Pacific Islands Regional Climate Assessment (PIRCA)

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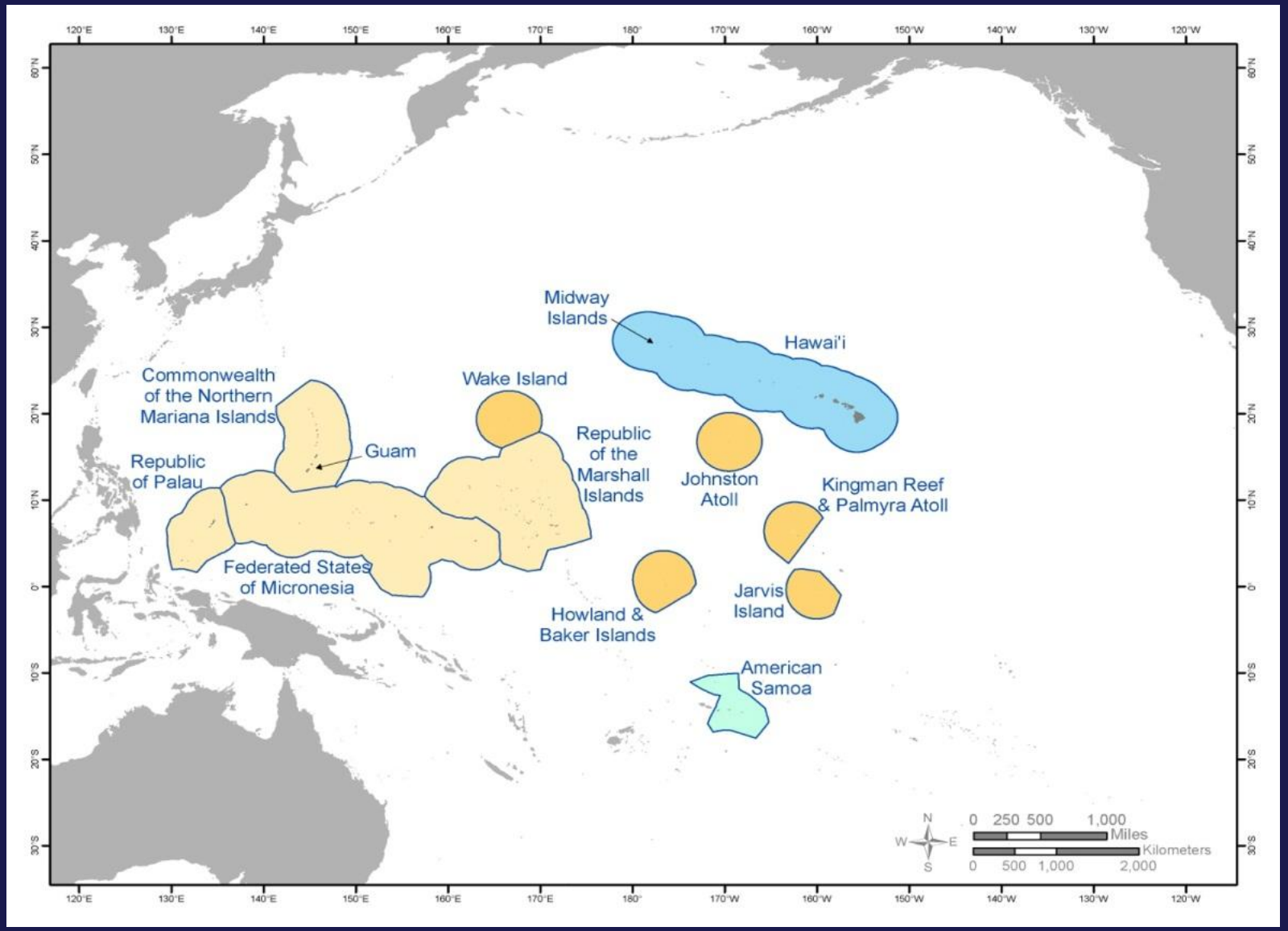
22 – August– 2012 USCRTF Business Meeting Pago Pago, American Samoa

Pacific Islands Regional Climate Assessment (PIRCA)

The PIRCA is a **collaborative effort** aimed at assessing **the state of climate knowledge, impacts, and adaptive capacity** in Hawai‘i and the US-Affiliated Pacific Islands.

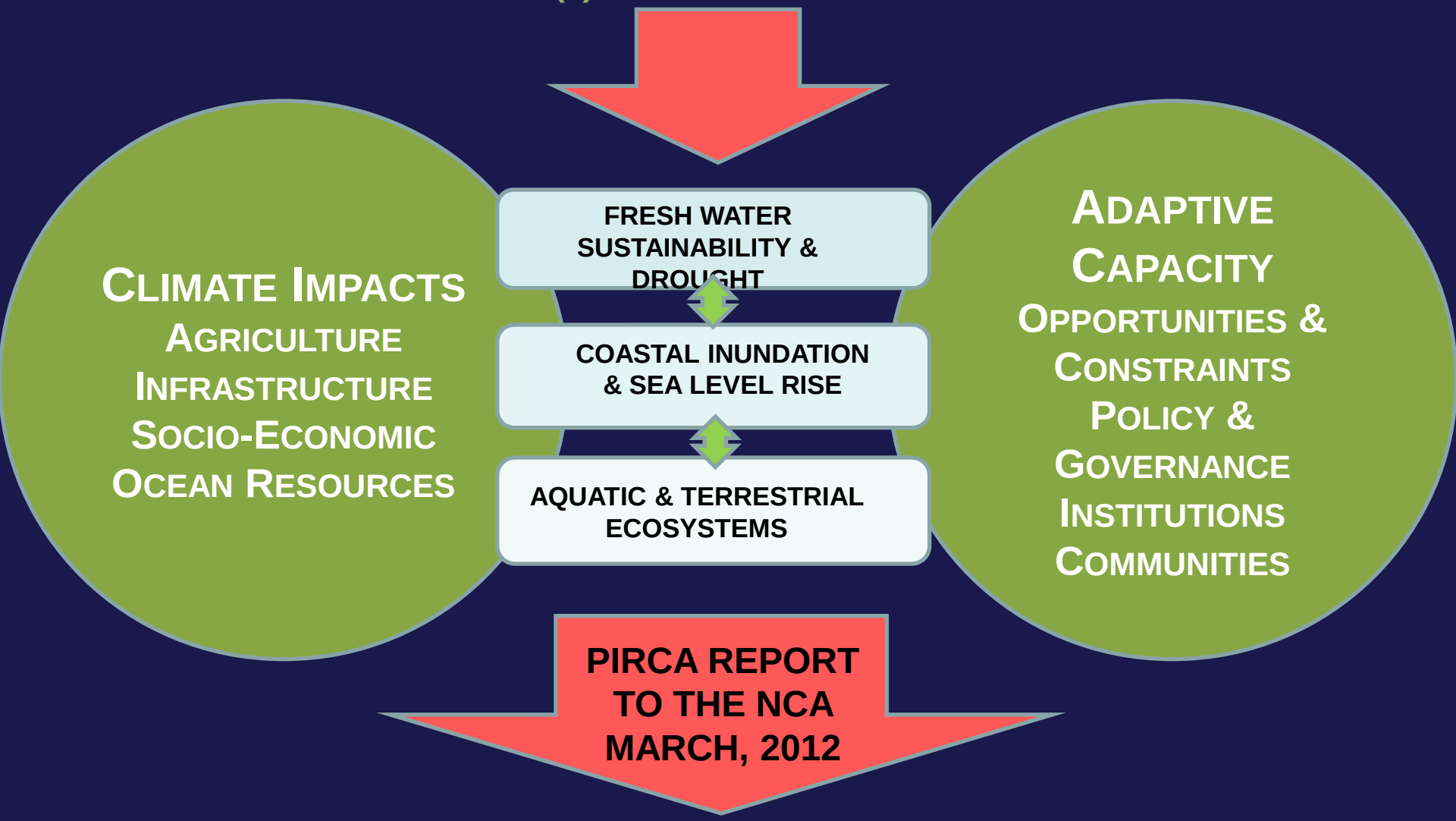
The **most recent activity** was bringing together scientific experts and practitioners to generate **an integrated report** that constitutes a regional contribution to the National Climate Assessment (NCA) and a **stand-alone report** to be published in September 2012.

