



Earth observations for marine ecosystem monitoring

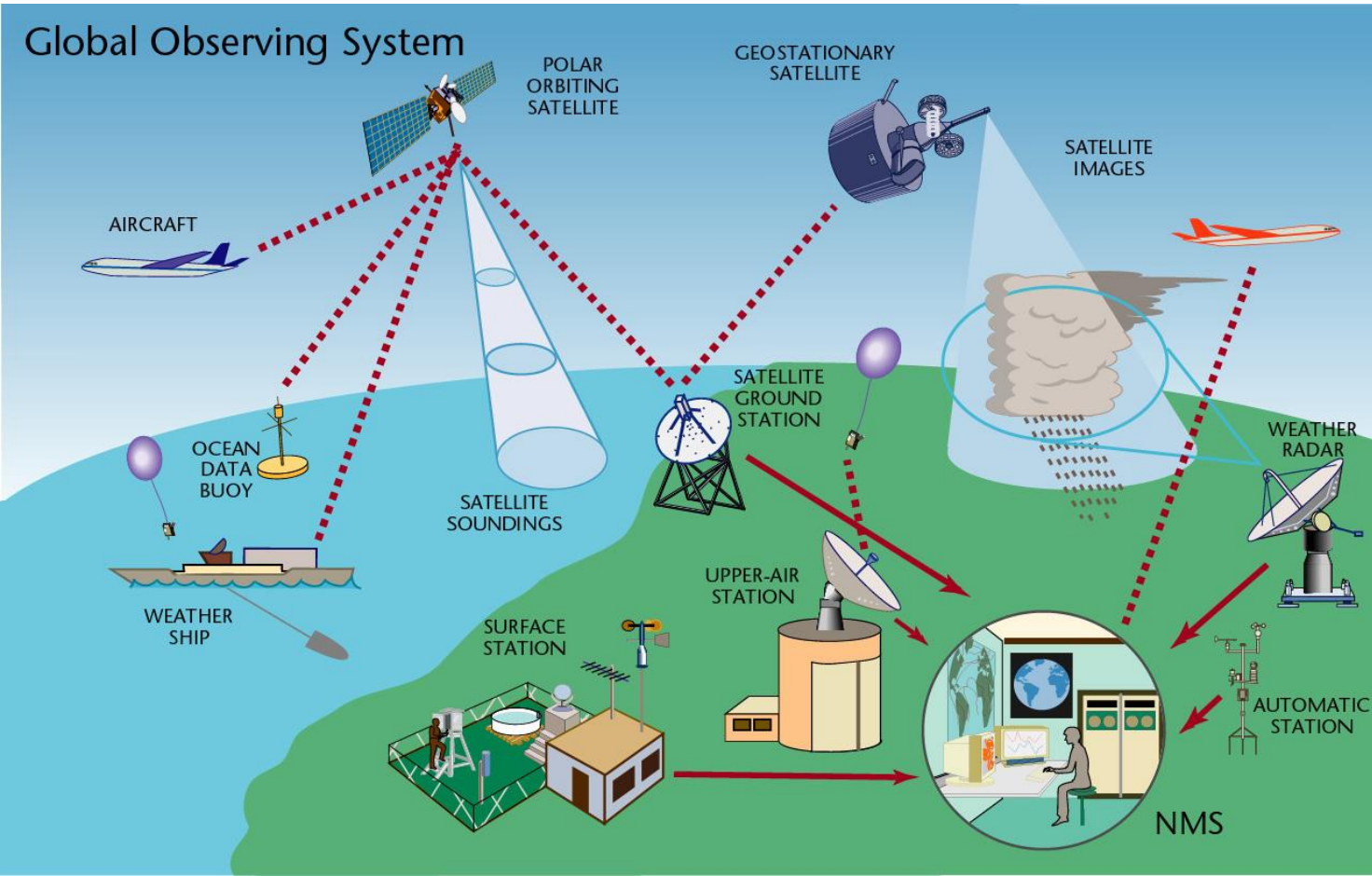


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NOAA/NESDIS/STAR/SOCD
UMD/ESSIC

What is Earth Observation System?

Earth observation is the gathering of information about planet Earth's physical, chemical and biological systems. It involves monitoring and assessing the status of, and changes in, the natural and man-made environment.

