

Past and future trends of convective heavy rainfall and associated flash floods (CARLOFFF)

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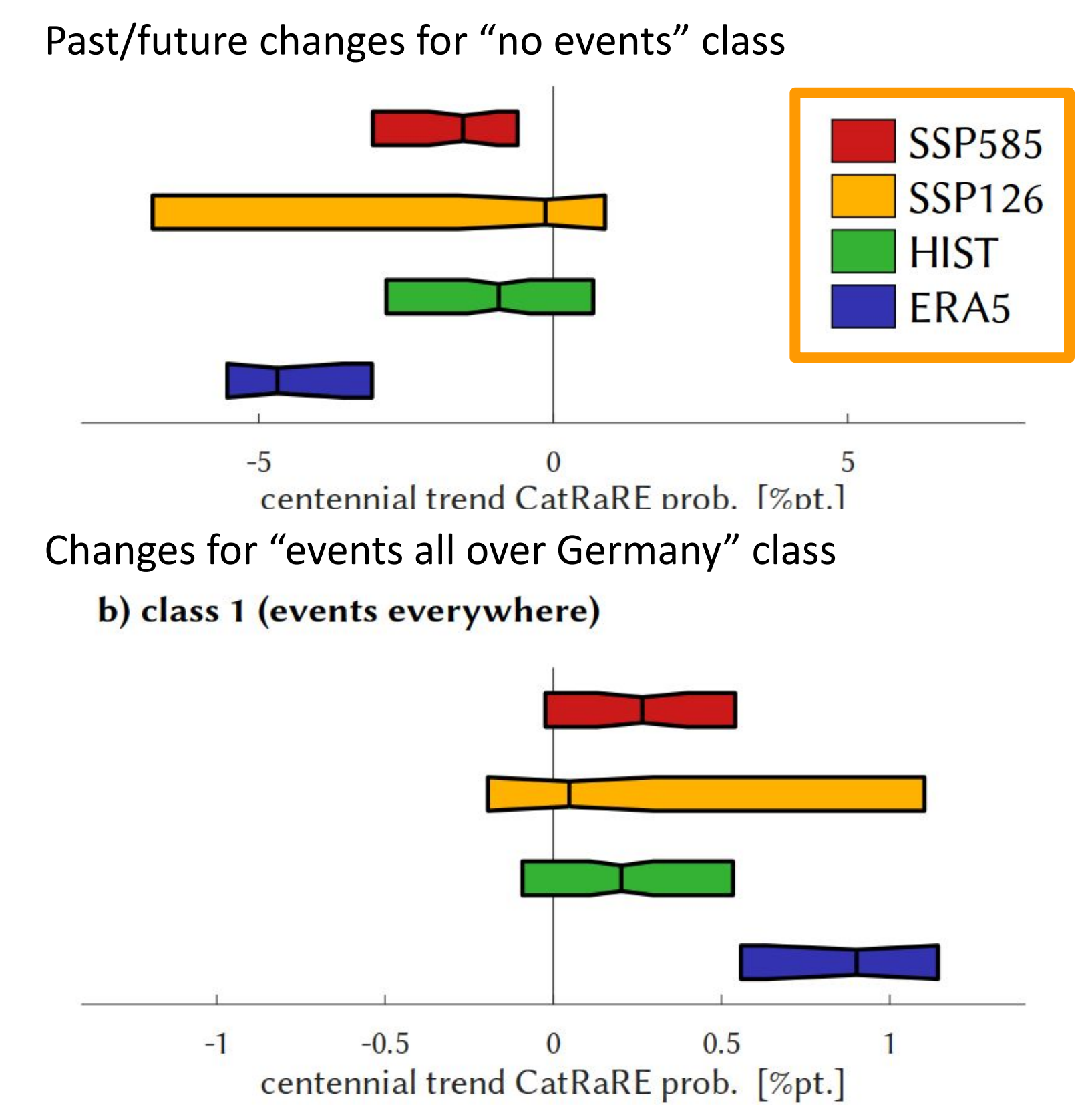
1

Present and future trends of extreme convective rainfall in Germany

We linked the occurrence of convective heavy rainfall events in four main quadrant regions of Germany to “convective environments” as represented by ERA5. We then used CMIP6 ensembles to infer future trends for these events.

