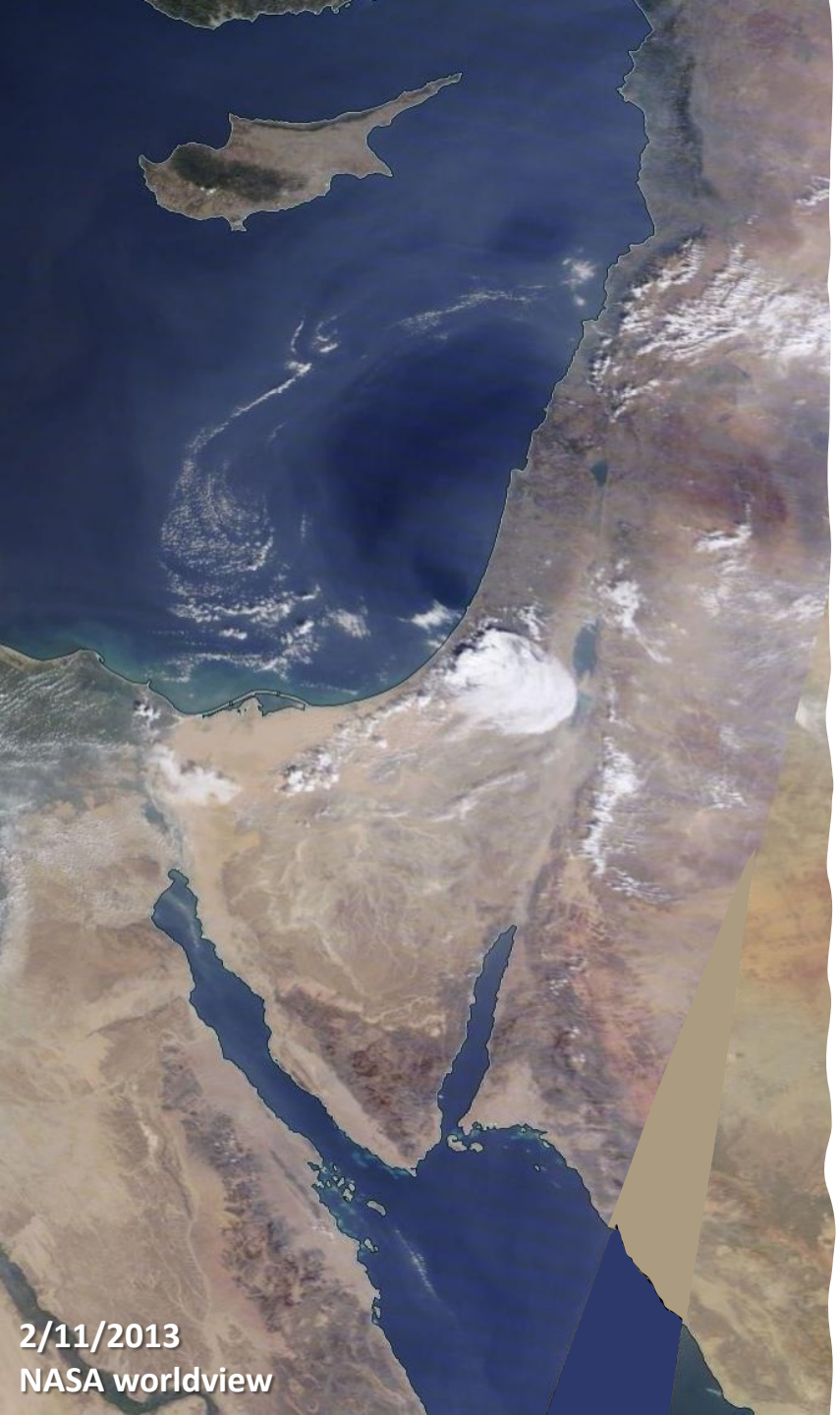


Reduced rainfall in future heavy precipitation events related to **contracted rain area** despite increased rain rate

