# Weather and Climate Extremes

A Summary of key findings from the United Nations **Intergovernmental Panel on Climate Change's** (IPCC) Sixth Assessment Report (AR6) on the Physical Science Basis

## Pacific will face fewer but **more intense tropical cyclones**

**Less frequent** in the western and eastern North Pacific

**More frequent** in the subtropical Central Pacific

## The Pacific will face **INCREASED HEAT STRESS**

with an increased number of days where combined heat and humidity are harmful to human health

## Extreme

rainfall

storm surges

heat stress

will become **more frequent**, **more intense** and **more widespread**

Extreme rainfall events could intensify by about

**7% per degree of warming**

**1 in 2 chance**

**of drought conditions increasing in the Pacific**

## Sea level rise will lead to

increased frequency and intensity of storm surge events

increased coastal inundation

ocean water intrusion into freshwater supplies

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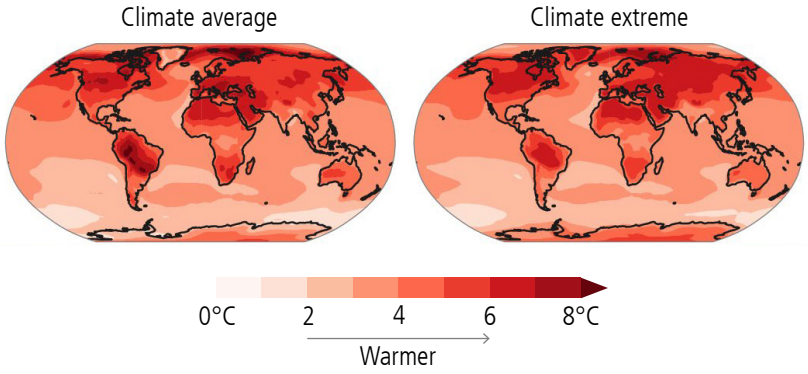
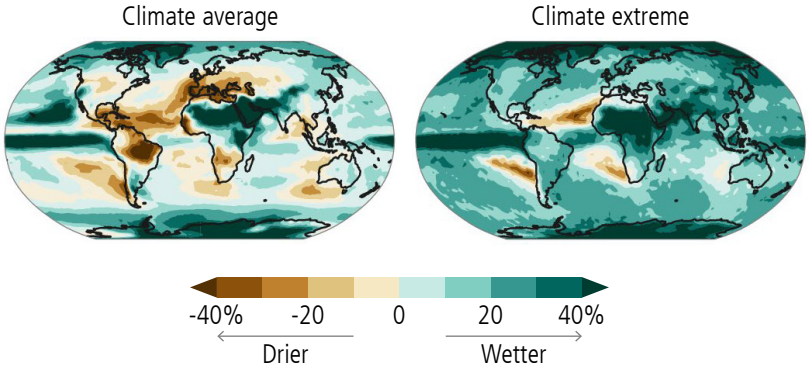
**Extreme rainfall, storm surges and heat stress would all become more frequent, more intense and appear in new locations across the Pacific with further warming.[1] Tropical cyclones will become more intense, whilst their frequency may generally decrease.[2]**

**How will changes in climate extremes compare with changes in climate averages?** The direction and magnitude of future changes in climate extremes and averages depend on the variable considered.

Future **changes in temperature** averages and extremes will be **similar**




Future **changes in precipitation** averages and extremes can be **very different**




Excerpt from FAQ 11.1 from the *AR6 Physical Science Basis* report.

## CHANGES SO FAR

**There has been a decrease in the total number of tropical cyclones but an increase in their intensity in the Pacific over the past 40 years.[3]** There is an 8 out of 10 chance that the increases in heavy precipitation associated with tropical cyclones is human-caused.[4] There has been a significant north-westward shift in tropical cyclone tracks and a poleward shift in the average latitude where tropical cyclones reach their peak intensity since the 1980s.[5]

## FUTURE PROJECTIONS

**The Pacific is projected to face fewer but more intense tropical cyclones under all emissions scenarios.[6]** This means there may be more frequent Category 4-5 storms and increased intensity of rainfall, with relative sea level rise exacerbating the potential for storm surge.[7] There is an 8 in 10 chance that rain rates will increase with all emissions scenarios, with a median projected increase of 14% at 2°C, doubling at 4°C.[8] By the late 21st century, tropical cyclones are projected to be less frequent in the basins of the western and eastern North Pacific but more frequent in the subtropical central Pacific. The poleward movement of the area where tropical cyclones reach peak intensity in the western North Pacific is *likely* to continue. Projections also indicate an increase in the tropical cyclone frequency during El Niño events and a decrease during La Niña events by the end of the 21st century.[9]

**Storm surge events will increase in frequency and intensity in the Pacific, mainly due to sea level rise.** Among various storm surge factors, there is *high confidence* that sea level rise will lead to higher possibility of coastal inundation in most regions.[10]

Content sourced from the IPCC's AR6 Physical Science Basis report:

