

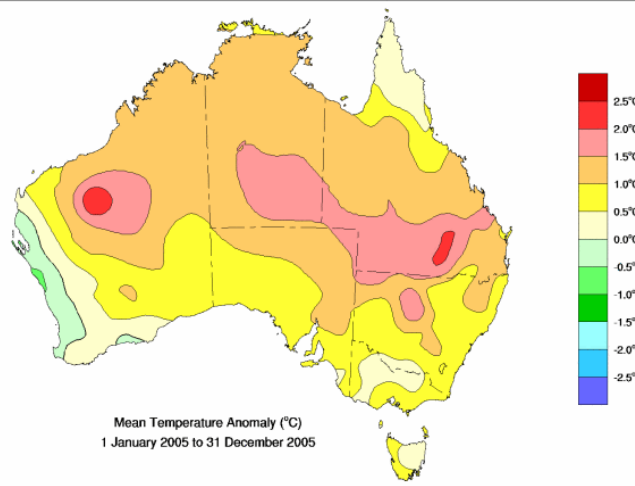
Climate change and Australian ecosystems

IPCC Working Group II Fourth Assessment Report
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Key messages

1. Impacts so far
2. Existing stresses
3. Impacts expected
4. Hotspots identified
5. Adaptive capacity



1. Some species and systems already showing impacts

Alpine zone:

- Snowy Mountains snow depths declined 40% over past 40 years
- Snow gums establishing at higher elevations
- Feral and native animals appearing at higher elevations

Northern Territory rivers

- Mangroves encroaching on freshwater wetlands
 - associated with sea level and rainfall changes

Great Barrier Reef

- Eight mass bleaching events since 1979
- Most serious events in 1998 and 2002
- Triggered by unusually high sea surface temperatures
- No serious events known prior to 1979
- Up to 50% reefs in GBR affected

Migratory birds

- Arriving earlier and departing later

Sub-Antarctic islands

- Population changes in seabirds, seals,
- Plant colonization of bare ground exposed by glacial retreat

2. Many natural ecosystems already stressed

- Habitat degradation, fragmentation and loss
- Salinity, erosion
- Invasive species
- Pressure from urban and agricultural development

3. Significant impacts expected for many species & ecosystems

- Distributions
- Life cycles
- Populations
- Community composition and structure
- Ecosystem function
- Extinction rates

Australian species vulnerable:

- High degree of endemism (species with narrow ranges, found nowhere else)
- Many species already rare or threatened, many protected areas small and isolated
- Impacts of fire: eg. frequency of extreme fire danger days projected to increase 4-25% by 2020, 15-70% by 2050
- Low topographic relief limits opportunities for migration

Temperature projections

Within 800 km of coast (relative to 1990):