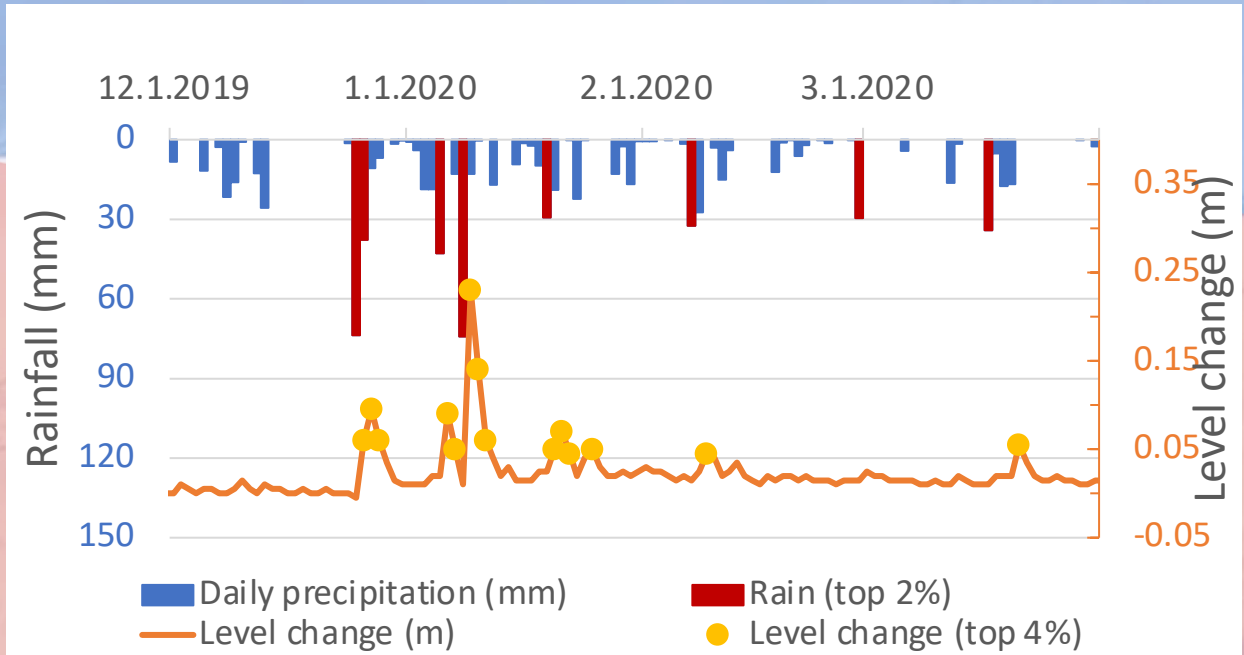
Moshe (Koko) Armon, Yair Rinat, Francesco Marra, Chaim Garfinkel, Dorita Rostkier-Edelstein, Ori Adam, Uri Dayan, Yehouda Enzel and Efrat Morin

Armon et al., 2022: Earth's future
https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021EF002397


Mediterranean
Semi-Arid
Arid
Google earth

Heavy precipitation events

Water resources

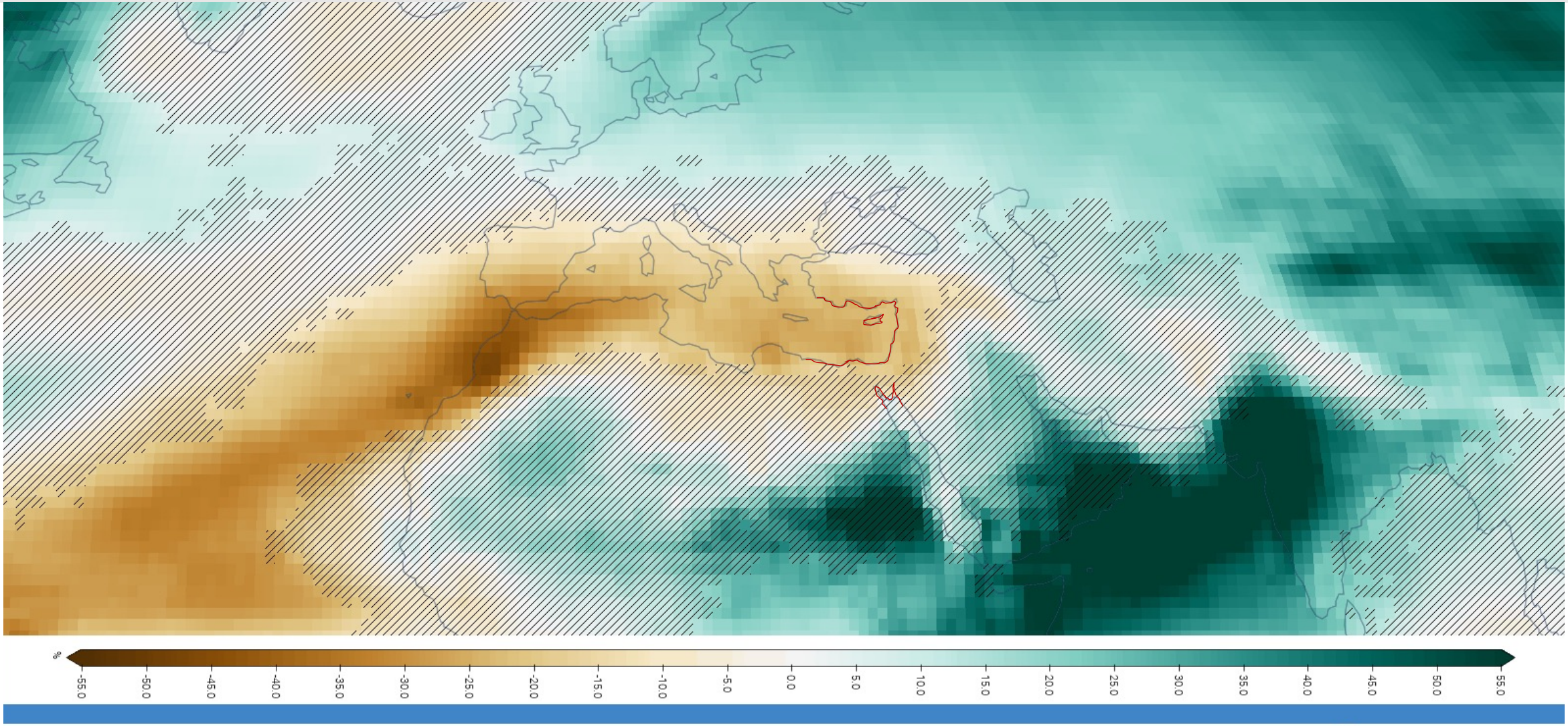


Natural hazards

Paran Stream – Reuters: 18/1/2010

Google earth

Total precipitation projection: end of 21st century

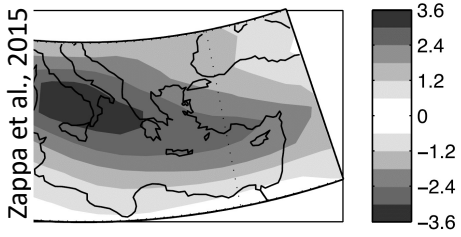


Total precipitation (PR) - Change (%)
Long Term (2081-2100) (SSP5-8.5) (rel. to 1995-2014)
CMIP6 - October to May (33 models)

