

MAKING Ocean Observations MATTER

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GEO Blue Planet Symposium
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Warming + El Niño



Indonesian Wildfires

July-October 2015

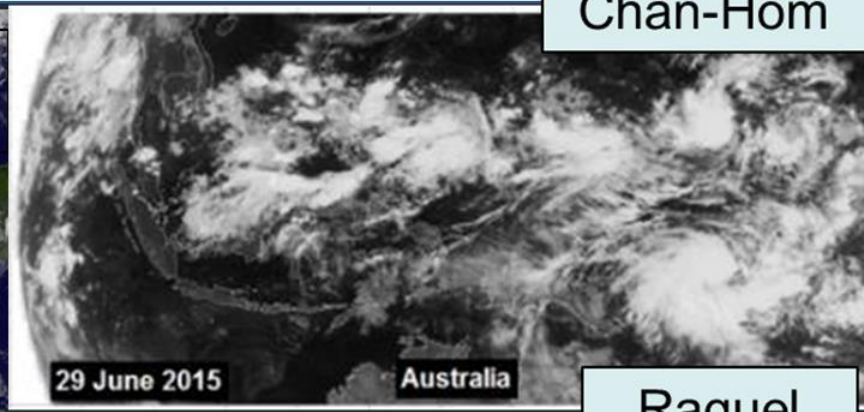
“The combination of **heat** [from greenhouse gas forcing] and **drought** [from El Niño] contributed to fires across much of the country....

--King et al, 2016, BAMS

2015 Record Year for Tropical Storms in the Pacific



Hurricane Patricia
22 Oct 2015



Chan-Hom

29 June 2015

Australia

Raquel



3 Category 4s
30 August 2015

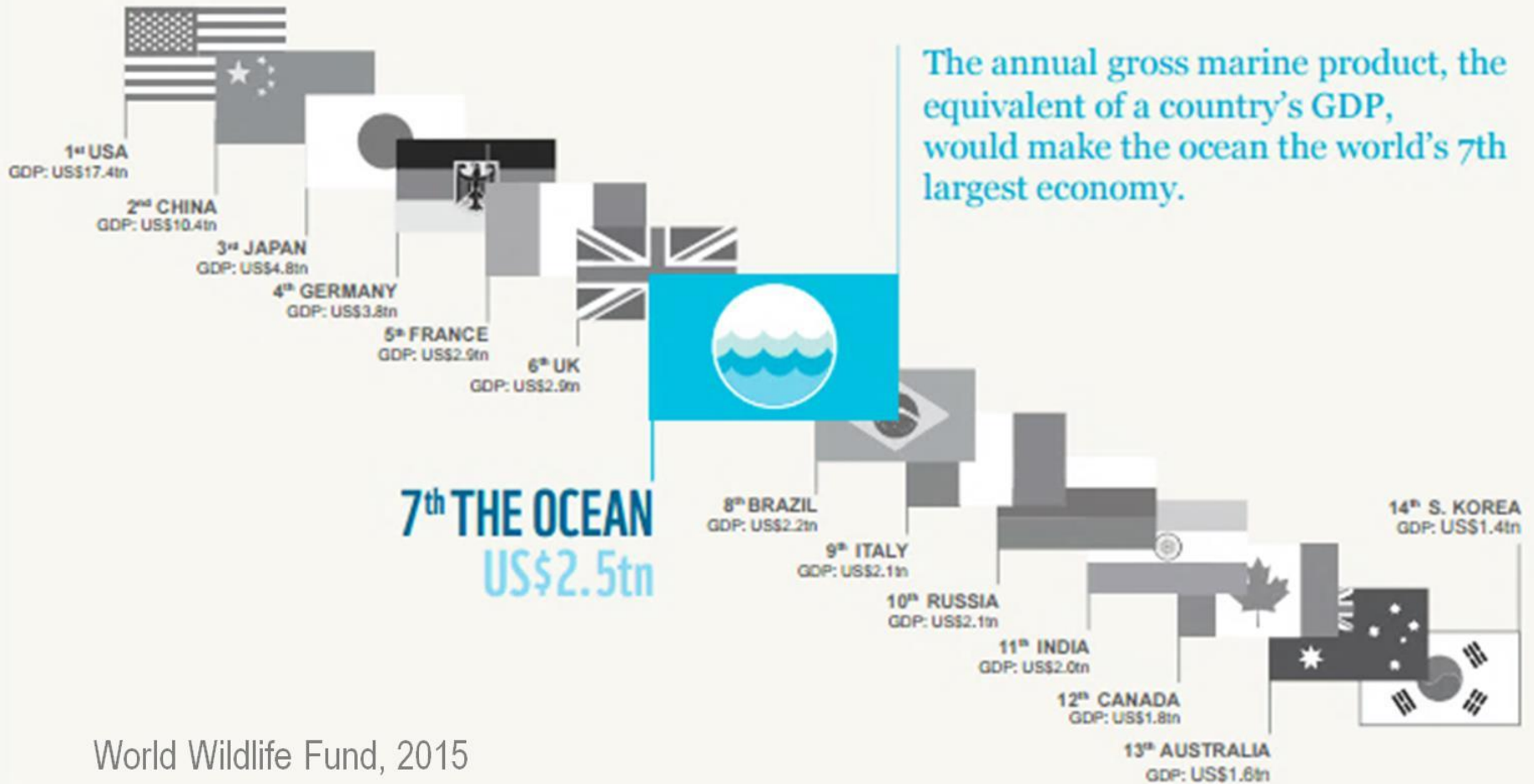
“...caused by El Niño...but more extreme because of anthropogenic forcing...”