Geographical Scope



PIRCA Map courtesy of Miguel Castrence/East-West Center.

REGIONAL CLIMATE PROGNOSES: (1) WESTERN NORTH PACIFIC (2) CENTRAL NORTH PACIFIC (3) CENTRAL SOUTH PACIFIC

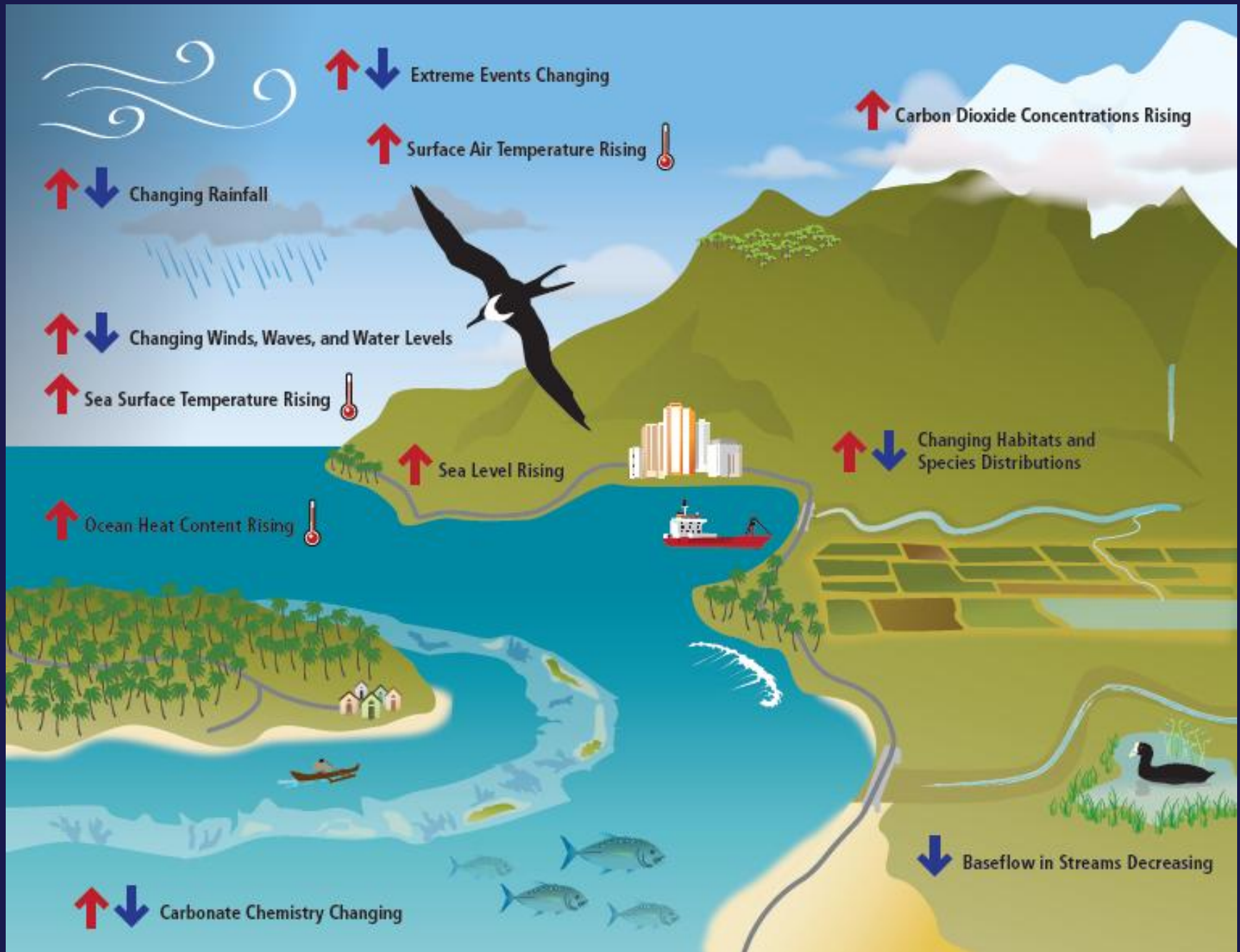


PIRCA REPORT TO THE NCA MARCH, 2012

PACIFIC ISLANDS REGIONAL CLIMATE IMPACTS FORUMS IN 2012 & 2013

(Figure courtesy Victoria Keener, East-West Center)

Indicators of a Changing Climate in the Pacific Islands Region



(Figure courtesy Susan Yamamoto)