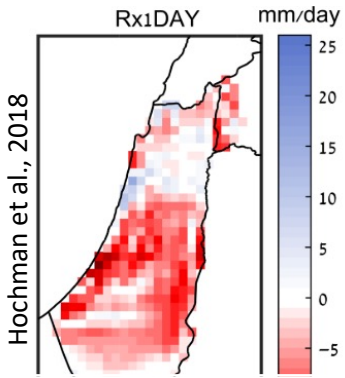
High agreement
Low agreement

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

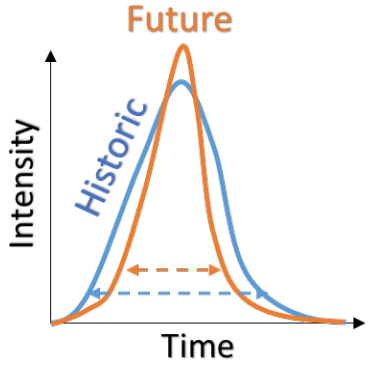
Possibilities for the decrease in rainfall



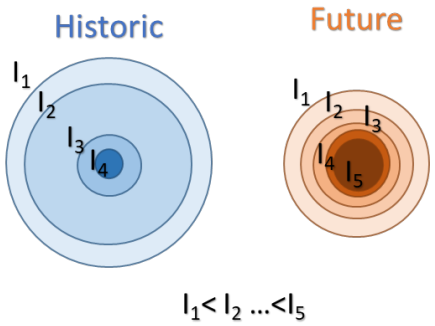
Reduced frequency of events



Decreased rainfall intensity



Shortened event duration



Contraction of the rain area

Research goals

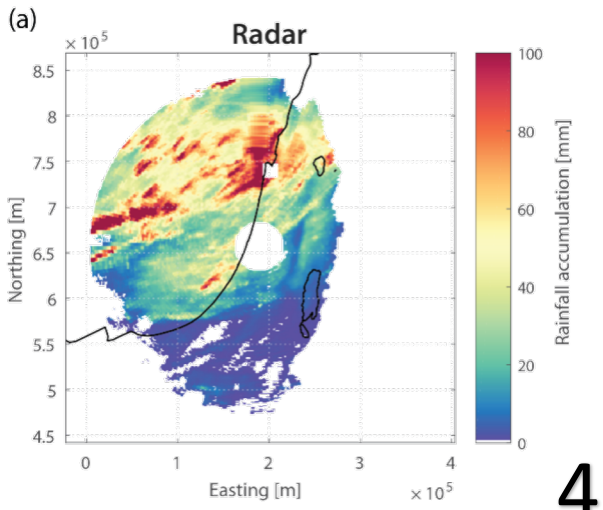
Identify and quantify **changes in rainfall patterns** during HPEs induced by global warming

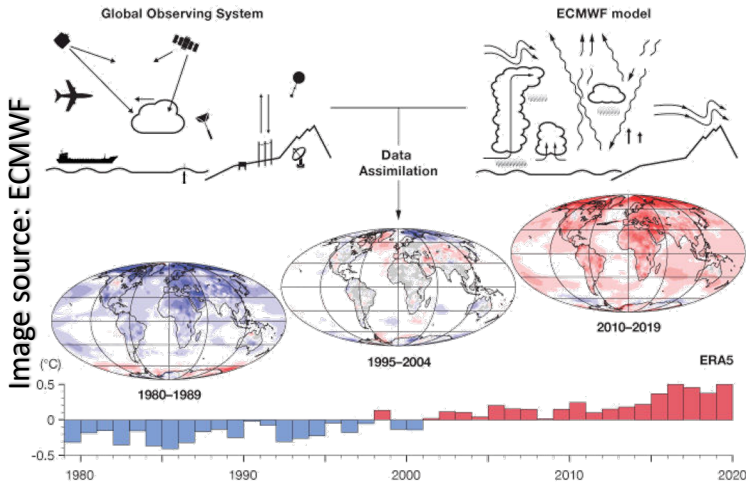
Total rainfall | Rain rate | Duration of storms | Rain area

Is there a **common change** over a variety of HPEs?

