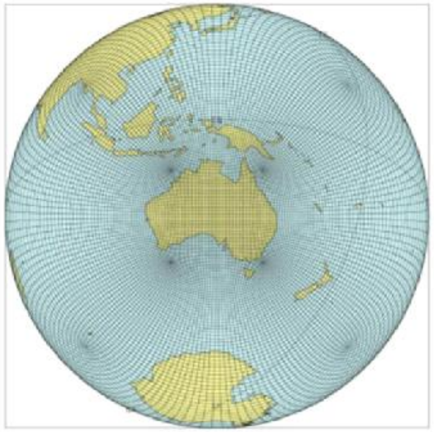


An assessment of the viability of prescribed burning under a changing climate

Bec Harris, Tom Remenyi, Paul Fox-Hughes,
Peter Love, Nathan Bindoff

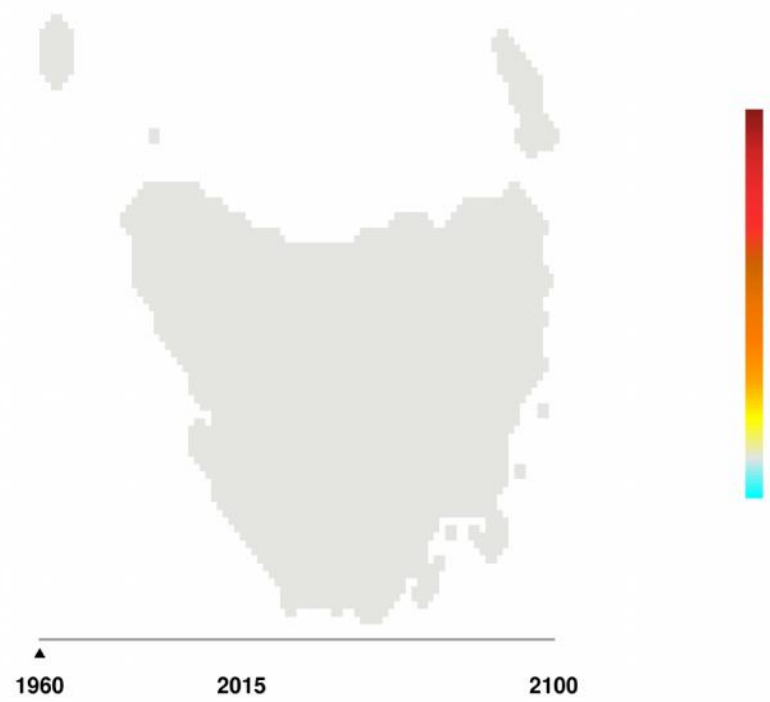
climatefutures

PROJECT BACKGROUND

Fox-Hughes et al 2014 showed:

- a steady increase in fire danger into the future, particularly in spring
- Longer seasons
  - (earlier start, later finish)
- 2081-2100
  - Double the danger over twice the area.

Annual cummulative Forest Fire Danger Index

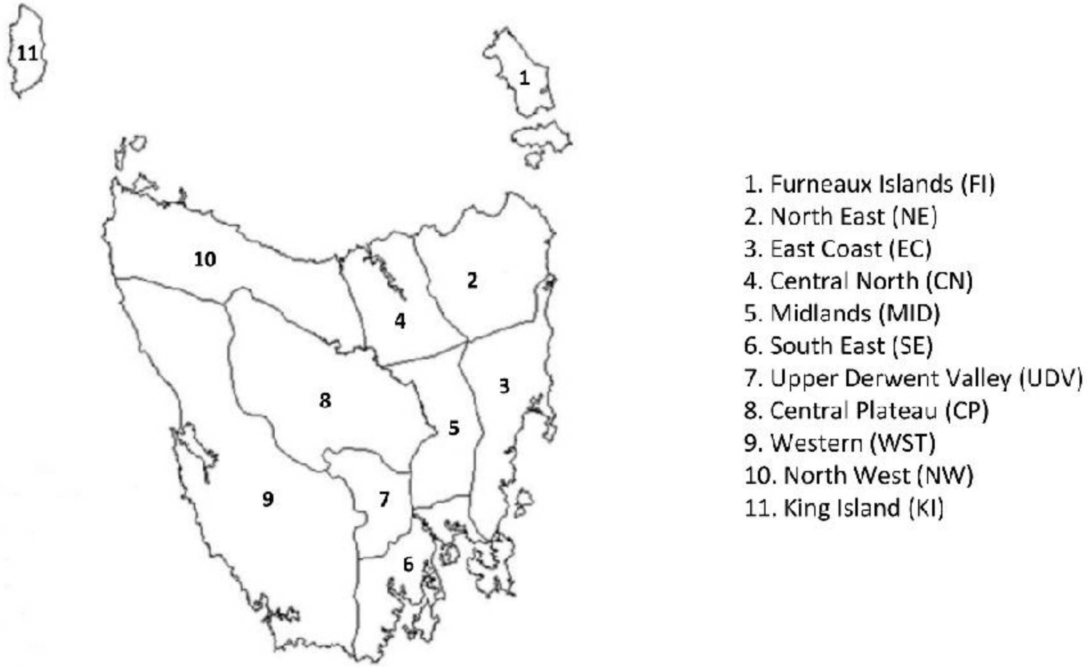


What are the consequences for prescribed burning as a management tool in the future?

OBJECTIVE: Assess prescribed burning variables

Statewide and district summaries of:

- Temperature (Tmin, Tmax)
- Rainfall
- Relative humidity (minimum)
- Soil Dryness Index
- Drought Factor
- Fire Danger Index (FFDI, MFDI)
- C-Haines
- Wind Speed and Direction



Bureau of Meteorology weather forecast districts

Changes to seasonal values between current and future time periods (1961-1980; 1981-2000; 2001-2020; 2021-2040; 2041-2060; 2081-2100)

Changes to monthly values between current and future time periods

PROJECT FINDINGS

Conditions suitable for prescribed burning are less frequent into the future.

Because:

- Temperature is expected to increase.
- Rainfall is expected to stay steady, or slightly decrease.
- Dryness is expected to increase significantly, increasing the risks when burning.

Consequence

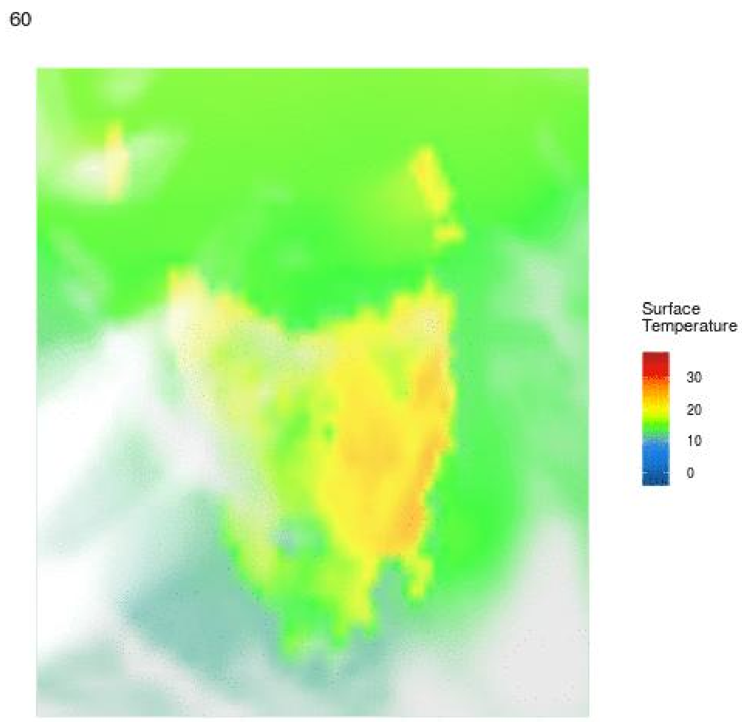
Alternative management tools will be needed to complement prescribed burning as a bushfire mitigation strategy

Funded by: National Bushfire Mitigation – Tasmanian Grants Program

Climate Futures Team: our methods

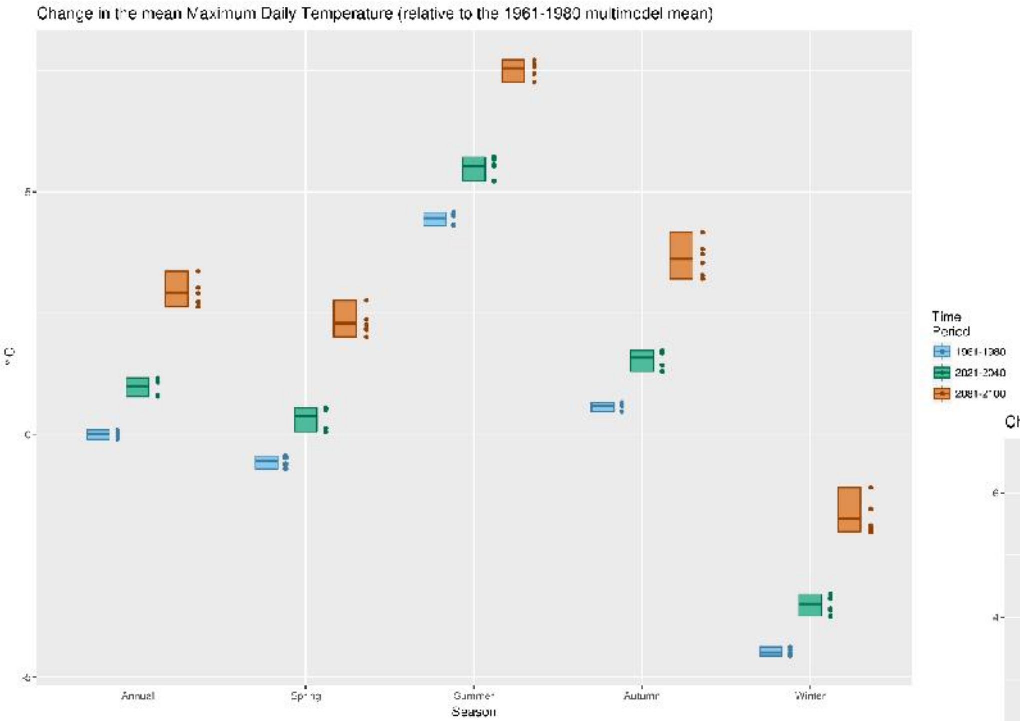
Conformal Cubic Atmospheric Model (CCAM)

