



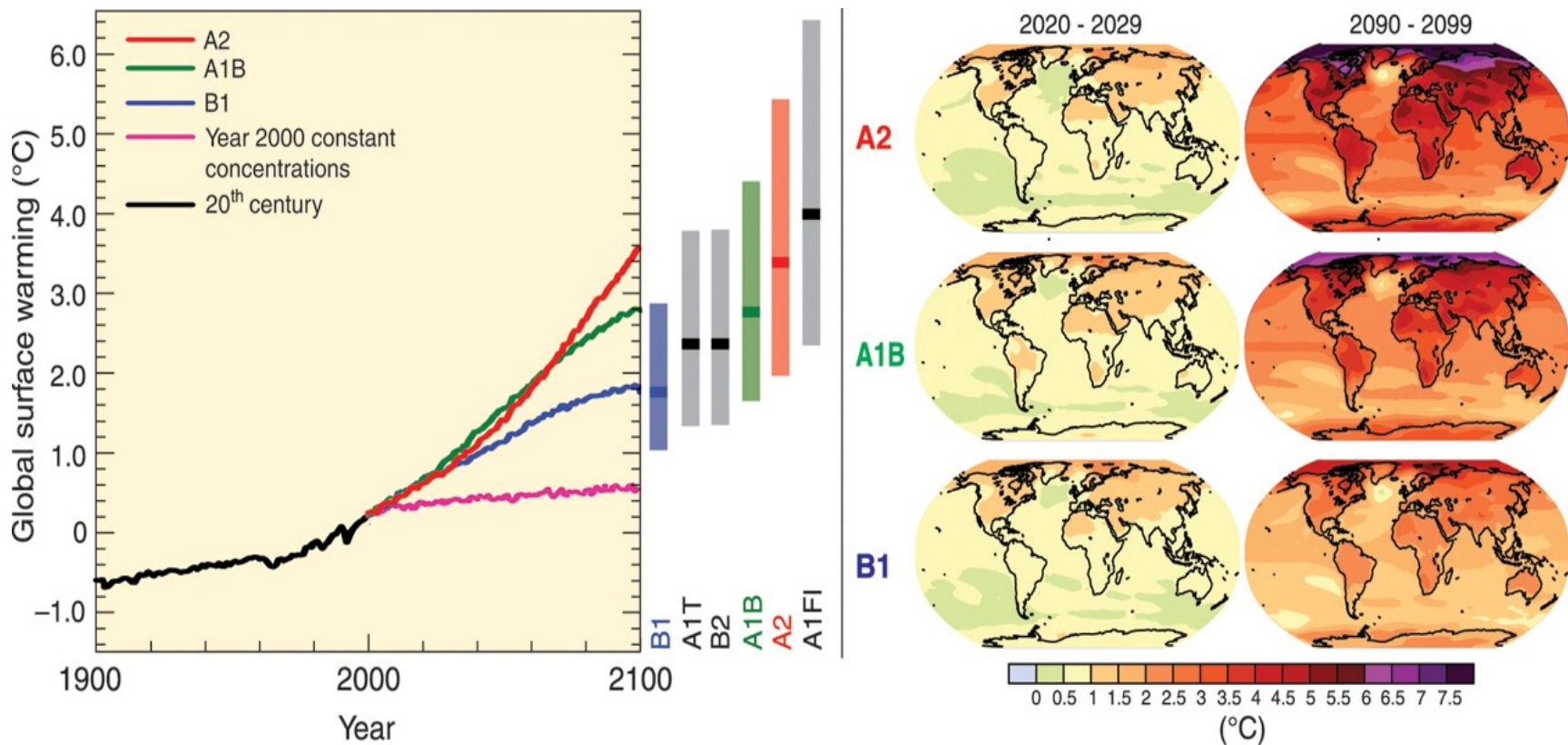
Tony Press



ANTARCTIC CLIMATE
& ECOSYSTEMS CRC

www.acecrc.org.au

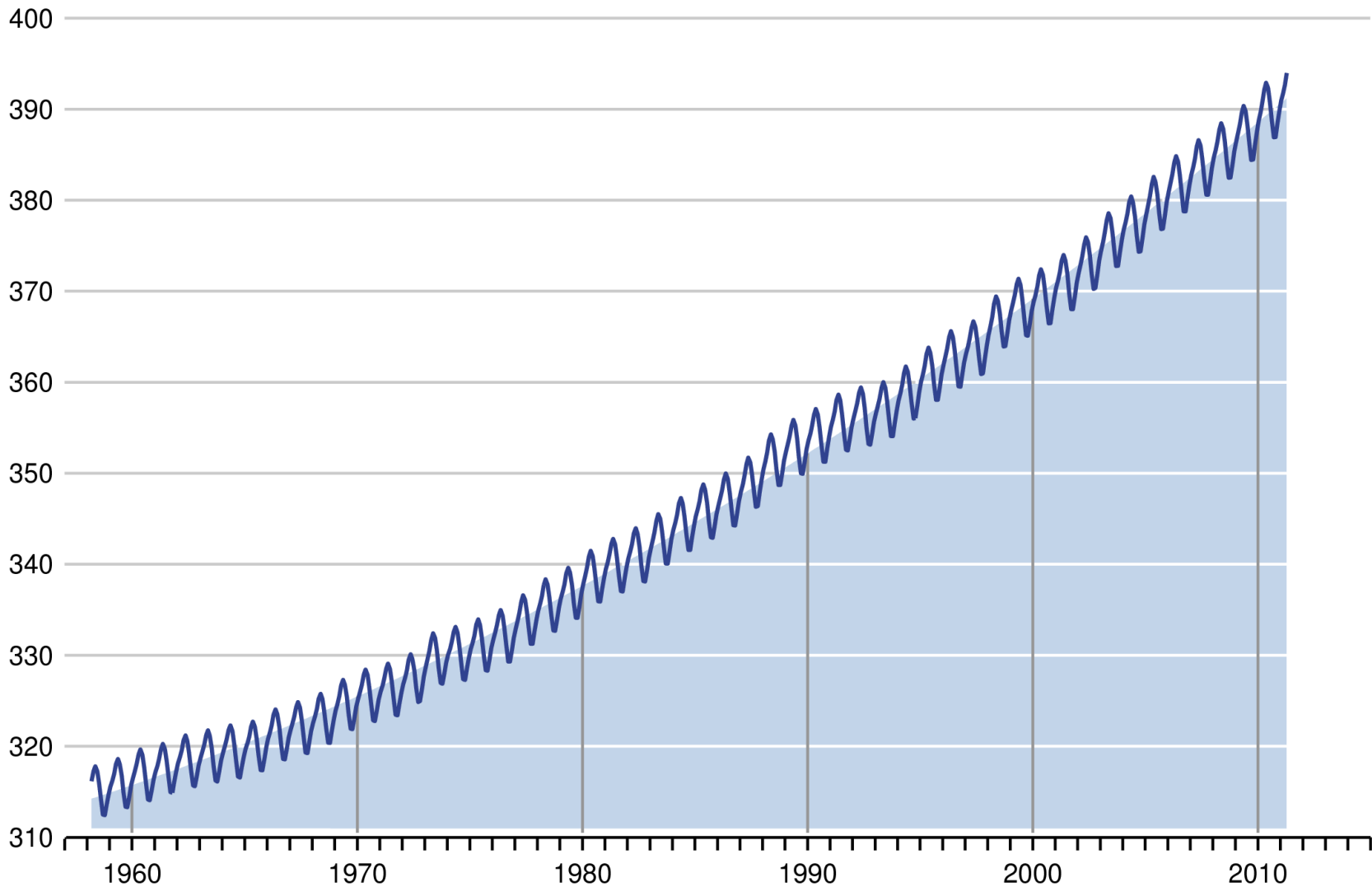
Projections of Global Temperature Change



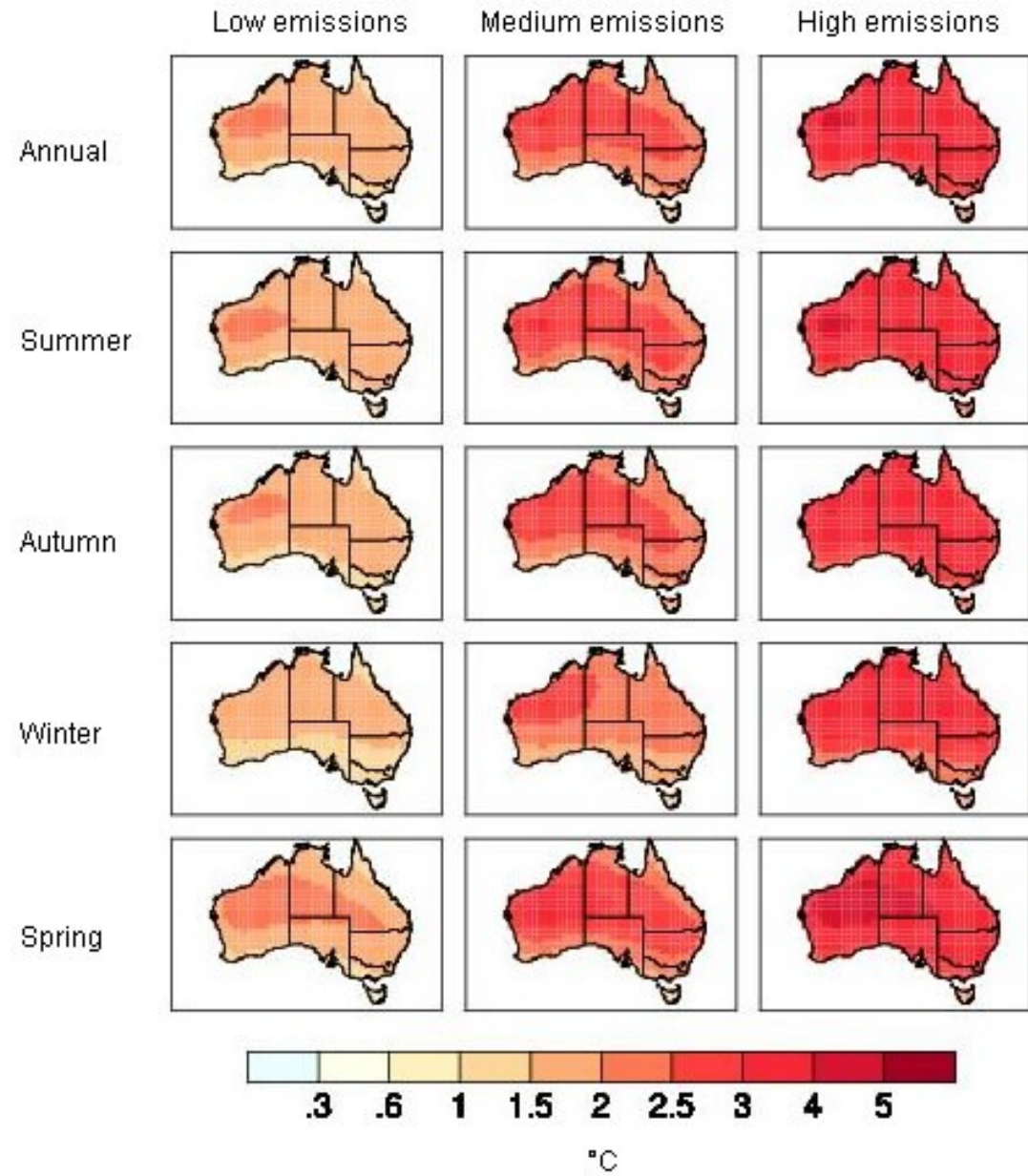
The Scipps Institution CO2 record from Mauna Loa