HPEs under climate change - Methodology

Armon et al., 2020: HESS

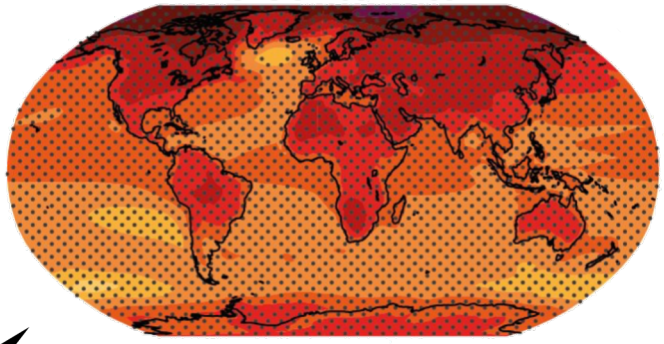




29 CMIP5 models:

SLP, T, wind, moisture

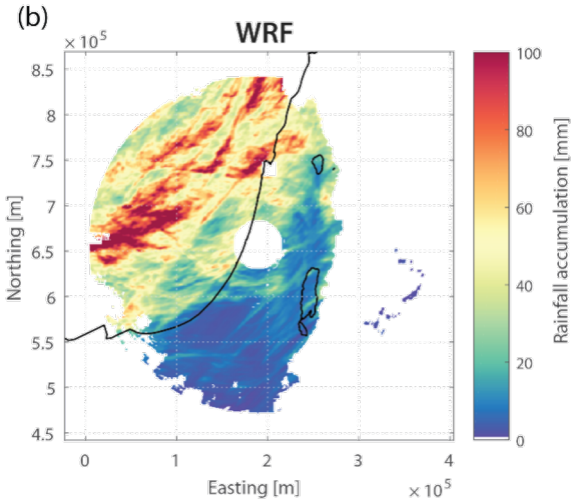
