



Australian Government
Bureau of Meteorology

Climate Change in Southwest WA Storm Events, Sea Level Rise, etc...

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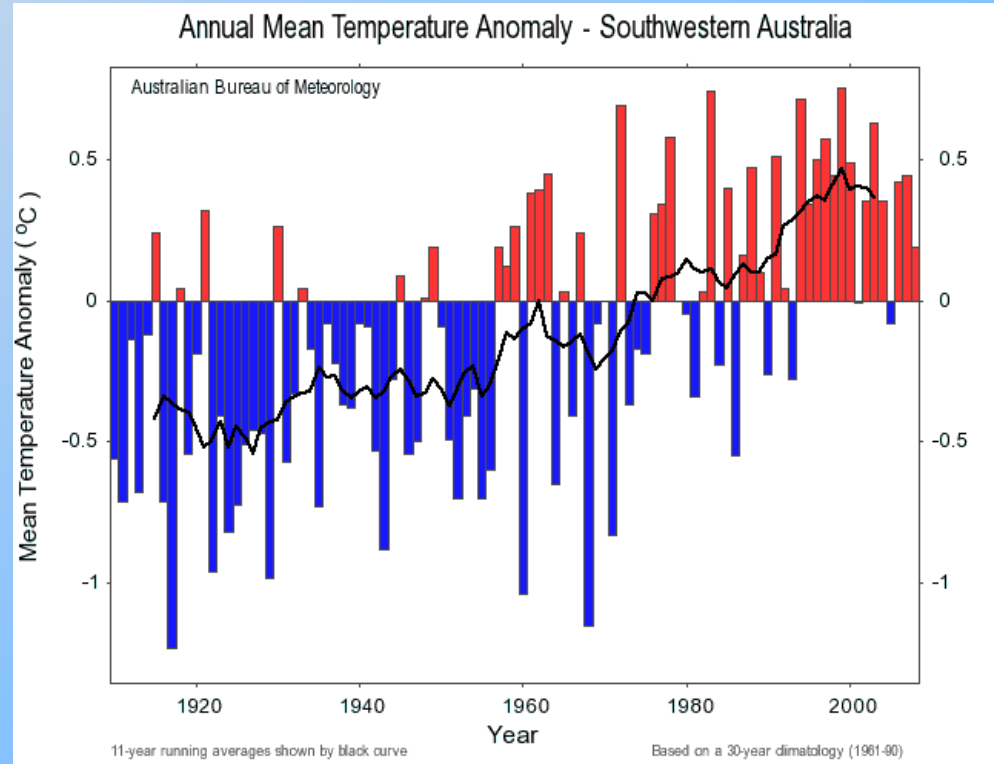
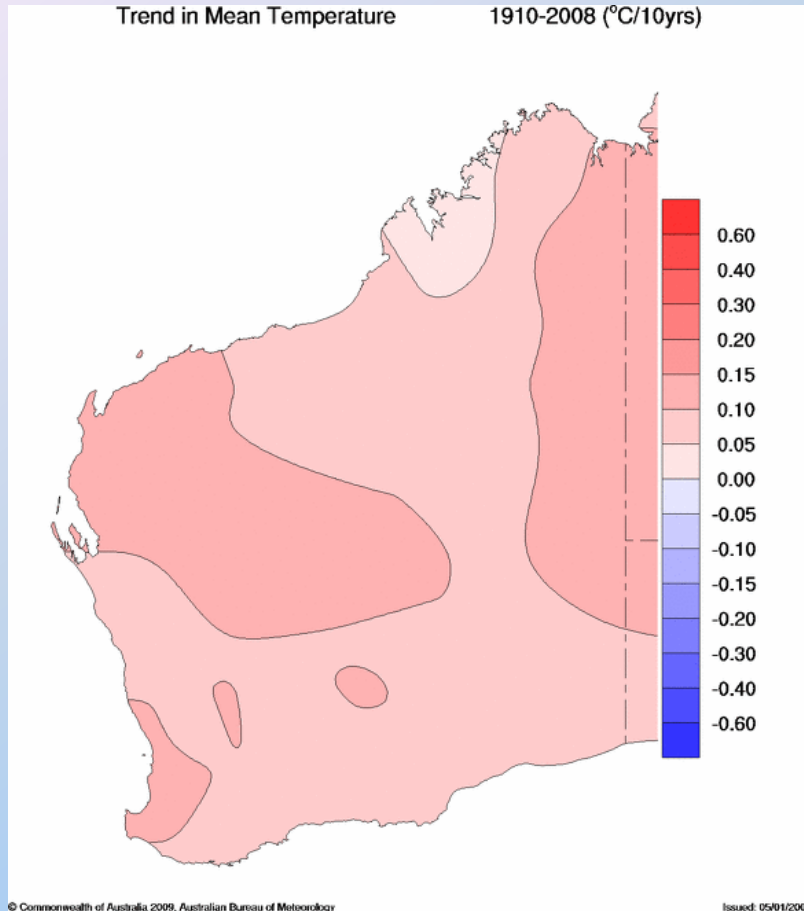