--Zhang et al, 2016, BAMS



Why should people care?

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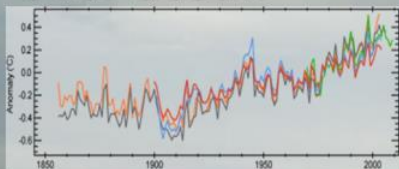


World Wildlife Fund, 2015

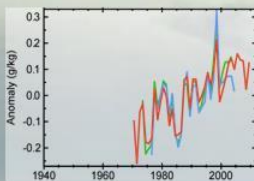


12 Indicators of a Changing Environment

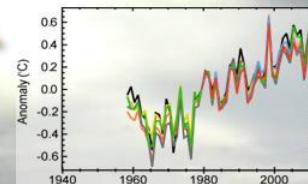
Air temperature over ocean



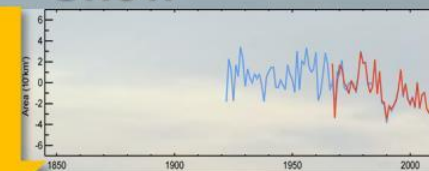
Humidity



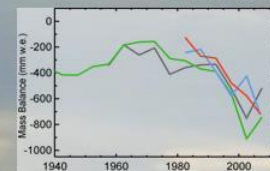
Temperature of the lower atmosphere



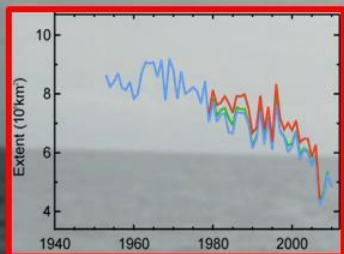
Snow



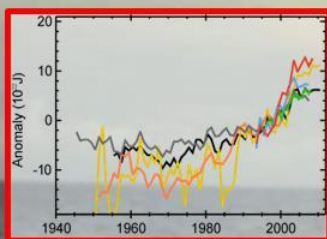
Glaciers



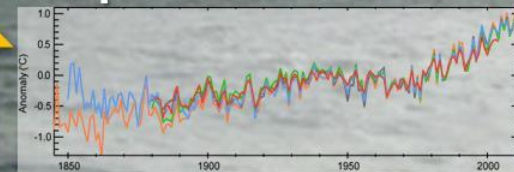