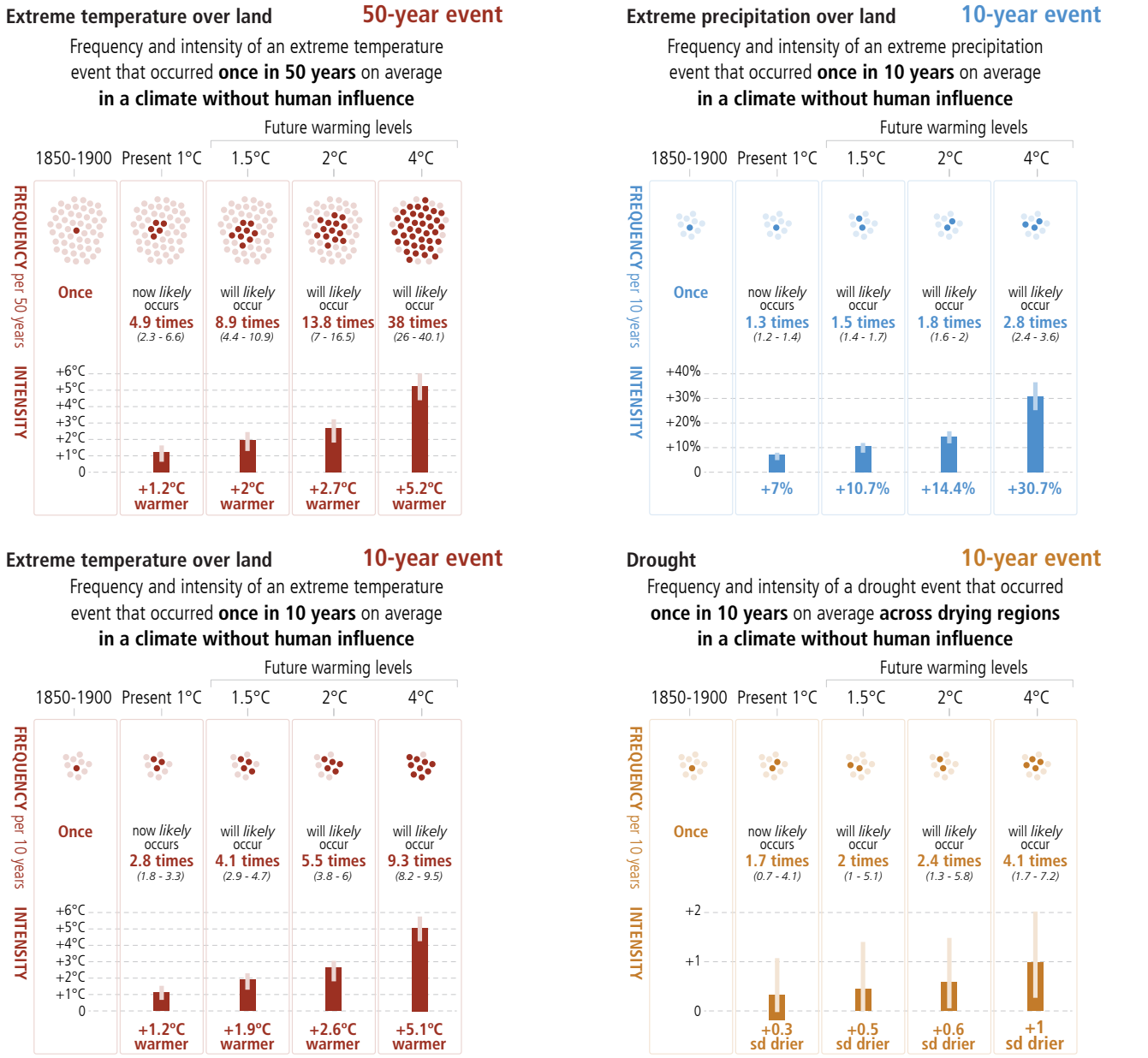
1 B.2
2 B.2.4
3 A.3.4
4 TS.10
5 11.7.1.2, 12.4.2.3
6 B.2.4
7 12.4.7.3
8 Table 11.2
9 12.4.7.3
10 12.4.7.3, 12.4.7.4

**The Pacific will face increased heat stress in the future under further warming.**[11] The Pacific can expect an increase in the number of days with an apparent temperature (a measure of combined humidity and air temperature) at levels dangerous to human health (>41°C) by the end of the 21st century under a very high-emission scenario.[12]

**Extreme rainfall events will become more frequent and intense with additional warming.** There is *high confidence* in the increase in frequency and intensity of extreme rainfall in the western tropical Pacific in the 21st century even for a very low-emission scenario, but *low confidence* in the size of this change.[13] Extreme rainfall events will intensify by about 7% per degree of warming at the global scale.[14]

**There is a 1 in 2 chance of drought conditions increasing in the Pacific.**[15] Even if future rainfall increases in line with projections in the Pacific, higher temperatures can increase the rate of evaporation from plants and soil on land, offsetting the benefits of the potential rainfall increases and further contributing to lowered freshwater availability and increased water stress. For example, a 20% decline in groundwater availability is projected by 2050 in the coral atoll islands of the Federated States of Micronesia (FSM). Under a high sea level rise scenario, availability of fresh groundwater in the FSM could decline by more than half due to ocean water intrusion and drought events.[16]

**Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming**




Excerpt from Figure SPM.6 from the IPCC's *AR6 Physical Science Basis* report

11 C.2.1 12 12.4.7.1 13 12.4.7.2 14 B.2.4 15 12.4.7.2 16 Cross-Chapter Box Atlas.2