#SROCC

Sea-Level Rise and Extreme Hazards

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IPCC Special Report Meeting

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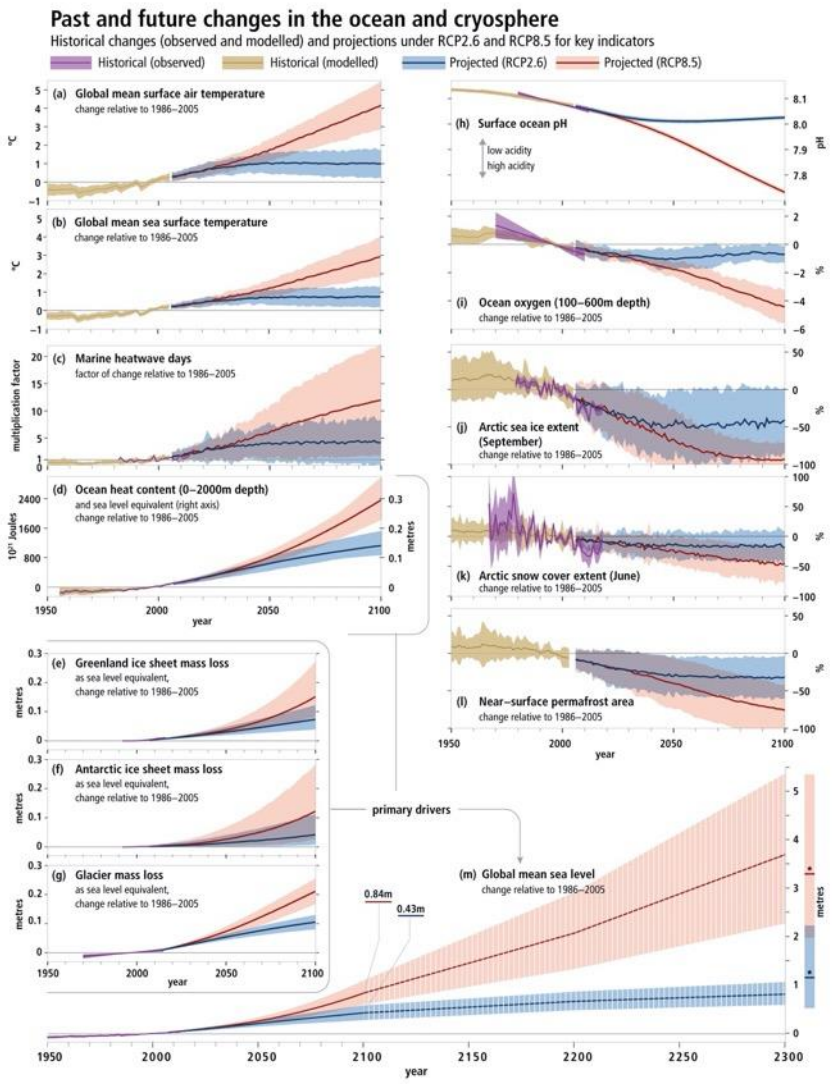
SPM Figure 1



- Changes in the ocean and cryosphere
- Past changes since 1950
- Future changes under low and high greenhouse gas emissions scenarios