Introduction

- Observed Climate Change in SW WA
- Reasons for the Changes
- Projected Future Change

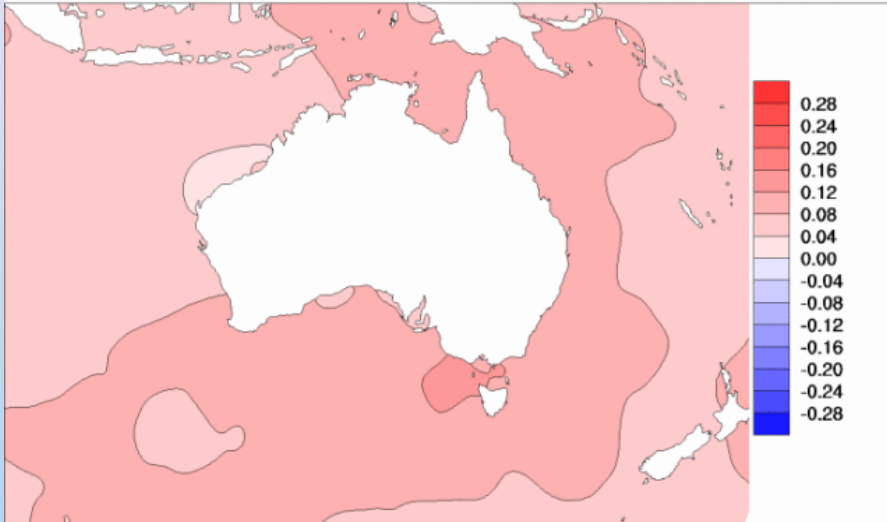


What changes have we seen?

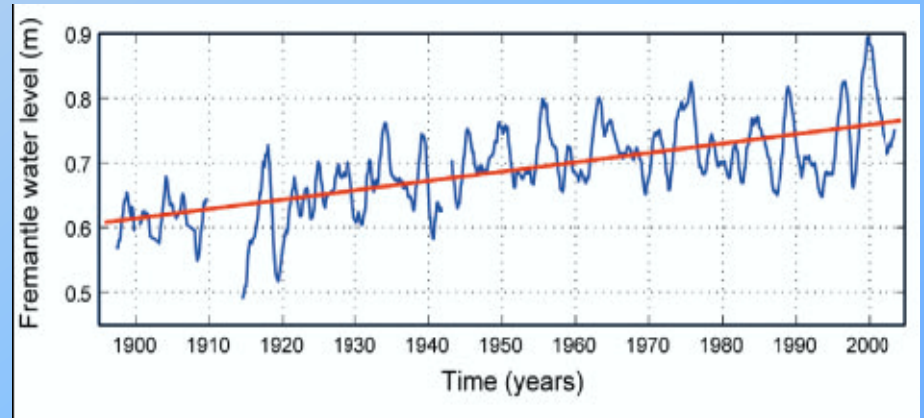


What changes have we seen?

