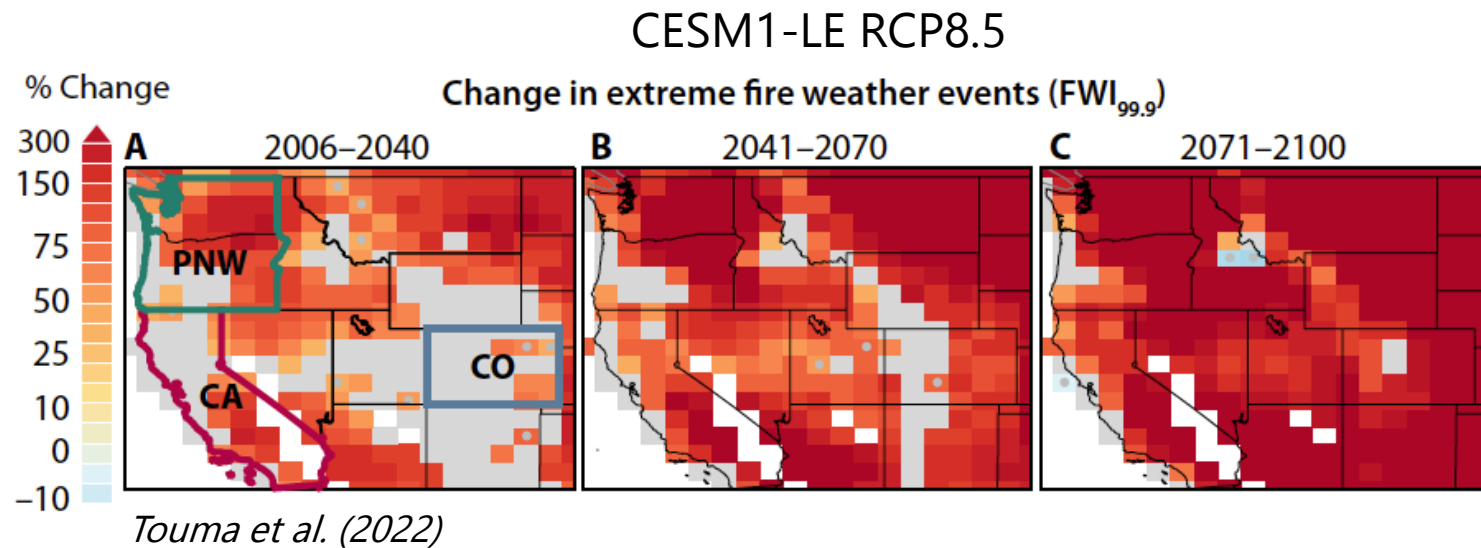


Drivers of more persistent and widespread extreme fire weather events in the Western U.S.

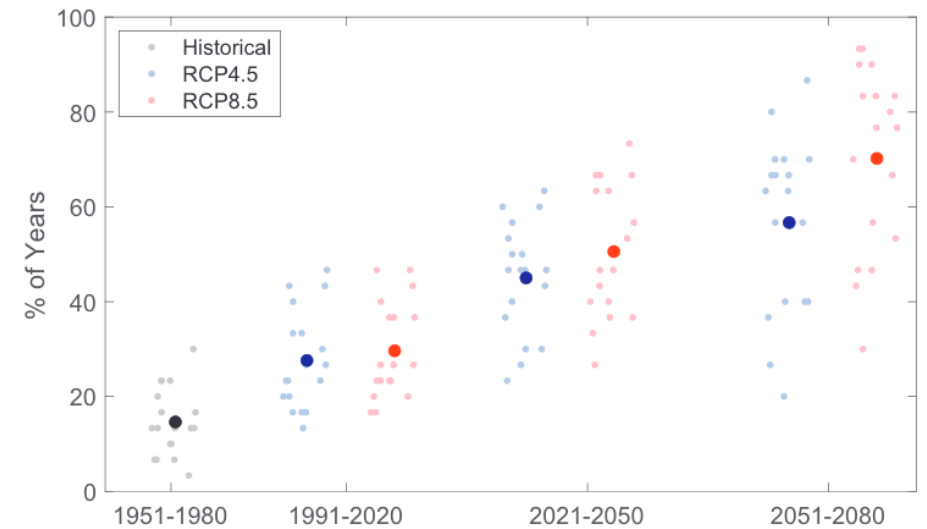
Danielle Touma & Clara Deser
UT Austin & NCAR



Increasing extreme fire weather frequency and concurrence by the end of the 21st century

