

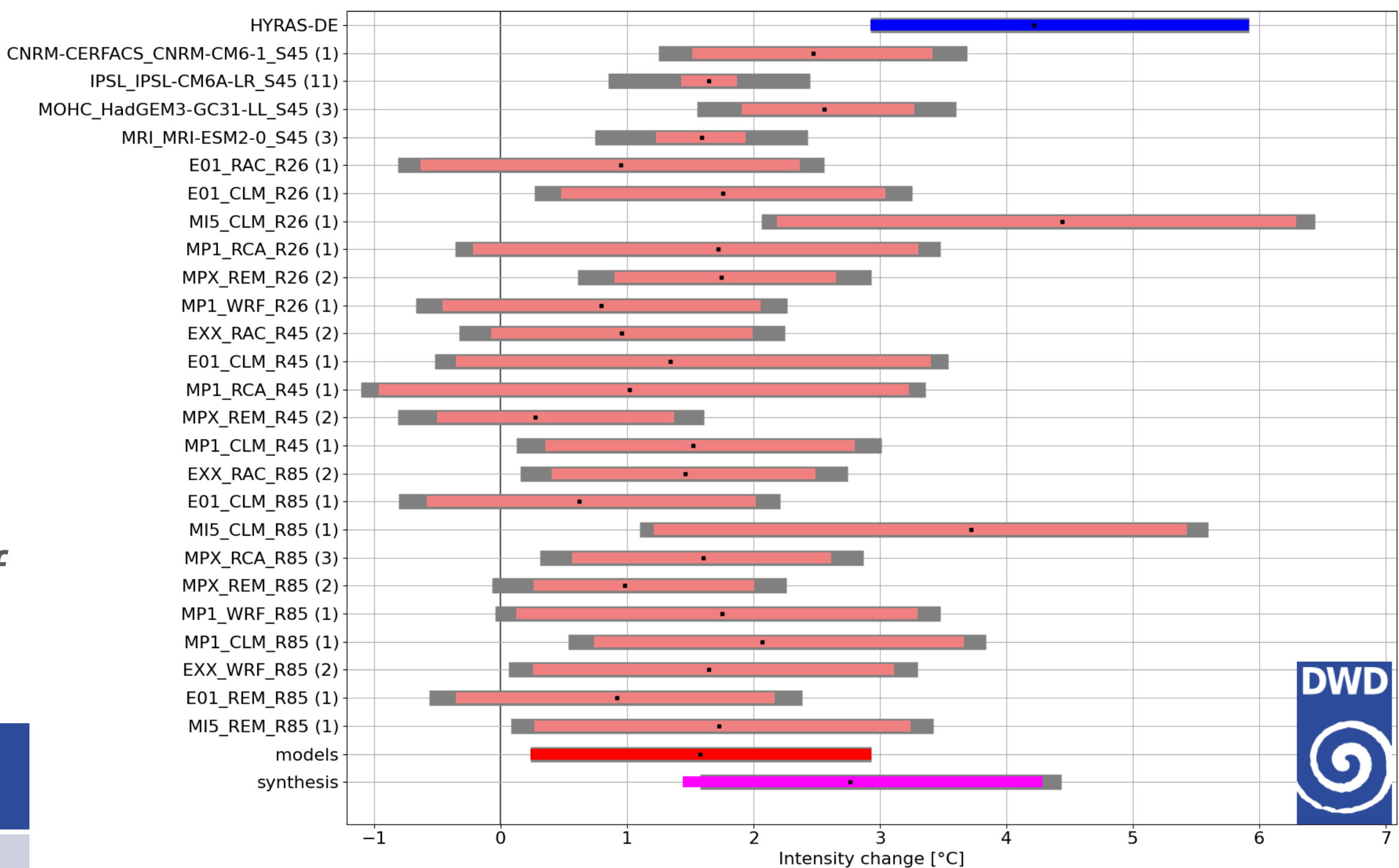


Probabilistic attribution of extreme weather events

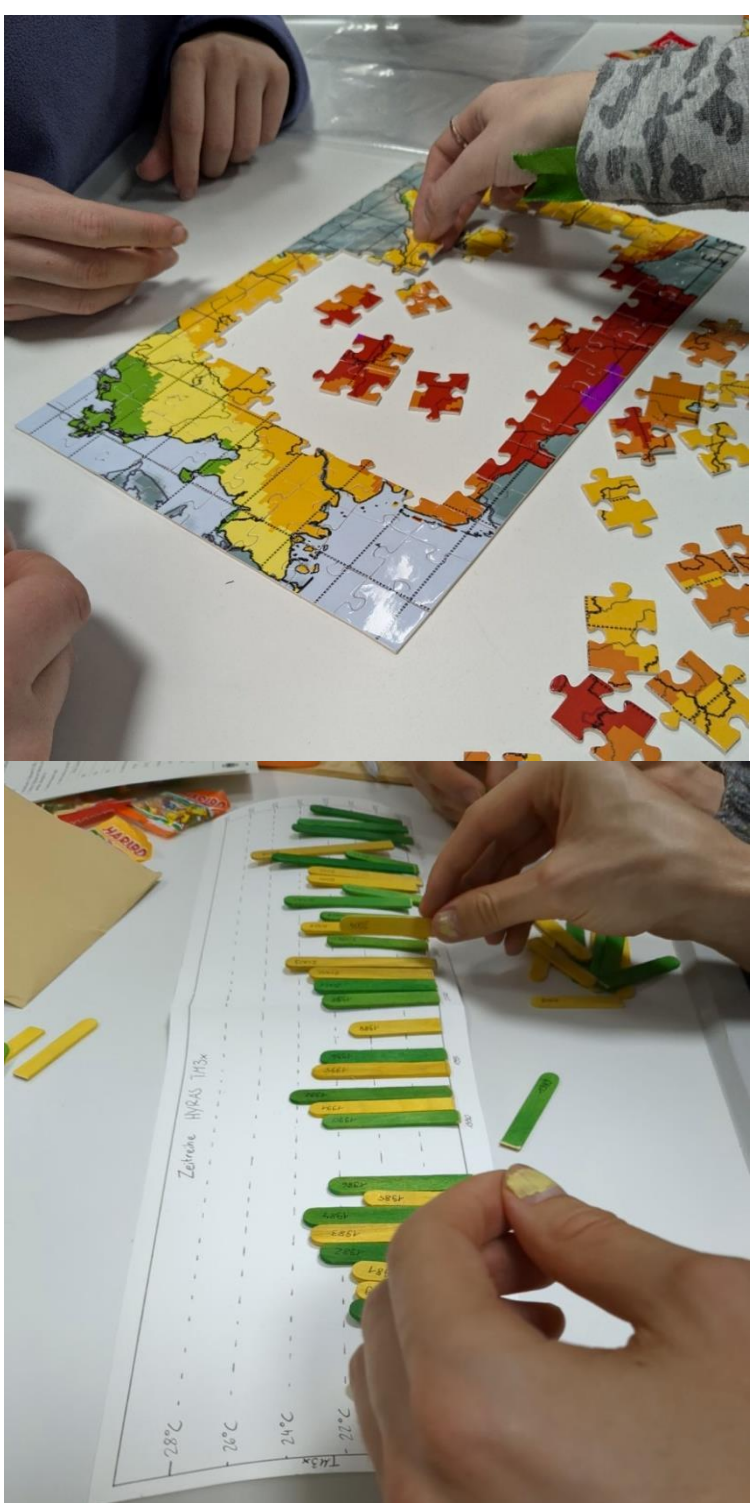
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The aim of extreme weather event attribution is to investigate the influence of anthropogenic climate change on the probability and intensity of an extreme event. For this, AXE_G_2 developed a rapid-analysis framework to analyse events fast to shorten the reaction time after extreme events. Six rapid attribution studies have been performed during ClimXtreme II. Additionally, specific topics have been investigated closer to improve methods and communication of uncertainties and attribution results.

Event	Result
Continuous Precipitation Lower Saxony December 2023	Non-significant increase in probability and intensity
Extreme Precipitation Southern Germany May/June 2024	Non-significant increase in probability and intensity
Extreme Precipitation Event „BORIS“ September 2024 (not published yet)	Non-significant increase in probability and intensity
Precipitation Deficit Northern Germany Spring 2025	Non-significant decrease in probability, non-significant increase in precipitation sum intensity, shift in dry period from February to April
Extreme Heat Germany July 2025	Significant increase in probability and intensity, climate models underestimate observed heat trends
Extreme Snowfall Northwest Germany January 2026	Significant decrease in probability and intensity



Example synthesis for the heat event in July 2025 by Schröter et al. (2025). Shown is the intensity change for the hottest day of the year with a return period of 3,9 years based on observations (blue) and climate models (light red). The model synthesis based on Otto et al. (2024) is shown in dark red, the full synthesis shown in magenta.