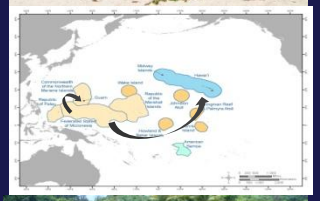
Key Messages

Fresh water supplies more limited

Coastal flooding and erosion

Changes in marine ecosystems

Native plant & animal stress



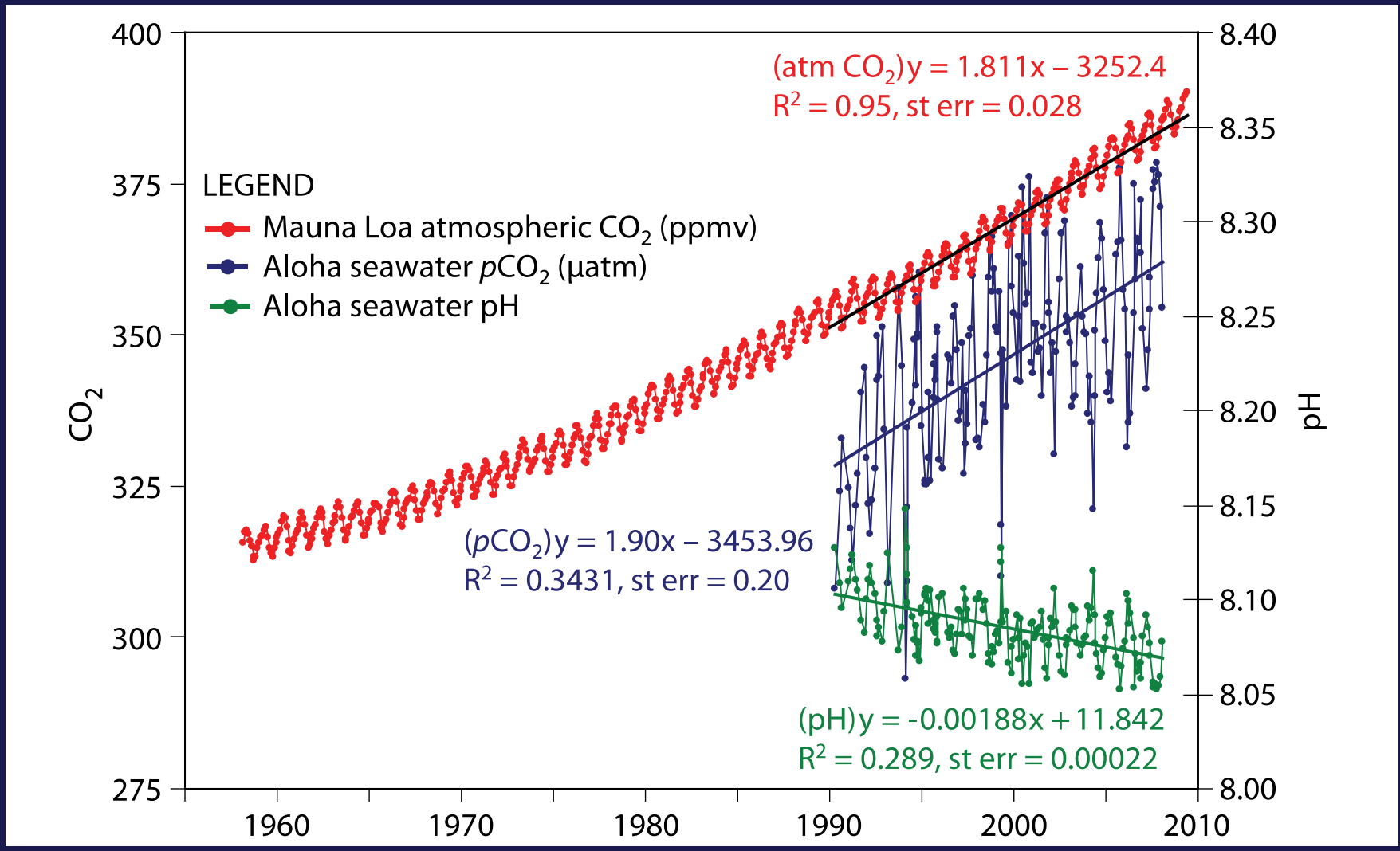
Increasing migration

Threats to indigenous cultures

(Figures and pictures courtesy: Susan Yamamoto, US FWS, Miguel Castrence, Melissa Finucane)

Carbon dioxide (CO_2) concentrations rising

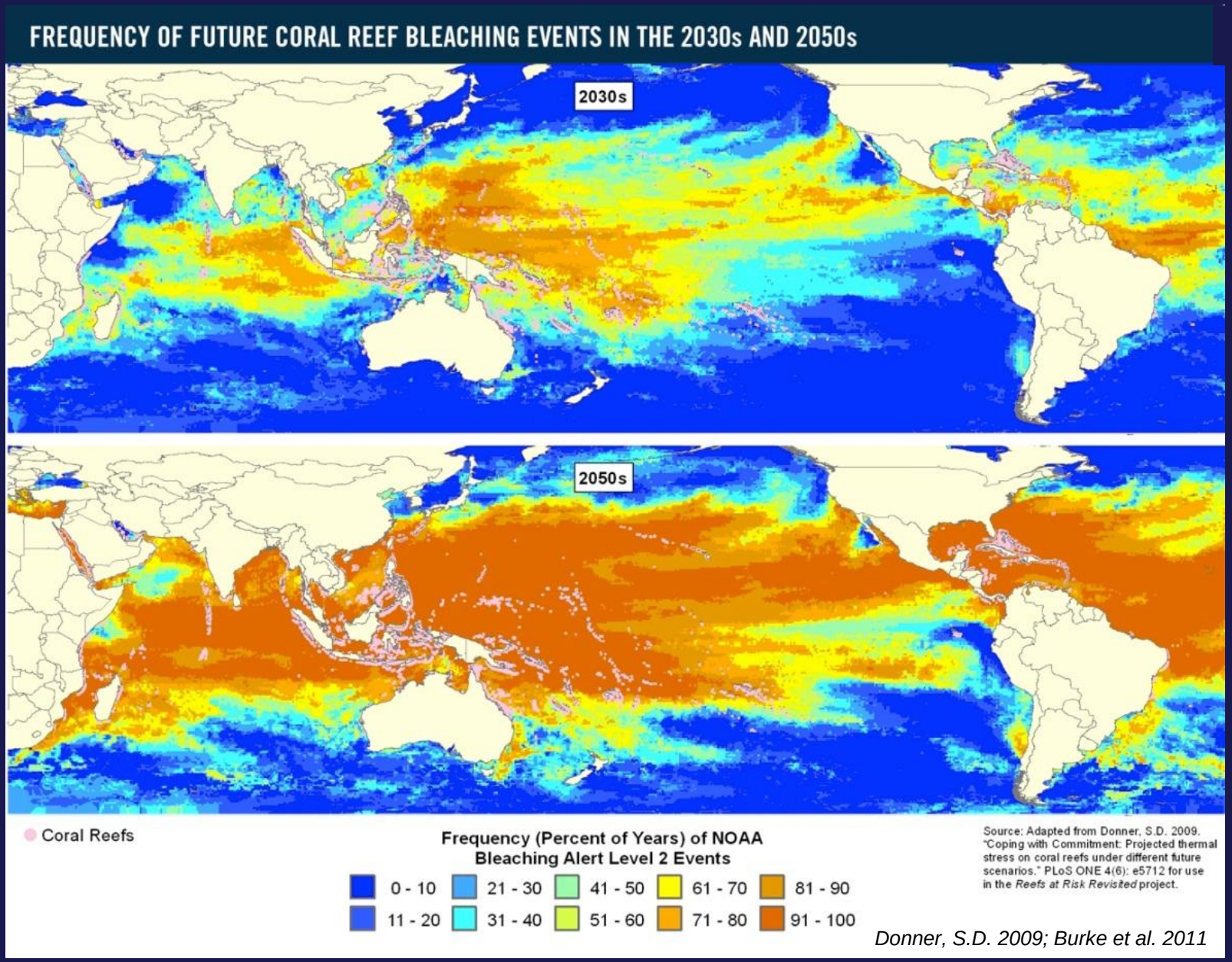
Ocean chemistry changing (more acidic)



Time series of atmospheric CO_2 at Mauna Loa (ppmv) and surface ocean pH and pCO_2 (µatm) at ocean Station Aloha.

