

COMPASS Hackathon

Climate and Impact Attribution — Call for Participants

Join an interdisciplinary, hands-on hackathon to explore how climate change influences complex extreme events and their impacts — and to test, extend and communicate tools developed by the COMPASS project.

Approximately 20–25 participants will work in 6 small teams on different scientific challenges. The Hackathon is supported by the European Centre for Medium-Range Weather Forecasts (ECMWF).

About COMPASS

COMPASS — Compound extremes attribution of climate change: towards an operational service — is a Horizon Europe research project developing a harmonised but flexible framework for climate and impact attribution of complex extremes. The project moves beyond single-driver events toward compound, sequential and cascading hazards, and from a hazard-centred perspective toward understanding impacts. Its methods are being tested across real-world Use Cases and translated into reproducible, open-source workflows, a web demonstrator and foundations for future operational climate-attribution services.

Learn more about the project and its Use Cases: <https://compass-climate.eu/>

Target group	Primarily early-career scientists, while applications from other researchers and practitioners are also welcome.
Participants	Around 20–25 participants, organised into 6 interdisciplinary teams of 4–5 people.
Selection	Places are limited. Priority will be given to early-career scientists. The application form will ask about skills and experience so that diverse, complementary teams can be formed.
Format	Hands-on teamwork supported by COMPASS partners, with feedback after each half day, an icebreaker, final presentations and reflection, and a possible social event.
Competition	No. The Hackathon is collaborative rather than competitive; groups will present their results in front of an expert panel.
Costs	Participants cover their own travel and accommodation. Food during the Hackathon will be provided.
Timing	8-9.02.2027

What the Hackathon aims to achieve

- Test and demonstrate solutions developed within COMPASS using real project data, model outputs and workflows.
- Give participants practical experience with climate and impact attribution for compound and complex extreme events.

- Create space for networking, interdisciplinary exchange and collaboration across climate science, hazard/impact modelling, programming, visualisation and communication.
- Identify promising directions for future research, tool development and the operationalisation of attribution methods.

Planned challenge scenarios

The Hackathon will offer six different challenge scenarios. Each group will work on one challenge and will focus on a different part of the climate-attribution chain — from constructing counterfactual climate conditions and testing modelling choices, through impact attribution, to communicating results.

1. Generating counterfactual climate time series with ATTRICI

Organised by: Potsdam Institute for Climate Impact Research (PIK)

Focus. Participants will gain hands-on experience with ATTRICI (ATTRibuting Climate Impacts), a Python package for constructing counterfactual climate time series from observational climate data by removing estimated changes associated with global mean temperature change.

What you will do. After a short methodological introduction, teams will configure ATTRICI, run it on a prepared dataset in Jupyter and interpret the resulting factual–counterfactual differences. The main experiment will compare Fourier-based and rolling-window approaches to seasonality. Participants will vary settings and examine how methodological choices affect seasonal behaviour, distributions, climate variables, locations and extreme values.

Optional technical strand. Participants with a software-development interest may work on focused improvements such as configuration validation, calendar handling for rolling windows, or extensions to the comparison notebook.

Expected output. A working ATTRICI configuration, generated counterfactual data, comparison plots and a concise interpretation of the results, providing a reproducible basis for applying the method to other datasets.

Useful background: basic familiarity with Python, Jupyter notebooks and climate time series.

2. How does data resolution affect attribution results? — Somerset Levels floods

Organised by: Met Office

Focus. This challenge examines how the spatial resolution of input data influences attribution results for the 2013–2014 Somerset Levels flooding in the United Kingdom.

What you will do. Participants will work with pre-run factual and counterfactual flood simulations forced by precipitation data at different UKCP resolutions, including convection-permitting (~2.2 km), regional (~12 km) and global (~60 km) scales. Using common COMPASS analysis scripts, teams will compare impact indicators such as flood extent, volume and depth across the factual–counterfactual simulation pairs.

Possible extension. A second strand may test the influence of digital elevation model (DEM) resolution, for example by comparing outputs from using a global coverage DEM with those from using a higher-resolution UK LiDAR DEM while holding precipitation resolution constant, or examine the combined influence of changing the resolution of both DEM and precipitation.

Key question. Does higher-resolution input data strengthen, weaken or otherwise alter the attribution signal, and what does this mean for transferring the COMPASS framework to regions where only globally available, and thus assumedly lower resolution, datasets exist?

Expected output. A consistent comparison of attribution metrics across resolutions, accompanied by clear conclusions on the sensitivity of attribution results to data resolution and implications for wider applicability.

Useful background: basic familiarity with Python; initial appreciation of potential impact, pros and cons of varying data resolutions

3. Advancing impact attribution for Tropical Cyclone Idai in Mozambique

Organised by: Deltares

Background. COMPASS has applied its globally applicable hazard-modelling framework to compound flooding during Tropical Cyclone Idai, which made landfall near Beira, Mozambique, in March 2019. This challenge uses that real-world case to explore new ideas for extending climate and impact attribution.