Trend in SST for the Australian Region (°C/10 yrs) annual 1900-2008



About 20cm in the past 100 years

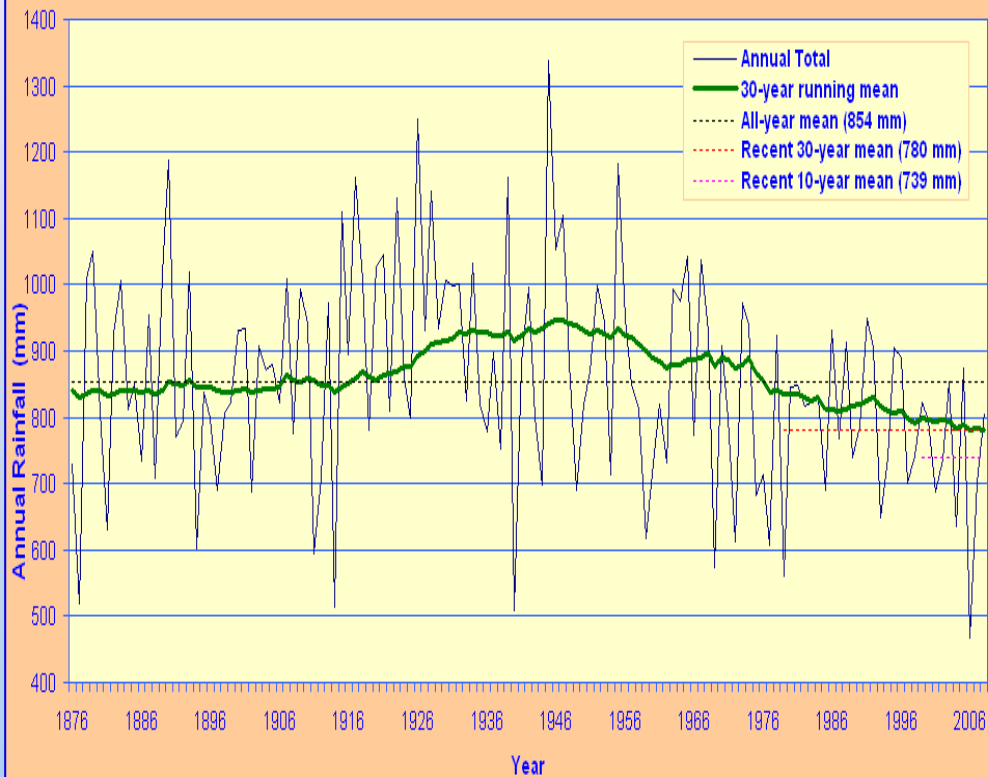


Time series of Fremantle sea level (one year running mean) with the linear trend of 1.54 mm per annum in red. (IOC)

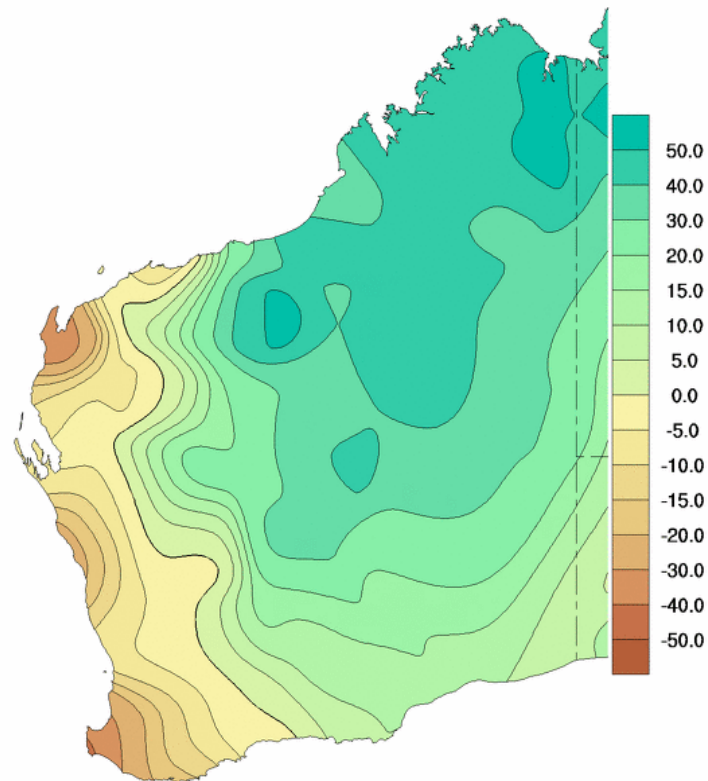


What changes have we seen?

