气候变化与小岛屿国家
CLIMATE CHANGE AND SMALL ISLANDS

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Outlines

Impacts of climate change on small islands：

- Sea level rise and coastal floods
- Warming ocean and heatwaves
- Intensified hurricanes, flood and drought
- Land-ocean-islands tele-connection impacts

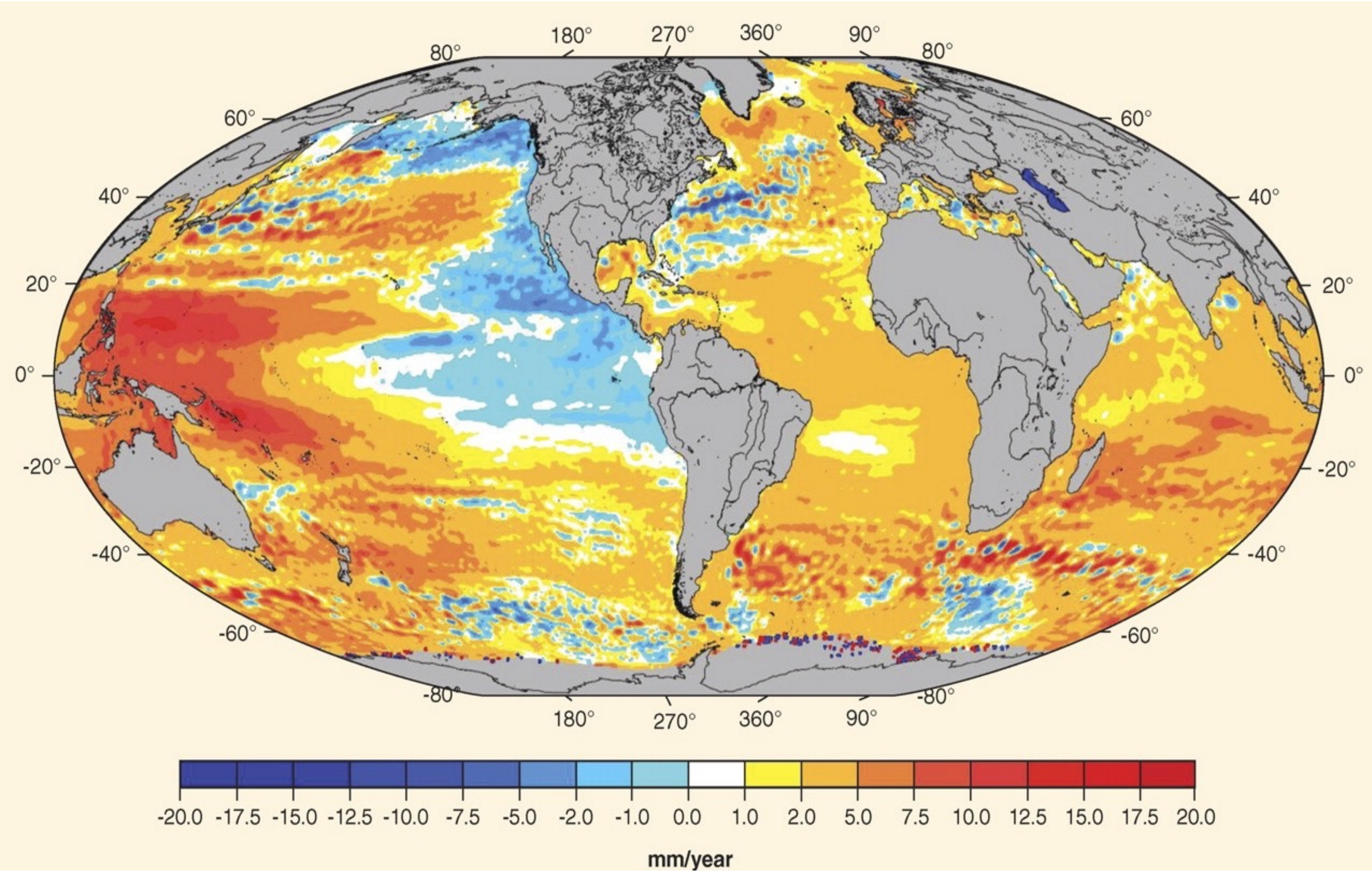
Climate change adaptation and mitigation：

- Coastal infrastructure adaptation and resilience
- Mangrove protection and restoration
- Nature-based solutions: buffer and blue carbon
- Off-shore wind and solar energy

Coastal and Ocean Impacts of Climate Change

- Sea Level Rise: ~2m by 2100.
- More extreme storms
- Stronger Hurricanes
- Increased ocean temperature
- Beach Erosion
- Ocean acidification
- Loss of coral reefs