How you can work. Teams can start from existing attribution simulation outputs or, where appropriate, work with parts of the underlying modelling workflow to generate new analyses.

Possible directions include:

- **Exposure and vulnerability attribution.** Explore how historical or future changes in exposure and vulnerability could be incorporated into attribution, which indicators are suitable for global application, and what is feasible for the Sofala Province, Mozambique.
- **Alternative impact metrics.** Go beyond currently used impact metrics by testing or conceptualising indicators such as agricultural damage, indirect and long-term impacts, disruption metrics, alternative impact models or combinations of physical and socio-economic indicators.
- **Communication and visualisation.** Design ways to communicate conditional attribution results to different audiences — scientists, practitioners, decision-makers or local communities — through visualisations, storylines or other communication products.
- **Comparing attribution approaches.** Assess alternative attribution methodologies, their strengths and limitations, data and computational requirements, and how conclusions might change across methods or be integrated with the existing COMPASS framework.

Expected output. Depending on the chosen direction: a proof-of-concept analysis, methodological workflow, visualisation/communication product, or recommendations for future development of impact attribution methods.

Useful background: some knowledge on attribution science and, depending on chosen direction, basic familiarity with Python.

4. Climate Attribution Story Generator with EarthKit

Organised by: University of Szczecin

Focus. Participants will work with curated factual and counterfactual climate and impact datasets produced within COMPASS Work Package 5 and use EarthKit to transform scientific outputs into a clear, evidence-based attribution story.

What you will do. Using earthkit-data, earthkit-transforms and earthkit-plots, teams will develop a reproducible prototype for a selected event, location and audience. The prototype should communicate what happened in the factual dataset, how counterfactual conditions differ, where the strongest changes are located, and how unusual the event is in its historical and seasonal context.

Possible ingredients. Maps, regional summaries, anomalies, percentiles, time series and impact indicators may be combined into a coherent attribution narrative.

Scope. The aim is not to reproduce the WP5 modelling workflow or build a full web application. The challenge is to derive and communicate new insight from existing outputs.

Expected output. A reproducible notebook or lightweight application producing an adaptable “event card” or attribution story, together with a short explanation of the scientific and visual choices made for the intended audience.

Useful background: basic familiarity with Python, Jupyter notebooks and climate time series in NetCDF format. Knowledge of the following will be useful: NumPy, Pandas, Matplot and EarthKit

5. Causal Mapping and Qualitative Counterfactuals

Organised by: Red Cross Red Crescent Centre

Focus. While quantitative methods are central to extreme-event and impact attribution, COMPASS has also explored the complementary value of qualitative approaches for understanding how hazards translate into impacts. Causal mapping has been applied across several COMPASS Use Cases to represent complex and cascading pathways from an initial hazard through to multiple impacts.

Why causal mapping? Causal maps can represent interactions between hazards, exposure and different forms of vulnerability affecting communities, infrastructure and other systems within a particular context. They can also incorporate factors that are difficult to quantify through standard indicators, such as failures in early warning systems, communication problems, institutional decisions or challenges in the management of displaced populations. This makes it possible to combine documentary evidence, expert judgement and stakeholder knowledge within the attribution analysis.

What you will do. Participants will draw on multiple lines of evidence to develop a causal map for the Honduras Use Case, focusing on the impacts of Tropical Cyclones Eta and Iota. A Kumu-based template developed by the COMPASS team will be provided to support the mapping process. The team will identify key hazard, exposure and vulnerability factors, examine how they interacted, and trace the pathways that contributed to observed impacts.

Qualitative counterfactuals. Using the causal map, participants will then explore how impacts might have differed under alternative conditions. Examples could include more effective early-warning communication, different approaches to displacement management, or improved preparedness and risk-management measures. Such qualitative counterfactuals provide an important complement to quantitative and hazard-focused counterfactuals by addressing social, institutional and policy-related drivers that are difficult to represent in physical models.

Key question. How can causal mapping and expert-informed qualitative counterfactuals improve our understanding of the pathways from climate hazards to impacts, and how can they complement quantitative attribution methods?

Expected output. A causal map of the Honduras Eta and Iota case, together with one or more qualitative counterfactual scenarios illustrating how changes in vulnerability, preparedness, communication or response could have altered the observed impacts. The team will also reflect on how qualitative approaches can be integrated with quantitative attribution results and used to support policy and intervention planning.

Useful background: Familiarity with extreme attribution in order to interpret results. Knowledge of or experience of causal mapping and Kumu mapping tool would be useful.

6. Beyond climate: disentangling the drivers of water scarcity in Crete

Organised by: SEVEN

Background. Water scarcity is not determined by climate alone. It emerges from interactions between hydroclimatic conditions, water availability, land use, water demand and management decisions. The COMPASS Crete Use Case applies a long-term system-attribution approach to the Tympaki basin, using a WEAP water-resources model to investigate how these interacting drivers have shaped water scarcity over recent decades. Unlike attribution of an individual extreme event, the case examines the evolution of a water-resource system and compares factual conditions with counterfactual scenarios representing alternative climate and land-use conditions.

