

# The impact of stratospheric aerosol injection on extreme fire weather risk

**Danielle Touma**

Colorado State University & National Center for Atmospheric Research  
CESM Workshop: Climate Variability and Change Working Group Meeting

June 14, 2023

# The impact of stratospheric aerosol injection on extreme fire weather risk

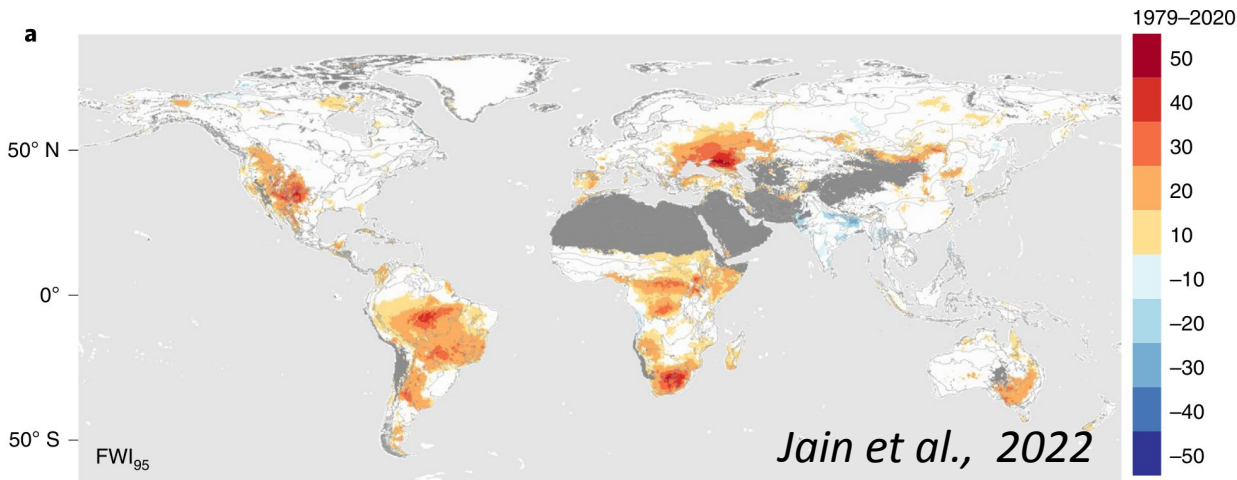
Jim Hurrell (CSU), Mari Tye (NCAR) & Katie Dagon (NCAR)

Special thanks to NCAR for ARISE-SAI-1.5 simulations



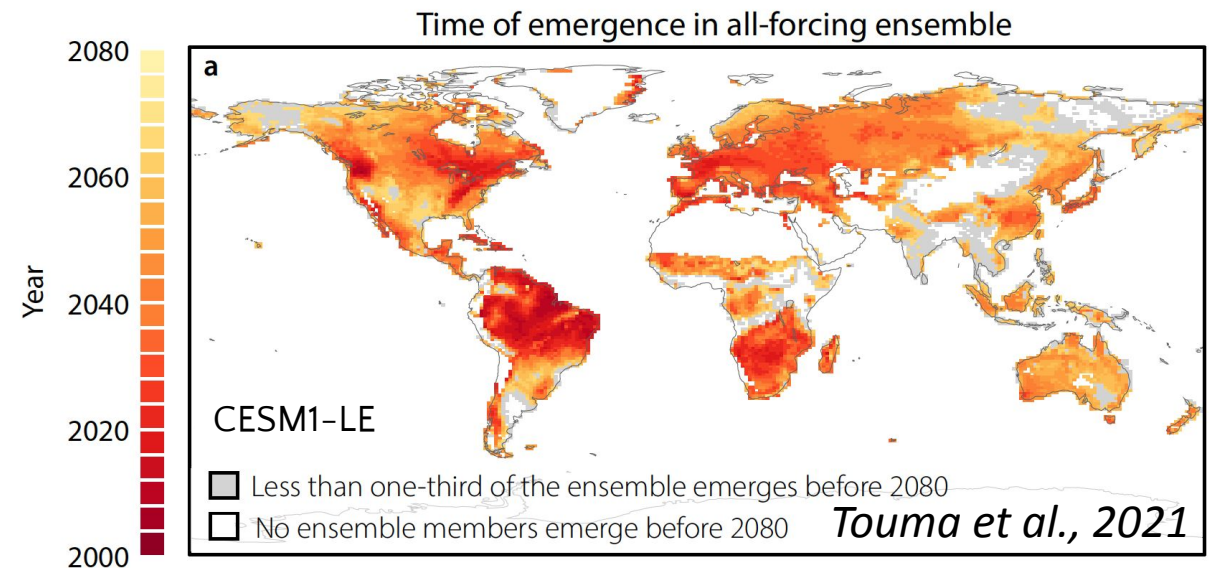
# Recent and future trends in extreme fire weather

Trends in extreme fire weather frequency from 1979–2020



Extreme fire weather events have increased significantly in the last four decades