RCP8.5: 2081-2100

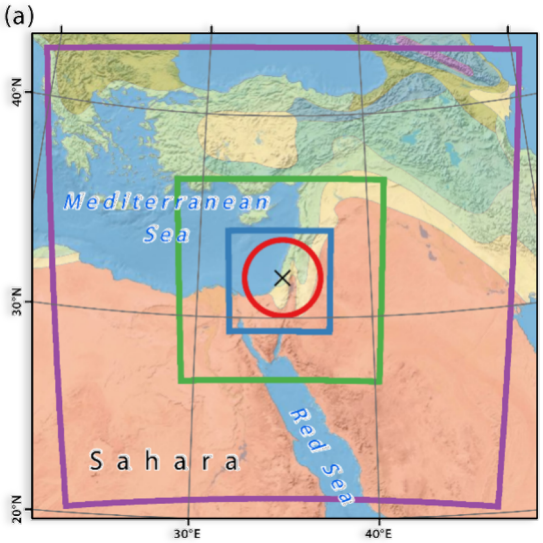


41 HPEs

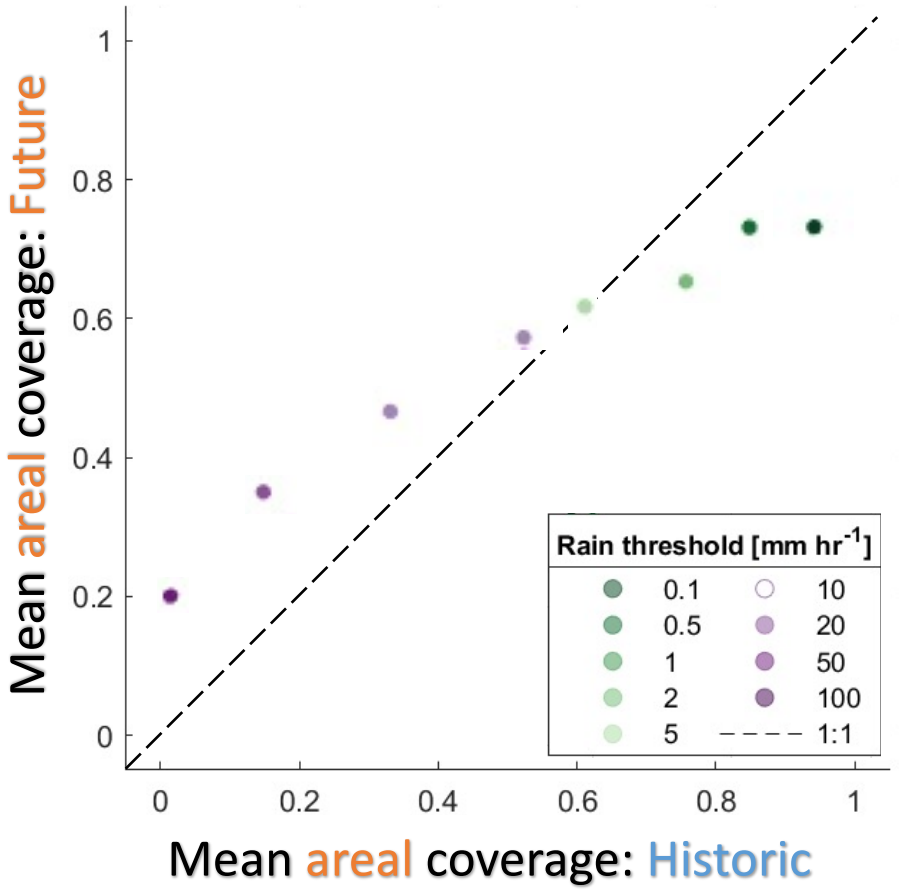
Pseudo Global Warming

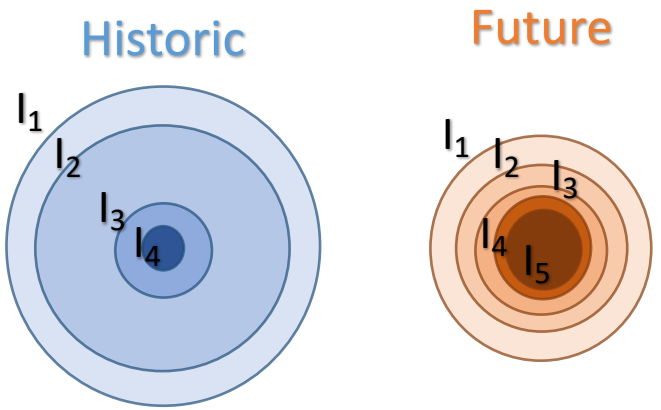
Schär et al., 1996





