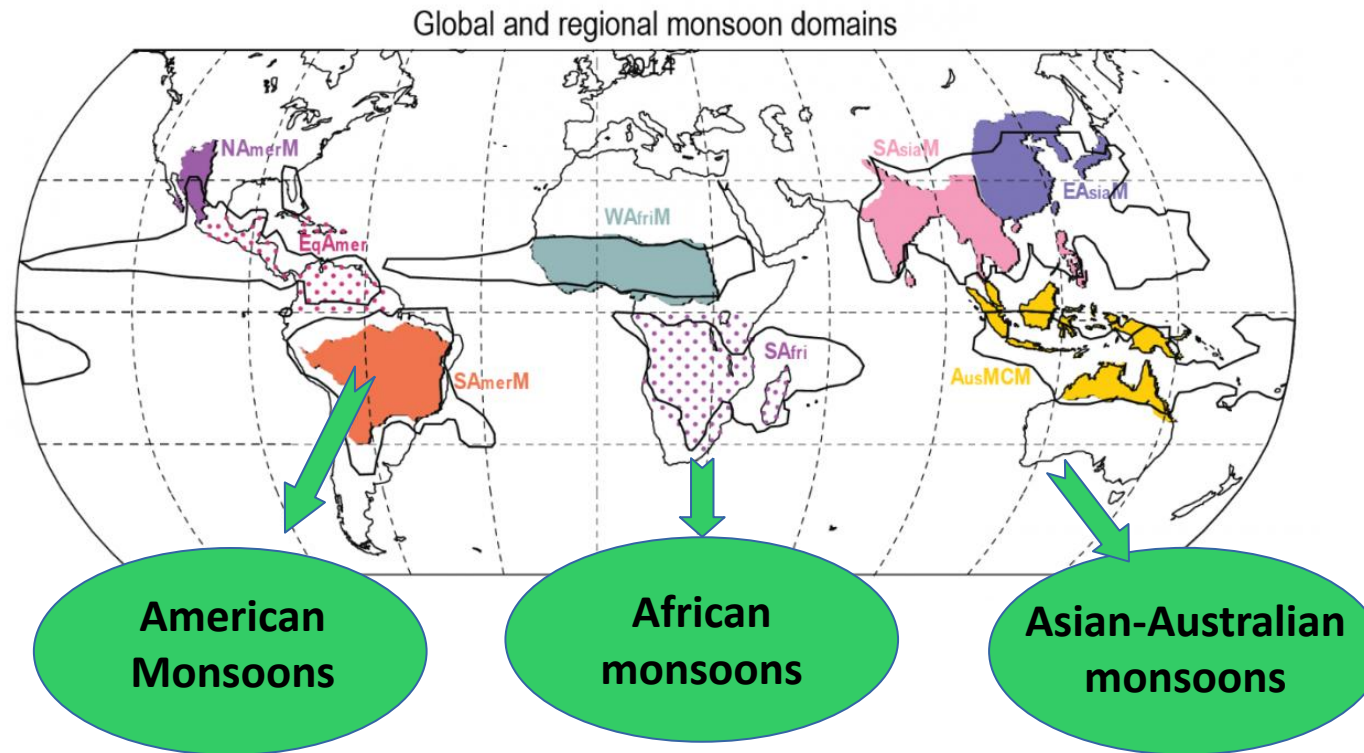


Co-Chairs: **Prof. Leila Carvalho (USA) & Dr. Suryachandra A. Rao (India)**



A joint panel spanning both CLIVAR & GEWEX with membership from both communities

Established in its current form after June 2014 GEWEX Conference

<https://impo.tropmet.res.in/wcrp-monsoon>

<http://www.clivar.org/clivar-panels/monsoons>

Overall Panel Objectives:

Overarching Goal: Advancing understanding of monsoon variability and improving its prediction with observations and modelling as cornerstones of research activities

- Enhanced emphasis on linkages across scales and physical processes
- Seek for new methods to enhance monitoring, advance diagnostics and improve models (AI/ML included)
- Development of more elaborate process studies coordinated with modelling activities
- Empowering the next generation of scientists around the world to advance our knowledge of monsoon systems, in key regions of interest.

