

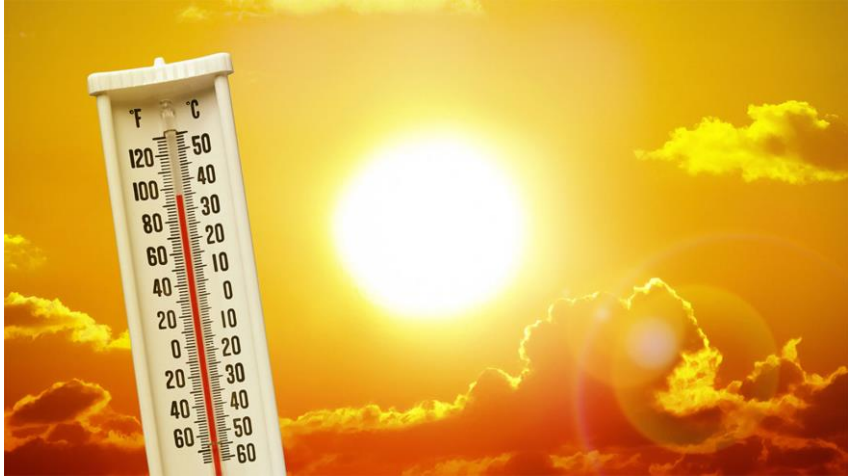


The Bureau  
of Meteorology

## **Session 4: Looking Back Long-Term: Status of key variables**

### **Air Temperature**

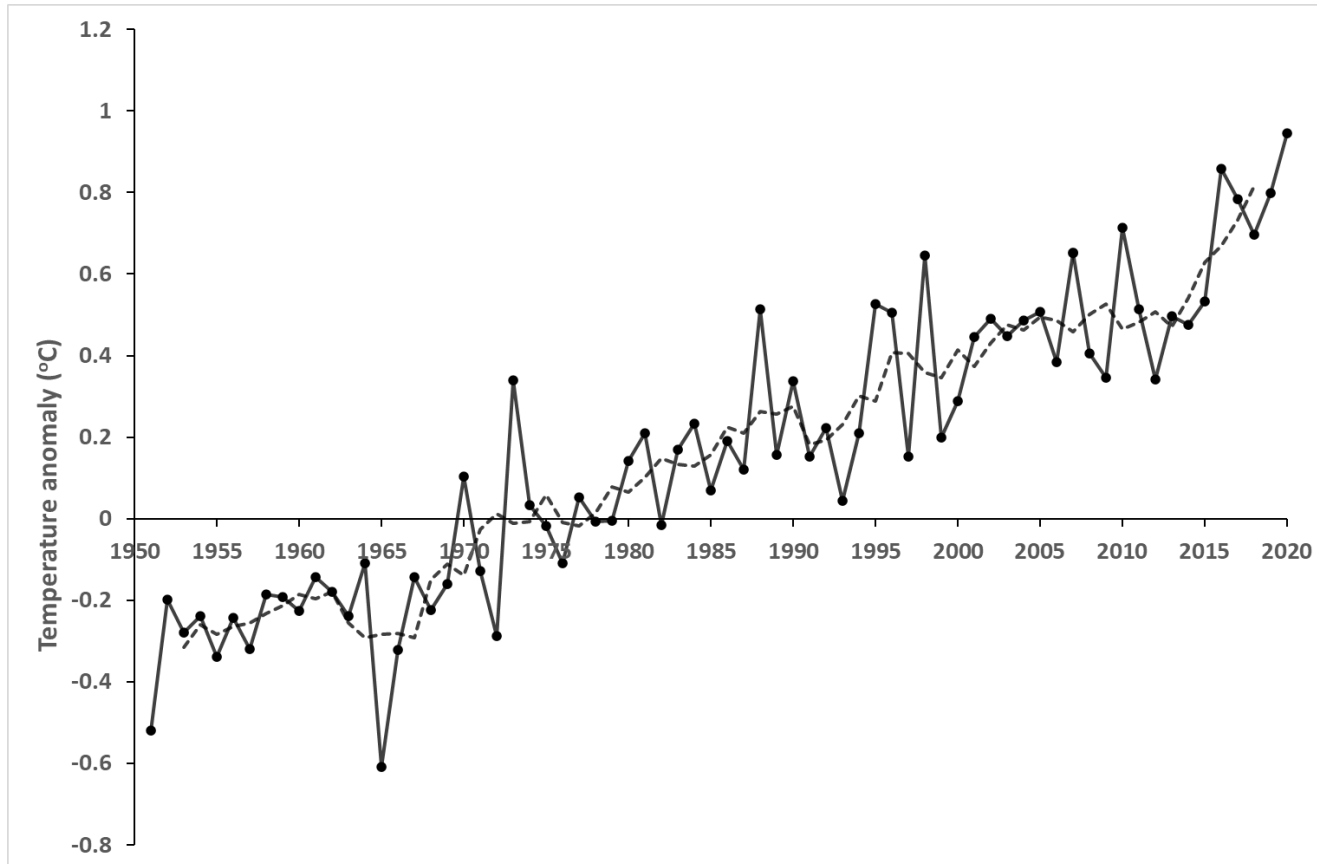
