Impacts of marine heatwaves on tropical western and central Pacific Island nations and their communities

Leanne Webb
presenting on behalf of:

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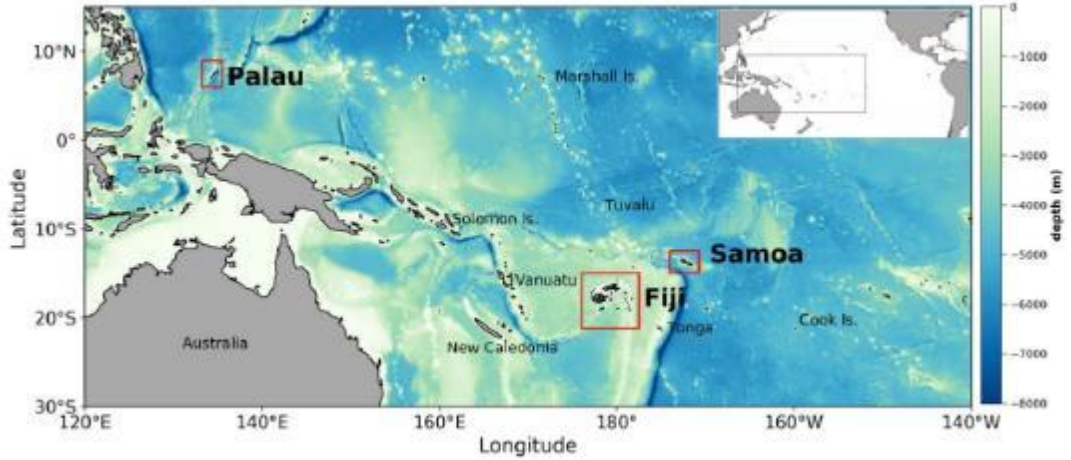

Presentation:
PICOF-14
Shangri-La hotel, Sigatoka, Fiji Islands

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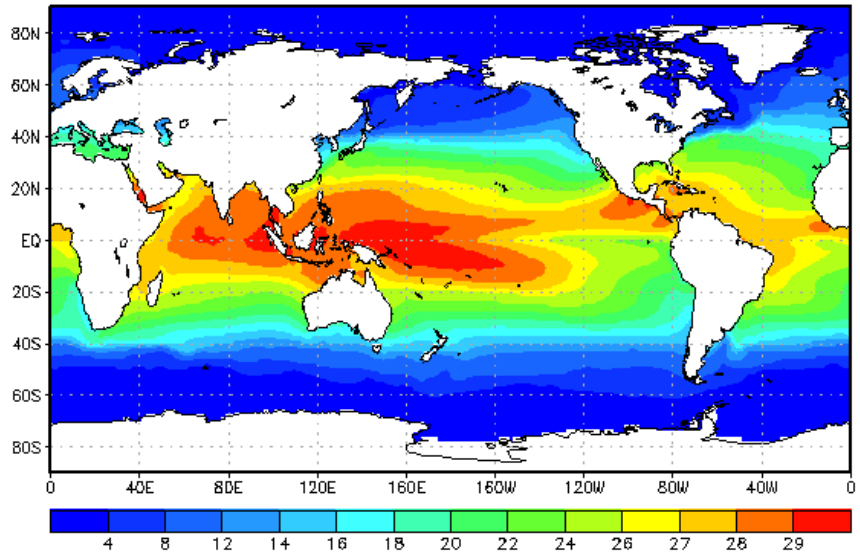
Background

- **Pacific Island countries** are among the most **vulnerable** in the world to climate change (The World Bank 2013)
- **Marine heatwaves (MHWs)** can significantly **impact ecosystems** (tropical **coral reefs**, **seagrass** and kelp habitats) and species, with flow-on effects to **human communities** and **livelihoods**
  - ➢ MHW occurrences, intensity and duration are increasing with climate change! (e.g. Oliver et al. 2018, 2019; Frölicher et al. 2018)
- **Ciguatera fish poisoning** incidences have an association with **temperature** (Llewellyn 2010; Skinner et al. 2011)
- Accurate **climate predictions** (Dunstan et al. 2018) and **climate change projections** are important for planning, responses and to build adaptation strategies

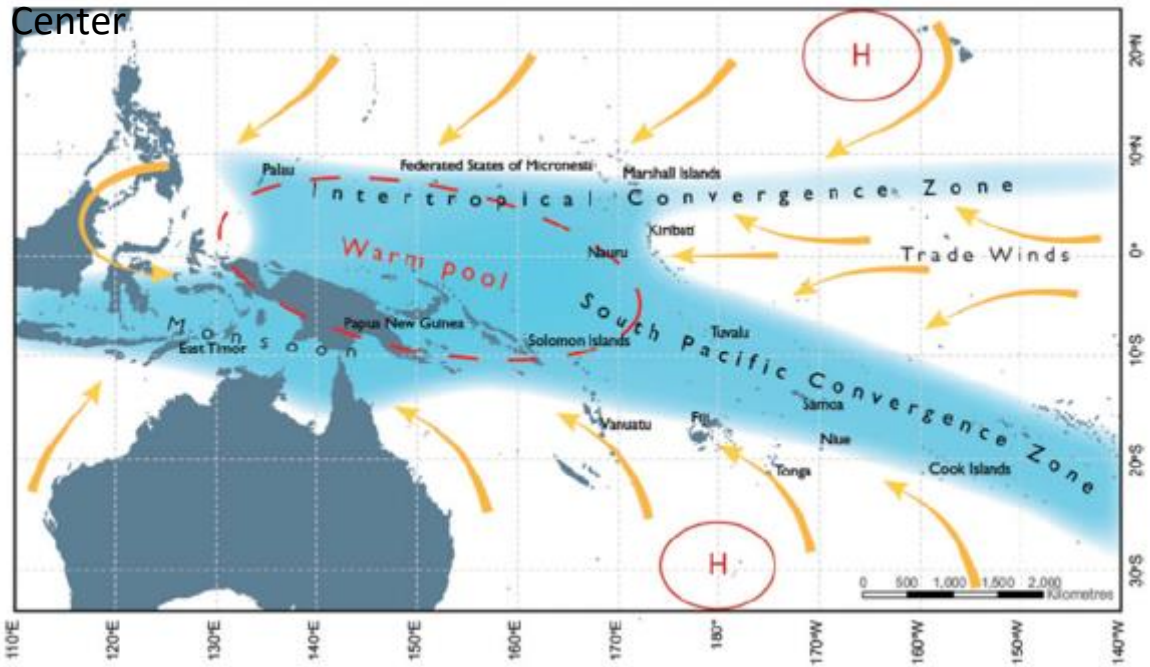
https://thefisheriesblog.com/2012/05/28/the-latest-on-ciguatera-fish-poisoning/