- Regional Climate Model developed by CSIRO (now open source)
- Fully dynamic, 4D simulation of the climate system (i.e. lon, lat, elevation, time)
- ~10 km over Tasmania
- ~5 km resolution over the Australian Alps

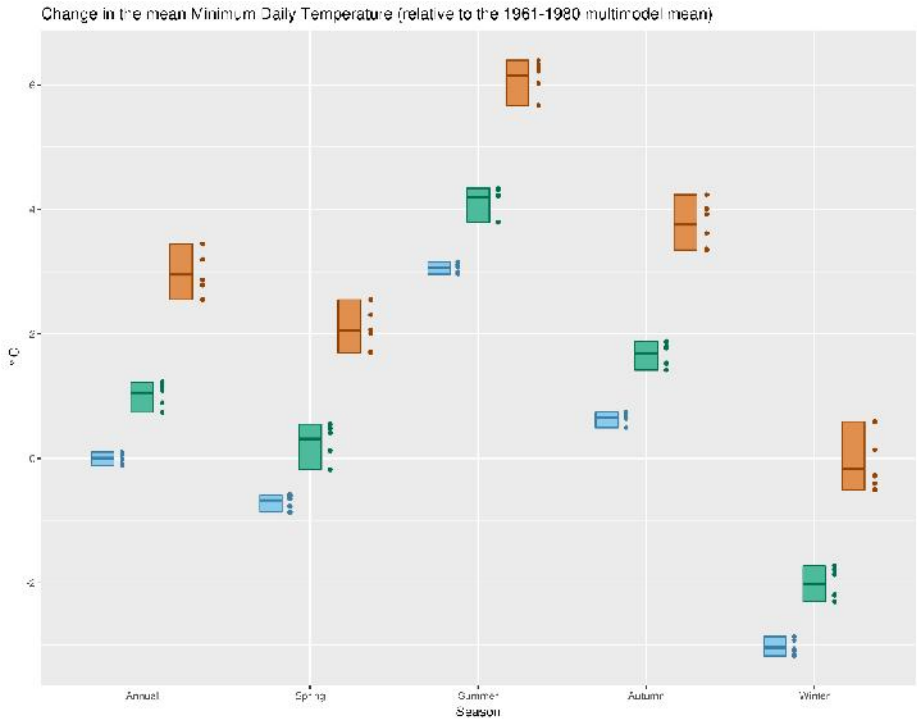


Surface Temperature with overlying cloud at low, medium and high levels, presented at hourly time steps.

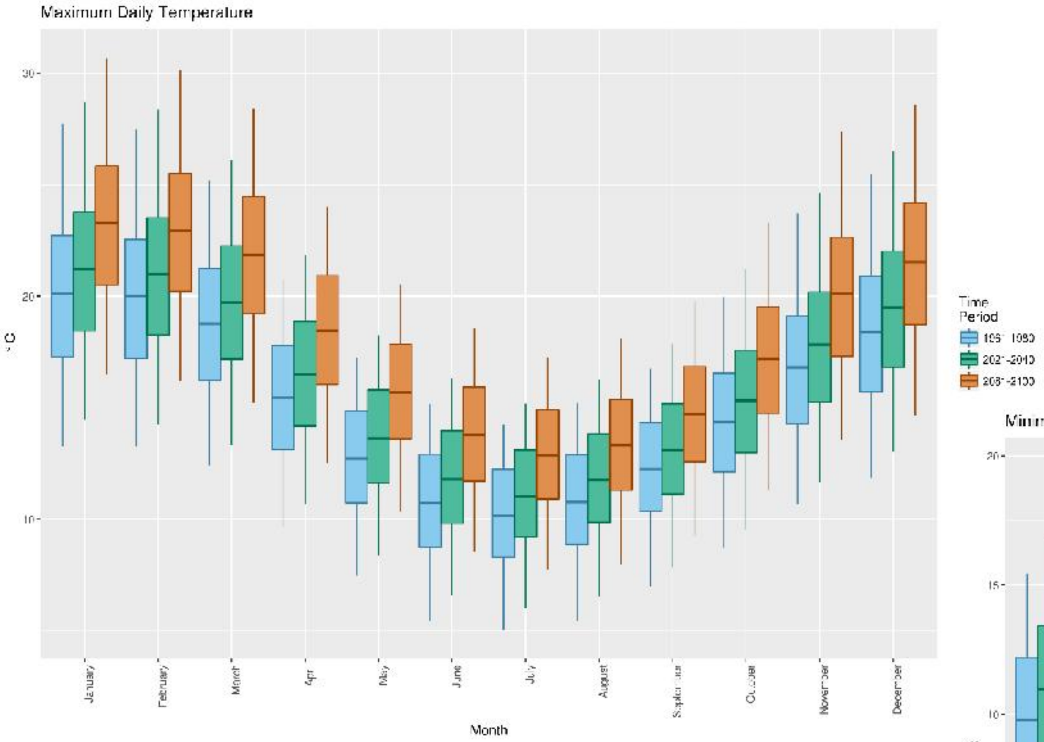
TEMPERATURE CHANGE

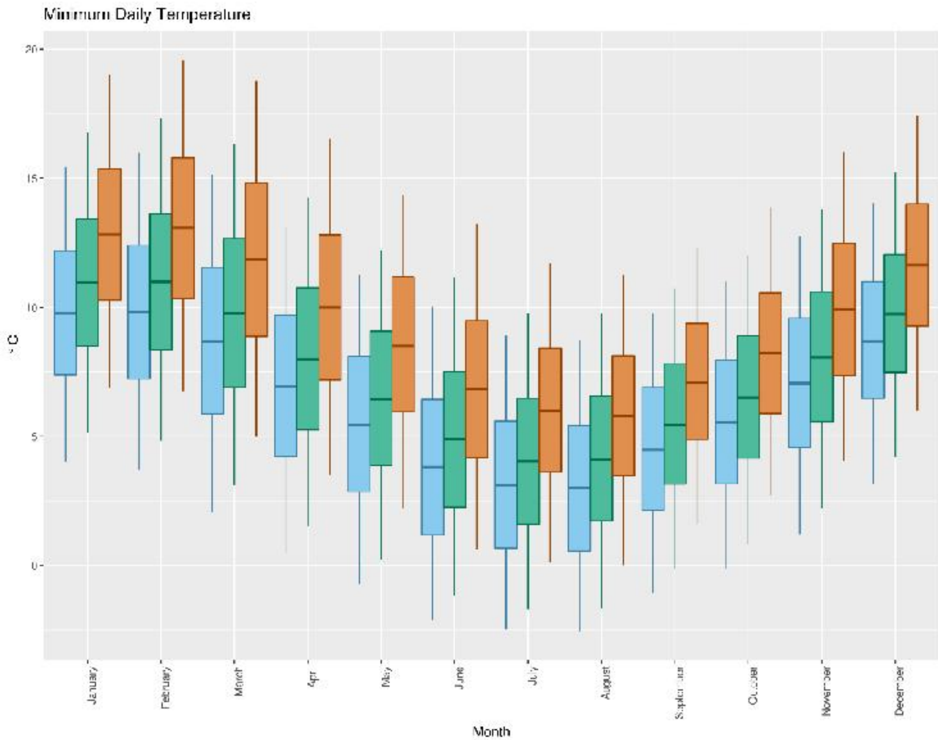


Mean of six climate models. The box indicates the interquartile range, the bar shows the mean, and the dots show the mean of each climate model.