PERTH METRO (1876-2008)

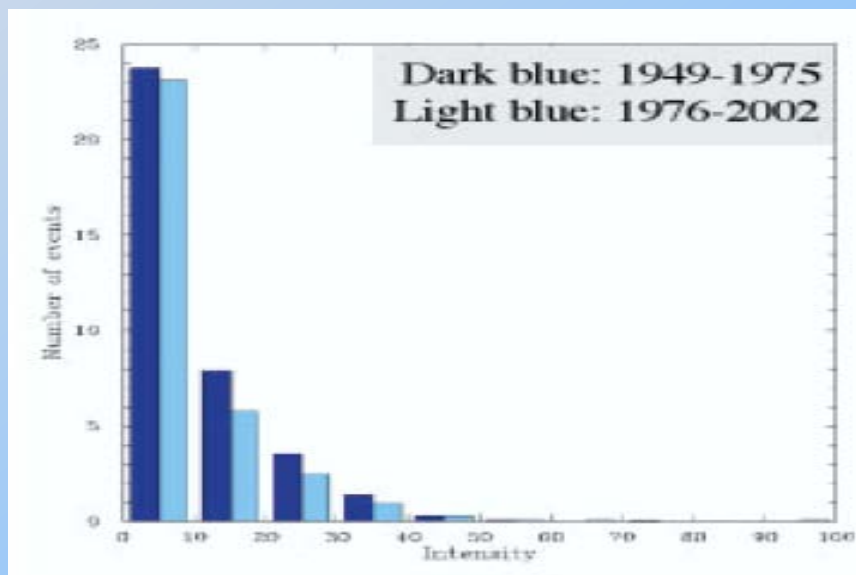


Trend in Annual Total Rainfall 1960-2008 (mm/10yrs)



What changes have we seen?

- Declining rainfall in SW WA suggests fewer and generally weaker cold fronts, particularly early in the season
- Significant decline in tropical cloud band interaction with fronts
- Decline in moderate rainfall events (20-40 mm)
- Swan River flood events have declined - consistent with rainfall ↓



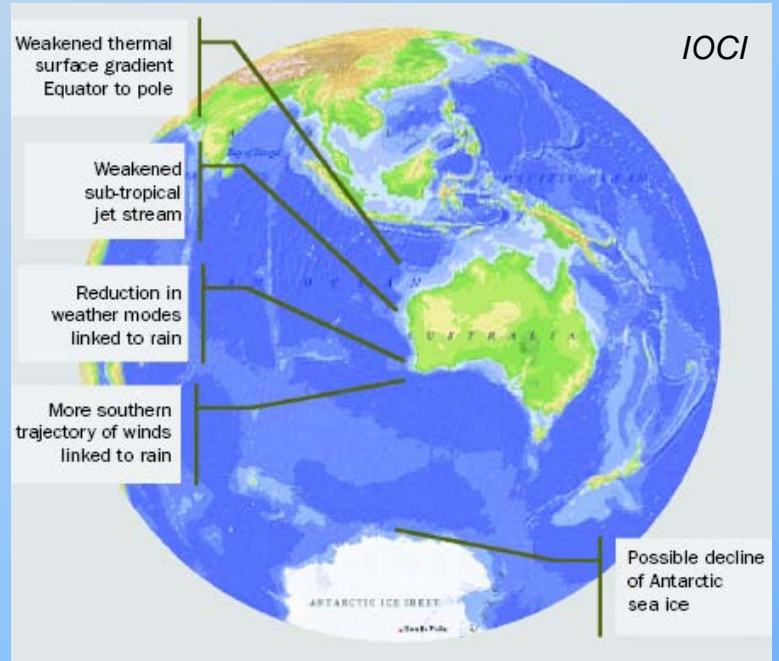
Perth Airport June and July -
Average number of rainfall
days per year in 10 mm
intensity bands for two epochs