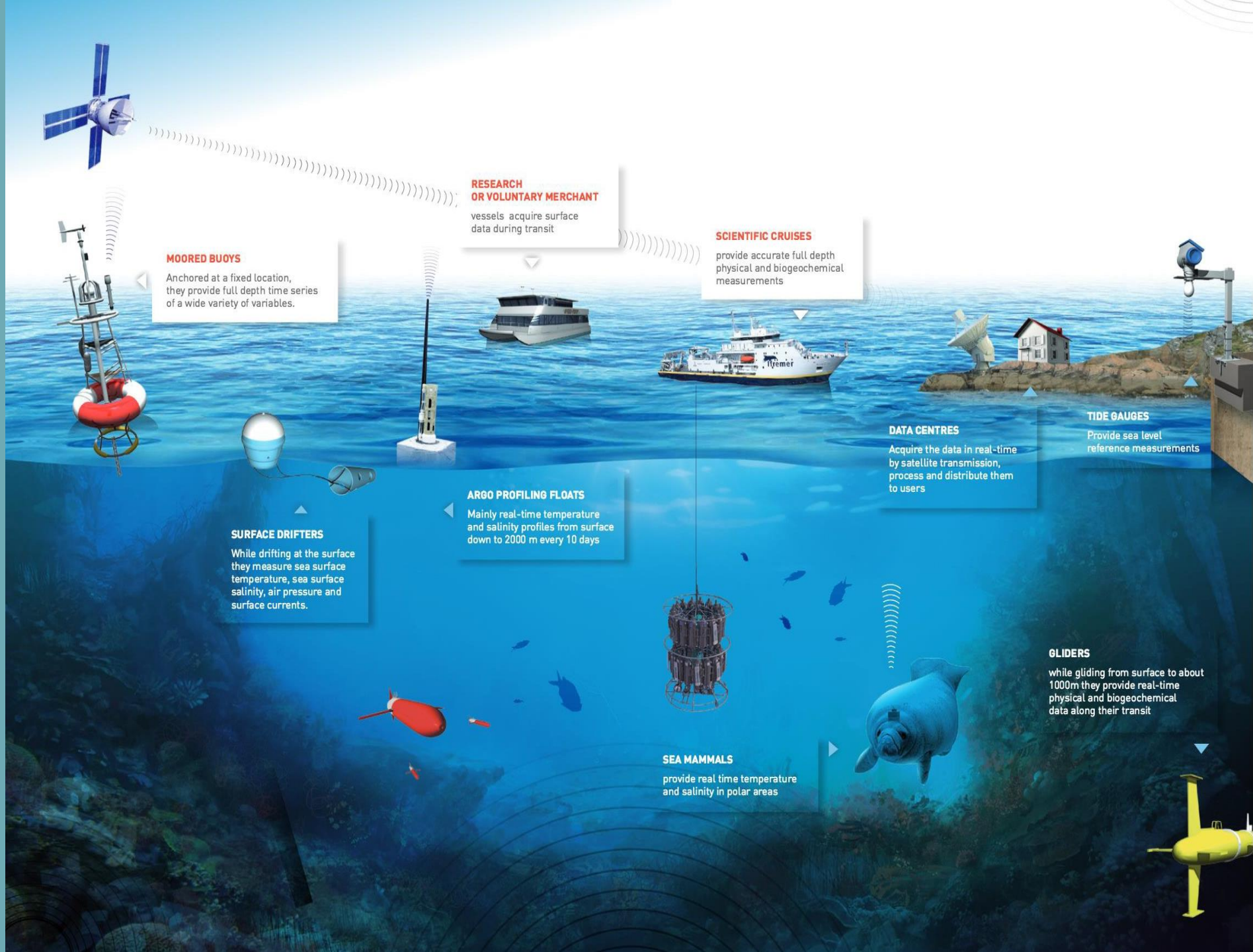


Space Based observation



In situ observation

Ocean and Coastal Observing Systems



MOORED BUOYS
Anchored at a fixed location, they provide full depth time series of a wide variety of variables.

RESEARCH OR VOLUNTARY MERCHANT
vessels acquire surface data during transit

SCIENTIFIC CRUISES
provide accurate full depth physical and biogeochemical measurements

SURFACE DRIFTERS
While drifting at the surface they measure sea surface temperature, sea surface salinity, air pressure and surface currents.