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Sea level changes

SPM Figure 1

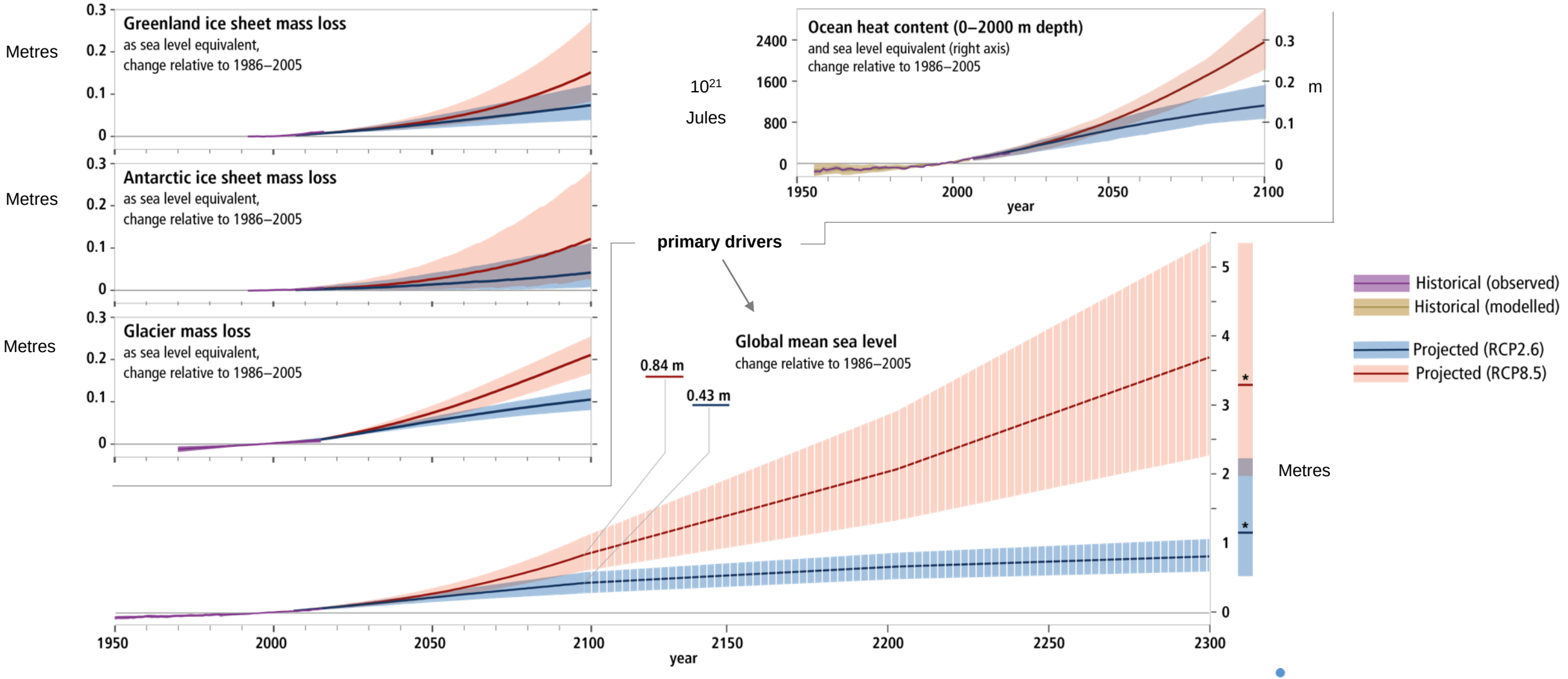

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