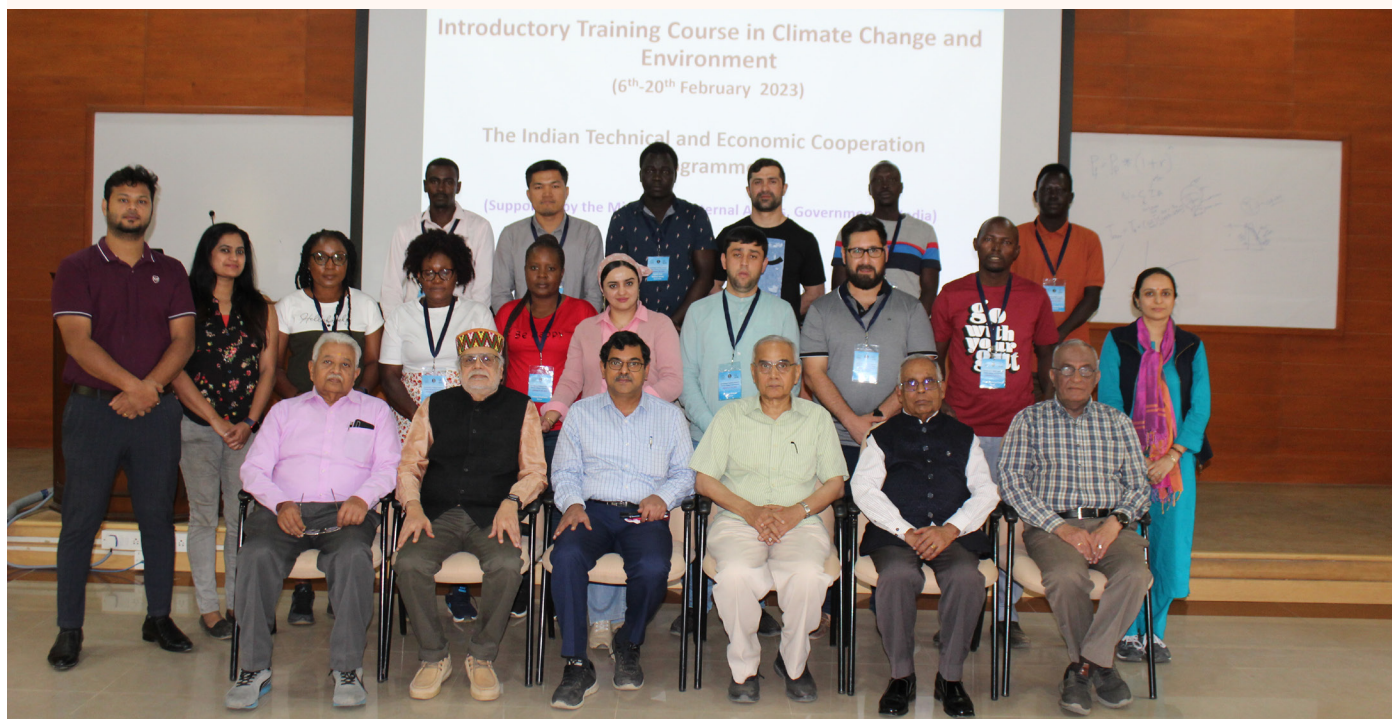


Dr. R. Srinivasan, Visiting Prof. DCCC, IISc, delivering his talk at the training program



Participants of the program with the speakers and organizers

INDIAN TECHNICAL AND ECONOMIC COOPERATION PROGRAMME: INTRODUCTORY TRAINING COURSE IN CLIMATE CHANGE AND ENVIRONMENT



Participants with Prof. S.K.Satheesh, Chair, DCCC, IISc

An introductory Training course on “Climate Change and Environment” was conducted by Divecha Centre for Climate Change from 6-20 February 2023. This course was sponsored by Ministry of External Affairs (MEA). The participants were from Africa, Central Asia and East Asia participated in this program.

The theme of the two-week training course was “Climate Change and Environment”. The training course began with a lecture on energy resources that contributed to modern economic growth from early industrialization

through present and provided a basic understanding of the technology, economics, social, and political aspects of various energy systems. The participants discussed the various options to mitigate global warming and climate change. This was followed by lectures on “Science of Climate Change”, “Energy, emissions, And climate”, “Air Pollution”, “Climate change and hydro power”, “Climate change and water security”, “Environmental pollution and Health”, “Development and Climate change”, “Renewable Energy”, “Demography and climate change”, “Water quality”,

“Sustainable development”, “Vegetation and climate”, “Aerosols”, “Biomass Energy”, “Climate policy, Energy”, “Climate and Gender”, “Climate and agriculture”, and “Climate Finance”. The afternoon sessions were devoted to field visits and

presentation by participants.