ARGO PROFILING FLOATS
Mainly real-time temperature and salinity profiles from surface down to 2000 m every 10 days

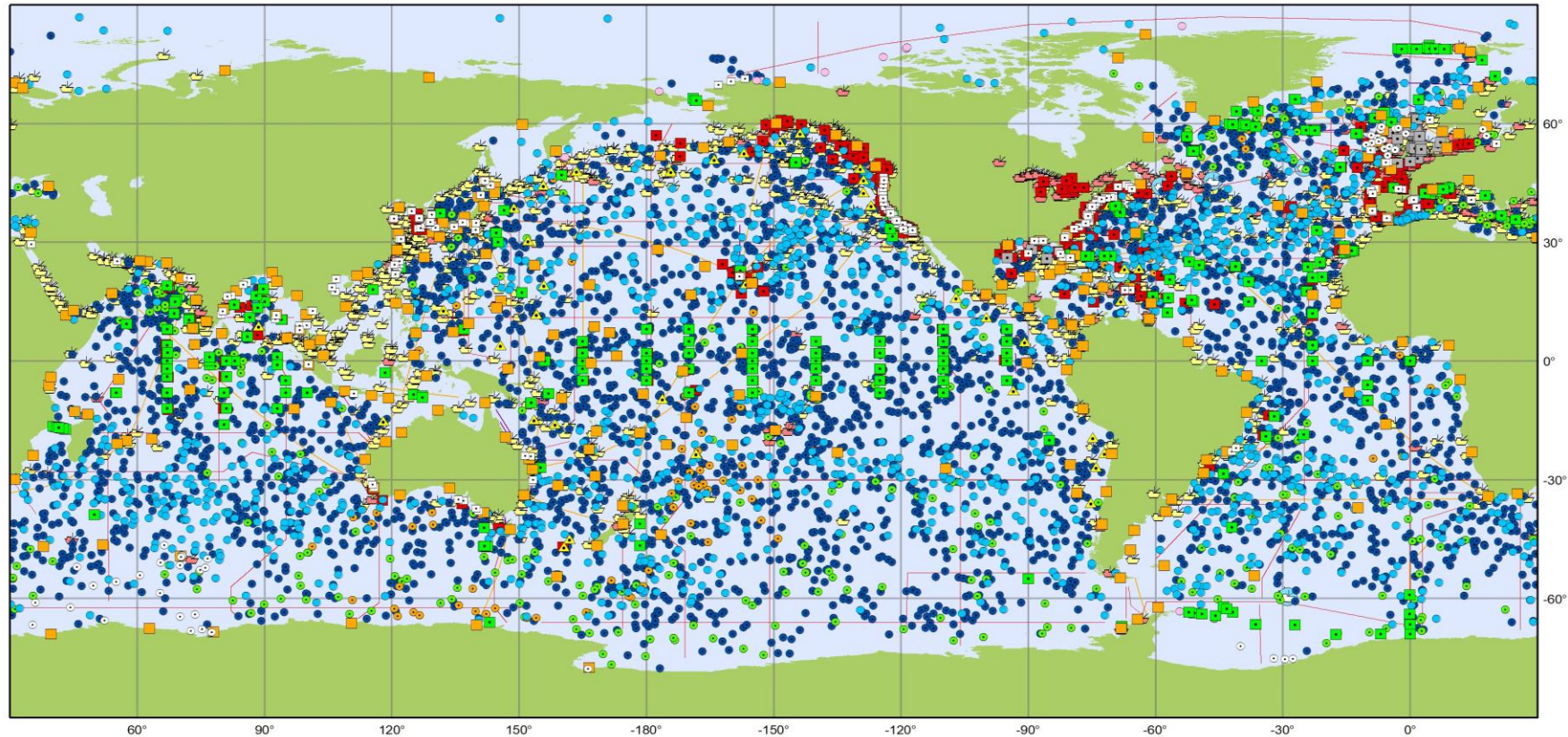
DATA CENTRES
Acquire the data in real-time by satellite transmission, process and distribute them to users

TIDE GAUGES
Provide sea level reference measurements

SEA MAMMALS
provide real time temperature and salinity in polar areas

GLIDERS
while gliding from surface to about 1000m they provide real-time physical and biogeochemical data along their transit

In situ observing systems



Main in situ Elements of the Global Ocean Observing System

April 2019

Profiling Floats (Argo)	Data Buoys (DBCP)	Timeseries (OceanSITES)	Ship based Measurements (SOT)	Other Networks
● Core (3880)	● Surface Drifters (1444)	■ Interdisciplinary Moorings (351)	🌡️ Automated Weather Stations (257)	📡 HF Radars (270)
● Deep (79)	■ Offshore Platforms (97)	Repeated Hydrography (GO-SHIP)	🚢 Manned Weather Stations (1324)	🐼 Animal Borne Sensors (53)
● BioGeoChemical (352)	● Ice Buoys (11)	— Research Vessel Lines (62)	🌤️ Radiosondes (11)	— Ocean Gliders (31)
	■ Moored Buoys (358)	Sea Level (GLOSS)	📏 eXpendable BathyThermographs (34)	
	▲ Tsunameters (38)	■ Tide Gauges (252)		



