Extreme event attribution

- Extreme event attribution has received increasing attention because extremes, despite being rare, have disproportionately large impacts.
  - In addition to extreme event frequency or intensity attribution, impact attribution is a quickly developing field.
- Extreme event attribution depends both on how the question is framed and what method is used.
- General approaches
  - Statistical methods of attribution
  - Coupled climate modeling: unconditional attribution
  - AMIP/seasonal prediction/weather forecasting approaches: conditioned with SST or circulation patterns
  - ML-based approaches

Extreme event attribution: Challenges

- Uncertainties and biases of numerical models:
  - The confidence of attribution depends on the model's skill in simulating extremes under both factual and counterfactual scenarios. How should we evaluate a model and how do we quantify the uncertainties related to model deficiencies?
- Model configuration:
  - Long-term simulations or large ensembles are often necessary to estimate the frequency of extremes, and high resolution or coupled processes (land-atmosphere interaction, air-sea interaction) may be necessary or desirable as well.
  - How should we balance between model ensemble size, simulation length, and model resolution? Which approach offers the most effective path forward: global kilometer-scale modeling, or intermediate-resolution modeling combined with downscaling (including ML)?
- Length and quality of observational data
- Method dependence
  - How sensitive is attribution to different methods?
  - A common event attribution initiative --- Dr. Yukiko Imade, EPESC WG3

Session D-2: Extreme event attribution

- 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
- *Lunch Break (12:35-13:30)*
- 13:30 | Nick Leach: Forecast based weather and impact attribution
  13:45 | Seung-Ki Min: Global warming-induced warmer surface water over the East China Sea can intensify super typhoons like Hinnamnor
  14:00 | Yang Chen: Human-caused increases in humidity-related compound extremes constrained by homogenized observations
  14:15 | Christian Franzke: The first emergence of unprecedented compound extremes in the Anthropocene
  14:30 | Discussion