Participants visited the University of Agricultural Sciences, Bengaluru, to learn about innovations in agriculture. The program concluded with a valedictory function.



Aerosol laboratory demonstration



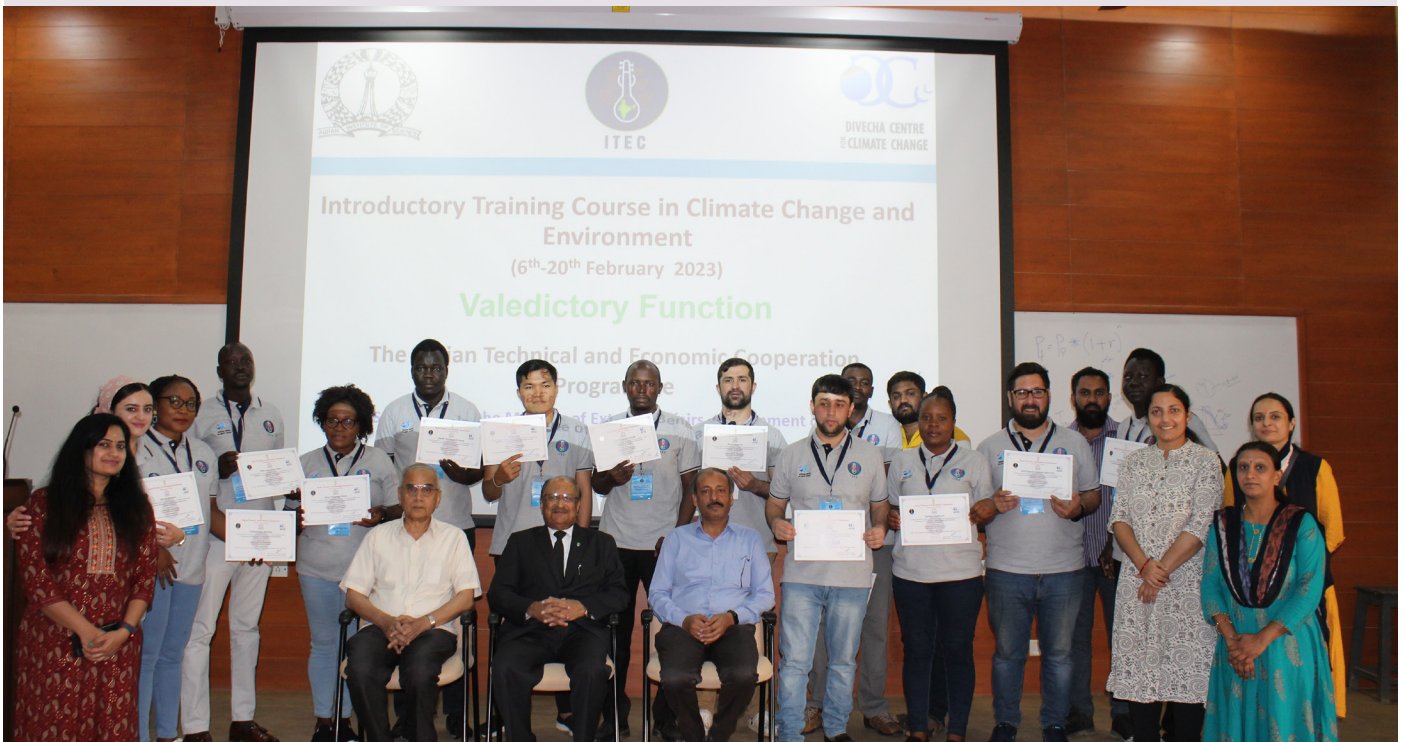
Participants at University of Agricultural Sciences



Participants at 100 kW solar photovoltaic plant in NIAS, IISc



Participants at the Combustion Gasification and Propulsion Laboratory at the Indian Institute of Science



Valedictory Function

OPEN DAY 2023



School children and visitors viewing the posters and demonstration of experiments at Divecha Centre for Climate Change on Open Day

On 4 March 2023, the Indian Institute of Science, celebrated its annual “Open Day” to showcase its ongoing research activities to the public. On this day, students, science and technology enthusiasts, and the public had an opportunity to visit the Institute and go around the campus to explore the exciting science and technology initiatives and activities of the Institute.