Changes of sea level



Icesheet melt

Sea ice

Thermal expansion

Uneven tides

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Majority of coastal cities

Lowland areas

Expansive infrastructure

Heavy population

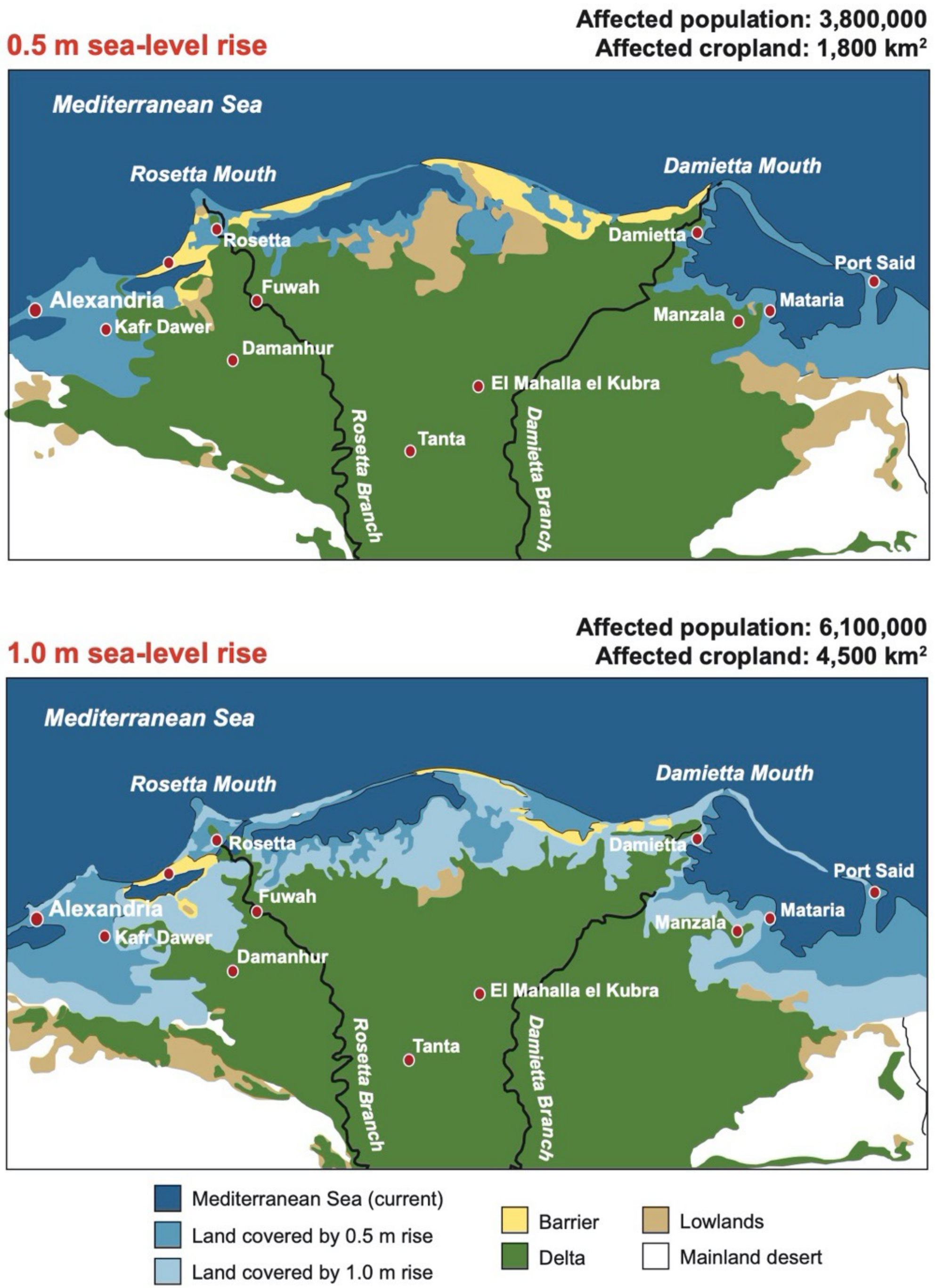
Sea level + high tide