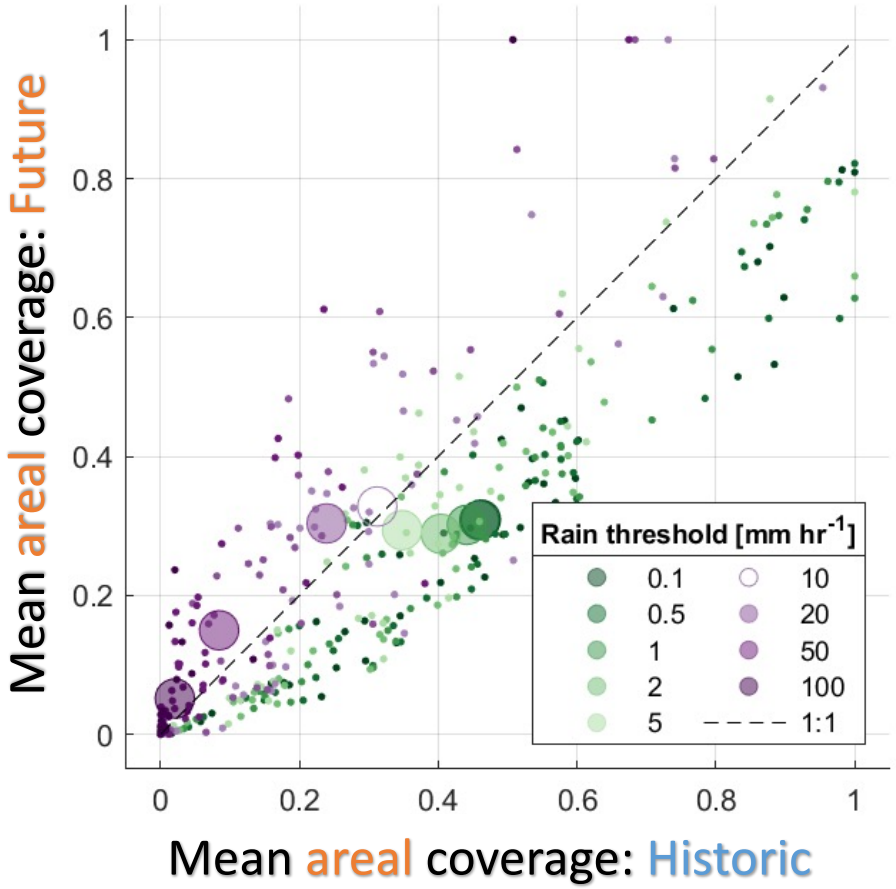
Areal rainfall cover

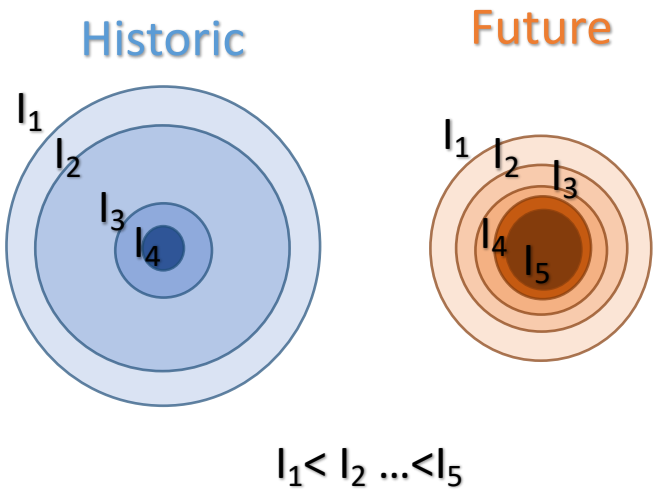




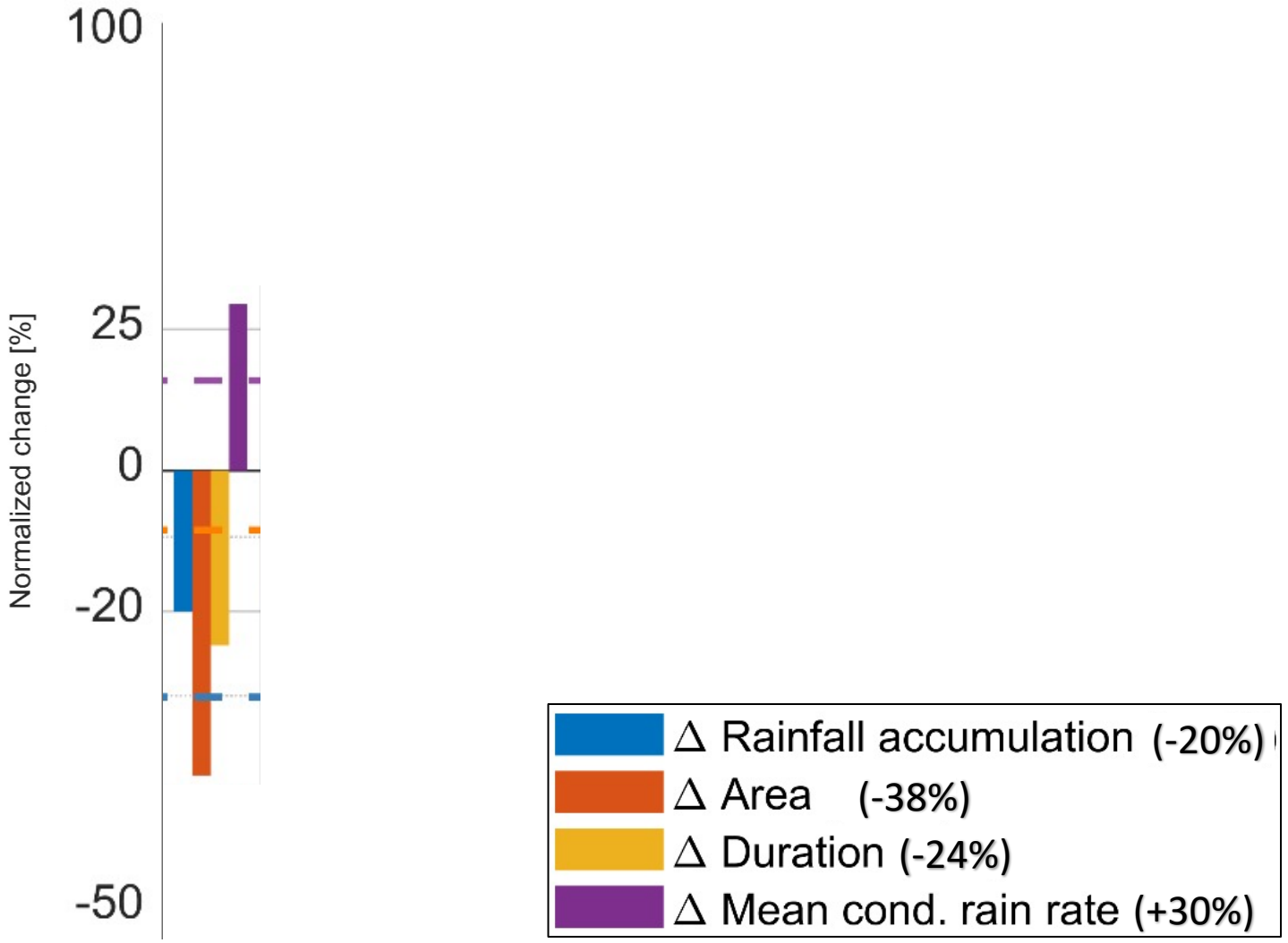
$I_1 < I_2 \ldots < I_5$

Areal rainfall cover