The Open Day featured popular lectures, experimental demonstrations, poster presentations, quiz contests, scientific competitions, and exhibitions hosted at various departments and Centres. A ‘Kids-Zone’ offered a special attraction for all the younger students with several science and technology demonstrations.



Dr. H. Paramesh, Visiting Prof. DCCC, IISc, interacting with school children on Open Day 2023

Divecha Centre for Climate Change also showcased a number

of experiments, posters, and quiz programs for the visitors.



DCCC staff conducting a quiz program for school children on Open Day

INTERNATIONAL CONFERENCE ON RADIATION AWARENESS AND DETECTION



Prof. Tibor Kovacs, Head, Radiochemistry and Radioecology Institute, Hungary, and Prof. S. A. Pandit, Divecha Centre for Climate Change, IISc, Bengaluru, India chairing a technical session at the international conference held between 2-4 March 2023, at Dehradun, Uttarakhand

The National Radon Network Society (RADNET) organized "First International Conference on Radiation Awareness and Detection in Natural Environment" at Dehradun, Uttarakhand during March 2-4, 2023. From DCCC, IISc Dr. S. A. Pandit and Dr. Manoj Kumar Jindal participated in the conference. The theme of technical presentations centered on issues arising from materials that emit ionizing radiation and measurement in the natural environment.

Dr. S. A. Pandit chaired technical session on along with Prof. Tibor Kovacs (Head of the Institute at

Radiochemistry and Radioecology, Hungary). Dr. Manoj Kumar Jindal presented the paper titled "High uranium dose rate from the groundwater of the granitic terrain in a part of eastern Karnataka, India".

Naturally occurring radioactive materials are common in the environment and as well in the human body. A detectable amount of radiation occurs naturally in soil, rocks, water, air, and vegetation, which enters/penetrates the body either by inhalation or ingestion. Ionizing radiation from outer space (cosmic radiation) bombards the earth constantly.



Prof. R. C. Ramola, HNB Garhwal University, Prof. Kazumasa Inoue, Tokyo Metropolitan University and Prof. S. A. Pandit, DCCC, IISc

Radon (Rn-222) and its progeny are important as they contribute more than 50% of the total radiation dose received by human population due to inhalation. The next important source of radiation dose is through ingestion of water containing uranium and its daughter products. Although, it is known that a large percentage of such ingested uranium in water

is expelled, a small amount is retained and absorbed by the human body, which is the main health risk. Prof. Kazumasa Inoue, Professor of Radiological Sciences, Tokyo Metropolitan University who was the leader of Japanese team expressed his interest to collaborate with DCCC, IISc on this subject.



Participants of the conference

CIVIL20 INTEGRATED HOLISTIC HEALTH SUMMIT



From Left to Right: Dr. Sarthak Das (CEO of the Asia Pacific Leaders Malaria Alliance), Dr. Cheryl King (Professor, University of Michigan), Dr. Adolfo Rubinstein (Former Minister for Health, Argentina), Dr. Joshitha Sankam (DCCC, IISc), and Dr. Jaideep C Menon (Co-Lead, Working Group on Integrated Holistic Health)

Dr. Joshitha Sankam was a part of the One Health Panel at the C20 Integrated Holistic Health Summit, one of the official Engagement Groups of the G20 held during 7-9 April 2023 at the Amrita Hospitals Convention Centre, Faridabad, Haryana. She represented The Planetary Health Alliance based

at Harvard T.H. Chan School of Public Health and Divecha Centre for Climate Change in the meeting, as an invited participant, and spoke about Planetary Health: A New Scientific Lens, highlighting the importance of a holistic approach to health that addresses the physical, emotional, environmental, and social components to health. The panel discussed the interconnectivity between human, animal, and environmental health, and how addressing the health of one is essential for the health of all and also provide policy recommendations.

The C20 Integrated Holistic Health Summit is an international platform that brings together leading experts, practitioners, and researchers in the field of health to discuss the recent advances and best practices in the field. Delegates from more than 700 CSOs, health professionals, educators, and leaders from across the public health landscape participated in discussions and workshops that will directly impact the policy recommendations that will be launched at the C20 Summit.

