



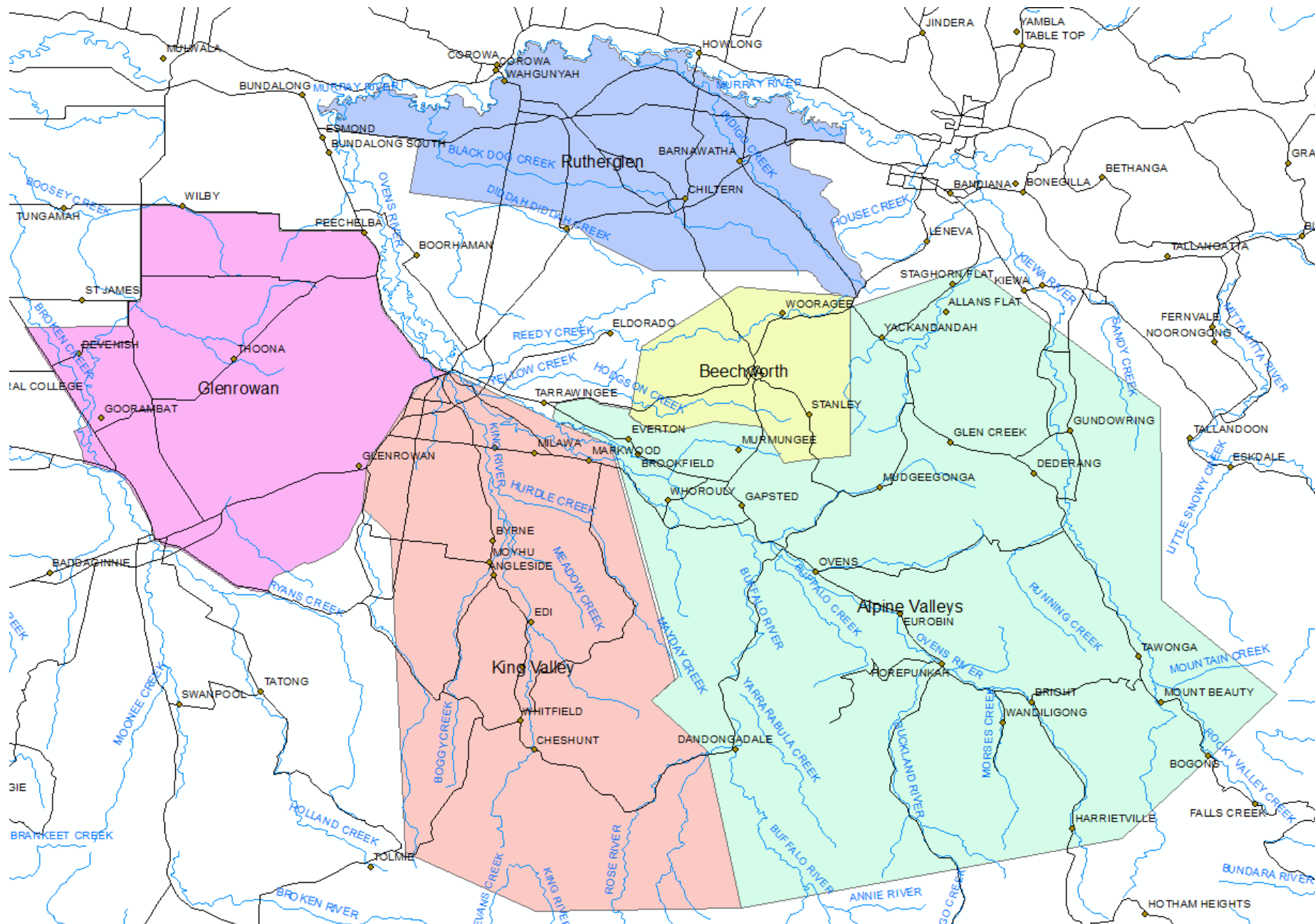
# Effect of potential atmospheric warming on winegrape growing in the Beechworth and surrounding GIs: an outlook for 2030 and 2050 (and 2070)