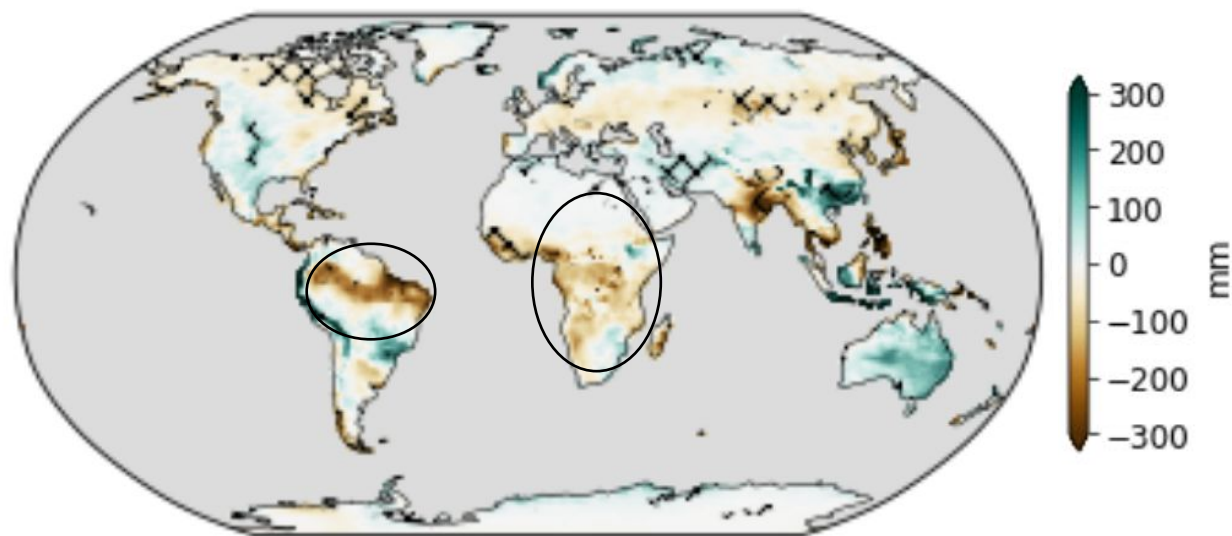
Extreme fire weather will become the new normal by 2080 in ~70% of the globe



# SAI decreases global temperatures but with unintended consequences

Increases in consecutive dry days and decreases in total wet-day precipitation in parts of the Amazon and western and southern Africa

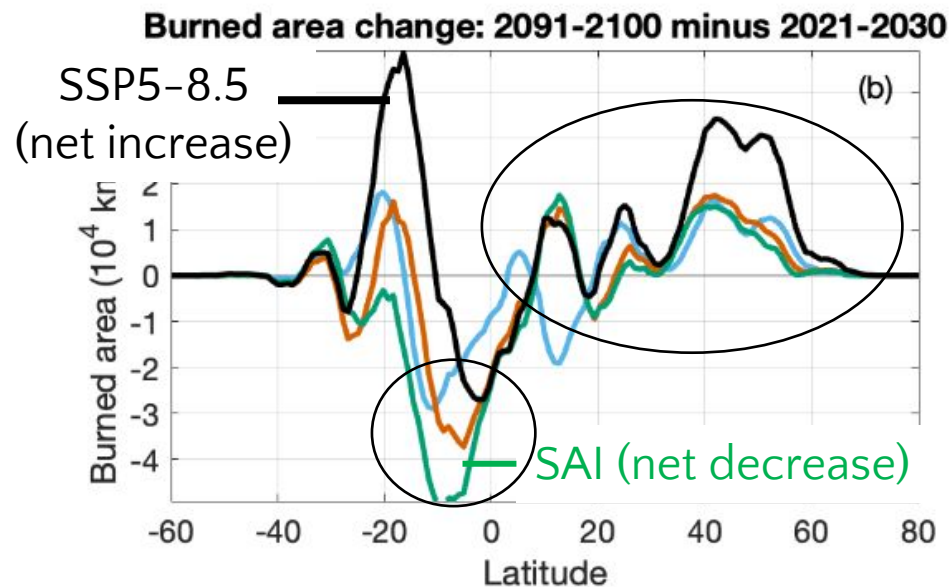
(a) Total Wet Day Precipitation (PRCPTOT)