Monthly Carbon Dioxide Concentration

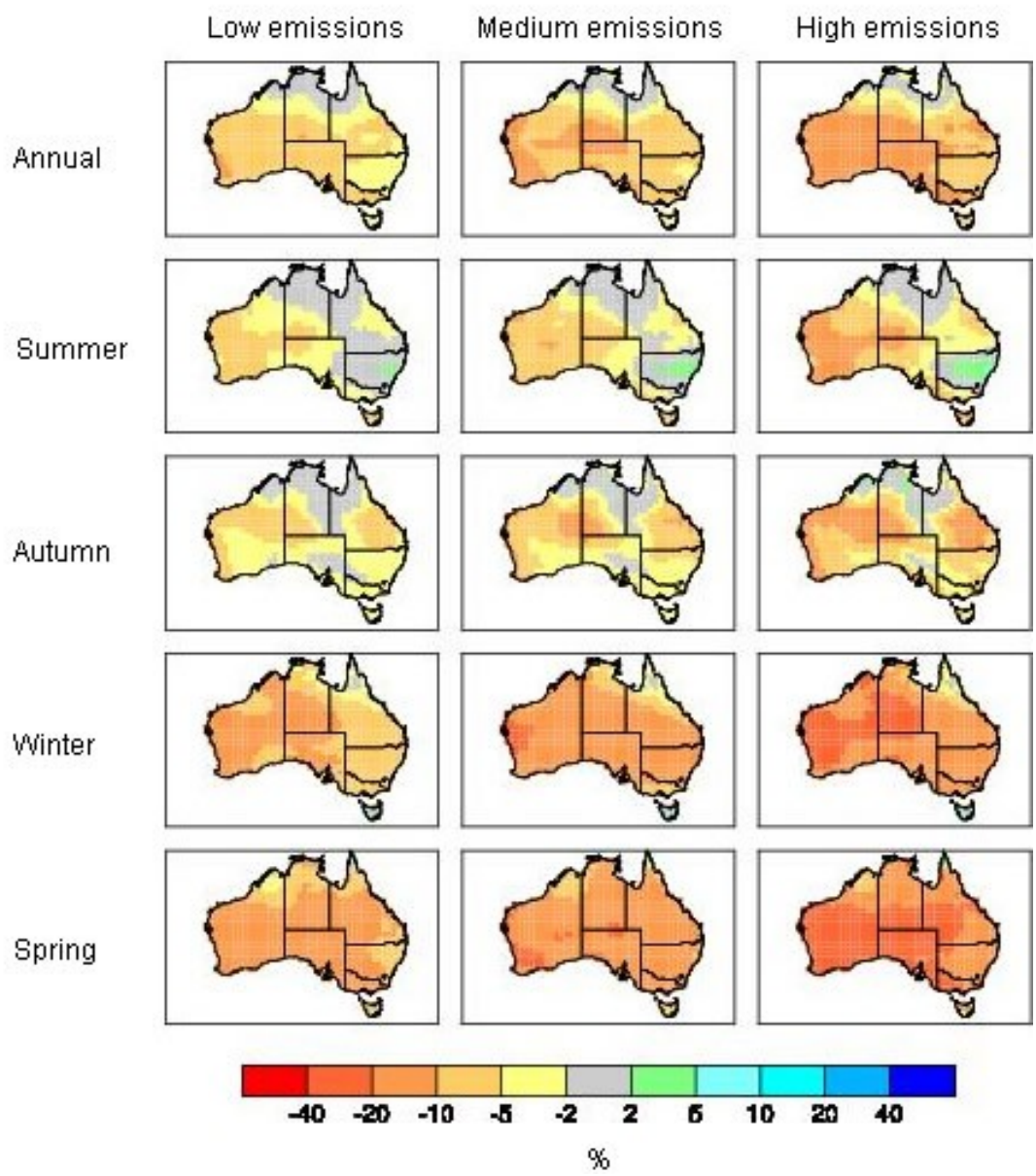
parts per million



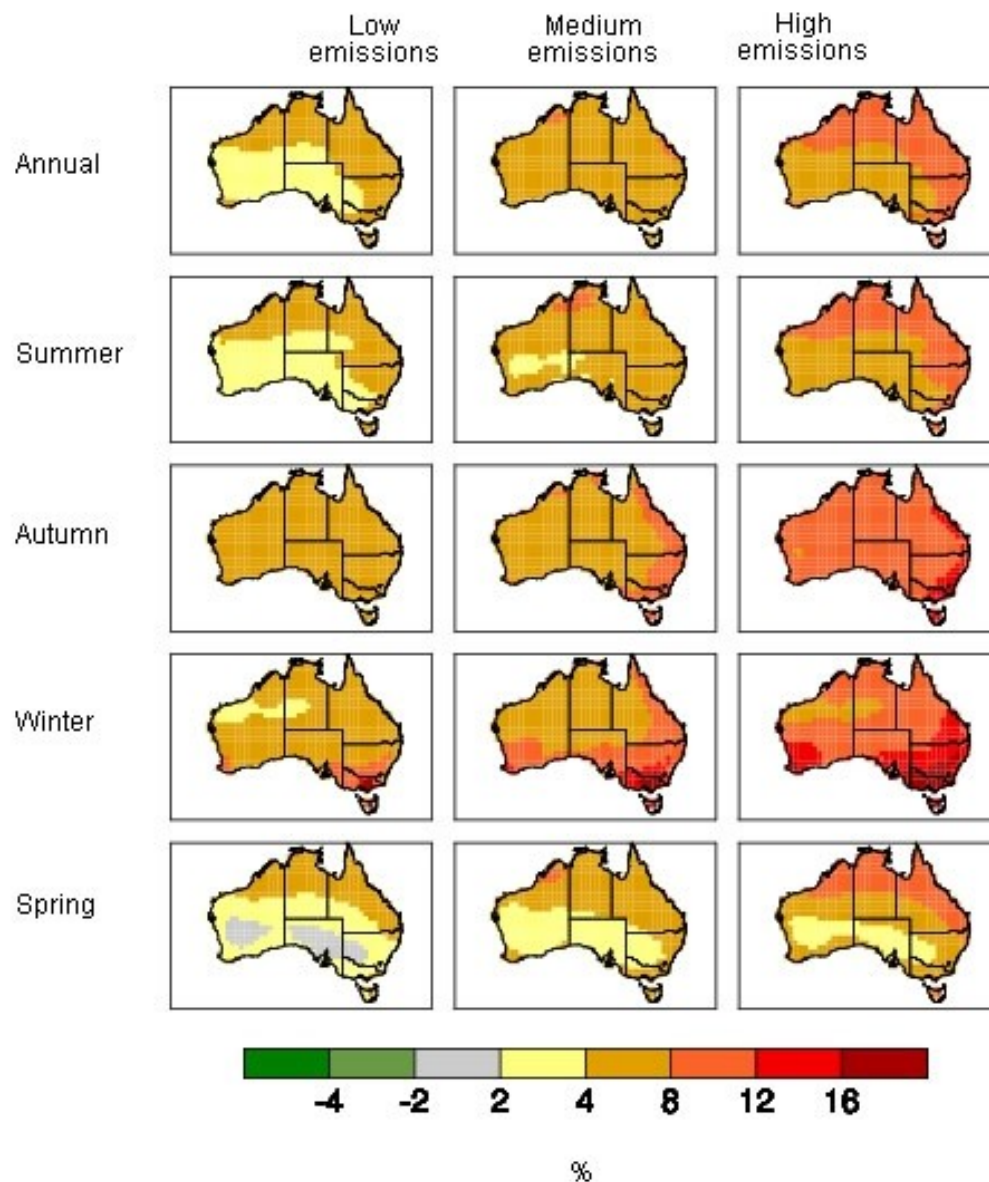
Temperature Projections for Australia to 2070



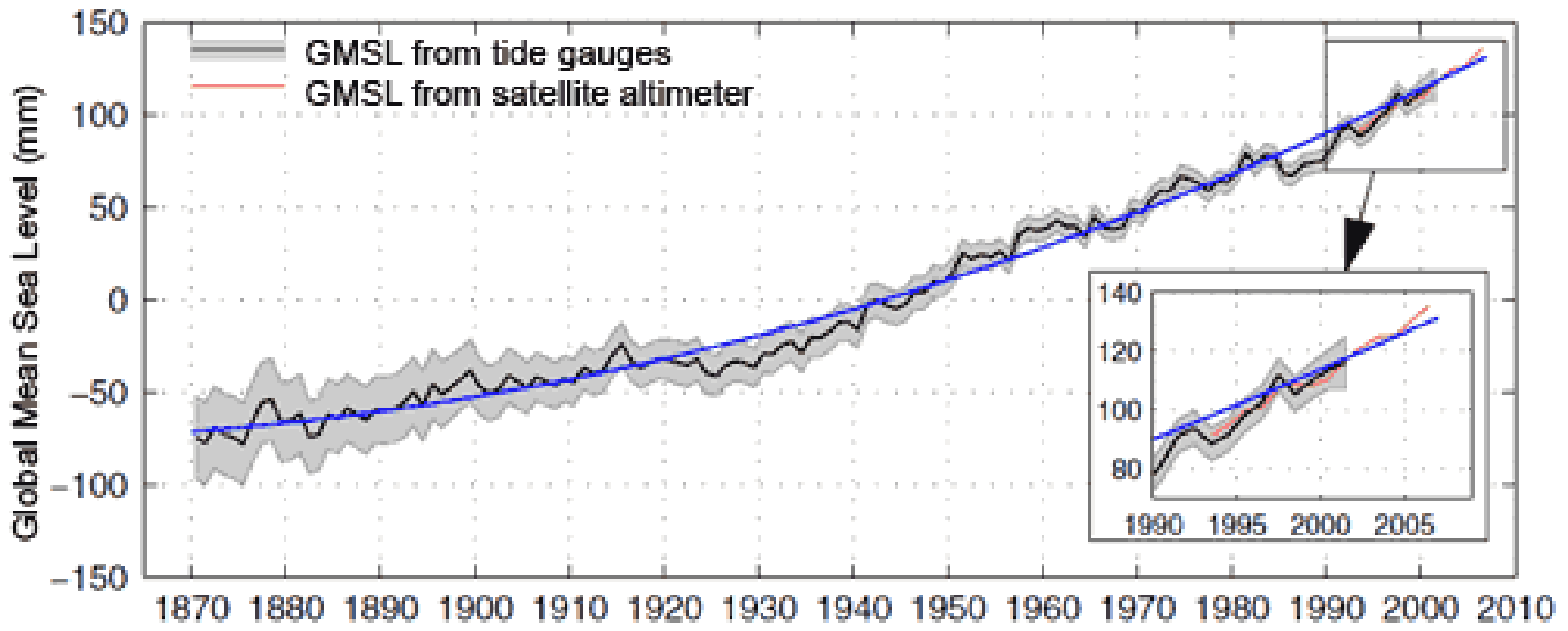
Changes in rainfall to 2070



Changes in evapotranspiration to 2070



Historic Sea-Level Rise



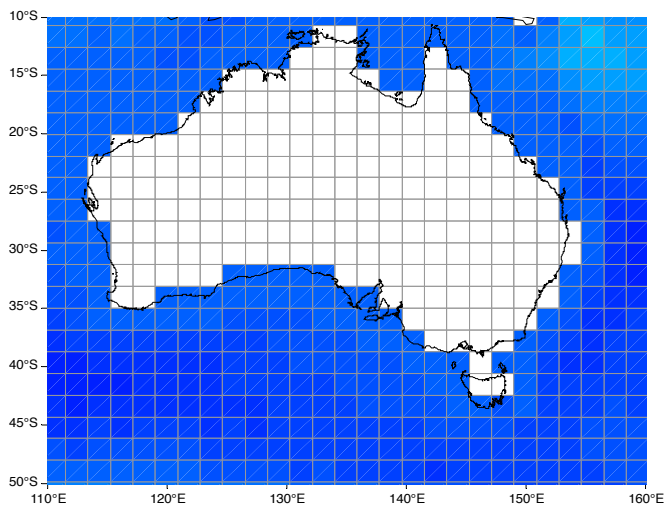
Increased frequency of extreme sea-level events with 0.5m of sea-level rise