Space based observing systems





**How can Earth
Observations be used
for data and products be
used for marine
ecosystem monitoring?**





Satellite Observations

Sea Surface Height

Sea Surface Roughness

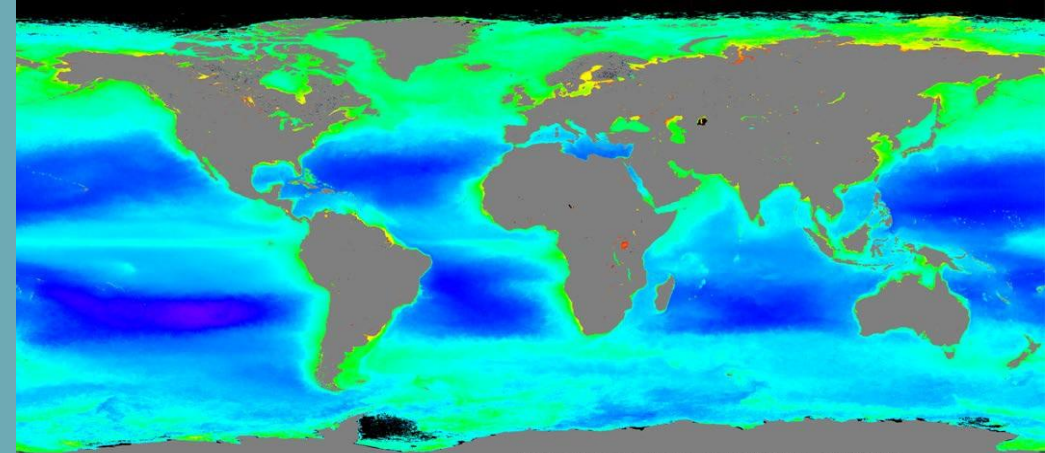
Sea Surface Salinity

Sea Surface Temperature

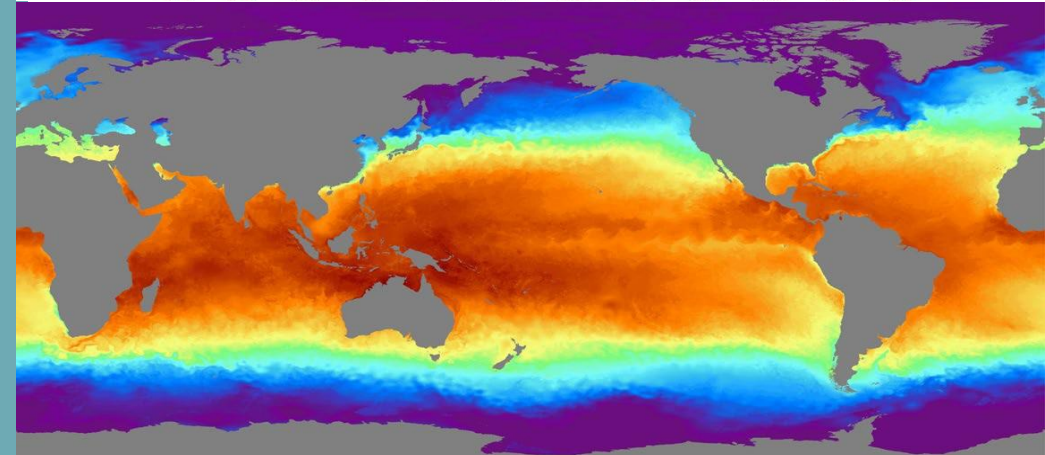
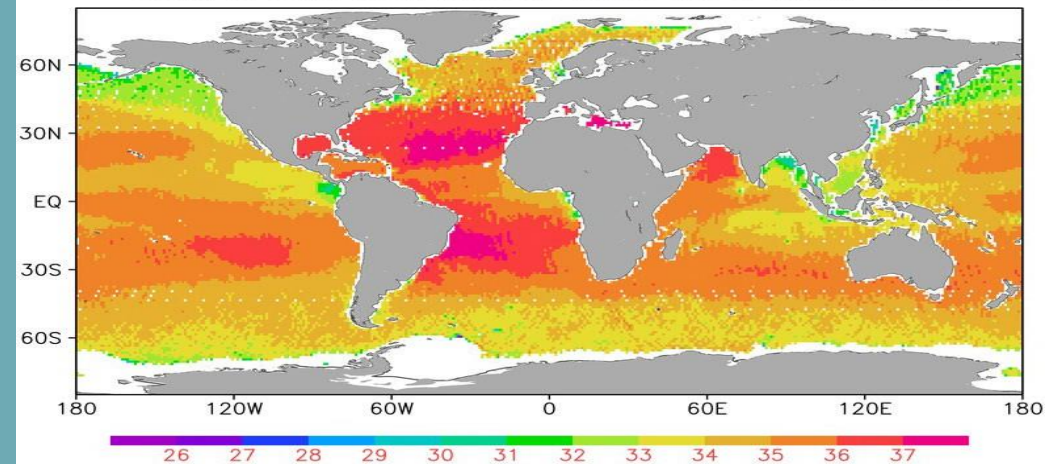
Ocean Color