10TH MEET OF THE MOUNTAIN STATES



Inaugural by Hon'ble Ministers for State, MoEFCC, Shri Ashiwni K. Choubey; the Hon'ble Minister for State, Tourism, Shri Ajay Bhatt and Hon'ble Tashi Gyalsen, Chief Executive Councilor (CEC)- Ladakh Autonomous Hill Development Council along with the organizers Prof. S. K. Satheesh, Chair, Divecha Centre and Director Future Earth South Asia Hub and President IMI, Ganga Auditorium, MoEFCC, Delhi, Mr. P. D. Rai, 23 March 2023

The Integrated Mountain Initiative (IMI), the Divecha Centre from Climate Change and the Ministry of Environment Forest and Climate Change organized the IMI's 10th Meet of the Mountain States (MoMS), in Delhi, Ganga Auditorium, Ministry of Environment and Forest and Climate Change (MoEFCC) Building, on March 23-24, 2023. The event brought together stakeholders, Legislators', scientists, delegates from all the mountain states of India,

delegates from Divecha Centre for Climate Change, officials from Govt. of India and members from various NGOs and institutions. The sessions had discourses and talks by legislators', farmers, scientists, and Agri-entrepreneurs to discuss "Plastic Waste Management- Extended Producer Responsibility implementation in the Indian Himalayan Region" and "Agroecology in Indian Himalayas 'Resurgence with Millets', Planetary issues on Glaciers and Climate Change. The goal



Prof. S. K. Satheesh, Chair, DCCC addressing the audience, dignitaries, and legislators on the dais. Pic:(left to right) - Mr. P. D. Rai, President IMI; Hon'ble Legislators': Dr Lorho S. Pfoze, MP-Manipur; Ram Muivah, MLA-Ukhrul Manipur; Ninong Ering, M.P.- Arunachal Pradesh; Munna Singh Chauhan, MLA-Uttarakhand; Dr. Rajkumar Ranjan, Minister of State for External Affairs and Education and Sonam Tshering Venchungpa, MLA- Sikkim)

of the conference was to make stakeholders, the policy makers and the ministers familiar with new knowledge and research, to innovate on the ways of handling the imperatives thrust by society for policy implementation. The President of Integrated Mountain Initiative (IMI), Mr. P. D. Rai and Chair, Divecha Centre for Climate Change, Prof. S. K. Satheesh addressed the inaugural and highlighted the importance of sustaining the mountains and the need for science-policy and research to help solve mountain issues related to plastic pollution, climate change and on the need to reintroduce millets to the mainstream diets through nature sensitive agriculture and nature-

based solutions.

Shri Bhupendra Yadav acknowledged the need for sustainable tourism in the IHR and stressed on plastic pollution in the Himalaya as well as extended producer responsibility implementation in the IHR. The need for legislative action to end plastic pollution in the mountains was acknowledged by all the Legislators who shared their childhood connections with millets and the need to revive and promote it for the well-being of people and the planet, and that the "UN Year of the Millets 2023" provided a great opportunity to revive a traditional food crop.



A coffee table book on major activities of Future Earth South Asia Regional Office was released by Prof S. K. Satheesh, Chair, DCCC and Director, South Asia Hub in the presence of Hon'ble Minister MOEFCC, Bhupendra Yadav, Hon'ble Dr. Rajkumar Ranjan, Minister of State for External Affairs and Education, Mr. P. D Rai, President IMI, Hon'ble Ram Muivah, MLA-Ukhrul Manipur, Hon'ble Ninong Ering, M.P- Arunachal Pradesh, and Hon'ble Sonam Tshering Venchungpa, MLA- Sikkim)

The establishment of Future Earth Global Secretariat Hub was announced in this meet. Invited speakers from Divecha Centre for Climate Change presented the research on glaciers, one health and millets and included Keynote talk by Professor Anil Kulkarni on the 'Challenges to mountain communities under changing climate'; and co-notes were presented by Dr. H. Paramesh and emphasized on the need to engage with local communities and healthcare providers in the development of sustainable healthcare systems; and Dr. Rohini Mattoo talked about the importance of agroecology in Indian Himalayas with an emphasis on the gluten

free and calcium rich property of millets, its long shelf life of 5 years, and an adaptive food crop that can sustain on varying soil including high-altitude climate. Dr. Smriti Basnett on behalf of DCCC expressed the need for further collaboration with continued efforts between IMI and DCCC through a three-year road map, to build on the Science-Solution-Policy dialogues and plan activities that will look into science-policy and involve researchers and policy analyst from DCCC to create solution pathways and recommend policies for the Indian Himalayan Region on the topics discussed at various annual Sustainable Development Mountain Summits (SMDS).