# Background – Air Temperature



- Important indicator of climate change and variability
- Higher temperatures tend to be associated with more frequent and intense heat events. Lead to
  - Human and animal health issues
  - Affect agricultural production
  - Increase in energy usages required to maintain indoor comfort
  - When combined with clear skies warming temperatures can exacerbate coral bleaching



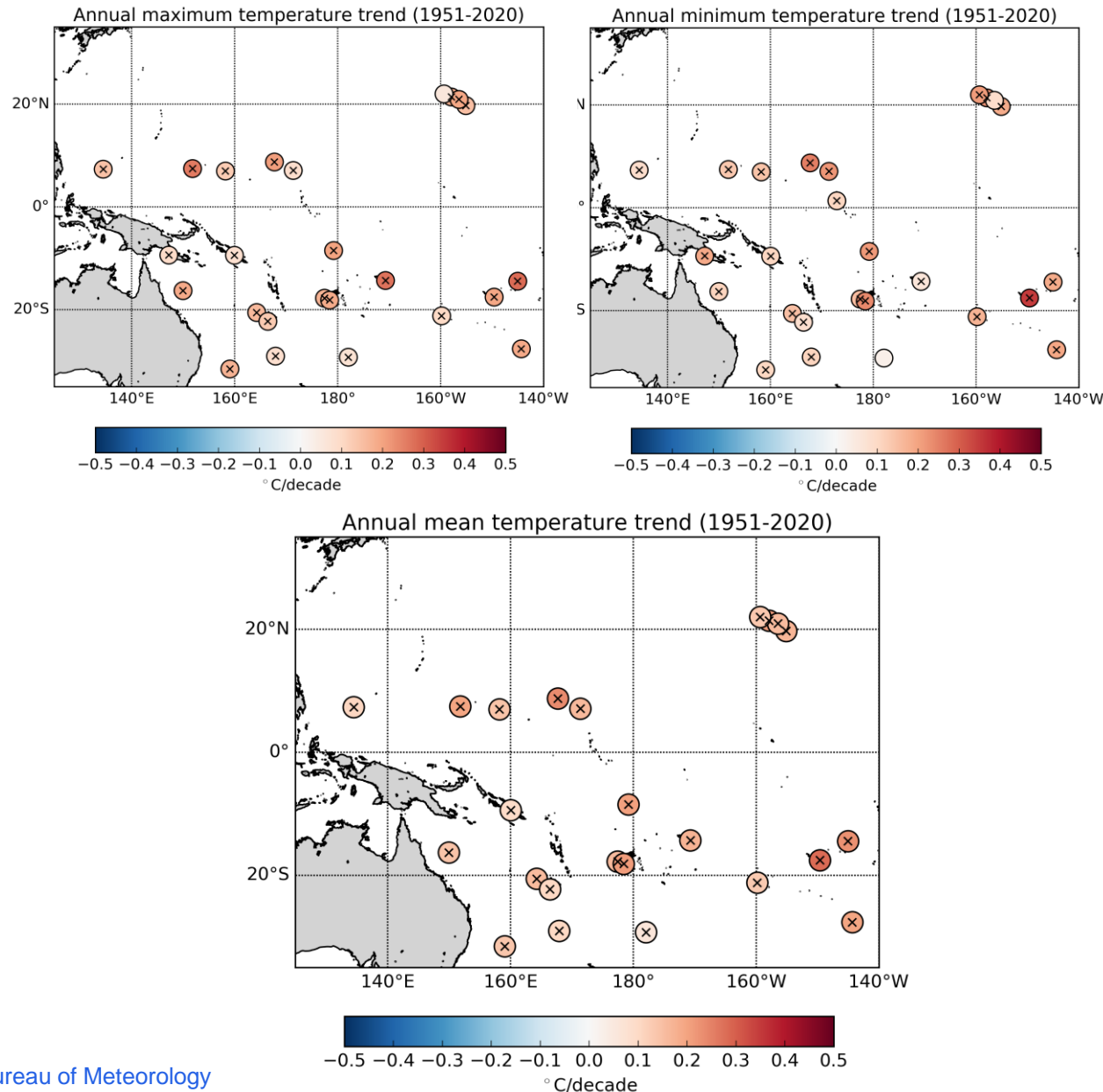
# Trends in annual mean air temperature (1951-2020)