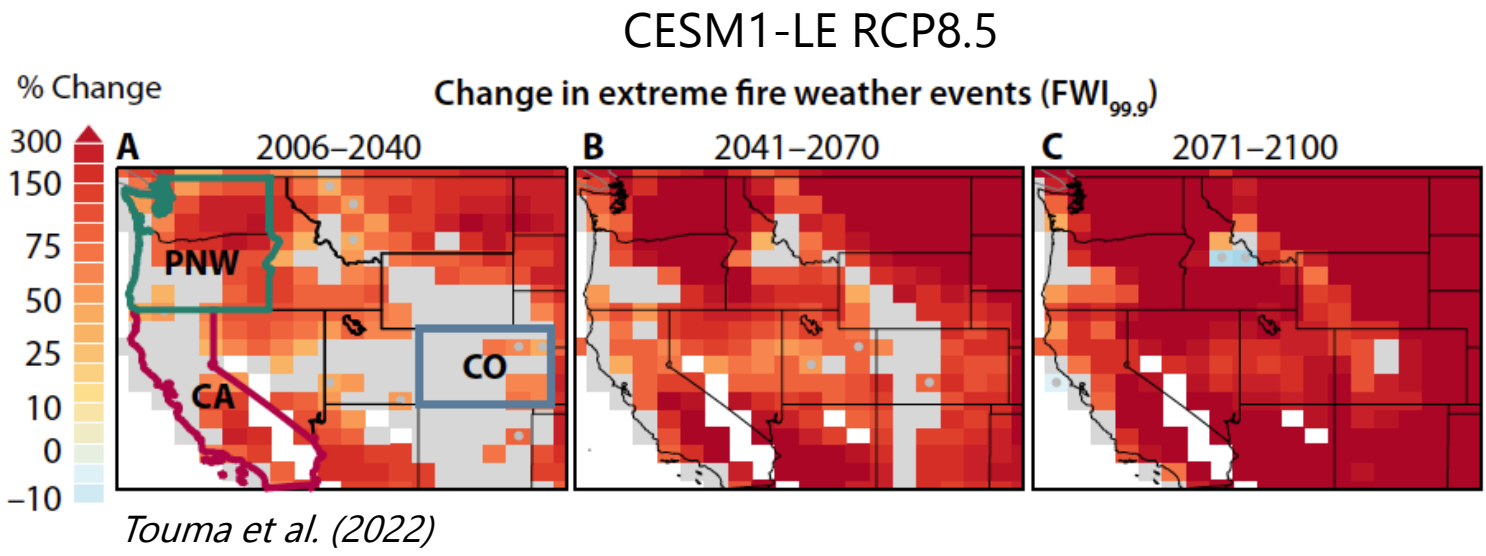


Increases in number of years with synchronous fire danger in the Western US

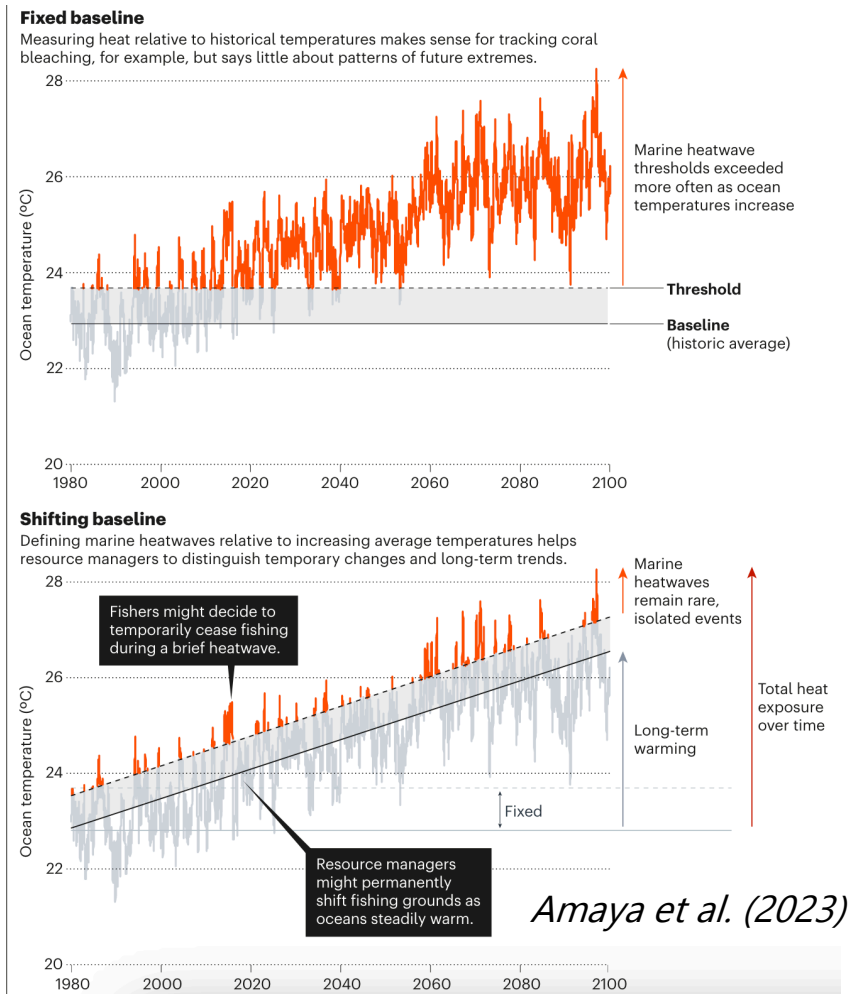


Abatzoglou et al. (2021)

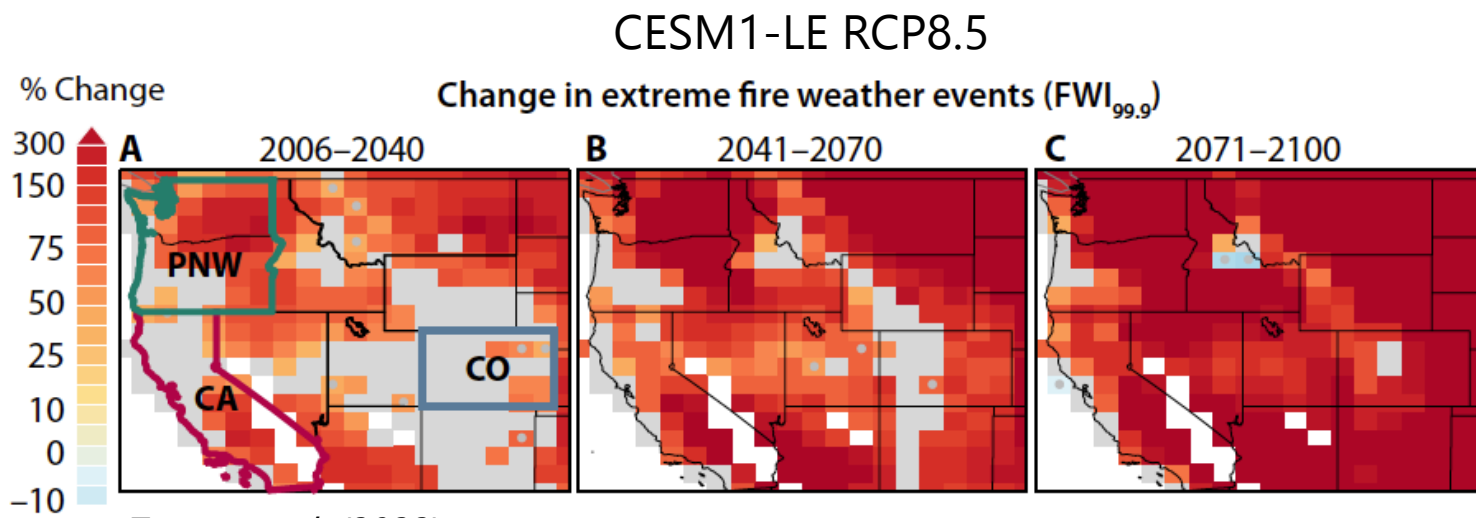
Q1: What is the impact of the baseline period on extreme fire weather event projections?



Fixed baseline period: 1980-2005



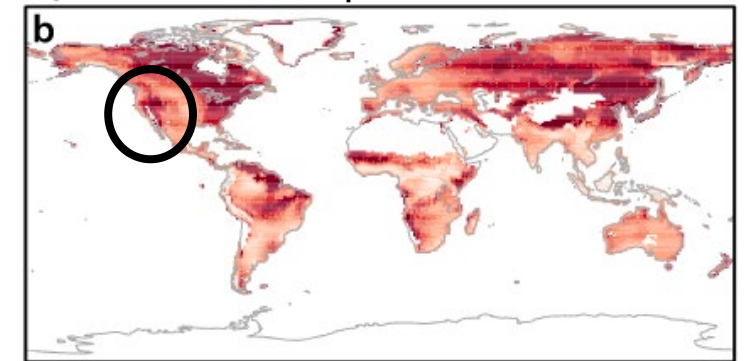
Q2: What is the role of mean changes versus changes in the variability in climate variables?



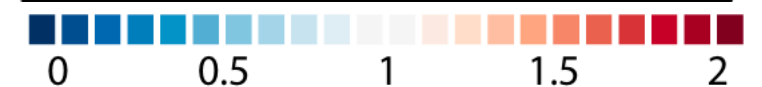
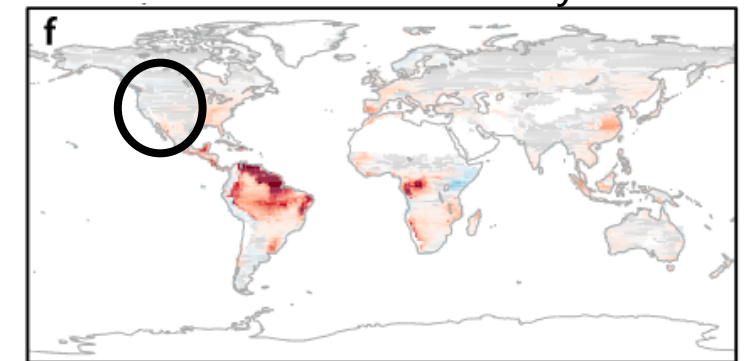
Touma et al. (2022)