RESEARCH HIGHLIGHTS

ROLE OF LAND-SURFACE VEGETATION IN THE MARCH OF INDIAN MONSOON ONSET ISOCHRONES IN A COUPLED MODEL

During boreal summer, the dominant direction of moisture transport over the South Asian region is eastward because winds blow from the west during the monsoon. The total column precipitable water vapor is higher over the Bay of Bengal than in the Arabian Sea because the former is warmer than the latter. This creates an east-to-west gradient in moisture that is against the direction of the mean low-level winds. In this paper, authors have shown that in observations, the intraseasonal component of the winds drives moisture westward from the Bay of Bengal to northwest India. In particular, the high frequency intraseasonal oscillation with a period less than 20 days is instrumental in such westward moisture transport. The Climate Forecast System version 2 (CFSv2) model was unable adequately represent this westward

moisture transport at the intra-seasonal timescale. When the authors replaced the existing vegetation cover in the model with that derived from recent satellite observations, this westward moisture transport increased, especially during the onset and withdrawal phases of the monsoon. As a result, the orientation of onset isochrones and seasonal mean monsoon rainfall simulation over northwest India improved in the CFSv2 model, which otherwise suffers a severe dry bias.

Reference:

Arindam Chakraborty, Jerry B. Samuel, Anagha Paleri, Role of land-surface vegetation in the march of Indian monsoon onset isochrones in a coupled model, Quarterly Journal of Royal Meteorological Society, 149, 115-132, 2023

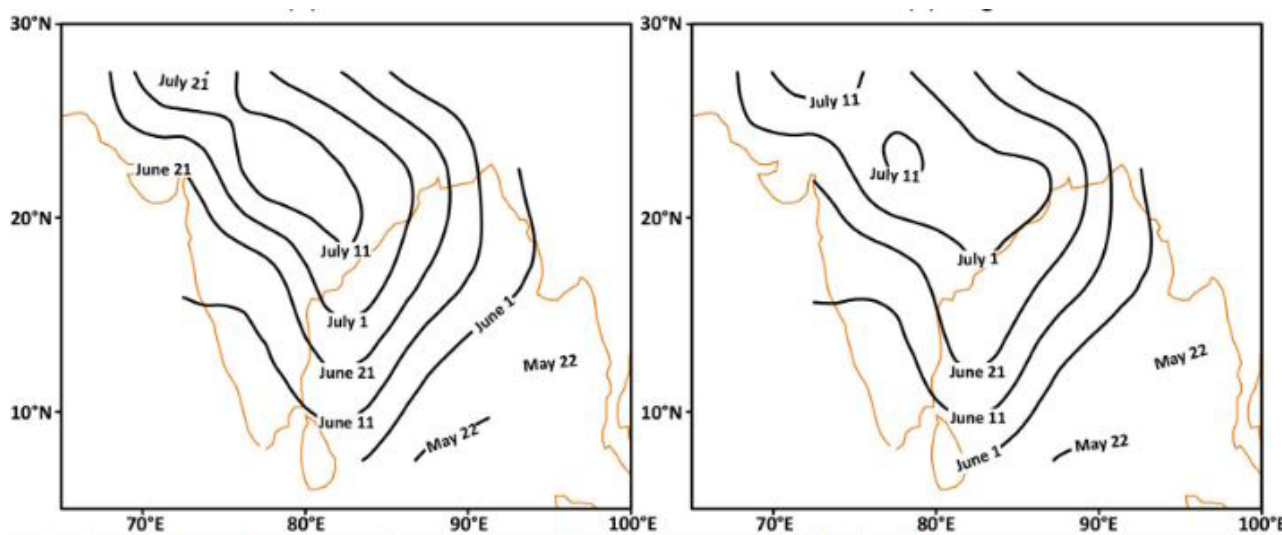


Figure: Onset dates of the monsoon in India in the CFSv2 climate model with the old (left) and new vegetation model (right)