Focus. This challenge will explore how climate and land-use/water-demand changes have contributed to the evolution of water scarcity and how the choice of counterfactual influences the resulting attribution. Participants will use prepared outputs from the Tympaki attribution analysis to compare factual conditions with climate and land-use counterfactuals and investigate their effects on water availability, water demand and unmet demand. The challenge will demonstrate why attribution of water scarcity needs to consider changes in exposure and human water demand alongside changes in climate.

What you will do. Participants will work with prepared climate data and WEAP model outputs. Using Python, they will analyse factual and counterfactual scenarios and explore indicators such as precipitation, potential evapotranspiration and drought conditions, together with water availability, water demand, supply and unmet demand. The central practical task will be to develop a small interactive **“Tympaki Water Scarcity Attribution Explorer”**, preferably as a lightweight web dashboard using Python and Streamlit. The dashboard will allow users to select factual or counterfactual scenarios from a dropdown menu, or select two scenarios for direct comparison. It will then dynamically display a set of linked time-series visualisations, organised around three components of the attribution chain: Climate, Water system, Impact. Users should be able to move easily between scenarios and observe how changing the assumed climate or land-use conditions propagates through the water system and ultimately affects water scarcity. Teams will also investigate which summary metrics most clearly communicate these differences, such as changes in mean or cumulative unmet demand, frequency and duration of water deficits, or differences during drought periods. The objective is therefore not simply to produce attractive visualisations, but to create an interactive tool through which users can explore and understand the attribution results themselves. A simpler implementation using Jupyter and interactive Plotly visualisations can be developed if appropriate, while teams with stronger programming experience may extend the prototype into a more complete Streamlit application.

Possible extension. Building on the quantitative results, participants may formulate additional management-oriented counterfactuals, such as improved irrigation efficiency, changes in irrigated area or crop composition, reduced groundwater abstraction, or alternative reservoir-management practices. Teams could identify where these interventions enter the water-scarcity causal chain and assess which could be represented quantitatively using the existing modelling framework and which would require additional data or modelling. This would extend the exercise from understanding what drove past water scarcity towards exploring what interventions could alter future outcomes.

Key question. How do climate change, land-use change and associated water-demand changes contribute to the evolution of water scarcity in the Tympaki basin, and how does the choice of counterfactual affect the resulting attribution? How can these interacting contributions be explored and communicated transparently to scientists and water-resource practitioners?

Expected output. A reproducible analysis and prototype **Tympaki Water Scarcity Attribution Explorer**, developed using Python and preferably Streamlit, through which users can interactively compare factual and counterfactual scenarios across climate, water-system and impact indicators. The prototype should be accompanied by a concise interpretation of the attribution results and an explanation of the indicators and visualisation choices. Depending on the team's interests and available time, the output may also include proposed management counterfactuals for future analysis.

Useful background. Basic familiarity with Python. Experience with Pandas, Jupyter notebooks and data-visualisation libraries such as Plotly or Matplotlib would be useful. Previous experience with Streamlit would be advantageous but is not required. Familiarity with hydrology, water-resources modelling or climate-impact attribution would also be useful but is not essential.

How the Hackathon will work

- Teams of 4–5 participants will work on one challenge scenario.
- COMPASS experts will be available throughout the event to support scientific and technical work.
- Each half day will include a short feedback session with the expert panel so that teams can refine their approach.
- At the end of the Hackathon, all groups will present their results to an extended expert panel; a representative of ECMWF will be also available.
- Selected elements of the Hackathon results will later be presented by COMPASS representatives during the final project conference.

Who should apply?

We particularly encourage applications from early-career scientists interested in climate attribution, climate-data analysis, hazard and impact modelling, compound extremes, programming, scientific visualisation or science communication. The Hackathon is intentionally interdisciplinary: you do not need to be an expert in all of these areas.

The registration form will ask about your background and skills so that the organisers can create balanced teams with complementary expertise. This information is intended primarily for team formation, not as a strict eligibility threshold. [Access the Registration Form.](#)

Why join?

- Work directly with methods, datasets and outputs developed by an international Horizon Europe consortium.
- Learn practical approaches to factual–counterfactual comparison and impact attribution.
- Collaborate across disciplines and institutions in a small-team setting.
- Contribute ideas that may inform future development of open-source attribution tools and operational climate services.
- Present your results to COMPASS experts and connect with researchers working across multiple climate hazards and Use Cases.

Practical information

Dates: 8-9 February 2027.

Location: Deltares (Netherlands)

Applications: planned from mid-October to November 2026.

Places: limited to approximately 20–25 participants.

Costs: participants cover travel and accommodation; food during the Hackathon will be provided.

Application link: <https://compass-climate.eu/registration-form/>

Deadline: 30 November