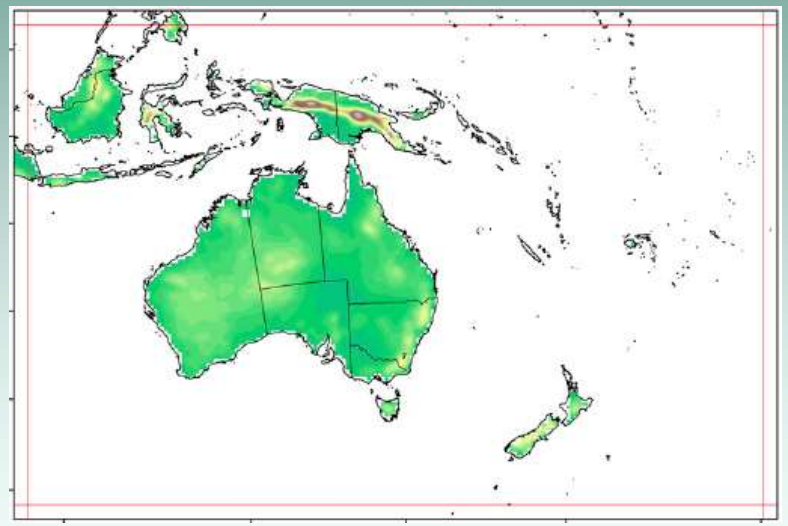
WCRP CORDEX
Coordinated Regional Climate Downscaling Experiment

Climate projections for Islands

How will global climate change effect the climate over Islands?

- Most islands are considered ocean in GCMs
- Current CORDEX domain resolution not high enough to simulate island climate.
- We have limited knowledge about how island climates will change.



From IPCC AR6 WG2 – Small Islands

Observed Impacts

- A sense of urgency is prevalent among small islands in the combating of climate change and in adherence to the Paris Agreement to limit global warming to 1.5°C above pre-industrial levels.
- The observed impacts of climate change differ between urban and rural contexts, island types and tropical and non-tropical islands (high confidence).
- TCs are severely impacting small islands (high confidence).
- Scientific evidence has confirmed that globally, and in small islands, tropical corals are presently at high risk (high confidence).
- Freshwater systems on small islands are exposed to dynamic climate impacts and are among the most threatened on the planet.
- Small islands host significant levels of global terrestrial species diversity and endemism. Due to the large range of insular-related vulnerabilities, almost 50% of terrestrial species presently considered at risk of global extinction also occur on

From IPCC AR6 WG2 – Small Islands

Projected Impacts

- Projected climate and ocean-related changes will significantly affect marine and terrestrial ecosystems and ecosystem services, which will in turn have cascading impacts across both natural and human systems (high confidence).
- Projected changes in the wave climate superimposed on SLR will rapidly increase flooding in small islands, despite highly contrasting exposure profiles between ocean sub-regions (high confidence).
- Modelling of both temperature and ocean acidification effects under future climate scenarios (RCP4.5 and RCP8.5) suggest that some small islands will experience severe coral bleaching on an annual basis before 2040 (medium confidence).
- Projected changes in aridity are expected to impose freshwater stress on many small islands, especially Small Island Developing States (high confidence).
- The continued degradation and transformation of terrestrial and marine ecosystems of small islands due to human-dominated will amplify the vulnerability of island peoples to the impacts of climate change (high confidence).
- Reef island and coastal area habitability in small islands is expected to decrease because of increased temperature, extreme sea levels and degradation of buffering ecosystems, which will increase human exposure to sea-

From IPCC AR6 WG1 – Small Islands

- It is very likely that the significant recent warming trends observed in the small islands will continue in the 21st century, which will likely further increase heat stress in these regions.
- Observed and projected rainfall trends vary spatially across the small islands. Higher evapotranspiration under a warming climate are projected to partially offset future increases or amplify future reductions in rainfall, resulting in drier conditions and increased water stress in the small islands (medium confidence).
- Projections indicate that small islands will generally face fewer but more intense tropical cyclones (medium confidence) although there is substantial variability across small island regions given projected regional shifts in storm tracks.
- In summary, relative sea level rise is very likely in the oceans around small islands, and along with storm surges and waves will exacerbate coastal inundation in small islands. Shoreline retreat is projected along sandy coasts of most small islands (high confidence). There is high confidence that MHWs will increase around all small island nations.