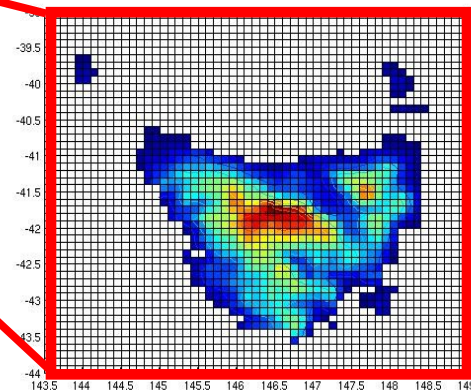
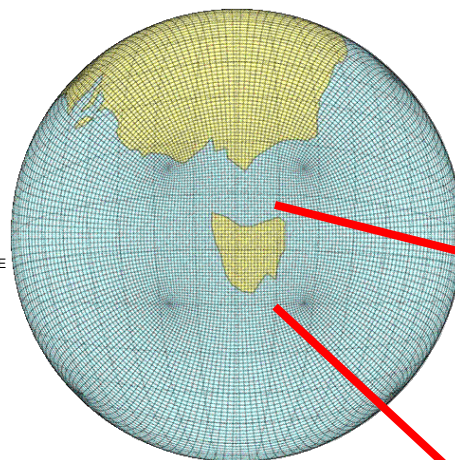
Inse



Global Climate Models



Dynamical
Downscaling
process

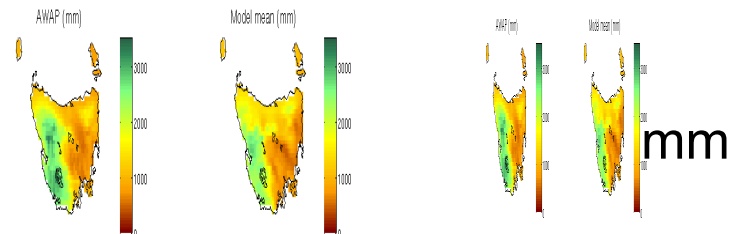
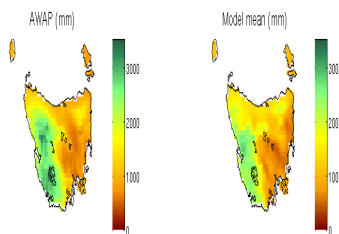


Model validation
High and Low emissions
6 Global Models
Spatial correlations

Comparing the models to 50 years of real climate records

AWAP data

Mean of the models



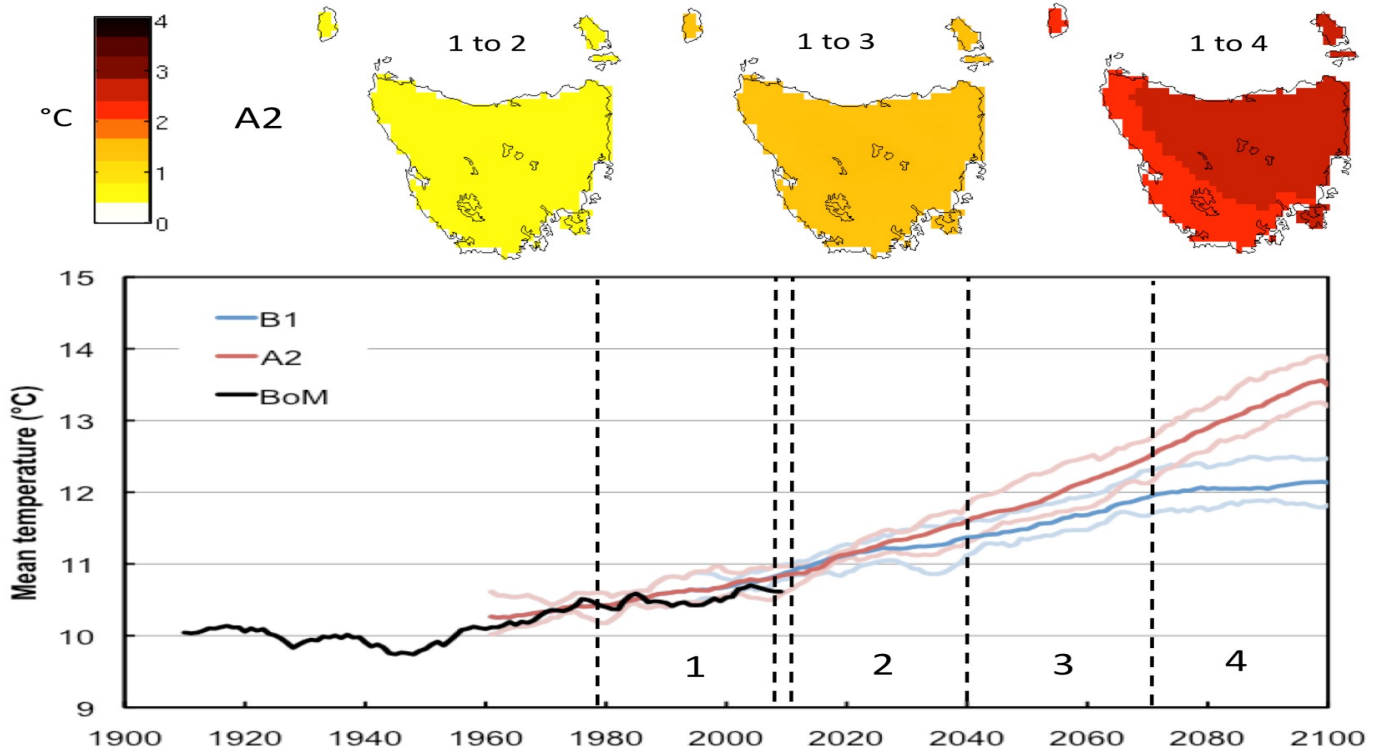
Annual Rainfall
1961-2007

Rainfall (mm)

Model resolution	Mean Monthly Temperature	Mean Monthly Rainfall
GCM	0.45	0.28
0.5°	0.79	0.44
0.1°	0.93	0.63

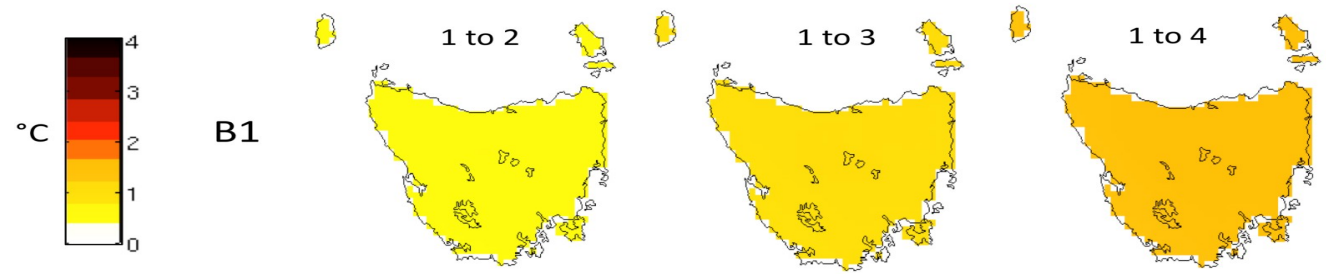
Seasonal cycles

Climate change projections mean temperature from 6 models



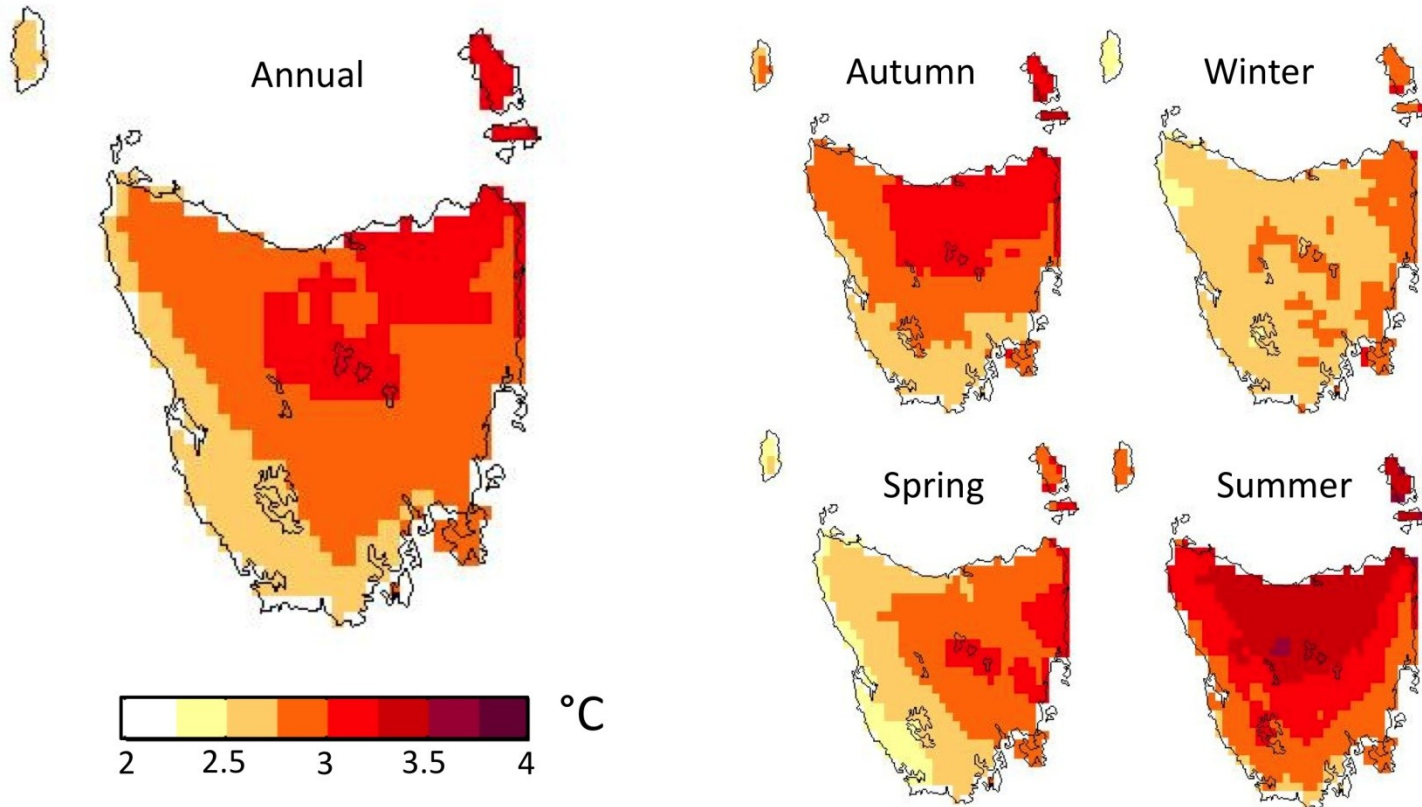
A2 +2.9°C
(global +3.4°C)