We found that large-scale factors promoting convective heavy precipitation are increasing in the future - but so are factors that inhibit it. This leads to a high degree of uncertainty in the assessment, even though we could confirm a general increase in extreme convective precipitation in Germany. No strong differences between the quadrant regions were discovered.

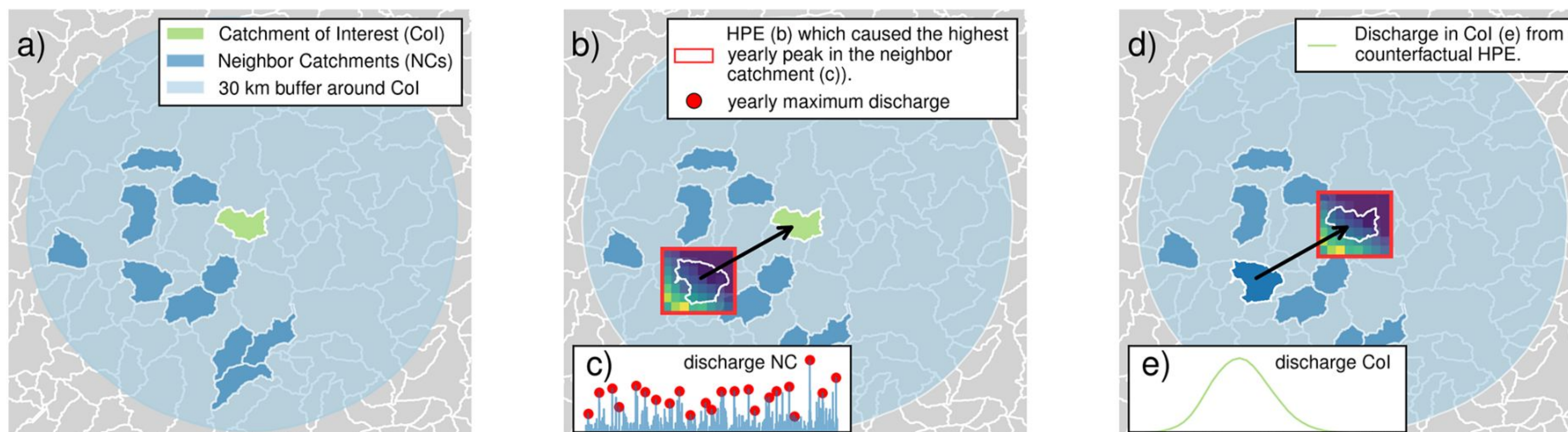
Find main results in Bürger, G., Heistermann, M.: Present and future trends of extreme short-term rainfall events in Germany, by downscaling convective environments of ERA5 and a CMIP6 ensemble, EGU sphere [preprint].



