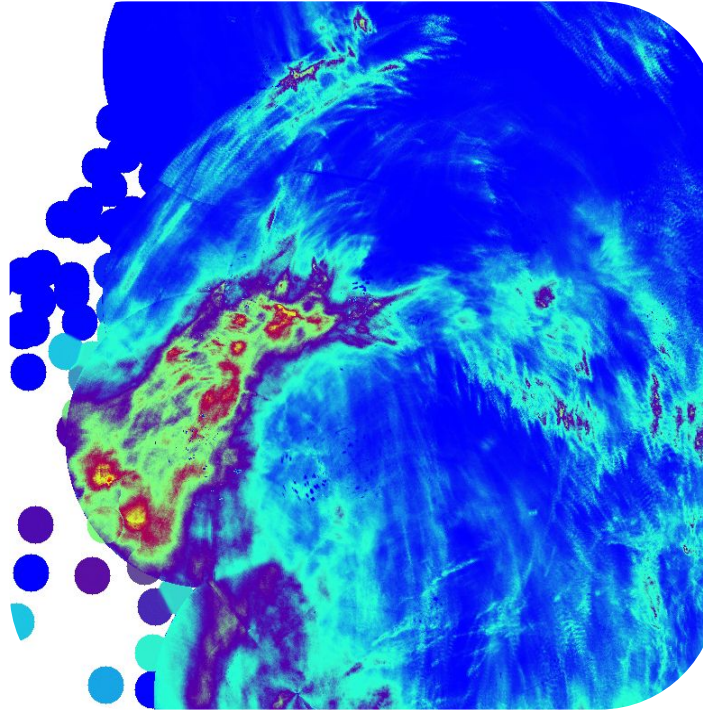




xWEI – A novel cross-scale index for extreme precipitation events

Paul Voit, Maik Heistermann

spatial extent and **duration**

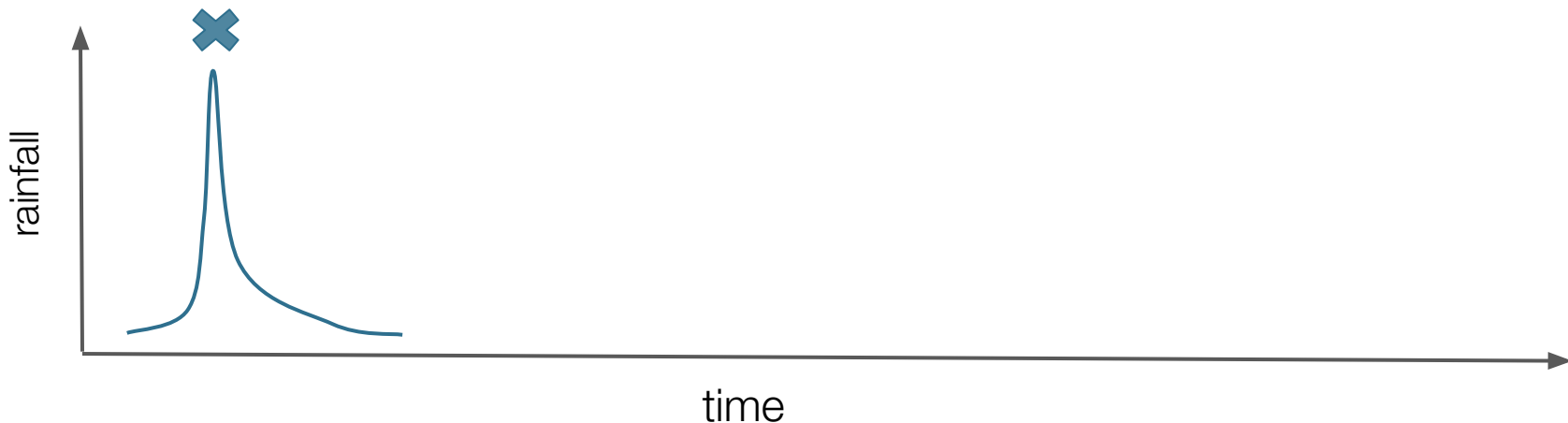
Heavy precipitation events (HPEs) can be extreme on multiple spatio-temporal scales (cross-scale)

compound effects: overlay, amplification

spatial extent and **duration**

Heavy precipitation events (HPEs) can be extreme on multiple spatio-temporal scales (cross-scale)