Arctic sea ice



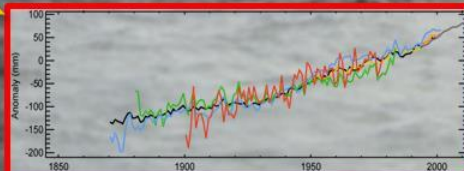
Ocean heat content



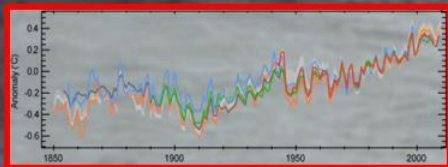
Air temperature over land



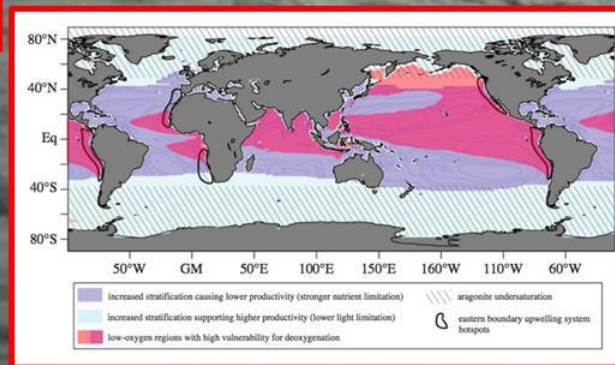
Global sea level



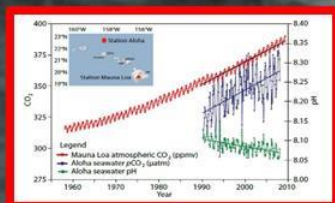
Sea surface temperature



Vulnerability to deoxygenation



Ocean pH





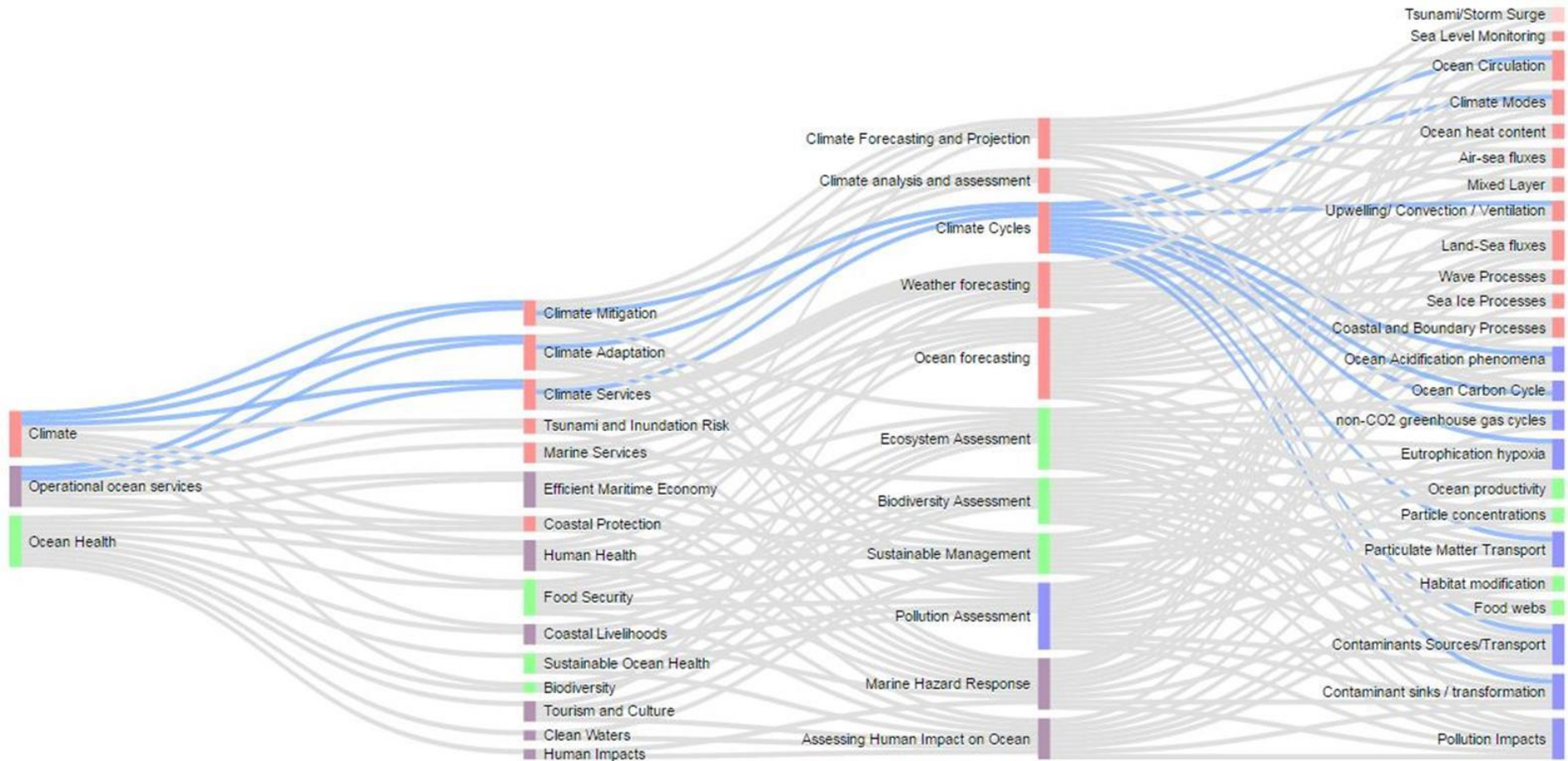
Plymouth Marine
Laboratory *et al.* 2011

HOT
OCEAN HEAT CONTENT

SOUR
OCEAN ACIDIFICATION

BREATHLESS
OXYGEN CONTENT

VALUE | OCEAN OBSERVATIONS



Source: GOOSocean.org



NOAA

Satellite support systems



XBT
(Expendable Bathythermographs)