2

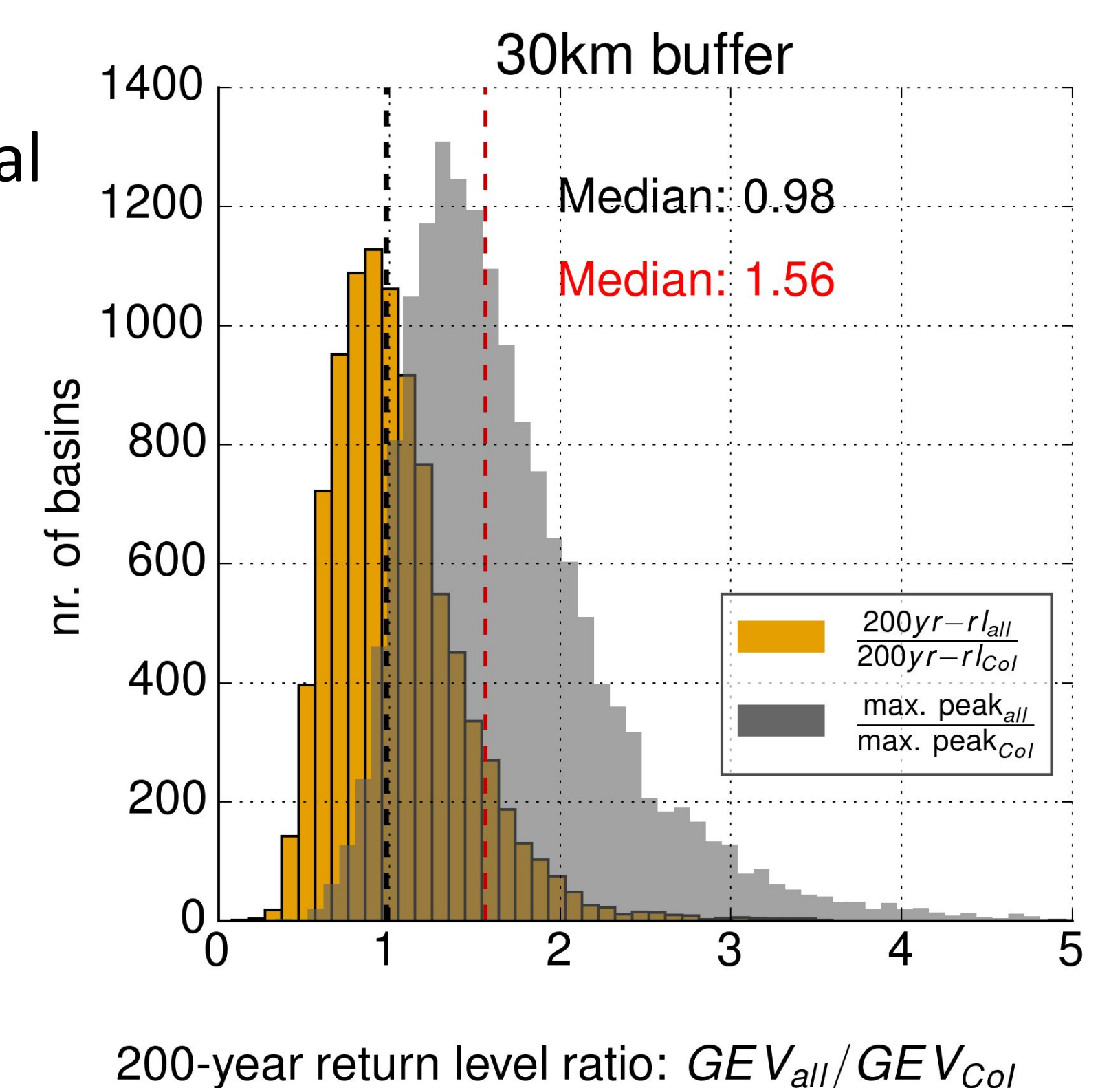
Spatial counterfactuals for more robust return level estimation

Radar rainfall series are too short to estimate high return levels, and sufficiently long discharge series are typically unavailable in small catchments. We introduced a framework to enhance local rainfall series by rainfall events that occurred in a neighbourhood, and use these to force a rainfall-runoff model.



Local counterfactuals are created by sampling extreme rainfall events (a, b) from the close neighbourhood and modelling the consequent runoff reaction in the basin of interest (c).

Find main results in Voit, P., Fauer, F. and Heistermann, M.: Considering rainfall events from a neighbourhood improves local flood frequency analysis, NHESS.