- Land-based annual mean temperature increased by 1.1°C since 1951. Increased over both halves of the 70-year period (1951–1985, 0.5°C [0.9°F] and 1986–2020, 0.6°C [1.1°F]) and in all seasons.
- On a regional scale, 2020 was the warmest year on record, 0.9°C (1.6°F) above the 1961–1990 average of 24.9°C (76.8°F).
- Seven of the warmest eight years on record occurred from 2007. Every year since 1983 has been above the 1961–1990 average.



# Trends in annual air temperature (1951-2020)

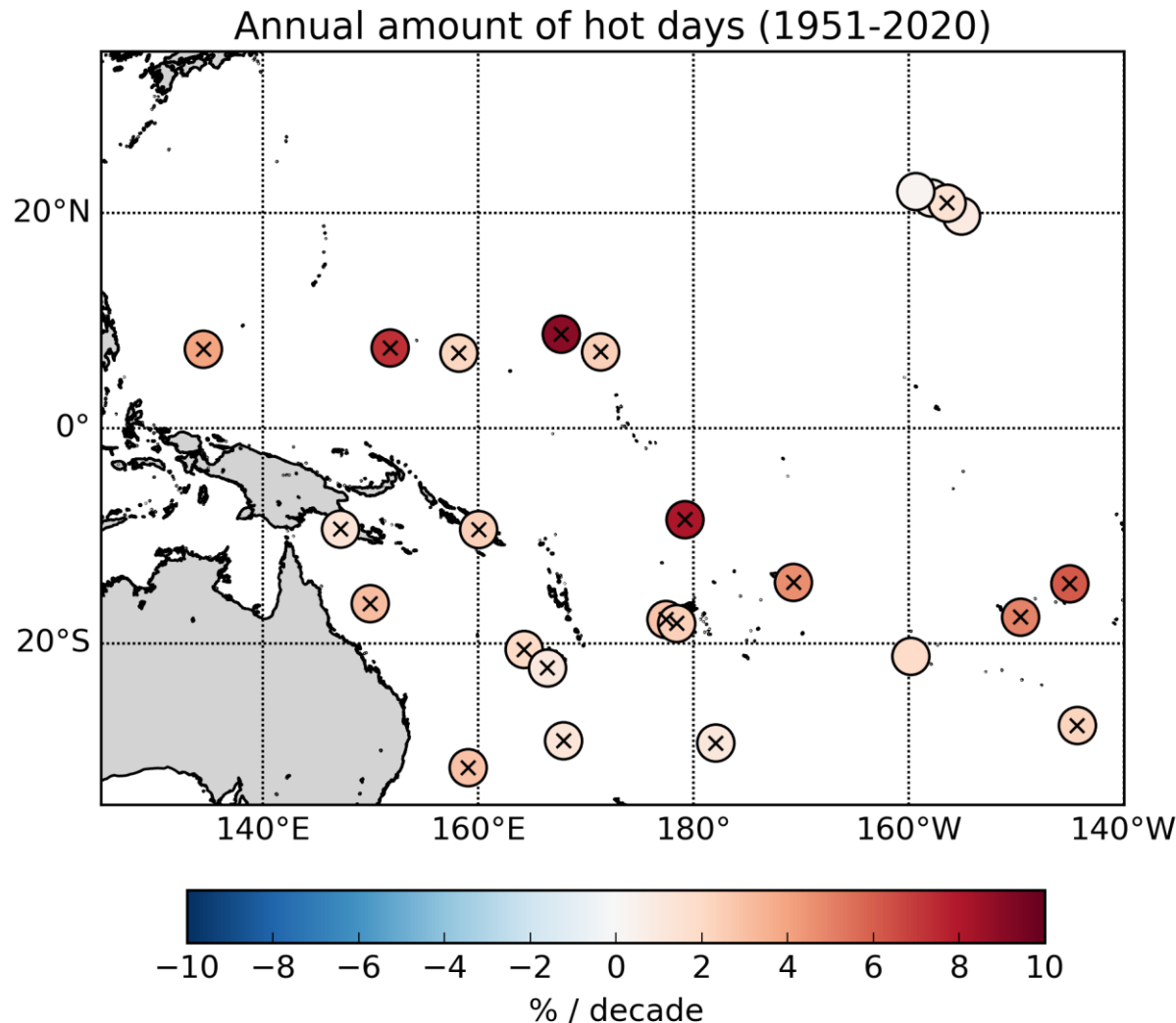


- Daytime maximum and overnight minimum temperatures increases were similar.
- Increases in annual mean temperature occur at all stations, in both hemispheres.
- Trend magnitudes for the period 1951–2020 range from 0.05°C (0.09°F)/decade at Raoul Island in the subtropics of the South Pacific to 0.28°C (0.5°F)/decade at Tahiti-Faaa in French Polynesia.
- Average trend value is about 0.16 °C (0.29°F)/decade.
- Overall, warming in the northern hemisphere (0.17°C/decade) is marginally stronger than that in the southern hemisphere (0.16°C/decade).
- All site specific annual mean temperature trends are statistically significant at the 95% level



