

# Communicating Climate Change

Module 3

October 2008

An initiative of the National Agriculture and Climate Change Action Plan

## Observed climate change: Victoria

Victoria's climate is changing. Farmers have long been aware of natural cycles in the climate associated with factors such as El Niño, but now human-induced climate changes are becoming apparent. These changes will have significant impacts on the way Victoria is farmed.

### Key facts

- Victoria's climate has changed substantially over the past 100 years.
- Since the 1950s, the state has experienced a pronounced warming trend, with 2007 being its warmest year on record at 1.2°C above average.
- Rainfall changes are less clear, with wetter conditions dominating the period from the late 1940s to the late 1990s.
- 1997–2007 is the state's driest 11-year period on record.

### Observed changes in rainfall

At the annual time scale, Victoria's rainfall patterns show that conditions were relatively dry from 1900 (the Federation Drought) to the late 1940s (Figure 1). The middle decades of the 20th century, in particular the 1950s and 1970s, were rather wet, with major floods a common occurrence. Since 1996, rainfall has been consistently low and 1997–2007 is the state's driest 11-year period on record.

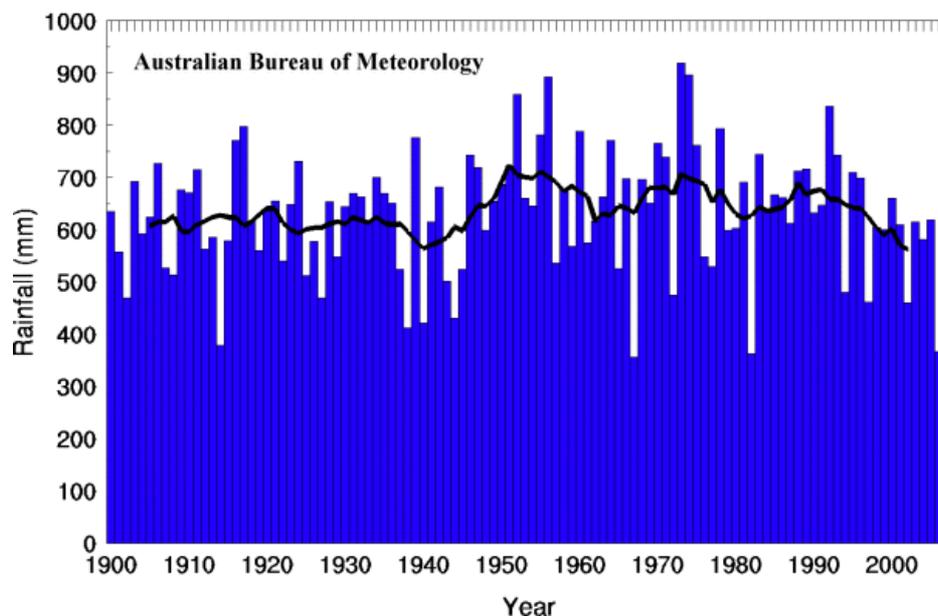


Figure 1: Annual average rainfall (mm), Victoria

A cooperative venture between



**Australian Government**  
**Department of Agriculture,**  
**Fisheries and Forestry**  
**Bureau of Meteorology**



Victoria's mean autumn rainfall has decreased over the past 100 years (Figure 2), reflecting a delayed autumn break in rainfall. Spring rainfall has tended to increase. The delay of the autumn break has become very pronounced over the last 20 years and is responsible for a severe reduction in river flows across Victoria.