SST, mean circulation, ITCZ and SPCZ

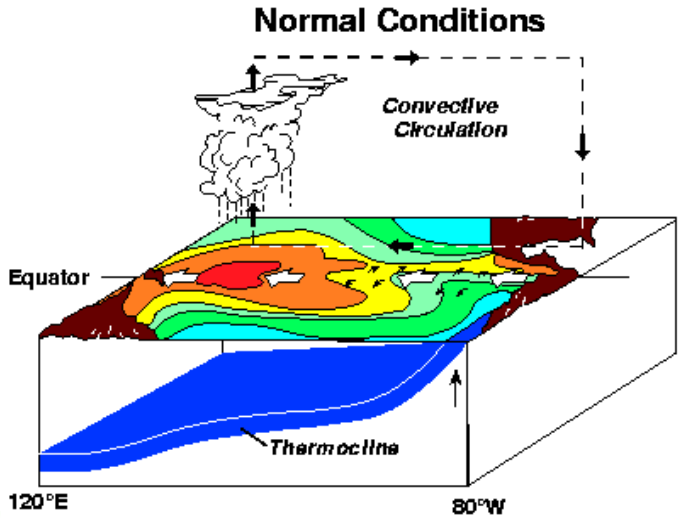
Tropical western and central Pacific Ocean (TWCPO)

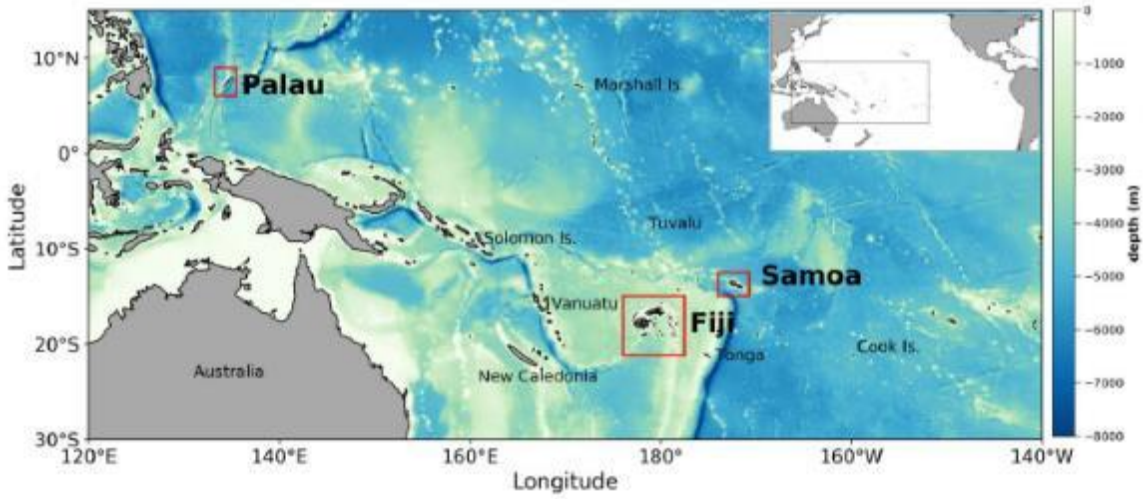


Annual Mean Sea Surface Temperature (°C) (1982-1995) from US National Weather Service Climate Prediction Center

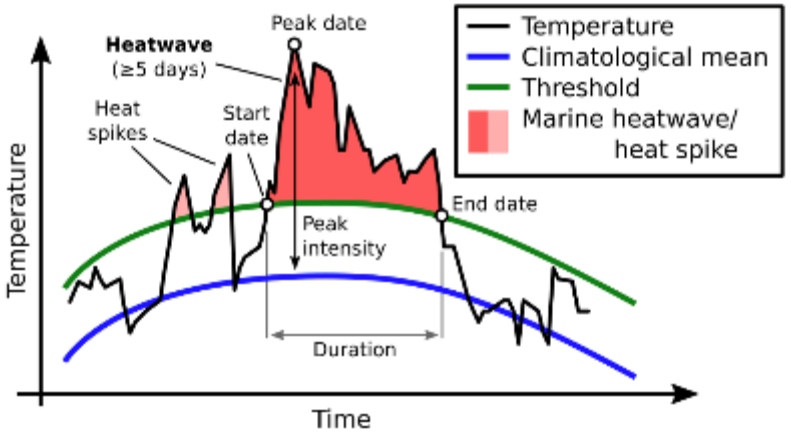


Source: Australian BoM and CSIRO (2011)



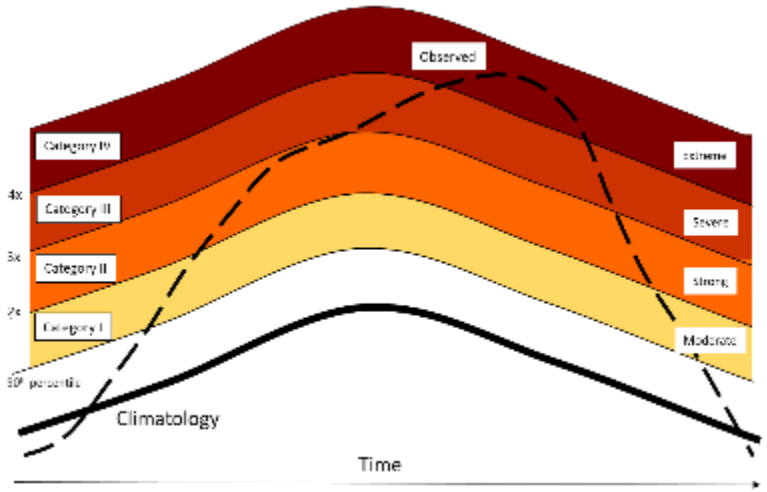


Marine heatwave and intensity categorisation definitions



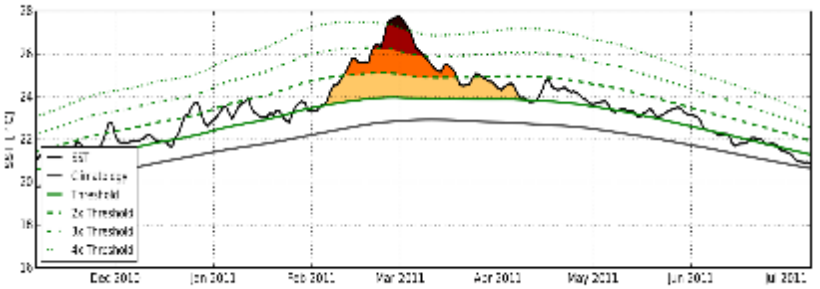
www.marineheatwaves.org/all-about-mhws.html

