EPESC – LEADER Science Meeting

15-18 July 2025 | APEC Climate Center Busan, Republic of Korea

DRAFT AGENDA, v5 (Subject to change!)

TUESDAY 15 JULY 2025

09:00 | Check-In

09:15 | Welcome, Workshop Logistics, Framing the Goals of the Meeting | June-Yi Lee, Erich Fischer, Organizing Committee

09:25 | Session A-1: Setting the stage with model-obs framing: What are models good at, where are they deficient?

09:25 | Erich Fischer: Introduction from the session chair

09:30 | Tiffany Shaw: Confronting Earth system model trends with observations

09:45 | Kirsten Findell (virtual): What do models get right about changes in evapotranspiration? Attribution of mechanisms of ET change

10:00 | Lijing Cheng: A large-ensemble observational ocean temperature/heat content product and the application

10:15 | Andrea Steiner: Tropospheric and stratospheric temperature trends from observations

10:30 | Rei Chemke: Targeted large-ensemble simulations for elucidating modelreanalysis discrepancies in storm track trends

10:45 | Discussion

11:15 | Coffee Break

11:45 | Session A-2: Predictions and predictability of large-scale modes, Part I

11:45 | Chaim Garfinkel: Introduction from the session chair

11:50 | June-Yi Lee: Estimating predictability of tropical trans-basin climate variability using the CESM2-based multi-year prediction system

12:05 | Doug Smith: The need to account for model error in attribution and prediction **12:20 | Jeong-eun Yun:** Exploring ocean-driven multi-year predictability of terrestrial ecosystem components

Hold discussion until after lunch

12:35 Lunch Break

14:00 | Session A-2 (cont.): Predictions and predictability of large-scale modes, Part II

Chair: Chaim Garfinkel

14:00 | Leonard Borchert: PDO-facilitated seasonal predictions of growing season heat in the central USA

14:15 | Dim Coumou: Al in climate science: mining knowledge and boosting predictability

14:30 | Rashed Mahmood (virtual): Multi-decadal initialized climate predictions using the EC-Earth3 global climate model

14:45 | Markus Donat (virtual): Towards understanding the sources of forecast signals and skill in interannual to decadal climate predictions

15:00 | Stephanie Fiedler (virtual): On the community effort to provide updated forcings every year or so to enable operationalized A2D prediction and attribution **15:15 | Discussion**

15:45 | Coffee Break

16:15 | Introduction of the Breakout Room Topics, followed by Breakout Discussions

Topic 1 | Model errors including the signal-to-noise paradox; what we have learned and ways forward

Discussion leads: Doug Smith and Scott Osprey

- Signal-to-noise issues in the models
- Exploiting model differences
- What are the implications for predictability and long-term signals?
- What have we learned and how can we deal with understanding the S/N paradox?

Topic 2 | Attribution methods for extreme events Discussion leads: James Risbey and Yukiko Imada

- What attribution approaches are available, and what are the strengths and weaknesses of these approaches? What attribution are they addressing (conditional vs. unconditional, risk approach, intensity, storyline approach, all-forcing)
- How can we bring together multiple lines of evidence and methods?
- What are the opportunities and challenges in the next step towards impact attribution?

Topic 3 | Confronting models and observations Discussion leads: Tiffany Shaw and Erich Fischer

- What are the major pitfalls in confronting models and observations (internal variability, forcing uncertainty, model response biases, observational uncertainty)?
- What experiments and methods are suitable for disentangling the differences?
- What are the challenges in observational products and how can we make progress?
- Can we come up with a protocol for good practice guidance?

18:00 | Group Dinner Provided by the Local Organizing Committee

WEDNESDAY 16 JULY 2025

08:45 | Check-In

08:55 | Session B-1: Tropical circulation variability and trends

08:55 | Andrea Dittus: Introduction from the session chair

09:00 | Andrea Dittus: Update on tropical circulation activity and LESFMIP sprint **09:15 | Jonathon Wright:** The South Pacific Convergence Zone: Reanalysis and LESFMIP Perspectives

09:30 | Rei Chemke: Historical Hadley circulation strength changes: resolving the model-reanalysis discrepancy

09:45 | Seok-Woo Son: Accelerated Hadley circulation weakening by aerosol mitigation

10:00 | Chaim Garfinkel: Forced changes in the QBO in the LESFMIP simulations

10:15 | Discussion

10:30 | Coffee Break

11:00 | Breakout Room Reports and Discussion

11:00 | 5-minute reports from Breakout Topics 1-3

11:15 | Discussion

11:30 | Session B-2: Response to solar and volcanic forcing

11:30 | Scott Osprey: Introduction from the session chair

11:35 | Basudev Swain: Lessons from historical volcanic eruptions for projecting the Tonga event's impact on polar warming

11.50 | Davide Zanchettin: Volcanically-forced climate variability in the historical period: perspectives from LESFMIP (community paper)

12.05 | Wenjuan Huo: A retrospective study of climate response to solar variability with outputs of LESFMIP (community paper)