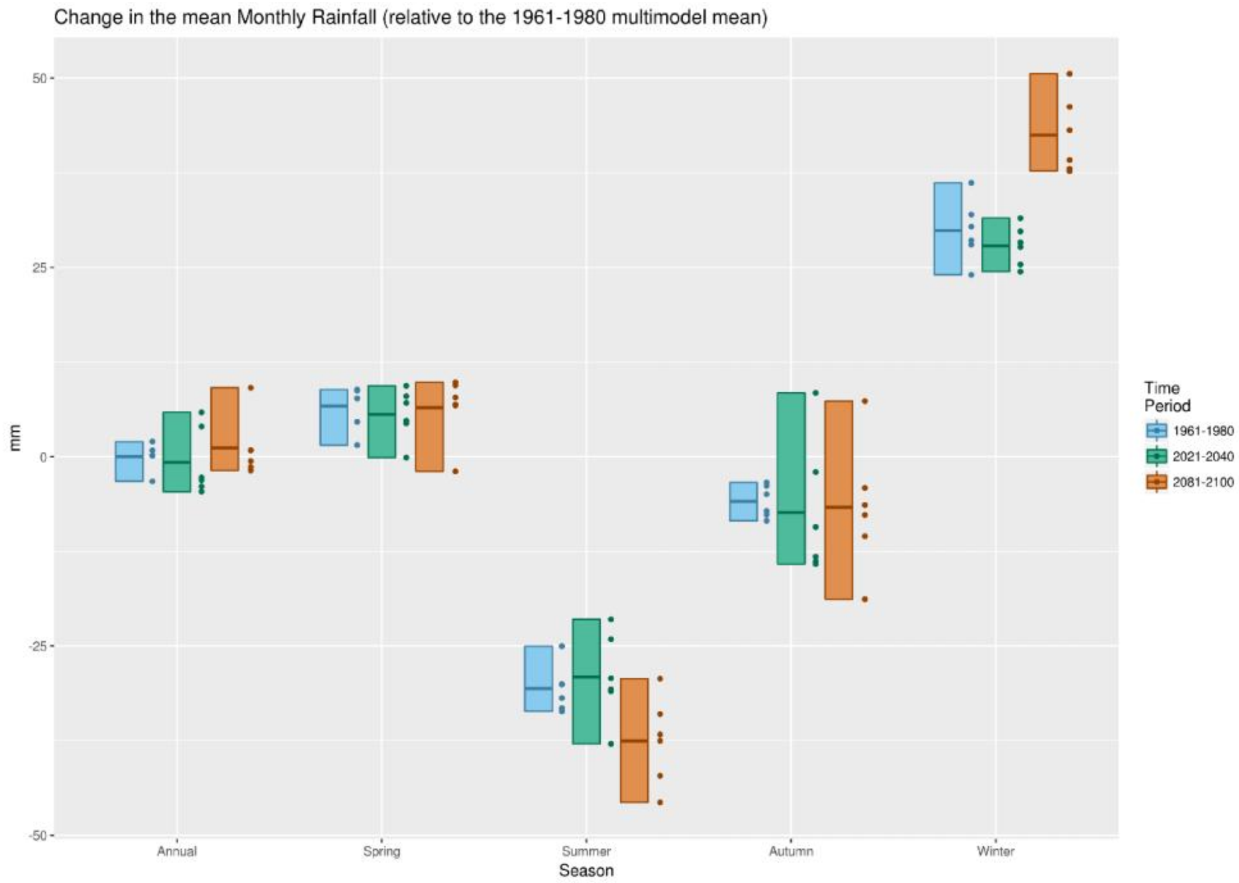
MONTHLY TEMPERATURE





Mean of six climate models. The box indicates the interquartile range, the bar shows the mean, and the whiskers extend up to 95th percentile, and down to the 5th percentile.

RAINFALL CHANGE



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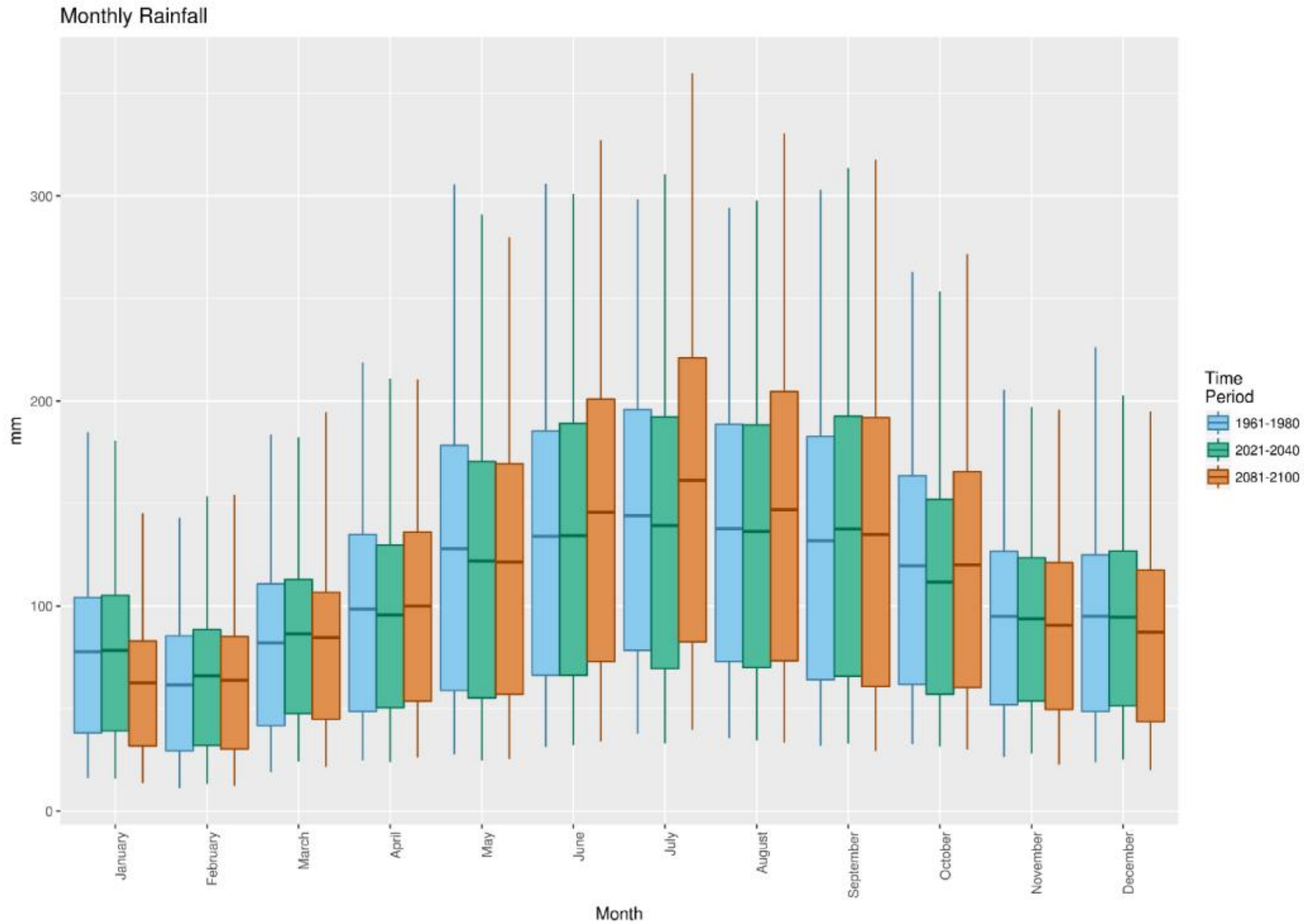
MONTHLY RAINFALL