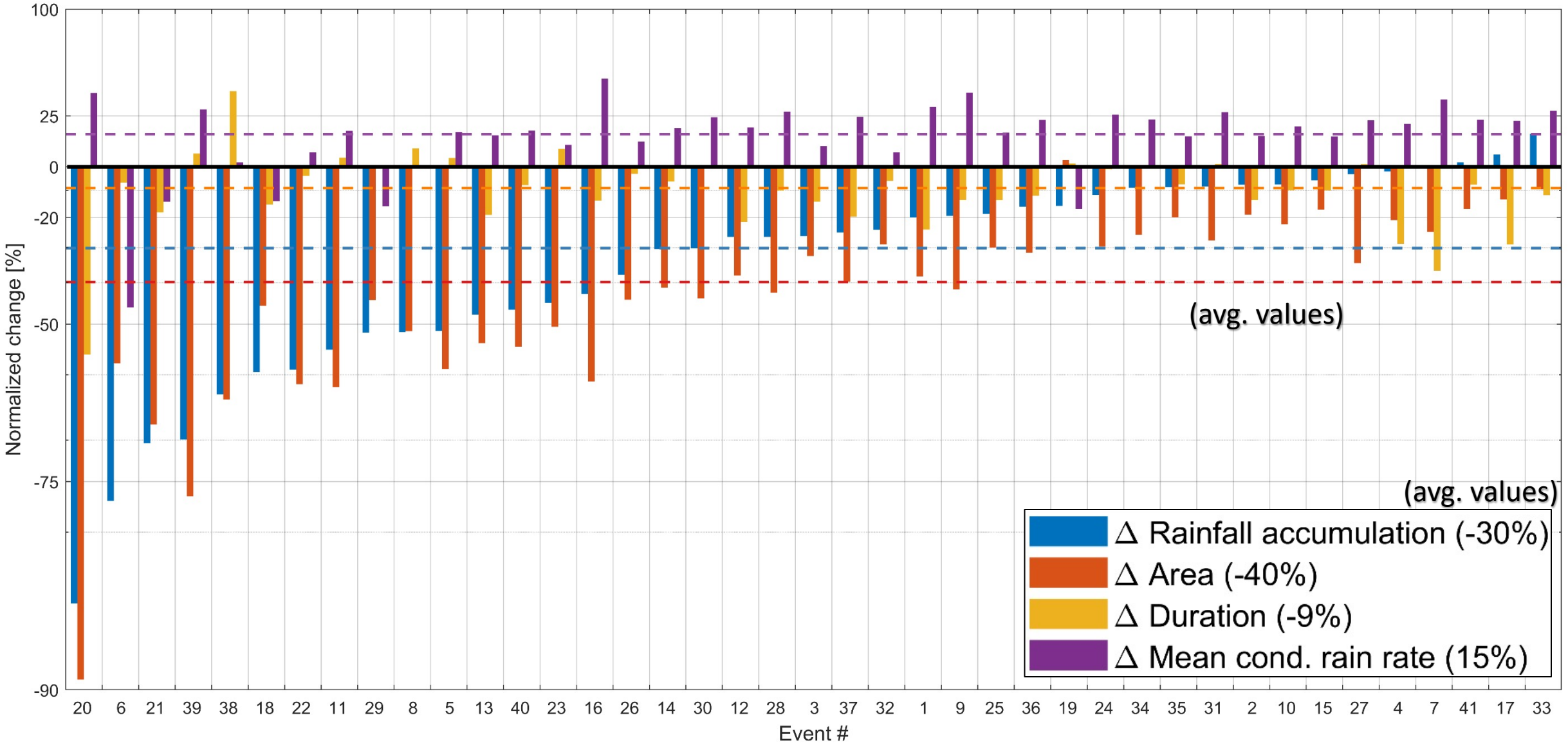




Change in rainfall properties under PGW conditions



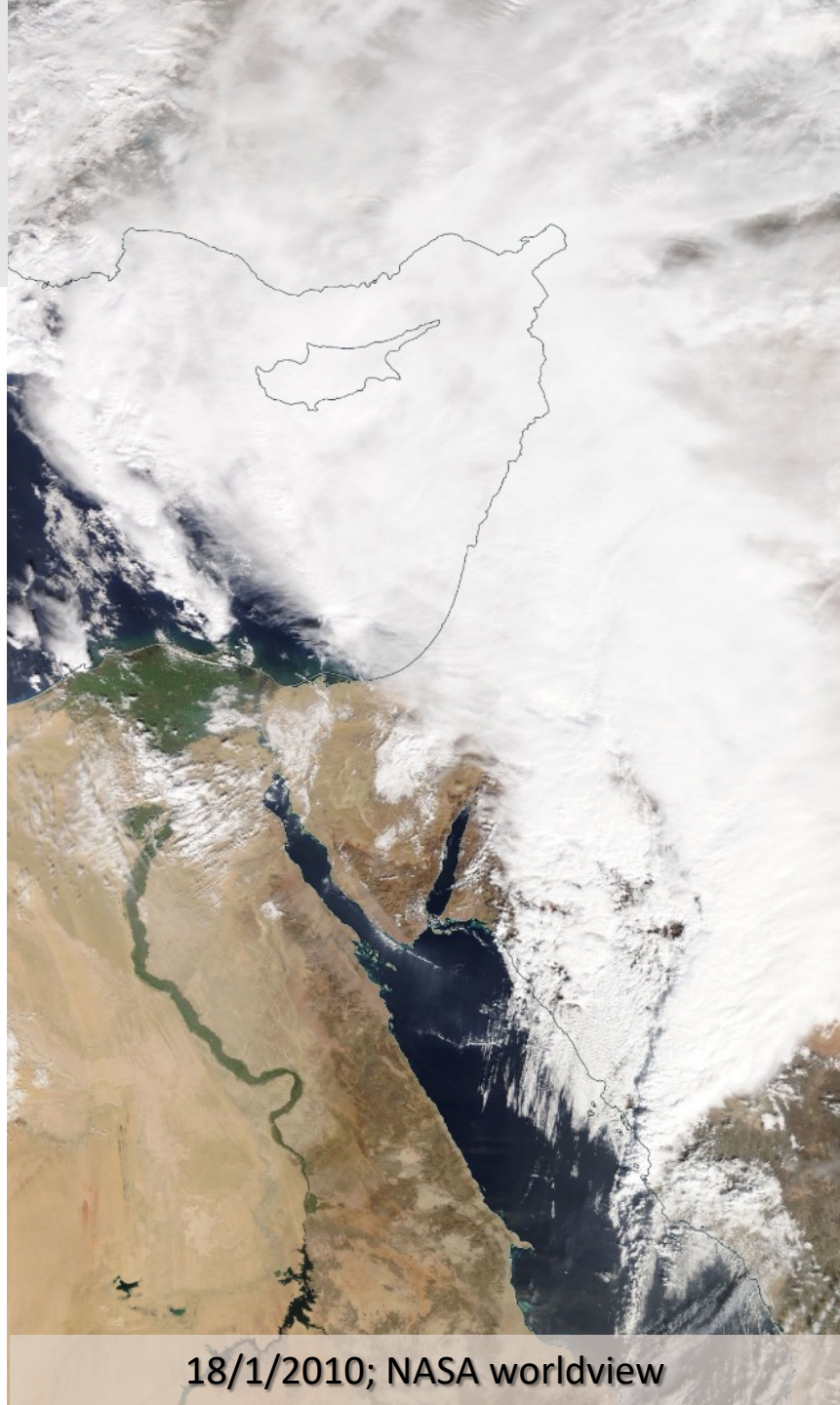
Change in rainfall properties under PGW conditions