12.20 | Indrani Roy: Effect of strong volcanoes on QBO and Surface signatures –OR– Solar cyclic variability in Atmosphere-Ocean Coupling (one to be a poster) **12:35 | Discussion**

12:50 Lunch Break

14:00 | Session B-3: Tropical circulation variability and trends: Monsoonal focus

14:00 | Jonathan Wright: Introduction from the session chair

14:05 | Suyeon Moon: Climate change-driven evolution of East Asian summer monsoon frontal precipitation

14.20 | Shubham Waje: Understanding the impact of the Quasi-Biennial Oscillation on the subseasonal variability of the Indian monsoon

14.35 | Melissa Seabrook:

14.50 | Annalisa Cherchi: Global and regional monsoons in a changing climate

15:05 | Discussion

15:20 | Extended Coffee Break with Poster Session [posters will be up all week]

- David Avisar: Changes in ENSO teleconnections in response to human activities diagnosed from the LESFMIP simulations
- Leandro B. Díaz: Southern Hemisphere surface climate response to human activities analyzed using LESFMIP simulations
- Chaim Garfinkel: Teleconnections between the African monsoon and extreme summer temperatures in the Eastern Mediterranean
- Kourosh Haddadi Moghaddam (awaiting confirmation): Climate change of biogenic substance and bio productivity of water in the northern part of the Caspian Sea
- Kourosh Haddadi Moghaddam: El Nino and its role on the global carbon cycle in the Caspian Sea
- Bianca Mezzina: TBD
- Yunju Park: Soil Moisture–Precipitation feedback over East Asia using radiosonde observations
- Amitava Roy: Volcanoes causing regional weather extremes
- Indrani Roy: Effect of strong volcanoes on QBO and surface signatures –OR– Solar cyclic variability in Atmosphere-Ocean Coupling (one to be a talk)
- Abhinav Rajalakshmi Subrahmanian: Improving North Atlantic climate predictability on interannual -to- decadal timescales
- Sohan Suresan: Diagnosing Atlantic subtropical jet variability and forcing dependencies in LESFMIP

16:10 | Session B-4: Summer northern hemisphere atmospheric circulation trends

16:10 | June-Yi Lee: Introduction from the session chair

16:15 | Alexia Karwat: Exploring multi-year predictability of terrestrial heatwaves in Global Hotspot Regions

16.30 | Tiffany Shaw: Anthropogenic aerosols have significantly weakened the regional summertime circulation in the Northern Hemisphere during the satellite era

16.45 | Gerard Marcet-Carbonell (virtual): On the Northern Hemisphere summer circulation: Disentangling the contributions of different forcings through LESFMIP experiments

17.00 | Tilda Huntingford (virtual): External forcing of European summer heatwaves and circulation

17.15 | Jitendra Singh (virtual): Quantifying the role of externally forced atmospheric circulation change in heat extremes from nudged circulation

17:30 | Discussion

THURSDAY 17 JULY 2025

08:45 | Check-In

08:55 | Session C-1: Southern hemisphere circulation trends and extremes

08:55 | Doug Smith: Introduction from the session chair

09:00 | Leandro B. Díaz: Response of the Southern Hemisphere atmospheric and oceanic circulation to single forcings (community paper)

09:15 | Ghyslaine Boschat: Role of external forcing on the Southern Annular Mode and its impact of Southern Hemisphere climate

09:30 | William Dow: The role of external forcing in Antarctic peninsula temperature extremes in austral summer and the links with large-scale atmospheric circulation patterns

09:45 | Kewei Lyu: Roles of external forcings and tropical teleconnections in the Southern Ocean warming

10:00 | Bianca Mezzina: Exploring the contributions of single atmospheric forcings on Antarctic sea ice trends using large ensembles

10:15 | Sabine Bischof: Contributions of Various Climate Forcings to Historical Southern Hemisphere Stratospheric Vortex Strength and Lifetime
10:30 | Discussion

11:00 | Coffee Break

11:30 | Session C-2: North Atlantic atmosphere and ocean circulation, Part I

11:30 | Leandro B. Díaz: Introduction from the session chair

11:35 | Chaim Garfinkel: The response of the North Atlantic atmospheric and oceanic circulation to external forcings: understanding intermodel spread (community paper)

11.50 | Shoshiro Minobe: Spatiotemporal structures of forced response revealed by a novel analysis approach designed for LESFMIP

12.05 | Sara Bennie: Do externally forced atmospheric trends resemble modes of internal variability?