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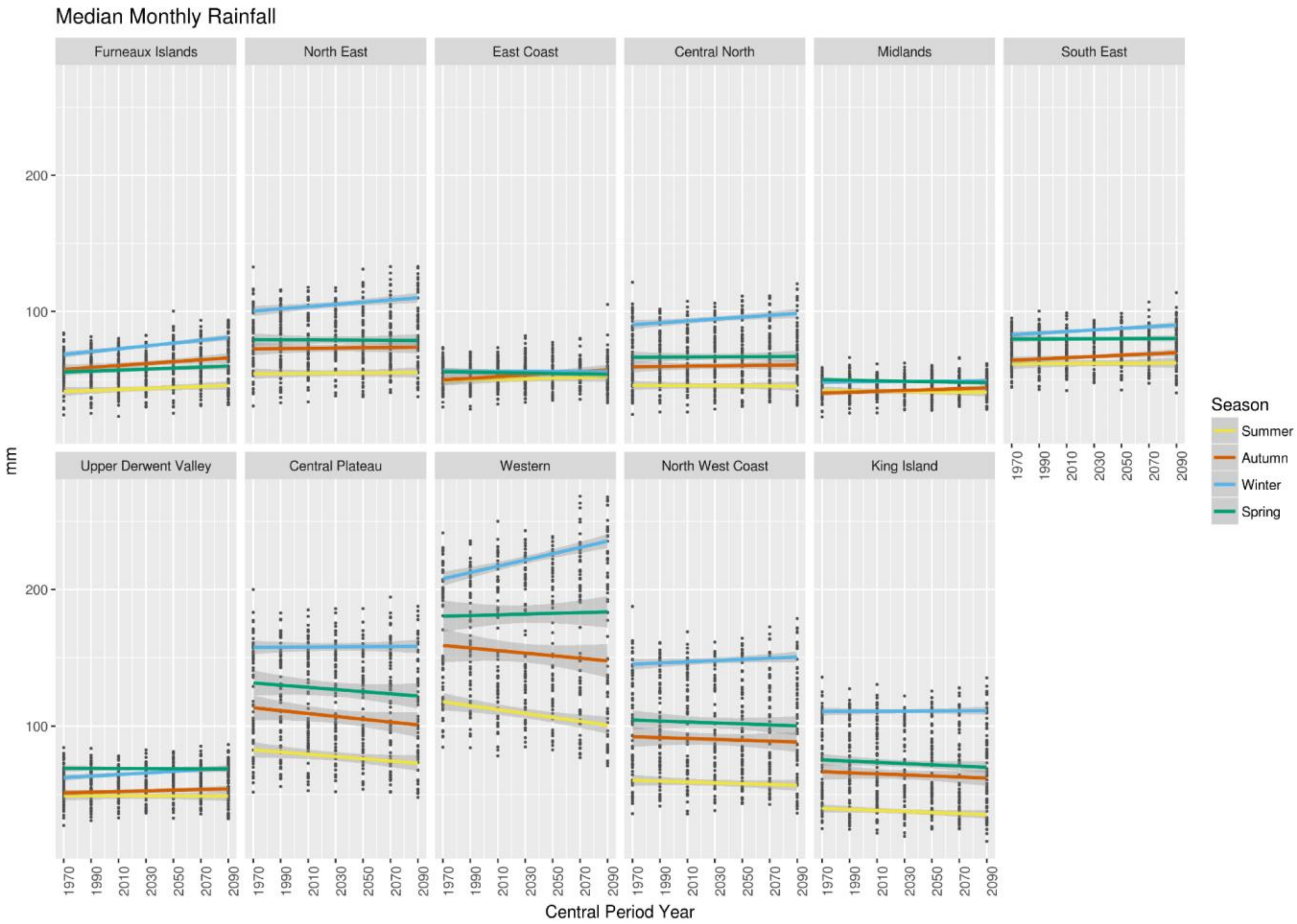
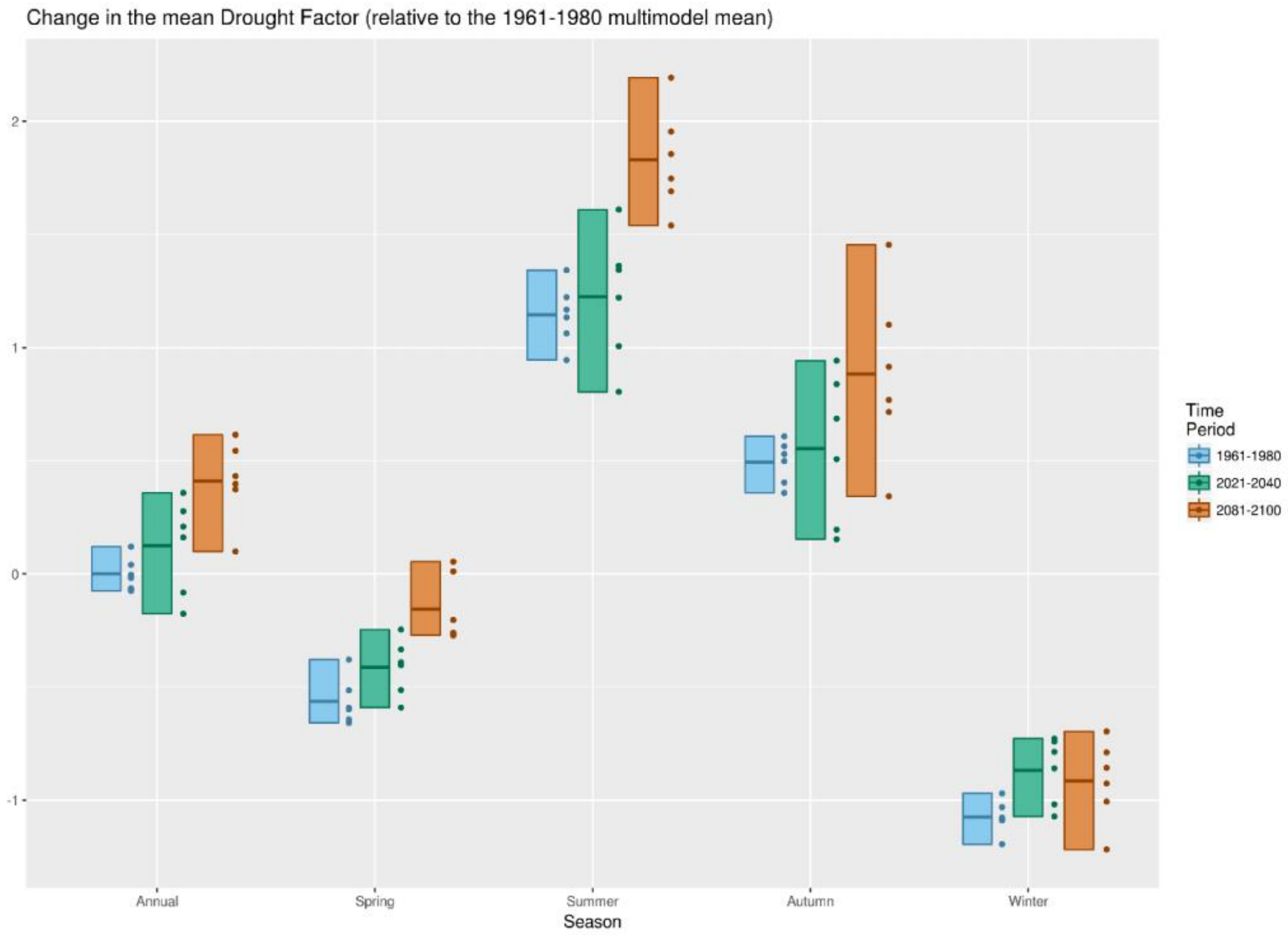


Median Monthly Rainfall
Furneaux Islands
North East
East Coast
Central North
Midlands
South East
Upper Derwent Valley
Central Plateau
Western
North West Coast
King Island
mm
200
100
1970
1990
2010
2030
2050
2070
2090
Central Period Year
Season
Summer
Autumn
Winter
Spring

DROUGHT FACTOR CHANGE



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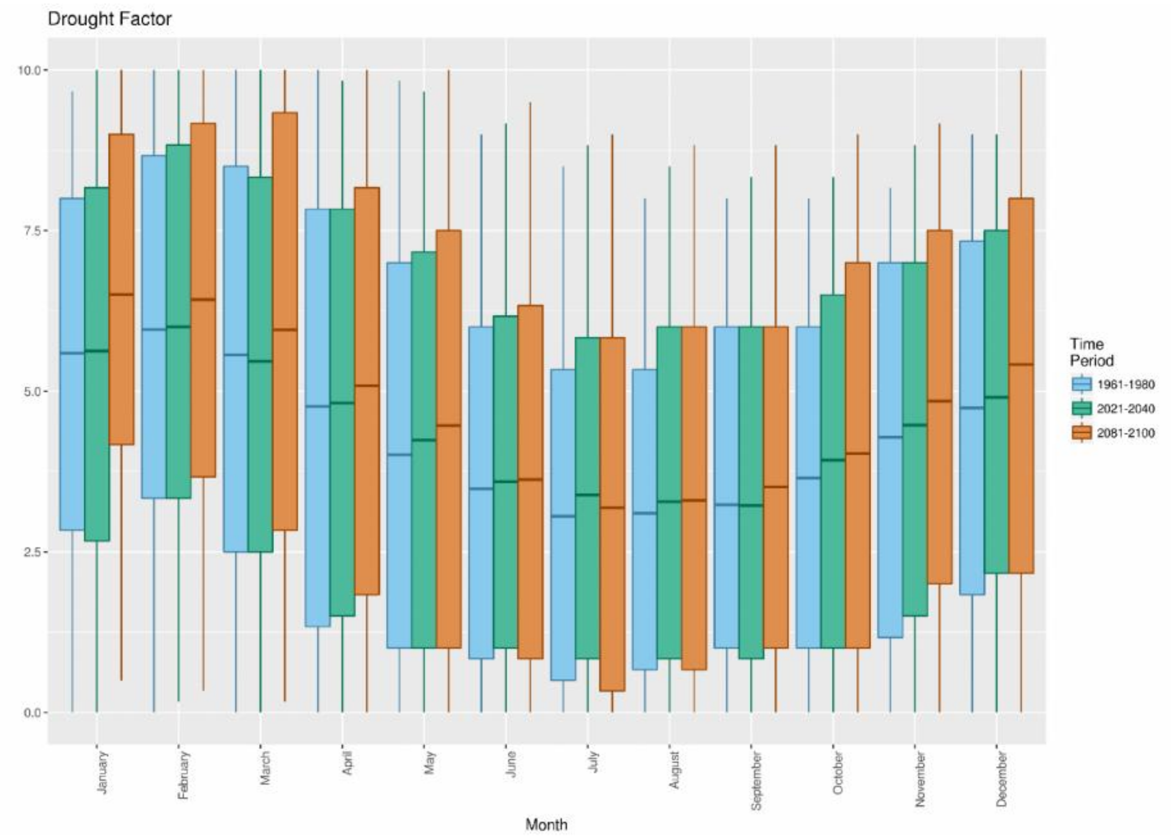
MONTHLY DROUGHT FACTOR