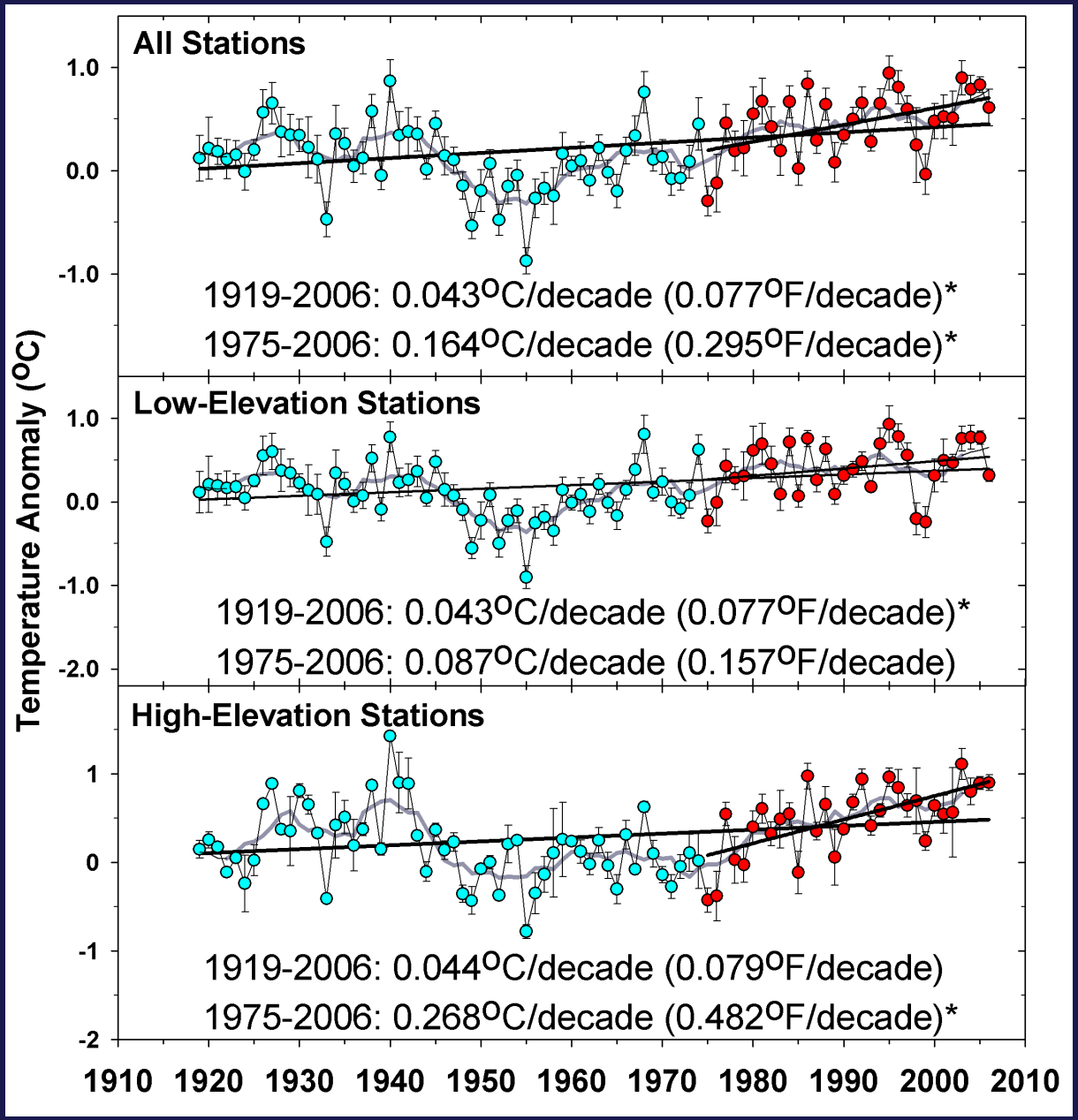
Feely et al. 2009

Sea-surface temperature is rising



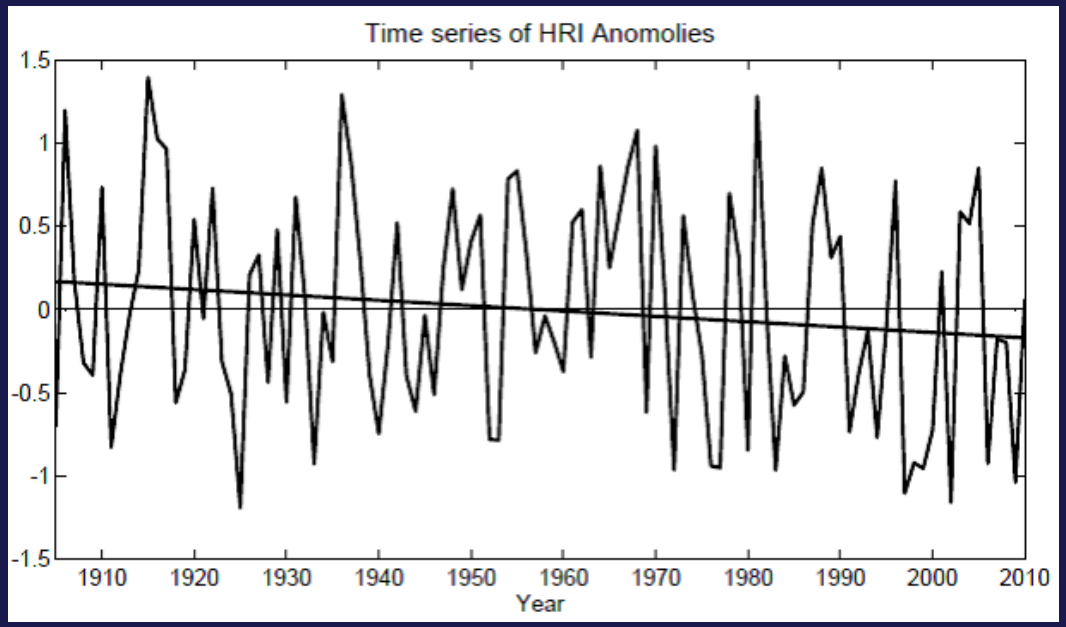
Donner, S.D. 2009; Burke et al. 2011

Surface air temperature is rising



Annual average surface → temperature anomalies are increasing at both high and low-elevation stations in Hawai'i.

Giambelluca et al. (2008)



Rainfall amount and distribution is changing

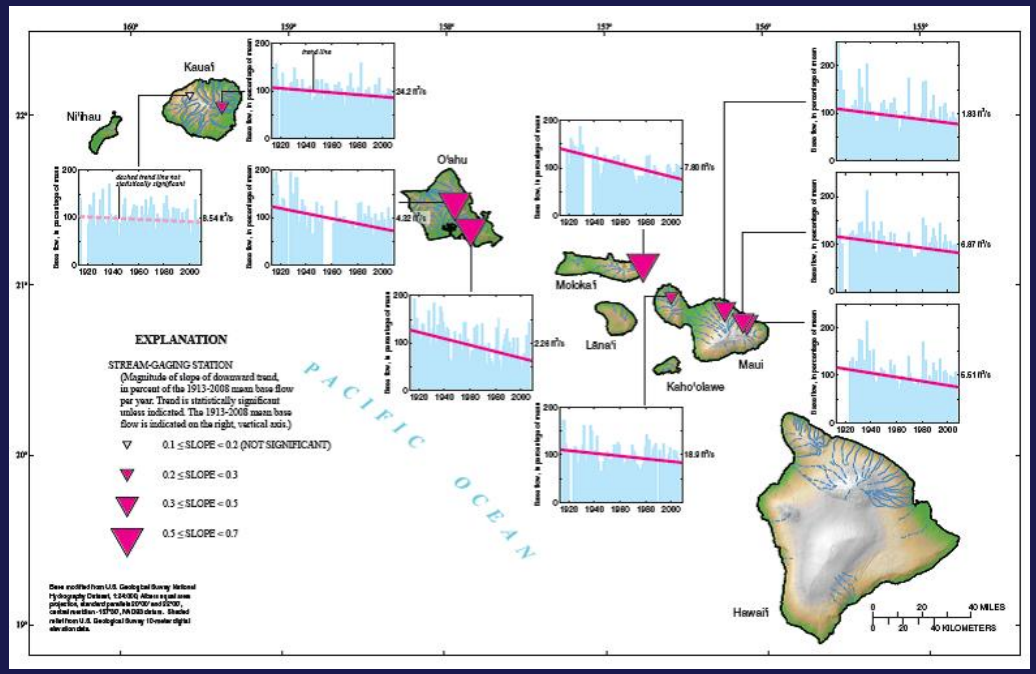
← Annual time series of the Hawai'i Rainfall Index (HRI) from 1905 to 2010 shows a long-term downward (drying) trend over the last century.