Flood, erosion

Sea water intrusion

Novel urban planning

Coastal barriers



Rising high-impact marine heatwaves

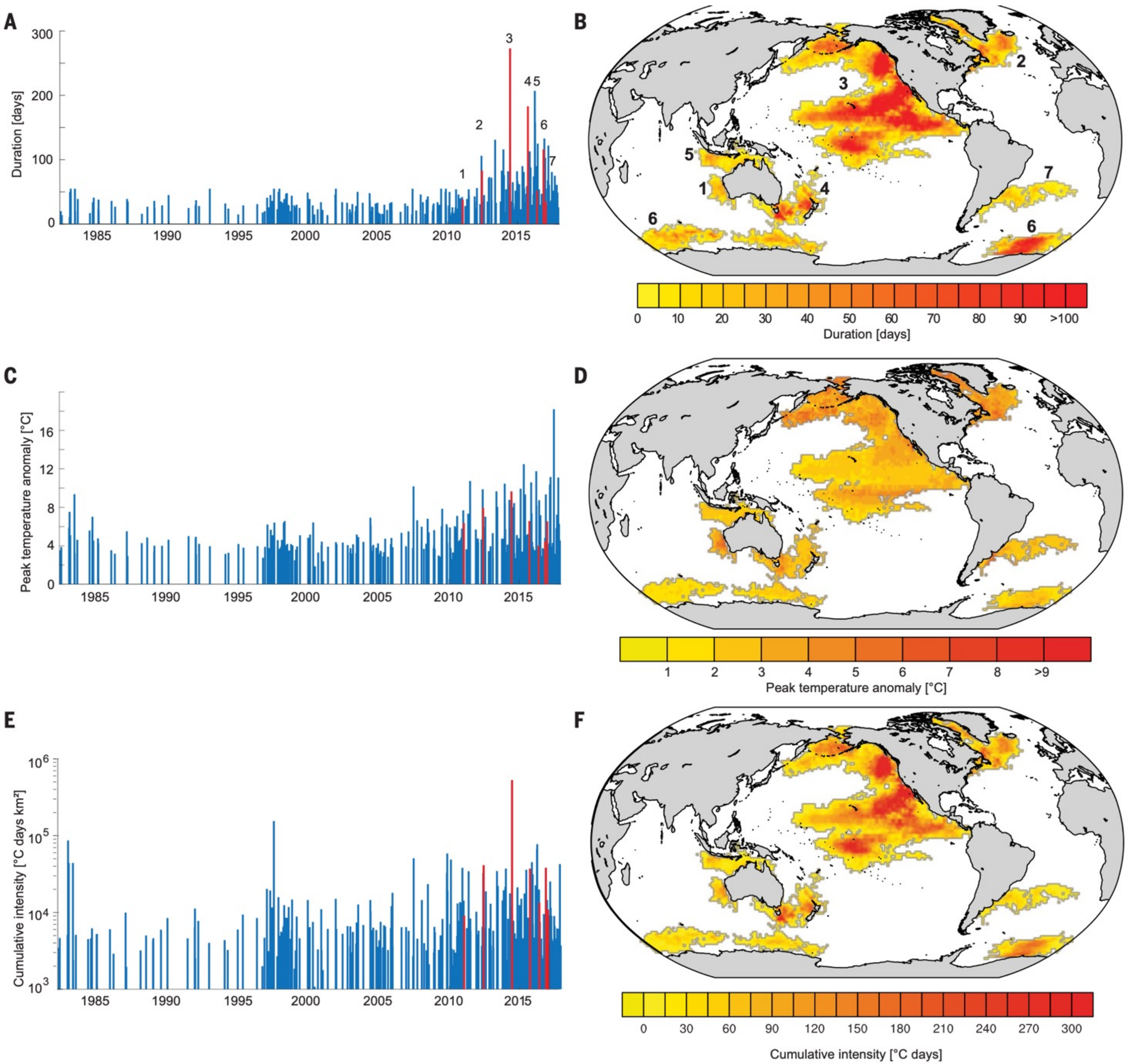
Ocean absorb heat

Warm much slow

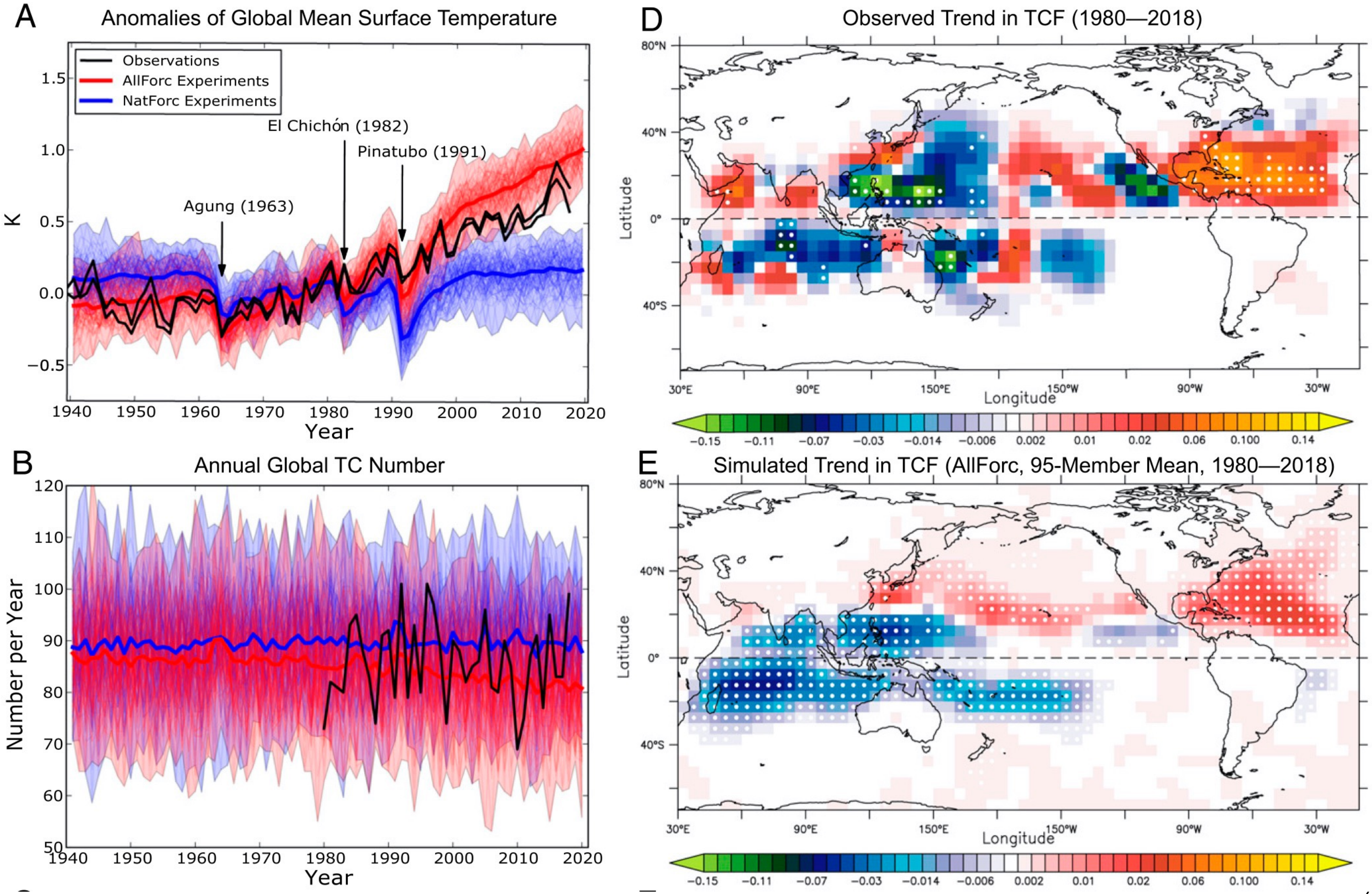
Likely reach limit

Cyclones

(Laufkötter et al, 2020, Science)