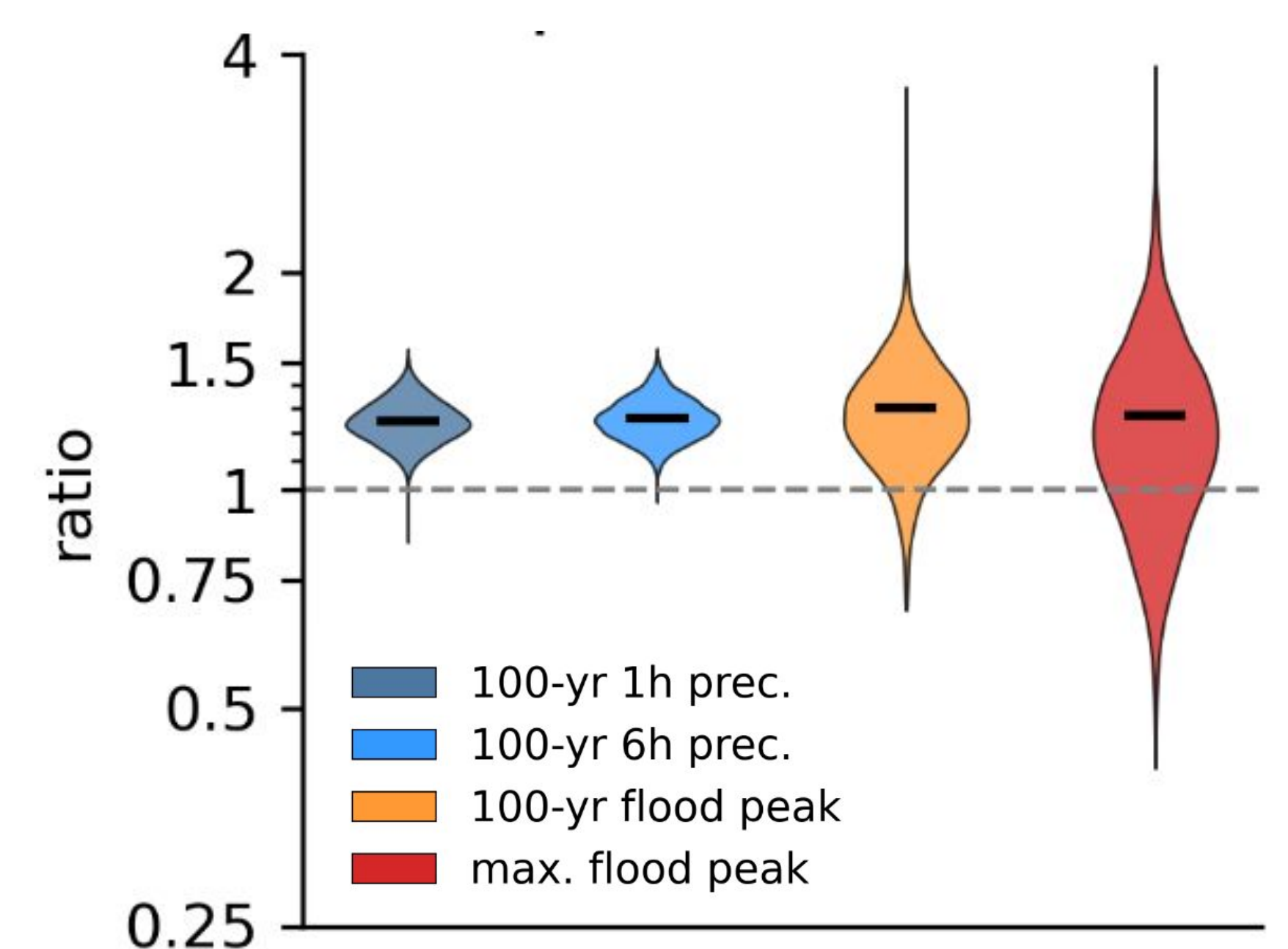
Return level estimates do not necessarily increase when including counterfactual scenarios.

3

100-year flash flood expected to increase by 30 % under an RCP8.5 climate

The fine resolution (1 h, 3 km) of convection-permitting models (CPMs) allows for an assessment of future rainfall and consequent flash floods. In our study we compared extreme rainfall and flash floods for the historical (1971-2000) and the future (2071-2100) under the RCP8.5 scenario with an ensemble of six CPMs. The results indicate an overall increase of extreme rainfall events and flash floods for the German part of the Danube basin. 94 % of the 3128 subbasins show an increased 100-year flood in the future with a median increase of 30 %.

Find main results in: Voit, P., Hundhausen, M., Seregina, L., Feldmann, H., Ahrens, B. and Heistermann, M.: Southern Germany's 100-year flash flood discharge expected to increase by 30 % under an RCP8.5 climate, EGU sphere [preprint].



Ratio of present and future flood and rainfall extremes (100 a) for south German catchments (ensemble mean)