2020: 0.1-1.3°C

2050: 0.3-3.4°C

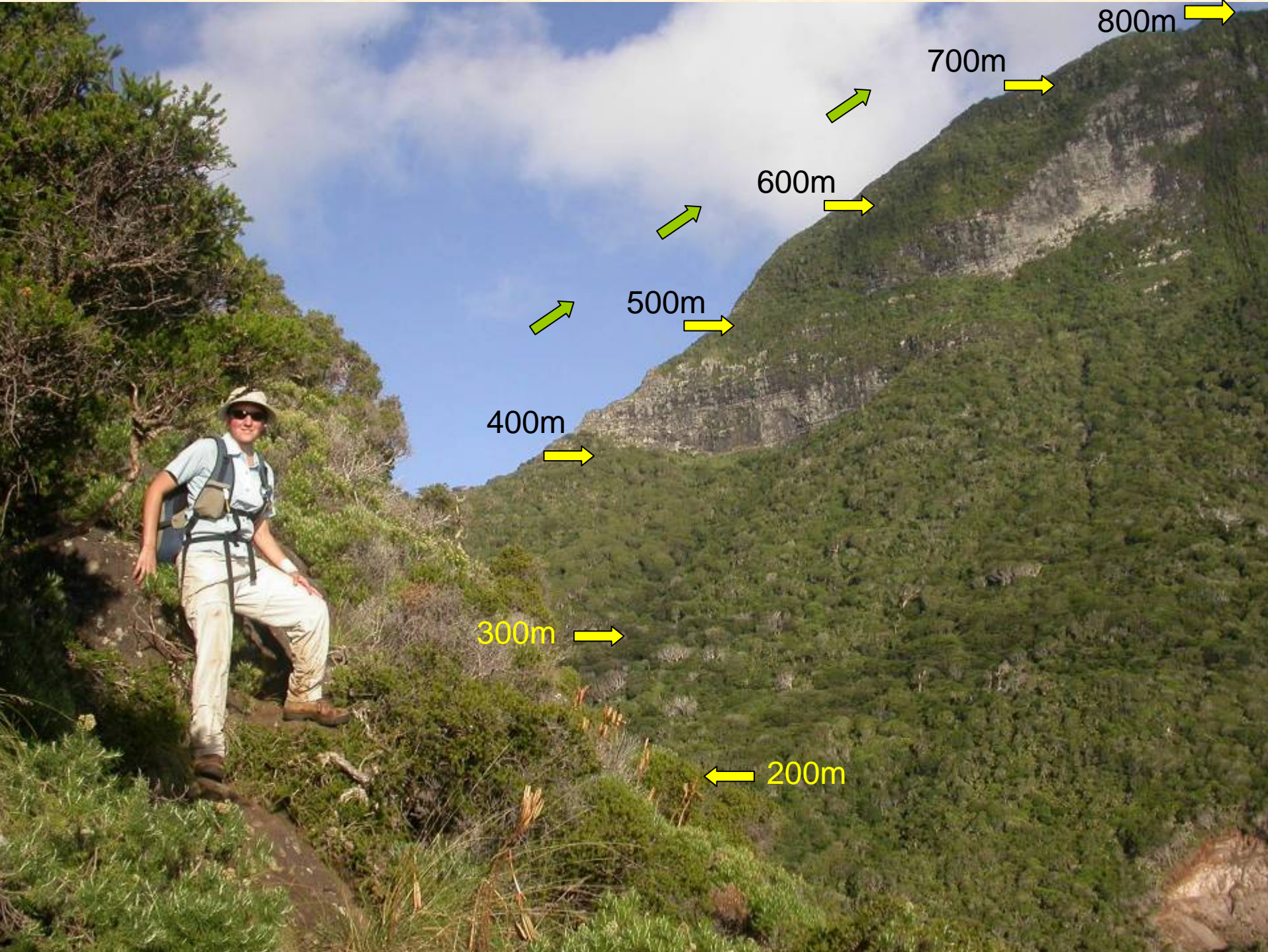
2080: 0.4-6.7°C

Geographic perspective

1°C temperature increase

~ 100 m altitude shift

~ 125 km N-S shift



800m →

700m →

600m →

500m →

400m →

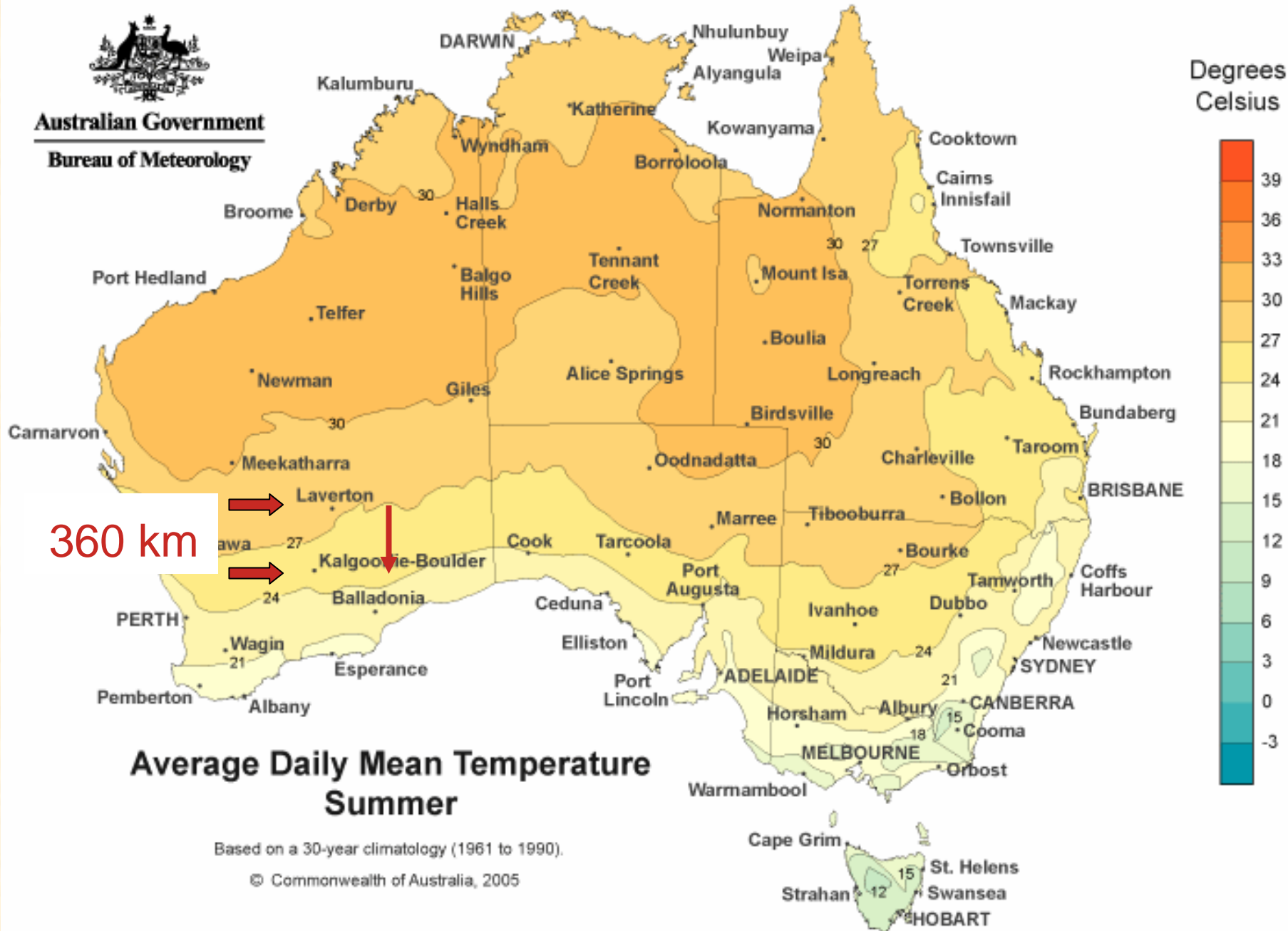
300m →

← 200m

Average maps - Australian Climate Variability and Change



Australian Government
Bureau of Meteorology



Hotspots identified:

Coral reefs

- Increased frequency of bleaching
- By 2030-2050 (depending on scenario), bleaching may occur annually
- Little evidence that corals can adapt fast enough
- Potential replacement of coral by algal communities
- Also threatened by increasing acidification of ocean, reduces calcification rates

Alpine zone

- Area with at least 1 day snow cover likely to shrink 10-40% (2020), 22-85% (2050)
- Low altitudinal relief
- Many species already threatened
- Likely expansion of woody vegetation, increases in fire risk

Hotspots identified (cont):

Coastal wetlands

- Already experienced major losses in area
- Vulnerable to sea level rise (global prediction: 0.19-0.58m by 2100), tidal surges and changes in precipitation
- Ongoing reductions in saltmarsh communities