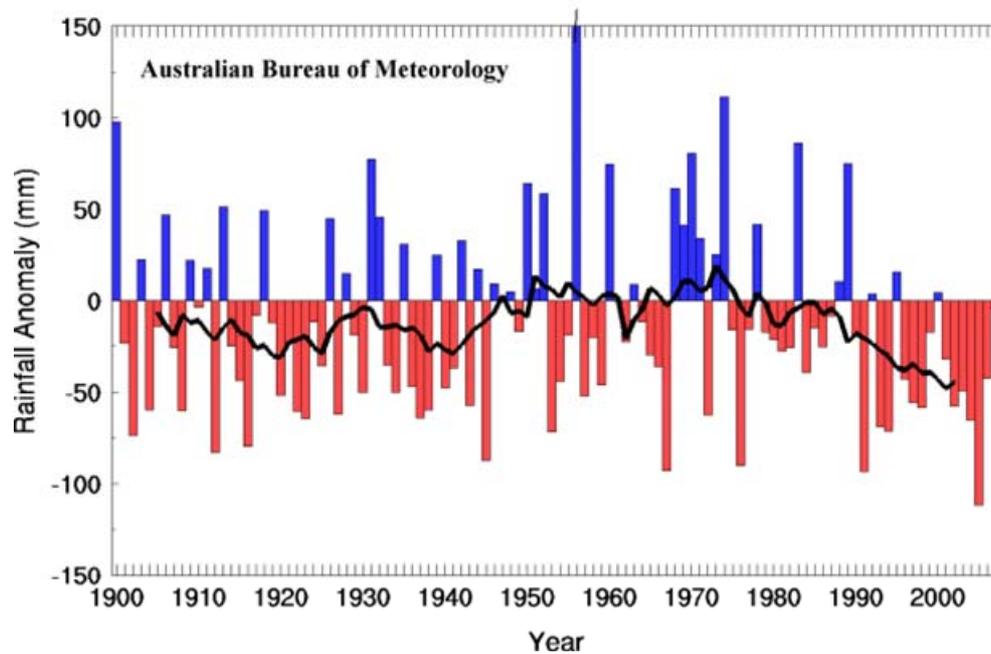
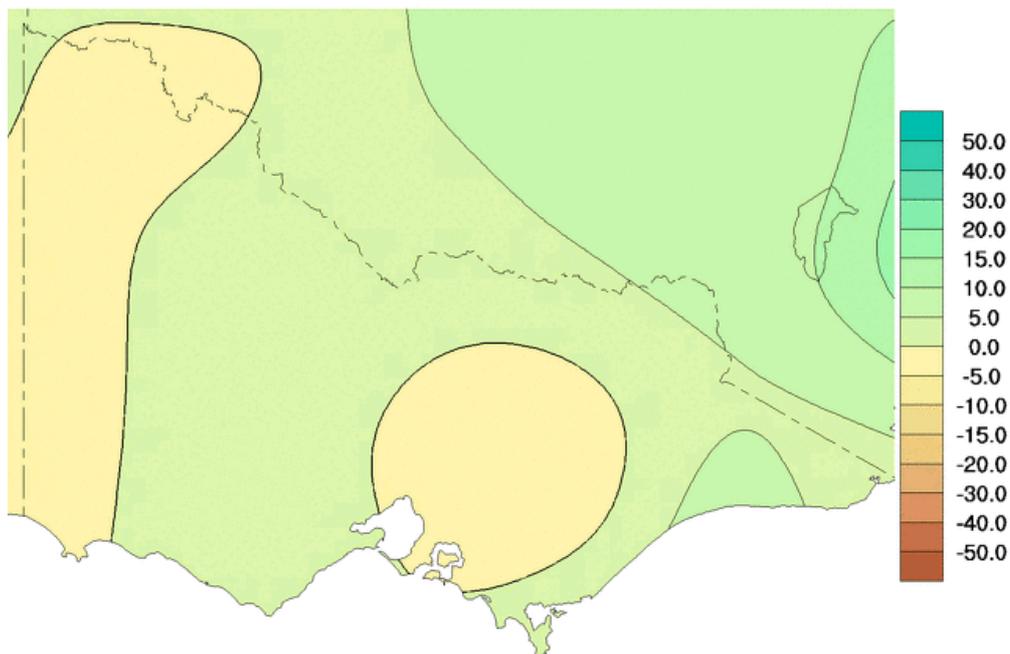


Figure 2: Annual autumn rainfall relative to the long-term average (mm), Victoria (blue = above average rainfall, red = below average rainfall)

Against the historical background of variability, trends in rainfall are not meaningful for Victoria. For example, rainfall trend maps show little change since 1900 despite the fact that 1997-2007 has been exceptionally dry (Figure 3).