Climatic change in global distribution of tropical cyclones



Frequent

Timing

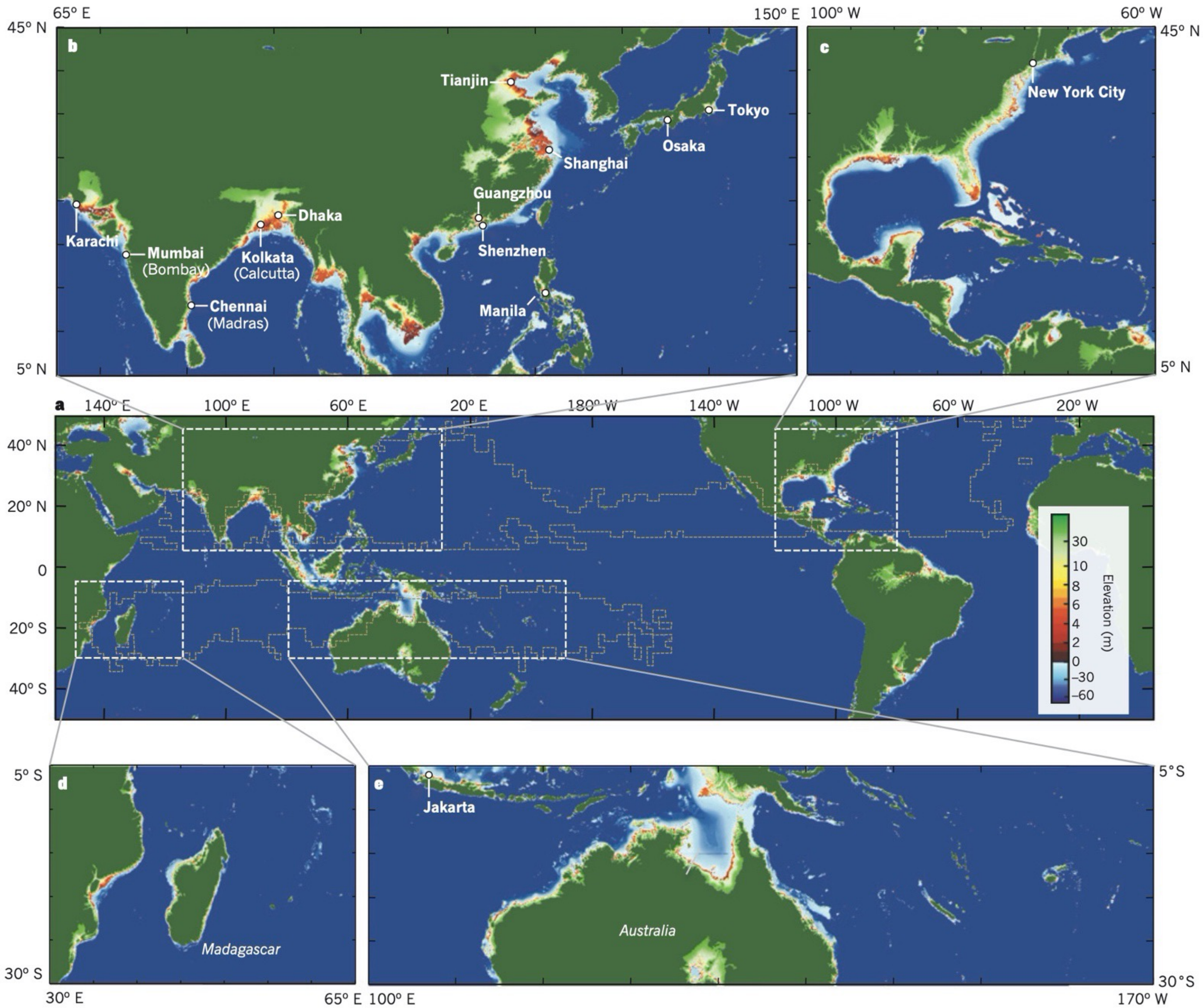
Intensive

Uncertain

Distructive

Polewards

(Murakami et al, 2020, pnas)



Coastal flooding by tropical cyclones and sea-level rise

(Woodruff et al, 2013, Nature)

