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Welcome Message



Axel Timmermann
Organizer
Director, IBS Center for Climate Physics
Distinguished, Professor, PNU

Dear colleagues

Monsoon rainfall affects the livelihoods of more than 1.5 billion people worldwide. Understanding how it varies across intraseasonal to multidecadal timescales, and how it will respond to greenhouse warming, is necessary to develop effective regional adaptation strategies and reduce the impacts of flooding and drought.

Despite decades of research, many fundamental questions remain unresolved. These include:

- persistent rainfall biases in coupled general circulation models
- the dynamics and predictability of active and break cycles
- the origin of multidecadal rainfall trends in the tropics
- the role of aerosol forcing in monsoon rainfall
- the influence of transbasin coupling on monsoon systems
- the effects of vegetation on regional monsoons
- the influence of extratropical processes on monsoon systems
- the emergence of compound extremes in monsoon regions
- the impact of local terrain, such as the Western Ghats, on large-scale rainfall patterns
- the effects of parameterized convection on extreme rainfall
- the response of monsoon systems to paleoclimate forcings

Addressing these questions (and many others) is important for improving hydroclimate projections relevant to agriculture, water security, human mobility, and ecosystems.

To broaden perspectives and encourage further discussion and collaboration, we have merged the IBS Conference on Global Monsoon Systems with the East Asian Climate Workshop. This joint conference brings together experts in atmospheric science, climate modeling, hydrology, oceanography, and paleoclimate to advance our understanding of monsoon systems, including the variability and predictability of global and regional monsoons, as well as their sensitivity to past and future forcings.

We hope our conference will provide a stimulating platform for exchanging ideas, fostering new collaborations, and learning from one another.

Finally, the IBS Center for Climate Physics is pleased to celebrate its 10th anniversary with you.

PROGRAM

DAY 1, AUGUST 10th

KS Keynote Speaker **IT** Invited Talk

Time	Program / Speakers	Abstract Title
08:00 - 09:00	Registration	
09:00 - 09:10	Axel Timmermann / Kyung-Ja Ha	Welcome Remarks
SESSION 1	Global monsoon system: variability and forced responses	CHAIR: June-Yi Lee
09:10 - 09:40	Bin Wang KS	Global Monsoon Response to External Forcing and Internal Feedback
09:40 - 09:55	Tim Li	Multi-scale Variabilities and Interactions in the Global Monsoon
09:55 - 10:10	Jonathon Wright	The Changing Asian Monsoon Overturning: Perspectives from LESFMIP
10:10 - 10:25	Tao Zhou	Distinct Impacts of the Boreal Summer Asian – Australian Monsoon and Tropical Sea Surface Temperature Anomalies on the Interannual Variability of Southern Hemisphere Circulation
10:25 - 10:40	Huang-Hsiung Hsu	Tropical Cyclones Enhance Climate Variability in Monsoons – An Evaluation based on TC-Removed Global Reanalysis
10:40 - 11:00	Break	
11:00 - 11:30	Fei-Fei Jin KS	An XRO Perspective on the Global Monsoon System’s Seasonal-to-Interannual Variability and Predictability
11:30 - 11:45	Annalisa Cherchi	Global and regional monsoons in a changing climate
11:45 - 12:00	Myong-In Lee	Emerging dynamic links between Atmospheric Angular Momentum and the Asian Summer Monsoon: Implications for enhanced long-range predictability
12:00 - 13:30	Group Photo & Lunch	
SESSION 2	Regional monsoons: dynamics and predictability	CHAIR: Christian L.E. Franzke
13:30 - 14:00	Renhe Zhang KS	Interdecadal Shift in the Influence of East Asian Winter Monsoon on El Niño: The Role of the Arctic Oscillation
14:00 - 14:15	Jung-Eun Lee	Precessional Forcing and East Asian Monsoon Dynamics: Insights from Isotope-Enabled GFDL Modeling
14:15 - 14:30	Yu Liu	Recent centennial drought on the Tibetan Plateau is outstanding within the past 3500 years
14:30 - 14:45	Wan-Ling Tseng	A novel Asian Summer Monsoon Index reconstructed from mixed approach and the multidecadal variability revealed in 1400-1900s
14:45 - 15:00	Bian He	The Role of Tibetan Plateau Thermodynamic Forcing in Shaping Multi-scale Variability of the Asian Summer Monsoon from a Potential Vorticity Perspective
15:00 - 15:15	Yuanrui Chen	Interactions Between the SPCZ and Convectively Coupled Equatorial Waves
15:15 - 15:30	Break	
SESSION 2	Regional monsoons: dynamics and predictability	CHAIR: Christian L.E. Franzke
15:30 - 15:45	June-Yi Lee	Atmospheric Rivers and Associated Hydroclimate Extremes as an Important Component of the East Asian Monsoon System
15:45 - 16:00	Mohan Kumar Das	JetStream Evolution, Moisture Transport, and Barotropic Instability Associated with Indian Summer Monsoon Onset Variability
16:00 - 16:15	Marco Polo A. Ibanez	Assessment of a Localized Monsoon Index for Describing Monsoon–Rainfall Variability over the Philippines Using a 20-year High-resolution Gridded Rainfall Dataset
16:15 - 16:30	Ramesh Kumar Yadav	Factors influencing the north-south rainfall pattern of the Indian summer monsoon
16:30 - 18:00	Break	
18:00 - 20:00	Welcome Reception / ICCP 10th Anniversary	