B1 +1.6°C
(global +1.8°C)



Seasonal and spatial pattern

Temperature



Summer days

Summer days
(1961-1990)

Change
(2070-2099)

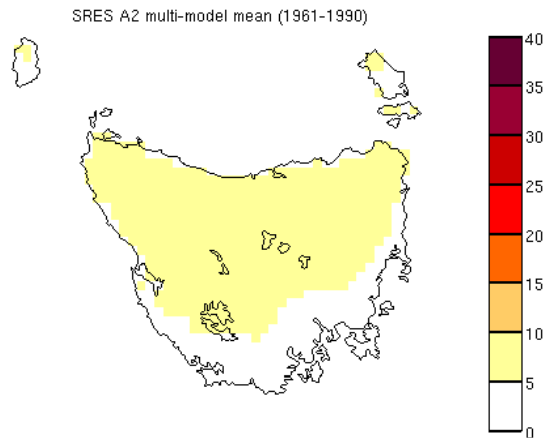


Summer days = daily maximum temperature is $>25^{\circ}\text{C}$

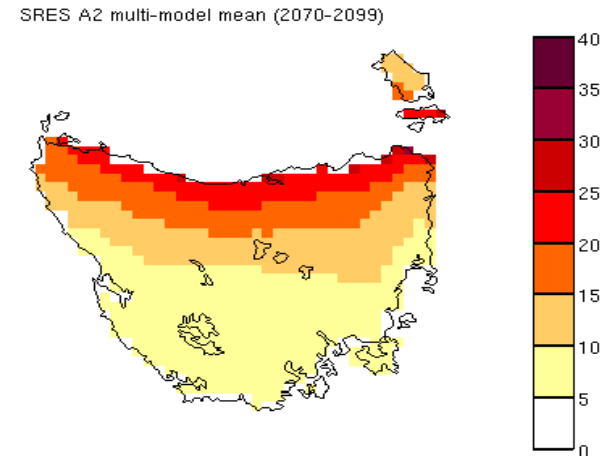
Extremes

warm spell duration

1961-
1990



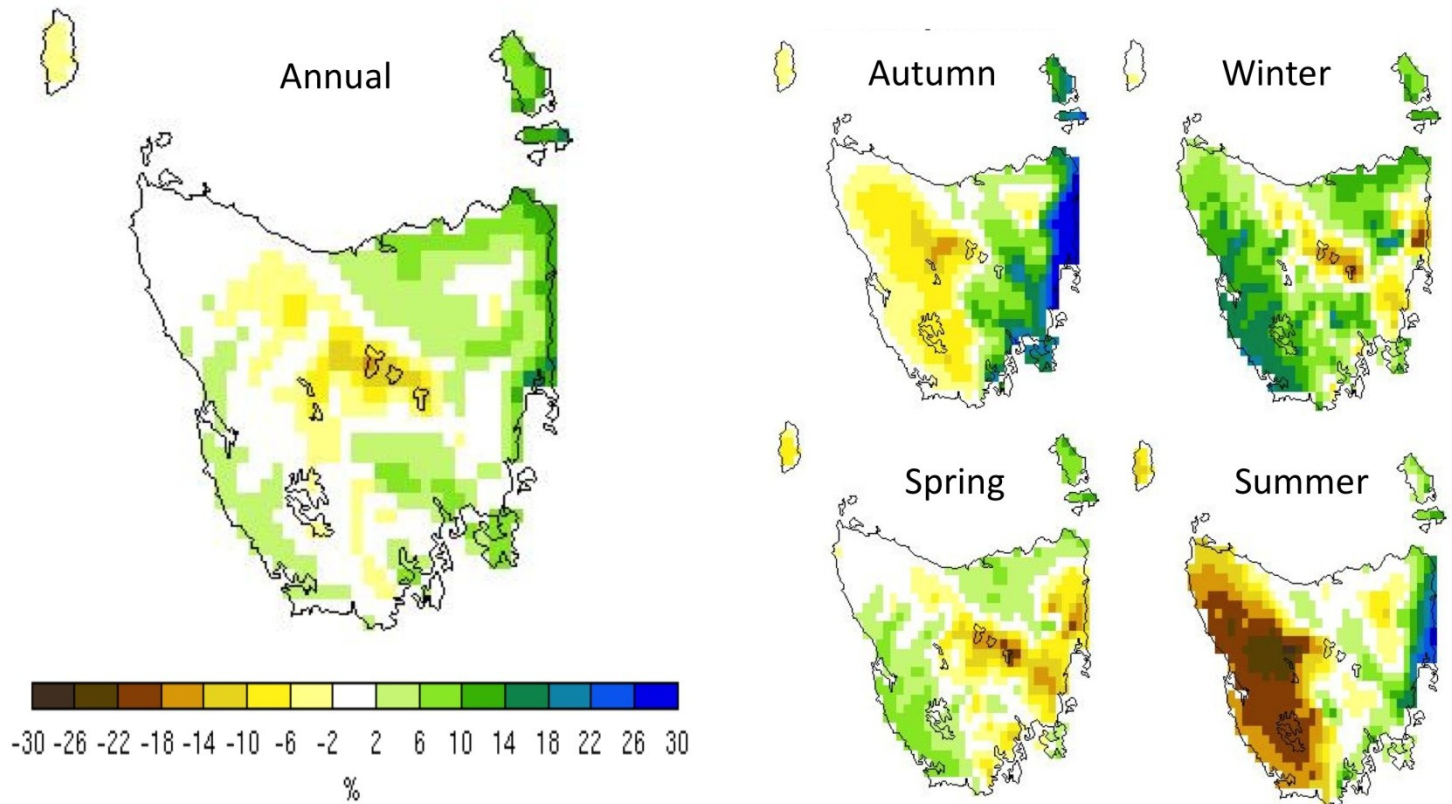
2070-
2099



Comparison of the maximum number of consecutive days above the 1961-1990 90th percentile per calendar year (30-yr means, multi-model mean projections, SRES A2)

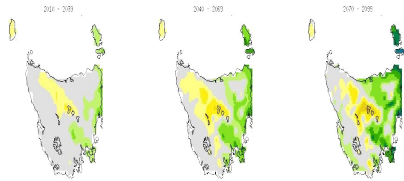
Climate projections mean rainfall from 6 models

1980-1999 to 2090-2099 (SRES A2)

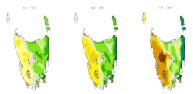


Climate projections mean rainfall from 6 models

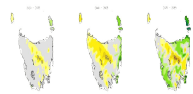
Annual



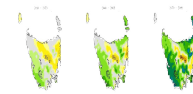
Summer



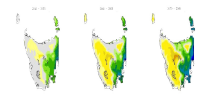
Spring



Winter



Autumn



Rainfall

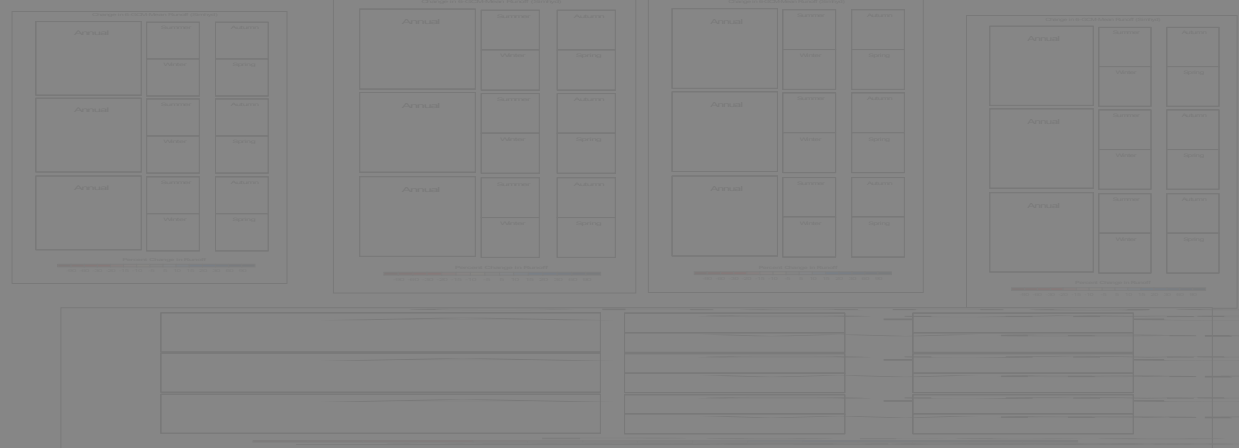
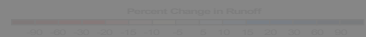