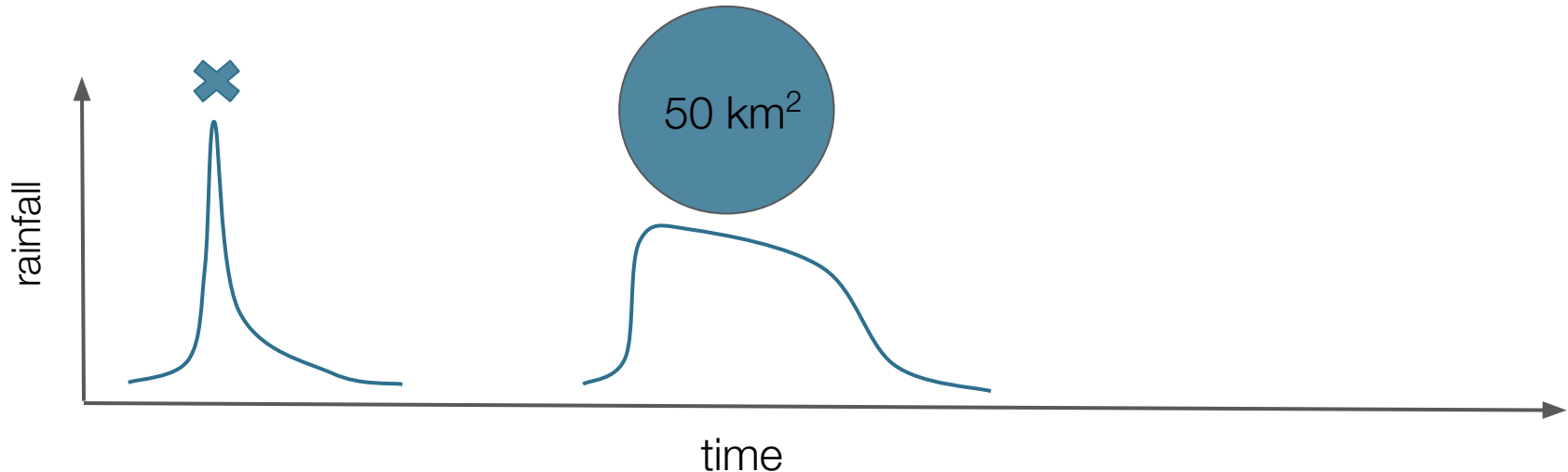
compound effects: overlay, amplification



spatial extent and **duration**

Heavy precipitation events (HPEs) can be extreme on multiple spatio-temporal scales (cross-scale)