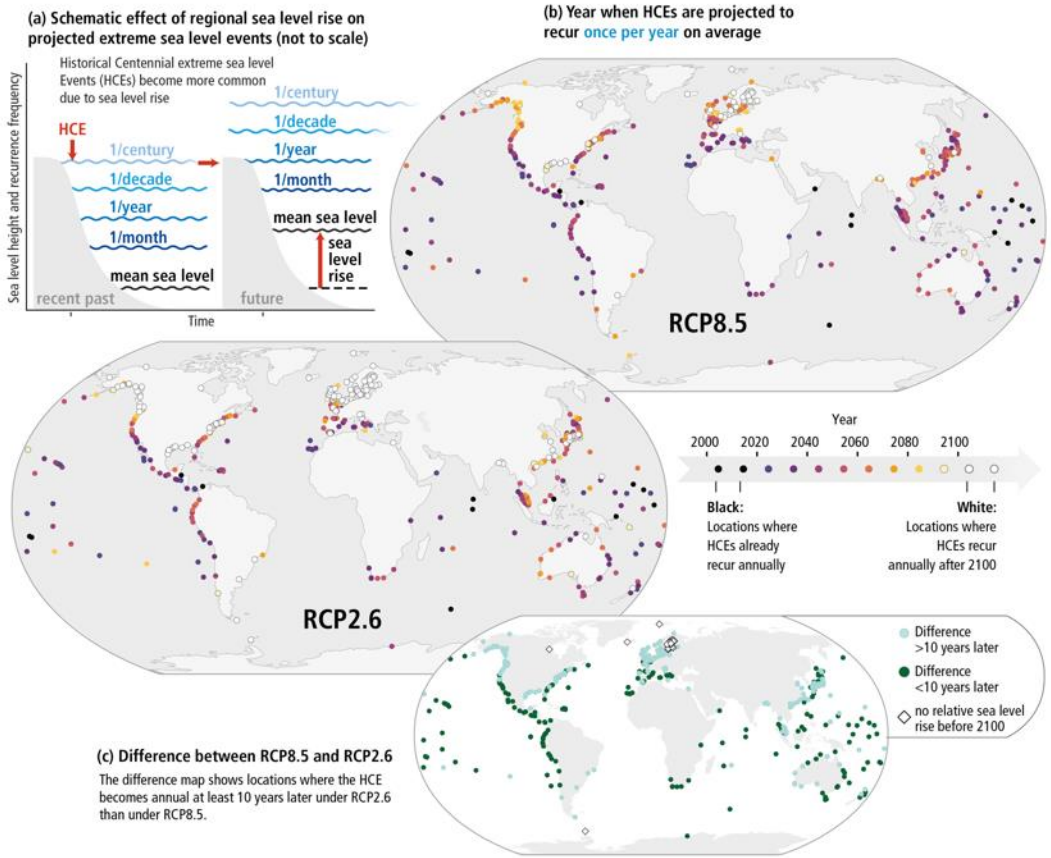
Figure 4

The effect of regional sea level rise on extreme sea level events