Coral reef bleaching

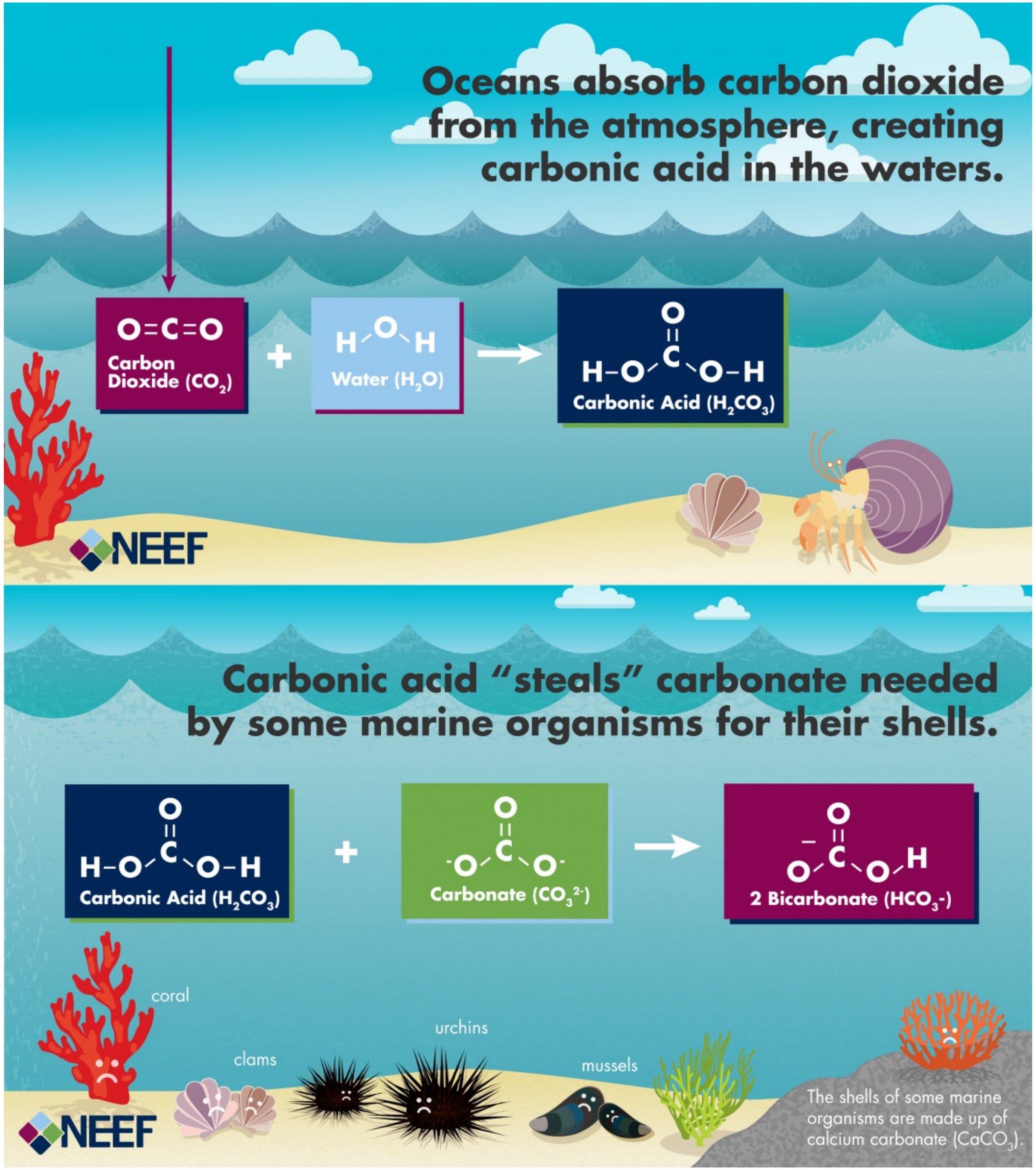
Warming ocean and heatwaves

Chronic bleaching has killed many reefs that are unlikely to recover even over century-long timescales