compound effects: overlay, amplification

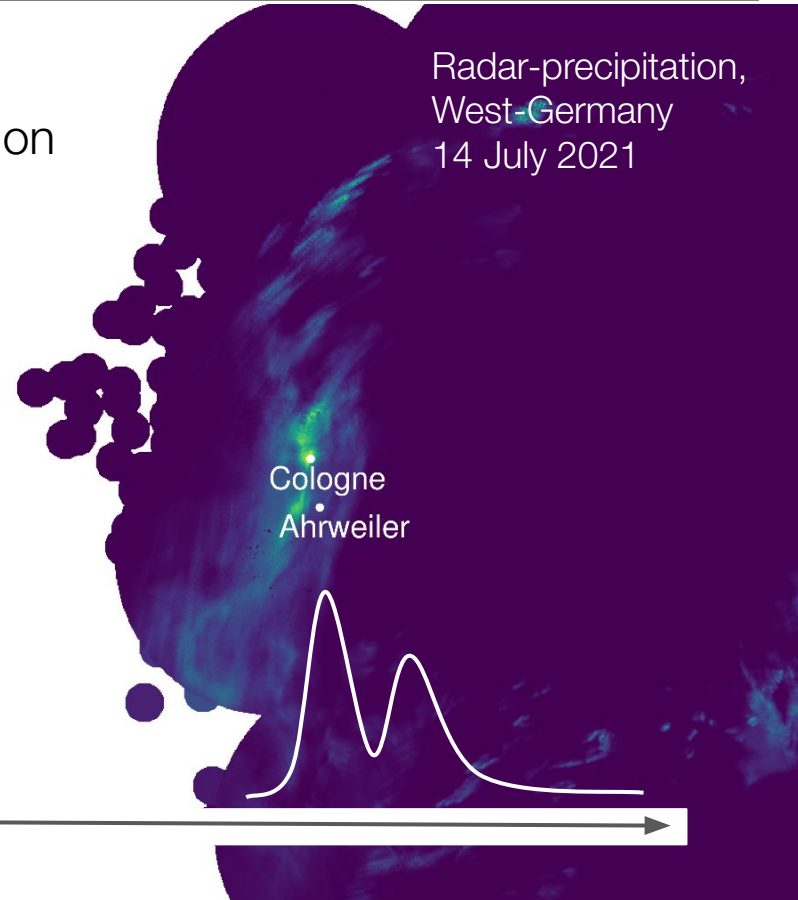
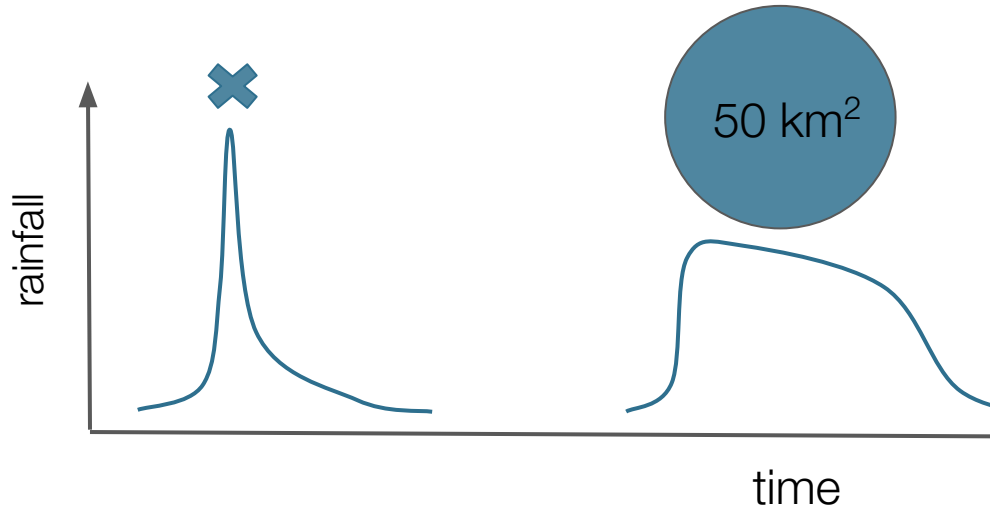


What is “extreme” precipitation?

spatial extent and **duration**

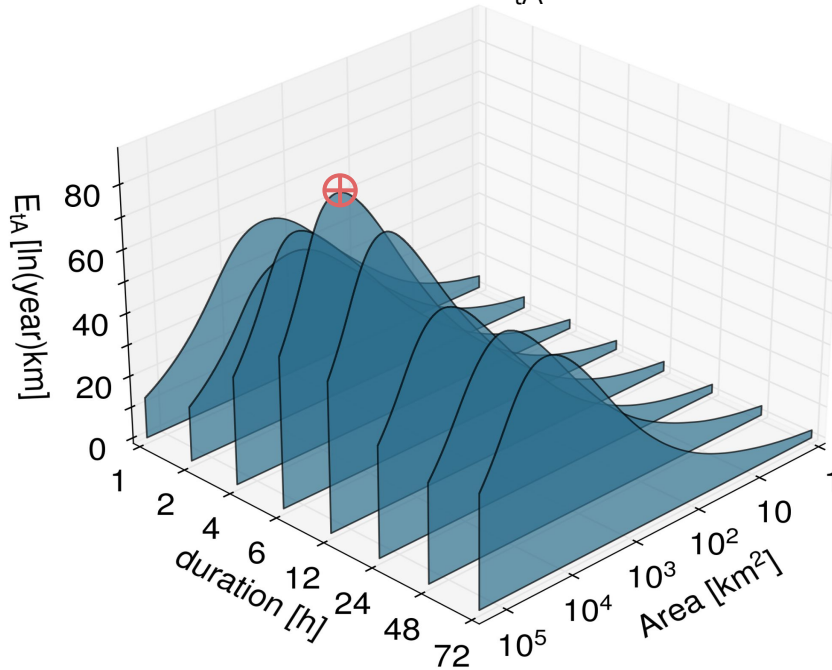
Heavy precipitation events (HPEs) can be extreme on multiple spatio-temporal scales (cross-scale)