Isolating impact of variables on risk ratio

Temperature



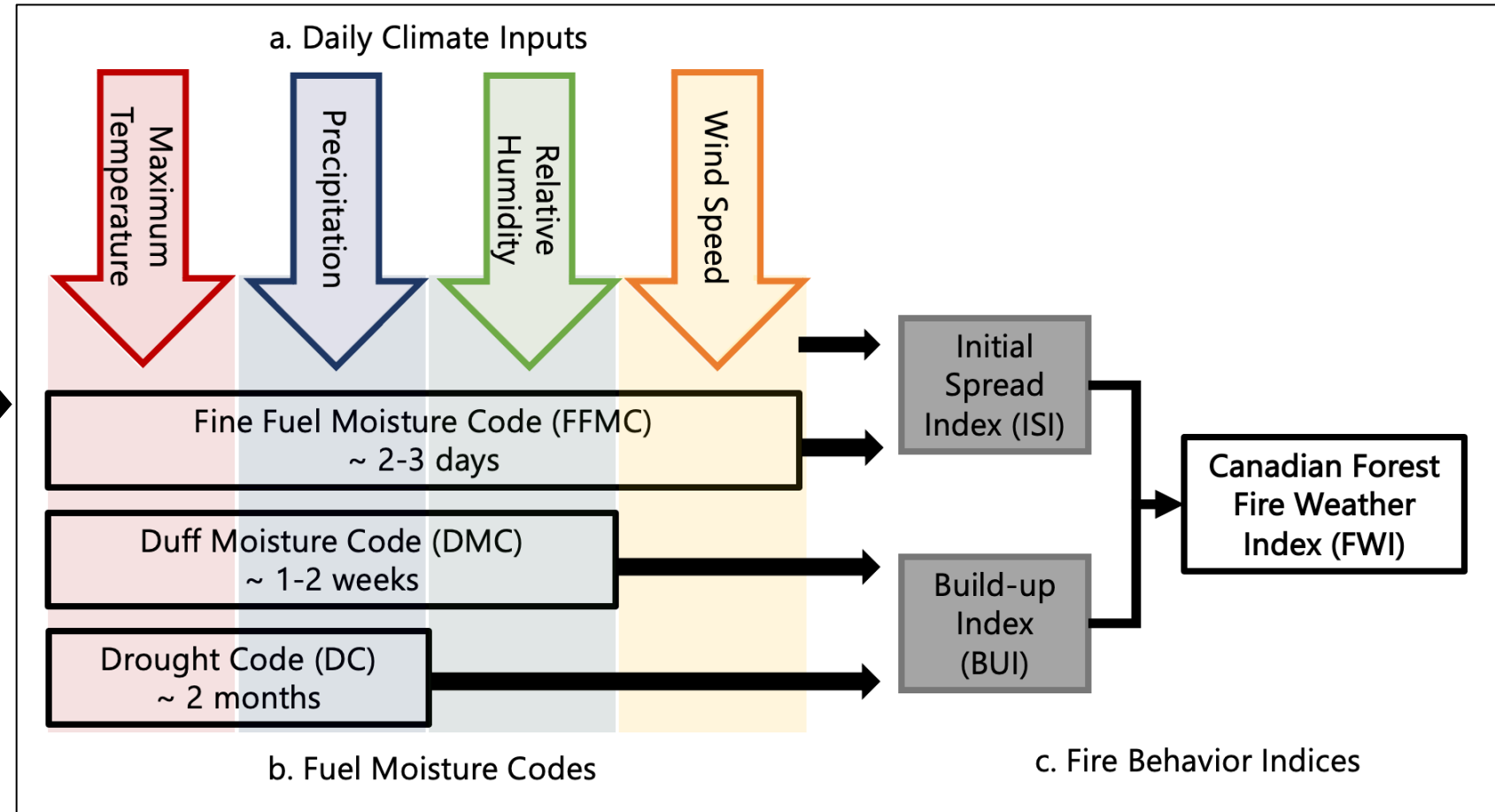
Relative Humidity



Touma et al. (2021)

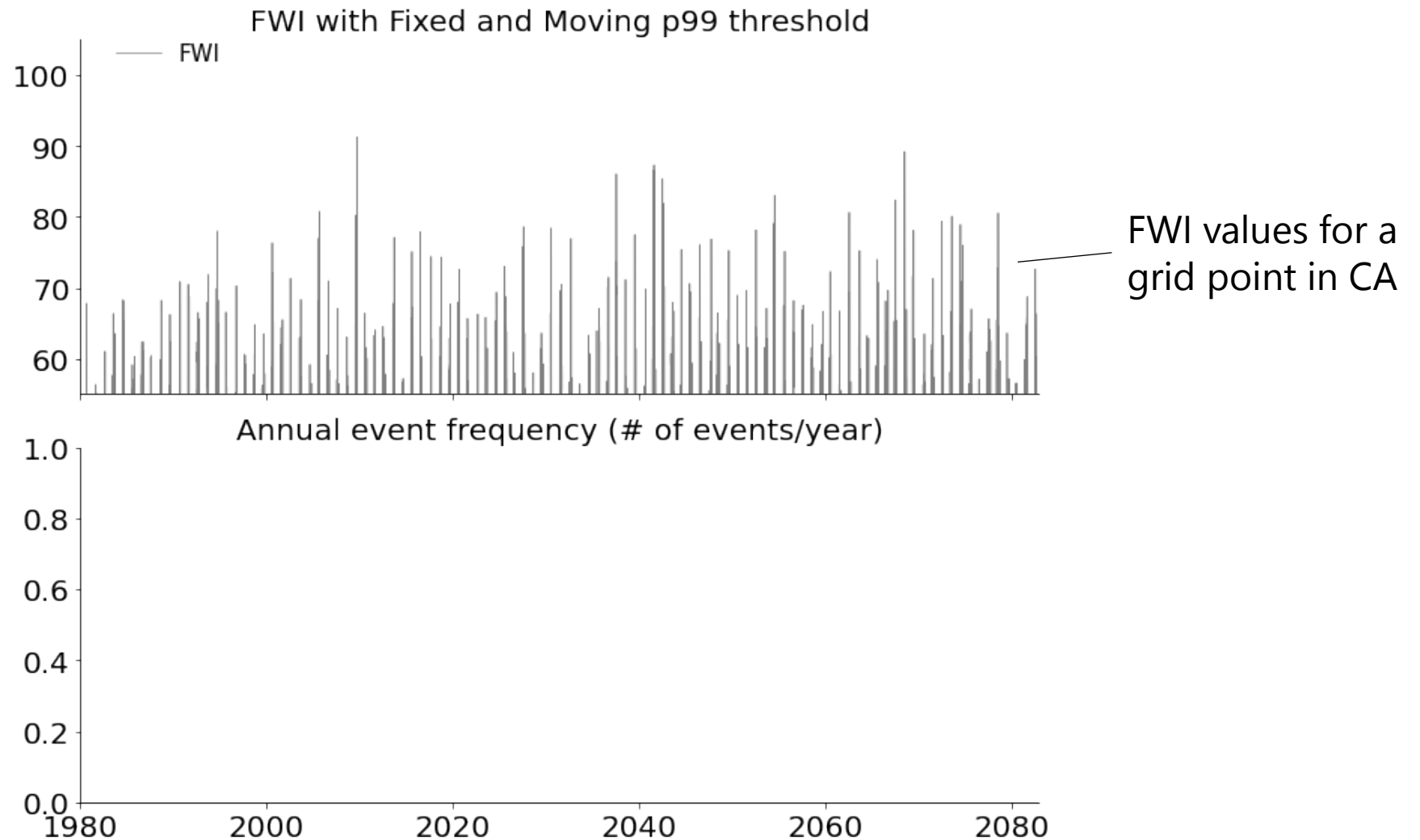
Quantifying extreme fire weather under climate variability and change

Canadian Forest Fire Weather Index (FWI)