Ocean exploring vessels



Atlas Mooring Buoy



Sampler

Argo Floating Array



Drifting Buoy



Argo sampling at depth



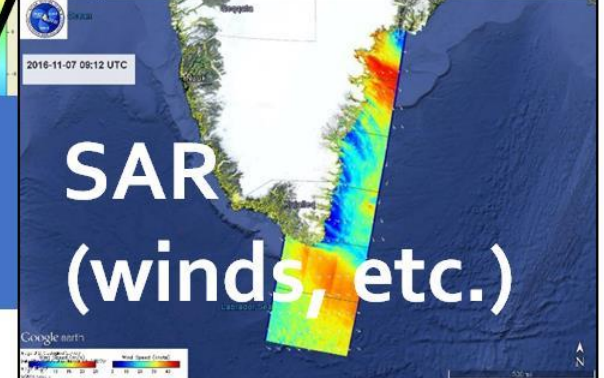
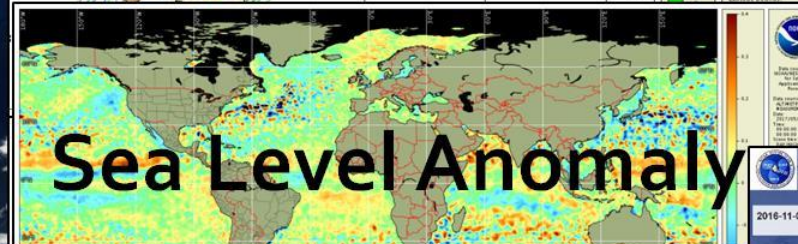
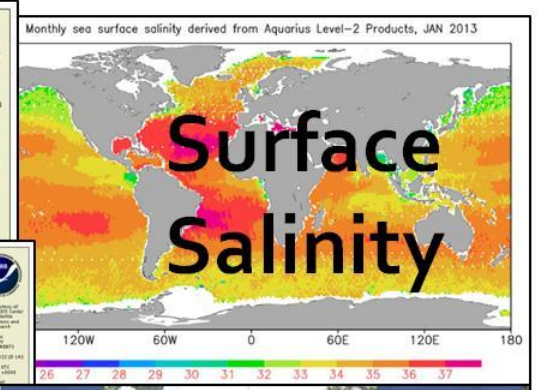
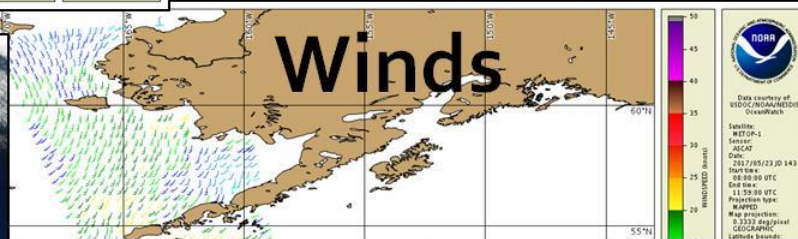
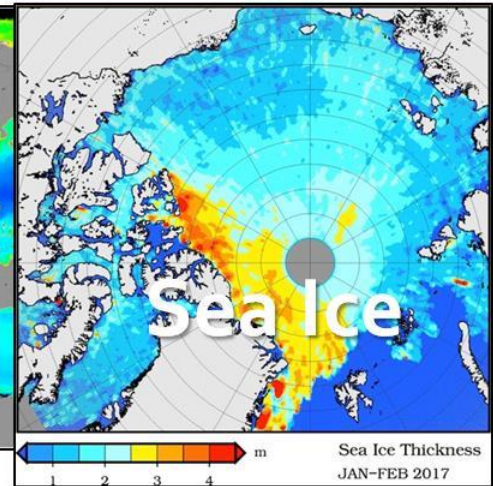
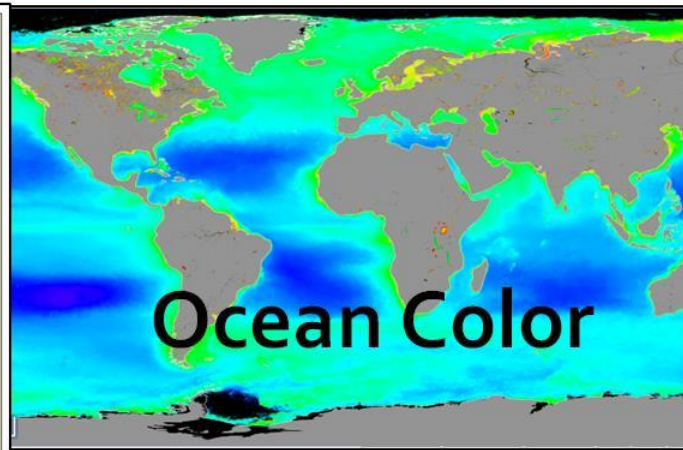
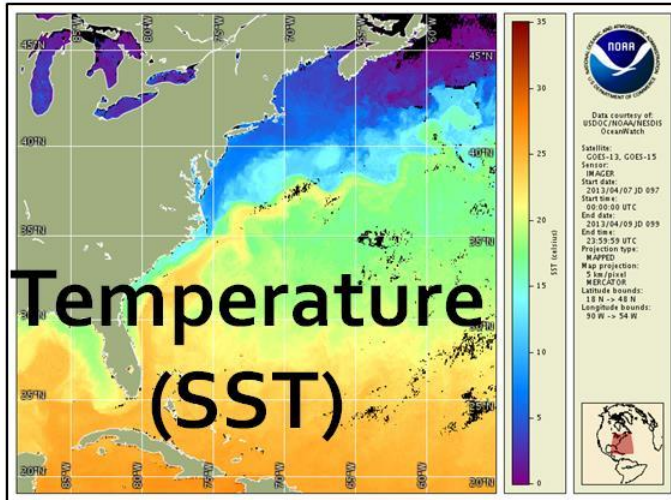
Spray Glider