Panel's Goals

Overarching Goal: Advancing understanding of monsoon variability and improving its prediction with observations and modelling as cornerstones of research activities

- Enhanced emphasis on **linkages across scales** and **physical processes**
 - ✓ **Why Coupled Models overestimate ENSO-Monsoon Relation?**
- Seek for **new methods** to enhance monitoring, advance diagnostics and improve models
 - ✓ **Incorporated several new modules to improve diurnal to seasonal characteristics. Impact of weakly coupled DA.**
- Development of more elaborated **process studies** coordinated with modelling activities
 - ✓ **Why 2022/2023 Monsoons are very peculiar? (Look for Presentation from Dr. Thea)**
- Empowering the **next generation of scientists** around the world to advance our knowledge of monsoon systems, in key regions of interest
 - ✓ **Working Groups and R2O activities (SASCOF, ASEANCOF, EASCOF etc.)**

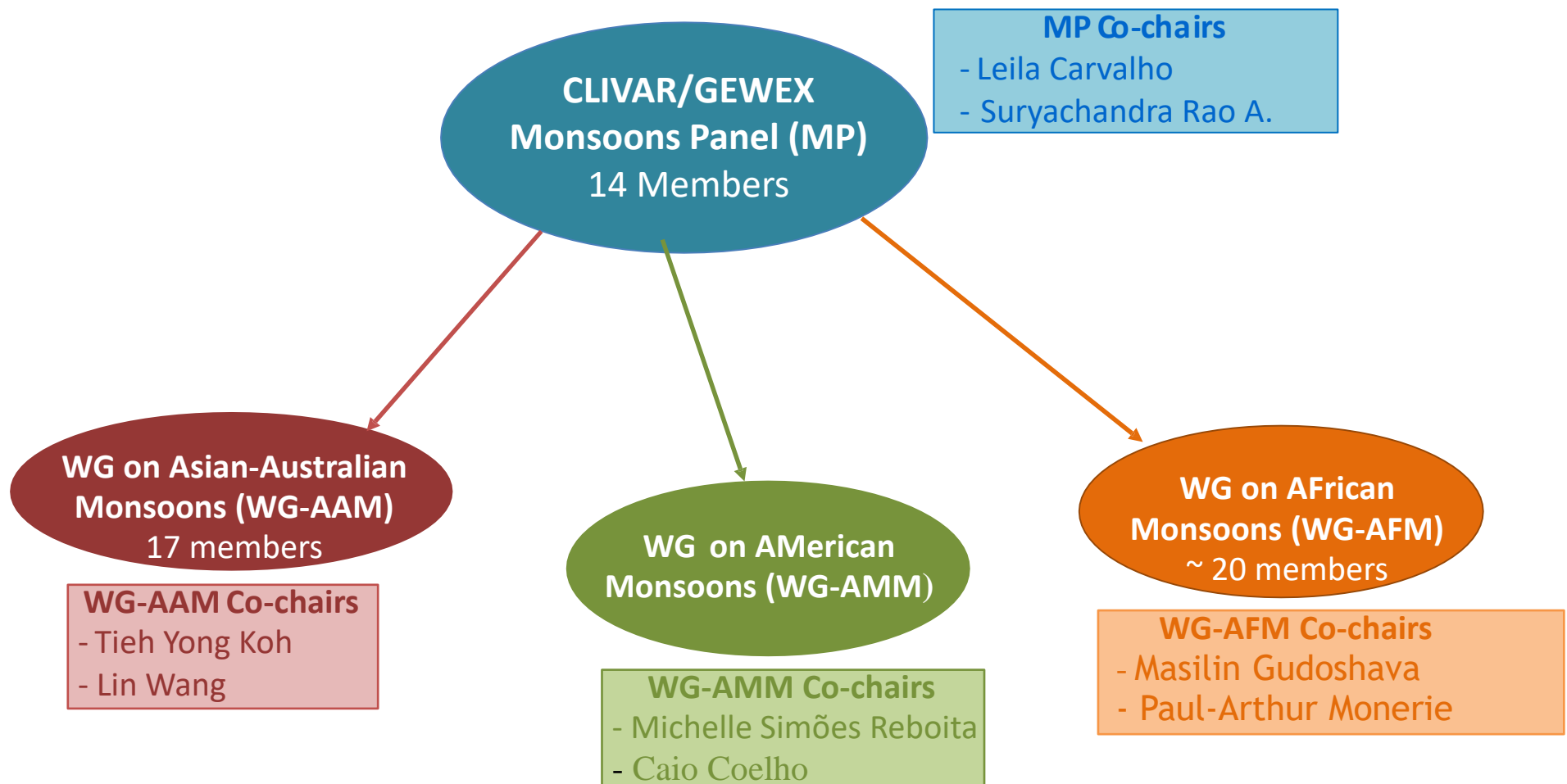
Panel's Current Focus