- Some mangrove communities extending landwards

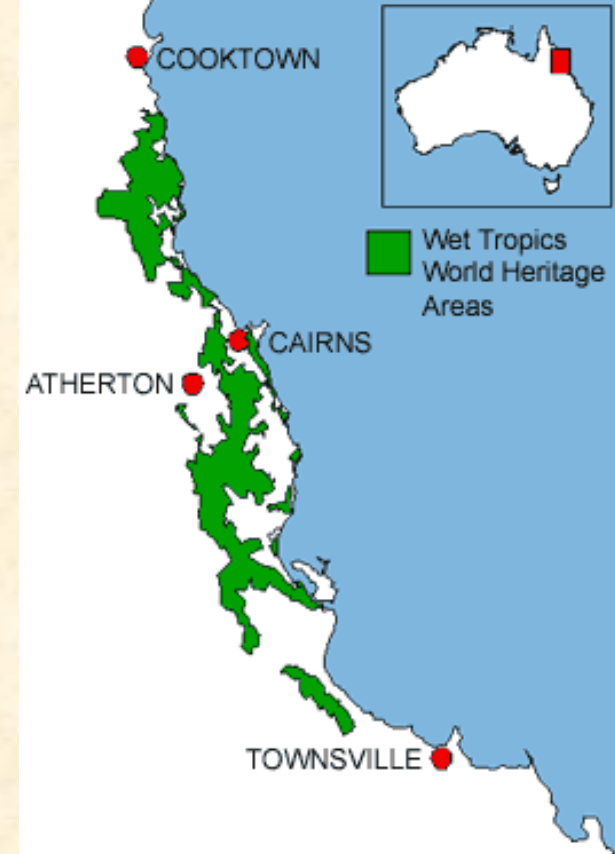
Freshwater wetlands & riverine environments

- Reduced runoff likely over most of continent
- 2030: up to 20% more droughts, 2070: up to 80% more in SW WA; annual streamflow in Murray Darling Basin likely to fall 10-25% by 2050, 16-48% by 2100
- 50% chance by 2020 average salinity in lower Murray will exceed threshold for desirable drinking water
- Increases in toxic algal blooms likely

Hotspots identified:

North Queensland Wet Tropics

- World Heritage Area
- 10,000 km² (0.1% continent)
- 600 vertebrate species (28% of Australia's total)
- Many regional endemics adapted to cool, wet upland environments
- 62 confined to montane forests >600m
- 2080: 46% endemic vertebrates projected to lose core habitat



5. Natural systems have limited adaptive capacity

- Rate of future climate change is faster than the rate at which most species can adapt genetically
- Significant barriers to migration for many species
- Limited opportunity for movement to higher elevations

What to do:

- Improve resilience of natural systems by reduced other stresses
- Improve adaptation opportunities (eg by promoting greater habitat connectivity)