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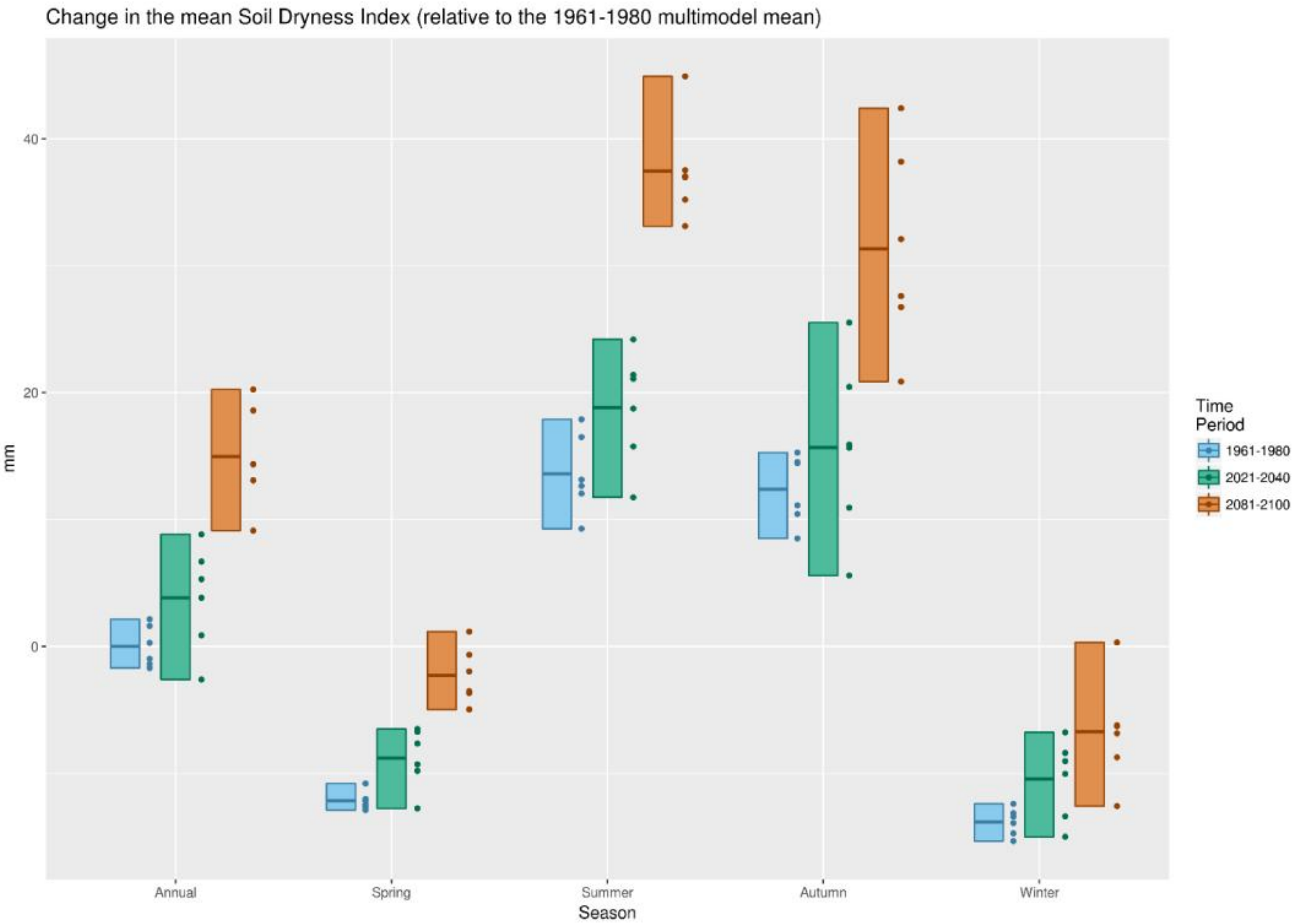
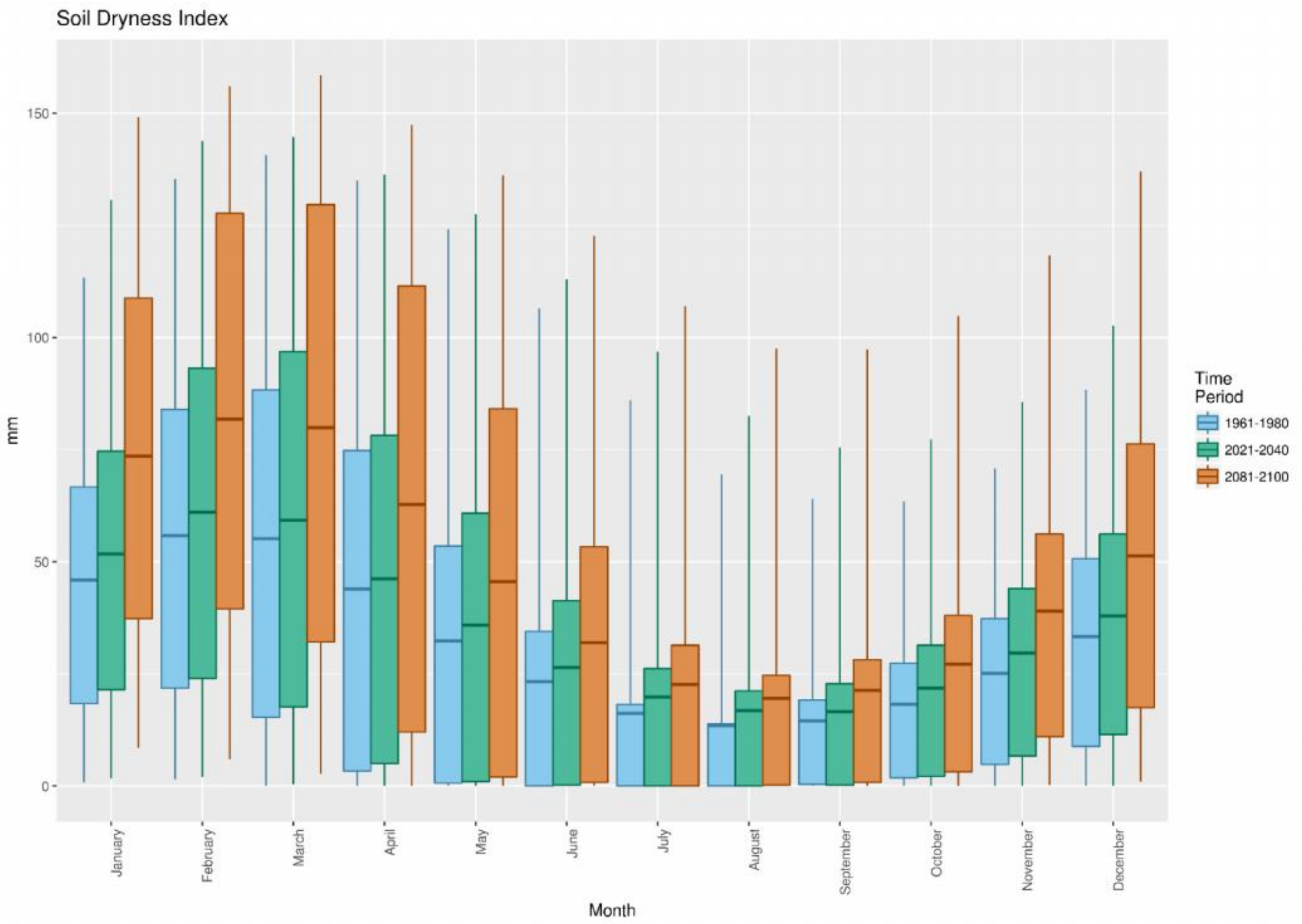
SOIL DRYNESS CHANGE



Mean of six climate models. The box indicates the interquartile range, the bar shows the mean, and the dots show the mean of each climate model.

MONTHLY SOIL DRYNESS INDEX



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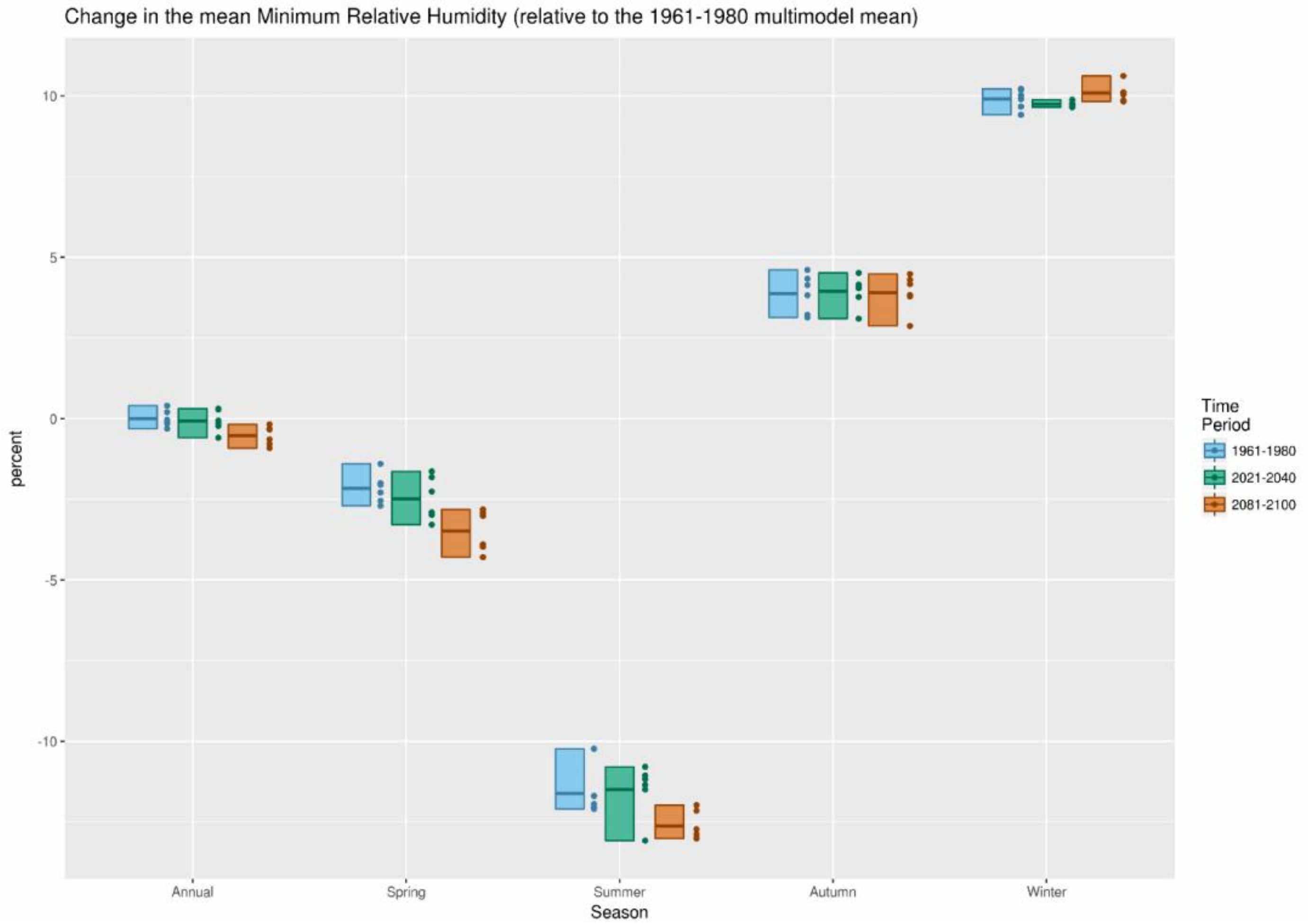
HUMIDITY CHANGE