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Extreme sea level events

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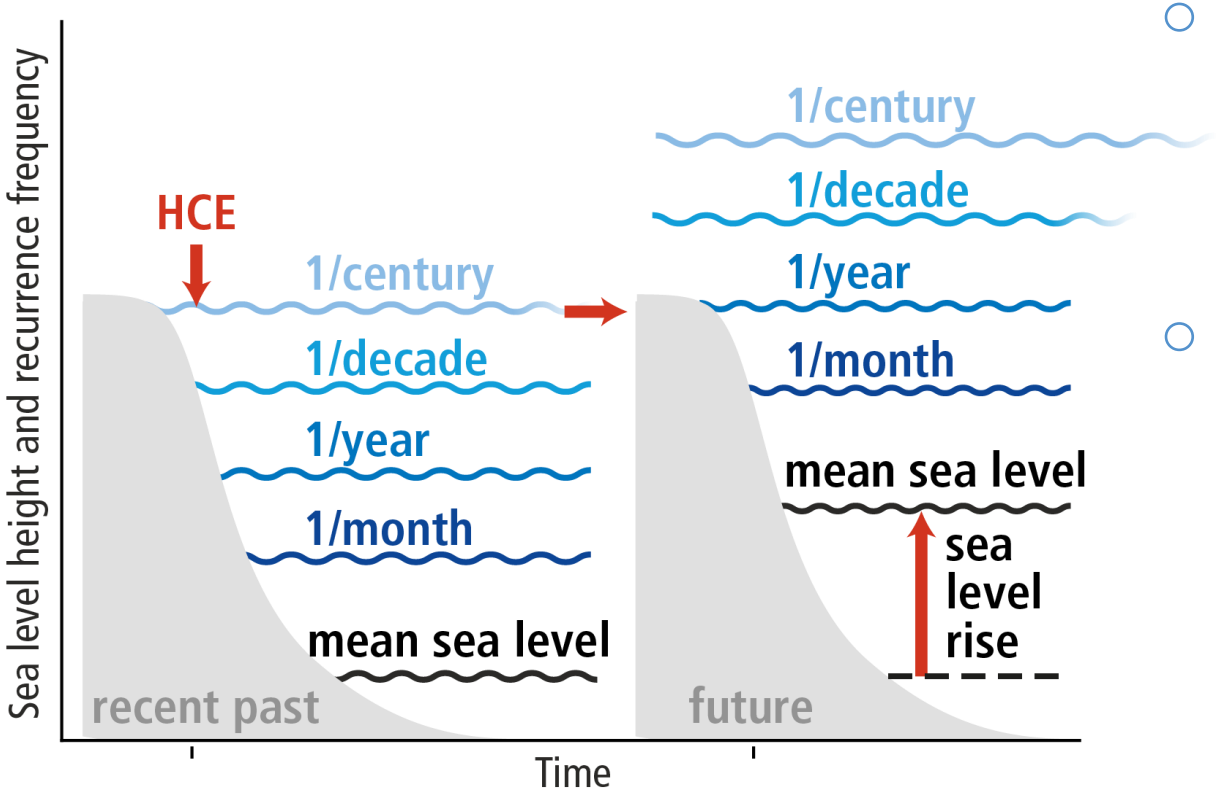
Figure 4a