1961-1990 vs 2070-2099

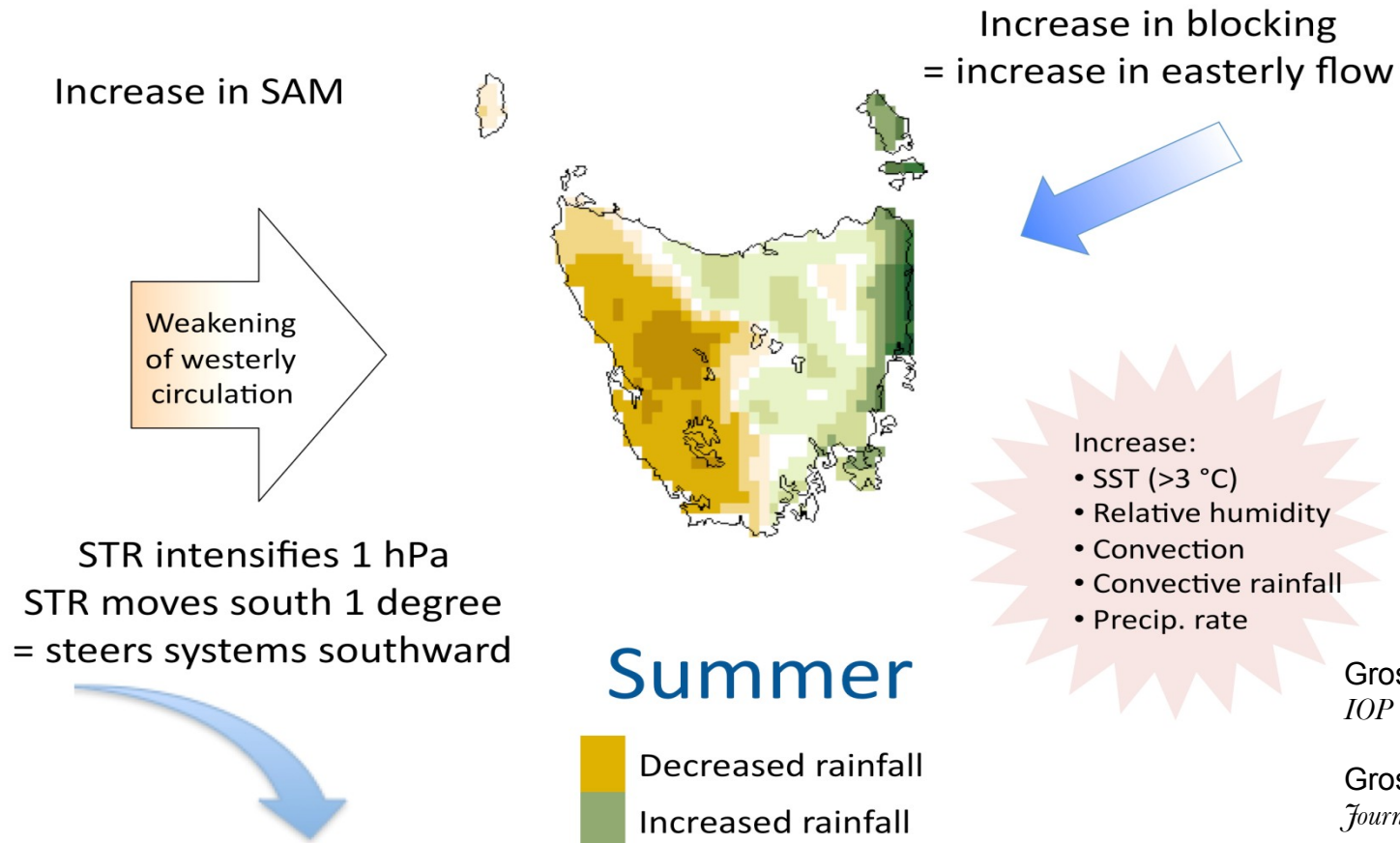
Percent Change in Rainfall



Runoff



Examining regional processes



Grose *et al.* (2010)
IOP Conference Series

Grose *et al.* Submitted
Journal of Climate

Grose *et al.* Submitted
Climate Dynamics

Water in Tasmania



Hydropower



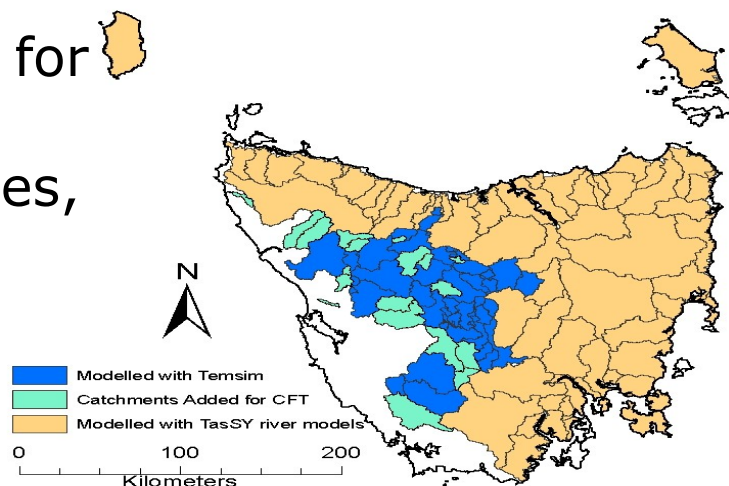
Irrigation/Agriculture



Environment

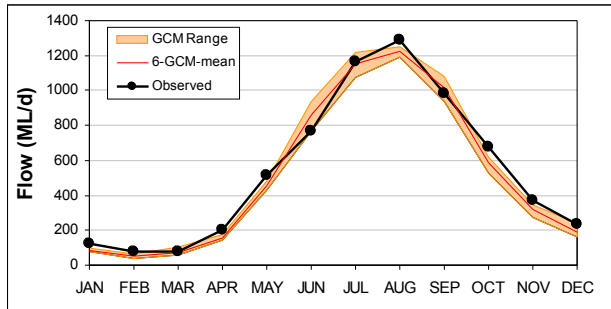
Rivers Modelled

- 78 Tasmanian Rivers + Hydro-electric System
- 1900 subcatchments
- Account for water use for irrigation, town water supplies, water storages, etc.
- Simhyd Runoff model

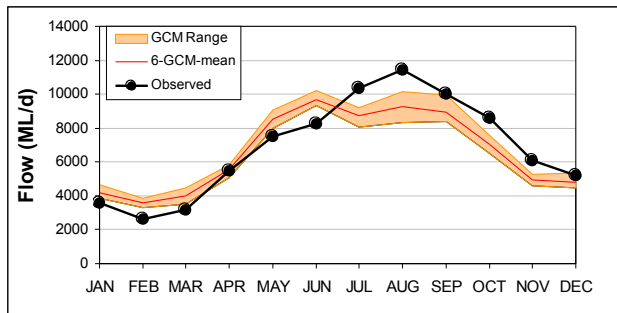


How do the CCAM inputs behave in hydrological models?

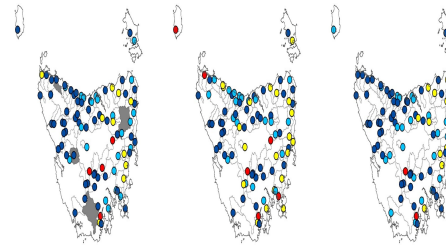
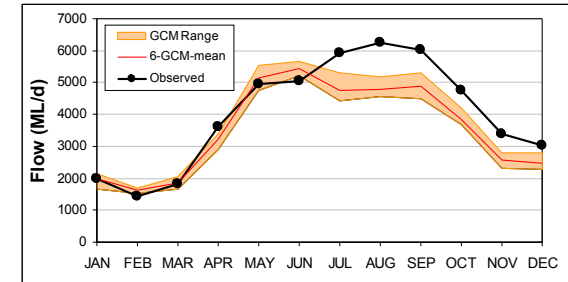
Black River



Franklin River

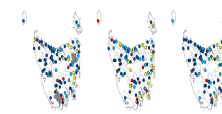


South Esk River



Abs Vol Diff

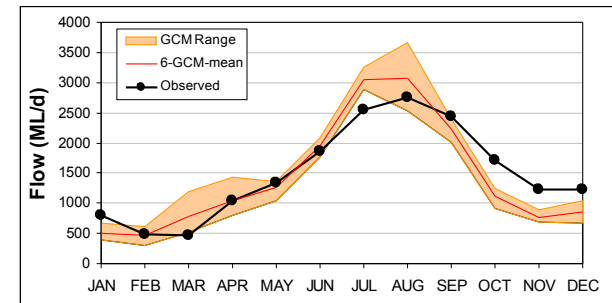
- 0 - 10 %
- 10 - 20 %
- 20 - 40 %
- > 40 %



Abs Vol Diff

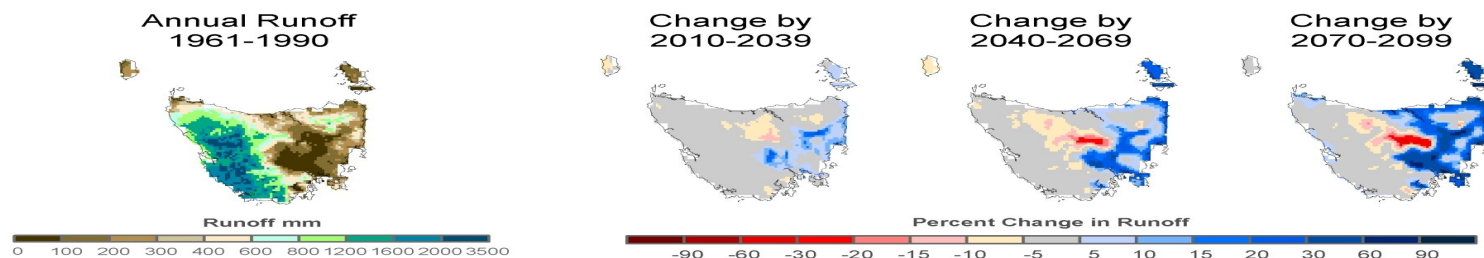
- 0 - 10 %
- 10 - 20 %
- 20 - 40 %
- > 40 %

Huon River



Changes to Rivers: Annual Runoff

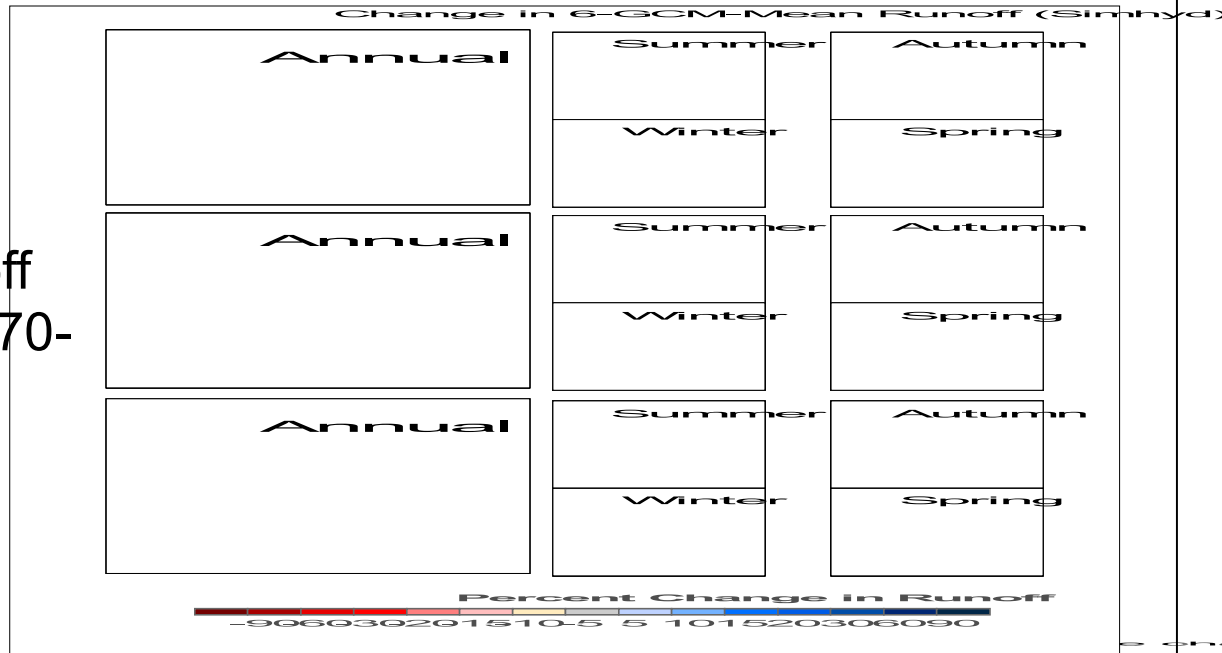
6-GCM HISTORIC ANNUAL RUNOFF AND CHANGE



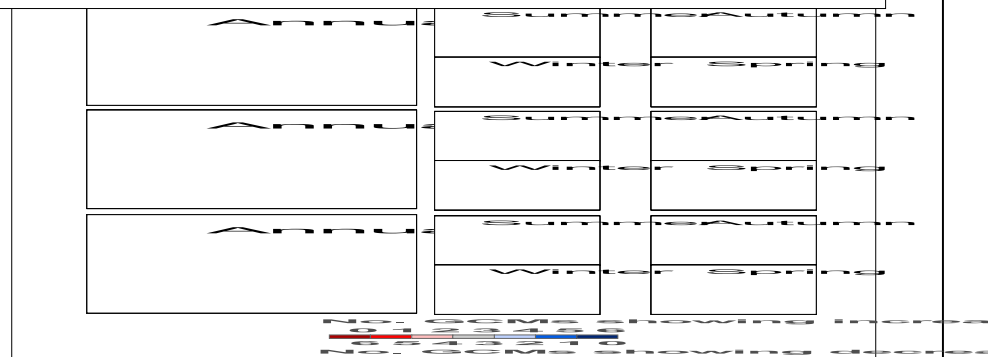
- Slight statewide increase in runoff by end-of-century (+1.1 %)
- Progressive increase on east coast
- Progressive decrease in central highlands