© Commonwealth of Australia 2008, Australian Bureau of Meteorology

Issued: 11/02/2008

Figure 3: Trend in Victoria's annual average rainfall (mm/decade), 1900–2007

In contrast, since the 1950s the rainfall trend is strongly downwards (Figure 4), though this partly reflects the very wet conditions around the middle of last century.

It is more accurate to think of Victoria's rainfall as tending to vary between wetter and drier periods, rather than searching for simple trends from wet to dry.

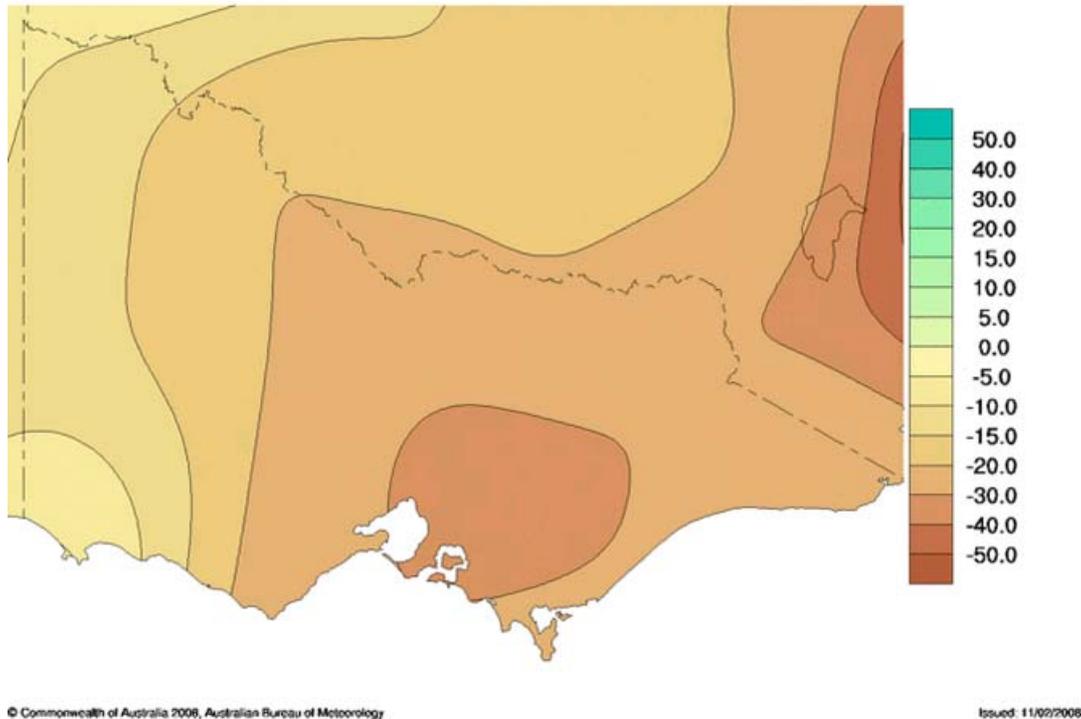


Figure 4: Trend in Victoria's annual average rainfall (mm/decade), 1950–2007

## Observed changes in drought

Victoria has a history of short and severe droughts, which often coincide with El Niño events. These droughts include those occurring in 2006, 1982 and 1972.

Droughts tend to be less frequent during the wetter decades and more common during the drier periods, such as since the mid-1990s. For example, only two major drought years occurred between 1950 and 1990.

## Observed changes in temperature

Temperature records for Victoria show strong warming since the 1950s (Figure 5).