# Trends in extreme air temperature (1951-2020)

## Indicator: Amount of Hot Days

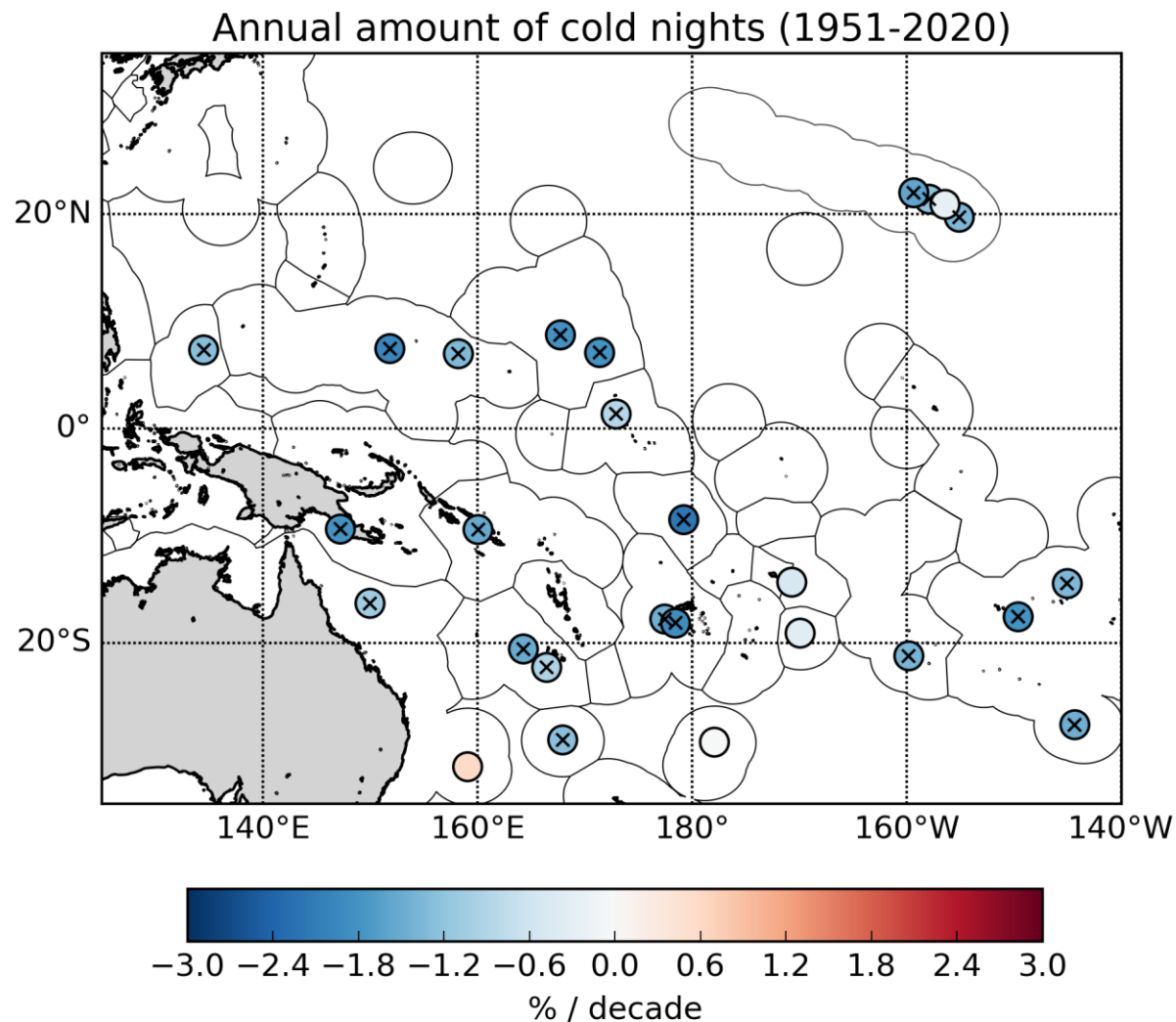


- *Virtually certain* that the number of warm days and nights has increased and the number of cold days and nights has decreased on the global scale since 1950 (Intergovernmental Panel on Climate Change AR6 WG1 report)
- Shift to a warmer climate in the Pacific is accompanied by more extreme daily heat events
- Annual number of hot days has increased at most of the indicator stations. A hot day is defined as a day when the highest temperature is within the highest 10% of observations (for the respective location) between 1961 and 1990
- The regional average change in hot days was 3.1%/decade. At the station level, about 70% of the trend magnitudes were within the 0.7–5.5%/decade range