Identify bottlenecks to achieve improved skills in representing all monsoons in dynamical models, from synoptic (weather) to large-scale (climatological scale), with great emphasis on extremes. These activities include:

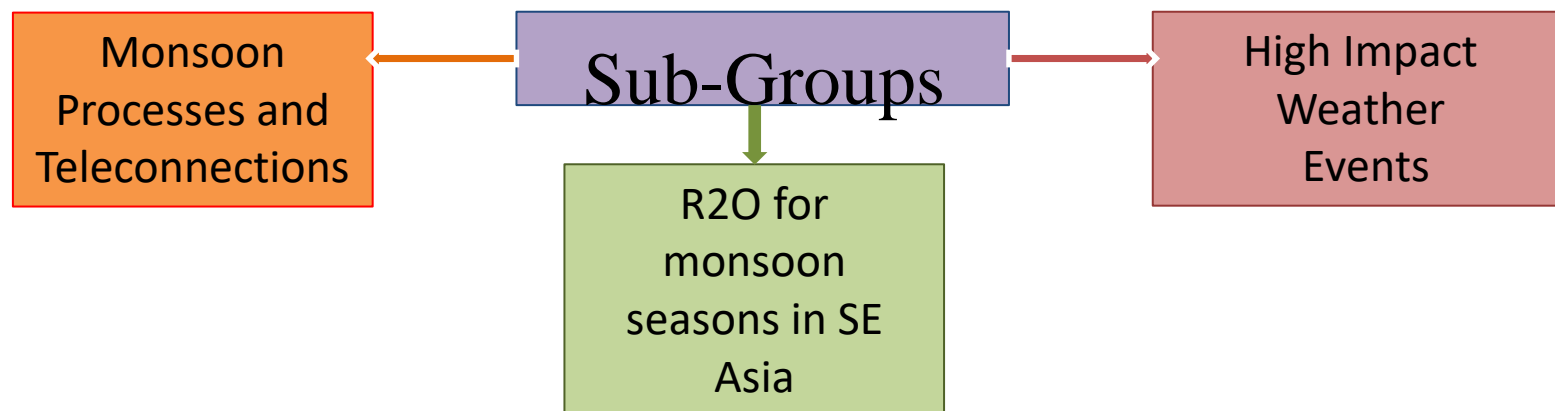
- **Assess the skill of dynamical models in simulating rainfall in regional monsoons** and identify bottlenecks for further improvement.
- **Improve understanding of dynamical and physical processes** associated with **extreme events** in monsoon regions and identify deficiencies and gaps in capturing these extremes in present-day models.
- **Support Research to Operations (R2O)** activities to help the Regional Climate Outlook Forums (RCOFs) and operational meteorological services.
- **Communicate existing products and provide guidance** on their (adequate) application and limitations focusing on the operational and (relevant) impacts communities and participate in relevant training activities.
- **Build Capacity** through working groups by promoting **Early Career Scientist (ECS)** representation in the working groups and subgroups.