IOCI 2005



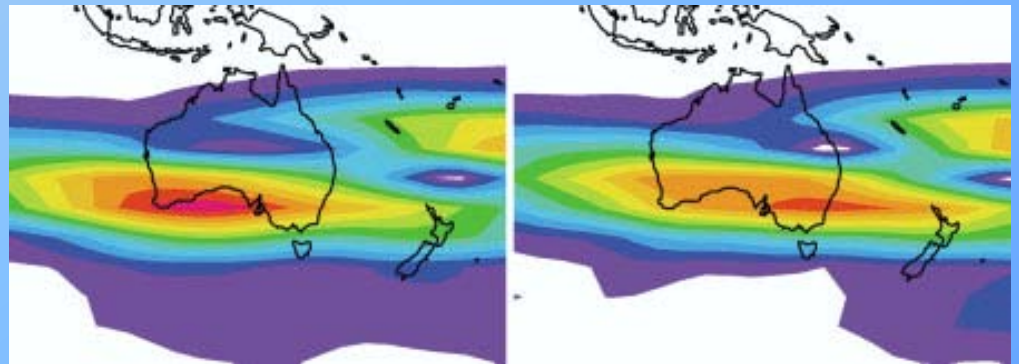
What changes have we seen?

Large scale changes in atmospheric circulation patterns have been observed since the 1970s

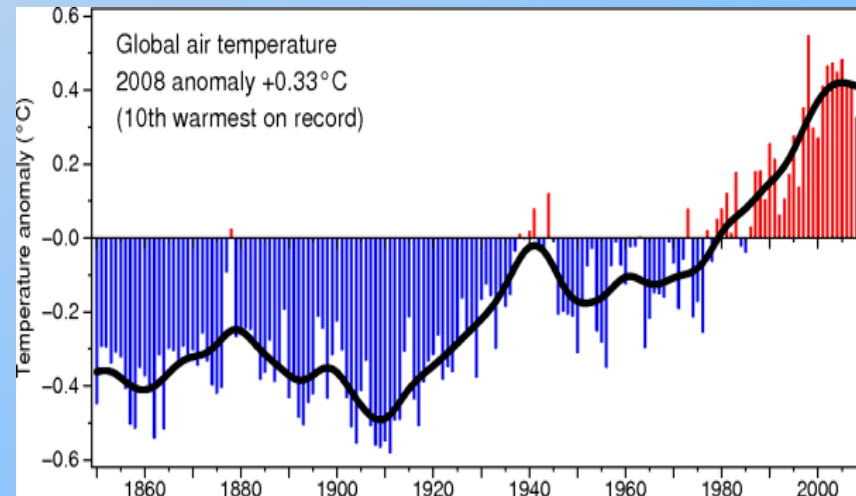
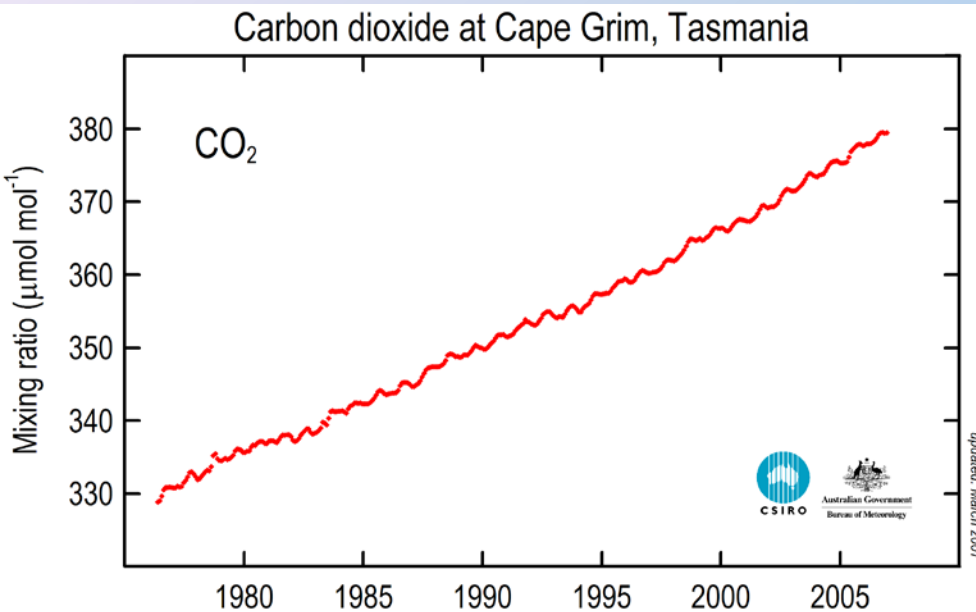