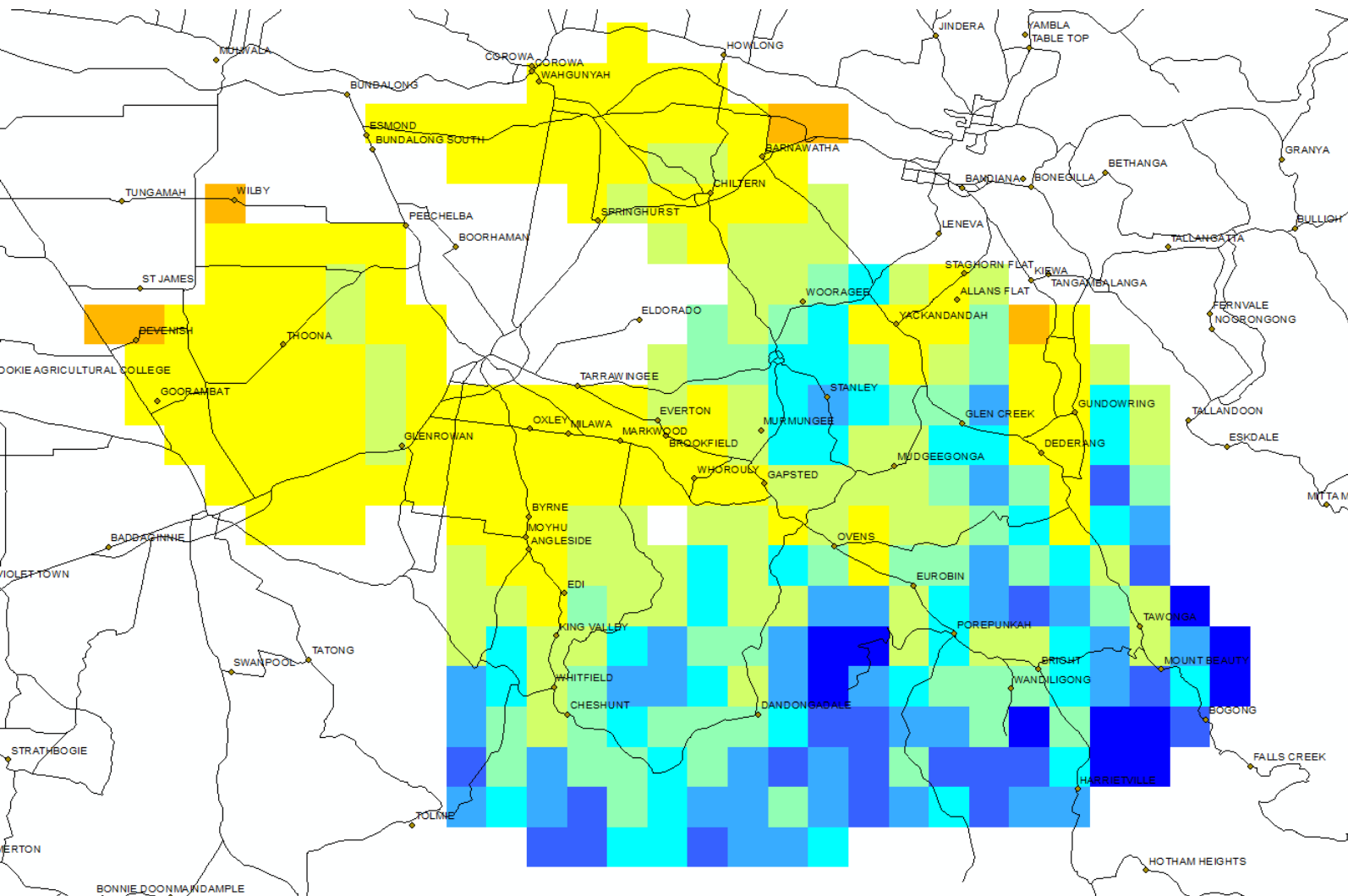
**Andrew Hall**

Beechworth, 18 June 2014

# Key messages

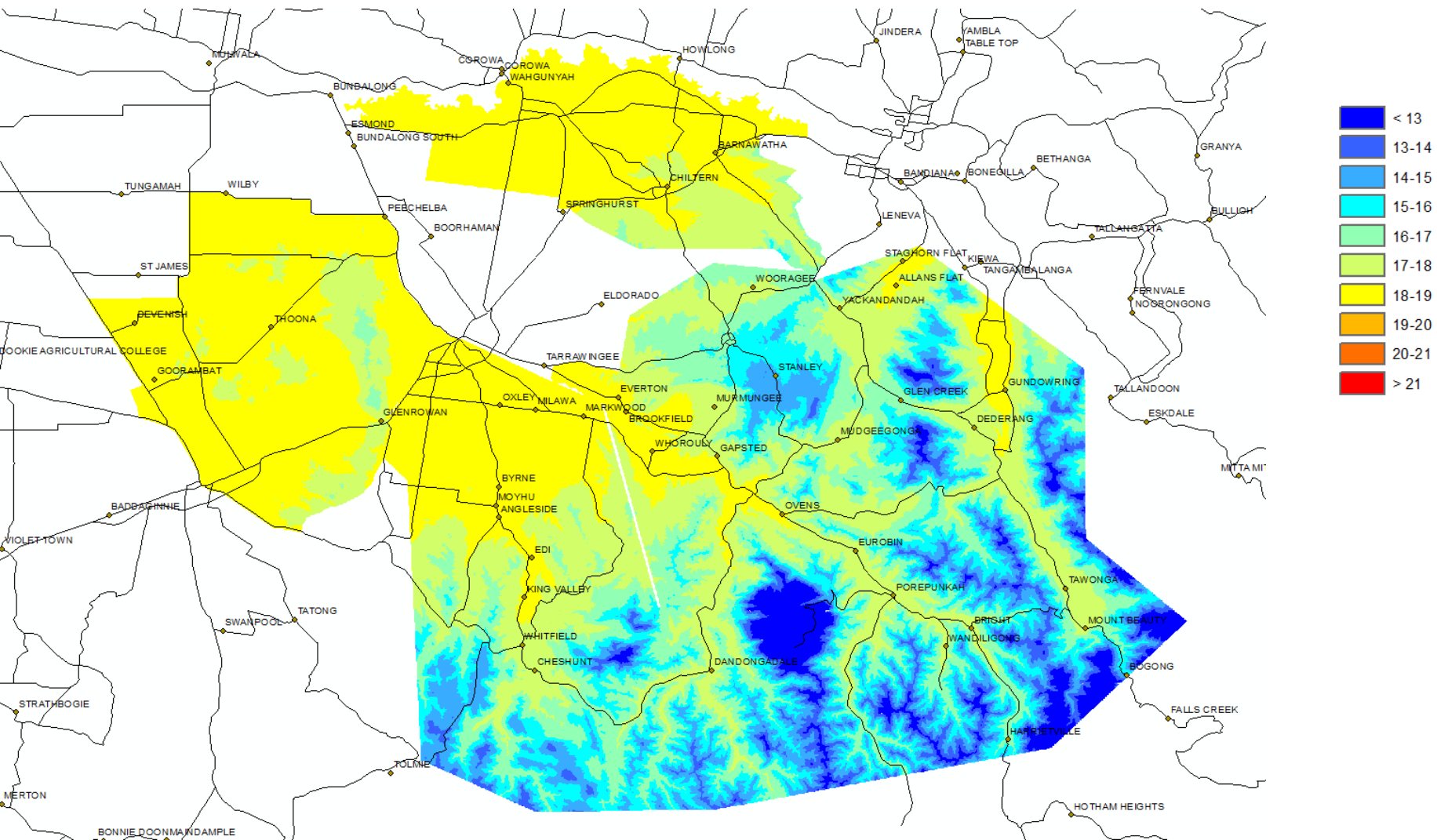
- The temperature climates of the NE Victoria GIs are highly variable.
- There is uncertainty in the rate of warming.
- Warming for the region is set to be a little more rapid than for the average Australian winegrowing region.
- Ripening period temperature is set to increase more rapidly than overall average temperature, with a greater change for cooler areas.





Data from  
Australian  
Water  
Availability  
Project

<http://www.bom.gov.au/jsp/awap/>



$R^2=0.725$

# Spatial Range of Growing Seasons Temperature (°C) in the NE Vic GIs (Hall and Jones, 2010)

<i>GI</i>	<i>Min</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Max</i>
Alpine Valleys	11.56	15.51	16.98	18.07	19.05
Beechworth	16.63	16.66	17.11	17.17	17.73
Glenrowan	17.45	18.58	18.81	18.95	19.18
Rutherglen	17.66	18.30	18.61	18.76	19.03
King Valley	13.54	15.14	17.07	18.2	18.67

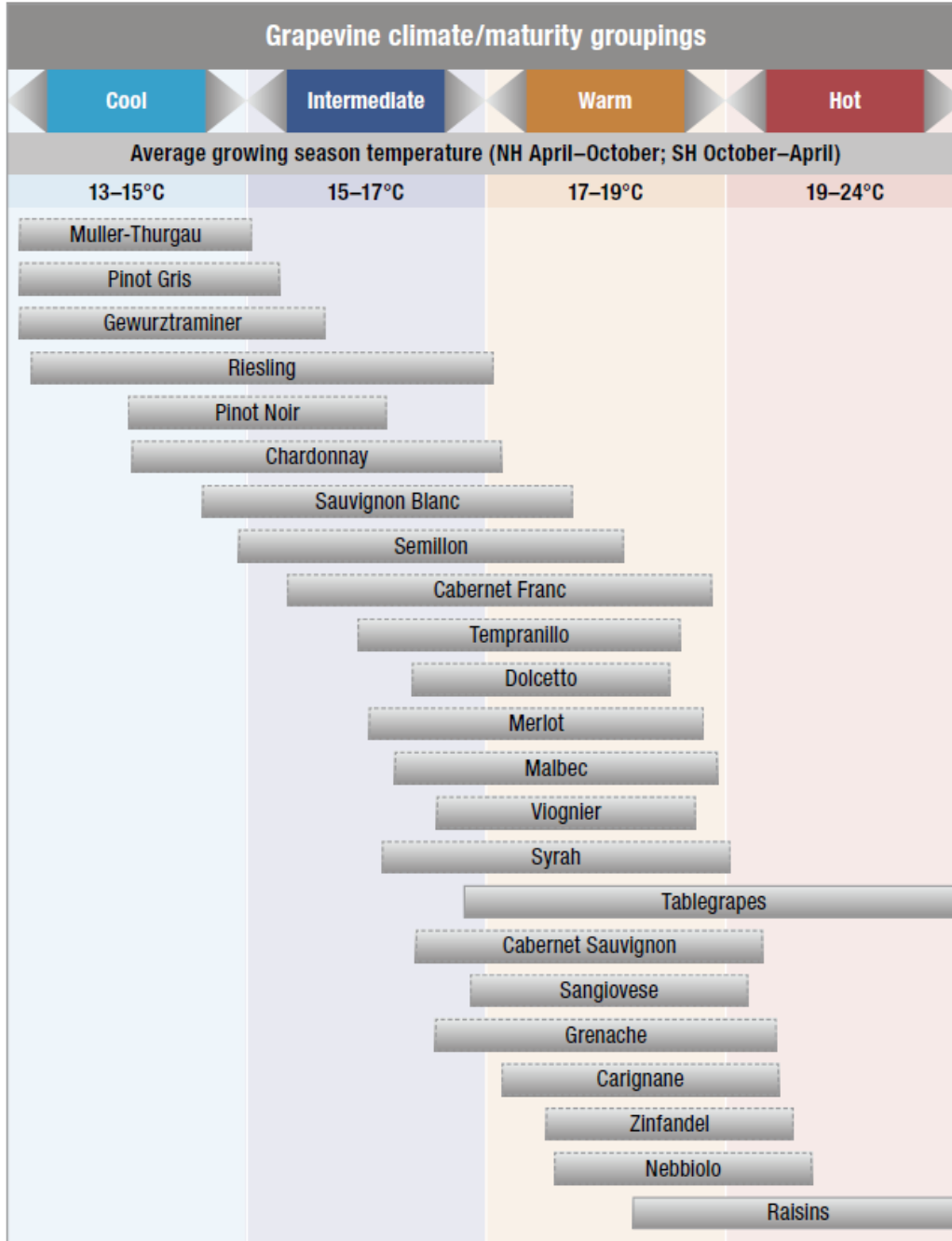
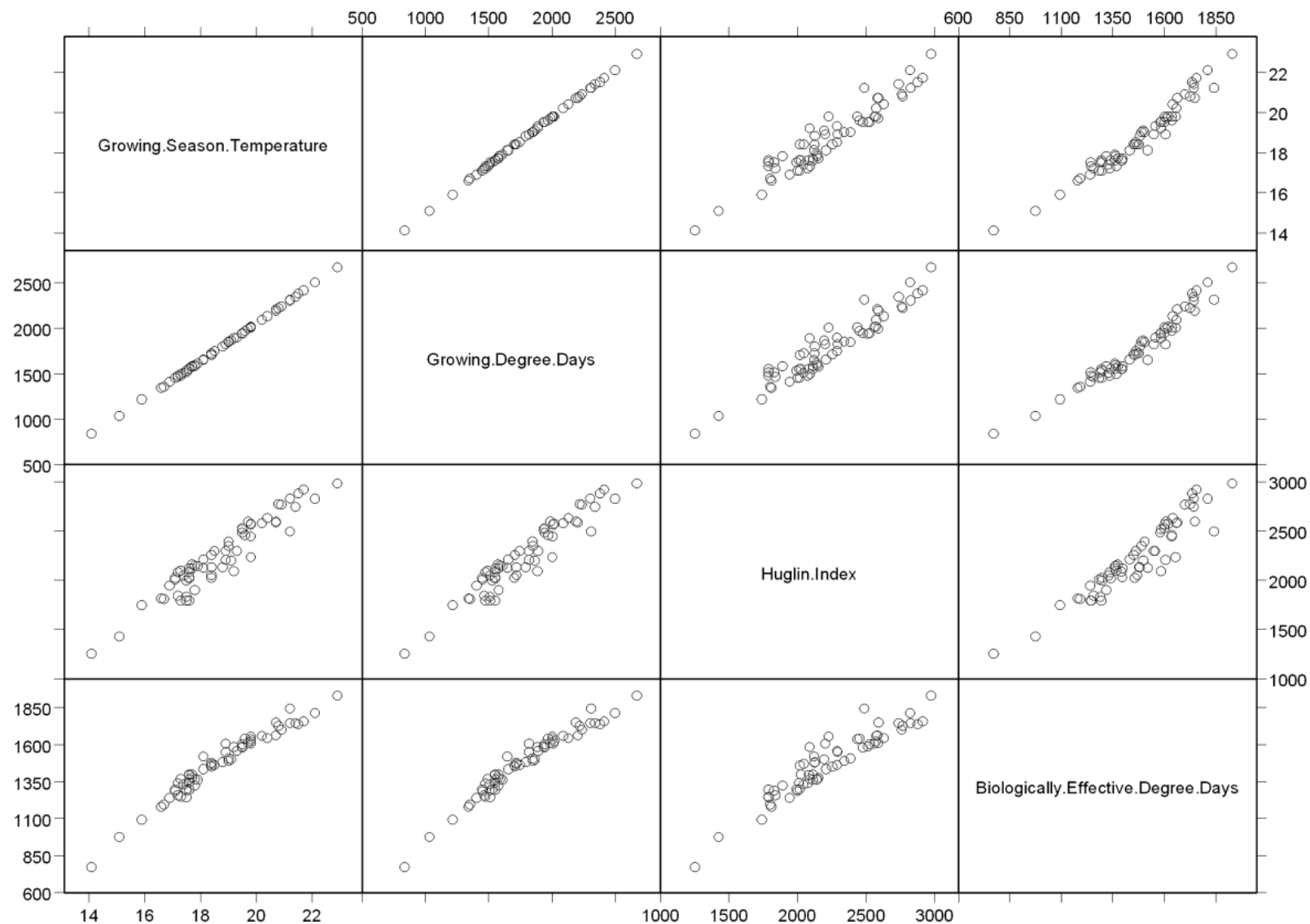