Chu & Chen (2005)

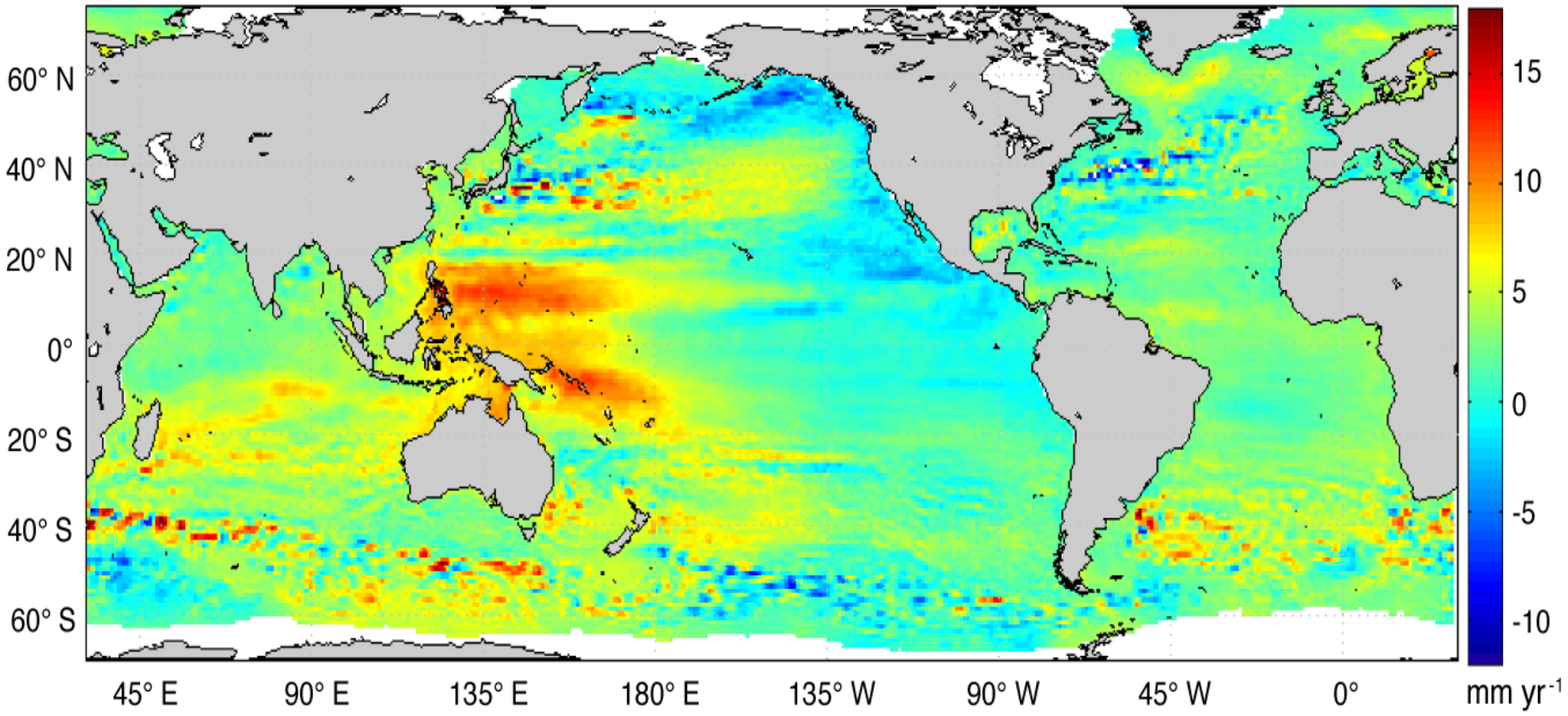
Stream "base flow" is decreasing

Base flow at eight out of the nine long-term → streamflow gauges in Hawai'i show significant decreases of 20 to 70 percent over the past 100 years

Oki, 2004; Bassiouni & Oki, 2012



Sea level is rising

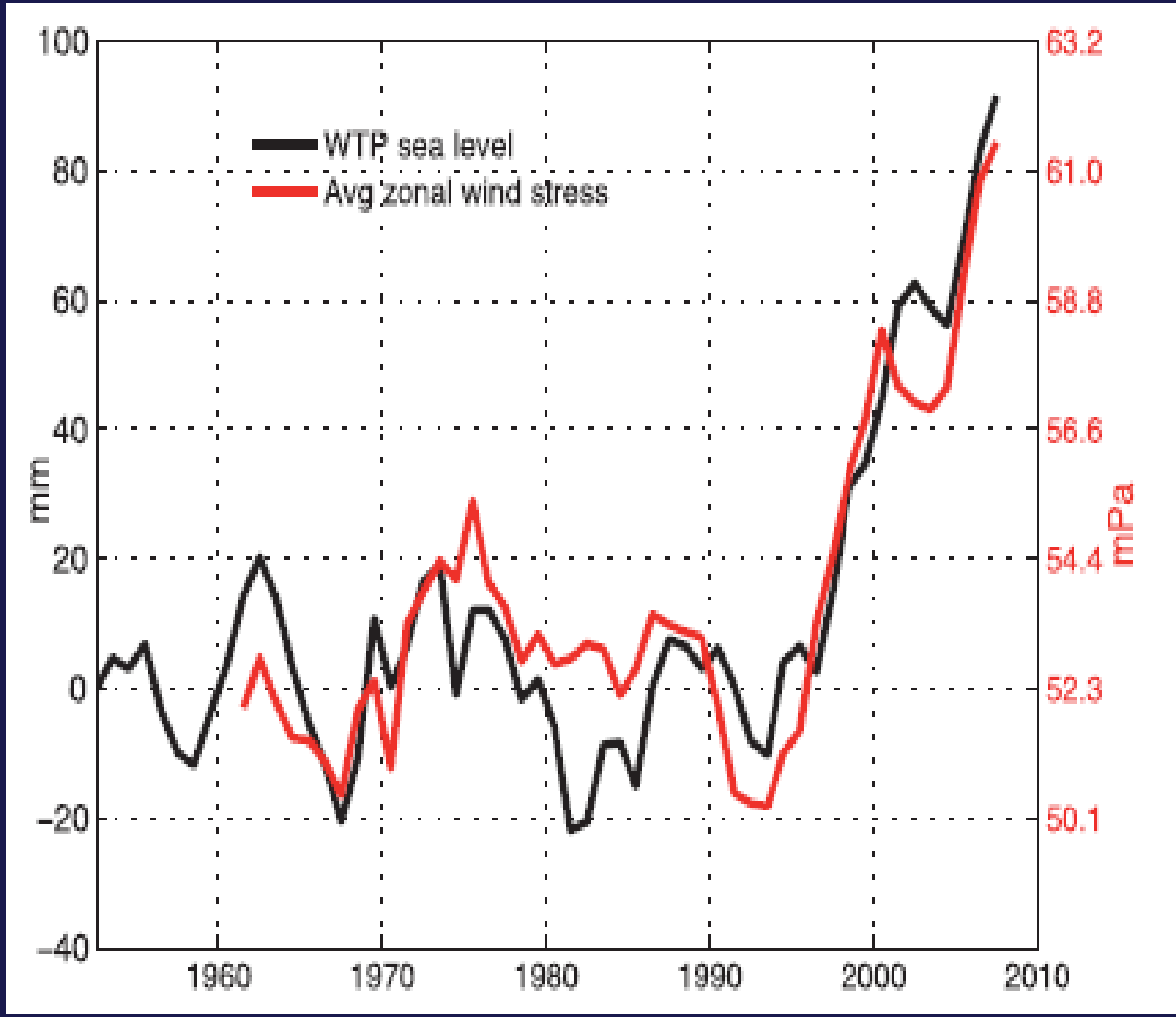


Sea-level trend for 1993-2010 from Aviso altimeter.