In southwest WA

- Average surface pressure has increased
- The favoured region for winter storm development has shifted away



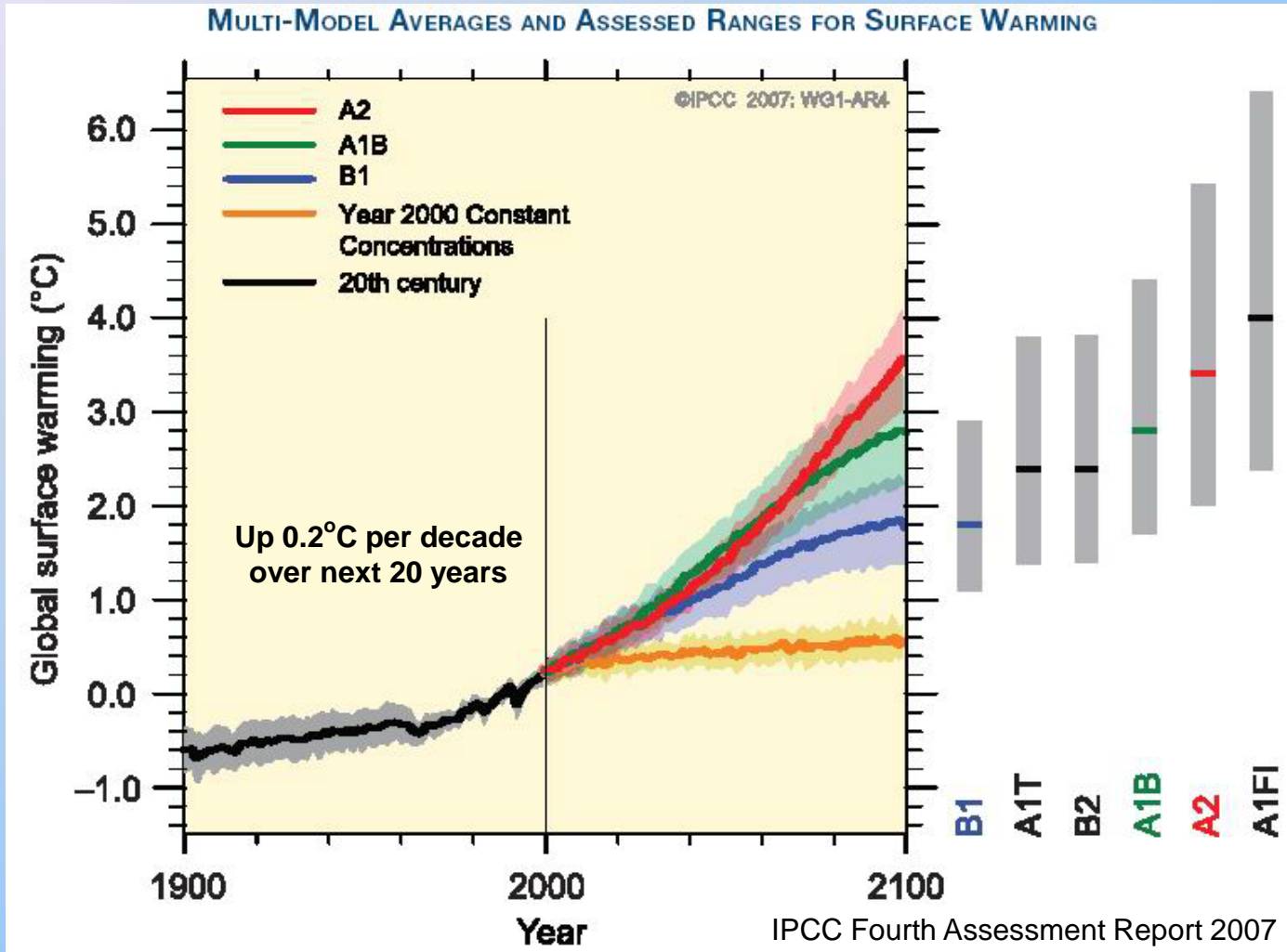
Reasons?