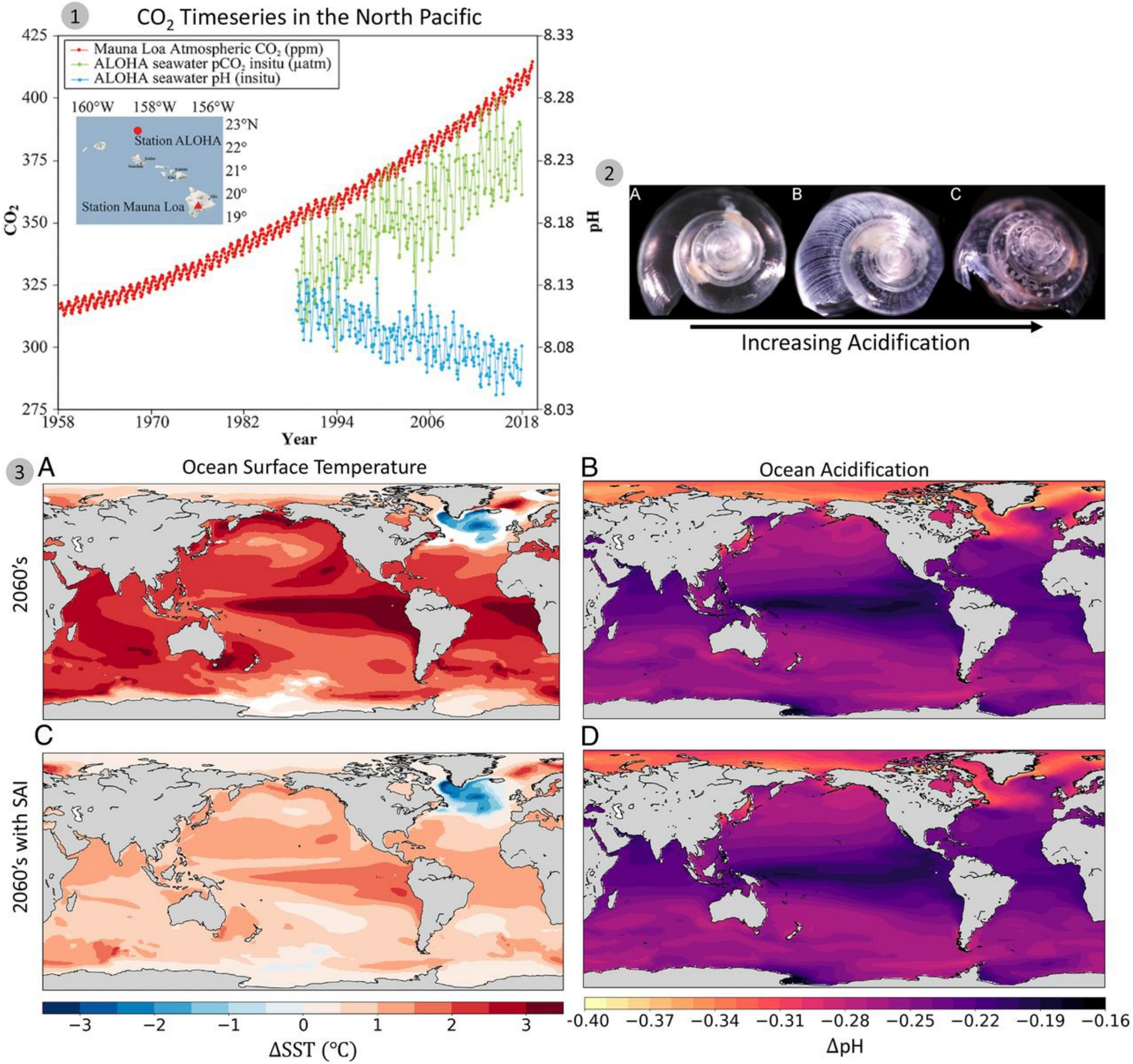
Reef death will be followed by loss in fisheries, tourism, livelihoods and habitats

Bleaching occurs when symbiotic algae that lives within coral tissues are expelled due to warmer temperatures. Algae give corals' color so when algae leave coral, the reef appears white.

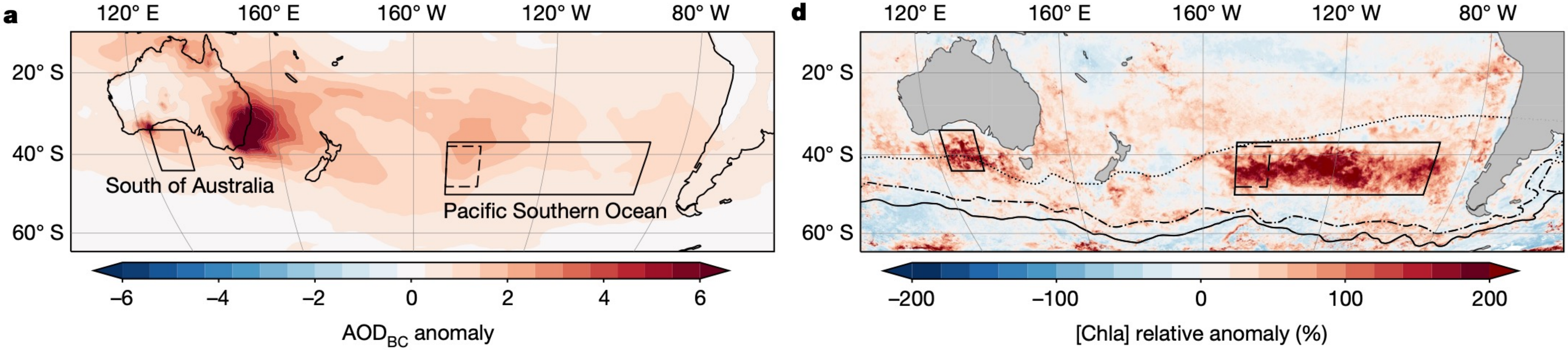
Ocean acidification



Ocean acidification



Teleconnection: 2019-2020 Australia fire triggers Phytoplankton in the Pacific



(Tang et al, 2021, Nature)