Panel structure: Monsoon Panel (MP) & 3 regional Working Groups (WG)

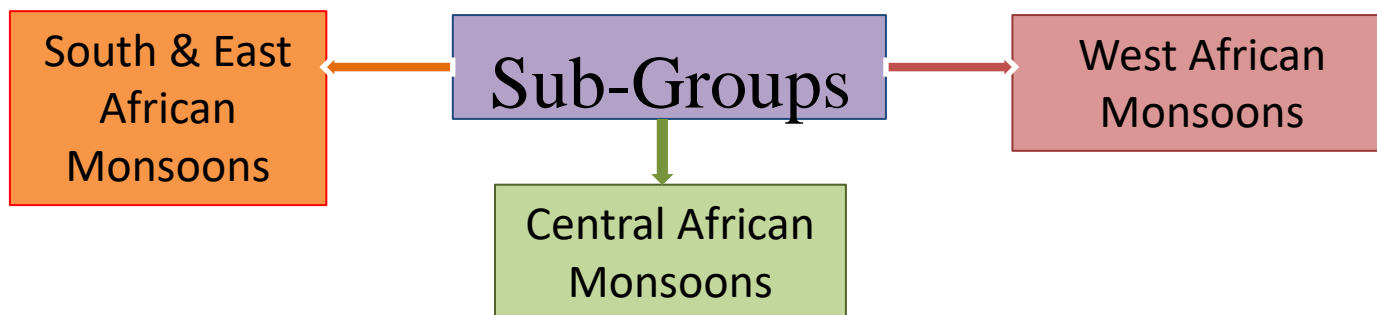
- Regional WGs tasked with identifying priority areas for targeting advances
- Regional WGs relatively flexible to organize themselves under the guidance of MP



Regional WG on Asian-Australian Monsoons' Activities



Regional WG on African Monsoons' Activities



Membership

Co-Chair(s) and Term Dates: 1) Leila CARVALHO; 2020– Present

2) Suryachandra Rao ANGULURI; 2019– Present

Members and Term Dates:

1) Rondrotiana BARIMALALA; 2021– Present

2) Annalisa CHERCHI; 2022– Present

3) Thea TURKINGTON; 2022– Present

4) Hui SU; 2023– Present

5) Hiroshi TAKAHASHI ; 2023– Present

6) Jhan-Carlo ESPINOZA; 2024– Present

7) Samson Hagos; 2024– Present

8) Satyaban Bishoyi RATNA; 2024– Present

9) Hanh NGUYEN; 2025– Present

10) Vasubandhu MISRA; 2025– Present

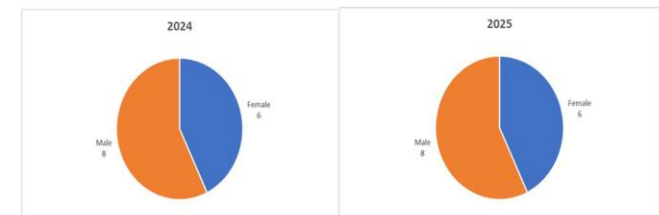
11) Fengfei SONG; 2025– Present

12) Luis BRITO-CASTILLO; 2025– Present

Regional Balance



Gender Balance



Scientific Capacity Building and Career Support Activities in 2023-24

WCRP CLIVAR GEWEX WWRP

Joint WCRP/WWRP WEBINAR SERIES

GLOBAL MONSOON

Wednesday, 13th Sept.
7:00-8:30 AM UTC
9:00-10:30 AM CEST

About Us

WCRP and WWRP have long led various research activities on both global and regional monsoons. The webinar series will be a platform to exchange knowledge, to discuss past and ongoing activities within the CLIVAR/GEWEX Monsoons Panel, and to explore methods that the scientific community and other stakeholders can engage with.

Speakers

Prof. Bin Wang
Global Monsoon Response to External Forcing and Internal Feedbacks

Dr. Annalisa Cherchi
Future of Monsoons in a Changing Climate - a Global Perspective

Chair

Dr. Suryachandra Rao Anguluri

JOIN US!