GLENS 2075-2095 minus  
2010-2030

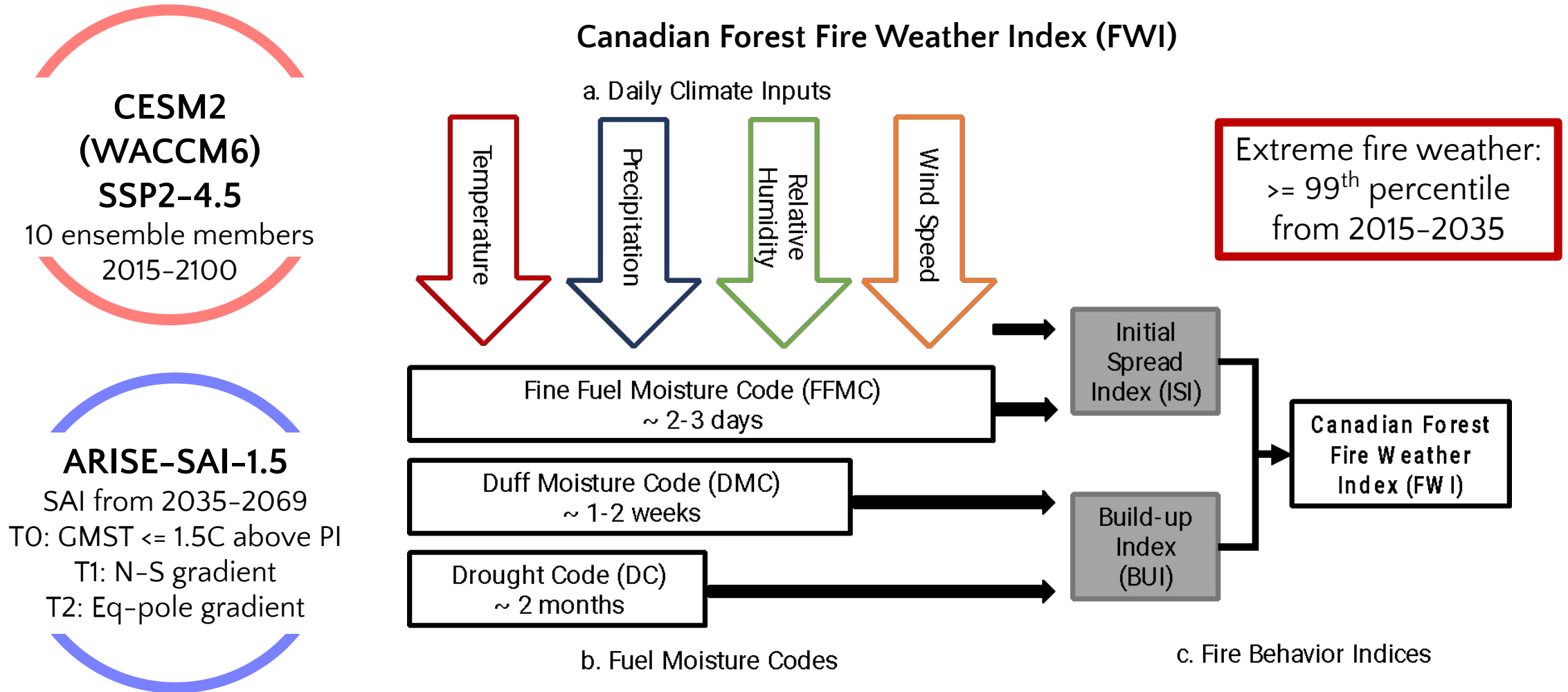
Tye et al., 2022

Global burn area decreases under SAI (G6sulfur) but impacts are regionally varied



Tang et al., 2023

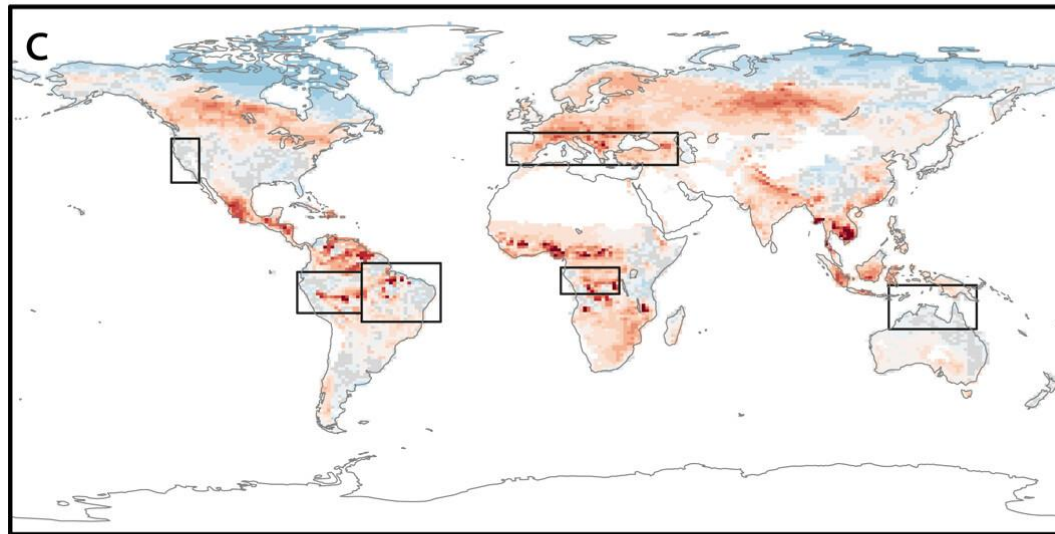
# Quantifying SAI impact on extreme fire weather