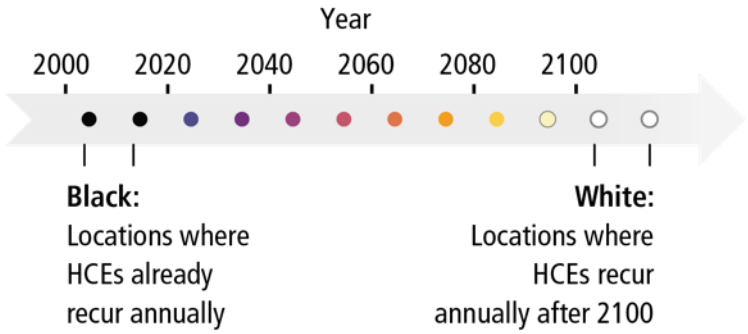
- Schematic illustration of extreme sea level events and their average recurrence in the recent past and the future.
- As a consequence of mean sea level rise, local sea levels that historically occurred once per century (historical centennial events, HCEs) are projected to recur more frequently in the future.

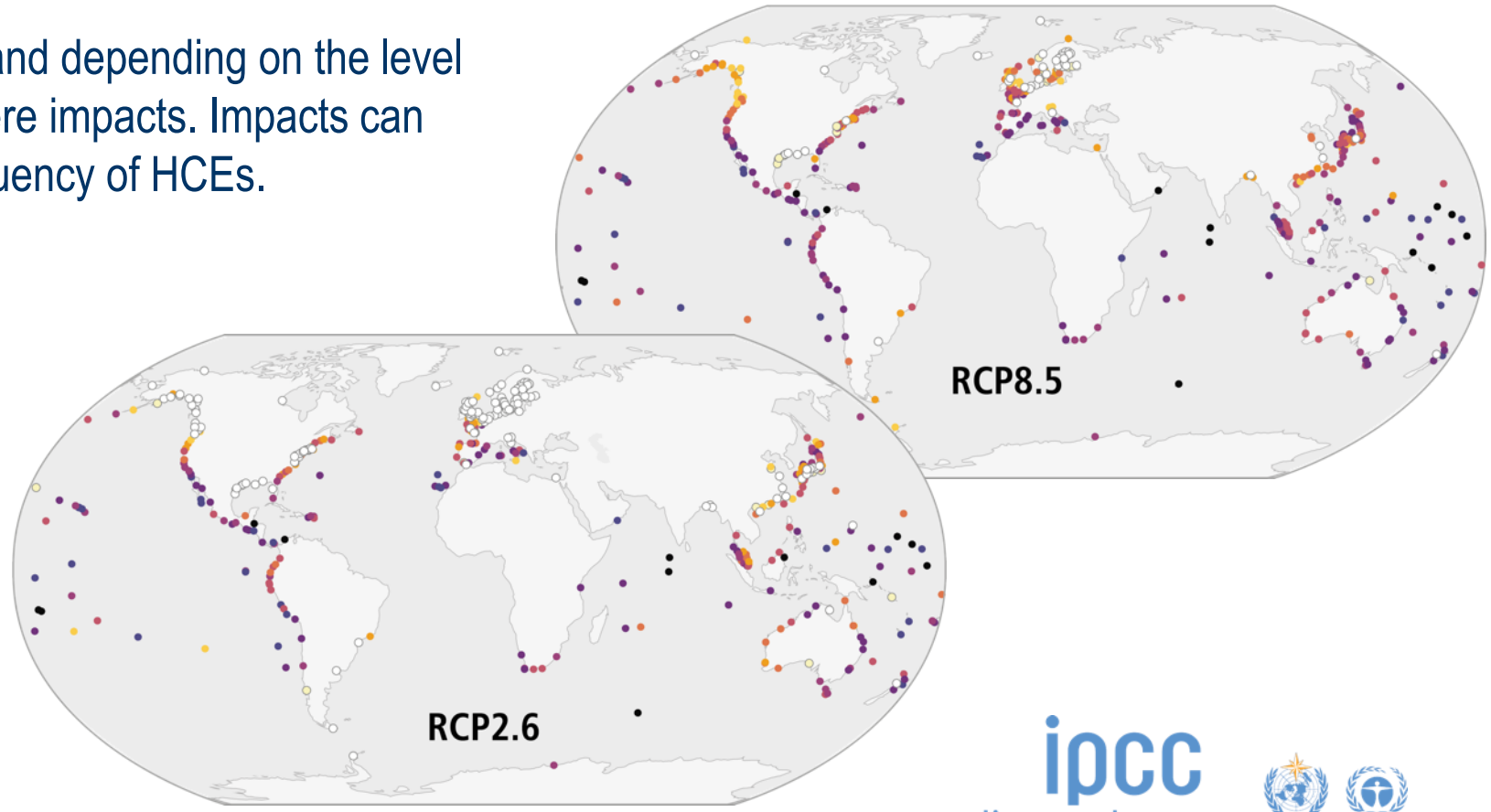
Extreme sea level events

Year when HCEs are projected to recur once per year on average

SPM Figure 4b

- Due to projected global mean sea level (GMSL) rise, local sea levels that historically occurred once per century (historical centennial events, HCEs) are projected to become at least annual events at most locations during the 21st century.
- The height of a HCE varies widely, and depending on the level of exposure can already cause severe impacts. Impacts can continue to increase with rising frequency of HCEs.