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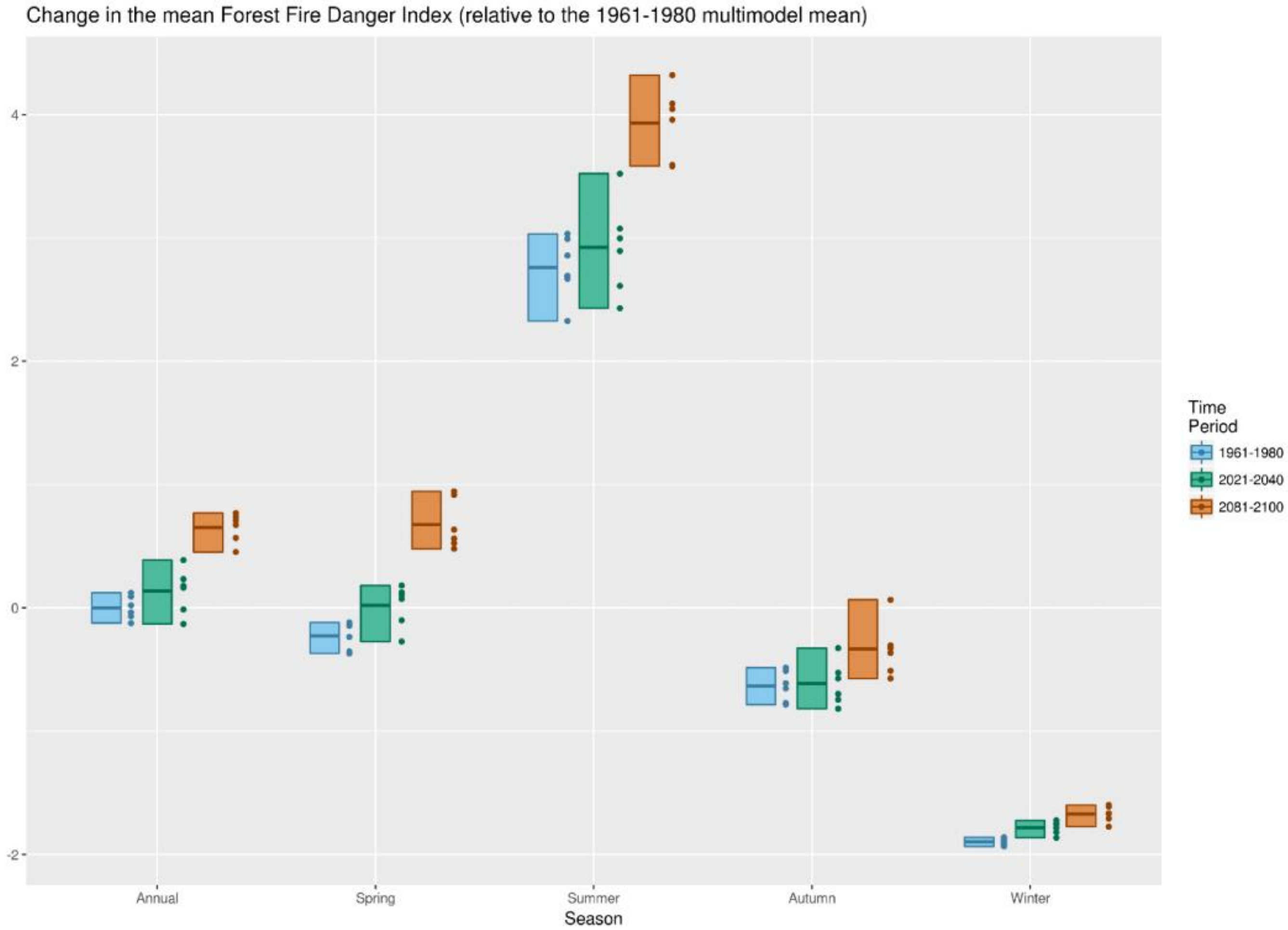
FFDI CHANGE



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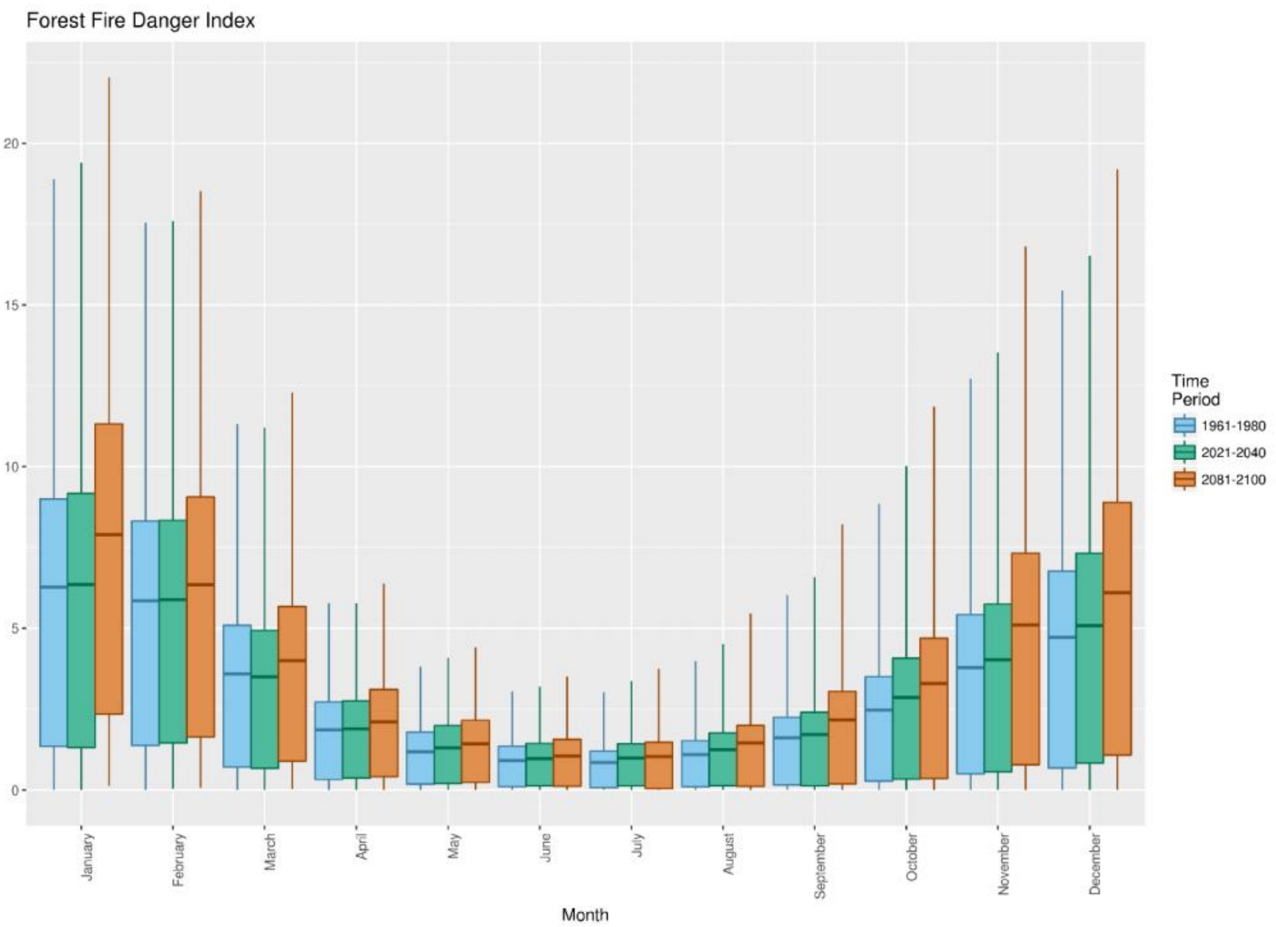
MONTHLY FFDI