Winds and waves are changing

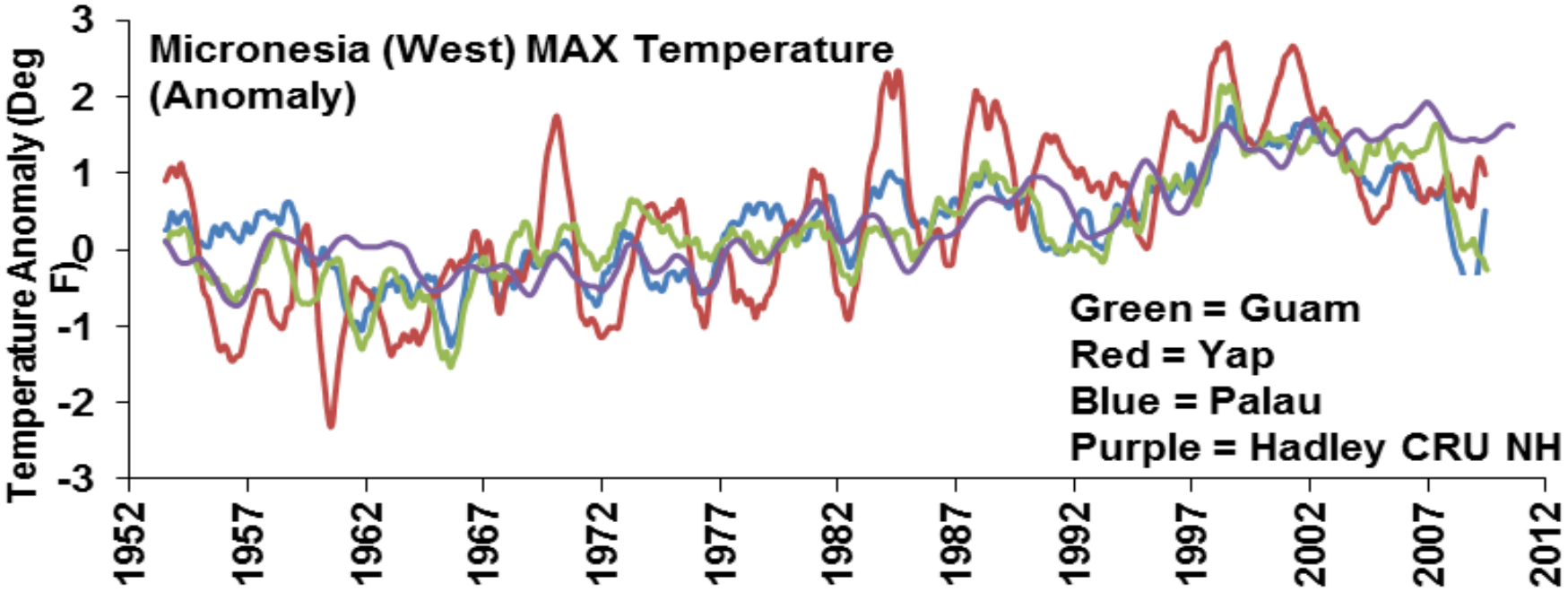
Comparison of average western tropical Pacific sea level and the amplitude of zonal wind stress averaged across the Pacific.

Merrifield, 2011



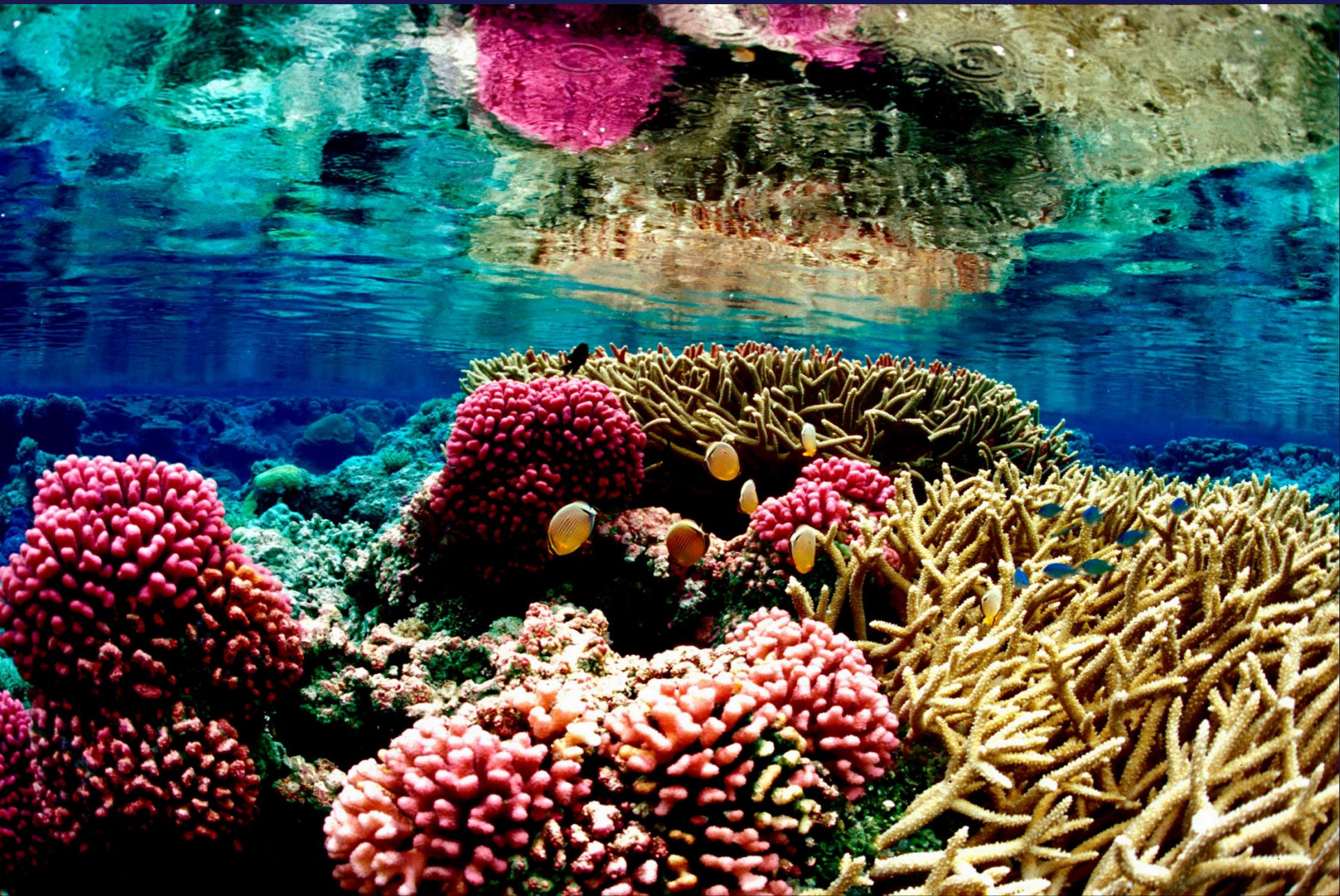
Climate Variability versus Change

The **high interannual and interdecadal variability** of the climate in the Pacific Islands region (e.g., ENSO, PDO/IPO) means that **over the near term** (next 25-30 years**) impacts are more about variability than change**.