Wildfire

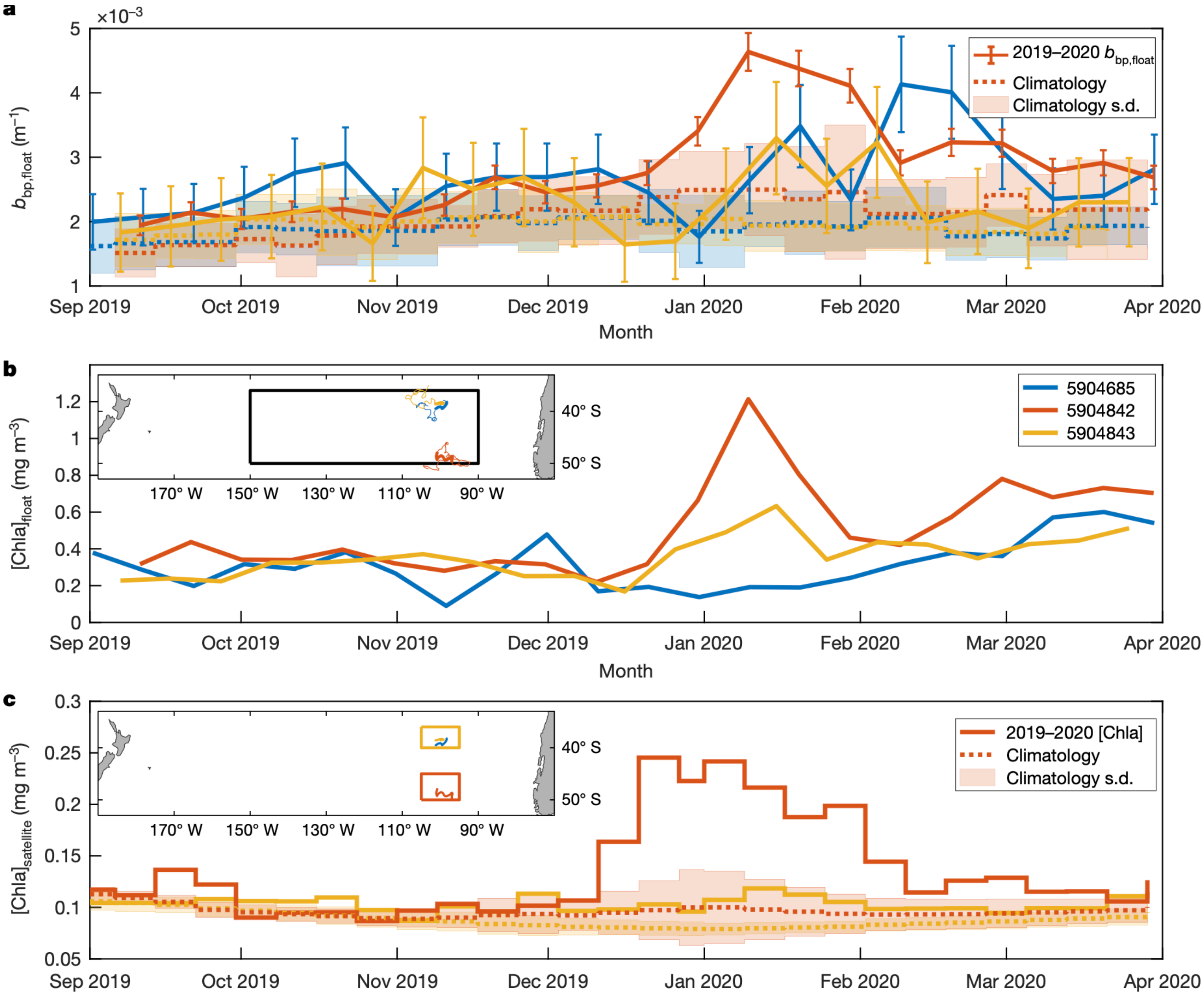
Black carbon

Spread eastwards

Ocean deposit

Phytoplankton

(Tang et al, 2021, Nature)



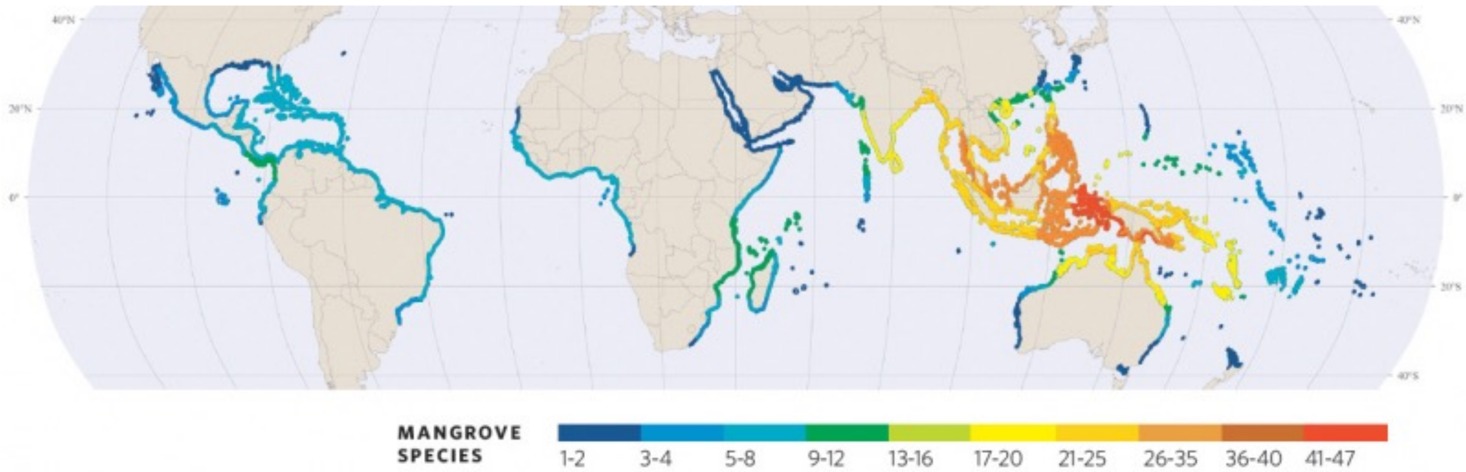
Mangrove features

Mangrove forests grow in hot, muddy, salty coasts, with roots in sea water

Tropical and subtropical coasts (138,000 - 200,000 km^2)