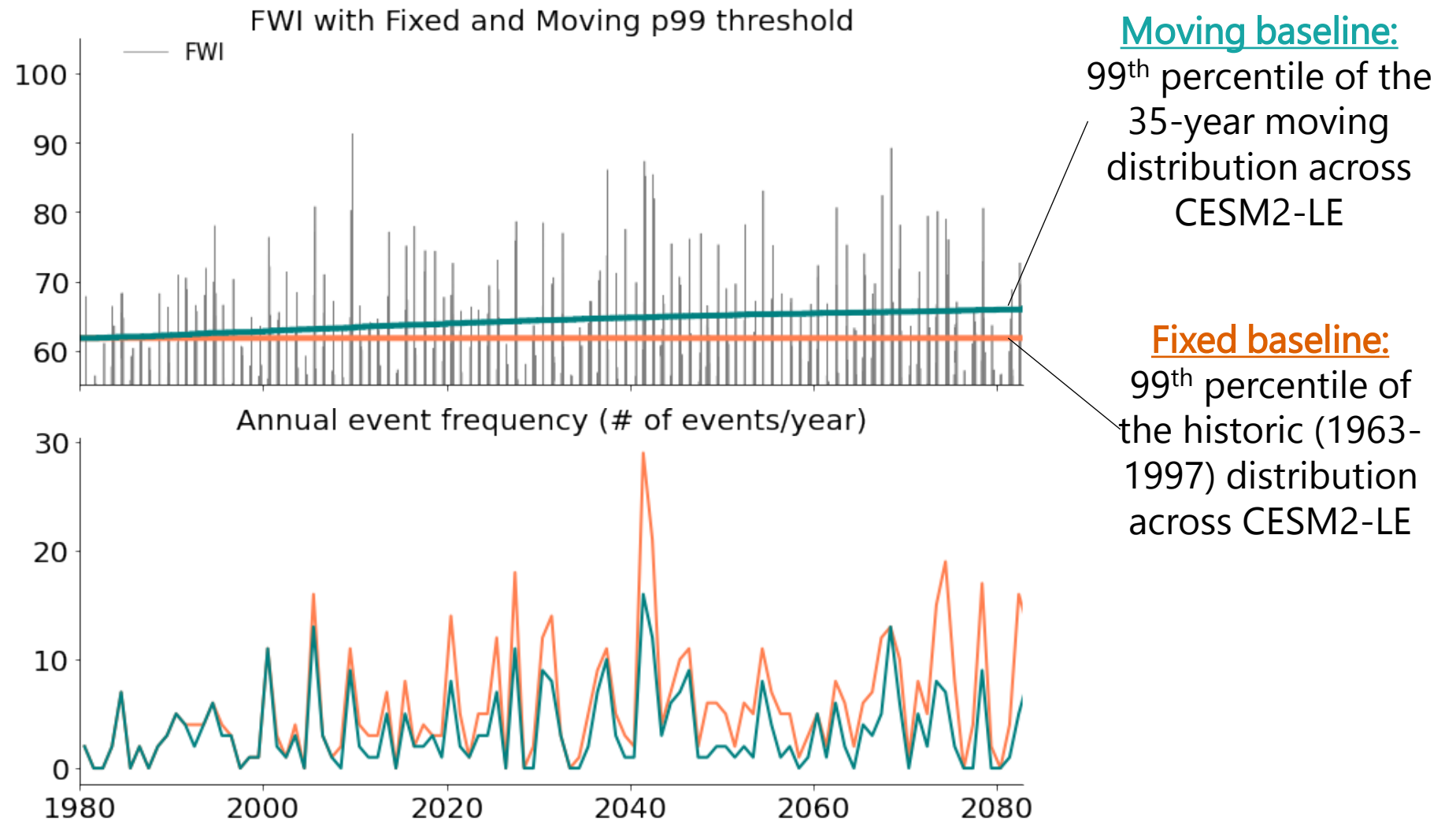


CESM2-LE
~100 members
Historic and SSP3-7.0
1980-2100

Q1: What is the impact of the baseline period on extreme fire weather event projections?

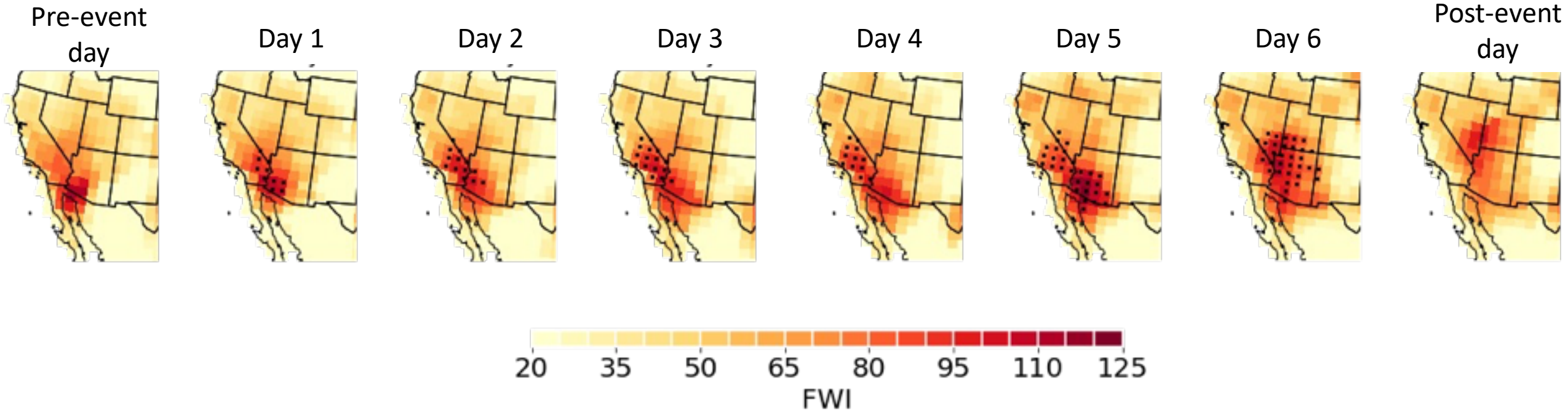


Q1: What is the impact of the baseline period on extreme fire weather event projections?



Identifying spatiotemporally connected extreme fire weather events

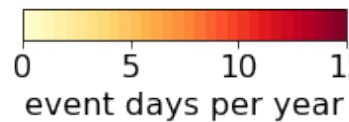
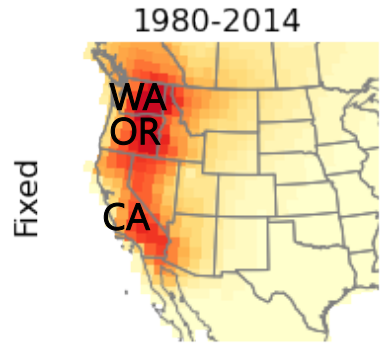
Example of 6-day extreme fire weather event in California



● spatiotemporally connected extreme fire weather event

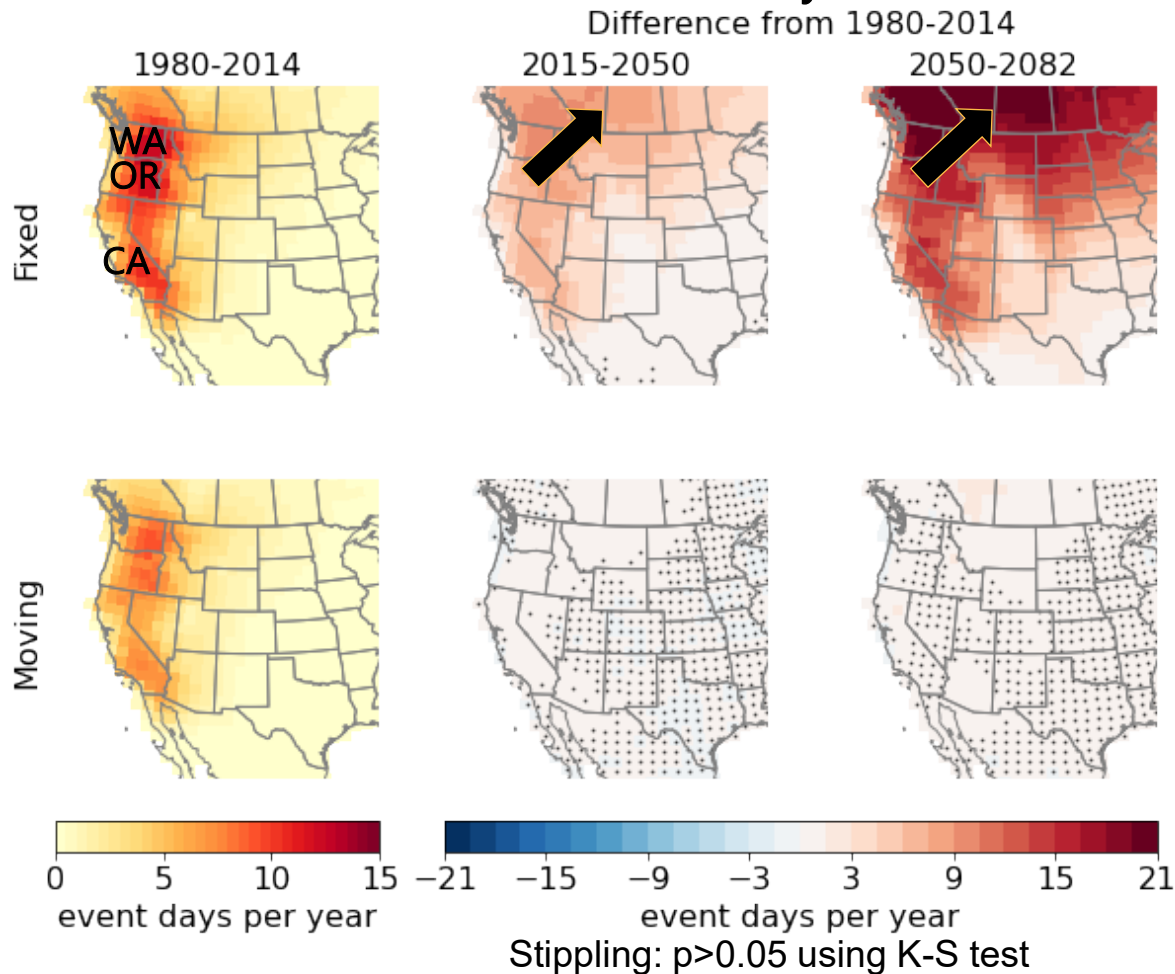
More frequent extreme fire weather events and more connected towards the northeast