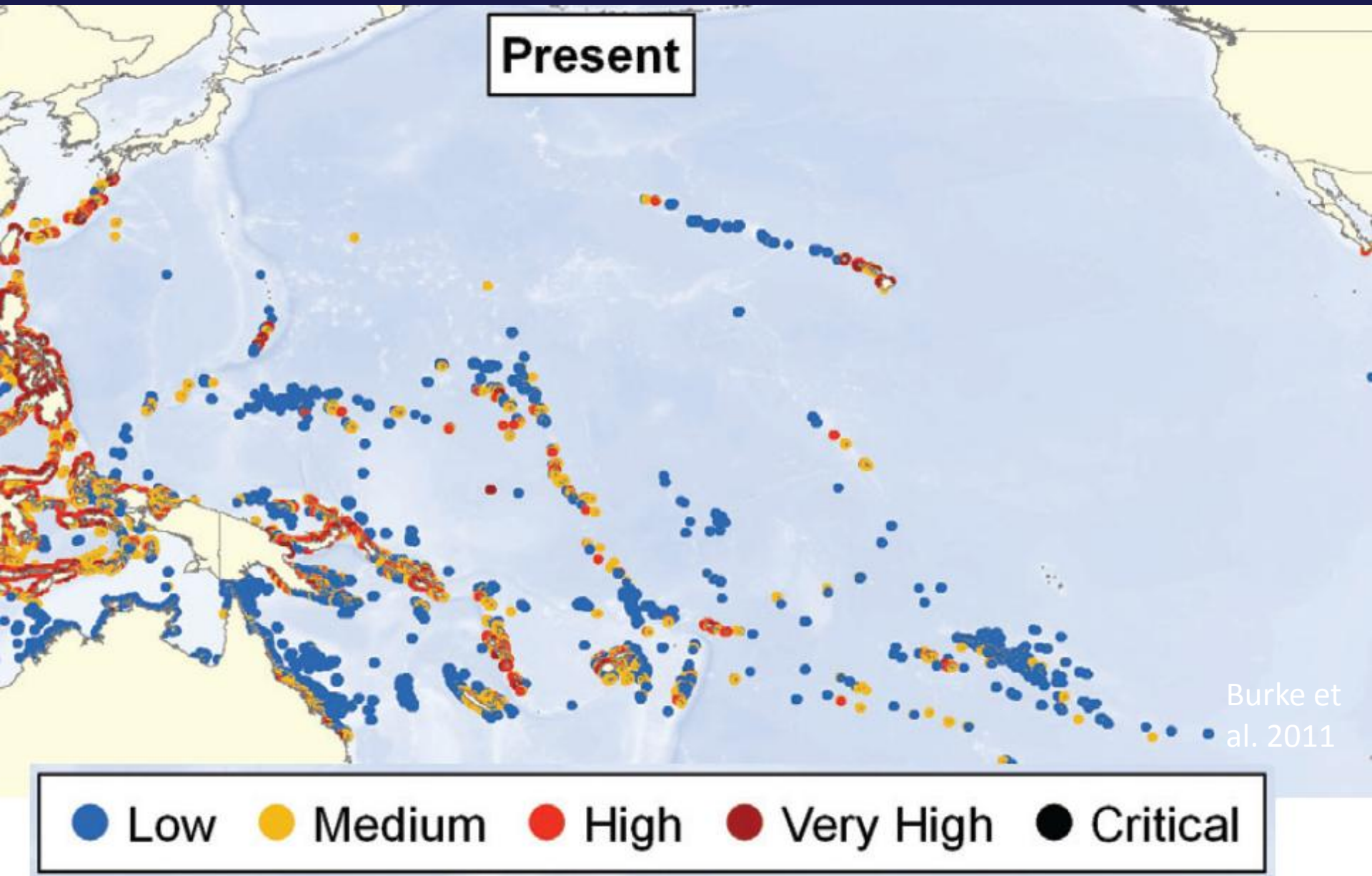


Maximum monthly temperature anomaly time series from 1952 to 2012 for single monitoring stations. The Northern Hemisphere temperature time series (purple line) is superimposed for comparison. *Adapted from Lander & Guard (2003).*

Coral Reef Ecosystems



Integrated threats to coral reefs
(development, fishing, pollution)



Burke et al. 2011

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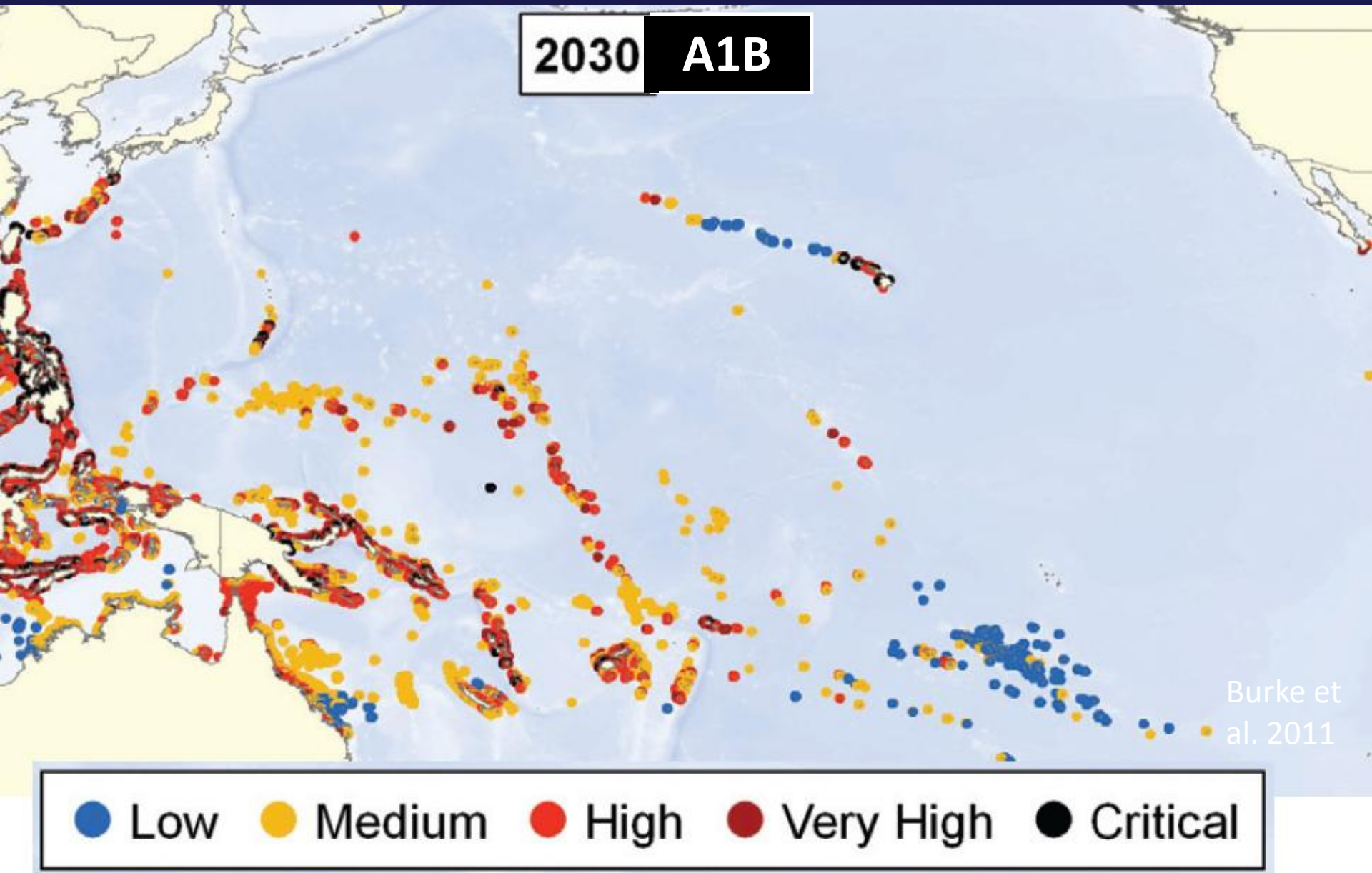
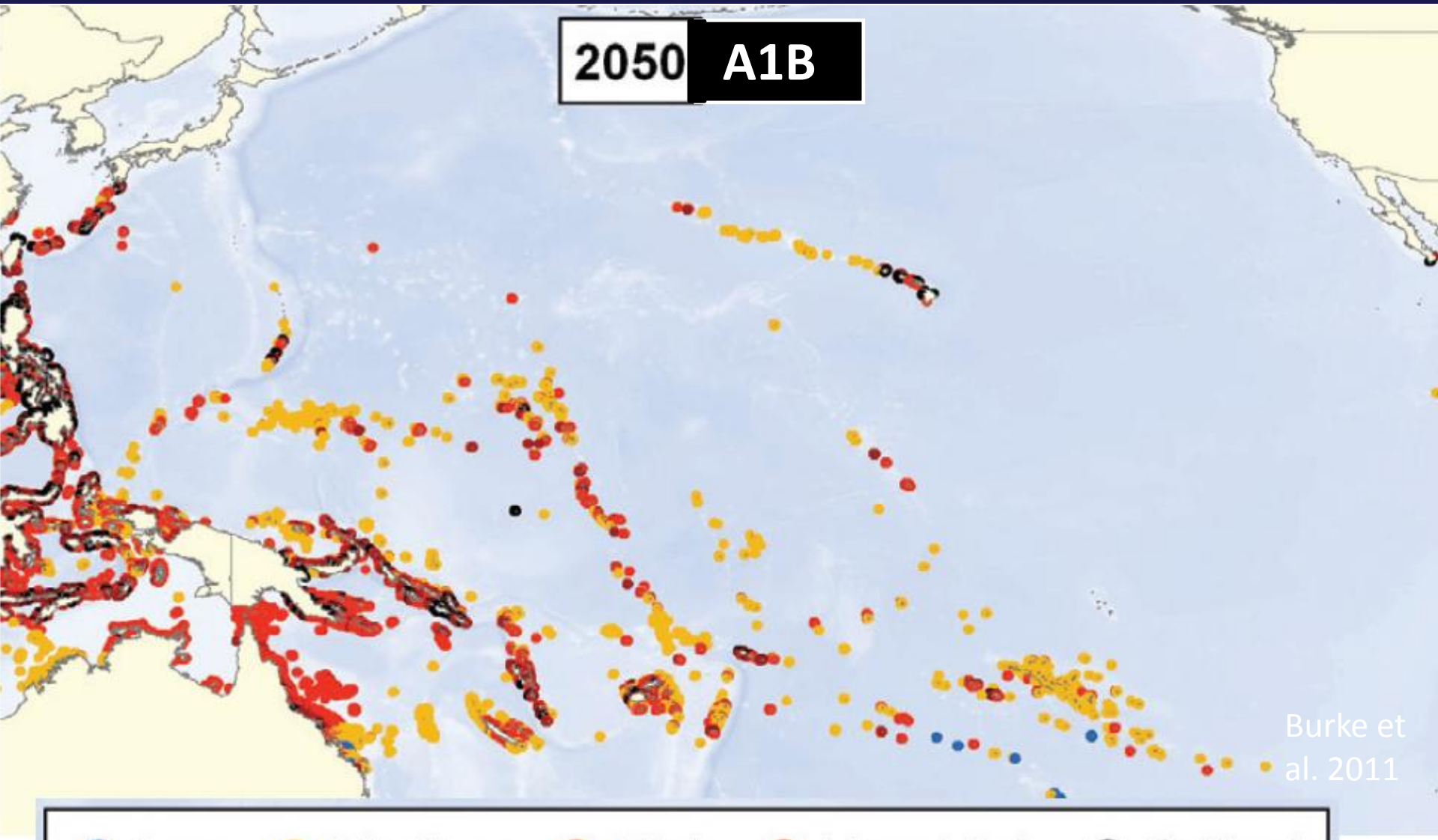