Coastal erosion and flood control

Rich biodiversity, fishery, and blue carbon



Mangrove now

Expansion under warming

Declining with urbanization

Aquaculture, e.g. shrimp farm

Mangrove restoration for coastal protection and blue carbon

Coastal protection and nature-based solutions

The International Business Alliance for Corporate Ocean Responsibility

World Ocean Council ***"Grey, Green, Blue Infrastructure Strategy"***:

1) Grey Infrastructure - the "hard" port and coastal built structures and facilities

2) Green Infrastructure **- "Nature-Based Solutions"** that harness the potential for natural systems to protect and maintain the integrity of coastal areas, i.e.

- coral reefs
- tidal marshes/coastal wetlands
- mangroves
- seagrass beds

3) Blue Infrastructure **- "Blue Carbon"** coastal habitats important for carbon sequestration, e.g. mangroves, wetlands, seagrass beds

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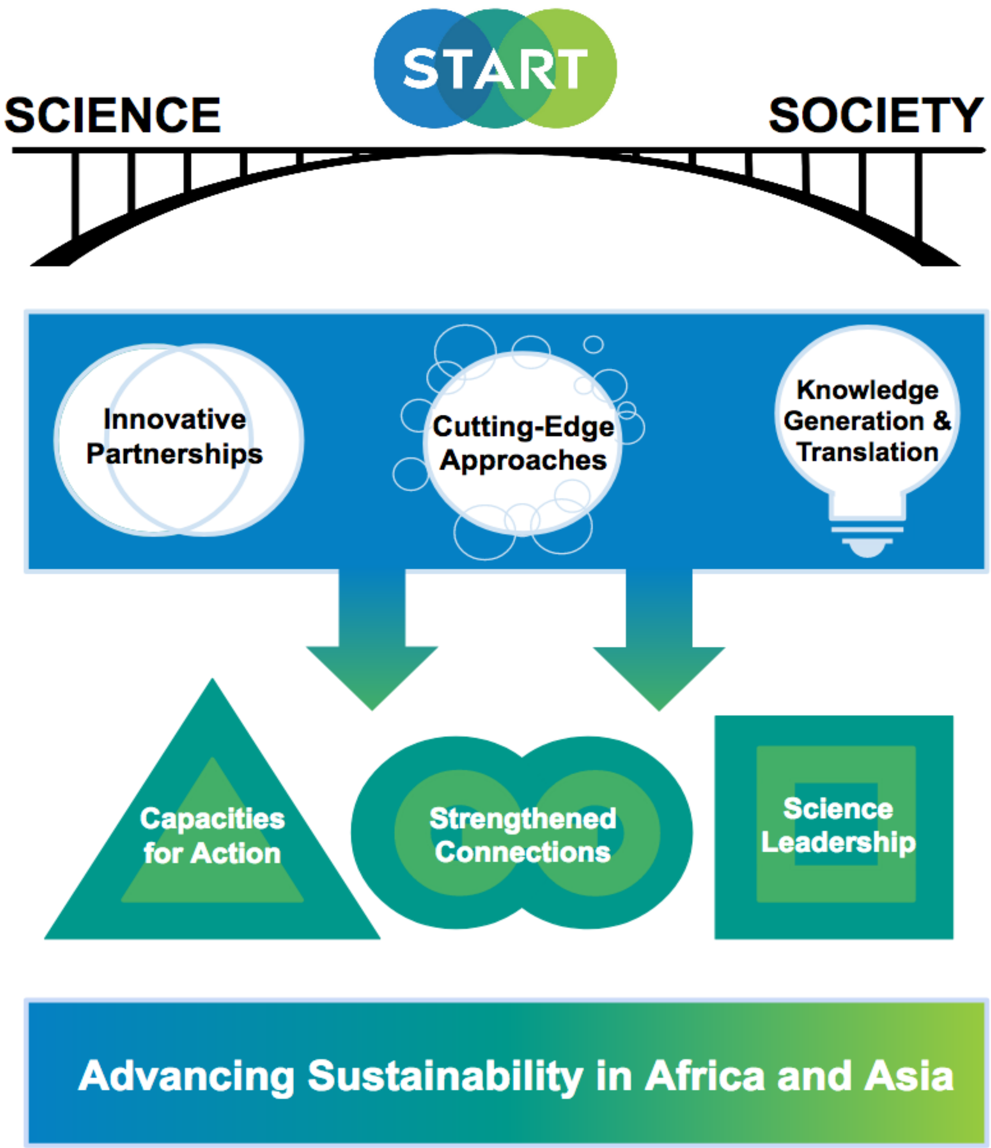
START-TEA Mission



Global change science

Science-policy interface

Capacity building

Questions?

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