Workshop impressions at LCOY Berlin in October 2024 teaching the concept of the attribution method to young adults. © Johanna Knauf, DWD

Development of an improved synthesis framework

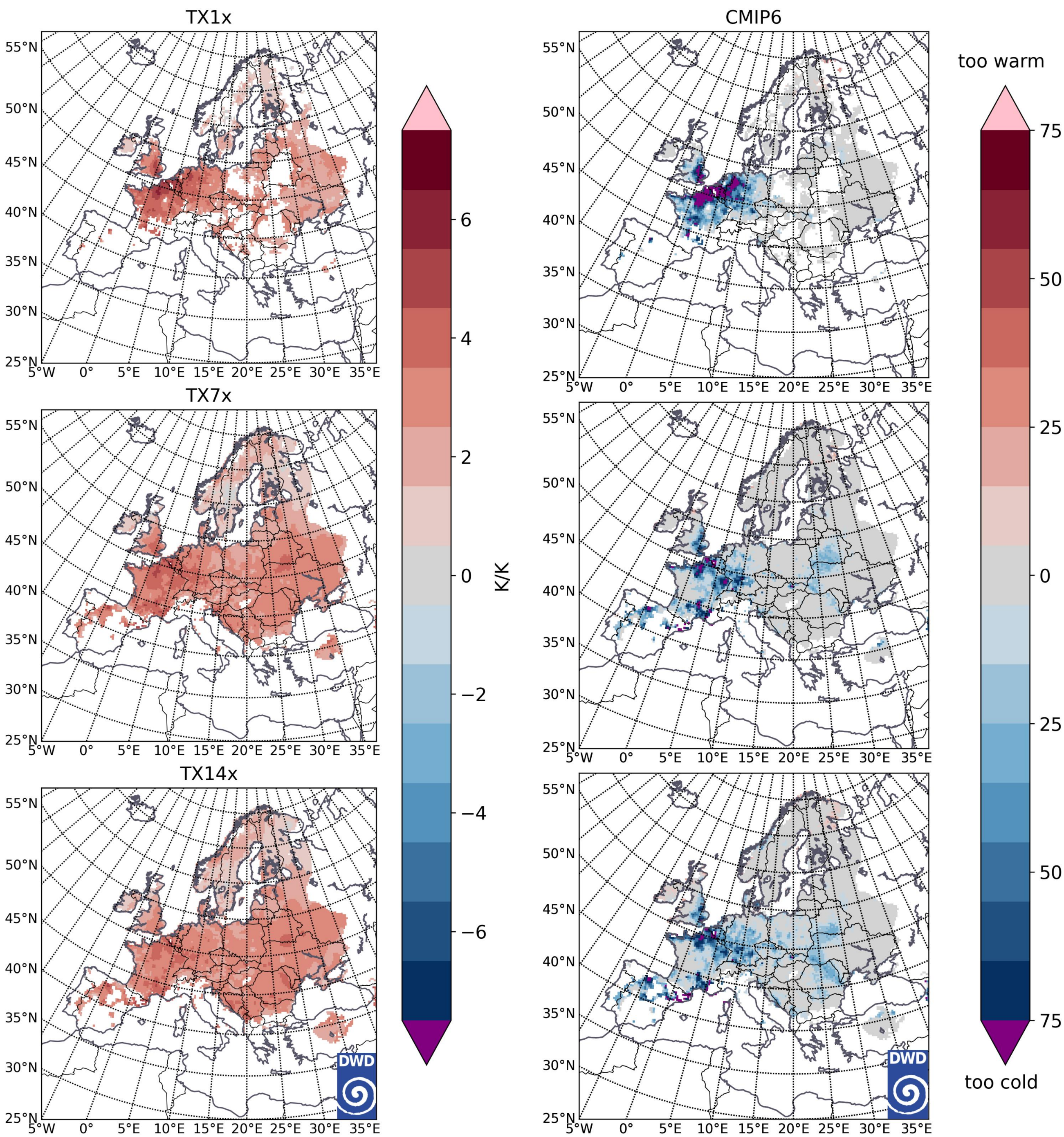
In cooperation with the project B3.3 – SCaHa, a new synthesis is currently in development. We aim for a mathematically sound and reproduceable alternative to the standard approach by the World Weather Attribution Initiative (WWA). For further information about the synthesis, visit the poster by Erik Haufs (B3.3).

Upcoming study: Decreasing uncertainty for rare extreme events (Project C5 – FLOOD, Project B3.3 – SCaHa)

AXE_G_2, FLOOD and SCaHa work together to combine knowledge of the different projects into a case study of an extreme precipitation event that happened in Berlin in 2017. While SCaHa brings the method of a pooling approach to increase the amount of available data from other regions with similar precipitation distributions, FLOOD uses a weather generator to simulate 10,000 years of data for the same region. Additionally, we plan to attribute the impacts of the event with FLOOD's weather generator. For more information about the weather generator, visit the poster by Dung Nguyen (C5).