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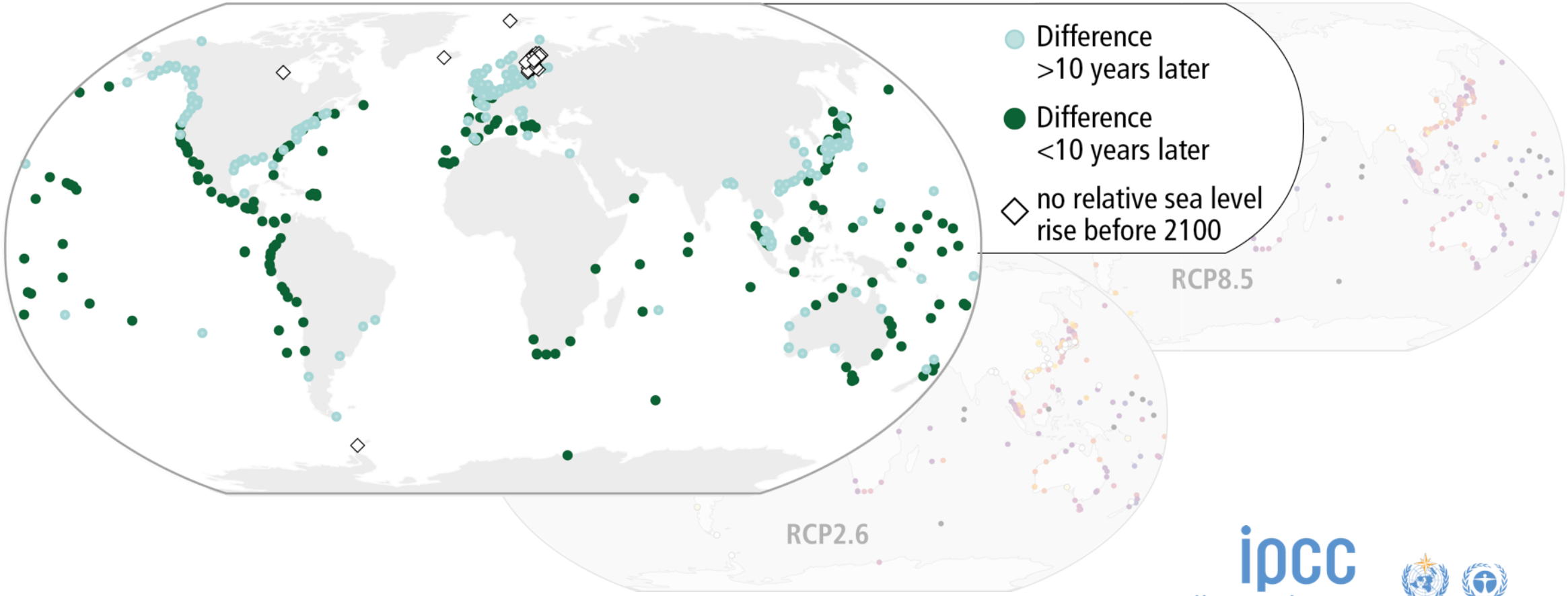
Extreme sea level events

Difference between RCP2.6 and RCP8.5

SPM Figure 4c

- The difference map shows locations where the HCE becomes annual at least 10 years later under RCP2.6 than under RCP8.5.