Chart: Jones (2006)



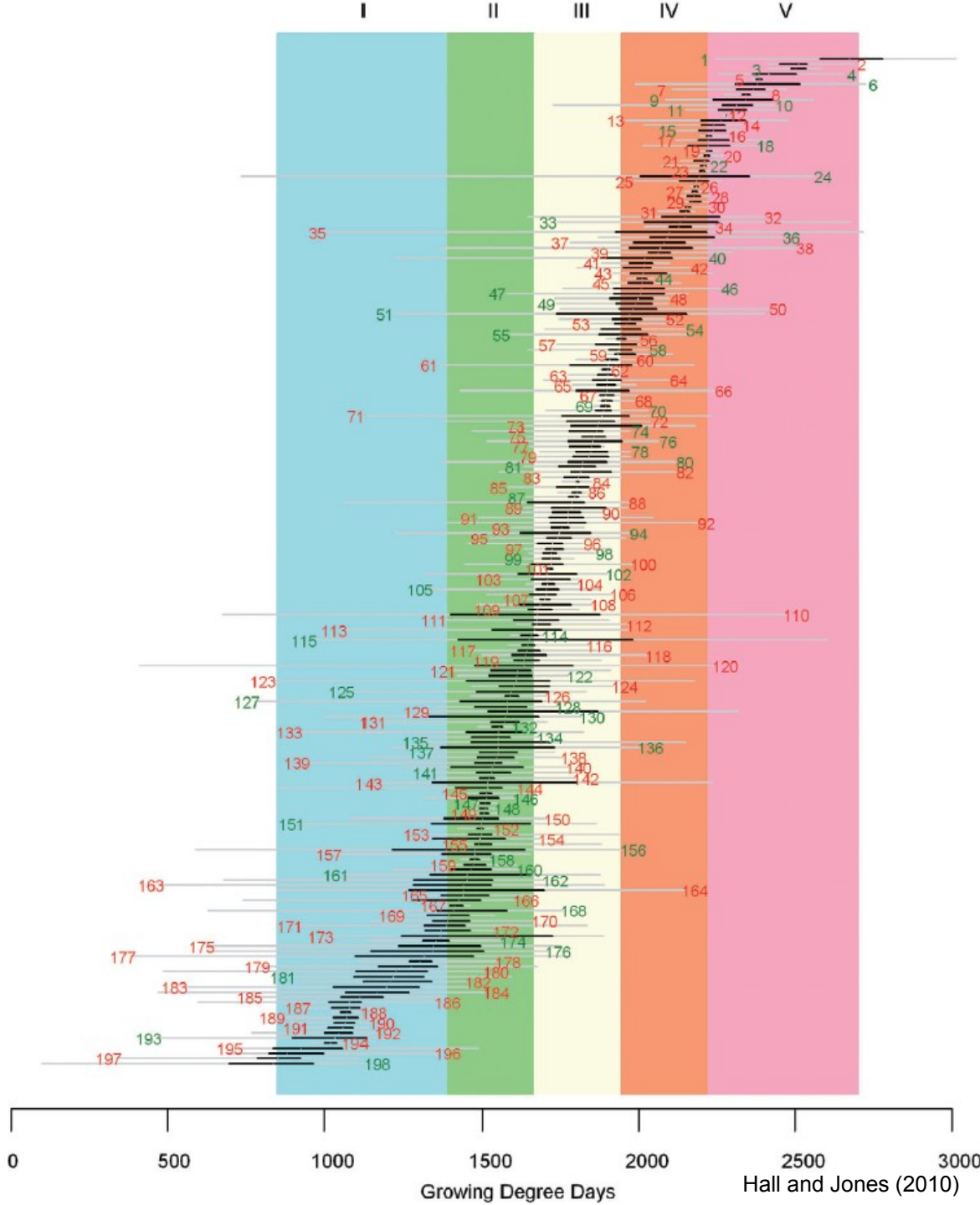
$$\text{Season total GDD} = 209 * \text{GST} - 2130, r^2 = 0.9995$$

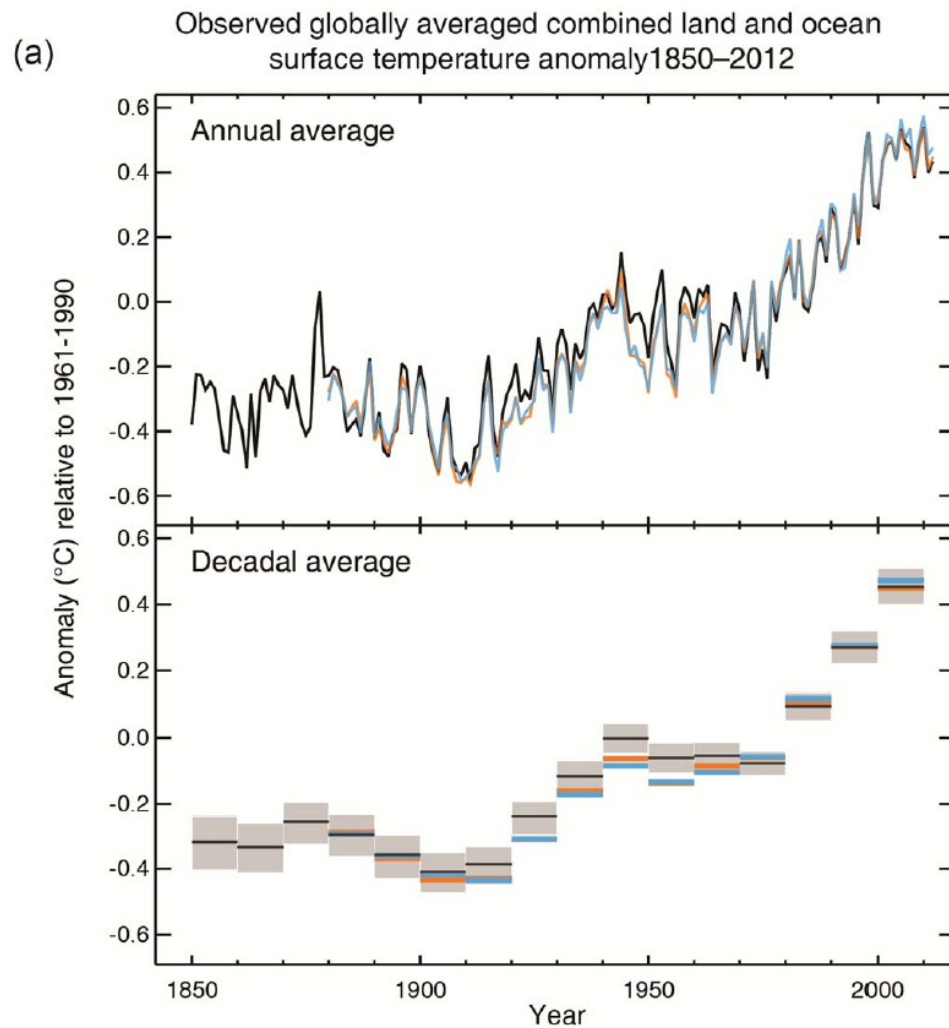
Hall and Jones (2010)



# GDD distributions 1971-2000

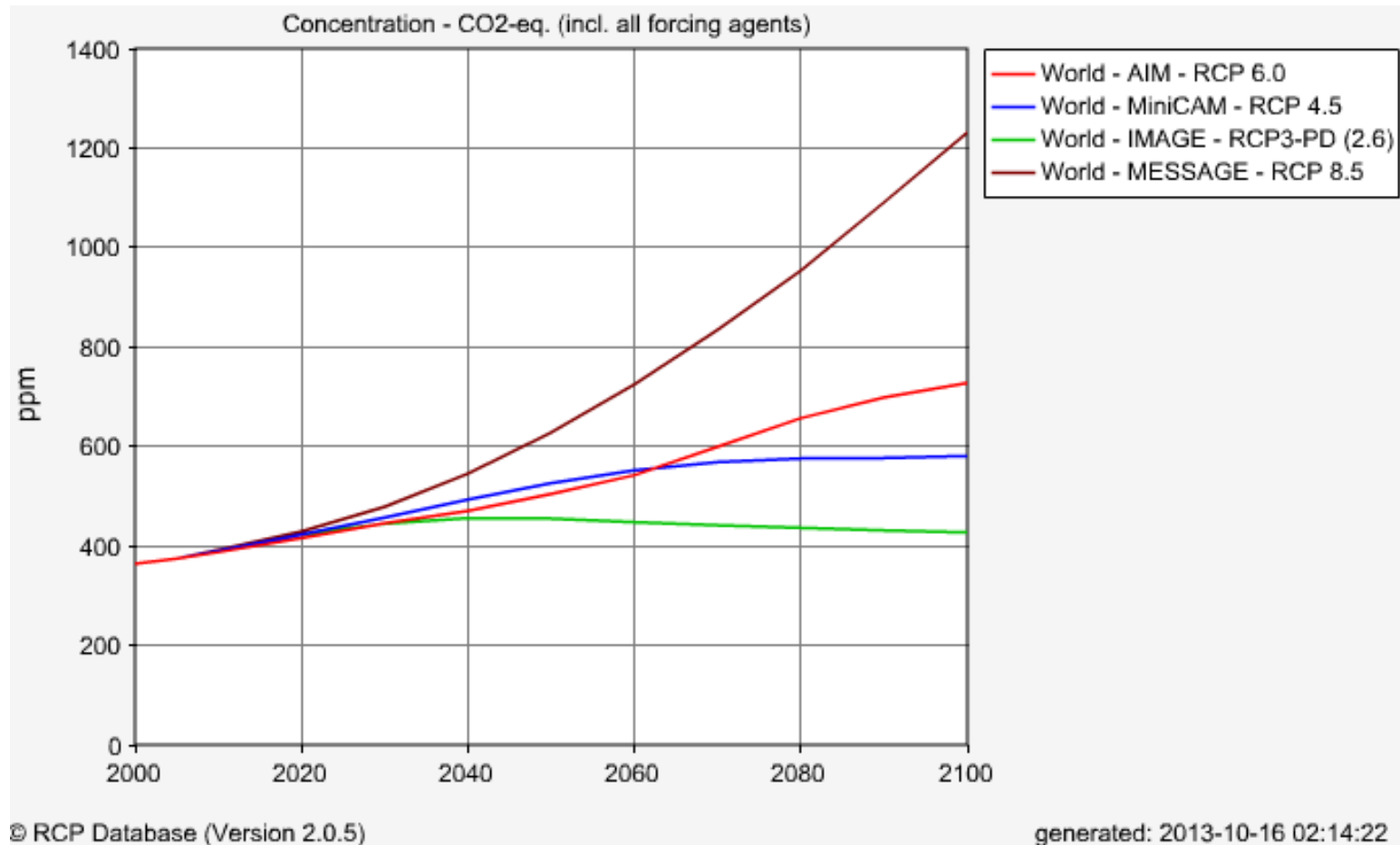
- 49 Rutherglen
- 58 Glenrowan
- 130 Beechworth
- 157 Alpine Valleys