Summary and conclusions

Rainfall during HPEs:

- **Decrease** by 30% on average (-36% over land)
- But rain rates **get higher** by 15% on average (22% for local, short duration rain rates)
- Events **become shorter** by 9%
- The rainy area is **much smaller** (-40% for 0.1 mm threshold)



18/1/2010; NASA worldview

Summary and conclusions

moshe.armon@mail.huji.ac.il

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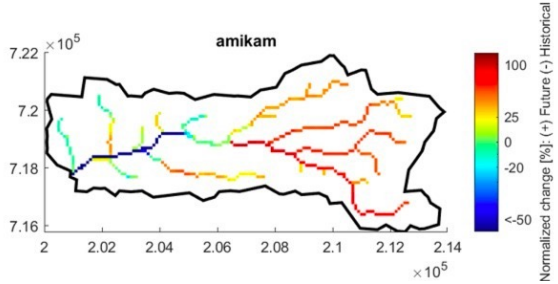
The rainy area is **much smaller** (-40% for 0.1 mm threshold)

Future work is focused on:
Meteorological causes for changes in rainfall patterns
Hydrological outcomes of these changes

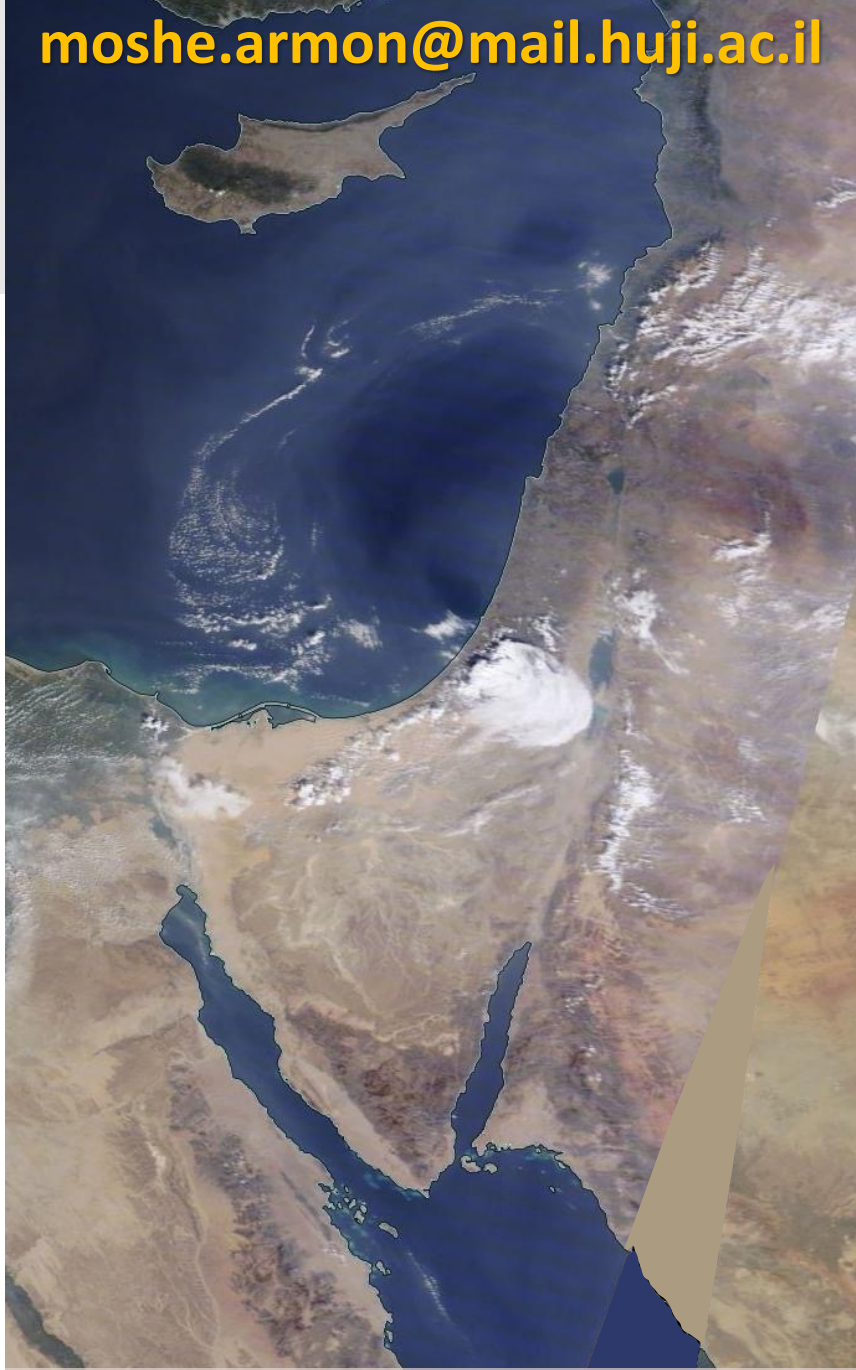
OSPP

Armon et al., 2022

Earth's future



Rinat, Y., et al., EGU22-477



2/11/2013; NASA worldview