compound effects: overlay, amplification



E_{tA} : product of rarity (return periods) and spatial extent: **extremeness**

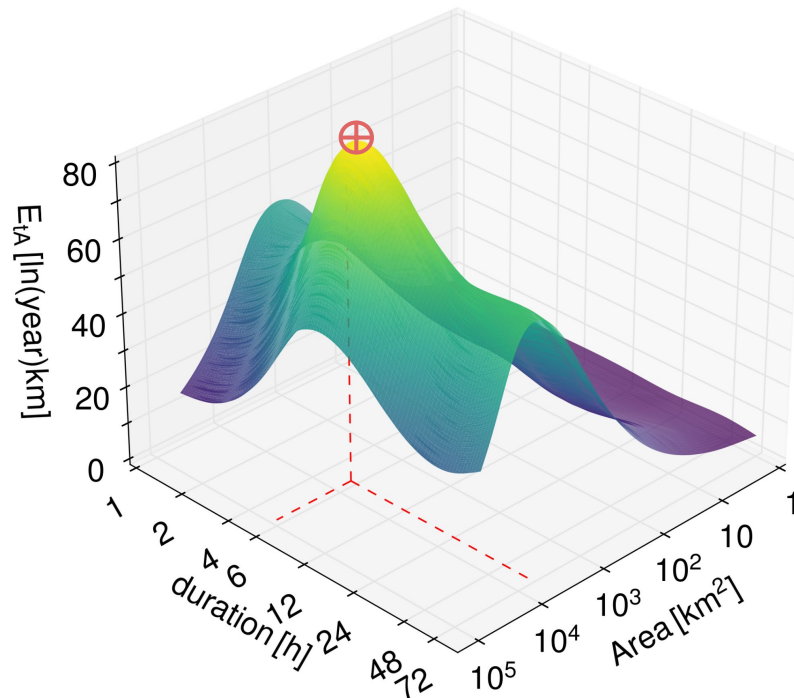
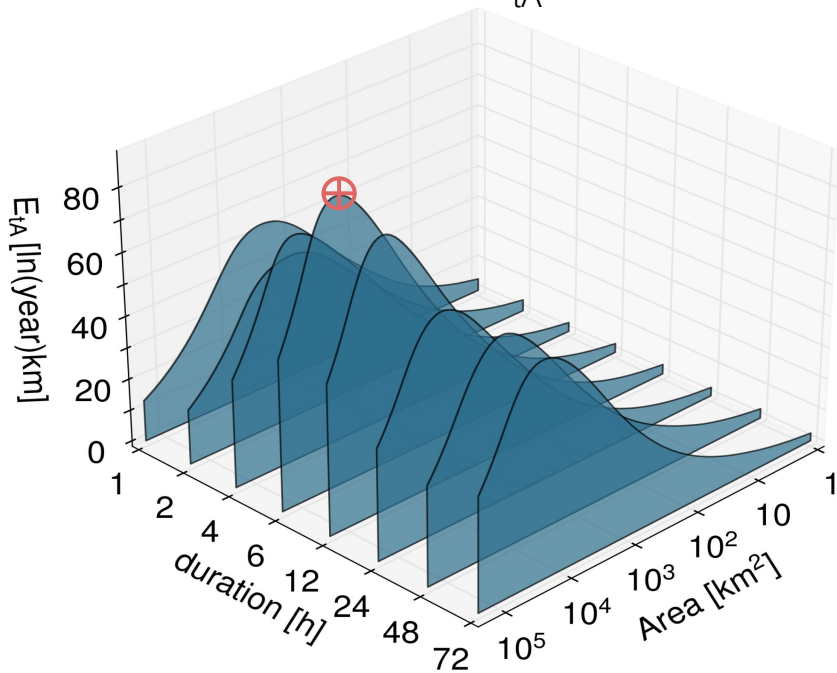
WEI¹: maximum of E_{tA} -curves