Contact Person:
Wushan Yang (wushan@geos.mcgill.ca)
More information:
www.wcrp-clivars.com/monsoons/webinars

Date: 13 Sept. 2023
Registration: 307
Attendees: 175
[YouTube Video](#) views: 435

WCRP CLIVAR GEWEX WWRP

JOINT WCRP/WWRP WEBINAR SERIES

ASIAN-AUSTRALIAN MONSOON

Speakers

B. N. GOSWAMI
Cotton University, India

Impact of Climate Change on Indian Monsoon

Tim COWAN
University of Southern Queensland, Australia

Australian Monsoon: Development and Implementation of Operational Services

Webinar Co-chairs

Gill MARTIN
Met Office Hadley Centre, UK

Thea TURKINGTON
Centre for Climate Research Singapore, Singapore

THURSDAY
NOV. 30
7:00-8:30 UTC

REGISTER NOW

Date: 30 Nov. 2023
Registration: 228
Attendees: 128
[YouTube Video](#) views: 289

WCRP CLIVAR GEWEX WWRP

JOINT WCRP/WWRP WEBINAR SERIES

AFRICAN MONSOONS

Speakers

Michela Biasutti
Columbia University, USA
Climate Change in the Sahel: The Past and the Future

Samson Hagos
PNL, USA
Synchronization of the Recent Decline of East African Long Rains and Northwestern Asian Warming

Webinar Co-chairs

Rondrotiana Barimalala
NORCE, Bergen, Norway

Akintomide Akinsanola
University of Illinois Chicago/Argonne National Laboratory, USA

Wednesday
6 March 2024
14-15:30 UTC

To know more about the webinar and to Register visit [african monsoons](#) webinar page.

REGISTER NOW

Date: 06 Mar 2024
Registration: 138
Attendees: 74
[YouTube Video](#) views: 264

WCRP CLIVAR GEWEX WWRP

JOINT WCRP/WWRP WEBINAR SERIES

AMERICAN MONSOONS

Speakers

Prof. Pedro Leite da Silva Dias
University of São Paulo, Brazil
Challenges for the South American monsoon predictability

Dr. Salvatore Pascale
University of Bologna, Italy
The North American monsoon: current scientific issues and perspective for the future

Webinar Chair

Prof. Alice Grimm
Federal University of Paraná, Brazil

Wednesday
24 April 2024
17:30-19 UTC

For more details visit [WCRP Monsoon Webinars](#)