Tidal Gauge

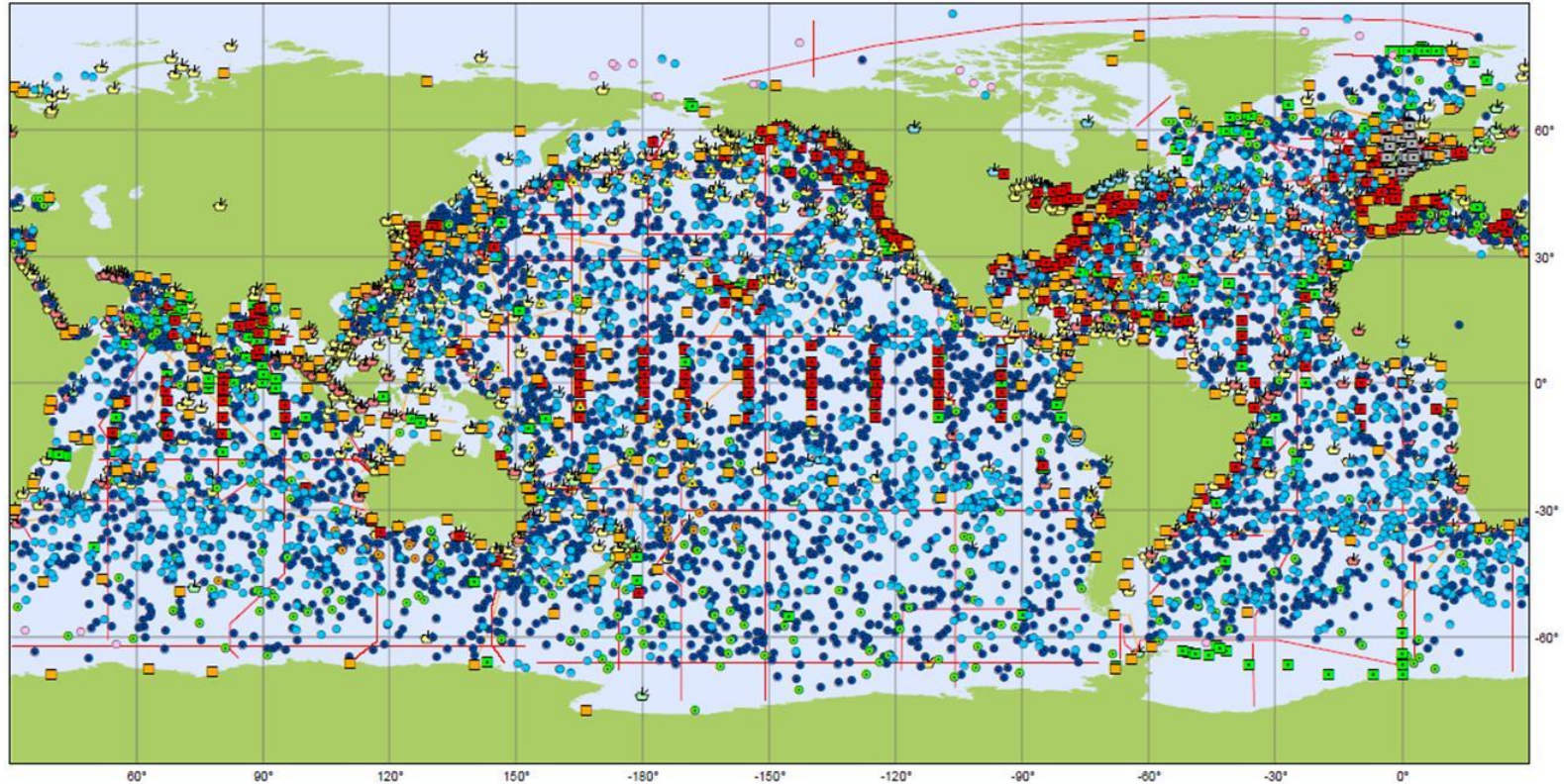


OCEAN PARAMETERS FROM SPACE



Utility of satellite data: broad spatial coverage for detecting patterns, frequency of observations for monitoring change over time

GLOBAL OCEAN OBSERVING SYSTEM



Main in-situ Elements of the Global Ocean Observing System

April 2017

Argo

- Argo (3929)
- Deep-Argo (29)
- BGC-Argo (289)

DBCP

- Surface Drifters (1488)
- Fixed Platforms (103)
- Ice Buoys (22)
- Moored Buoys (405)
- ▲ Tsunameter (35)

OceanSITES

- Platforms (332)

GO-SHIP

- GO-SHIP (61)

GLOSS

- Tide Gauges (252)

SOT

- ☞ VOSclim-Automated (103)
- ☞ VOSclim-Manned (372)
- ☞ VOS-Automated (149)
- ☞ VOS-Manned (1230)

- ☞ ASAP Radiosondes (18)
- SOOP XBTs (37)