DAY 2, AUGUST 11th

SESSION 2	Regional monsoons: dynamics and predictability	CHAIR: Sun-Seon Lee
09:00 - 09:30	Jung-Eun Chu KS	African Monsoon, Easterly Waves, and Tropical Cyclones
09:30 - 09:45	Yung-Jen Chen	The Role of Convection – Circulation Coupling in Abrupt South Asian Monsoon Onset: Insights from SP-CAM
09:45 - 10:00	Yen-Ting Hwang	South Asian Monsoon Change as a Regional Imprint of Global Energy Redistribution: From Satellite-Era Zonal Asymmetry to Future Meridional Shifts
10:00 - 10:15	Sarthak Mohanty	Are Climate Models Getting the Australian Summer Monsoon Right for the Right Reasons?
10:15 - 10:30	Hyemi Kim	Shaping Future MJO activity through Warm Pool Modification by Climate Engineering
10:30 - 10:45	Break	
SESSION 3	Detection and attribution	CHAIR: Renhe Zhang
10:45 - 11:05	Jiangping Li IT	Rossby wave phase tracing and its application to the Pacific-Japan teleconnection pattern
11:05 - 11:25	Yukiko Imada IT	Multidecadal modulation of local heavy rainfall frequency: Roles of Pacific and Indian Ocean variability
11:25 - 11:45	Wenxia Zhang IT	Increased extreme precipitation in North China since 2000s contributed by Inter-decadal Pacific Oscillation
11:45 - 12:00	Cheng-Ta Chen	Probabilistic event attribution for the 2025 mid-summer week-long southwesterly extreme rainfall event in southern Taiwan
12:00 - 12:15	Xiao Xiao	Soil moisture – atmosphere coupling intensifies wildfires in Siberia in 2021
12:15 - 13:30	Lunch	
13:30 - 15:00	Poster Session	
SESSION 3	Detection and attribution	Chair: Lin Wang
15:00 - 15:30	Taikan Oki KS	Pan-Asian monsoon droughts triggered by tropical volcanic eruption
15:30 - 15:45	Robert Badrina	Evaluation of Performance of Localized Southwest Monsoon Index (LSWMI) On selected 2025 Enhanced Habagat (Southwest Monsoon) Events in the Philippines
15:45 - 16:00	Xiaoyu Liu	Increasing Likelihood of the 2025 Persistent Summer Rainfall over Northern China under Anthropogenic Forcing
16:00 - 16:15	Yu Deng	Historical cold biases exaggerate future elevation-dependent warming over the Tibetan Plateau
16:15 - 16:30	Chih-Yen, Tsai	Separating Forcing-Specific Climate Signals from Internally-driven Variability with Interpretable Deep Learning Approaches: Implications for Detection and Attribution Framework
16:30 - 16:45	Xiao Lin	Network Security for Ocean Climate Data Sharing System Integrating Blockchain and Federated Learning
16:45 - 17:00	Break	
SESSION 4	Climate variability	CHAIR:

IBS CONFERENCE ON
**GLOBAL MONSOON
SYSTEMS**

AUGUST 10^{MON}-13^{THU}, 2026
Paradise Hotel Busan, Busan, Korea



ICCP 10TH ANNIVERSARY:
Climate Science for a Better World

SESSION 1

**Global monsoon system:
variability and forced responses**

CHAIR

June-Yi Lee

SPEAKERS

KS Bin Wang

University of Hawai'i

Tim Li

University of Hawai'i at Manoa

Jonathon Wright

Tsinghua University

Tao Zhou

Fudan University

Huang-Hsiung Hsu

Research Center for Environmental Changes, Academia Sinica

KS Fei-Fei Jin

University of Hawai'i

Annalisa Cherchi

National Research Council of Italy, Institute of the Atmospheric Sciences and Climate

Myong-In Lee

Ulsan National Institute of Science and Technology

Keynote Presentation

Speaker **Bin Wang**
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Abstract **Global Monsoon Response to External Forcing and Internal Feedback**

This talk presents a modern perspective on the monsoon concept, its climate variability, and projected future changes, with a focus on land monsoon rainfall, which provides water resources for approximately 70% of the world’s population. Regional monsoons have been extensively studied, yet they have only recently been recognized as a global system. The talk will begin with a discussion of the emerging concept of the Global Monsoon and its critical roles in driving the annual variations of the Hadley circulation, the Intertropical Convergence Zone, deserts, and the subtropical high. I will then discuss observed global land monsoon rainfall variability across intraseasonal to multidecadal timescales and its primary drivers, including the attribution of recent trends and the exploration of the decadal predictability of Northern Hemisphere land monsoon rainfall. The critical physical processes responsible for projected changes in the climate sensitivity of monsoon rainfall to global warming will be discussed. We emphasize that the thermodynamic effects of greenhouse gas forcing may be weaker than reported in the literature, and that anthropogenic forcing-induced circulation changes (dynamic effects) are primarily responsible for regional differences. The critical physical processes responsible for the Global Monsoon’s response to natural forcing (for instance, solar and volcanic) over the past millennium will also be discussed.

Presentation

Speaker **Tim Li**
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Abstract **Multi-scale Variabilities and Interactions in the Global Monsoon**

Tim Li*¹, Renhe Zhang*², Chunhui Yang*³

**¹ University of Hawaii, USA*
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**³ Nanjing University of Information Science and technology, China*

A long-standing question in atmospheric science concerns how, and to what extent, climate variabilities across different timescales interact to shape global weather and climate extremes. Here we address this issue through a quantitative framework that integrates both large-scale climate controls and upscale feedback processes. Coherent co-variability across multiple timescales appears throughout the global monsoon (GM) domain. While land precipitation on the interannual timescale exhibits a coherent inphase relationship across all the sub-monsoon systems, largely governed by El Niño-Southern Oscillation (ENSO), it is controlled to a large extent (about 80%) by the Madden-Julian Oscillation (MJO) on the intraseasonal timescale. Significant positive correlations are found between the interannual variability (IAV) and the intensity of the intraseasonal oscillation (ISO) and between the ISO and the intensity of synoptic-scale variability (SSV) across the entire GM domain, indicating a large-scale control of lowerfrequency modes to higher-frequency variabilities. It is further demonstrated that higher-frequency variabilities (e.g., SSV and ISO) may also exert marked upscale feedback to lower-frequency modes through nonlinear rectification of atmospheric condensational heating. About 90% of extreme precipitation days occur during the active phase of the ISO across the GM domain, laying foundation for sub-seasonal prediction of weather and climate extremes.