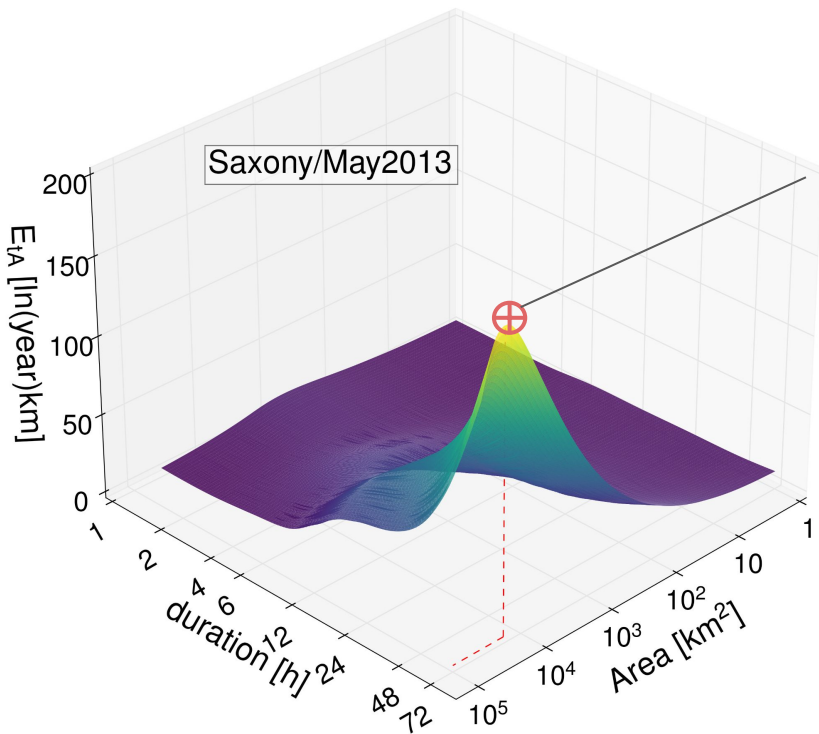
E_{tA} : product of rarity (return periods) and spatial extent: **extremeness**