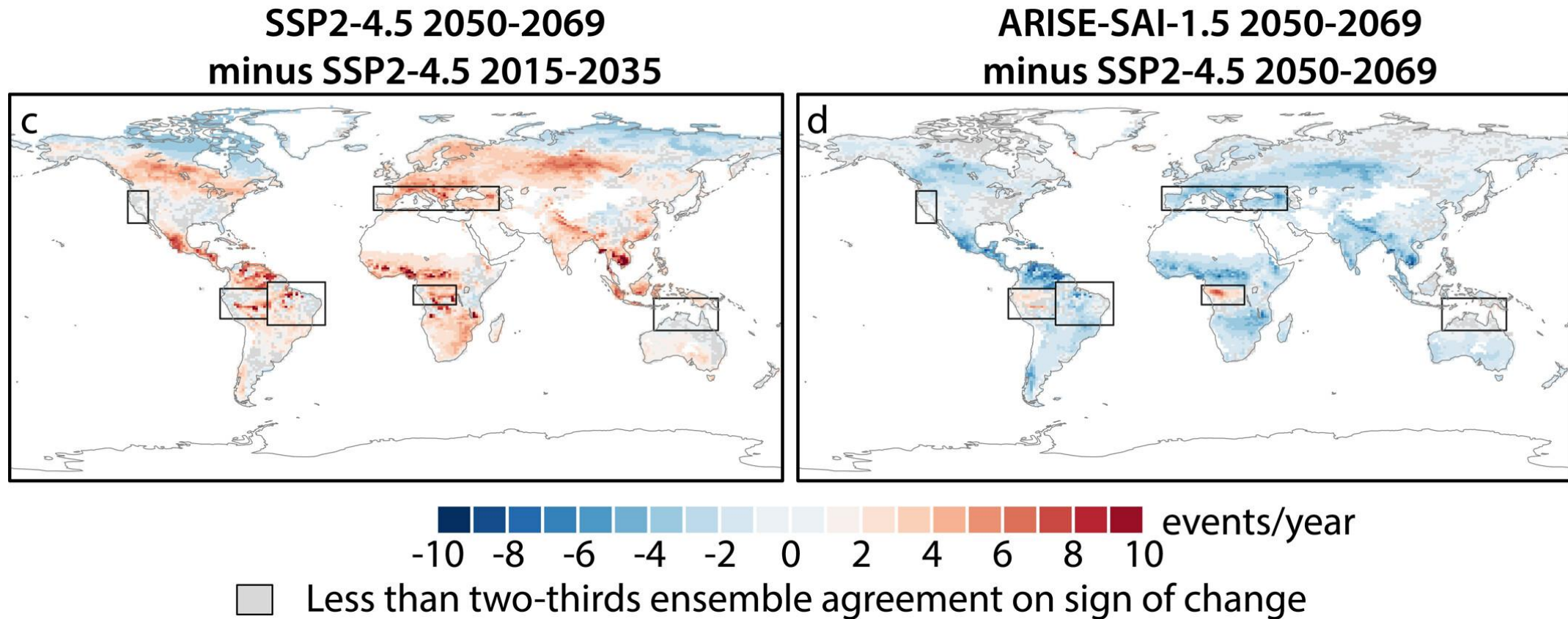
# Extreme fire weather frequency increases under SSP2-4.5

SSP2-4.5 2050-2069  
minus SSP2-4.5 2015-2035



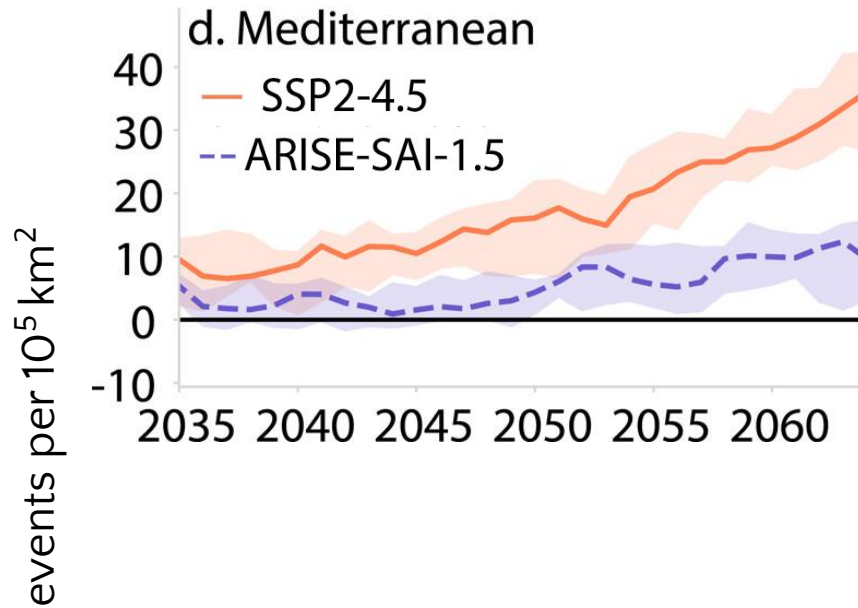
Less than two-thirds ensemble agreement on sign of change