REGISTER NOW

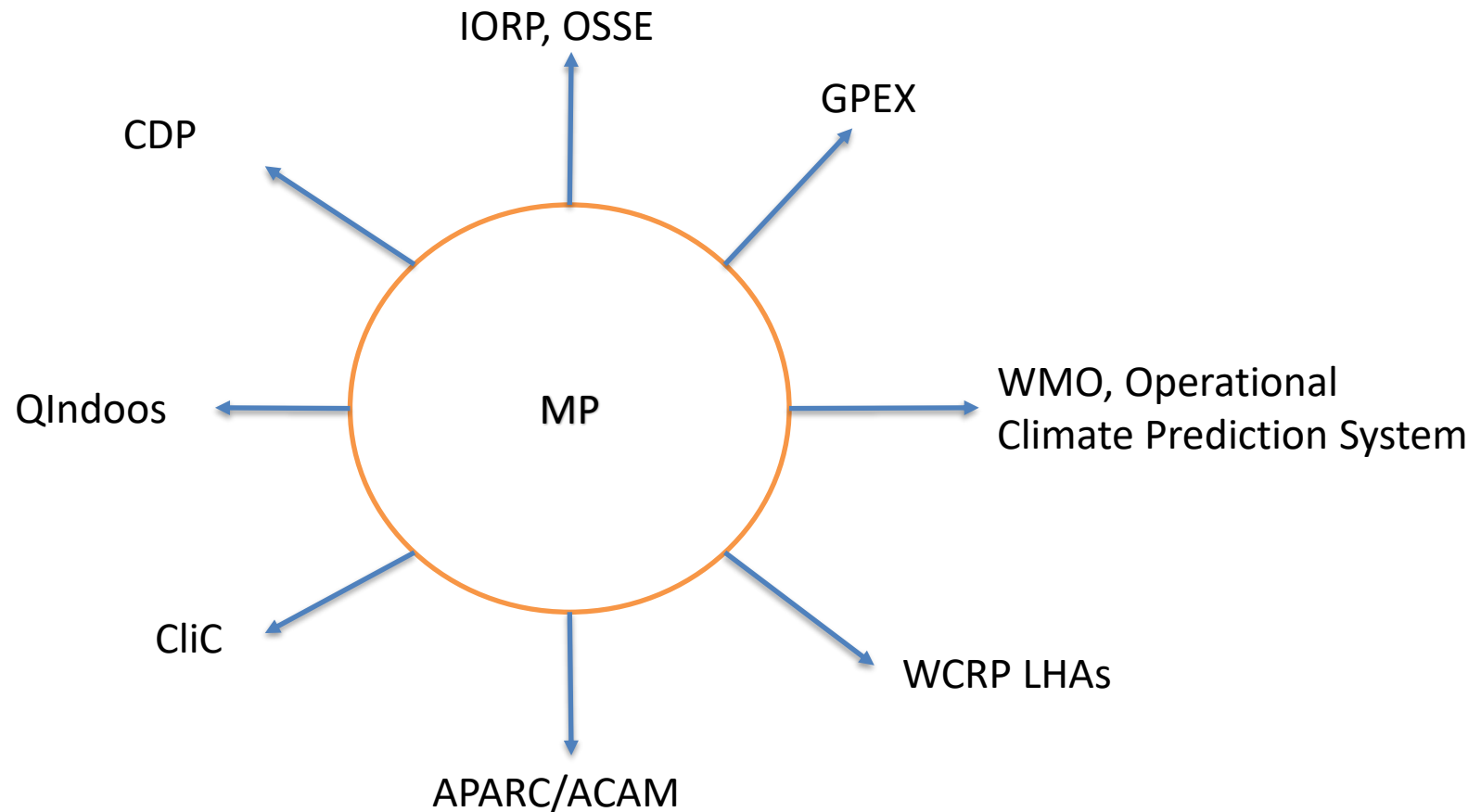
Date: 24 Apr 2024
Registration: 126
Attendees: 53
[YouTube Video](#) views: 143

Thanks to WCRP Project office support: Hindumati and Wushan

Organization of Major Workshops

- Involvement of MP/WG members in organizing the workshop and delivering talks at the International workshop on ***Stratosphere-Troposphere Interactions and Prediction of Monsoon weather Extremes*** [STIPMEX Workshop](#) 3-7 June 2024 at IITM Pune in collaboration with **APARC**
- Theme: Observational/modelling aspects of the stratosphere-troposphere coupling processes and extreme weather events associated with Asian summer monsoon.
- GEWEX OSC 7-12 July, Sapporo (Monsoon Session)
- The [8th WMO International Workshop on Monsoons \(IWM-8\)](#) is being organized jointly by the Indian Institute of Tropical Meteorology (IITM), Pune, Ministry of Earth Sciences (MoES), Government of India, the WWRP's Working Group on Tropical Meteorology Research (WGTMR) and the **CLIVAR/GEWEX Monsoons Panel** in cooperation with the India Meteorological Department and the International Monsoons Project Office (IMPO) during 17-21 March 2025 in Pune, India.
- [African Climate Change and Variability](#)” at the **2024 American Meteorological Society (AMS) Annual Meeting**
- [UCAR Africa Initiative Workshop](#) held during 21-22 March 2024 at Center Green, Boulder, CO, USA and online.