# Trends in extreme air temperature (1951-2020)

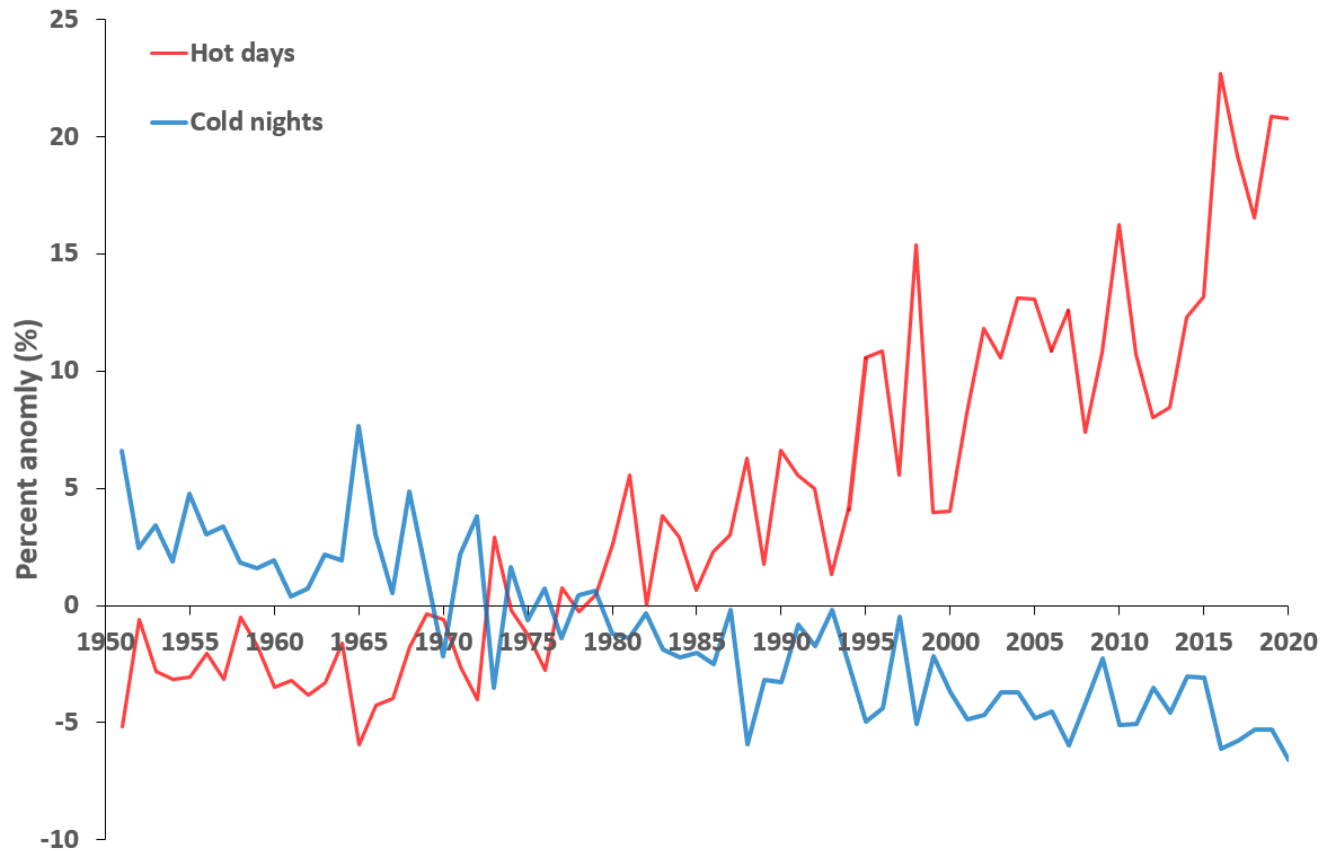
## Indicator: Amount of Hot Days



- Shift to a warmer climate in the Pacific is accompanied by fewer cold nights
- Annual amount of cold nights has decreased at most of the indicator stations. A cold night is defined as when the lowest recorded temperature (in a 24-hour period) is within the lowest 10% of observations (for the respective location) between 1961 and 1990.
- The regional average change in cool nights was -1.2%/ decade. At the station level, about 70% of the trend magnitudes were within the -1.9 to -0.6%/decade range