# Extreme fire weather increases are dampened under SAI



# SAI impact on daily to monthly fire weather conditions

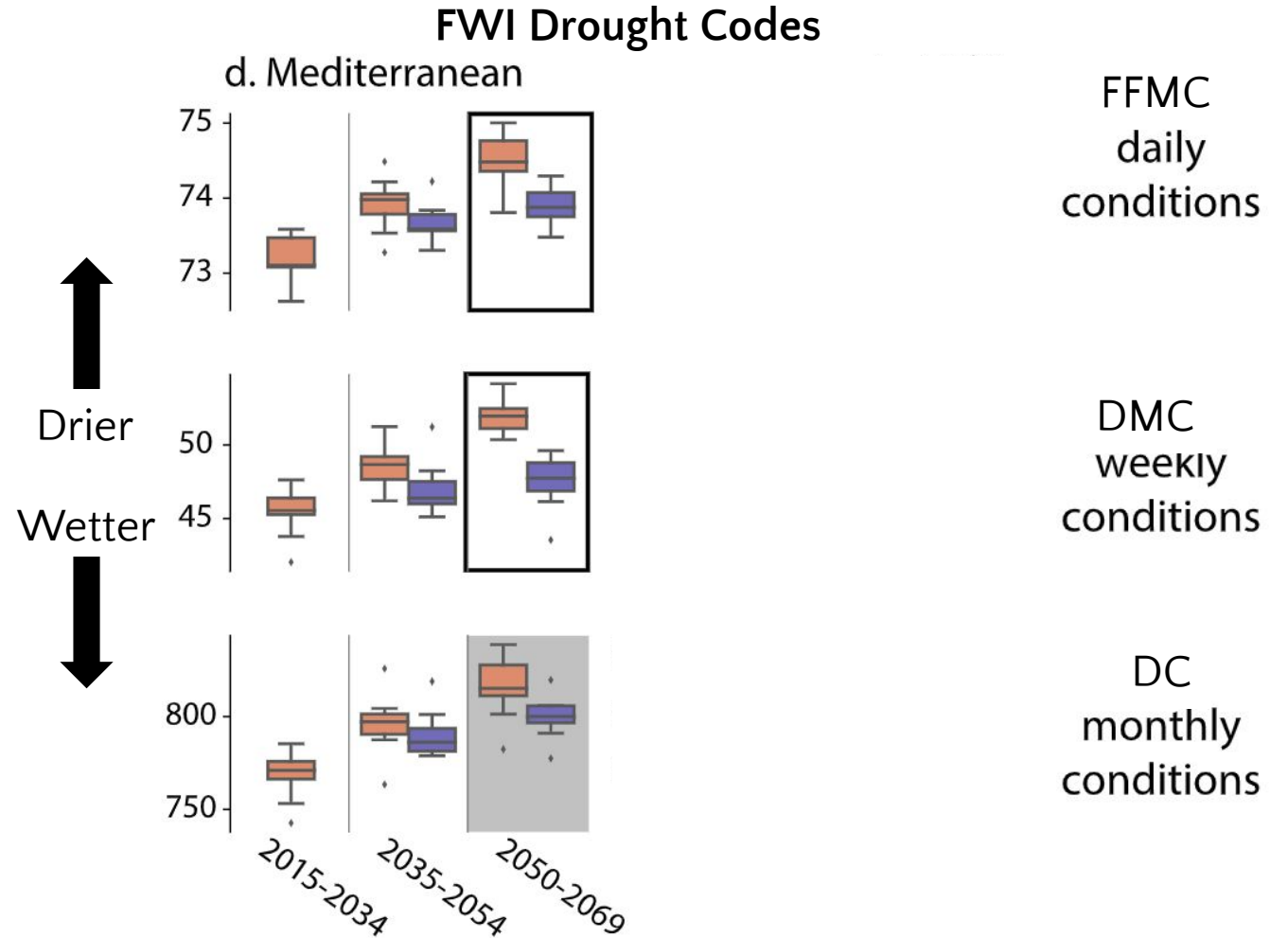
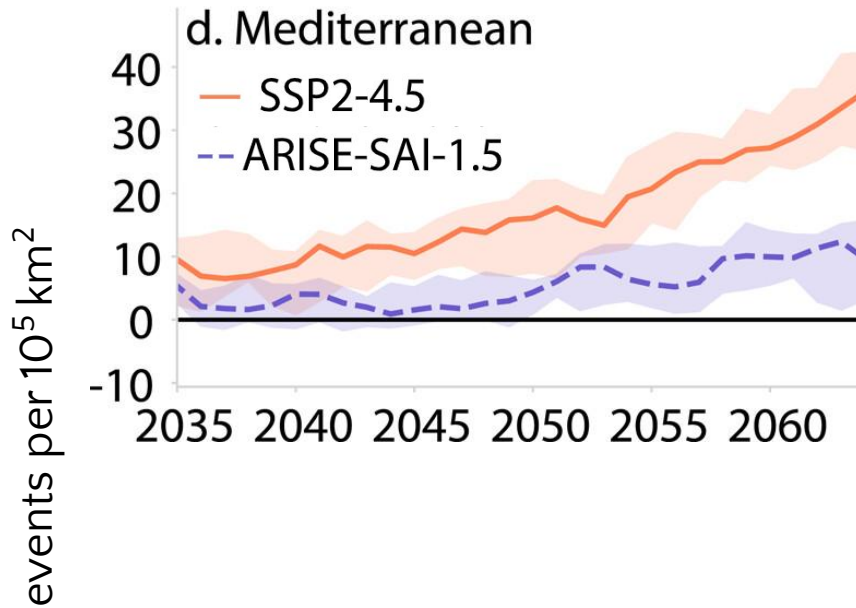
Change in extreme fire weather frequency from 2015-2035