Monsoons Panel's Cross Panel Activities in 2024



Cooperation with other WCRP Projects, Outside Bodies and links to applications

- Dr. Satyaban Ratna (MP Member) as a member of [CLIVAR Climate Dynamics Panel \(CDP\)](#) and [CLIVAR Pacific Atmospheric Teleconnections in a wArming Climate \(PATAC\)](#) working Group.
- Wei Ting Chen and Lin Wang of WG-AAM joined the SPARC activity on Atmospheric Composition and the Asian Summer Monsoon (ACAM).
 - Dr. Lin Wang participated in the [33rd APARC SSG meeting](#) at Forschungszentrum Jülich, Germany on 28th October and presented on “Collaboration Potentials between APARC/ACAM & CLIVAR/GEWEX Monsoons Panel”.
- Following the recommendations of the CLIVAR SSG for MP’s involvement in [Quantitative evaluation of the Indian Ocean Observing System to improve climate forecasts \(QIndOOS\)](#), a cross-panel discussion meeting was held on June 12, 2024, with Elisabeth Remy from the [SynObs Project’s Observing System Evaluation Task Team](#) and Dr. Suryachandra A. Rao (MP) to evaluate the Ocean Observing System. Under this cross-panel activity with the impact of different ocean observations on model simulations, particularly of Asian monsoon and Indian monsoon is being examined.
- Drs. Hui Su and Hiroshi Takahashi of MP are collaborating with CliC on understanding the connections between the Himalayan cryosphere and Asian monsoons & Impacts of reduced Arctic sea-ice on Asian monsoons.
- Drs. Michelle Reboita, Parthasarathi Mukhopadhyay and Hatsuki Fujinami are members of WWRP/WGTMR (Working Group on Tropical Meteorology Research).

Cooperation with other WCRP Projects, Outside Bodies and links to applications

- Caio Coelho (WG-AMM) is a member of the Expert team on Climate Services Information System Operations, co-chair of the Expert team on Operational Climate Prediction System, and co-chair of the Joint Working Group of Forecast Verification Research
- Annalisa Cherchi (MP) contributed to cross-panel activities as member of the SSG (interim) of the GPEX that has been recognized as a new WCRP LHA.
- 3 MP members (Drs. Annalisa Cherchi, Hui Su and Samson Hagos) participated in GPEX meeting held in Washington DC during 6-7 December 2024. From 1st January 2025, they are effective members of GPEX with Dr. Annalisa Cherchi as GPEX Co-chair, Dr. Hui Su as Co-chair of WG2 (Data development) and Dr. Samson Hagos as Co-chair of WG1 (Coordinated field campaigns).
- On an invitation from CLIVAR/ IOC-GOOS Indian Ocean Regional Panel (IORP), Suryachandra Rao (MP) made a presentation on the skill of the models in predicting Asian monsoon, especially Indian summer monsoon. As a follow-up IORP and WG-AAM will work together to create a document suggesting the future requirements to improve the monsoon prediction skill. Maheswar Pradhan (WG-AAM) will also be associated in it.

Contributions to WCRP, Including the Light House Activities

- High Impact Weather (HIW) events sub-group under WG-AAM, is focusing on high impact events from recent years during the monsoon seasons, which could lead to contributions to “Understanding High-Risk Events” LHA.
- There are some discussions in HIW sub-group under WG-AAM on how AI or Machine Learning could be used to enhance the warnings, and on the potential for involving social scientists to help understand public response to warnings. This could lead to contributions to “Digital Earth” LHA under "advanced digital technology".
- Masilin Gudoshava (WG-AFM) was actively involved in the “My Climate Risk” LHA.
- Izidine Pinto (WG-AFM) was actively involved in “Safe Landing Climates” LHA.
- Annalisa Cherchi (MP) was a member of GPEX Interim SSC and now she is the Co-chair of GPEX.
- Most members of the eastern Africa subgroup of WG-AFM were involved in EPESC LHA’s "Africa Case Study" focusing on modeling the Eastern African rainfall.
- Dr Joseph Basconcillo of WG-AAM has volunteered for GPEX LHA.
- WG-AFM is co-designing the Africa case study with the EPESC lighthouse activity.

Monsoons Panel's Scientific Activities in 2023

Scientific Activities of WG-AAM:

2. R2O for monsoon seasons in SE Asia (R2O) subgroup:

- This subgroup meets quasi-monthly and has been exploring a **wind-based definition for monsoon seasons in SE Asia** that draws upon research published by Lee and McBride (2016).
- An original formulation for the **South-East Asian Monsoon Progression Index (SEAMPI)**, when tested using NCEP/NCAR and ECMWF reanalyses, revealed sensitivity to the nominal definition of the windows in which we look for the onsets and terminations of northerly and southerly monsoons.
- The group has since been working on a revised approach to identifying reference monsoon winds in SE Asia. This work was presented at ASEANCOF-20 in May, where it was well received. A poster on the work was presented at WCRP OSC in October 2023..