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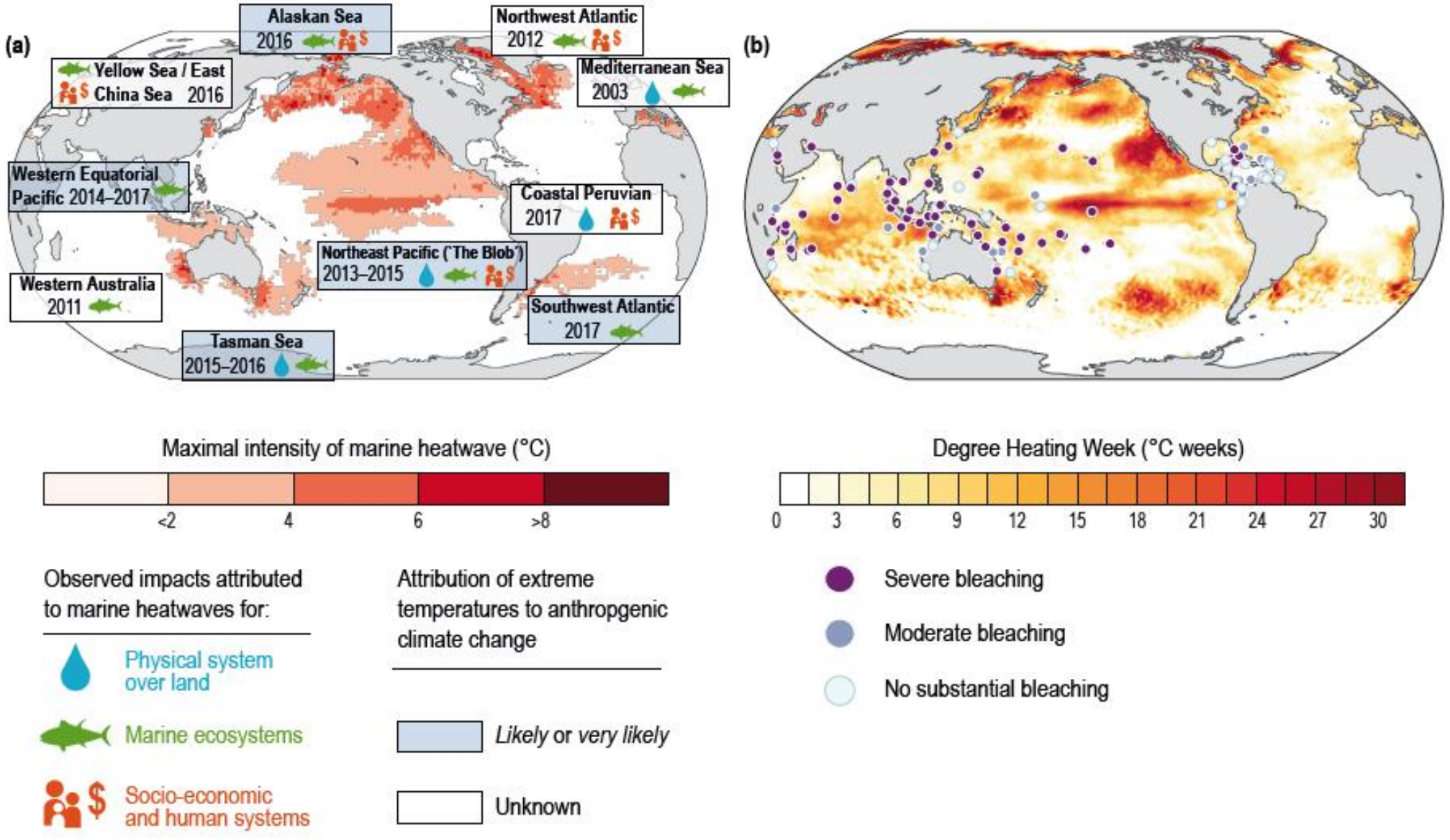
Sea Level Rise and Coastal Extremes

- Global mean sea level (GMSL) is rising, with acceleration in recent decades due to increasing rates of ice loss from the Greenland and Antarctic ice sheets, as well as continued glacier mass loss and ocean thermal expansion. ($\frac{dGMSL}{dt} > 0 & \frac{d^2 GMSL}{dt^2 > 0}$)
- Extreme sea level events that are historically rare (once per century in the recent past) are projected to occur frequently (at least once per year) at many locations by 2050 in all RCP scenarios, especially in tropical regions.
- For a high emissions scenario (RCP8.5), projections of global sea level rise by 2100 are greater than in AR5 due to a larger contribution from the Antarctic Ice Sheet.

Marine Heatwaves

Chapter 6
Figure 6.3



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Extreme Events and Event Attribution

Chapter 6
Figure 6.2

Cyclone
Extreme rainfall
Drought
Marine heatwave
Tidal flooding
Wave-induced flooding
Cold or snow storm
Sea ice minimum