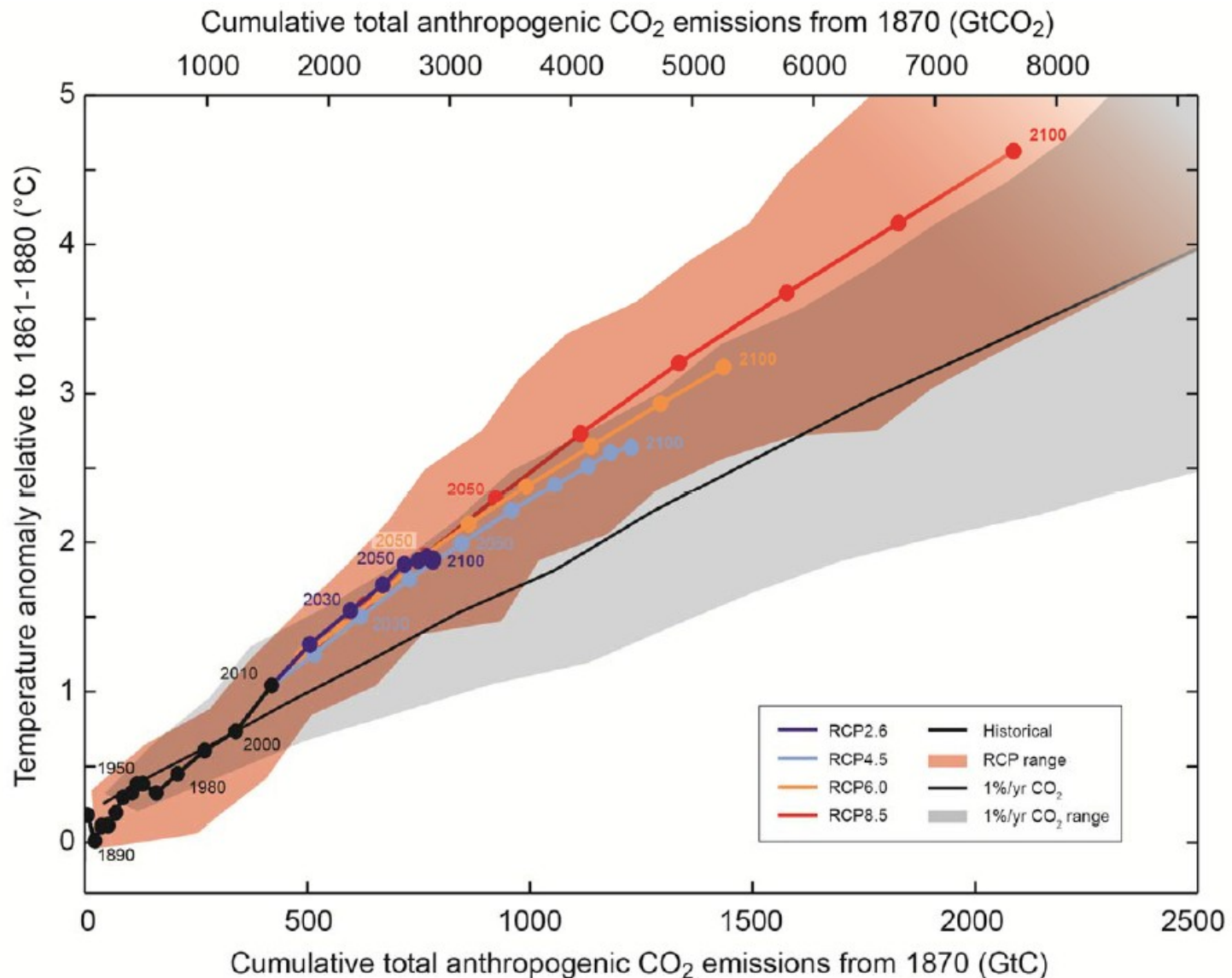


- Figure SPM.1
- Working Group I Contribution to the IPCC Fifth Assessment Report
- Climate Change 2013: The Physical Science Basis, Summary for Policymakers

# Representative Concentration Pathways (RCPs)



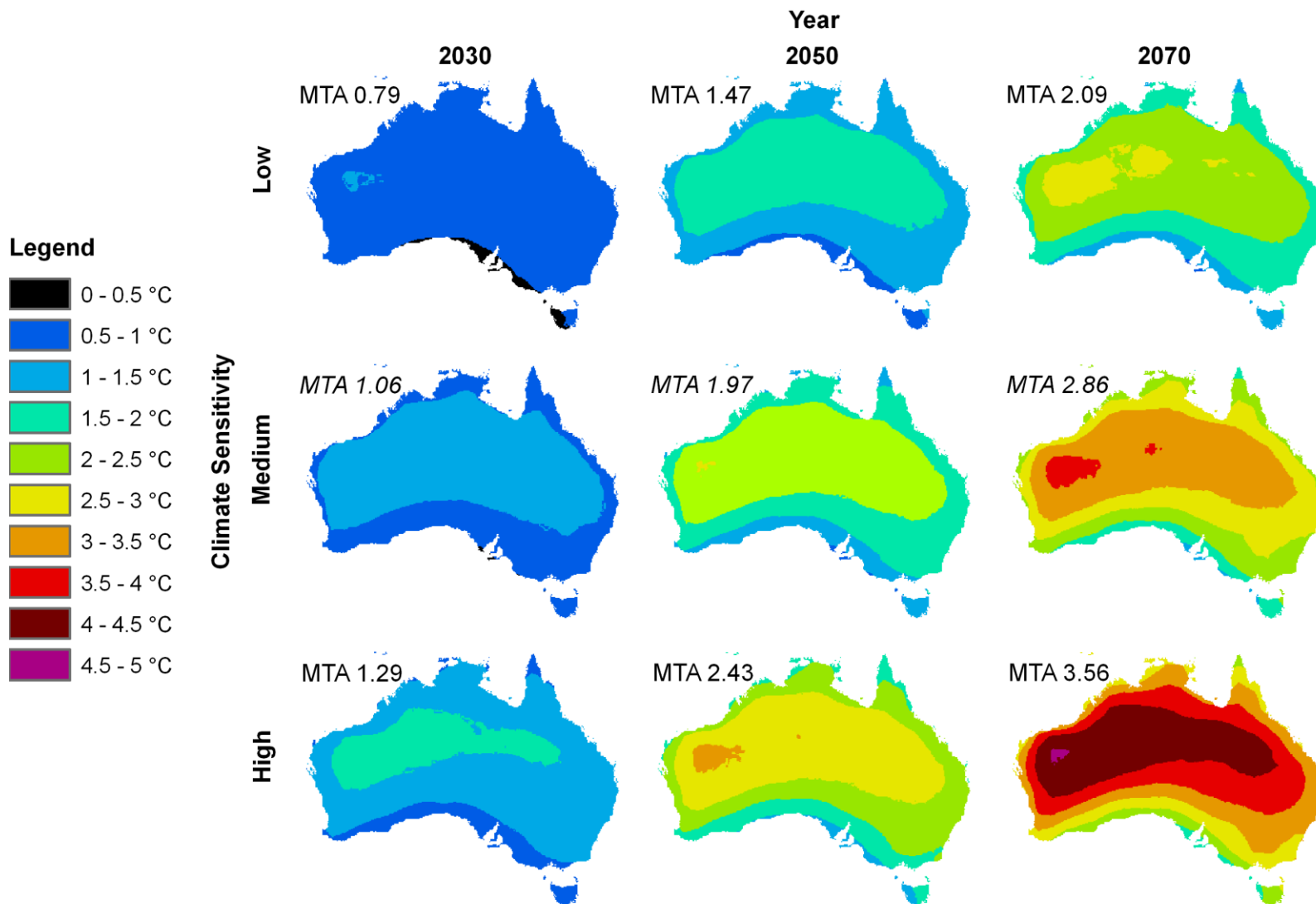
- [tntcat.iiasa.ac.at:8787/RcpDb](http://tntcat.iiasa.ac.at:8787/RcpDb)



- Figure SPM.10
- Working Group I Contribution to the IPCC Fifth Assessment Report
- Climate Change 2013: The Physical Science Basis, Summary for Policymakers

