

# Sea Level, Tropical Cyclones

Michael Grose, CSIRO

Lead Author: Atlas, Interactive Atlas (Contributing author: Ch 1, 10, 11, 12)

#ClimateReport

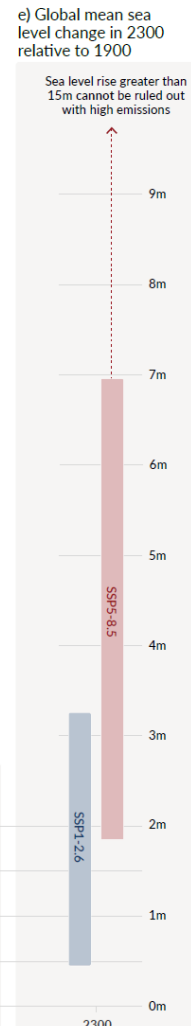
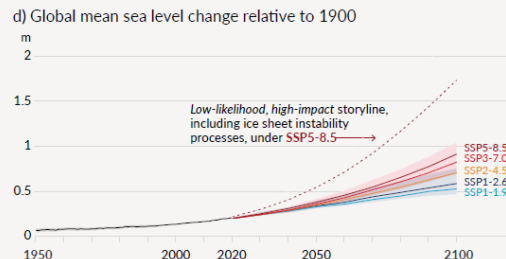
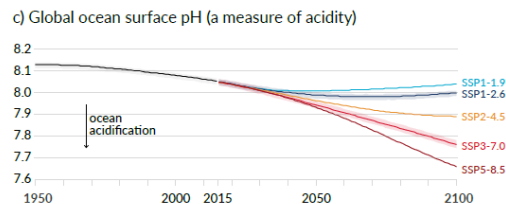
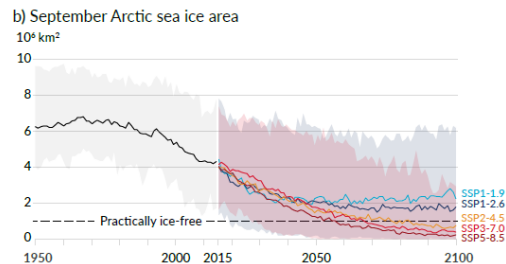
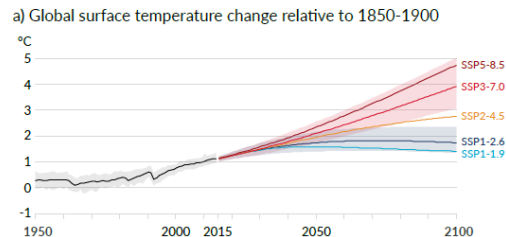
#IPCC



## Sea Level

Latest assessment:

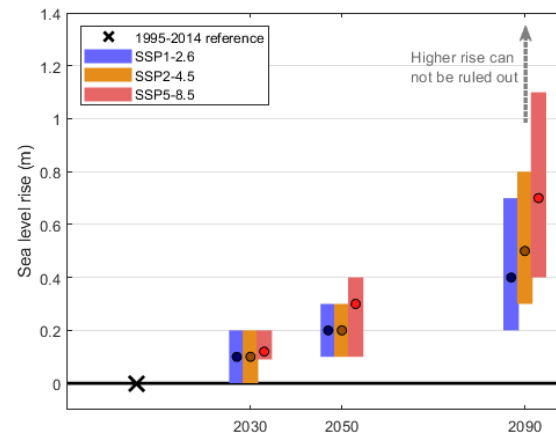
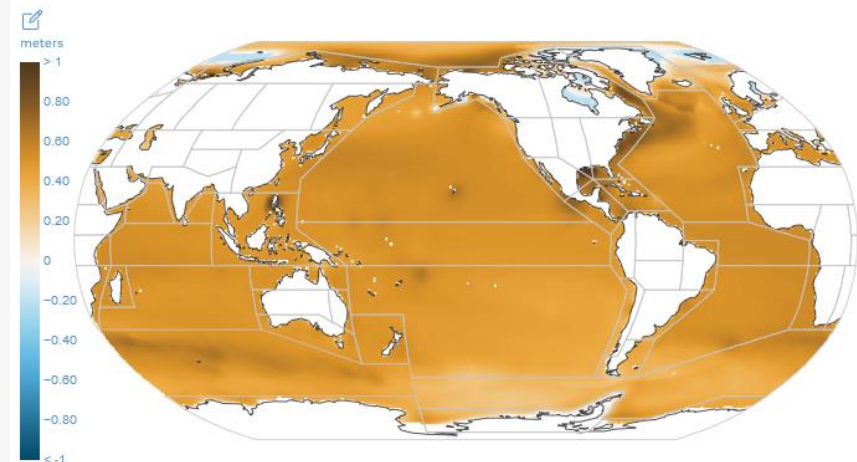
- Budget and ‘likely’ ranges similar to previous generations
- Further increase inevitable for centuries, but dramatically **slowed** under low emissions
- Big new item – assessment of ‘low likelihood, high impact’ outcome of more rapid rise – due to Antarctic ice melt. Can’t be quantified, but can’t be ruled out, especially for higher pathways (SSPs)



## Sea Level

Pacific slightly more than global average – less than some regions

But of course impact is also a function of exposure and vulnerability – coastal inundation, coastal erosion a huge issue, especially for coral atolls