Extreme fire weather event days across 100-members for California, Washington, and Oregon



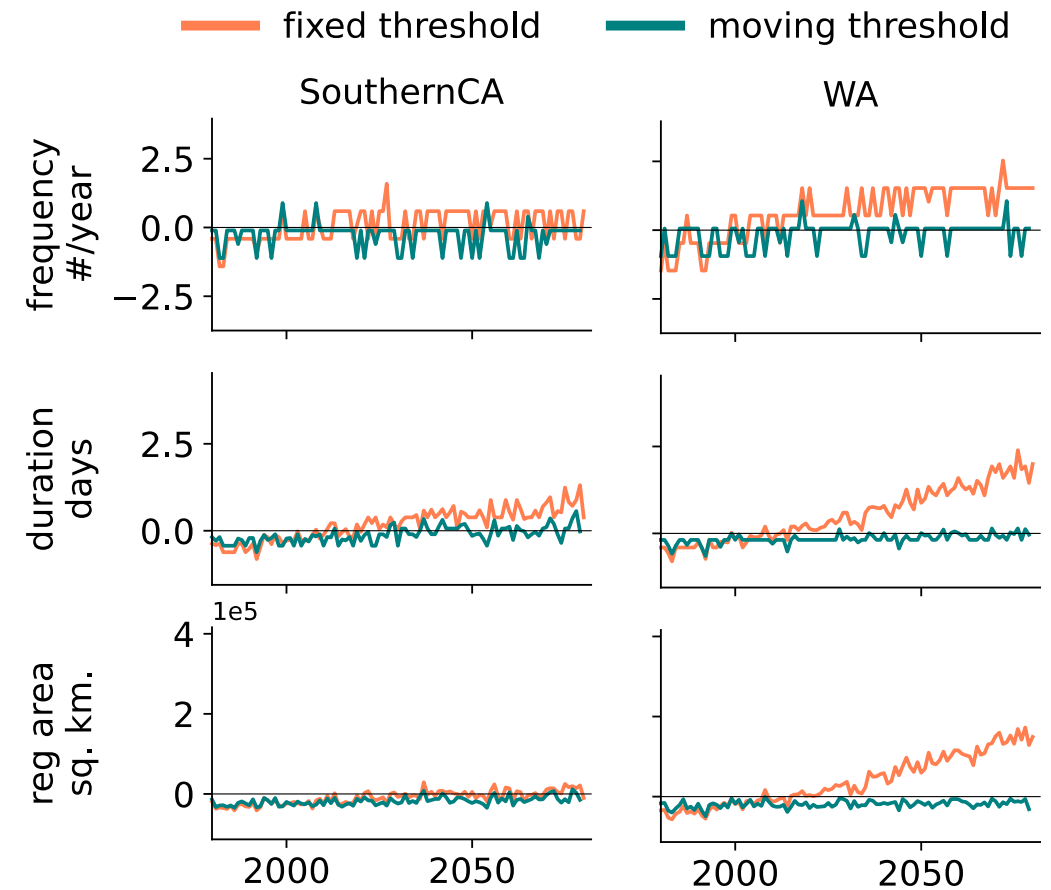
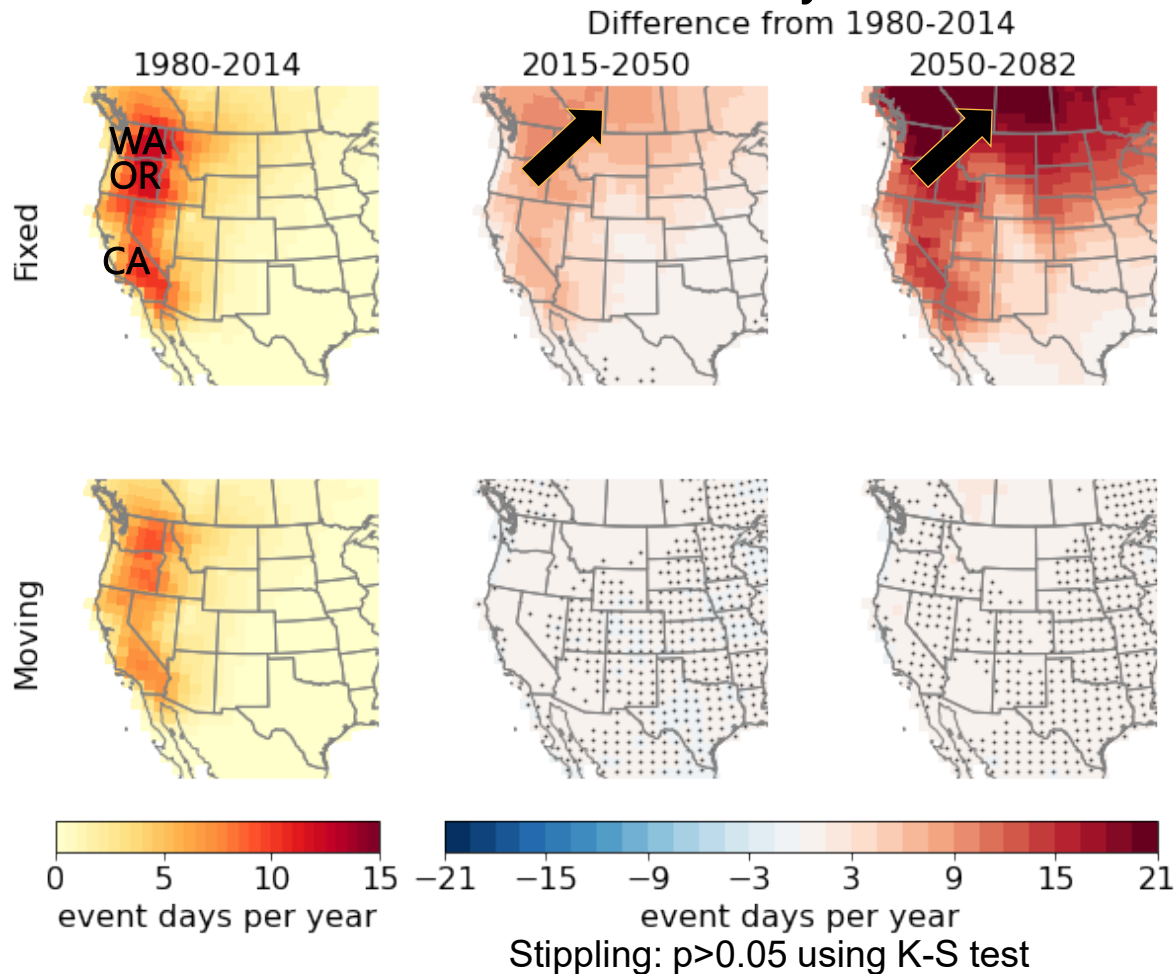
Little to no changes in event frequency

Extreme fire weather event days across 100-members for California, Washington, and Oregon