Changes to Rivers: Seasonal Runoff

Change in runoff
1961-1990 vs 2070-
2099



GCM agreement



Agriculture climate change impacts

Pastures

Broad-acre crops

Vegetables

Horticulture

Natural ecosystems

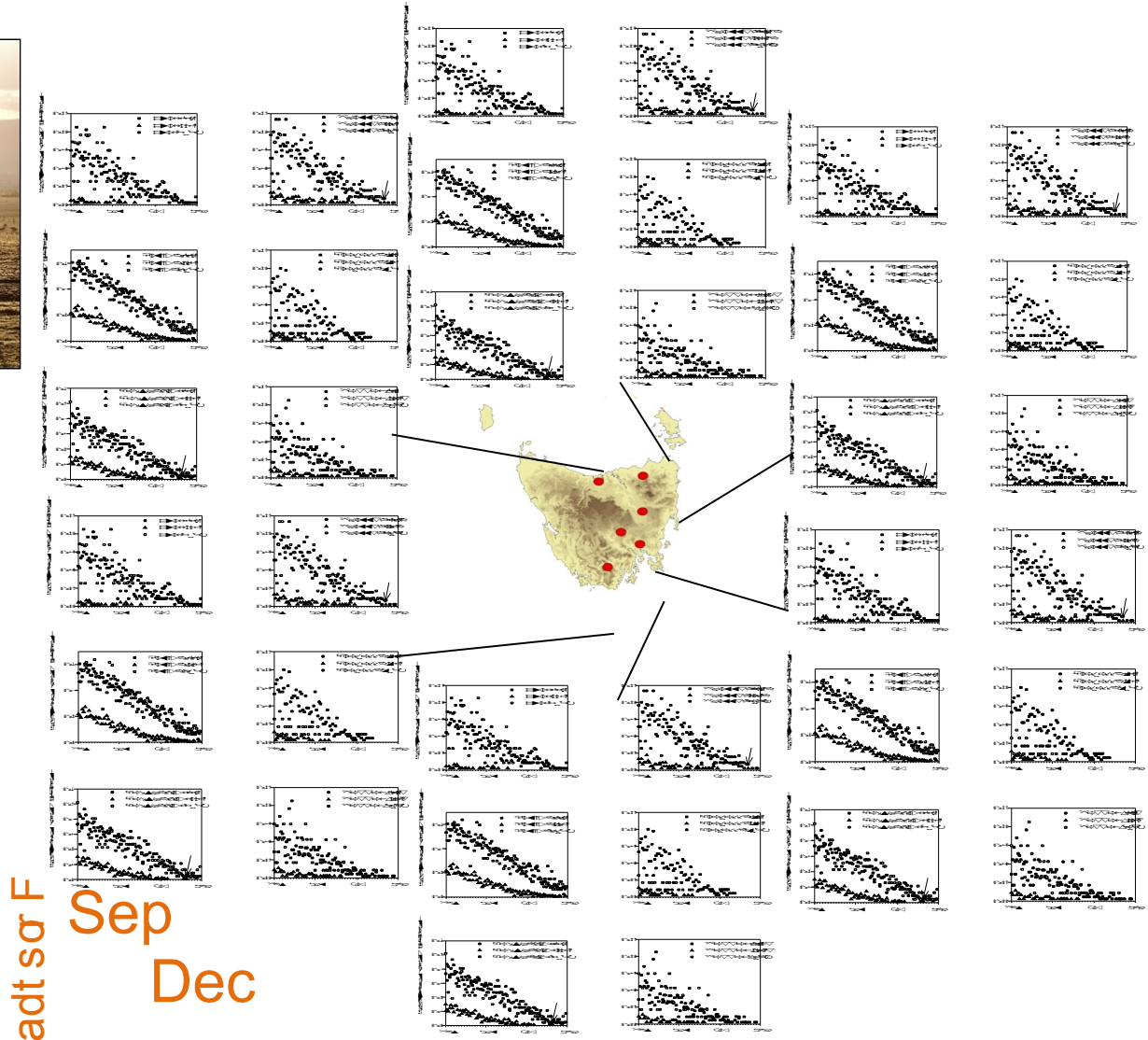
Pests diseases weeds



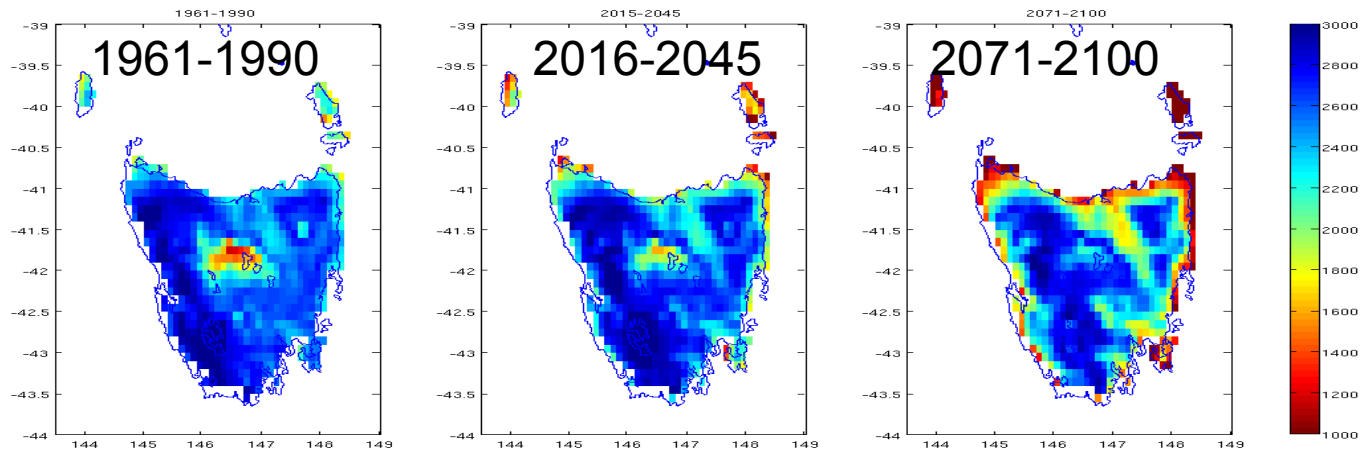
Mean number days $< 2^{\circ}\text{C}$ Sep-Nov 1961-1990 and 2070-2099 six GCMs SRES A2



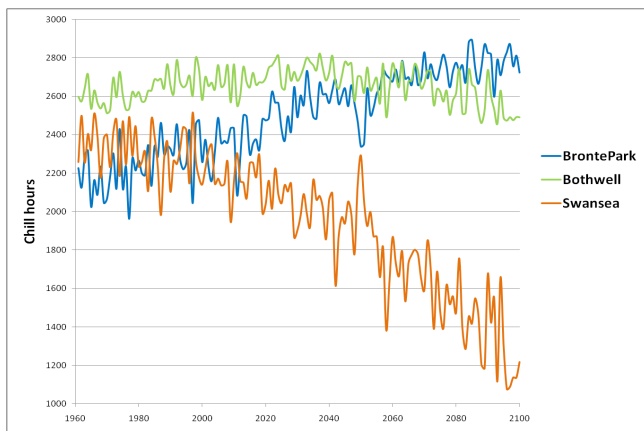
Frost in the Midlands



Chill hours



Chill hours

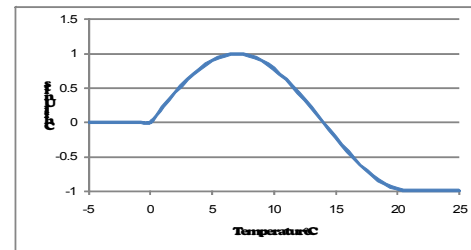


1961

2100

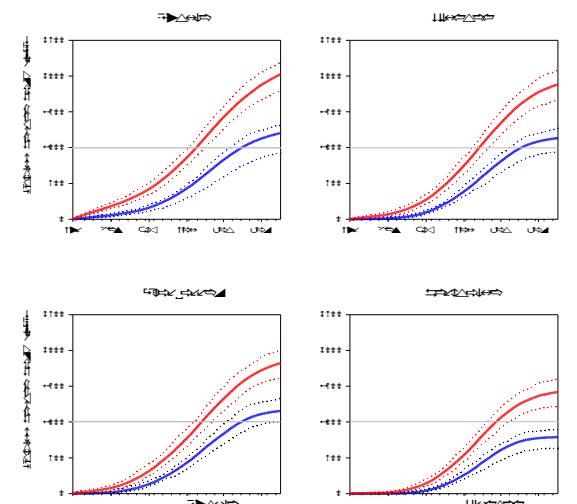
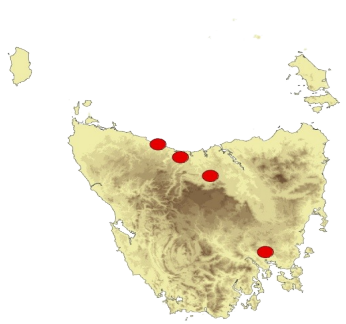
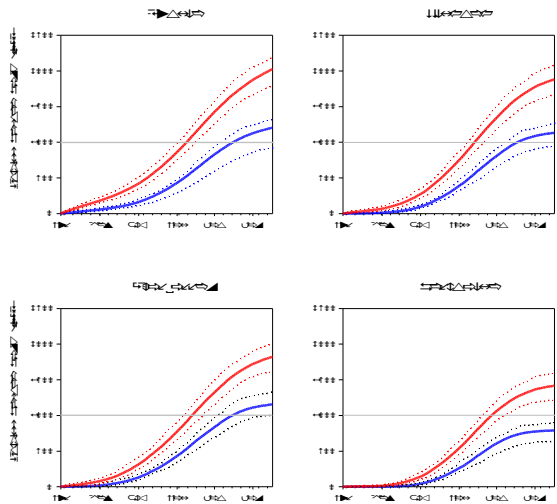