Hobday et al. (2016), Prog Oceanogr

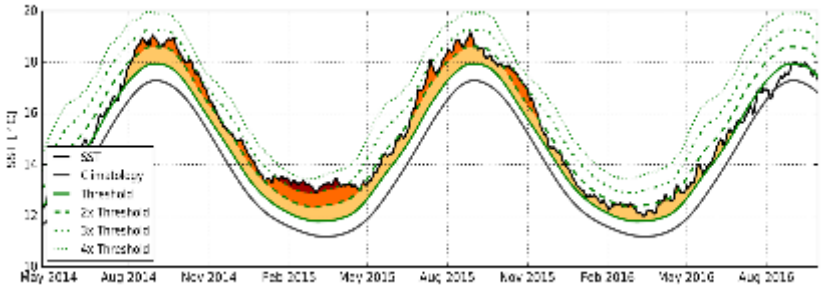


Hobday et al. (2018), Oceanography

Western Australia 2011

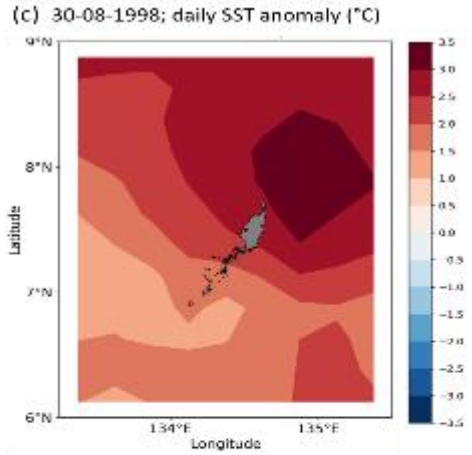


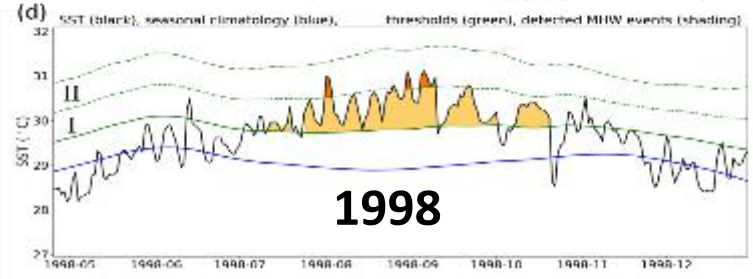
Northeast Pacific 2014-16

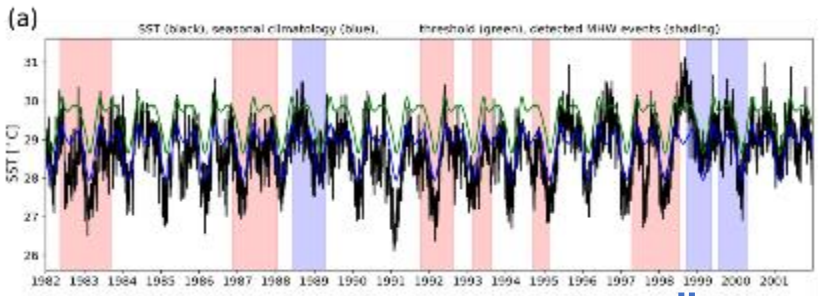


PALAU

MHW events on Pacific Islands and their communities