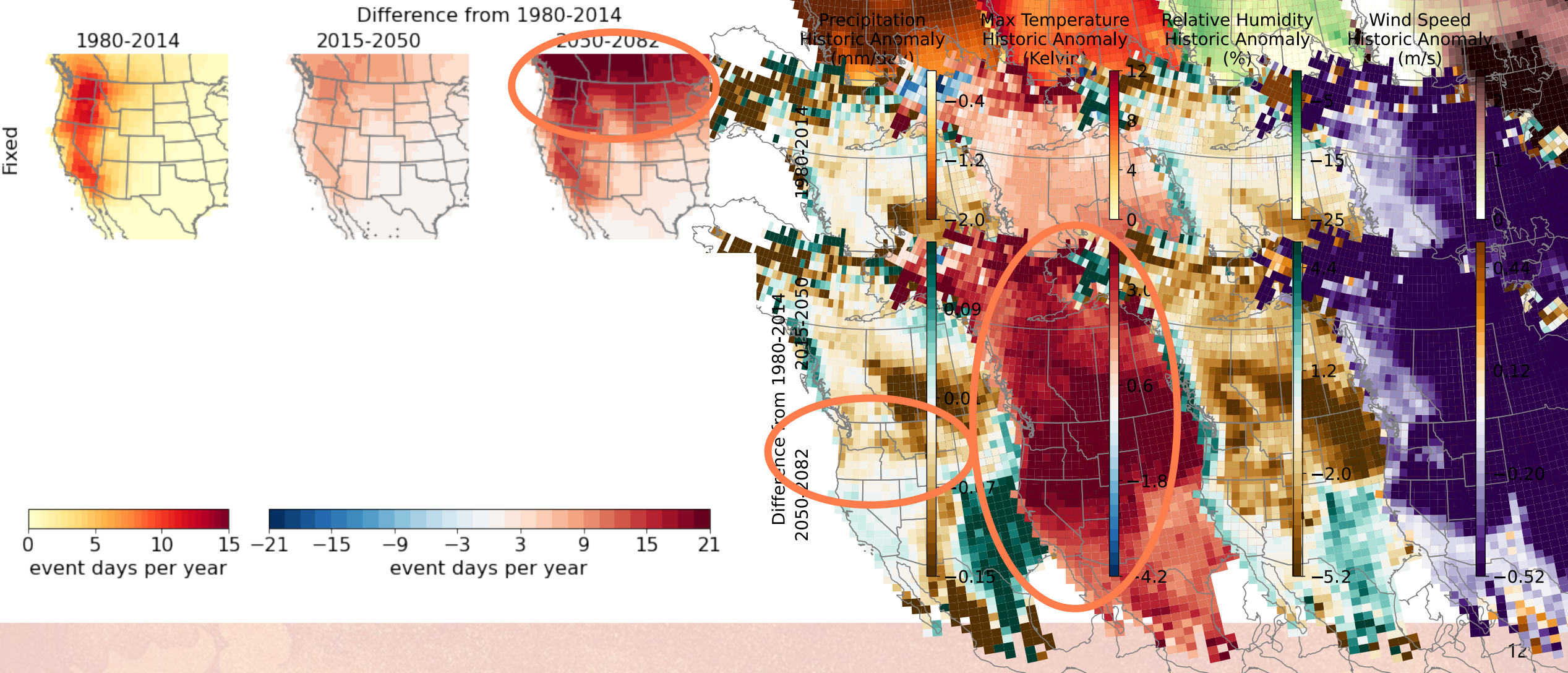


Regional variations in event characteristics

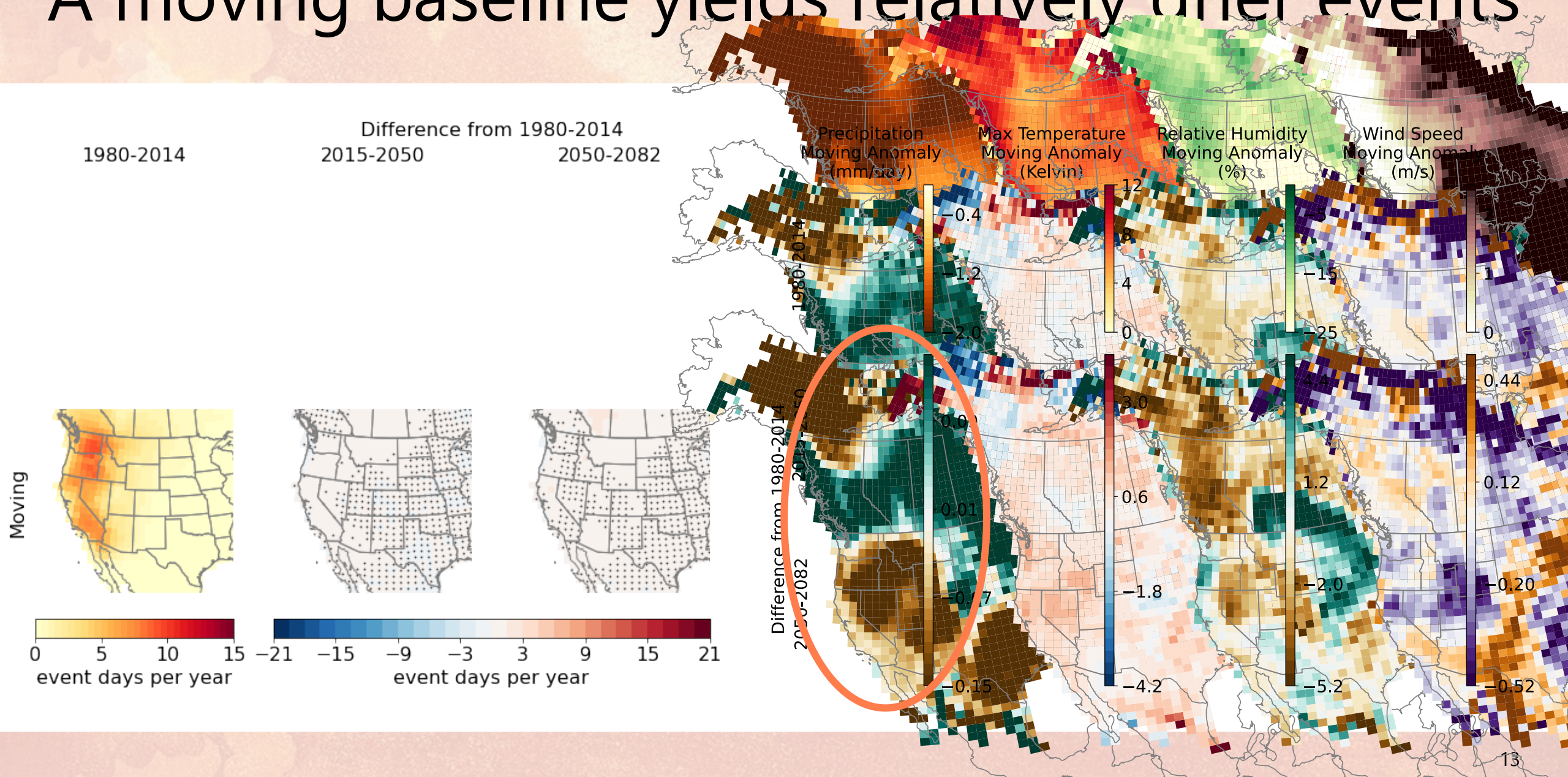
Extreme fire weather event days across 100-members for California, Washington, and Oregon



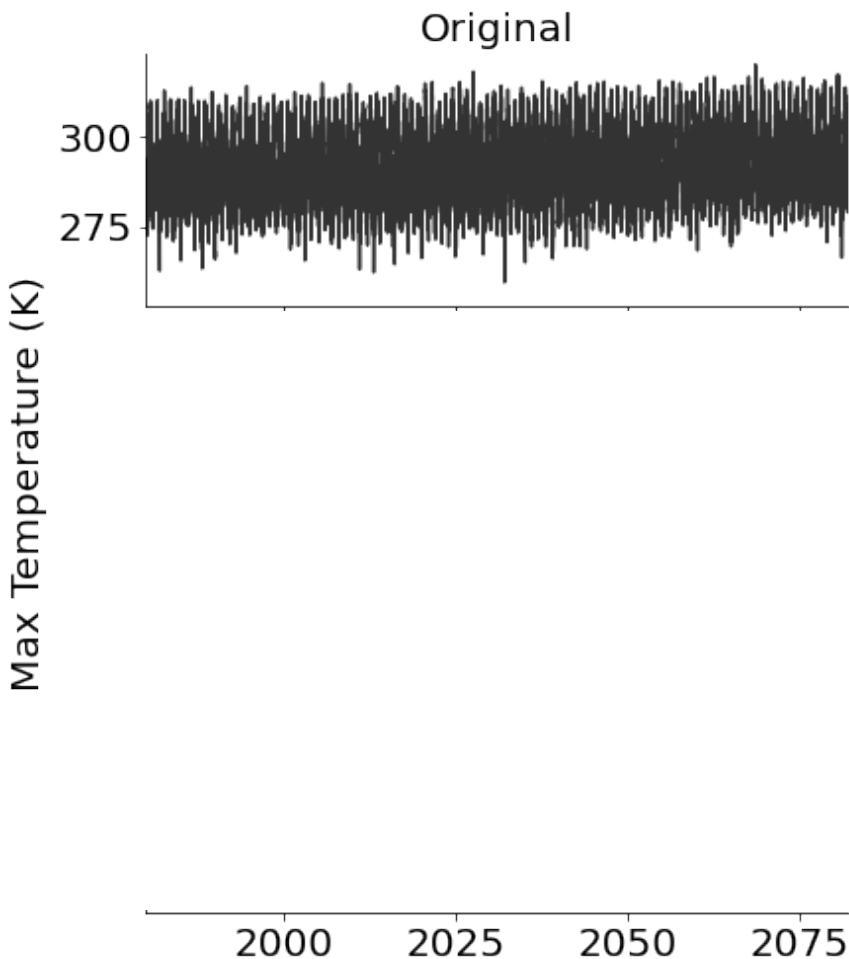
Relatively warmer events when using a fixed baseline