# Trends in extreme air temperature (1951-2020)



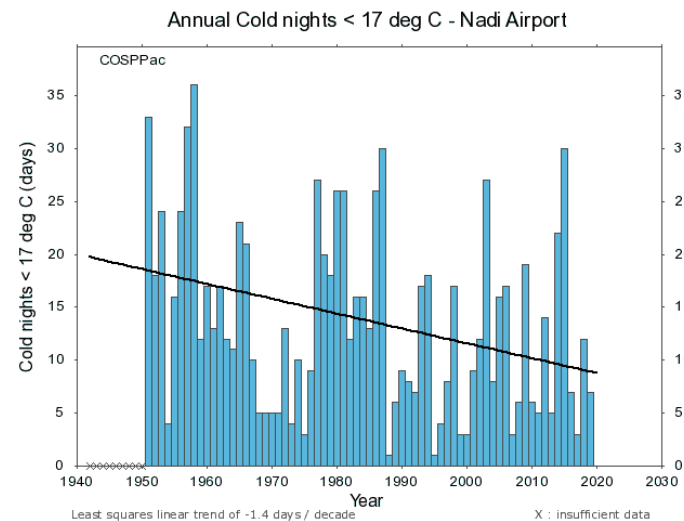
- Hot days were about three times as common in the 2010s as they were in the 1950s
- A record amount (percentage) of hot days occurred in 2016 (32.3%), which is 22.7% greater than the 1961–1990 average (9.5%).
- Cold nights were about 60% less frequent in the 2010s, compared to the 1950s



# Sugarcane in Fiji



- Temperature important in sugarcane production
- Leaf growth constrained with temperatures less than 14-19°C. Photosynthesis is partitioned to sugar accumulation rather than vegetative growth
- Unusually cool 'winters' (June-August) great for sugarcane production in Fiji
- Statistically significant decline in annual cold nights <17°C. Average of 17 days/year over 1950-70. Eleven days/year since 2000.





## Summary slide

- Air temperature is an important indicator of climate change and variability
- Higher mean temperatures tend to be associated with more frequent and intense heat events. Higher mean and extreme temperatures led to human and animal health issues and affect agricultural production. Higher temperatures are associated with an increase in energy usage required to maintain indoor comfort.
- Land-based annual mean air temperature increased by 1.1°C between 1951-2020. At a regional scale, mean temperature increased over both halves of the 70-year period (1951–1985, 0.5°C [0.9°F] and 1986–2020, 0.6°C [1.1°F]) and in all seasons. On a regional scale, 2020 was the warmest year on record, 0.9°C (1.6°F) above the 1961–1990 average of 24.9°C (76.8°F). Seven of the warmest eight years on record occurred from 2007. Every year since 1983 has been above the 1961–1990 average.
- Annual number of hot days has increased at most of the indicator stations in the Pacific Islands. A hot day is defined as a day when the highest temperature is within the highest 10% of observations (for the respective location) between 1961 and 1990.
- Shift to a warmer climate in the Pacific is accompanied by fewer cold nights. Annual amount of cold nights has decreased at most of the indicator stations. A cold night is defined as when the lowest recorded temperature (in a 24-hour period) is within the lowest 10% of observations (for the respective location) between 1961 and 1990.
- Hot days were about three times as common in the 2010s as they were in the 1950s. A record amount (percentage) of hot days occurred in 2016 (32.3%), which is 22.7% greater than the 1961–1990 average (9.5%). Cold nights were about 60% less frequent in the 2010s, compared to the 1950s
- Temperature important in sugarcane production. Leaf growth constrained with temperatures less than 14-19°C. Photosynthesis is partitioned to sugar accumulation rather than vegetative growth. Unusually cool 'winters' (June-August) associated with higher sucrose content in Fiji. Statistically significant decline in annual cold nights <17°C. Average of 17 days/year over 1950-70. Eleven days/year since 2000.





Thank you