12.20 | David Avisar: Revisiting the historical Drying of the Mediterranean in the LESFMIP Simulations

Hold discussion until after lunch

12:35 Lunch Break

14:00 | Session C-2 (cont.): North Atlantic atmosphere and ocean circulation, Part II

Chair: Leandro B. Díaz

14:00 | Rachel Wu: Stratosphere-troposphere coupling in LESFMIP (community paper)
14:15 | Ales Kuchar: Understanding historical changes in the Northern Hemisphere stratospheric polar vortex: insights from the Large Ensemble Single Forcing Model Intercomparison Project

14:30 | Discussion

15:00 | Coffee Break

15:20 | Session C-3: Impact of circulation changes on extreme events

15:20 | James Risbey: Introduction from the session chair

15:25 | Zhuo Wang: At the weather-climate interface: interactions between large scale circulation and extremes

15:40 | Hamish Ramsay: Poleward migration of the most damaging tropical cyclones **15:55 | Marlene Kretschmer (virtual):** Using machine learning to infer teleconnections of extreme weather events

16:10 | Discussion

16:25 | Introduction of the Breakout Room Topics, followed by Breakout Discussions

Topic 4 | Circulation response to external forcing Discussion leads: Doug Smith and Scott Osprey

- How can we make progress in isolating the forced response in circulation to external forcing?
- How can we address the potential challenges of the signal-to-noise paradox making it more challenging to isolate the forced response?
- What are the first insights from LESFMIP?
- What are the changes in which we have high/medium/low confidence?
- What are the next steps needed to move forward? Novel model experiments, more targeted analysis?

Topic 5 | What are the strengths and limitations of data-driven (AI) ensemble forecasting systems and can they play a role in EPESC? Discussion leads: Dim Coumou and TBD

- AIFS has become operational at ECMWF
- Al-driven ensemble forecasting systems such as GenCast have been released. If they are becoming better at representing longer time scales (https://arxiv.org/abs/2503.23953) and large-scale atmospheric fields, can they also inform EPESC-relevant activities?
- What are the risks and limitations vs. opportunities?

Topic 6 | *Not yet decided: Something around updated recent forcings?* Discussion leads: *TBD*

- Are we about to lose crucial satellites which provide key information needed for updated forcings? are we losing key satellites that help constrain EEI? Do we have a Plan-B?
- In the absence of blended historical and future forcings, can we discuss an intermediate staging, perhaps including something like a hindcast of the most recent decade, or a short (up to 5 years) forecast from present day with simple extrapolated future forcings? Depends on the outcome of discussion of updated forcings. Or the forecast impact of degraded future observations of forcings following defunding of observational networks?

18:00 | Early Career Scientist Networking Dinner

FRIDAY 18 JULY 2025

08:45 | Check-In

08:55 | Session D-1: The role of external forcings and internal variability on atmospheric temperature trends

08:55 | Andrea Steiner: Introduction from the session chair

09:00 | Benjamin Santer (virtual): On Human fingerprints of climate change (atmospheric temperature, models and observations)

09:15 | Mattias Stocker (virtual): Evaluating atmospheric temperature trends from LESFMIP simulations and observations

09:30 | Sebastian Sippel: Early-twentieth-century cold bias in ocean surface temperature observations & implications for constraints on future temperature projections

09:45 | Erich Fischer: On how the continued upward trend in temperature impacts hazard likelihoods (the increased likelihood of 5-sigma events)

10.00 | Satyajit Singh Saini (not yet confirmed): Aerosol transport and Polar Climate Extremes: Heatwave amplification, Snow-albedo feedback, and Cryosphere vulnerability **10:15 | Discussion**

10:45 | Coffee Break

11:15 | Breakout Room Reports and Discussion

11:15 | 5-minute reports from Breakout Topics 4-6 11:30 | Discussion

11:45 | Session D-2: Extreme event attribution, Part I

11:45 | Zhuo Wang: Introduction from the session chair

11:50 | Yukiko Imada: Event attribution methods and approaches

12:05 | Wenxia Zhang: Anthropogenic amplification of precipitation variability over the past century

12:20 | James Risbey: The role of model bias in model assessment of extreme events *Hold discussion until after lunch*

12:35 Lunch Break

14:00 | Session D-2 (cont.): Extreme event attribution, Part II

Chair: Zhuo Wang

14:00 | Nick Leach: Forecast based weather and impact attribution
14:15 | Seung-Ki Min: Attribution of heavy precipitation event using pseudo global warming simulations: sensitivity to vertical temperature changes
14:30 | Yang Chen: Bayesian attribution and projection of regional relative humidity responses constrained by homogenized observations
14:45 | Discussion

15:15 | Coffee Break

15:35 | Session D-3: The challenges and opportunities of taking research activities into operational mode

15:35 | Chair TBD: Introduction from the session chair

15:40 | Anca Brookshaw (virtual): On the different needs of research vs operational activities from the seasonal perspective; added challenges posed by the decadal time scales

15:55 | OkYeoin Kim: Advancing Annual-to-Decadal prediction of Extreme Climate Events in the Asia-Pacific Region

16:10 | Doug Smith: On the operational Annual-to-Decadal updates

16:25 Erich Fischer: The Future of EPESC and LEADER: where are we going? *Framing the long-term vision of EPESC: Where will the science of annual to decadal attribution and prediction be in 2050?*

16:40 | Final Discussion