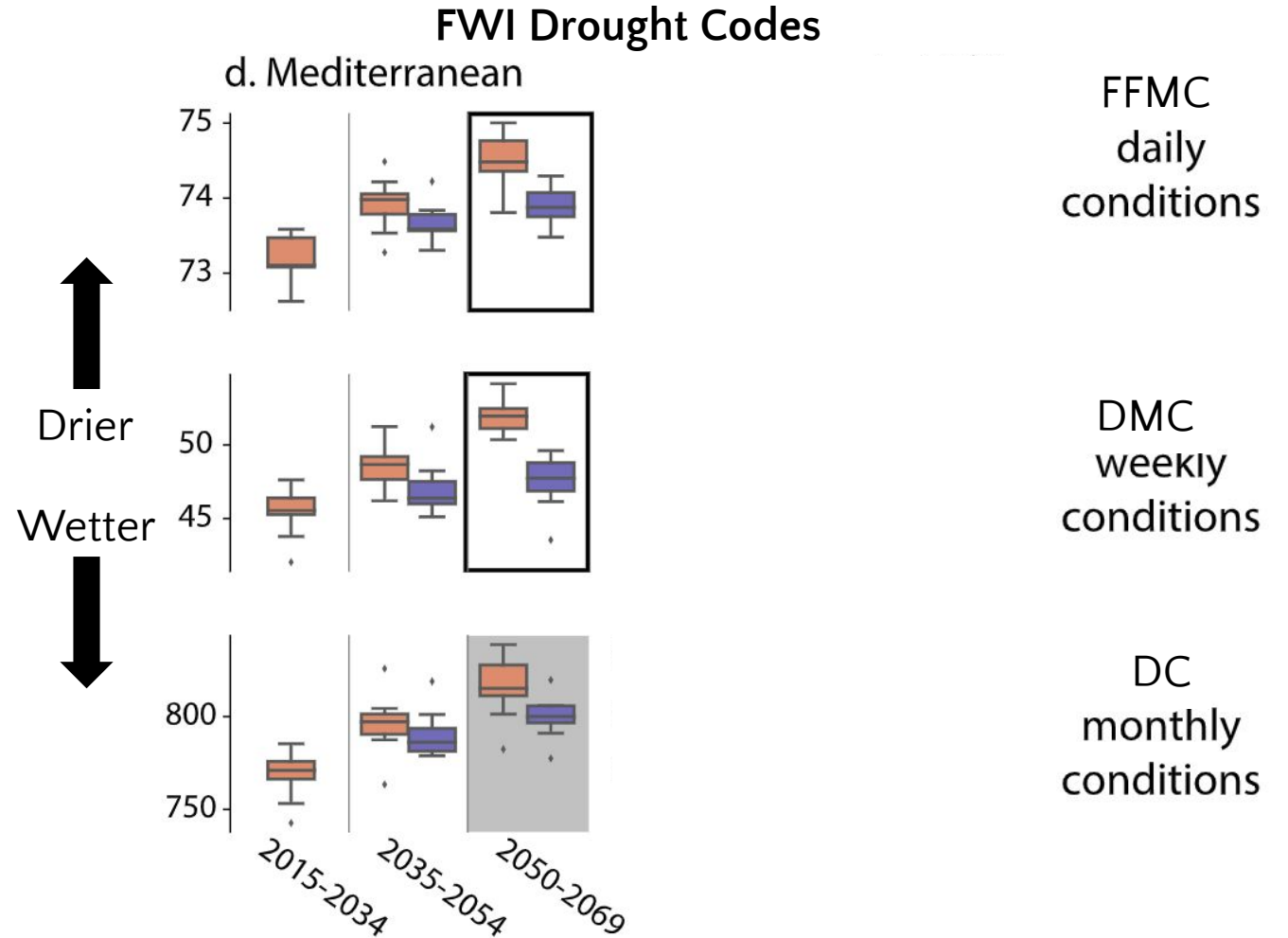
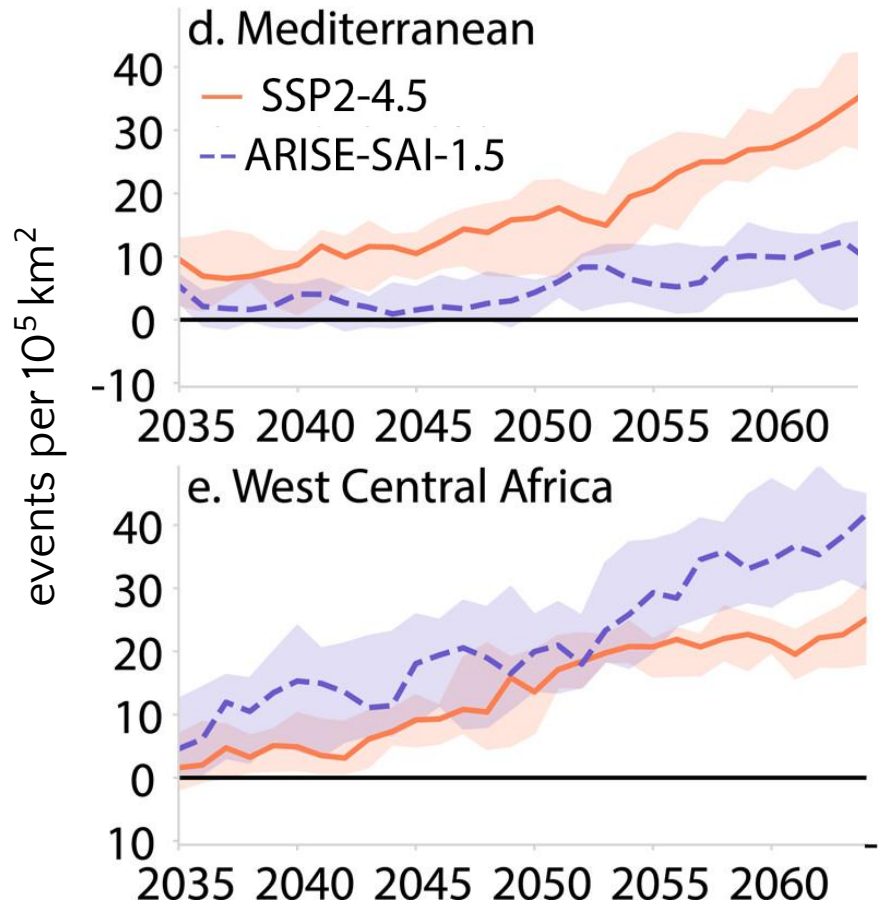
# SAI impact on daily to monthly fire weather conditions