These statements are based on **25 GCM** based studies &
3 RCM based studies (2@25km, 1@50km res)

From IPCC AR6 WG1 – Small Islands

Table 12.9 | Summary of confidence in direction of projected change in climatic impact-drivers in the small islands, representing their aggregate characteristic changes for mid-century for scenarios RCP4.5, SSP2-4.5, SRES A1B, or above within each AR6 region (defined in Chapter 1), approximately corresponding (for CIDs that are independent of sea level rise) to global warming levels between 2°C and 2.4°C (see Section 12.4 for more details of the assessment method). The table also includes the assessment of observed or projected time-of-emergence of the CID change signal from the natural interannual variability if found with at least *medium confidence* in Section 12.5.2.

Region	Climatic Impact-driver																												
	Heat and Cold				Wet and Dry								Wind				Snow and Ice						Coastal and Oceanic					Other		
	Mean air temperature	Extreme heat	Cold spell	Frost	Mean precipitation	River flood	Heavy precipitation and pluvial flood	Landslide	Aridity	Hydrological drought	Agricultural and ecological drought	Fire weather	Mean wind speed	Severe wind storm	Tropical cyclone	Sand and dust storm	Snow, glacier and ice sheet	Permafrost	Lake, river and sea ice	Heavy snowfall and ice storm	Hail	Snow avalanche	Relative sea level	Coastal flood	Coastal erosion	Marine heatwave	Ocean acidity	Air pollution weather	Atmospheric CO_2 at surface	Radiation at surface
Caribbean (CAR)	●														5								●		6		●		●	
Pacific Islands	●	1			2		3		4						5								●		6		●		●	

1. *Very high confidence* in the direction of change, but *low* to *medium confidence* in the magnitude of change due to model uncertainty.
2. Decrease in eastern Pacific and southern Pacific subtropics, but increase in parts of western and equatorial Pacific; with seasonal variation in future changes.
3. *High confidence* in increase in extreme rain frequency and intensity in western tropical Pacific; *low confidence* in magnitude of change due to model bias.
4. Increase in southern Pacific.
5. Increase in intensity; decrease in frequency except over central North Pacific.
6. Along sandy coasts and in the absence of additional sediment sinks/sources or any physical barriers to shoreline retreat.

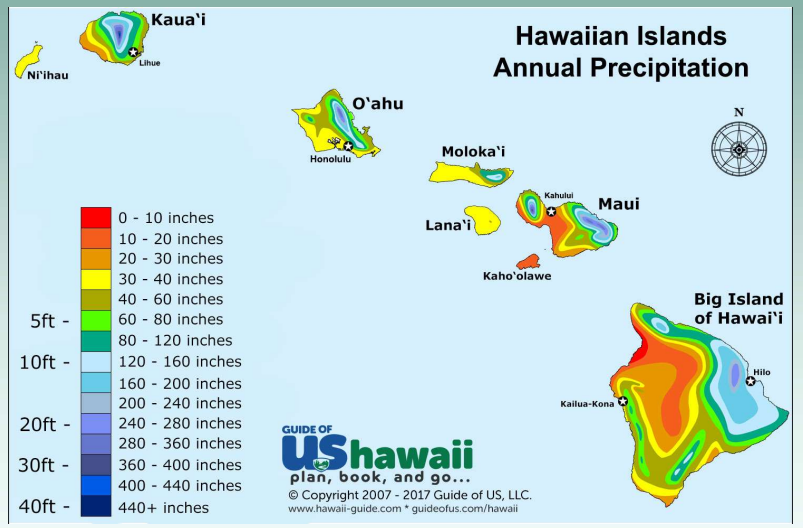
● Already emerged in the historical period (*medium* to *high confidence*)
● Emerging by 2050 at least in scenarios RCP8.5/SSP5-8.5 (*medium* to *high confidence*)
● Emerging after 2050 and by 2100 at least in scenarios RCP8.5/SSP5-8.5 (*medium* to *high confidence*)

High confidence of decrease | Medium confidence of decrease | Low confidence in direction of change | Medium confidence of increase | High confidence of increase | Not broadly relevant

Aims for this session

We want to share information and discuss:

- What research is being done around future island climates?
- What are the key gaps in our knowledge/ projections for islands
- How can we fill these knowledge gaps?



Future Island Climate Flagship Pilot Study

Could a CORDEX Flagship Pilot Study help us fill the knowledge gaps?

- Over what domain? (south Pacific?)
- At what resolution?
- Prescribed SST? Coupled ocean model?
- Other experiment design considerations…
- What observations are available