A moving baseline yields relatively drier events



Q2: What is the role of mean changes versus changes in the variability in climate variables?

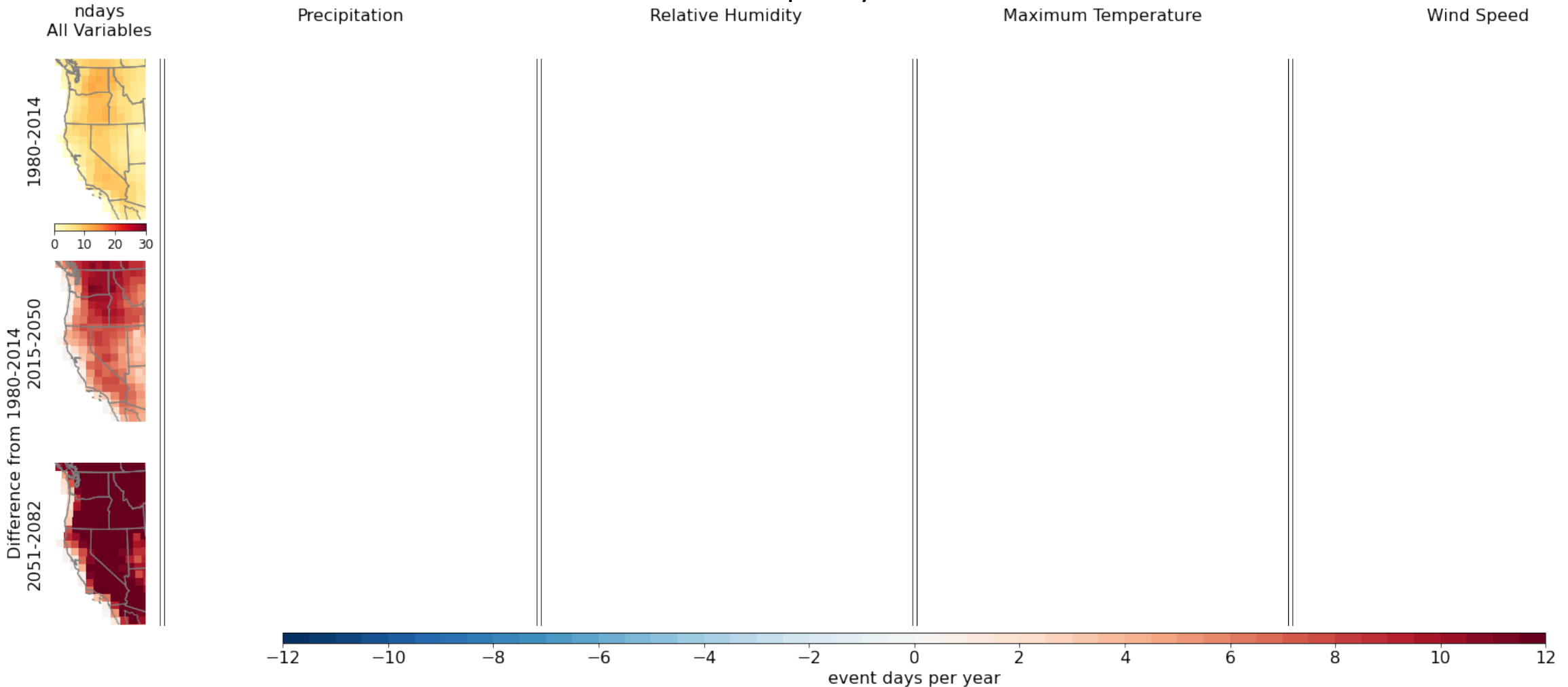


Robust estimate of 35-year, 30-day, 100-member **change in mean** compared to 1963-1997

Quantile mapping to estimate **changes in mean and variability** compared to 1963-1997

Isolating roles of variable changes on extreme fire weather events

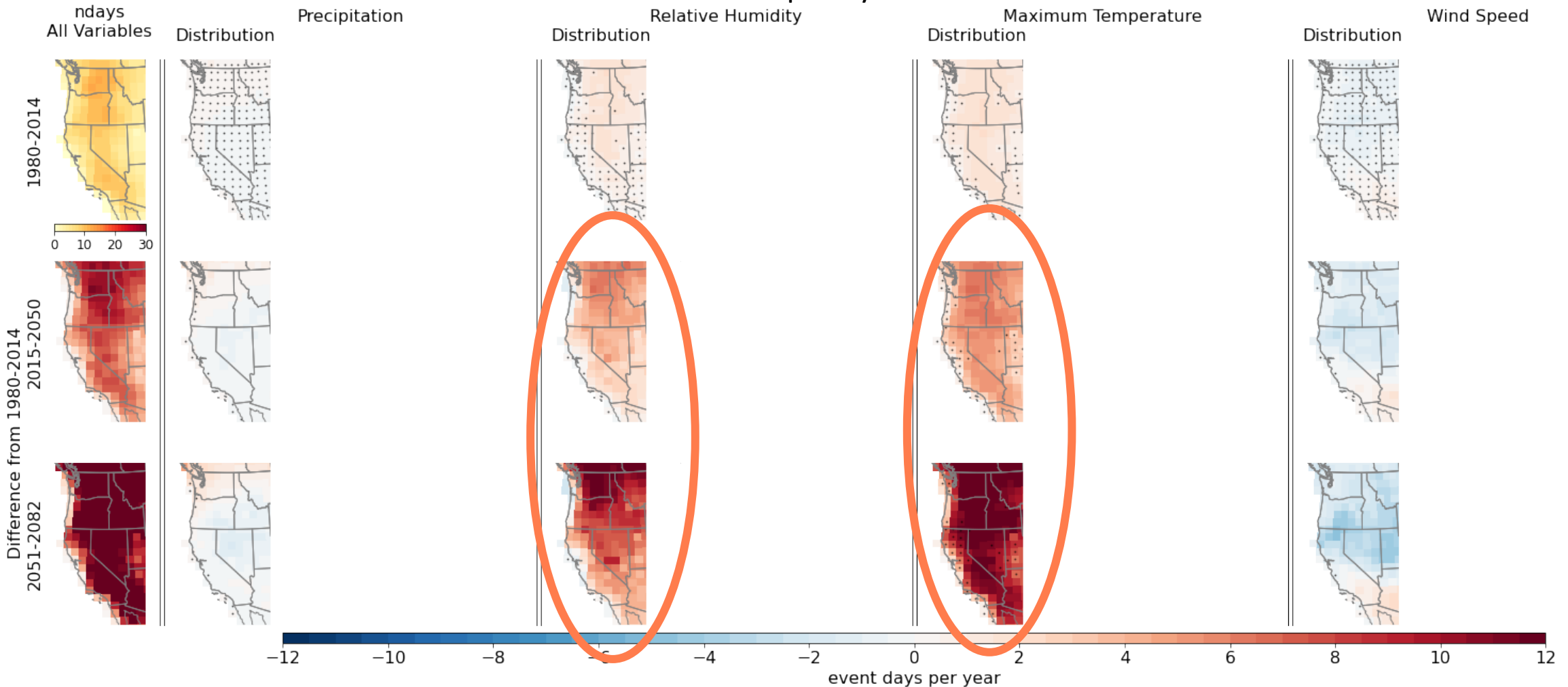
Effect of variables on the frequency of extreme fire weather events



*Only using 25 members at the moment!