Blackcurrants

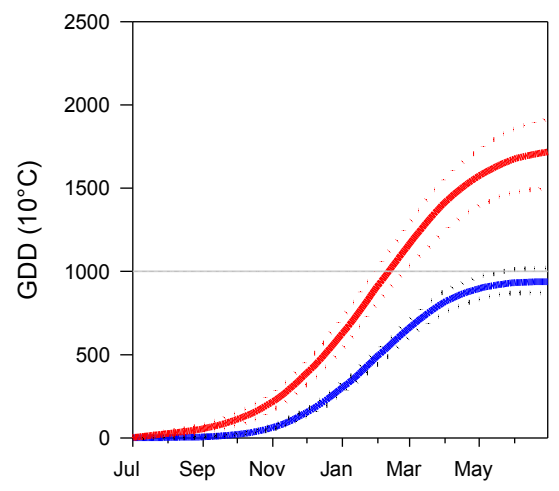


Modified Utah model

Growing Degree Days (10°C) GFDL-CM 2.1 SRES A2



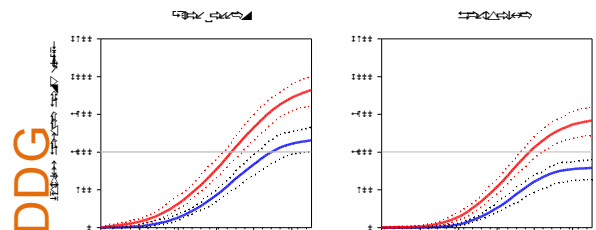
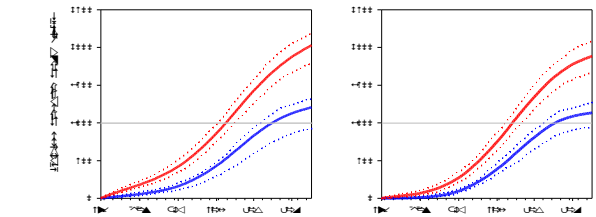
Kindred



(—) 1975
(—) 2085
(---) min and max



Tasmanian Potatoes



DDG

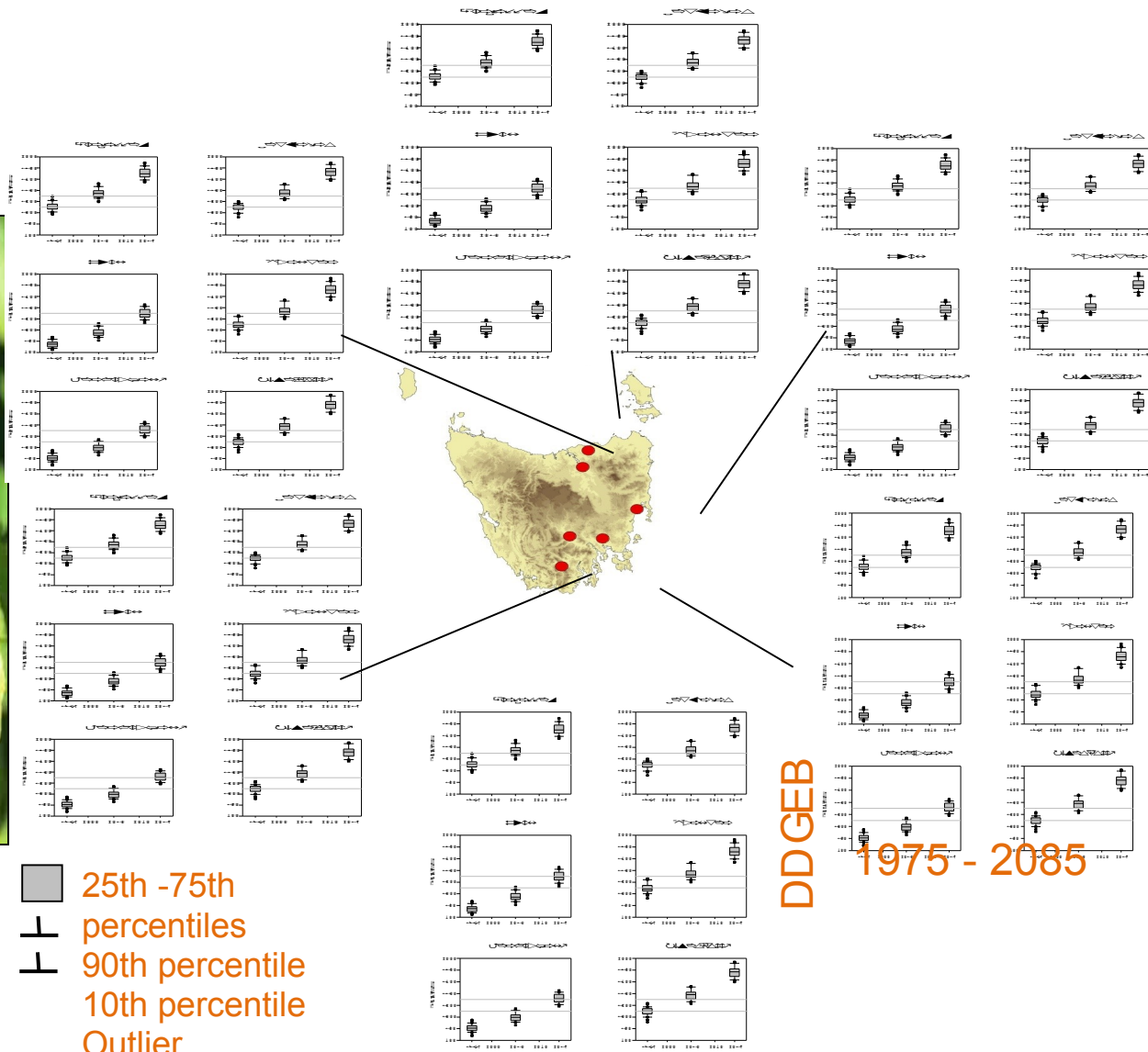
Jul

June

Annual BEGDD for 6 Tasmanian wine regions 1975-2030-2085 GFDL-CM 2.1 SRES A2



Pinot Noir Grapes



DDGEB
1975 - 2085

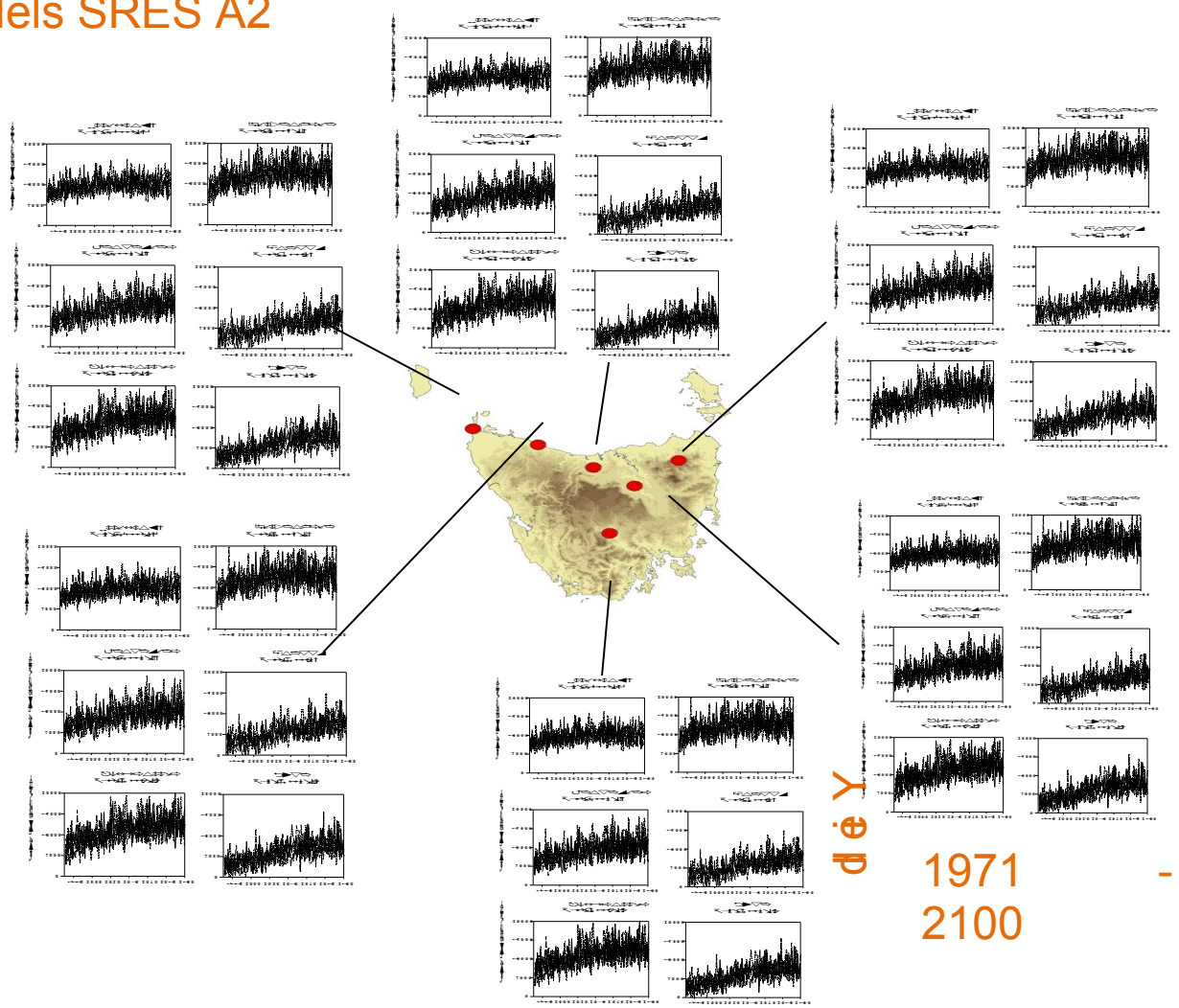
25th -75th percentiles
 90th percentile
 10th percentile
 Outlier