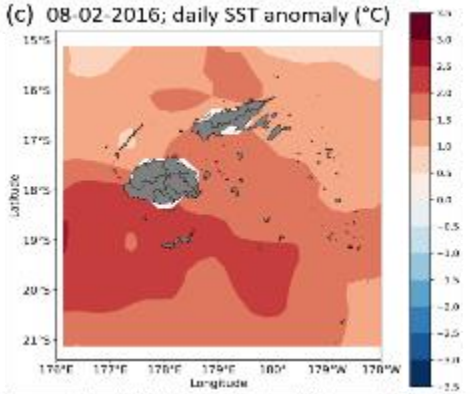


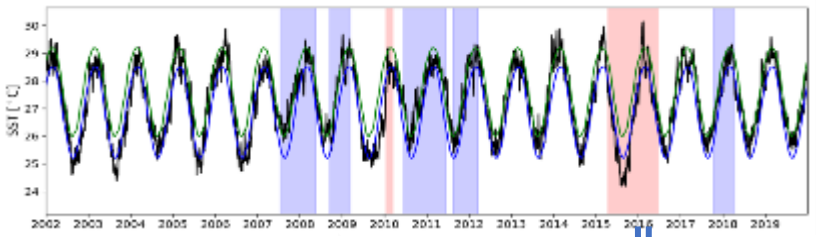




Jul-Oct 1998

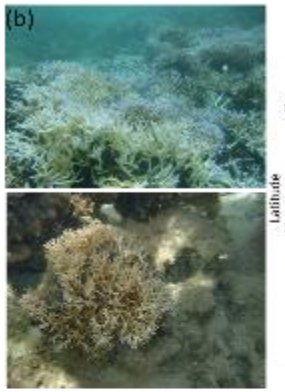
FIJI

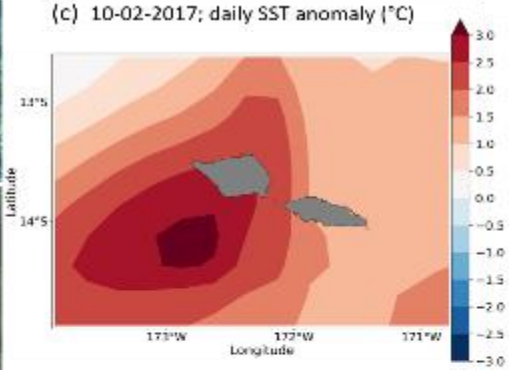




Jan-Feb 2016

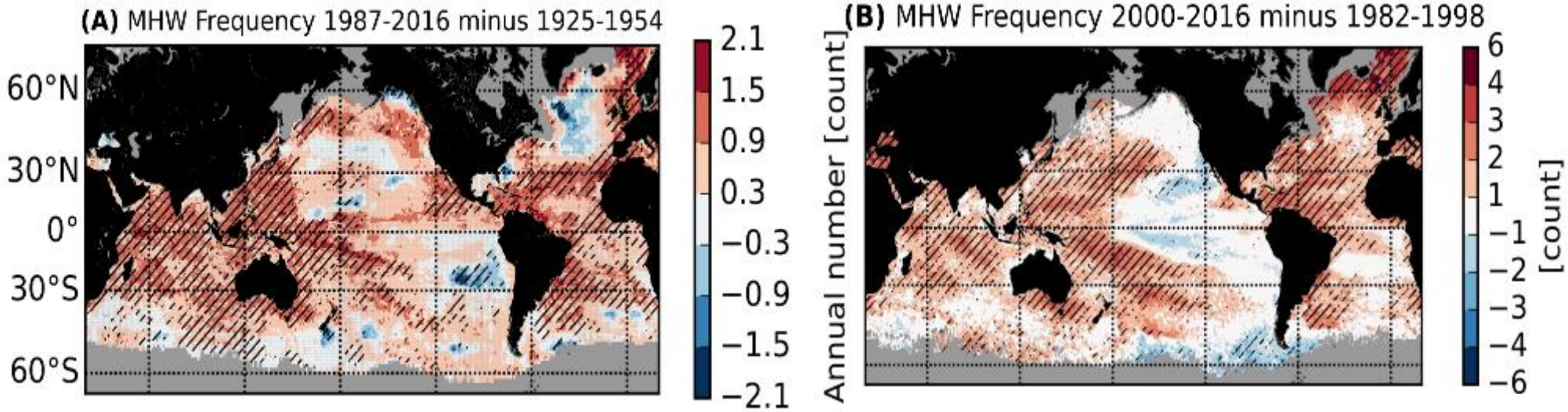
SAMOA

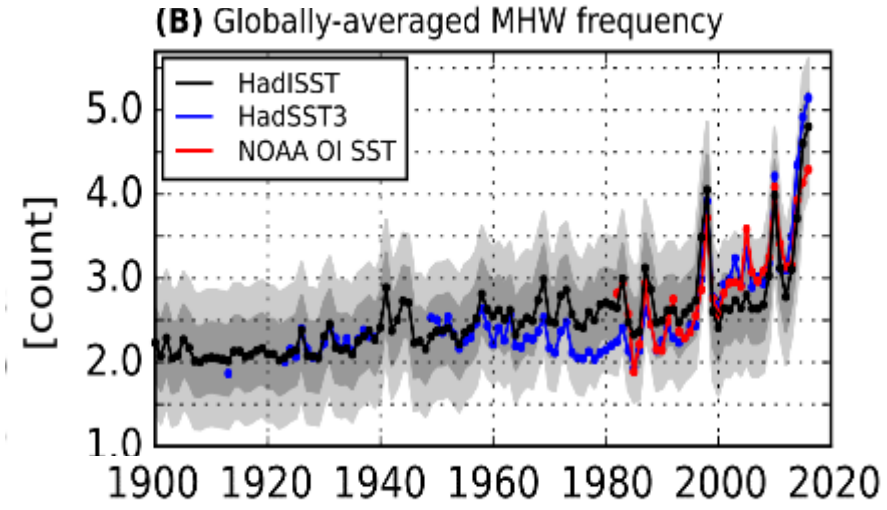




Holbrook et al. (2022), Glob. Planet. Change