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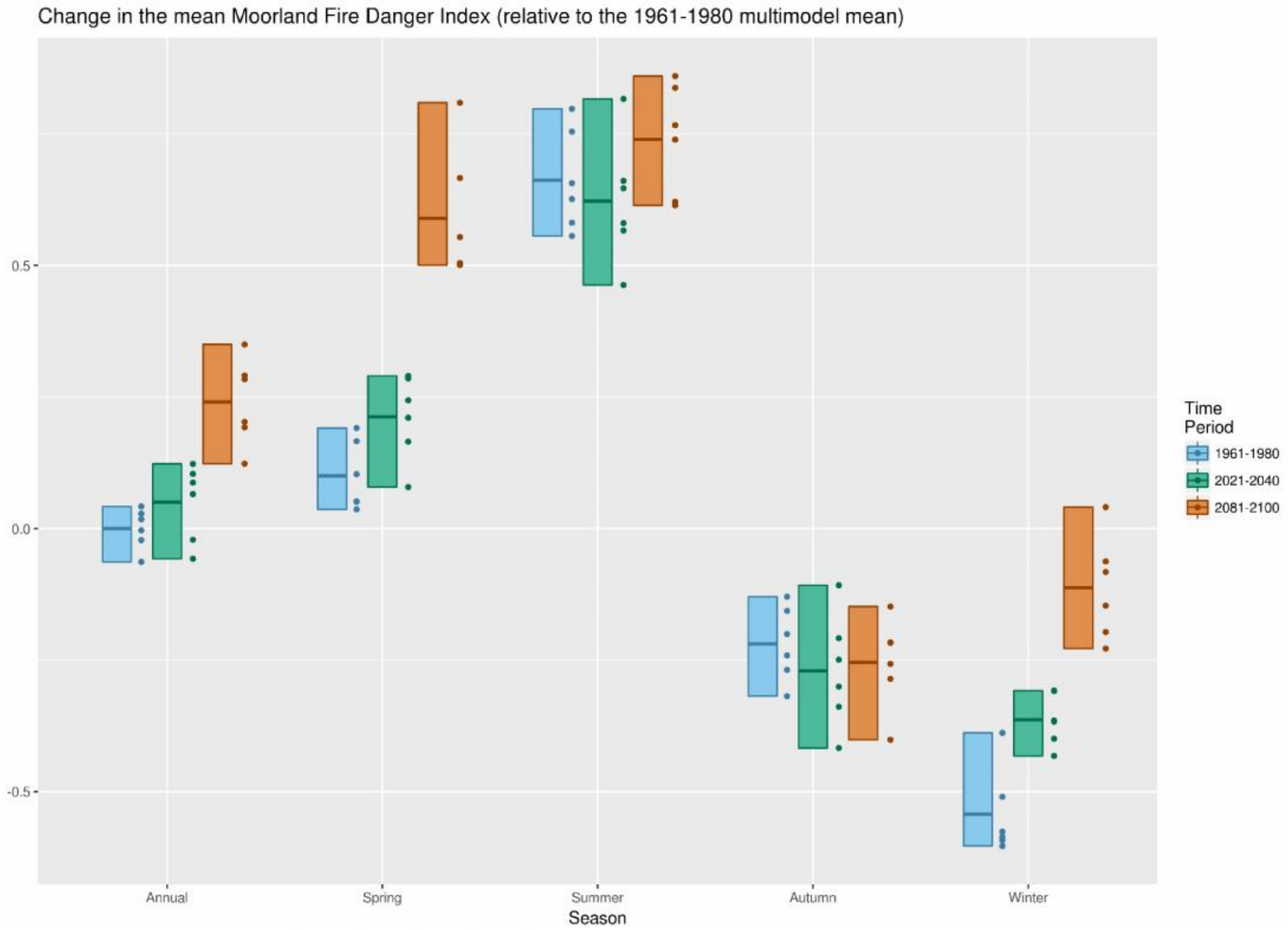
MFDI CHANGE



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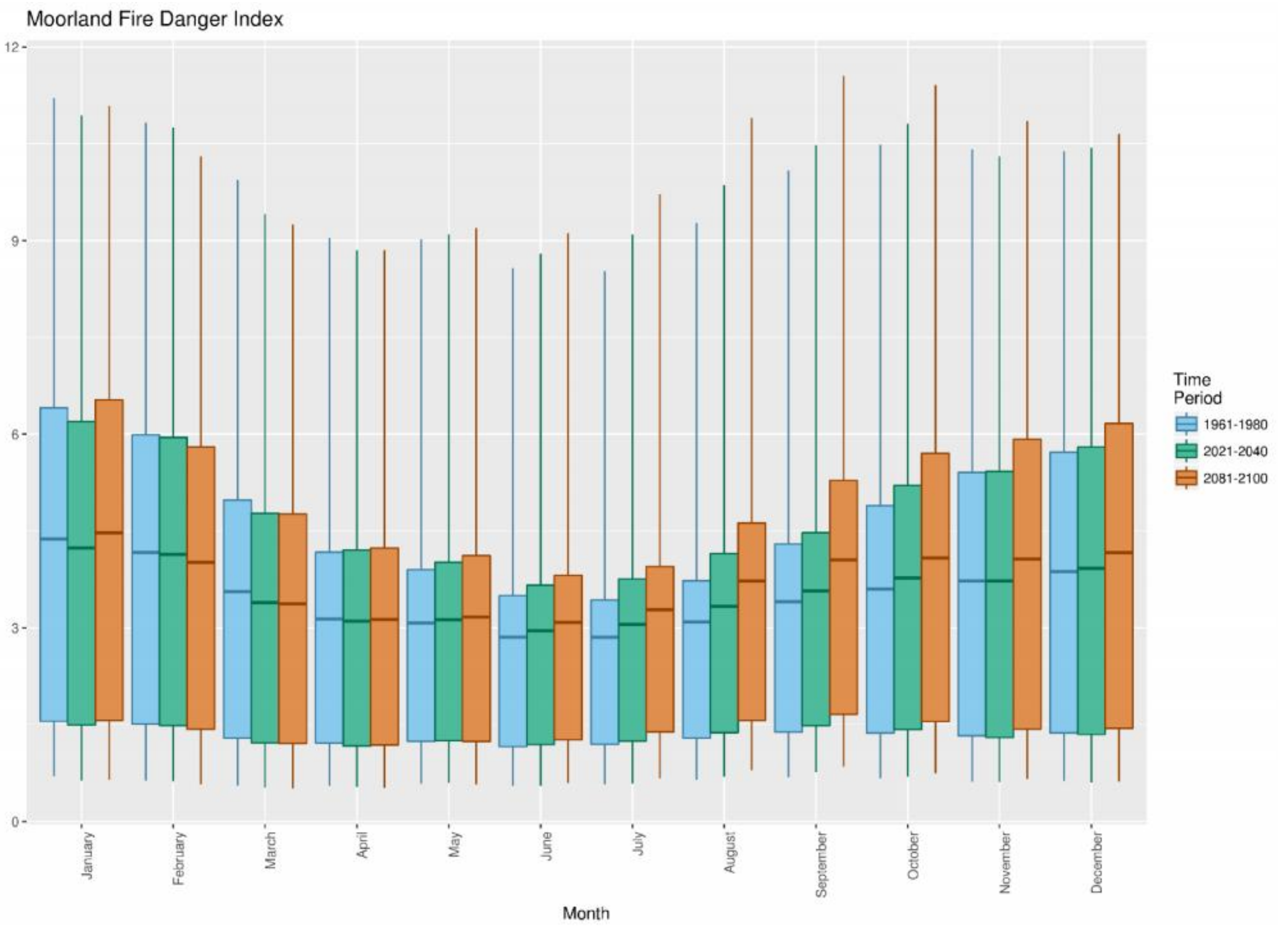
MONTHLY MFDI



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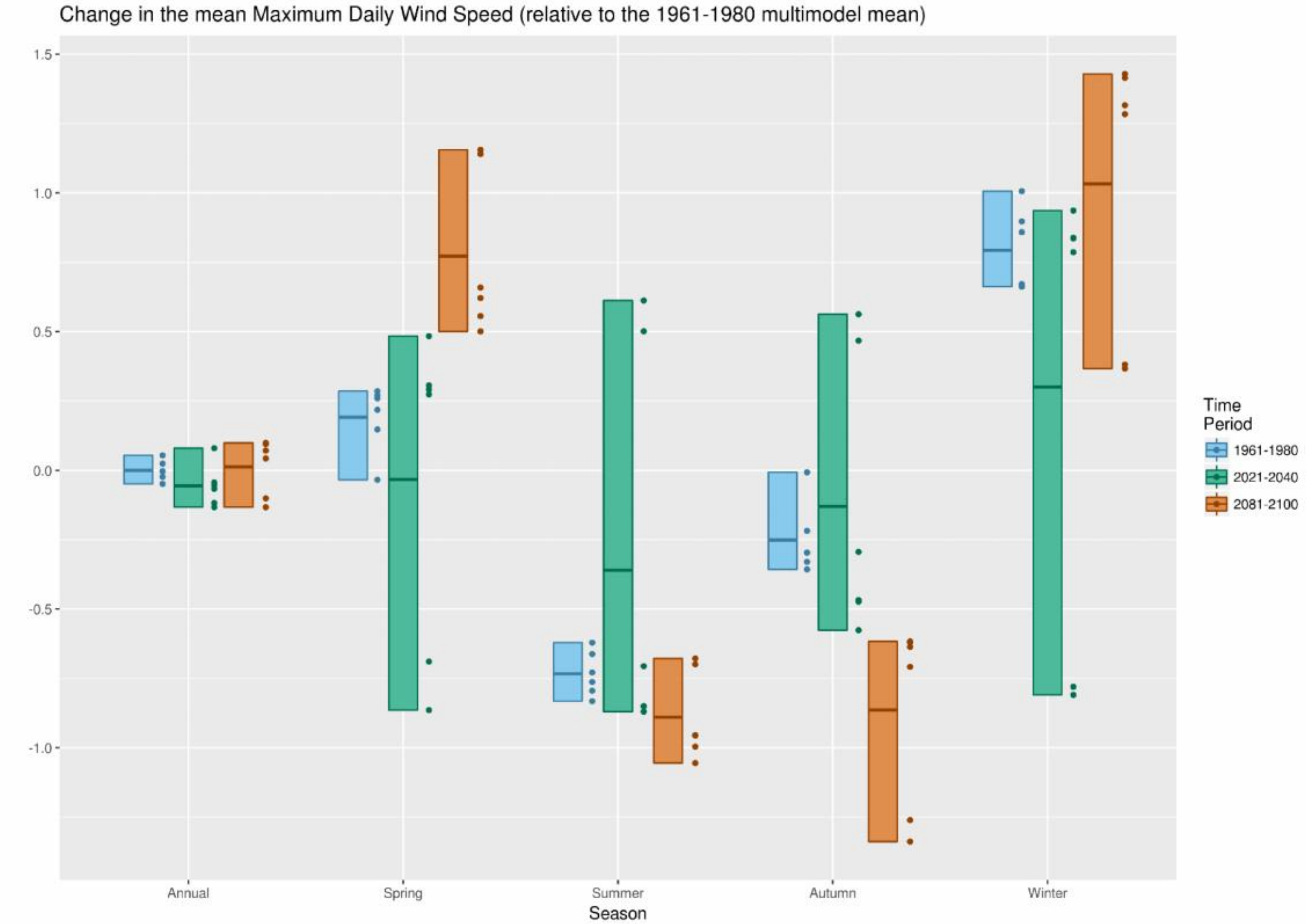
WIND SPEED CHANGE