Change in extreme fire weather frequency from 2015-2035



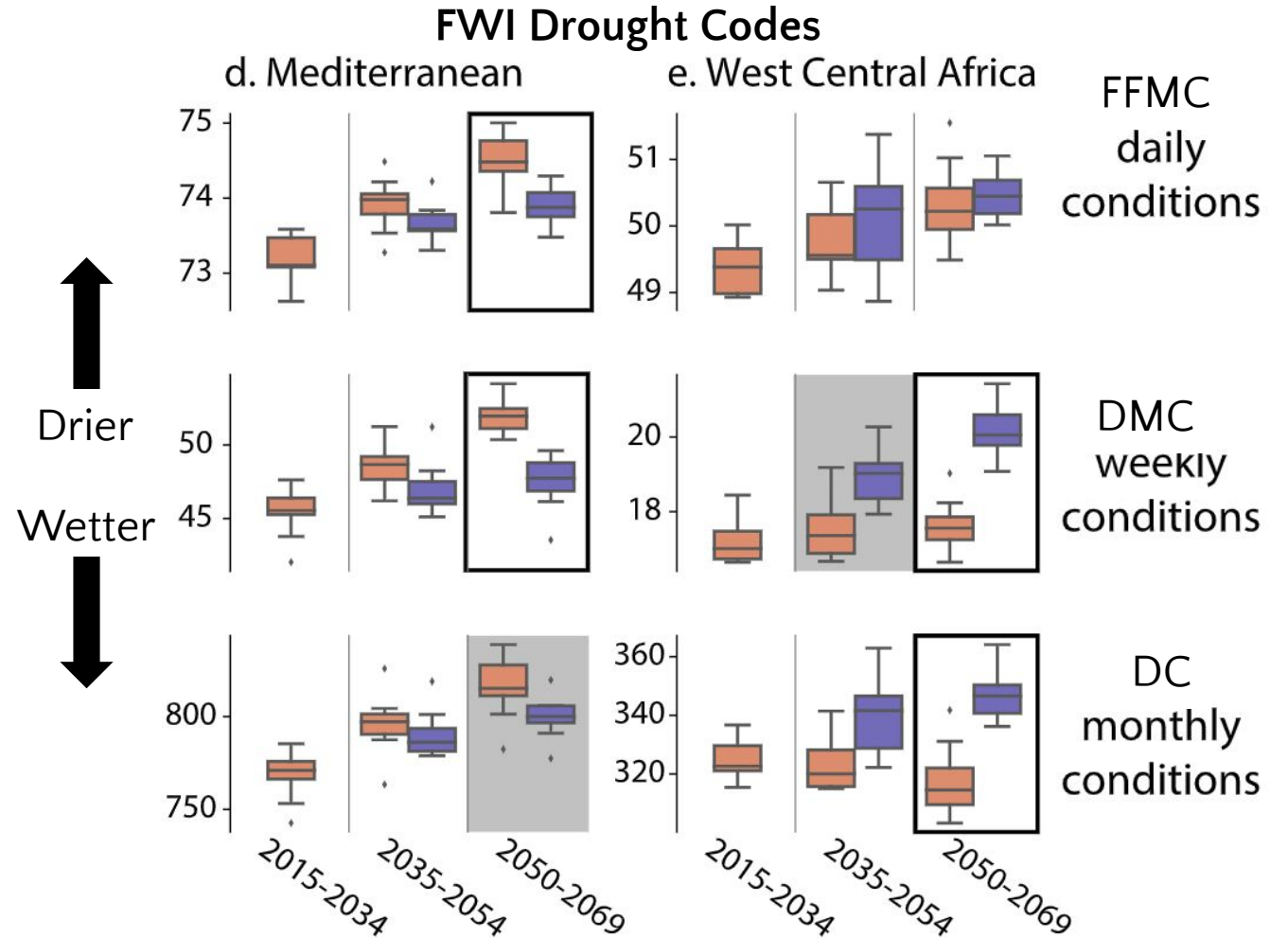
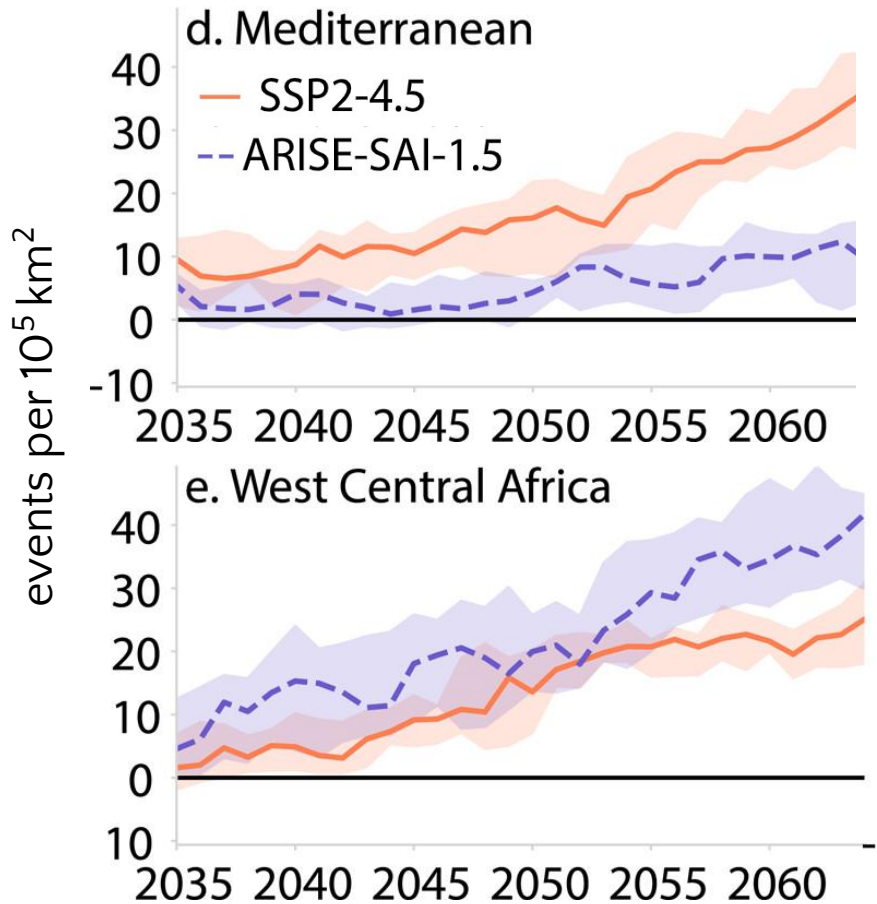
# SAI impact on daily to monthly fire weather conditions

Change in extreme fire weather frequency from 2015-2035



# SAI impact on daily to monthly fire weather conditions

Change in extreme fire weather frequency from 2015-2035





# The impact of stratospheric aerosol injection on extreme fire weather risk

SAI projected to dampen increases in extreme fire weather under warming in many regions

Some regions experience increases in extreme fire weather due to drying on weekly to monthly scales

Impacts of SAI on extreme fire weather vary seasonal and multi-annually

SAI impact of changes in fire fuels and ignition not examined