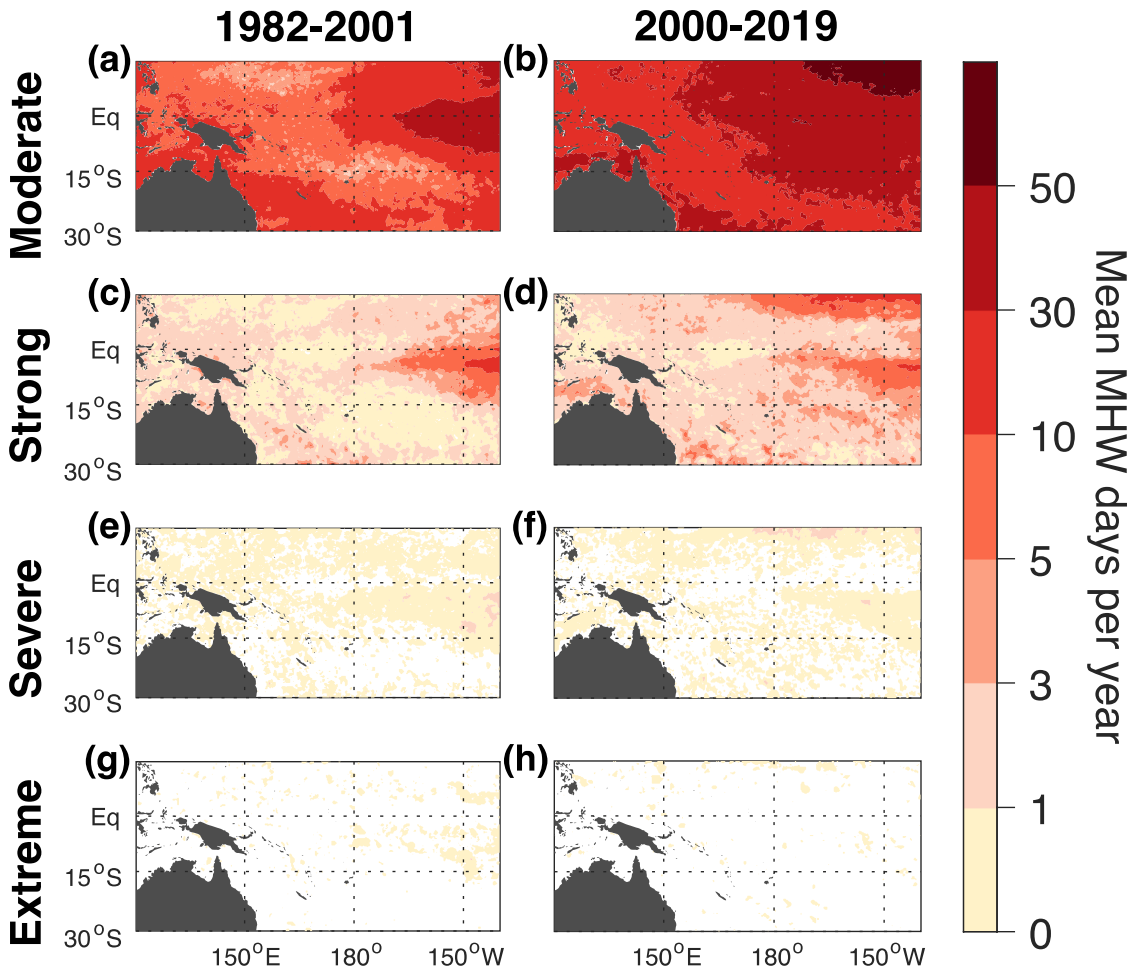
Trends in marine heatwaves

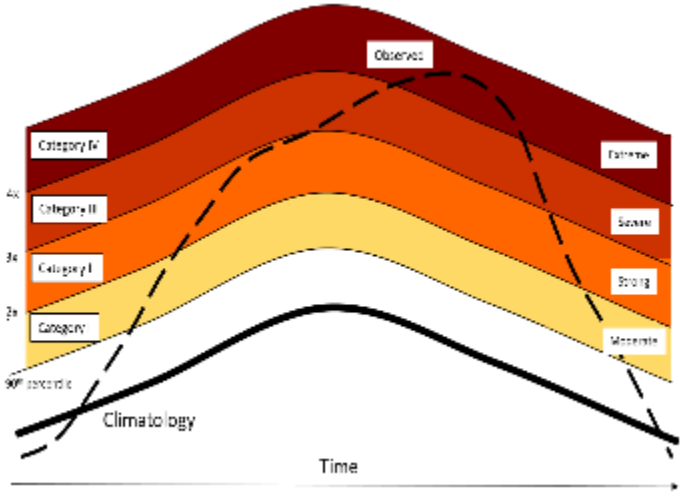




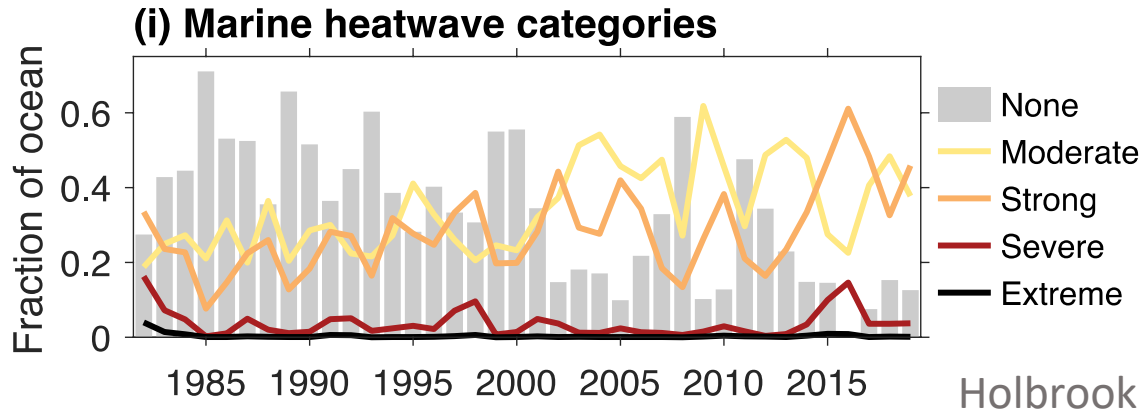
Oliver et al. (2018), *Nature Communications*

Observed counts of MHW days in each intensity category



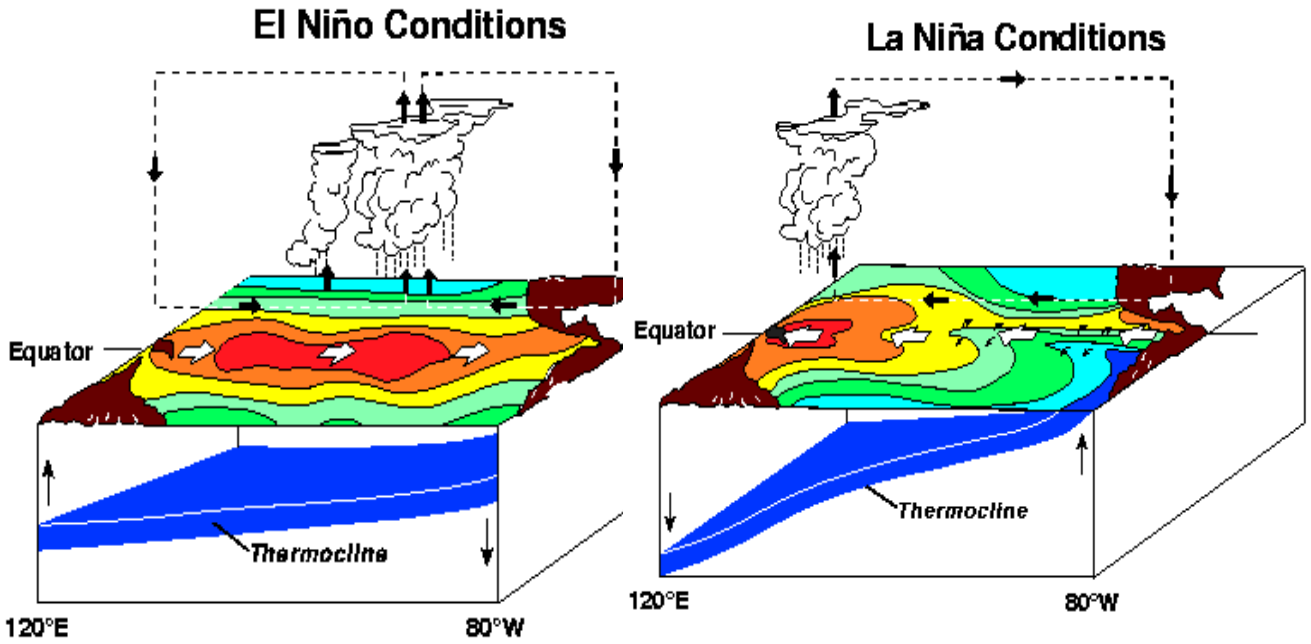


Hobday et al. (2018)