Compound events

Multiple cyclones
Drought, rainfall, marine heatwave
Drought, low sea levels

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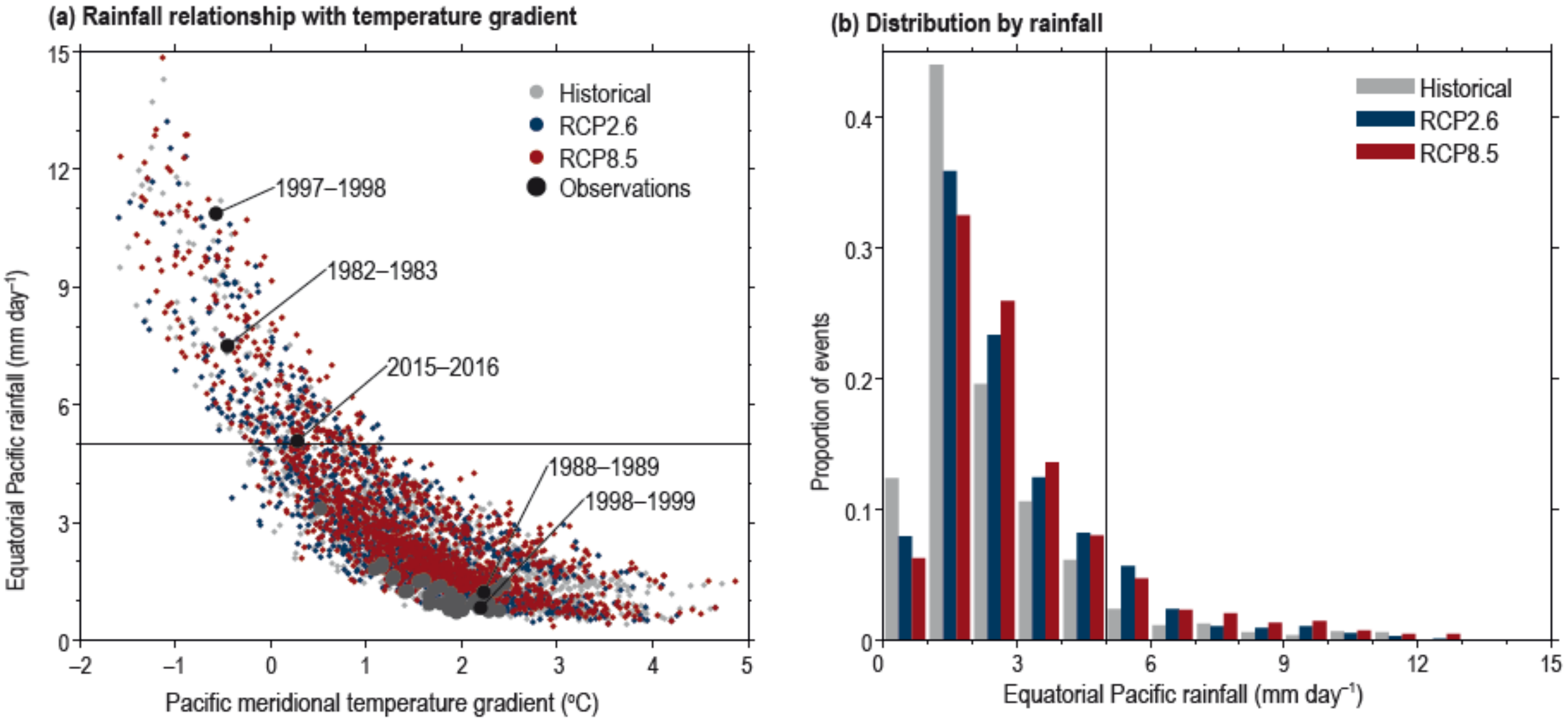
Extreme El Niño Events

Chapter 6
Figure 6.5



Extreme Hazards – Marine Heatwaves

- Marine heatwaves have doubled in frequency and have become longer-lasting, more intense and more extensive. More than 80% of marine heatwaves that occurred between 2006 and 2015 have been influenced by man-made climate change.
- Marine heatwaves are projected to further increase in frequency, duration, spatial extent and intensity. Climate models project increases in the frequency of marine heatwaves the end of the 21st Century by approximately 50 times under high CO_2 and 20 times under low CO_2 scenarios.

Extreme Hazards – Tropical Cyclones

- Human-induced climate change has increased precipitation, winds, and extreme sea level events associated with many tropical cyclones. There is emerging evidence for an increase in annual global proportion of Category 4 or 5 tropical cyclones in recent decades.
- The average intensity of tropical cyclones, the proportion of Category 4 and 5 tropical cyclones and the associated average precipitation rates are projected to increase for a 2°C global temperature rise. There is low confidence in changes in the future frequency of tropical cyclones at the global scale.
- Extreme El Niño and La Niña events are projected to increase in frequency in the 21st century and to intensify existing hazards, with drier or wetter responses in several regions across the globe.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