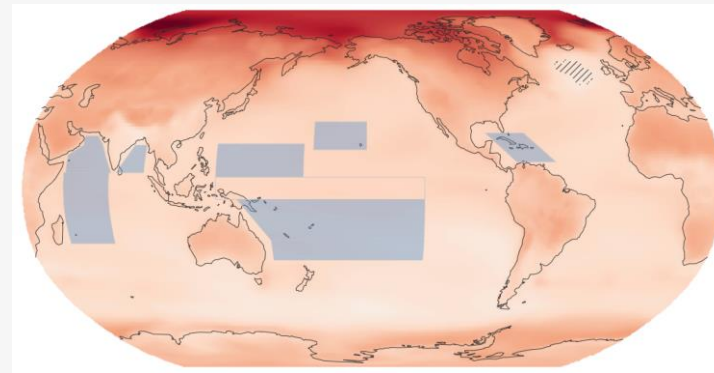
## Tropical cyclones

Can have devastating impacts to Small Islands:

1. Damaging winds
2. Storm Surge
3. Heavy rainfall

+ Can be beneficial to water resources

- Can cause flooding and damage



Tropical cyclones affect most of the Small Islands regions



Flooding from TC Ana, Fiji (source: Guardian)

## Past trends – global

- *Likely* that average peak intensity/strength has increased in the last 40 years, higher proportion in Cat 3-5
- Increase in extreme sea level events from TCs in many places
- Currently *limited evidence* for poleward migration of peak intensity location, except western North Pacific
- Slowing in average speed adds to damage – but *limited evidence* for this outside North America



Damage in Saint Martin (Getty Images, Scientific American)



Tank moved by extreme wave, TC Heta  
(Source: Niue Met Service)





## Past trends – regional

- Western north Pacific – possible shift in location of where TCs reach peak intensity, changing distribution of effects
- Trends in frequency by ocean basin have *low confidence*, evidence suggests decreased total and severe since 1981



Coastal damage in Fiji from TC Yasa (source: Fiji Gov.)



## Projections

Overall, greater effect. For a world 2 °C warmer or more:

- Increase in the average peak intensity/strength of all TCs and severe TCs, greater proportion in Cat 3-5
- Higher rain rates (*high confidence* globally)
- Landfall on a higher sea level: higher storm surges

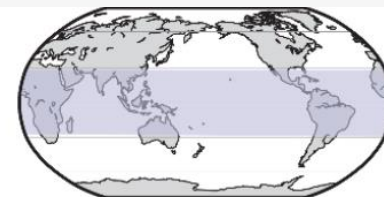
Some changes not yet clear:

- Decreased or unchanged average frequency – currently *low confidence* at basin scale
- Speed decrease – *low confidence*
- Change in location of tracks in each ocean basin unclear (except North Pacific)

### • Tropical cyclones

Increase in strength

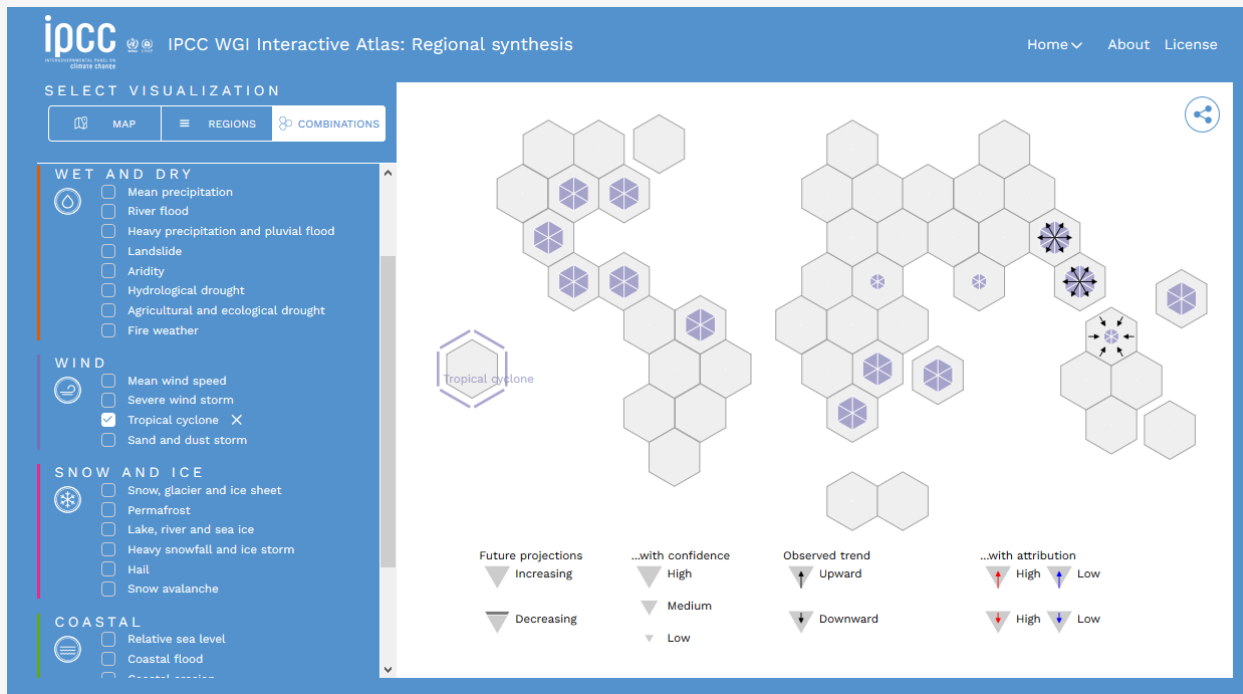
Decreased or unchanged  
genesis frequency



Extract from Figure 11.20



Wind damage from TC Winston, Fiji (source: ABC News Australia)



<https://interactive-atlas.ipcc.ch/>