Burke et al. 2011

Integrated threats to coral reefs

(present threats + ↑temp + OA)



Burke et al. 2011

Key Findings

- **Low islands, coral reefs, nearshore and coastal areas** on high islands, and high-elevation ecosystems are most vulnerable to climatic changes.

- **Freshwater supplies** will be more limited on many Pacific Islands, especially low islands, in response to warmer, drier conditions coupled with increased occurrences of saltwater intrusion.

- **Rising sea levels** will incrementally increase the likelihood of coastal flooding and erosion, damaging coastal infrastructure and agriculture, negatively impacting tourism, reducing habitat for endangered species, and threatening shallow reef systems.

Key Findings

- **Higher sea-surface temperatures** will increase coral bleaching, leading to a change in coral species composition, coral disease, and coral death.

- **Rising ocean acidification** and changing carbonate chemistry will have negative consequences for the insular and pelagic marine ecosystems; although potentially dramatic, the exact nature of the consequences is not yet clear.

- Distribution patterns of **coastal and ocean fisheries** will be altered, with potential for increased catches in some areas and decreased catches in other areas, but open-ocean fisheries being affected negatively overall in the long term.

Key Findings

- Threats to traditional lifestyles of **indigenous communities** in the region will make it increasingly difficult for Pacific Island cultures to sustain their connection with a defined place and their unique set of customs, beliefs, and languages.

- Mounting threats to food and water security, infrastructure, and public health and safety will lead increasingly to **human migration** from low islands to high islands and continental sites.

Information and Research Needs

- Further research on historical, current, and future **climate trends**. Data documenting changes in ocean chemistry and terrestrial ecosystems are particularly sparse.

- Development and testing of **integrated biogeochemical and physical models** to provide a better understanding **ecological responses** to climate change.

- Deeper understanding of **human responses** to climate change is needed to inform adaptation, identify barriers to the use of climate information decision-makers, and facilitate development of visualization tools and decision support systems.

Building Partnerships to Support Climate Services

Partnerships are fundamental for sustaining a regional climate assessment process and addressing the impacts of climate change across isolated and diverse islands.

The regional culture of communication and collaboration provides a strong foundation for this effort and will be important for building resilience in the face of the changing climate.

PACIS
PACIFIC CLIMATE INFORMATION SYSTEM

Pacific RISA
managing climate risk in the Pacific

PRiM
PACIFIC RISK MANAGEMENT 'OHANA

PICCC
Pacific Islands Climate Change Cooperative

Mahalo to all involved

PIRCA Steering Committee

Stephen Anthony (USGS PIWSC), Tim Brown (WRCC, DRI), Jeff Burgett (PICCC, FWS), Dolan Eversole (Sea Grant, University of Hawai‘i at Mānoa), Melissa L. Finucane (East-West Center, Pacific RISA), Charles Fletcher (SOEST, University of Hawai‘i at Mānoa), Kevin Hamilton (IPRC, University of Hawai‘i at Mānoa), Victoria W. Keener (East-West Center, Pacific RISA), Dawn Kotowicz (NOAA PIFSC), John J. Marra (NOAA NCDC), Mark Merrifield (JIMAR, University of Hawai‘i at Mānoa), Stephen E. Miller (FWS), Britt Parker (NOAA CRCP), Noriko Shoji (NOAA NMFS), Deanna Spooner (PICCC), Adam Stein (NOAA PSC), William V. Sweet (NOAA COOPS), Jean Tanimoto (NOAA PSC)

And the dozens of experts involved in workshops and peer review process!

Opportunities to Participate

PIRCA Sub-regional Forums

- Central North Pacific Forum – Dec. 11-12, 2013 in Honolulu, HI
- Central South Pacific Forum – Feb. or March 2013 in Suva, Fiji
- Western North Pacific – spring of 2013 (location tbd)

Join the PIRCA Steering Committee

Participate in writing of next report (2015-2016)

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For more on the PIRCA:
http://www.eastwestcenter.org/PIRCA