BENEFICIAL ROLE OF DIURNAL SMOOTHING FOR GRID INTEGRATION OF WIND POWER

Worldwide renewable installations are growing exponentially in the electricity mix. In a renewable-rich electricity grid, meeting continuously changing demand with weather-dependent intermittent renewable generation is highly complicated. Aggregating wind generation from sites with different diurnal cycles can reduce the variability of hourly generation (“diurnal smoothing”) (*Figure 1A*). Prior studies of smoothing have focused on geographical smoothing based on distance. In contrast, we propose a novel concept, “diurnal smoothing,” that depends on spatial variations in the timing of seasonal-mean diurnal cycle peak irrespective of separation distance. Our work, for the first time, quantifies the implications of variation in the diurnal cycle of wind speed on renewable energy integration and smoothing. The timing of the daily (“diurnal”) wind cycle maximum is

heterogeneous, yet the broad-scale patterns recur year after year (*Figure 1C*). “Diurnal smoothing” is more prominent for sites separated by 200 km or more with strong diurnal cycles (amplitude more than approximately 0.5 m/s). The diurnal smoothing achieved at shorter distances is comparable to the geographical smoothing benefit achieved from sites with larger separation distances but similar phases (*Figure 1B*). Thus, “diurnal smoothing” is a vital factor in the aggregation of large wind power plants. Grid integration is benefited by considering (in addition to distance) new wind plant sites with largely separated diurnal cycles, especially those differing by roughly 12 hours. Such diurnal smoothing is relevant for regions with strong wind speed diurnal cycles worldwide.