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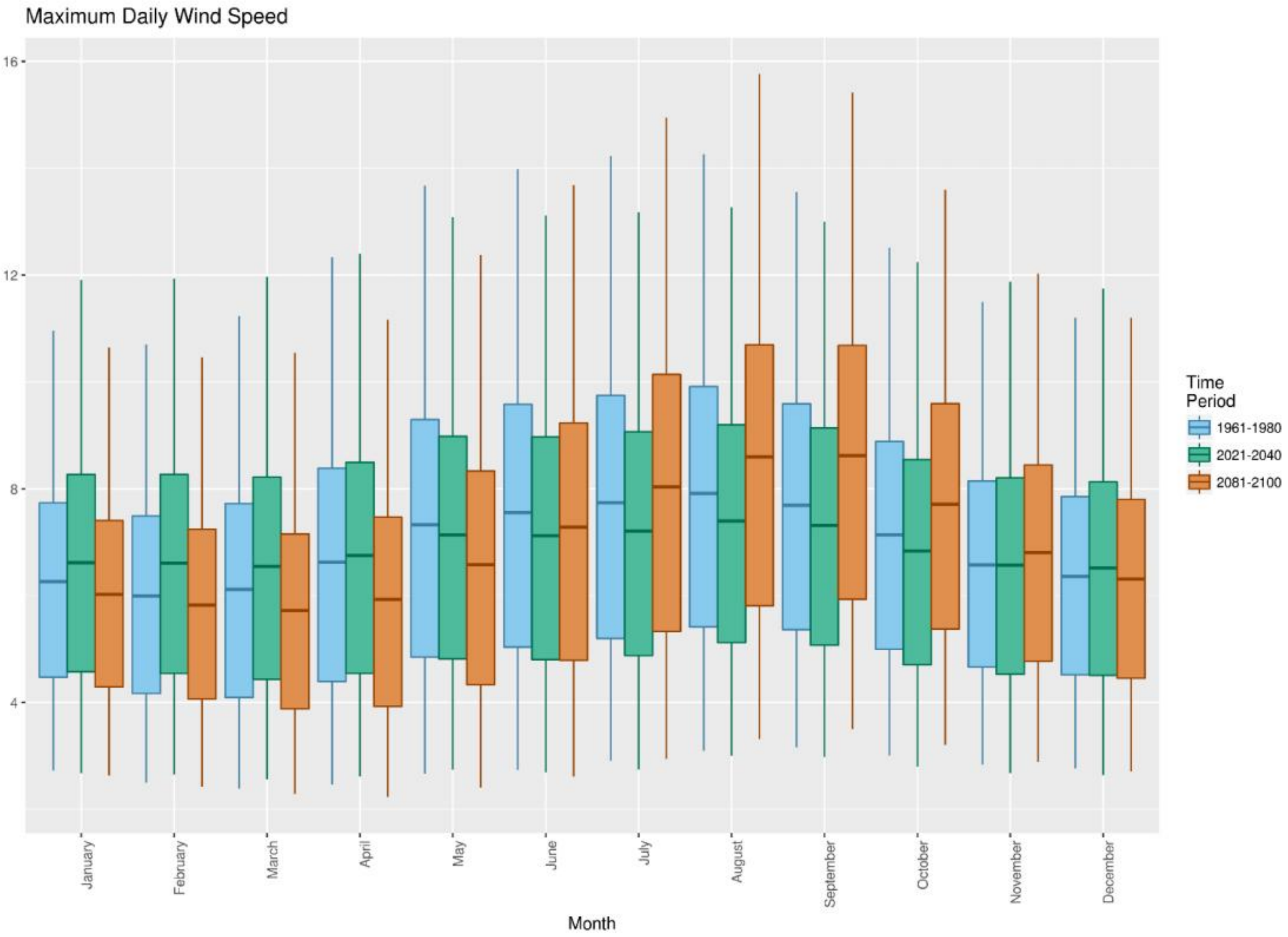
MONTHLY WIND SPEED



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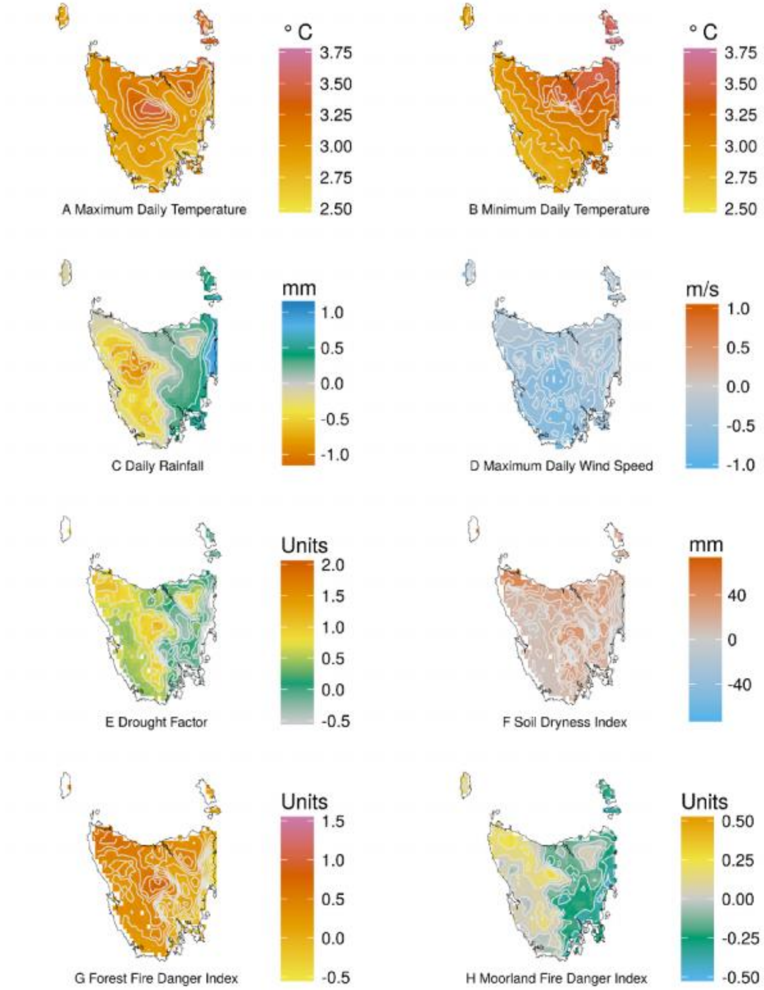
Spatial variability of change in climate variables for the autumn period

- Change by 2081-2100, relative to the baseline period (1961-1980).
- Regional differences projected across the state,
- Strong West to East gradient of moisture related variables (i.e. Daily Rainfall, DF, SDI, MFDI).



Implications for prescribed burning as a management tool into the future

- As the frequency of warmer and drier conditions increases in autumn and spring across Tasmania, increases the likelihood that fires will burn with faster rates of spread, higher intensities and a higher risk of escape than under current conditions

- Fewer opportunities to safely conduct prescribed burning
  - 2021-2040 Becomes evident
  - 2081-2100 Substanital changes expected

- More winter burning may be needed
  - (resource/training implications)

- Improve the understanding of fire behavior during prescribed burning

- Investigate different prescribed burning practices

  - Utilizing finer scale weather forecasting to support operational activities

  - Mechanical removal of fuels and the maintenance of fire breaks by grazing.

SUMMARY

- Temperatures follow a gradual and predictable increase, consistent across seasons
- Other variables show strong spatial and seasonal variability
- Rainfall projections show a range of plausible futures (although model agreement is high in some districts)
- Spring and Autumn - Increases in Fire Danger are projected, with very large increases in Spring MFDI
- Projected changes to Soil Dryness, Drought Factor may restrict opportunities for prescribed burning in Spring and Autumn
- Limited opportunity for prescribed burning in the future suggests the need to investigate alternative strategies

Thanks for your attention