Monsoons Panel's Scientific Activities in 2023

Scientific Activities of WG-AAM:

3. High Impact Weather events (HIW) subgroup:

- Case studies of high impact events from recent years have been reviewed to see how they were observed and forecast, and how decision-making was affected.
- The group has discussed the disconnect between seasonal outlooks, which are for the country and season as a whole, and the variability on sub-seasonal and medium-range timescales, plus extreme events, that are experienced on the ground. Some countries have no capacity for creating sub-seasonal outlooks, despite a pressing need for landslide and lightning forecasts.
- There is also a lack of consistency in how each regional met service communicates the risks of extreme events, as inferred from the seasonal outlooks, to their stakeholders. **A draft document is being written on this topic, with examples contributed by WG members** documenting the issues based on some benchmark extreme event case in their respective region.

List of New Projects and Activities in Place and Main Objective(s)

- WG-AAM's Subgroup activities will continue and aim to publish results of work from the past 1-2 years.
 1. **Monsoon Processes and Teleconnections Subgroup:**
 - To start the joint research on teleconnections between the Arctic Sea ice and East Asian cold extremes.
 - To analyze the influences of cold surge on East and Southeast Asia with new cold surge features.
 - To start joint research on monitoring and understanding heavy rainfall (including typhoons) over Southeast Asia and Northwestern Pacific.
 2. **Research-to-operations for monsoon seasons in SE Asia Subgroup:**
 - To handle post-submission reviews and present the paper, "Introduction of Wind-based SEA Monsoon Index"
 - To write up and submit the paper, "SEA Monsoon Characterization using wind-based SEA Monsoon Index"
 - To disseminate and collect feedback on our SEA Monsoon Index in ASEANCOF in 2025. A separate webinar may subsequently be organised to involve operational forecasters on the use of SEA Monsoon Index.
 - To verify the skill of our SEA Monsoon Index regarding monsoon seasons' onset, peak, termination and strength.
 - To explore the use of SEA Monsoon Index to analyse changes in the region's monsoon under climate change scenarios using SingV3 8-km outputs from Meteorological Service Singapore.
 3. **High-impact weather event Subgroup:**
 - Completion of the weather warning paper draft, followed by feedback from the larger AAMWG and then submission.
 - Possible development of a second paper focusing on one particular case (e.g., of a tropical cyclone with compound flood/wind hazards) that affected multiple countries. This will compare forecasts and warnings issued by, and actions taken by, the affected NHMSs. A potential target is Typhoon Yagi.
- **Three WG-AAM members will participate in-person in the IWM-8 during 17-21 March 2025 and present the following papers:**
 - "Asian Summer Monsoon Variability during 2022–2023: Beyond Canonical Teleconnection Patterns" – as an Oral Talk by Thea Turkington
 - "Southeast Asian Monsoon Index for Its Monitoring and Prediction" – as an Oral Talk by Thea Turkington
 - "Using regional relaxation experiments to understand the development of errors in the Asian Summer Monsoon" – as an Oral talk by Gill Martin.
 - "Cloud and Convection Patterns Driven by Diurnal Ocean Warming" – as an Oral Talk by Maheswar Pradhan.
- **Three WG-AFM members will participate in-person in the IWM-8 during 17-21 March 2025 and present the following papers:**
 - "Investigating the Drivers of Dry Season Rainfall over Eastern Africa" - as a poster by Caroline Wainwright
 - "Southern African Monsoon: climatology and combined effect of SST interannual variability modes" - as a poster by Kenedy C. Silverio
 - "Model uncertainty in future changes in West African precipitation: component replication" - as an Oral talk by Paul-Arthur Monerie.
- Two MP Members (Suryachandra Rao A. and Satyaban Ratna) will deliver Invited/Oral talks in-person.

Acknowledgement



Dr E.N. Rajagopal
Executive Head

Thank You for Your Attention



Leila Carvalho, Co-chair



Suryachandra Rao A., Co-chair