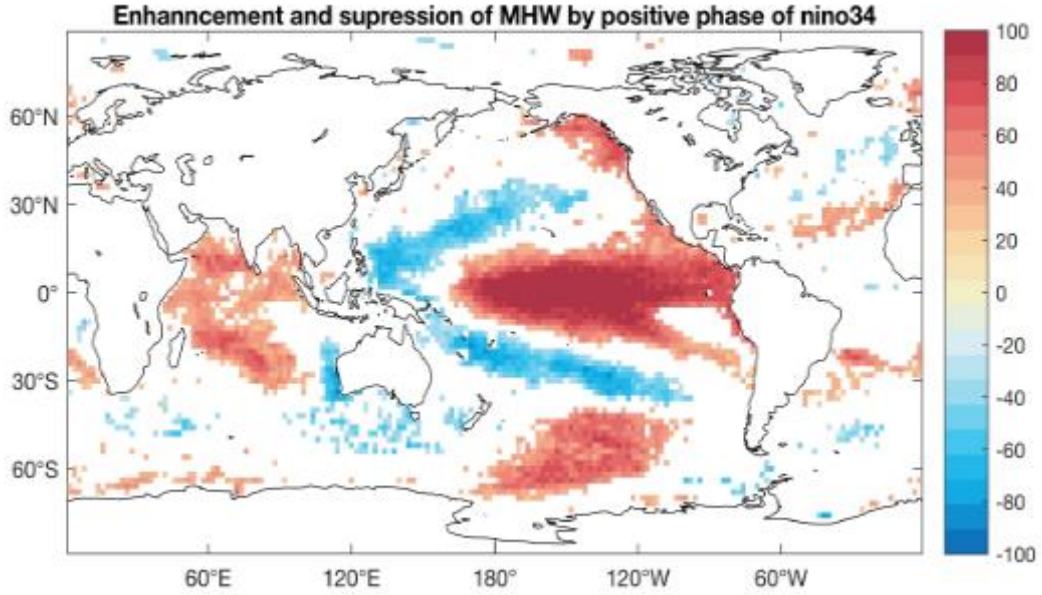
Holbrook et al. (2022), Glob. Planet. Change

El Niño–Southern Oscillation (ENSO) centre of action in the Pacific

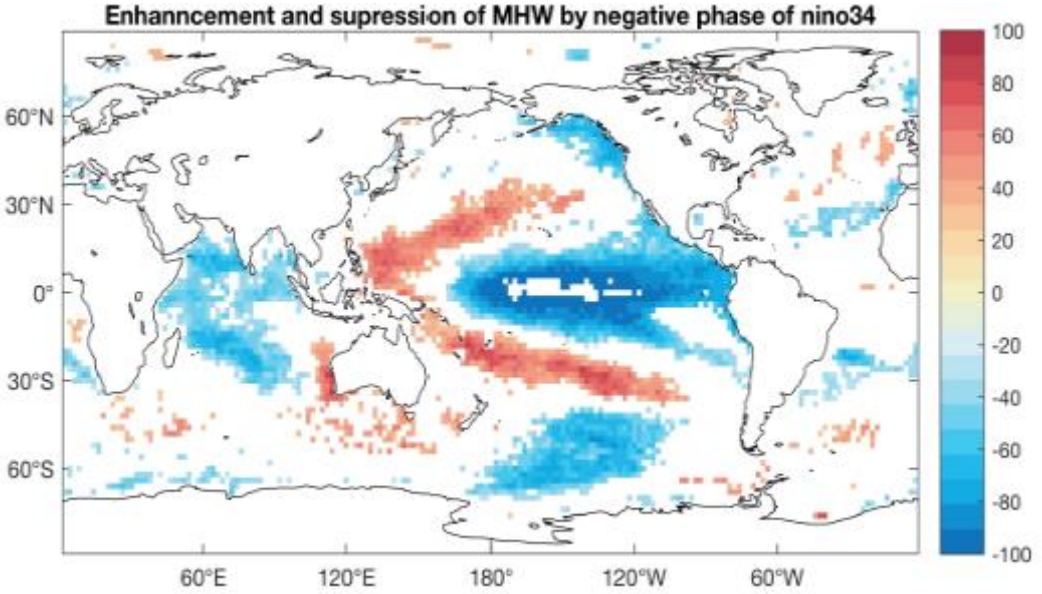


https://www.pmel.noaa.gov/elnino/what-is-el-nino
https://www.pmel.noaa.gov/elnino/what-is-la-nina

Percentage change in MHW days (El Niño)