Presentation

Speaker

Jonathon Wright

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Abstract

The Changing Asian Monsoon Overturning: Perspectives from LESFMIP

Jonathon S. Wright*¹, Tat-Fan Cheng*², Yuanrui Chen*¹, Lun Dai*²

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^{*2} Hong Kong University of Science and Technology, Hong Kong S.A.R.

Current climate models still struggle to represent many aspects of the Asian summer monsoon (ASM) and its interactions with other climate systems. Here, as part of the APARC Large Ensembles for Attribution of Dynamically-driven Extremes (LEADER) activity, we use historical and single-forcing simulations from the Large Ensemble Single-Forcing Model Intercomparison Project (LESFMIP) to evaluate simulations of the ASM and its changes over recent decades from the perspective of the monsoon overturning. We briefly outline common discrepancies in four key aspects of this overturning: (1) the location of peak low-level moist static energy; (2) the vertical distribution of deep convective heating; (3) the reversal of upper-level temperature gradients; and (4) the extent and intensity of the upper tropospheric monsoon anticyclone. Examples of biases against reanalysis benchmarks (representing model error) and model spread (representing internal variability) are set against the context of model-simulated forced responses to recent changes in aerosols and greenhouse gases. The results illustrate the scale of uncertainties in evaluating the forced response of the ASM circulation to climate forcing.

Presentation

Speaker

Tao Zhou

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Abstract

Distinct Impacts of the Boreal Summer Asian–Australian Monsoon and Tropical Sea Surface Temperature Anomalies on the Interannual Variability of Southern Hemisphere Circulation

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The boreal summer Asian–Australian monsoon (BSAAM) is a powerful yet intricate climate system comprising several interacting subsystems. Moving beyond traditional subsystem-based approaches, this study treats the BSAAM as an integrated entity and elucidates its coupled relationships with tropical sea surface temperature anomalies (SSTAs) and Southern Hemisphere (SH) atmospheric circulation.

The first leading mode of the BSAAM (BSAAM1) corresponds to anomalies of the Western Pacific Subtropical High, mainly modulated by Niño3.4. The second leading mode of the BSAAM (BSAAM2) represents anomalies of the Australian High, primarily driven by the Indian Ocean Dipole (IOD).

Interestingly, both BSAAM1 and BSAAM2 exhibit pronounced impacts on SH circulation, but with distinct spatial patterns. While monsoon variability and tropical SSTAs both act as key tropical forcings, their influences on SH circulation differ markedly. BSAAM1 independently generates Rossby wave source (RWS) west of Australia, exciting southeastward-propagating Rossby wave trains, whereas Niño3.4 induces RWS east of Australia, leading to a meridional circulation response over the southern Pacific. In contrast, BSAAM2 and IOD are highly coupled, jointly producing RWS over the subtropical Indian Ocean and triggering southeastward Rossby wave propagation. Eliminating either signal markedly weakens these effects, though BSAAM2 exerts a stronger independent role. These distinct SH circulation responses arise from different precipitation forcings and ultimately lead to contrasting Antarctic climate impacts. These observational results are further supported by the linear baroclinic model experiments.

These findings provide new insights into the distinct pathways through which the BSAAM and tropical SSTAs modulate the interannual variability of SH circulation.

Presentation

Speaker

Hyemi Kim

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Abstract

Shaping Future MJO activity through Warm Pool Modification by Climate Engineering

Daniele Visoni*¹, Ewa Bednarz*²

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The Indo-Pacific Warm Pool fundamentally drives the Madden-Julian Oscillation (MJO), but how climate engineering might alter this relationship remains uncertain. This study investigates how Stratospheric Aerosol Injection (SAI) modifies the Warm Pool's mean state and subsequently shapes future MJO activity. Using single-point SAI simulations in CESM2-WACCM6, we analyze resulting changes in warmpool and MJO. By quantifying impacts on MJO amplitude, frequency, and propagation, this research provides critical insight into how localized solar radiation management could inadvertently reshape global weather patterns tied to tropical variability.

Memo