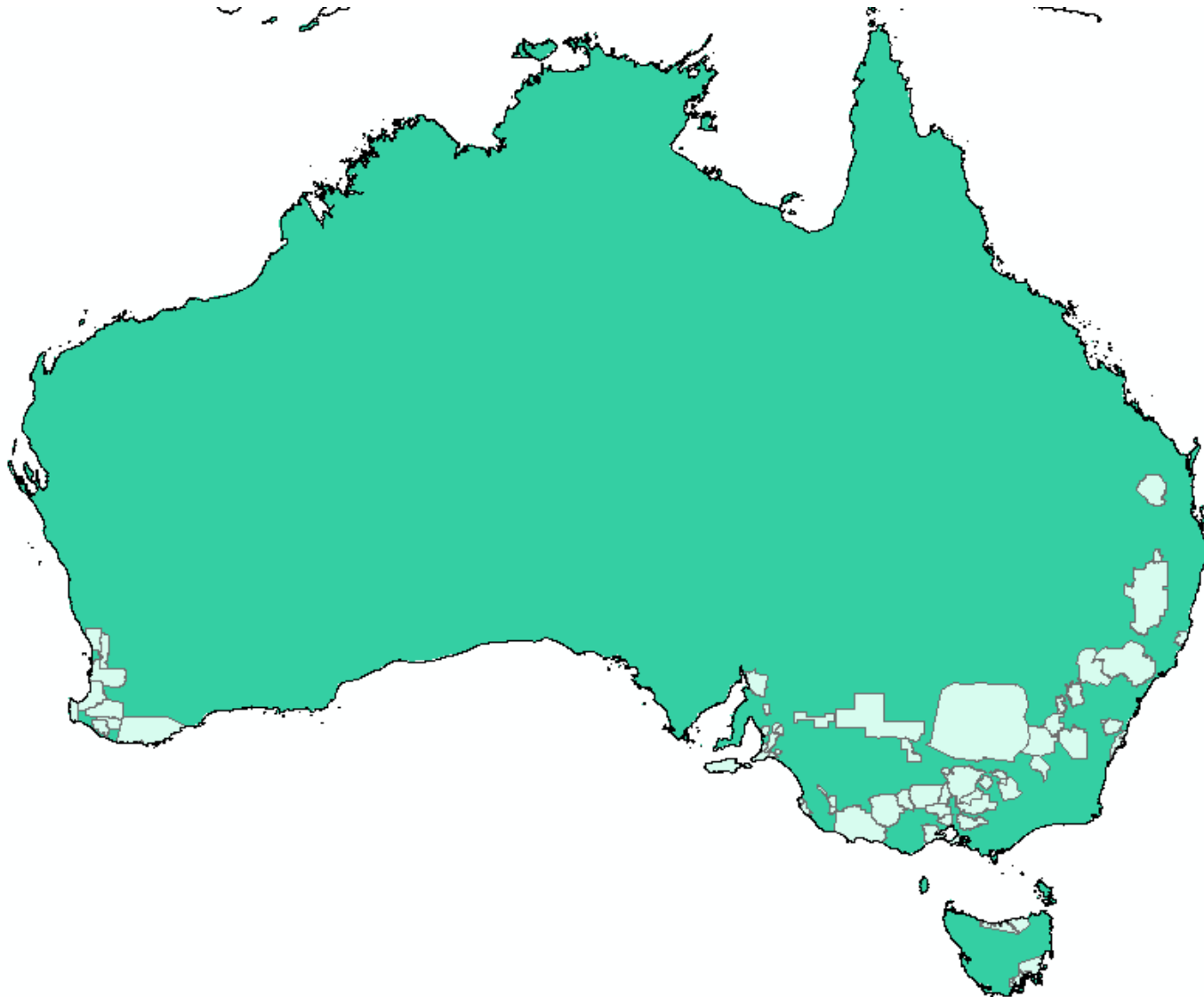
# Mean Temperature Anomalies, October-April

CSIRO Mk3.0 GCM Temperature Change Forecasts, SRES Scenario A1B



Source: Hall and Jones (2009), using data acquired from OzClim (CSIRO, 2007)

# Australian Wine Regions



Data Sources: GeoScience Australia, Wine Australia, Hall and Jones (2009)

# Projected GST Increases for NE Vic

- 2030 increased by 0.9°C
- 2050 increased by 1.7°C
- 2070 increased by 2.4°C
- Data source: Hall and Jones 2009, using CSIRO Mk3.0 GCM, SRES A1B, with medium sensitivity, i.e. Increase temperature of 2.6°C for a doubling of atmospheric CO<sub>2</sub> from 280 to 560 ppm, increases are from a base period of 1971-2000

# Australian Wine Region Temperature Changes are Less Than Australian Mean Temperature Changes

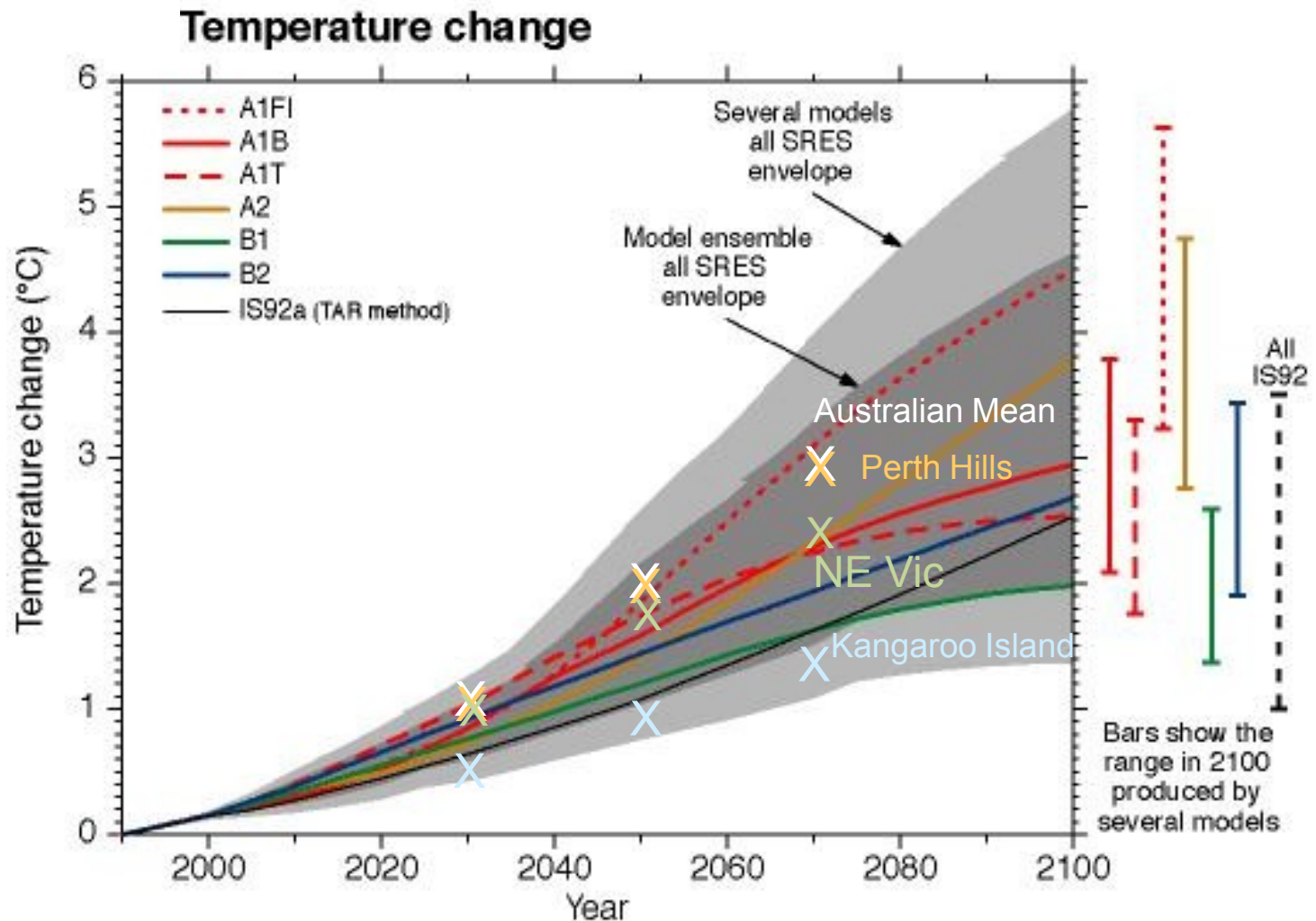
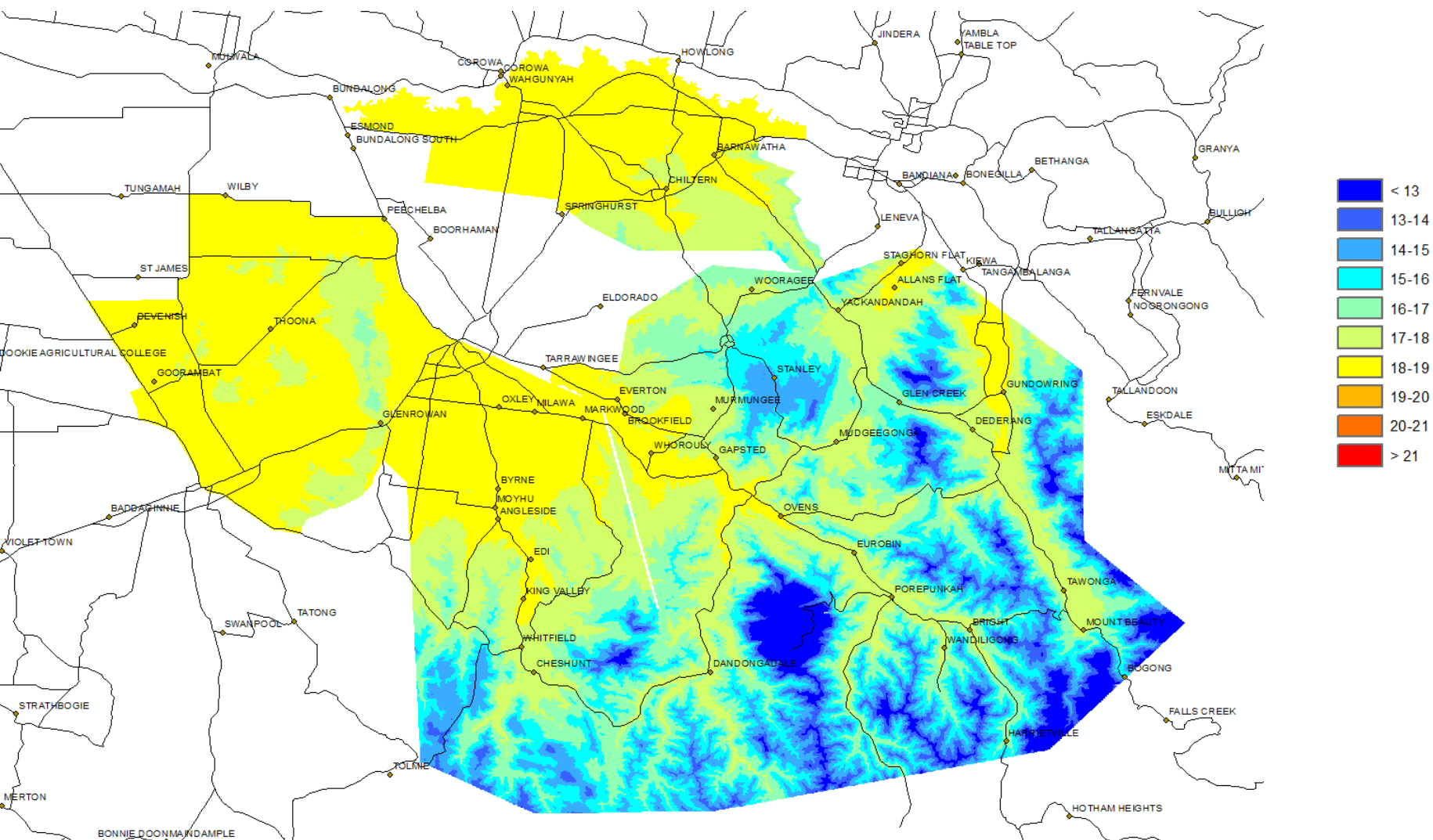