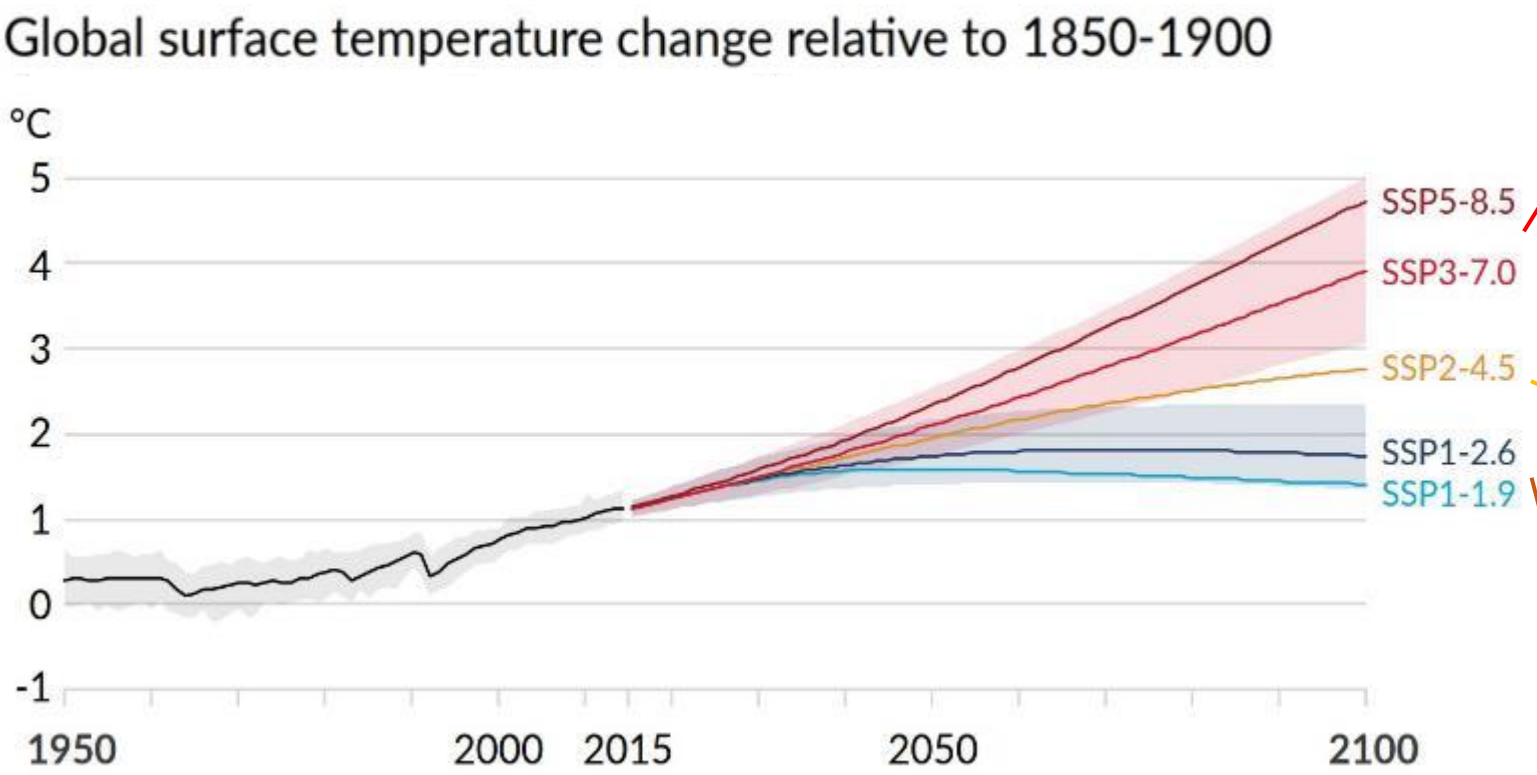
Percentage change in MHW days (La Niña)



Holbrook et al. (2019), Nat. Commun.

Projected global surface temperature change according to Shared Socioeconomic Pathways

The Paris Agreement (2015) aimed to limit warming to well below 2°C, and preferably below 1.5°C



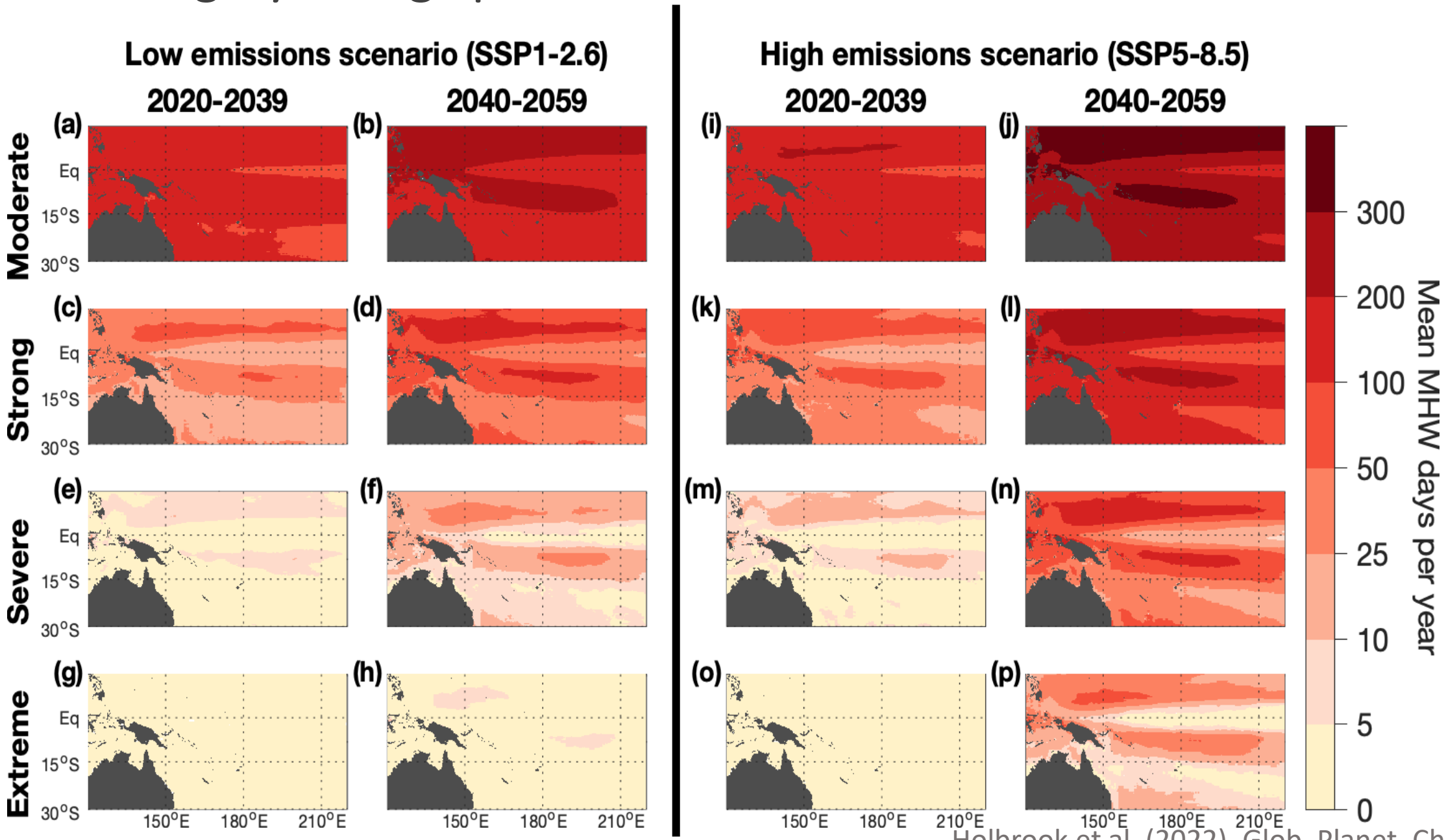
SSP5-8.5 and SSP3-7.0 (**low international priority for environmental concerns** and **fossil-fuel development)** are potentially catastrophic scenarios

SSP2-4.5 (**middle of the road**) best warming estimates of 2°C by 2060 and 2.7°C by 2100. The path reflects no marked shift in social, economic or technological trends.