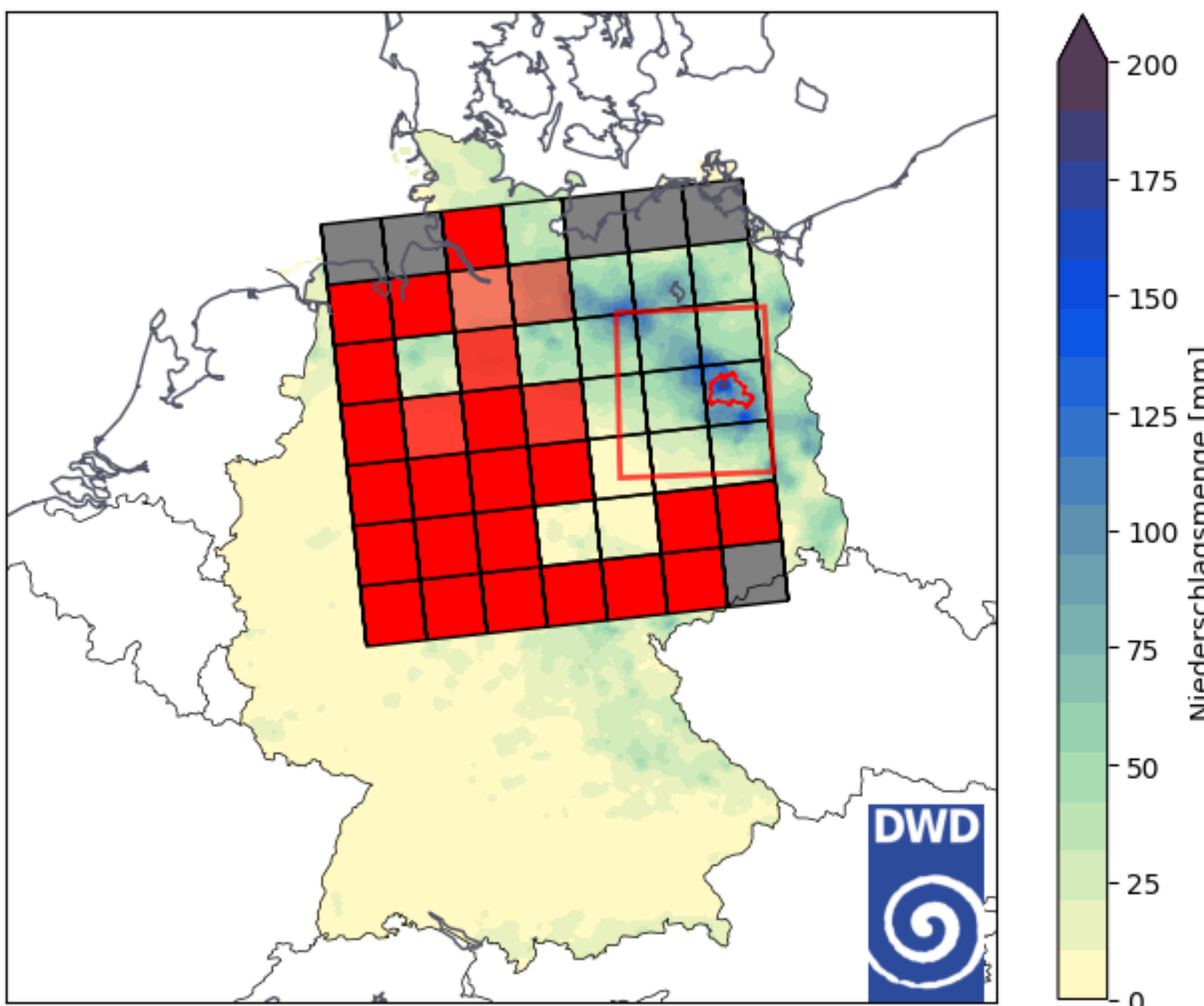
Workflow improvements

- ➔ Additional approach with GMST as covariate
- ➔ Added analysis of future scenarios
- ➔ Replaced Regnie with HYRAS-DE v6.1
- ➔ Global and regional climate models included



Best estimate of the temperature trend for the variables TX1x, TX7x and TX14x in Europe based on the E-OBS dataset. Values of the white regions were not available or were excluded because they showed a Pearson correlation of less than 0,9 with ERA5. (Schröter et al., 2026)

Analysis of the new EURO-CORDEX models based on CMIP6 compared to the trends found in E-OBS. The graphic shows in which regions the regional climate models underestimate (blue) or overestimate (red) the trend of the variables TX1x (top), TX7x (middle) and TX14x (bottom). (Schröter et al., 2026)