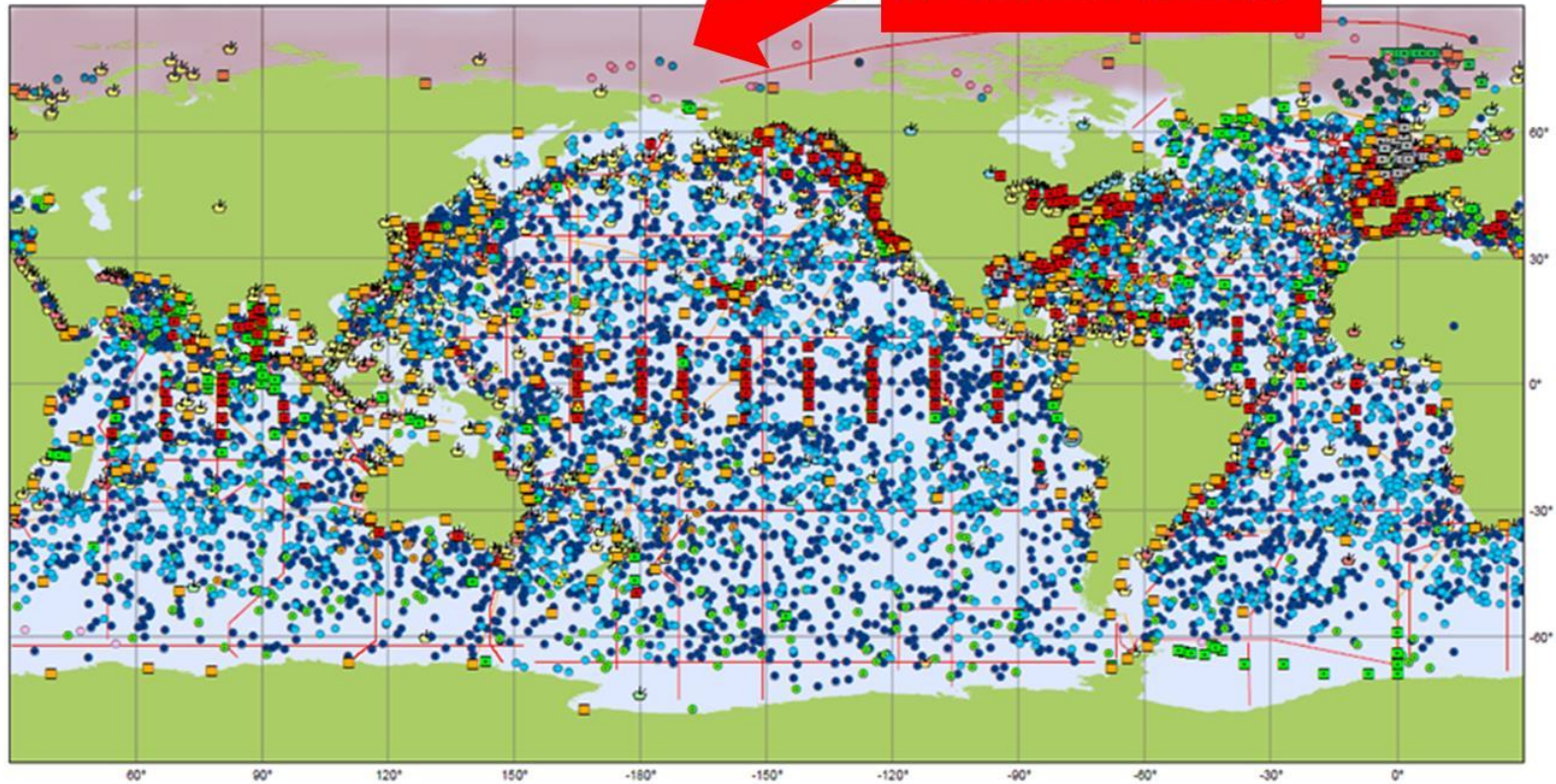


Generated by www.jcommops.org, 22/05/2017



GLOBAL OCEAN OBSERVING SYSTEM

ARCTIC



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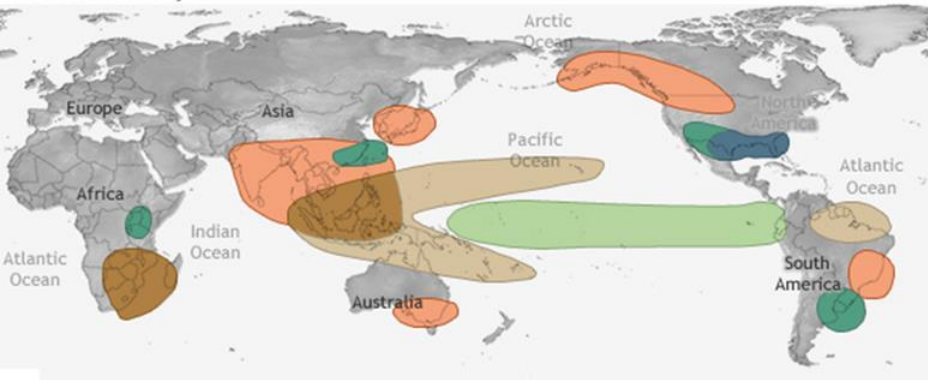


The background image shows the deck of a research vessel. In the foreground, a person wearing a white hard hat and a dark t-shirt stands looking towards the right. The deck is cluttered with various pieces of scientific equipment, including a large metal frame structure, a complex piece of machinery with many pipes and gauges, and various cables. In the background, the ocean is visible under a cloudy sky. A large blue banner is overlaid across the middle of the image, containing the text "OCEAN OBSERVATIONS that MATTER".