SSP1-2.6 and SSP1-1.9 are the **more sustainable** pathways. While 1.5°C is still likely to be exceeded by 2030, temperatures are projected to decline after 2050

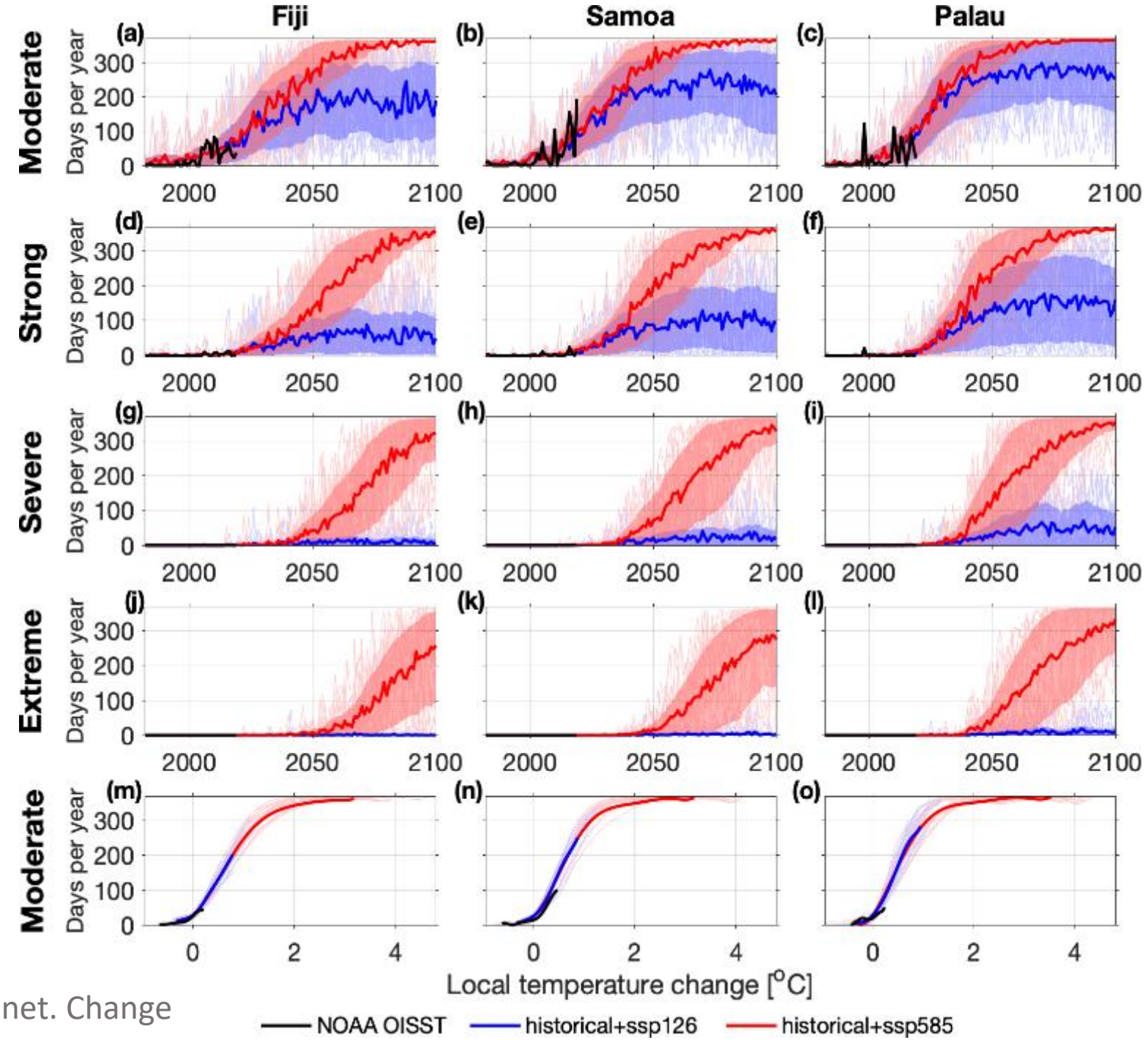
SOURCE: IPCC Sixth Assessment Report, IPCC_AR6_WGI_SPM.pdf

MHW category change patterns: CMIP6 under SSP1-2.6 and SSP5-8.5



Holbrook et al. (2022), Glob. Planet. Change

CMIP6 projections on MHW days per year



Holbrook et al. (2022), Glob. Planet. Change

Key Messages

- **MHWs** in the TWCPO region have **increased in occurrence and intensity** over the past 40 years leading to tangible ecosystem and fisheries impacts
- MHW projections under **SSP5-8.5** would be expected to have serious implications for **food security**, **livelihoods** and **health** of communities in Pacific Island countries (PICs)
- **Adaptation options** for PIC communities to strong or higher category MHWs may be insufficient in the future without aggressive emissions reduction
- **Low emissions scenario (SSP1-2.6)** will be important going forward!

https://thefisheriesblog.com/2012/05/28/the-latest-on-ciguatera-fish-poisoning/

Acknowledgments
- Secretariat of the Pacific Regional Environment Programme (SPREP)
- Workshops@SPREP in Apia, Samoa (23-26 Sep 2019, 28-31 Oct 2019)
- Azarel Mariner (SPREP),Geoff Gooley (CSIRO)
- Australia-Pacific Climate Partnership
- NESP ESCC, NESP CS Hub, CLEX

Holbrook NJ, V Hernaman, S Koshiba, J Lako, JB Kajtar, P Amosa and A Singh, 2022: Impacts of marine heatwaves on tropical western and central Pacific Island nations and their communities. *Global and Planetary Change,* **208**, 103680.

Thank you for listening!

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