Dryland perennial ryegrass DairyMod

All climate models SRES A2



Perennial
Ryegrass



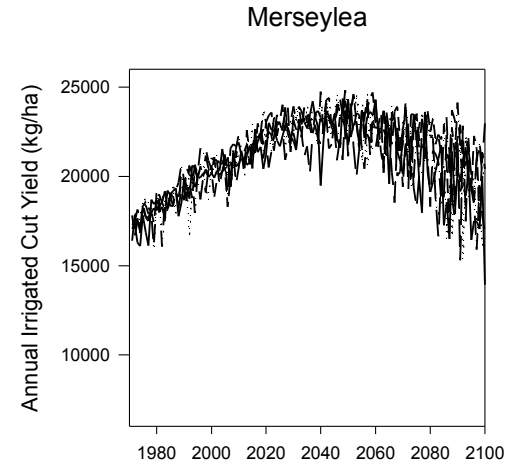
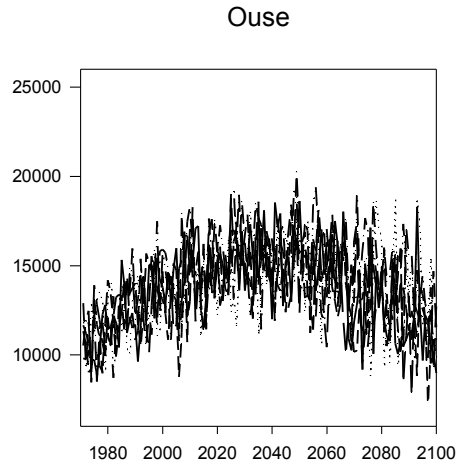
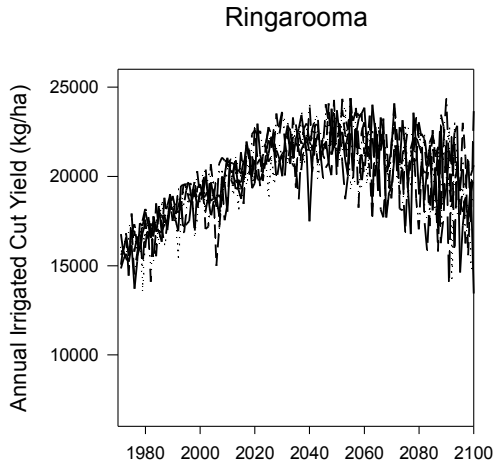
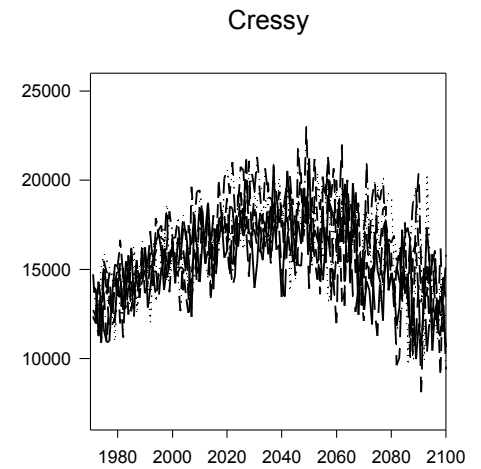
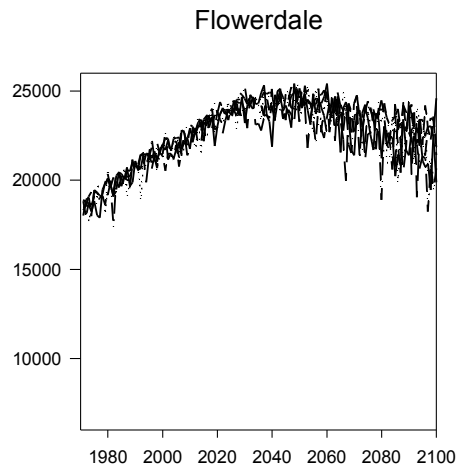
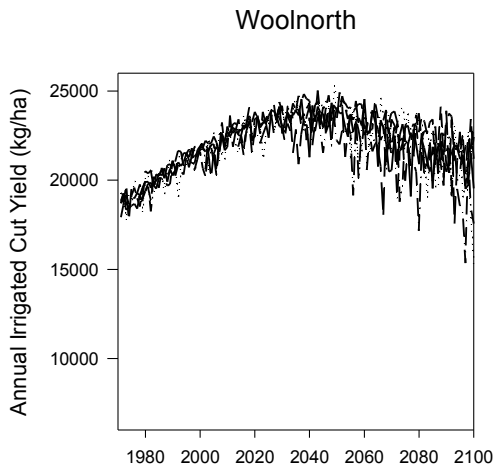
d
Y

1971
2100

-

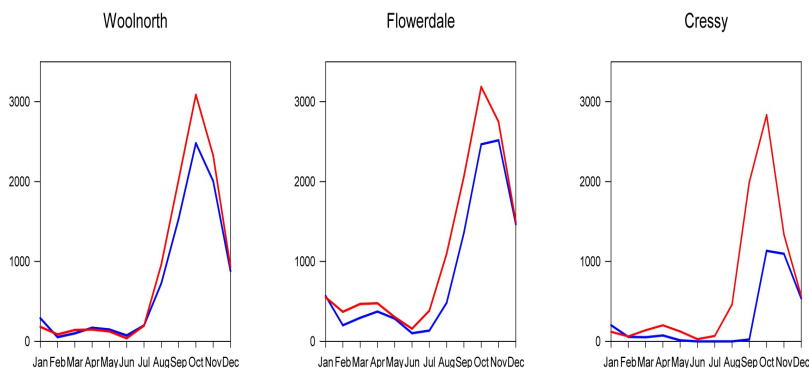
Irrigated ryegrass yield 1961-2100

All climate models SRES A2

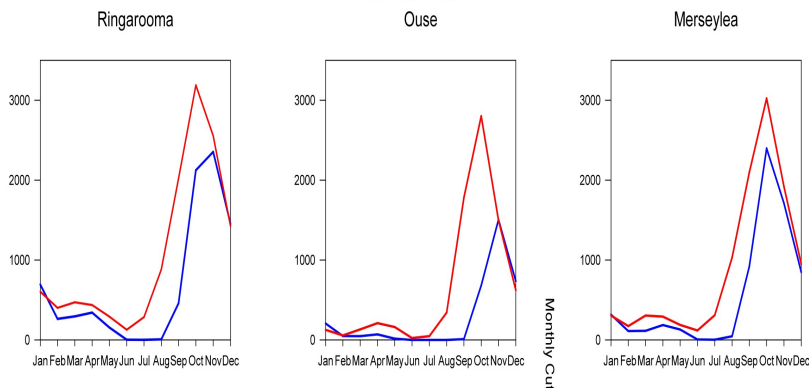


Complex influences

Dryland ryegrass yield Flowerdale



— 1971-2000
— 2071-2100
Ouse



Growth influenced by

- Mean temperature
- High/low temperatures
- Water (rainfall/evap)
- Radiation, etc

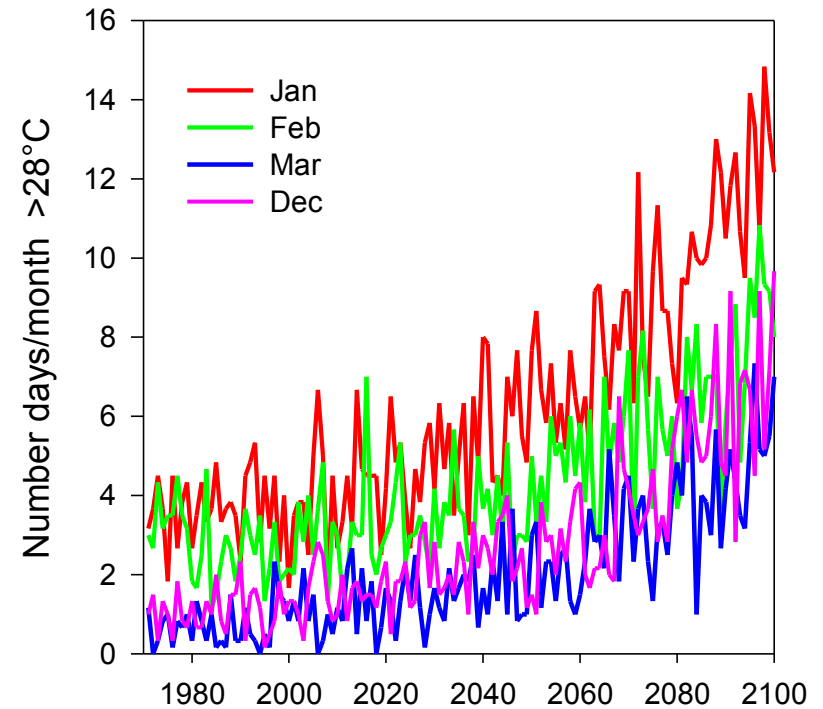
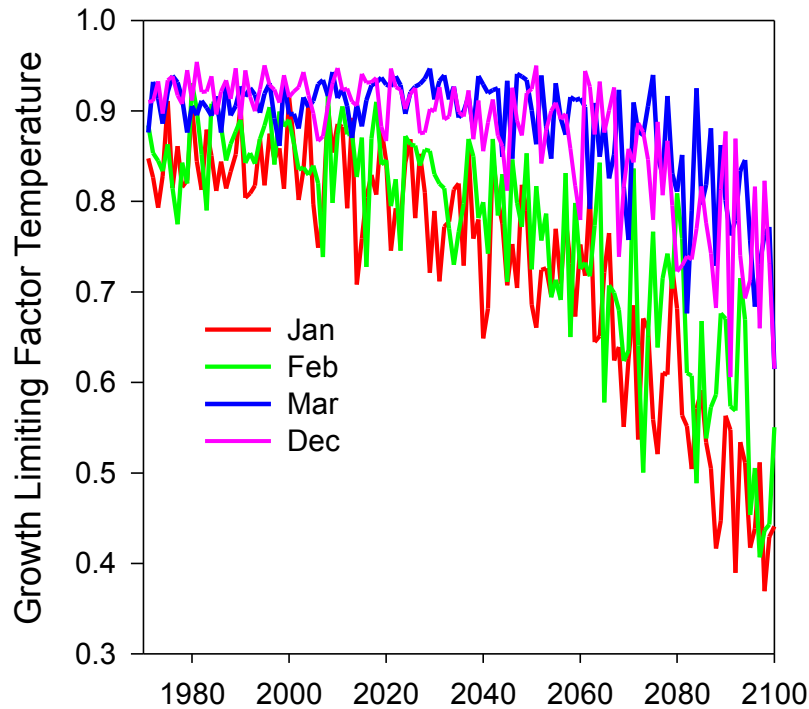
Changes impact

- Total growth
- Timing of growth (seasonality)

Holz et al. 2010

Ryegrass GLF Temperature days >28°C

Cressy



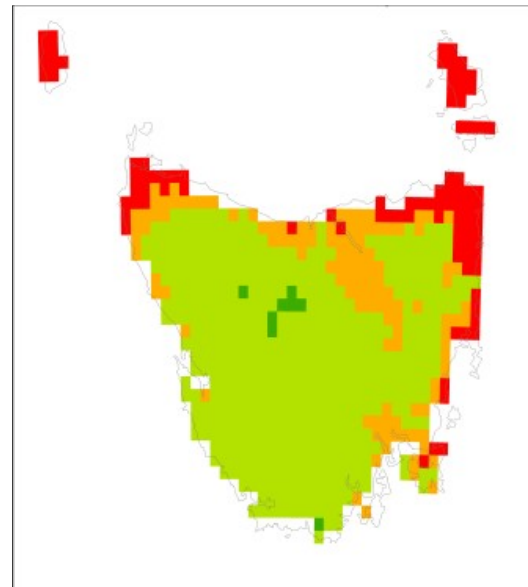
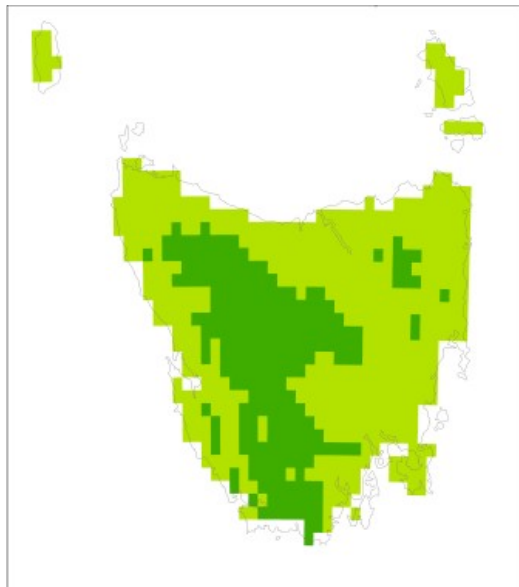
Queensland Fruit Fly

(*Bactrocera tryoni*)

Risk of fruit fly establishing in Tasmania CLIMEX and CSIRO Mk3.5 SRES A2

1961-1990

2071-2100



Average Daily Temperature (oC) TERMITE HAZARD SUSCEPTIBILITY [2070 to 2099]