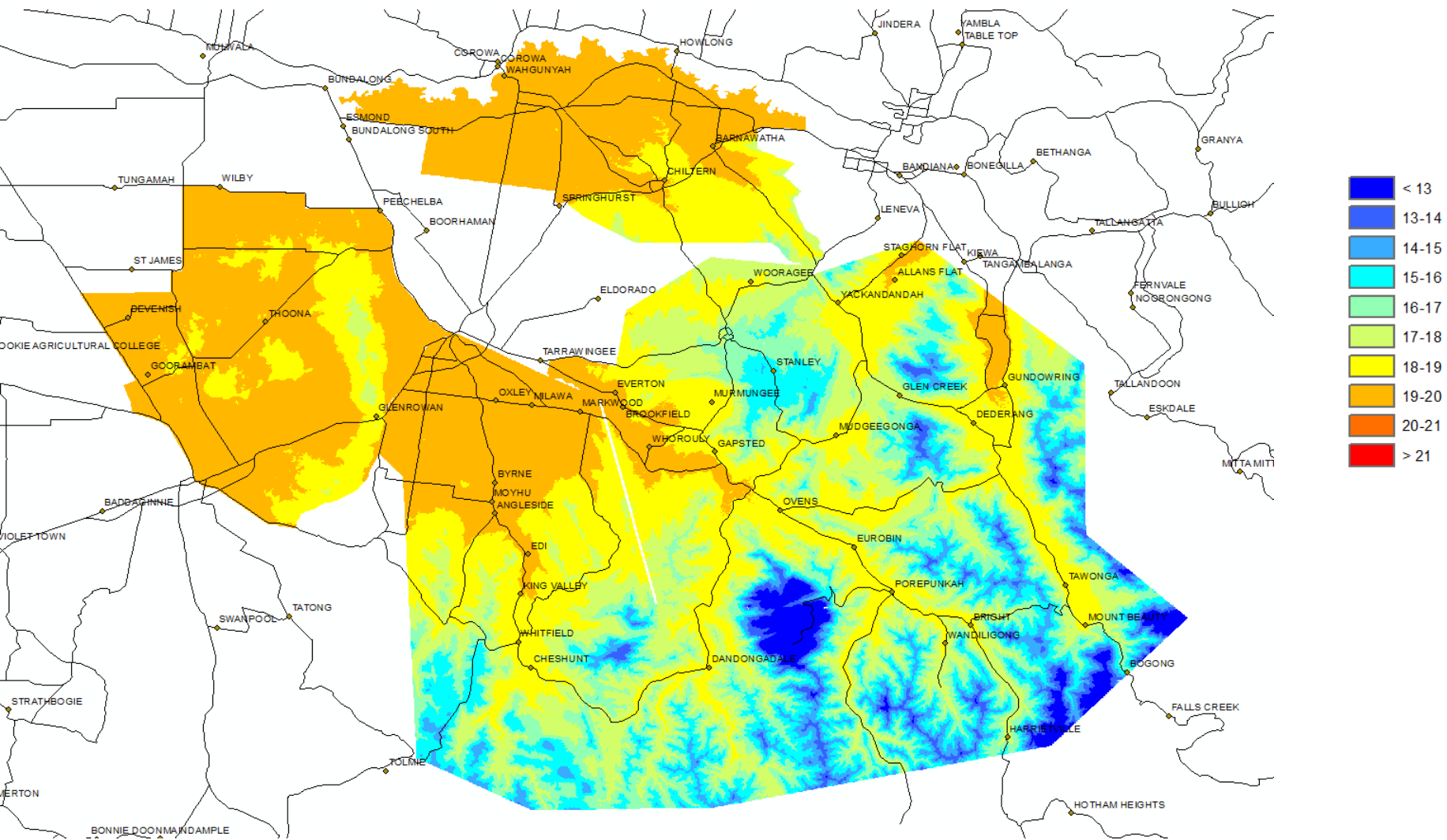
Chart: IPCC, 2007 (<http://www.ipcc.ch/graphics/2001wg1/large/01.33.jpg>)

Data represented by Xs: Hall and Jones (2009)