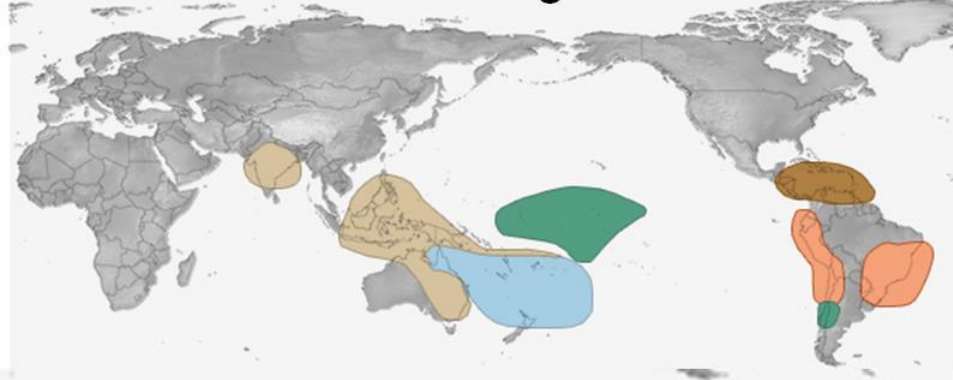
OCEAN OBSERVATIONS that MATTER

El Niño Impacts

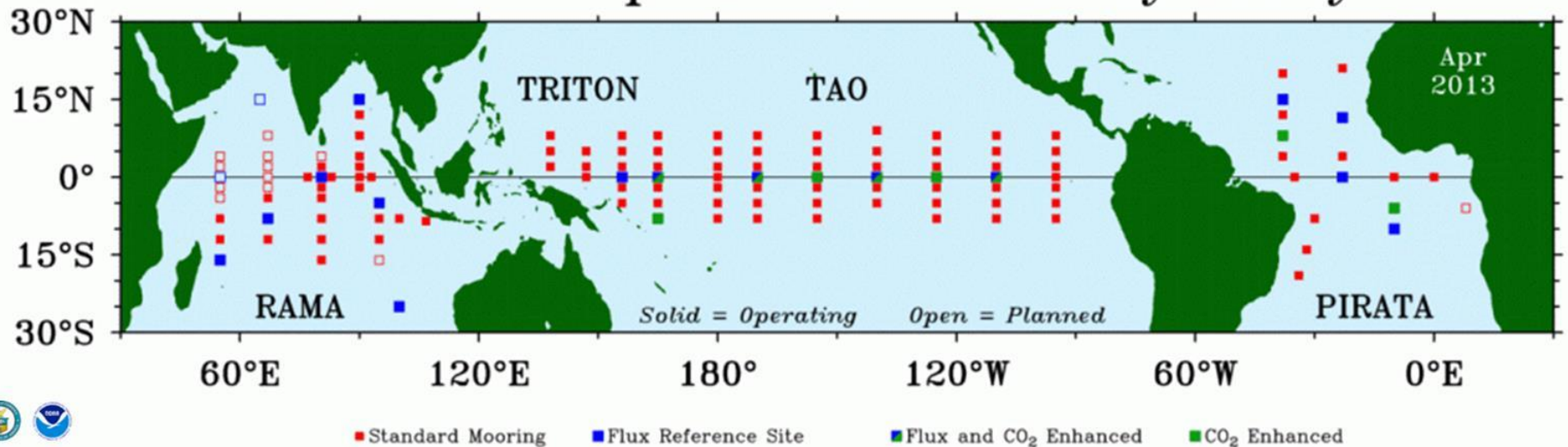
December-February



June-August

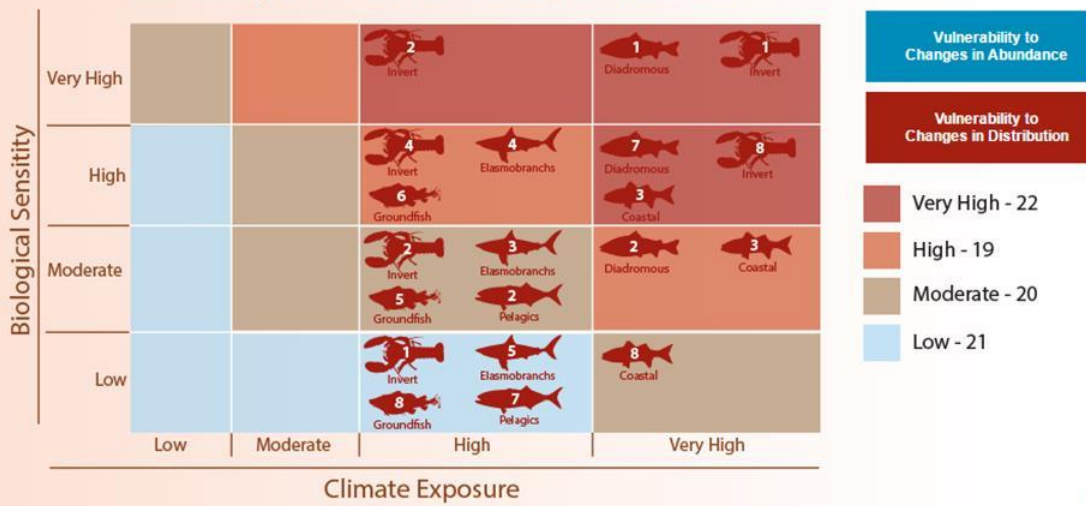


Global Tropical Moored Buoy Array

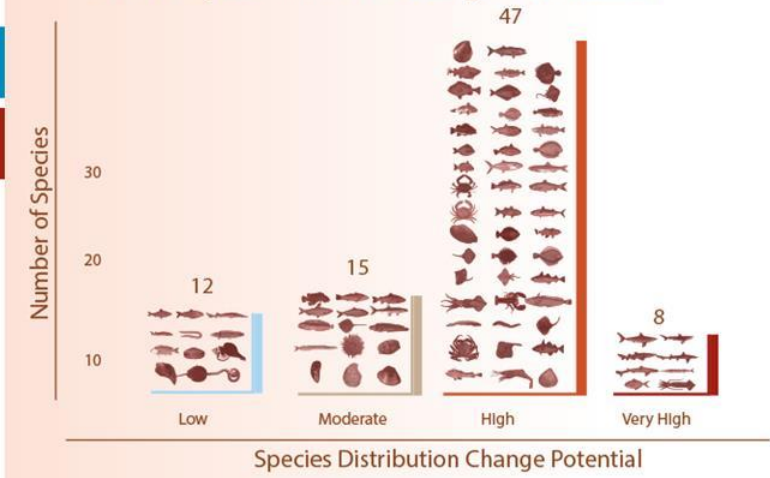


Vulnerability to Climate Change U.S. NORTHEAST FISHERIES

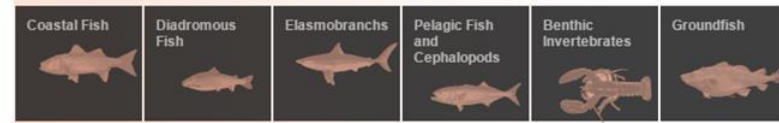
Vulnerability to Climate Related Changes in Abundance