WEI¹: maximum of E_{tA} -curves

xWEI: volume underneath E_{tA} -surface

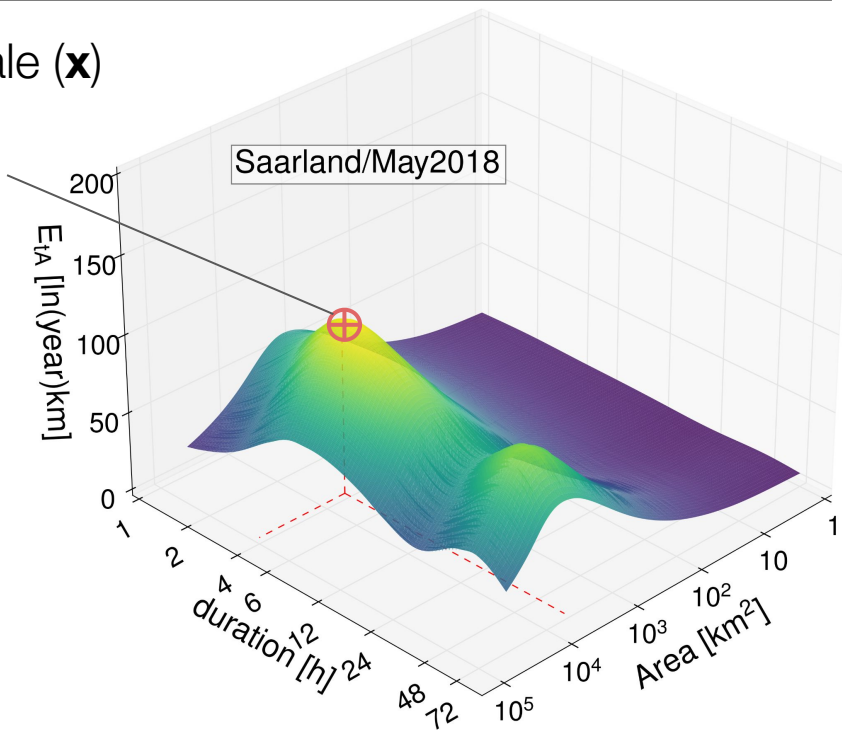


Which event is more extreme?

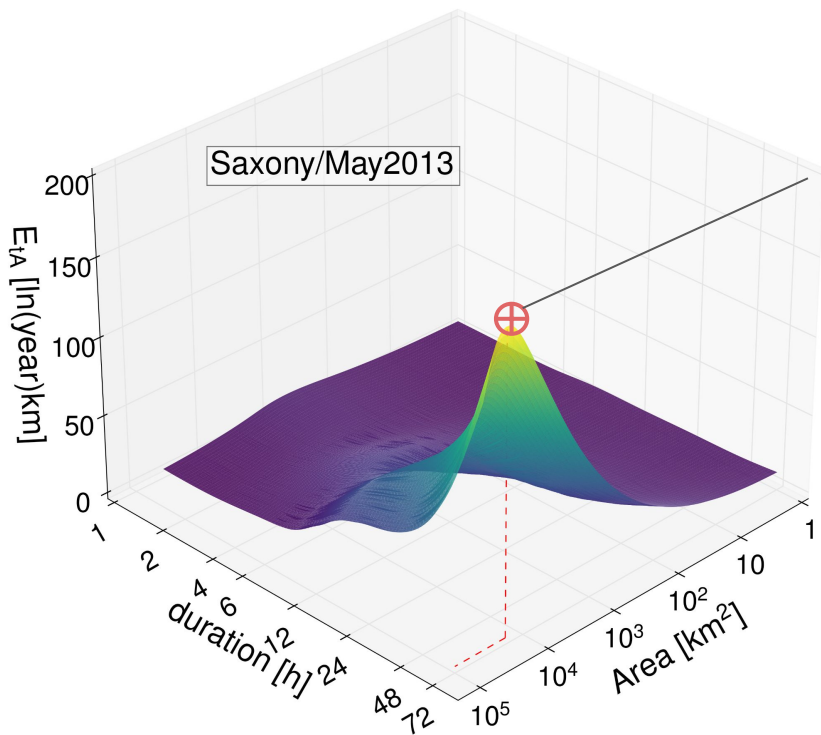


cross-scale ($\mathbf{x}$)