The state's warmest year on record was 2007, when the mean annual temperature was +1.2°C above the 1961–90 average. The total warming since 1910 is near 0.9°C, most of which has occurred since 1950. This warming is consistent with warming elsewhere in the world.

Both maximum (day) and minimum (night) temperatures show warming, though with considerable year-to-year variability. Much of this variability is driven by the large ranges in maximum and minimum temperatures which we tend to experience during drought years i.e. particularly cool nights and particularly warm days, relative to the average. Since 1997, the combination of low rainfall and global warming has resulted in particularly high maximum temperatures (Figure 6) and a series of notable heatwaves.

### Victoria Annual Mean T Anomaly (base 1961-90)

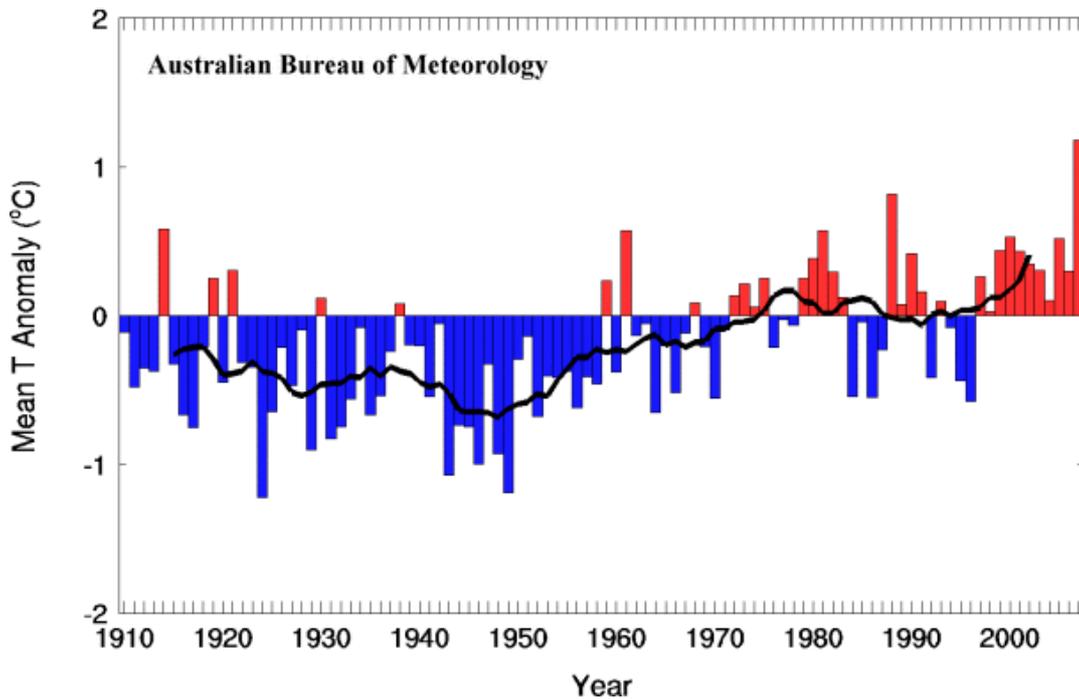


Figure 5: Annual mean temperature relative to the long-term average (°C), Victoria (red = above average temperature, blue = below average temperature)