Vulnerability to Climate Related Changes in Distribution



Species-Specific Results



Abundance

Distribution

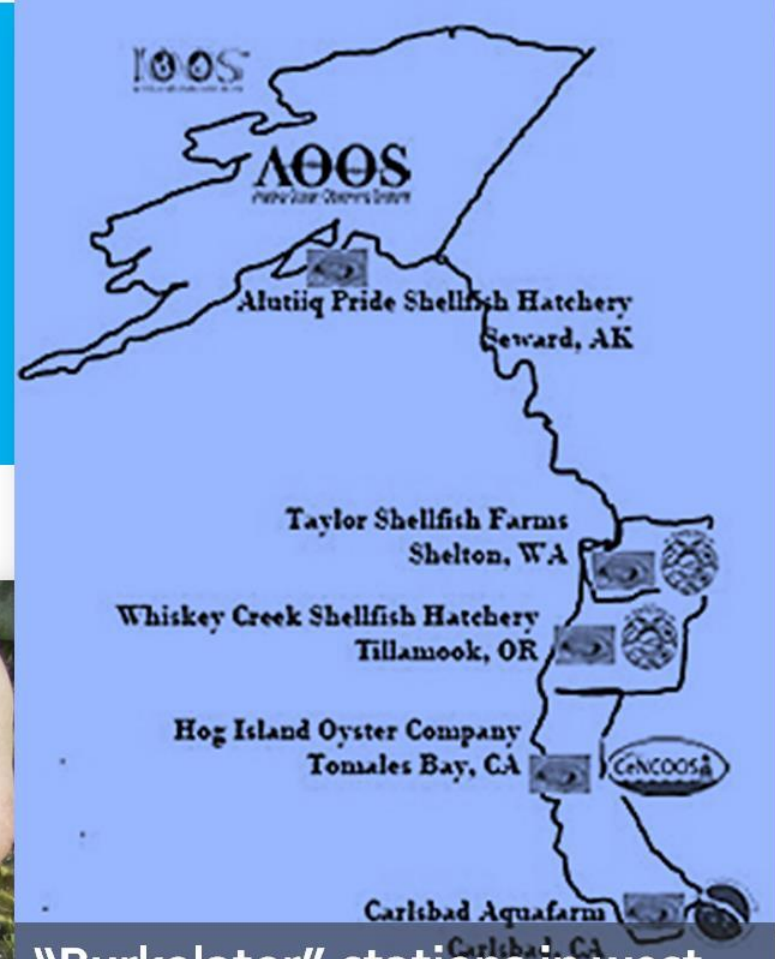
Approximately half the species assessed are estimated to a high or very high vulnerability to climate change

OCEAN ACIDIFICATION

Understanding risk



Photo: Taylor Shellfish



“Burkolator” stations in west coast shellfish hatcheries

Mitigating Risk

Develop resilient oysters

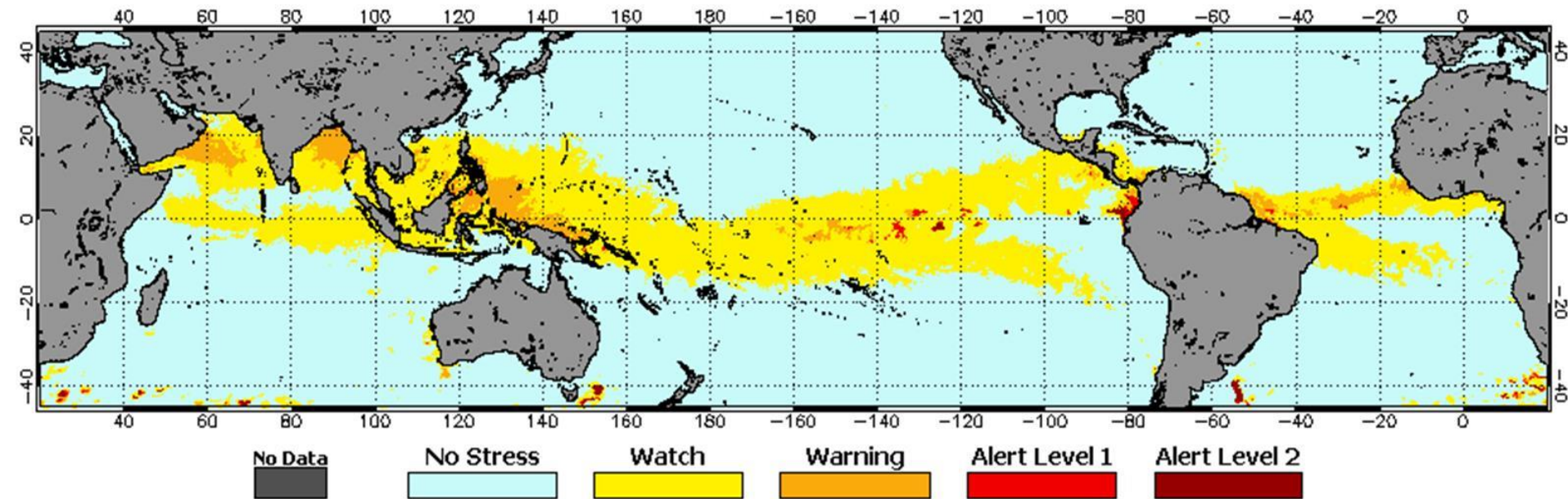


Photo: Oregon Sea Grant



Coral Reef Watch

NOAA Coral Reef Watch Daily 5km Bleaching Alert Area 7d Max (Version 3) 28 May 2017



coralreefwatch.noaa.gov



The background image shows a ship's deck with a large crane structure. A worker in a white hard hat and dark clothing is visible in the lower right, looking towards the equipment. The scene is set against a backdrop of the ocean and a cloudy sky. A blue horizontal band is overlaid across the middle of the image, containing the title text.

THE **GLOBAL** EFFORT

GLOBAL OCEAN OBSERVATIONS

MANY ORGANIZATIONS



Intergovernmental Oceanographic Commission
RESOURCES, MEETINGS, DOCUMENTS, PEOPLE



GROUP ON
EARTH OBSERVATIONS

BLUE PLANET
Oceans and Society



ICES
CIEM



Committee on Earth Observation Satellites

IOC's ROLE

A world map with a grid overlay, showing numerous small, multi-colored icons (circles and squares) scattered across the globe, representing data points or locations. The map is centered on the Atlantic Ocean.

Commitment
Coherence
Collaboration
Communication
Capacity development

SDG 14

Ocean Acidification

Science Capacity Development &
Marine Technology Transfer

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MANY ORGANIZATIONS



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Thank you
www.noaa.gov