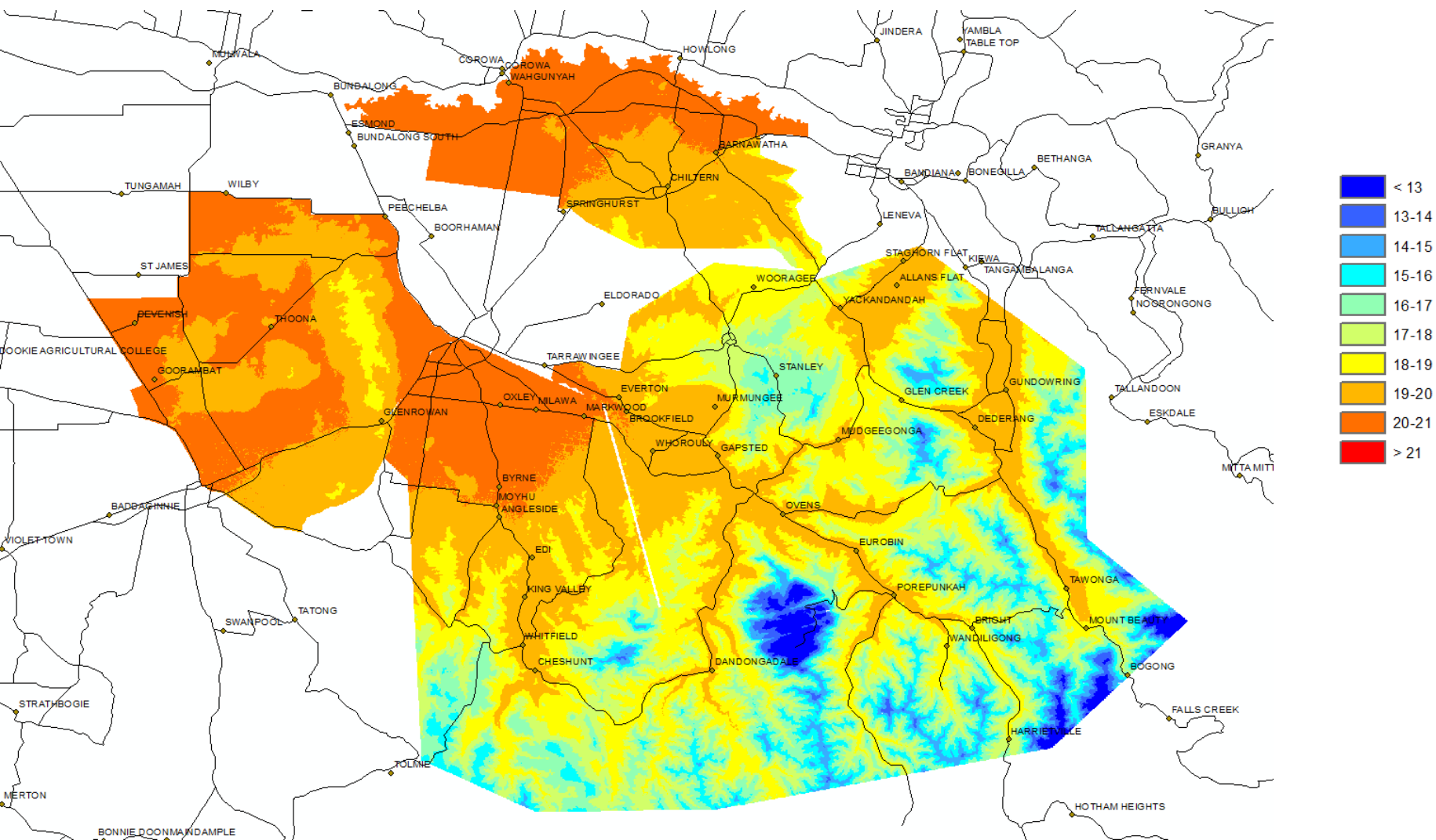




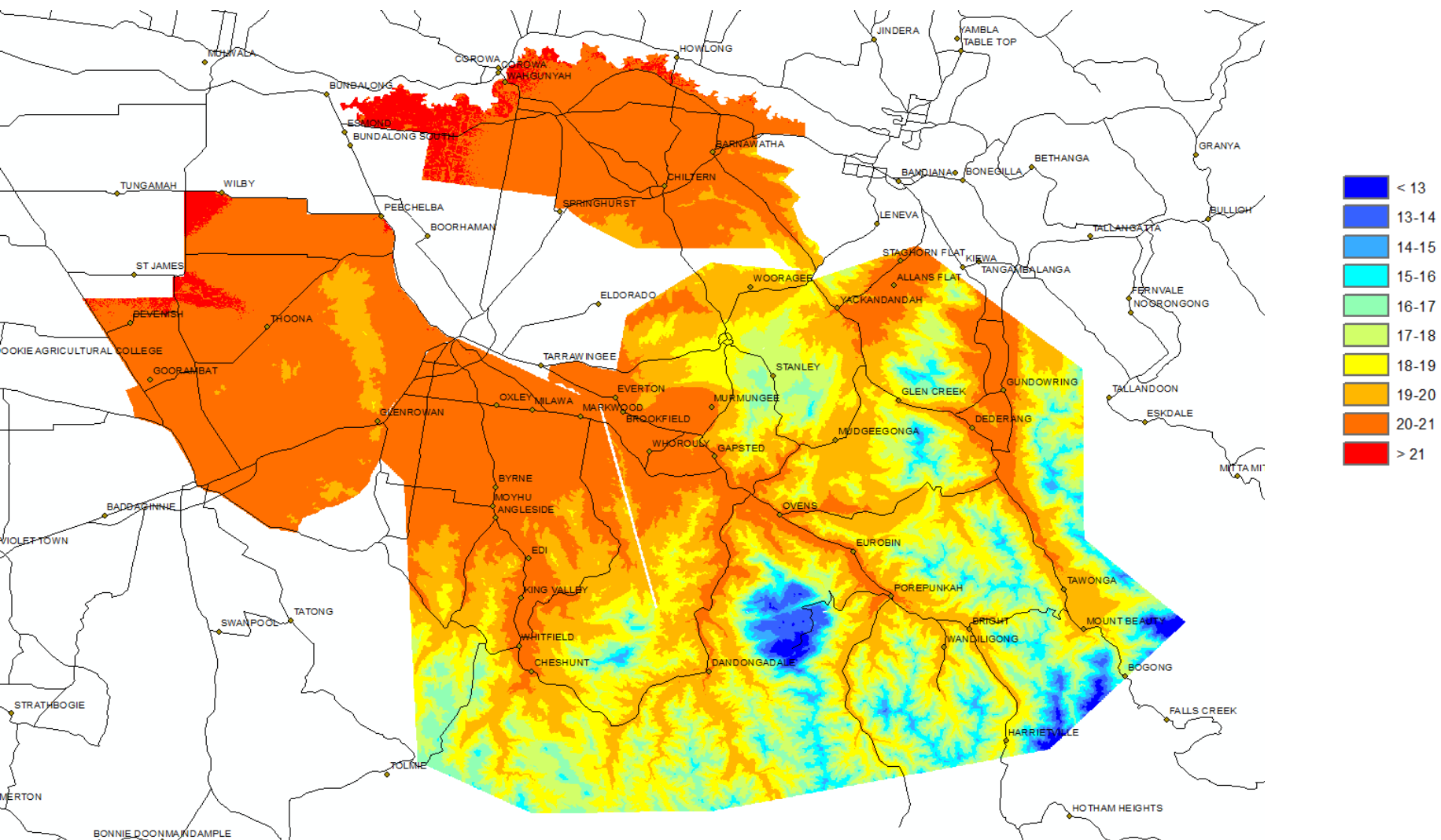
- 1971-2000 Growing Season Temperature (°C)



- 2030 Growing Season Temperature (°C)



- 2050 Growing Season Temperature (°C)



- 2070 Growing Season Temperature (°C)

# NE Victoria GIs Growing Season Temperature Projection

	<i>min</i>	<i>q1</i>	<i>median</i>	<i>q3</i>	<i>max</i>
base	7.58	15.88	17.30	18.22	18.64
2030	8.45	16.77	18.19	19.13	19.56
2050	9.24	17.54	18.96	19.91	20.37
2070	9.94	18.27	19.71	20.67	21.13

Base period is 1971-2000.

CSIRO Mk3.0 Global Climate Model with moderate GHG sensitivity and SRES scenario A1B.

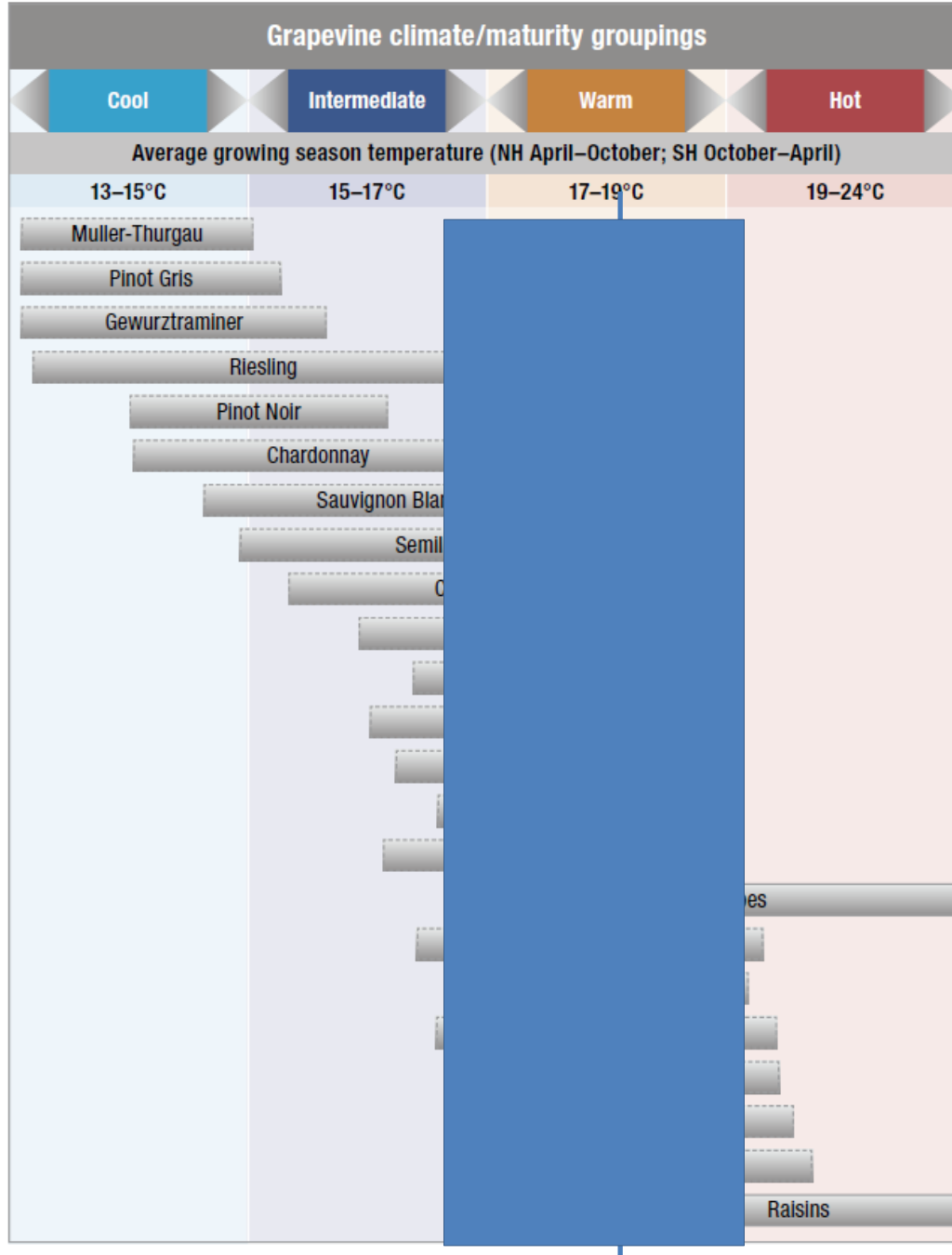
**Grapevine climate/maturity groupings**

Average growing season temperature (NH April–October; SH October–April)

Temperature Zone	Temperature Range (°C)	Associated Grape Varieties
Cool	13–15°C	Muller-Thurgau, Pinot Gris, Gewurztraminer, Riesling
Intermediate	15–17°C	Pinot Noir, Chardonnay, Sauvignon Blanc, Pinot Meunier, Pinot d'Océ
Warm	17–19°C	Pinot Noir, Chardonnay, Sauvignon Blanc, Pinot Meunier, Pinot d'Océ, Merlot, Cabernet Sauvignon, Shiraz, Grenache, Pinotage, Tempranillo, Zinfandel, Barbera, Sangiovese, Nebbiolo
Hot	19–24°C	Tablegrapes, Muscat, Concord, Blackberry, Raspberry, Strawberry, Peach, Apple, Pear, Plum, Cherry, Nectarine, Apricot, Mango, Pineapple, Banana, Orange, Lemon, Lime, Grapefruit, Watermelon, Cantaloupe, Honeydew, Kiwi, Strawberry, Raspberry, Blackberry, Peach, Apple, Pear, Plum, Cherry, Nectarine, Apricot, Mango, Pineapple, Banana, Orange, Lemon, Lime, Grapefruit, Watermelon, Cantaloupe, Honeydew, Kiwi