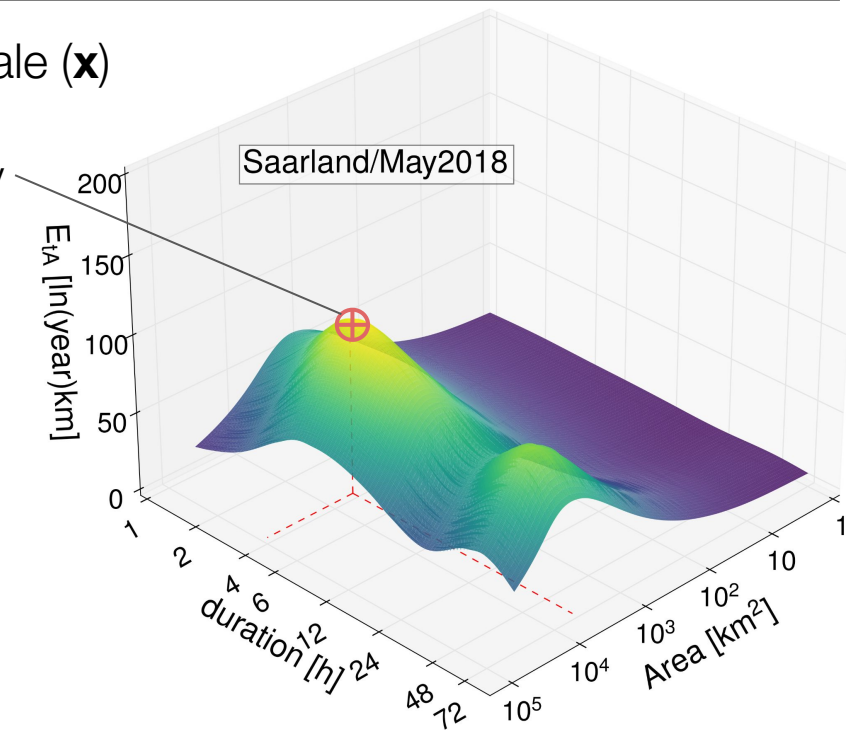
**Weather
Extremity
Index**



Which event is more extreme?



cross-scale (x)
Wather
Extrmity
Index



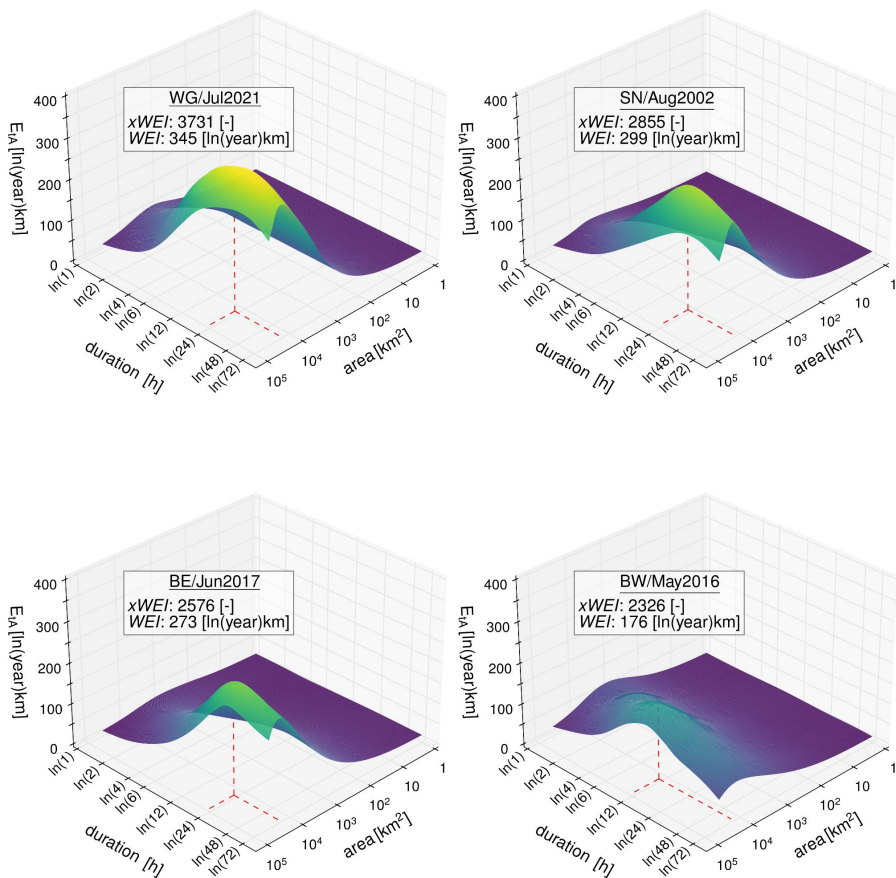
- Many HPEs in the past were extreme across scales
- Common indices might conceal important (compound) characteristics of HPEs
- xWEI might perform better to link impacts (floods, landslides) to event characteristics



Photo by H. Murdock

Voit, P. and Heistermann, M.: Quantifying the extremeness of precipitation across scales, Natural Hazards and Earth System Sciences Discussions, 2022, URL: <https://nhess.copernicus.org/preprints/nhess-2022-144/>, DOI = 10.5194/nhess-2022-144

¹ Müller, M. and Kaspar, M.: Event-adjusted evaluation of weather and climate extremes, Natural Hazards and Earth System Sciences, 14, 473–483, publisher: Copernicus GmbH, 2014.



Ranking of 100 most extreme events 2001-2021