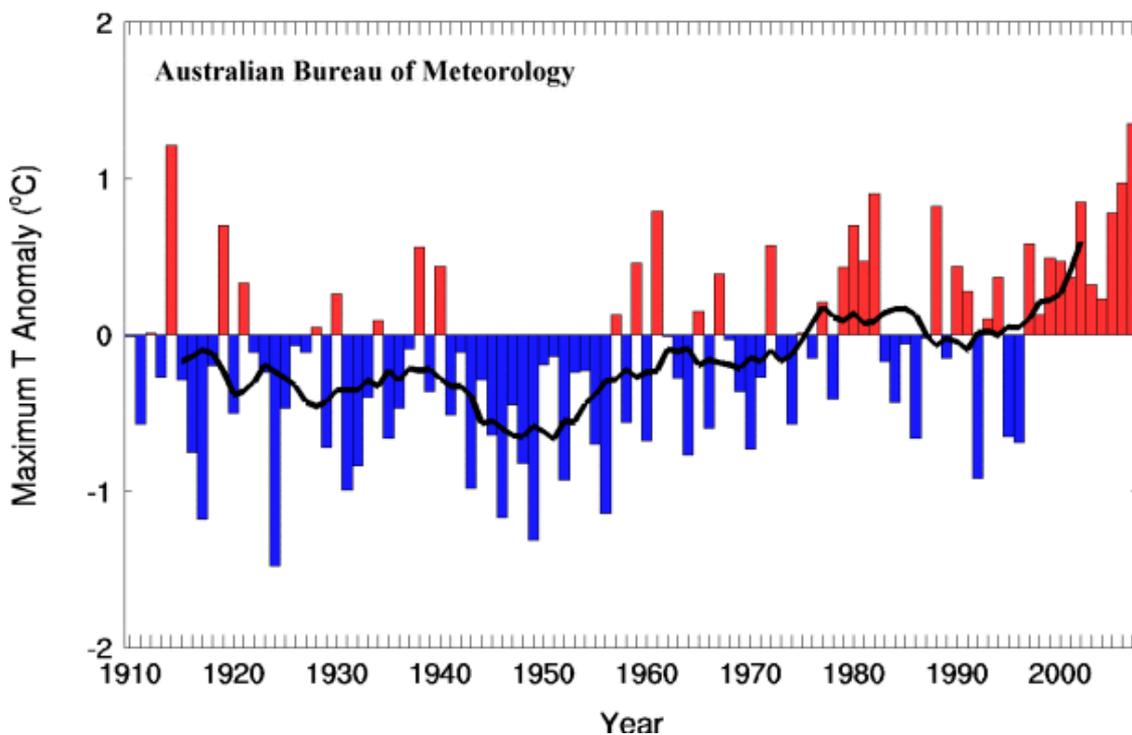


Figure 6: Annual maximum temperature relative to the long-term average (°C), Victoria (red = above average temperature, blue = below average temperature)

In large towns and cities in Victoria, the upward trend in minimum temperature has been particularly marked due to urban development, also referred to as the 'heat island effect'. This effect adds to global warming, and, in the case of Victoria's larger towns, means that cold nights and frost are becoming rare.

## Observed changes in evaporation and cloud cover

Analyses of trends in pan evaporation and other climate variables show mixed results. Accompanying the recent reduction in rainfall, cloud cover has decreased since the 1960s, particularly during autumn and winter.

## Observed changes in severe weather

The warming of the 20th century has resulted in fewer very cold days and nights, and more very hot days and nights. Recent summers and autumns, in particular, have had a number of exceptional heatwaves. There have been fewer days of extremely heavy rainfall and notably few flood events since the mid-1990s.

## Observed changes in Victoria's weather drivers

The dry conditions experienced in Victoria since the mid-1990s are due to the prevalence of high-pressure systems during autumn and winter, causing fronts and low-pressure systems to be weaker and to occur further south.

## What is causing the changes we have observed?

Scientists are confident that warming over Australia in recent decades is linked to global increases in greenhouse gas concentrations caused by human activities.

It is premature to definitively link the recent extended dry in Victoria to climate change. However, this dry is very unusual in the context of past rainfall variability and has clearly been exacerbated by the higher temperatures.

### Further information

The information presented here is sourced from:

- Bureau of Meteorology's climate change tracker: <http://www.bom.gov.au/climate/change>
- the *Climate Change in Australia* report: <http://www.climatechangeinaustralia.com.au>
- the Intergovernmental Panel on Climate Change: <http://www.ipcc.ch>