- **Natural Variability?**
- **Ozone hole?**
- **Land use change?**



Future Change?



Future Change?

PROJECTED PATTERNS OF PRECIPITATION CHANGES

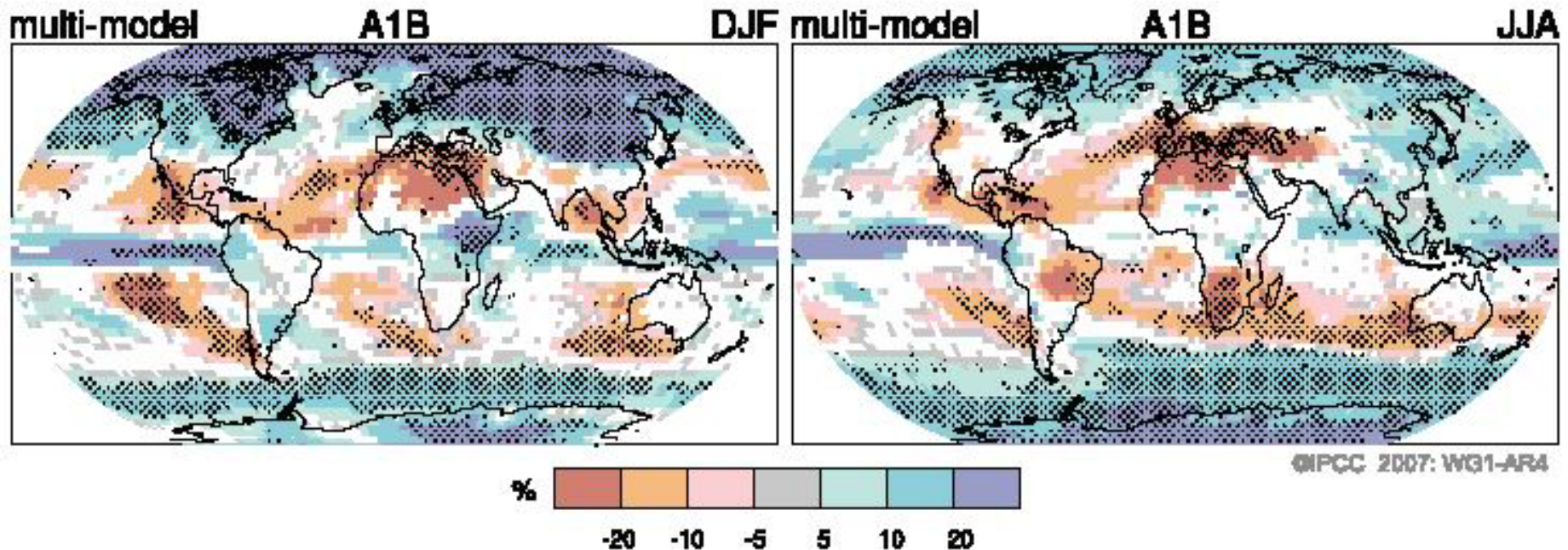


Figure SPM.7. Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. (Figure 10.9)