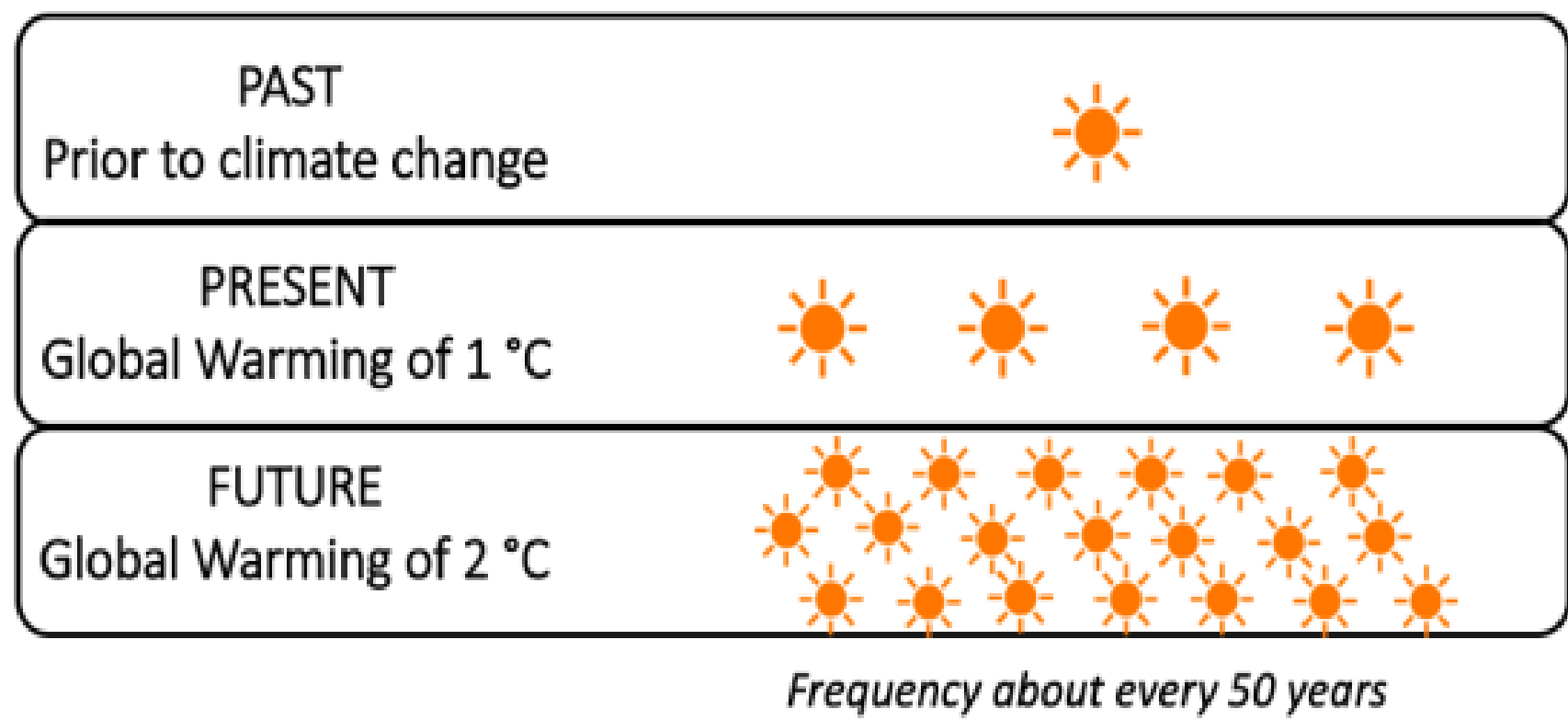


Precipitation sums of the Berlin event on 29th June 2017 (background). The borders of Berlin are shown in red. The black boxes show the analysed regions for the pooling approach by SCaHa with first results for excluded regions being filled red (preliminary). Grey boxes are excluded because of missing land coverage. The red rectangle shows the region simulated by the weather generator by FLOOD.

How to communicate uncertainties in attribution science?

Together with ClimXchange (C13), AXE_G_2 aims to improve the communication of attribution study results. Studies on extreme precipitation events generally come along with large uncertainties. These uncertainties are often misunderstood and the graphics showing them are difficult to understand. For this, we have done multiple interviews and workshops with journalists and attribution scientists to improve the understandability of the communication graphics and to learn about communication methods used by other meteorological services.

Visual 4 – Pictorial unit chart



Ettinger et al. (2021)



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