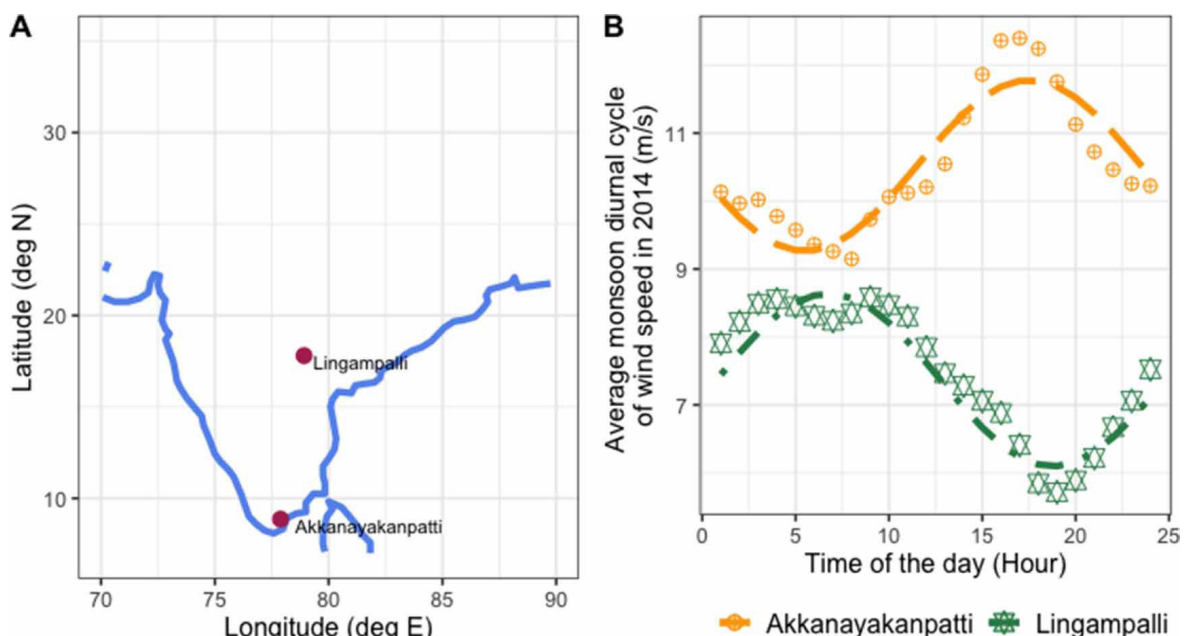


Figure: 1A

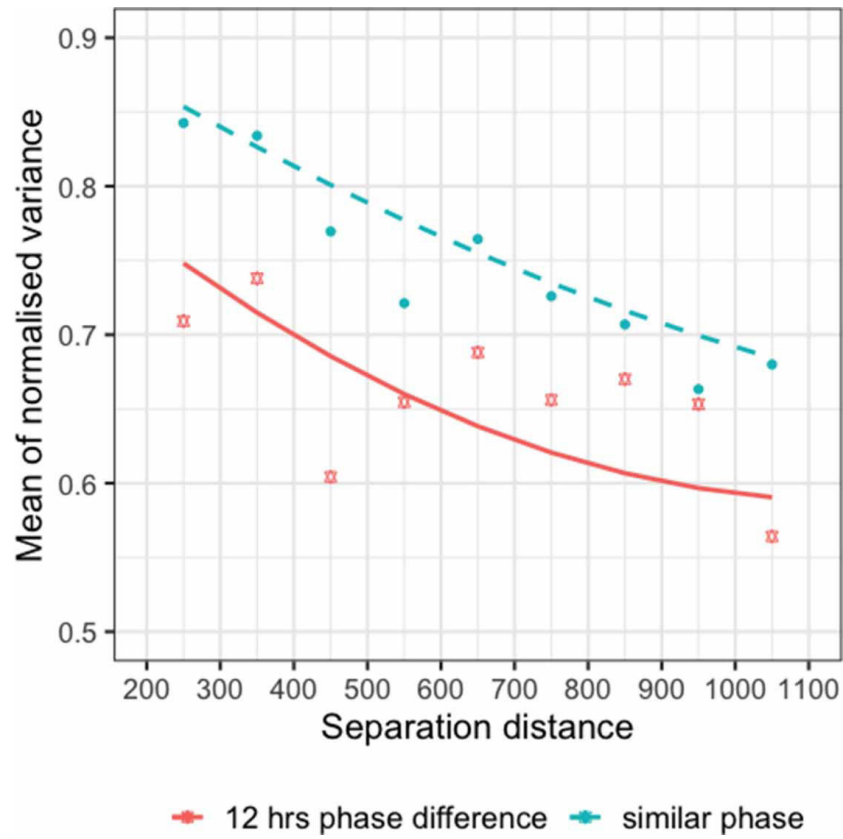


Figure: 1B

Reference:

Gangopadhyay, A.K.
Seshadri, N.J. Sparks, R.
Toumi, Beneficial role of
diurnal smoothing for
grid integration of wind
power, Environmental
Research Letters,
2023, 18 014022, DOI
10.1088/1748-9326/
aca9e6

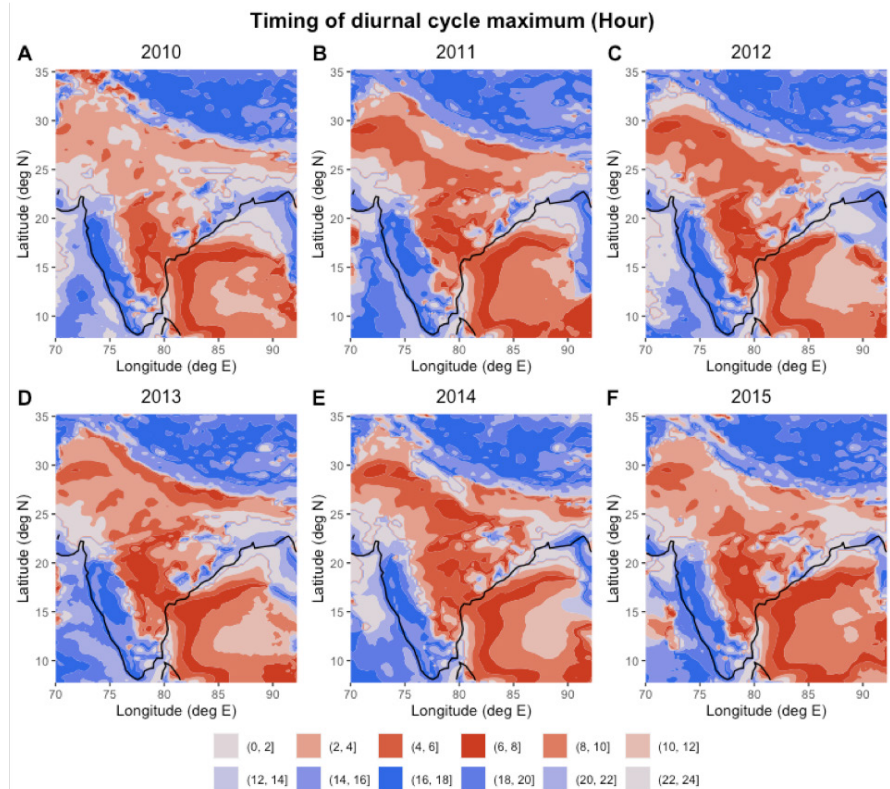


Figure: 1C