## 1971-2000

Background chart: Jones (2006)  
Animation data: Hall and Jones (2009)



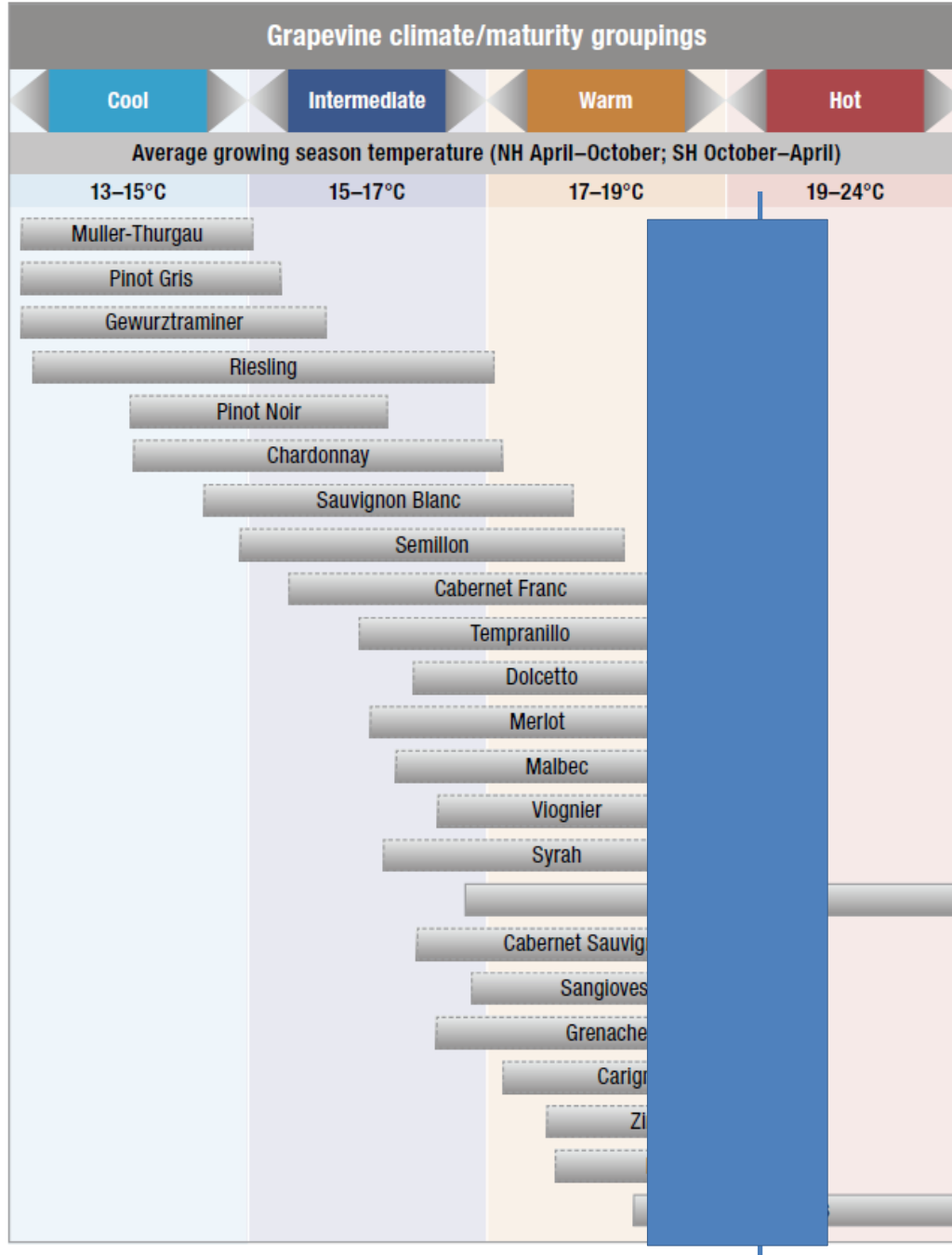
Background chart: Jones (2006)  
Animation data: Hall and Jones (2009)

Temperature Zone	Temperature Range (°C)	Grape Varieties
Cool	13–15	Muller-Thurgau, Pinot Gris, Gewurztraminer
Intermediate	15–17	Riesling, Pinot Noir, Chardonnay, Sauvignon Blanc, Semillon
Warm	17–19	Cabernet Franc, Tempranillo, Dolcetto, Merlot, Malbec, Viognier, Syrah, Cabernet Sauvignon
Hot	19–24	Shiraz, Zinfandel, Aglianico, Primitivo, Sangiovese, Negroamaro, Alicante Bouschet, Grenache, Barbera, Tannat, Mourvèdre, Muscat, Pinot Noir, Chardonnay, Sauvignon Blanc, Semillon, Cabernet Franc, Tempranillo, Dolcetto, Merlot, Malbec, Viognier, Syrah, Cabernet Sauvignon

# 2050

Background chart: Jones (2006)  
Animation data: Hall and Jones (2009)





Background chart: Jones (2006)  
 Animation data: Hall and Jones (2009)

# Beechworth GI Growing Season Temperature

	<i>min</i>	<i>Q1</i>	<i>median</i>	<i>Q2</i>	<i>max</i>
Base	16.7	16.7	17.1	17.2	17.7
2030	17.6	17.6	18.0	18.1	18.6
2050	18.4	18.4	18.8	18.9	19.4
2070	19.1	19.2	19.6	19.7	20.2
2030-Base	0.9	0.9	0.9	0.9	0.9
2050-Base	1.7	1.7	1.7	1.7	1.7
2070-Base	2.4	2.5	2.5	2.5	2.5

Base period is 1971-2000.

CSIRO Mk3.0 Global Climate Model with moderate GHG sensitivity and SRES scenario A1B.

Ripening Period Temperature and Season End Date based on harvest at 1300 BEDD (Shiraz).

Source: Hall and Jones (2009)

# Beechworth GI Total Season Heat Accumulation (BEDD)

	<i>min</i>	<i>Q1</i>	<i>median</i>	<i>Q2</i>	<i>max</i>
Base	1316	1322	<b>1369</b>	1382	1450
2030	1435	1440	<b>1481</b>	1492	1550
2050	1527	1532	<b>1568</b>	1578	1628
2070	1604	1608	<b>1639</b>	1649	1693
2030-Base	119	118	<b>112</b>	110	100
2050-Base	211	210	<b>199</b>	196	178
2070-Base	288	286	<b>270</b>	267	243

Base period is 1971-2000.

CSIRO Mk3.0 Global Climate Model with moderate GHG sensitivity and SRES scenario A1B.

Ripening Period Temperature and Season End Date based on harvest at 1300 BEDD (Shiraz).

Source: Hall and Jones (2009)

# Beechworth GI Estimated Ripening Period

Temperature (Temperature for 30 days following BEDD = 1300 (Shiraz))

	<i>min</i>	<i>Q1</i>	<i>median</i>	<i>Q2</i>	<i>max</i>
Base	14.2	14.7	16.3	16.7	18.4
2030	18.0	18.2	19.1	19.3	20.2
2050	19.8	19.9	20.5	20.6	21.6
2070	21.1	21.3	21.8	21.9	22.7
2030-Base	3.8	3.5	2.8	2.6	1.8
2050-Base	5.6	5.2	4.2	3.9	3.2
2070-Base	6.9	6.6	5.5	5.2	4.3

Base period is 1971-2000.

CSIRO Mk3.0 Global Climate Model with moderate GHG sensitivity and SRES scenario A1B.

Ripening Period Temperature and Season End Date based on harvest at 1300 BEDD (Shiraz).

Source: Hall and Jones (2009)

# Beechworth GI Estimated Harvest Date (modelled for Shiraz)

	<i>min</i>	<i>Q1</i>	<i>median</i>	<i>Q2</i>	<i>max</i>
Base	27-Mar	4-Apr	6-Apr	16-Apr	19-Apr
2030	18-Mar	22-Mar	23-Mar	27-Mar	28-Mar
2050	12-Mar	16-Mar	16-Mar	19-Mar	19-Mar
2070	8-Mar	11-Mar	11-Mar	13-Mar	14-Mar
2030-Base	-9	-13	-14	-20	-22
2050-Base	-15	-19	-21	-28	-31
2070-Base	-19	-24	-26	-34	-36

Base period is 1971-2000.

CSIRO Mk3.0 Global Climate Model with moderate GHG sensitivity and SRES scenario A1B.

Ripening Period Temperature and Season End Date based on harvest at 1300 BEDD (Shiraz).

Source: Hall and Jones (2009)

# Conclusions

- Current climate (1971-2000) of the NE Victorian GIs is very suitable for producing good economically sustainable table wine for many varieties.
- Increasing growing season temperature has a greater warming effect on ripening period temperature, particular in cooler climates.
- For a mid-range warming scenario, even by 2070, only small areas of the NE Victorian GIs may in the future have an unfavourable climate for growing some varieties of winegrapes.
- There is much uncertainty in GCM forecasting methods and in future human behaviour (IPCC 2007, 2013).
- Meso-climatic variation should be considered.

# Resources

- Download climate projections for NE Vic from:
  - <http://csusap.csu.edu.au/~ahall/NEVic/>
  - Google Earth required  
<http://www.google.com/earth/>
- Related Publications
  - Hall, A. and G. V. Jones (2009). "Effect of potential atmospheric warming on temperature-based indices describing Australian winegrape growing conditions." Australian Journal of Grape and Wine Research **15(2): 97–119.**
  - Hall, A. and G. Jones (2010). "Spatial analysis of climate in winegrape-growing regions in Australia." Australian Journal of Grape and Wine Research **16(3): 389–404.**
  - Jones, G. V. (2006). "Climate change and wine: Observations, impacts and future implications." Australian and New Zealand Wine Industry Journal **21: 21–26.**