Changes in maximum temperature and relative humidity lead to the largest increases

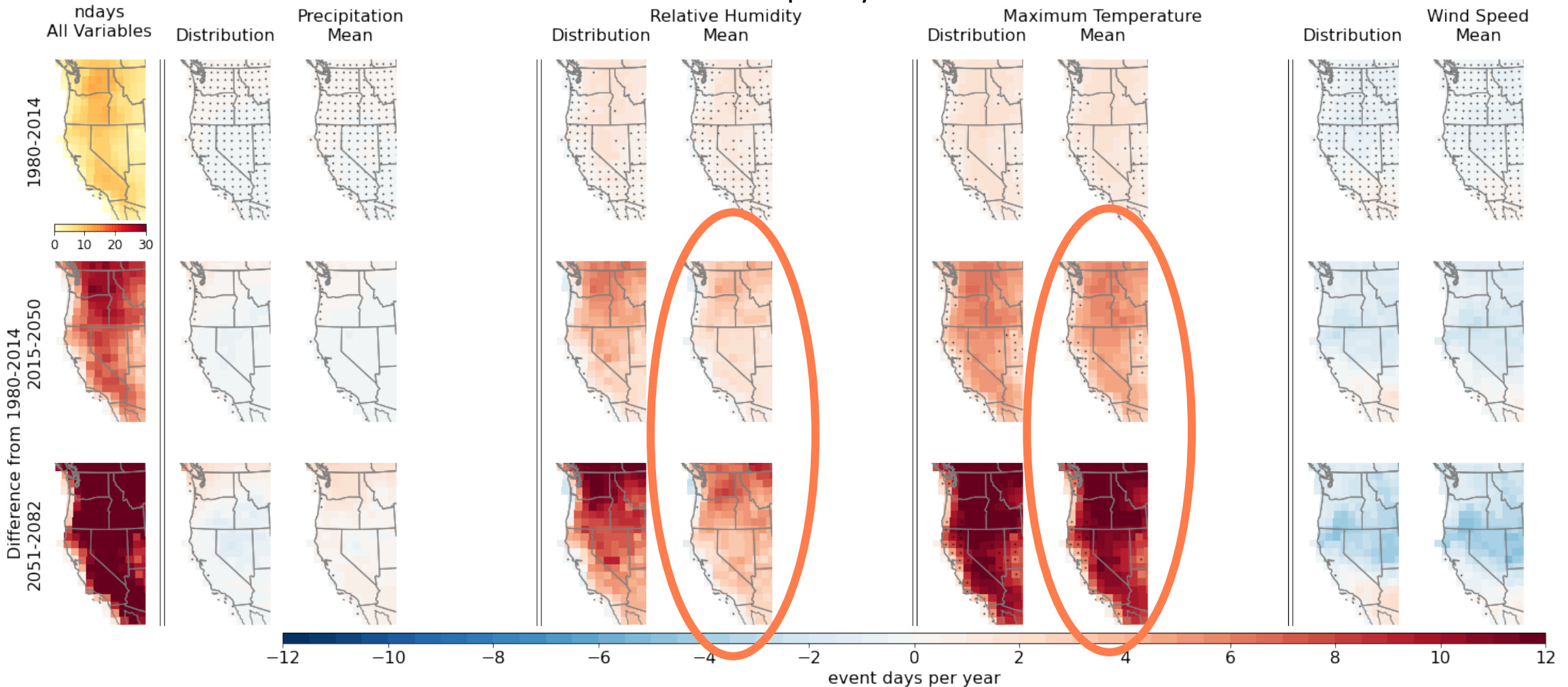
Effect of variables on the frequency of extreme fire weather events



*Only using 25 members at the moment!

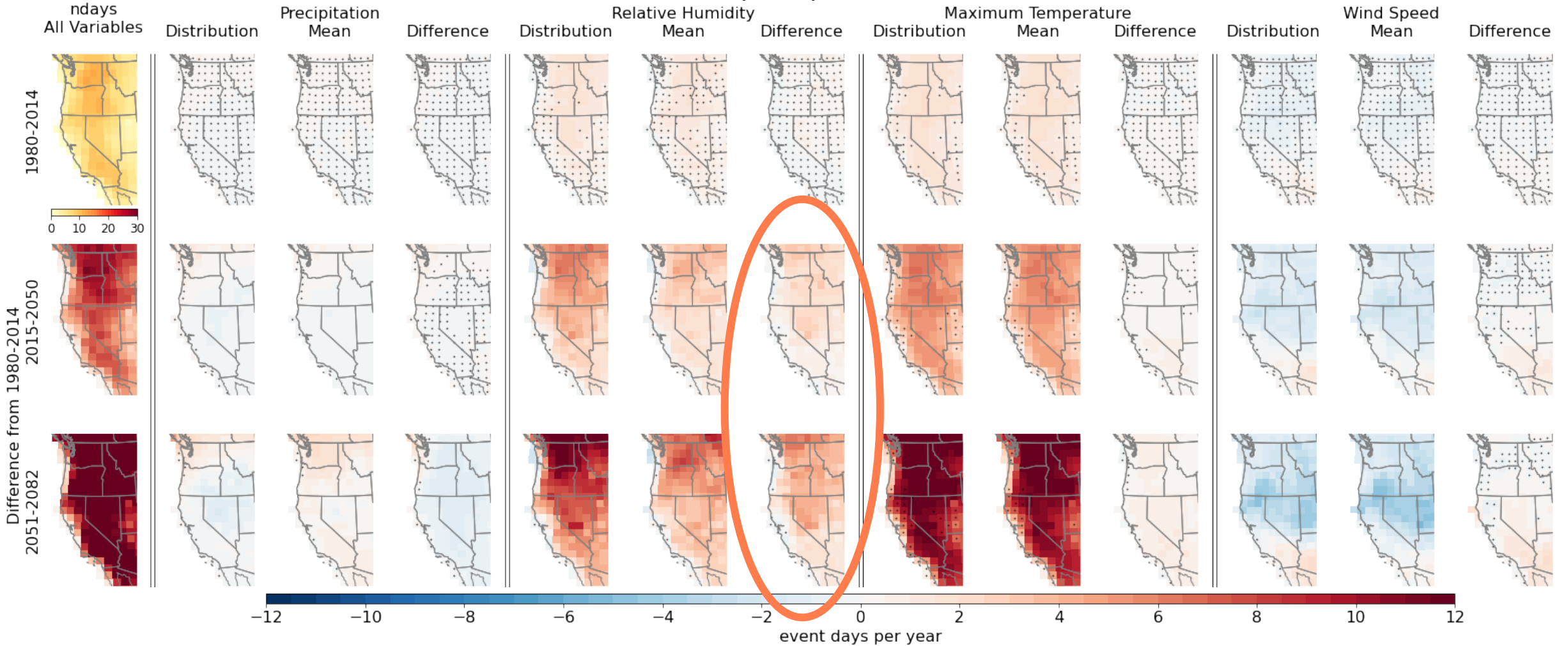
Mean changes in relative humidity and temperature drive much of these increases

Effect of variables on the frequency of extreme fire weather events



Changes in the variability of relative humidity also lead to increases in extreme fire weather events

Effect of variables on the frequency of extreme fire weather events



"Difference" = Variability effect estimate

Takeaways

Extreme fire weather events will become **more frequent, longer, and larger** compared to a **fixed baseline** under continued global warming and will become relatively much **warmer**.

Compared to a **moving baseline**, the frequency, area, and duration of extreme fire weather events **do not increase**, but become relatively much **drier**.

Increase in event frequency are largely due to the **mean increases** in maximum temperature and **mean decreases** in relative humidity, as well as **changes in the variability** of relative humidity.

Thank you! Questions?
danielle.touma@utexas.edu