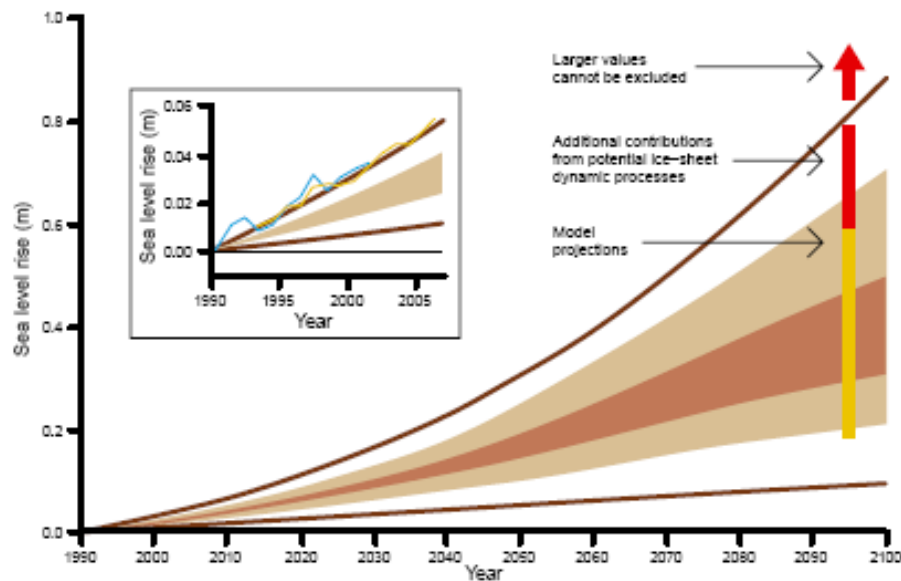
IPCC Fourth Assessment Report 2007



Future Change?

Sea level rise by 2100 – **18 cm to 76 cm** (IPCC AR4)

Figure 3. Projections of sea-level rise from 2100 from the IPCC Third Assessment Report and the Fourth Assessment Report (AR4).

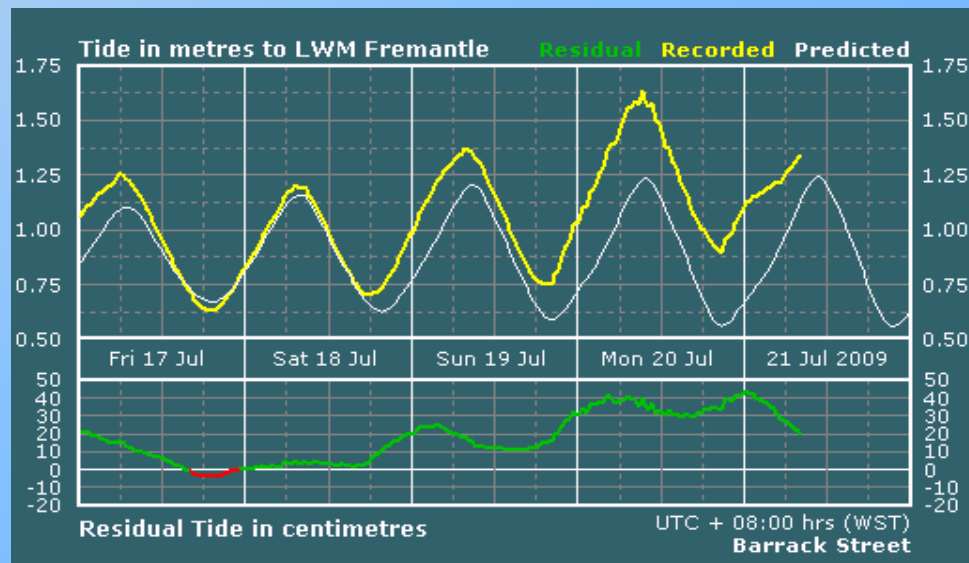


The Third Assessment Report projections are indicated by the shaded regions and the curved lines are the upper and lower limits. The AR4 projections are the bars plotted at 2095. The inset shows sea level observed with satellite altimeters from 1993 to 2006 (yellow) and observed with coastal sea-level measurements from 1990 to 2001 (blue). (Source: ACE CRC 2008)



Future Change?

- A continuing decline in rainfall in SW WA implies continuing decline in frequency and intensity of cold fronts
- A possible decline in the frequency of winter tornadoes (BMRC Res. Rep. 129)
- Strong fronts are likely to continue to occur, even if at a reduced frequency, with increased coastal erosion/inundation risk due to increasing sea levels



Can we learn from the past?