Ocean Surface Vector Winds

True Color Imagery

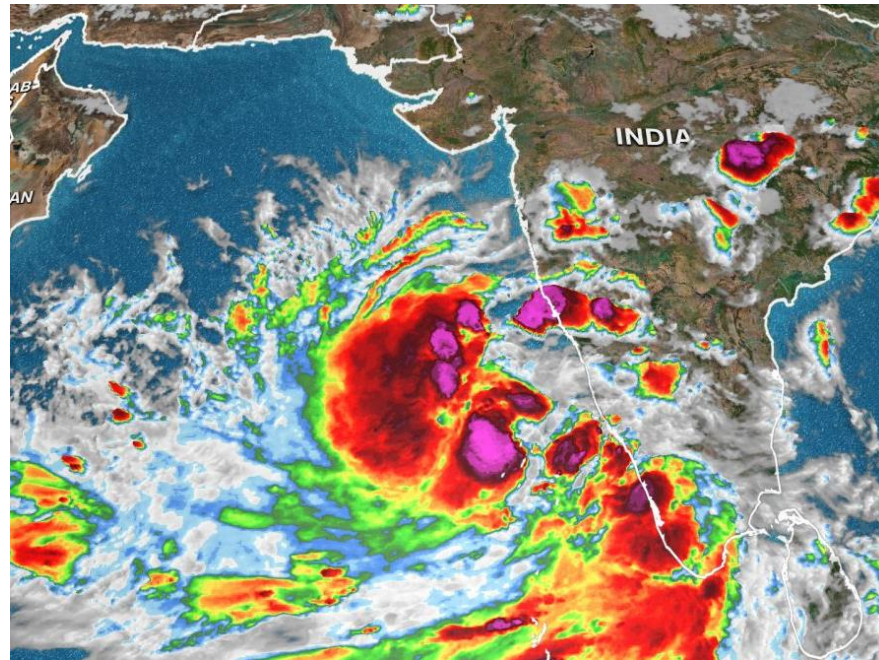


Climatology from 2012/04 to 2014/10
Monthly sea surface salinity derived from Aquarius Level-2 Products, JAN 2013



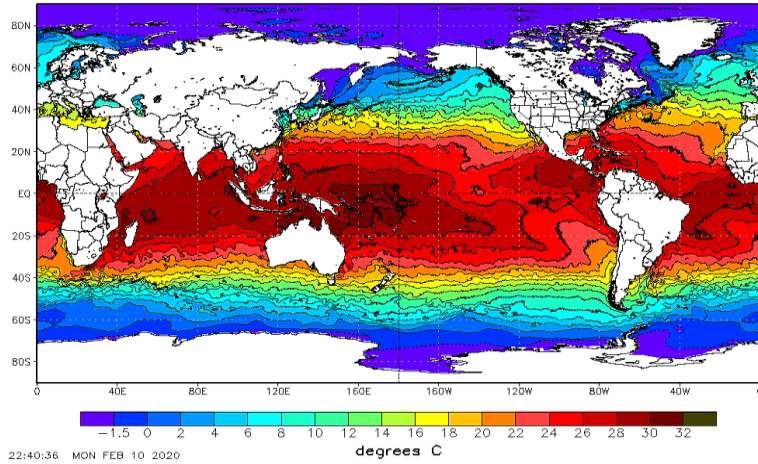
Marine and Coastal Hazard Forecast

- Deliver data and information required to forecast, mitigate and recover from disasters.
- Develop Early Warning System
- Provide information to prevent loss to marine and coastal biodiversity.

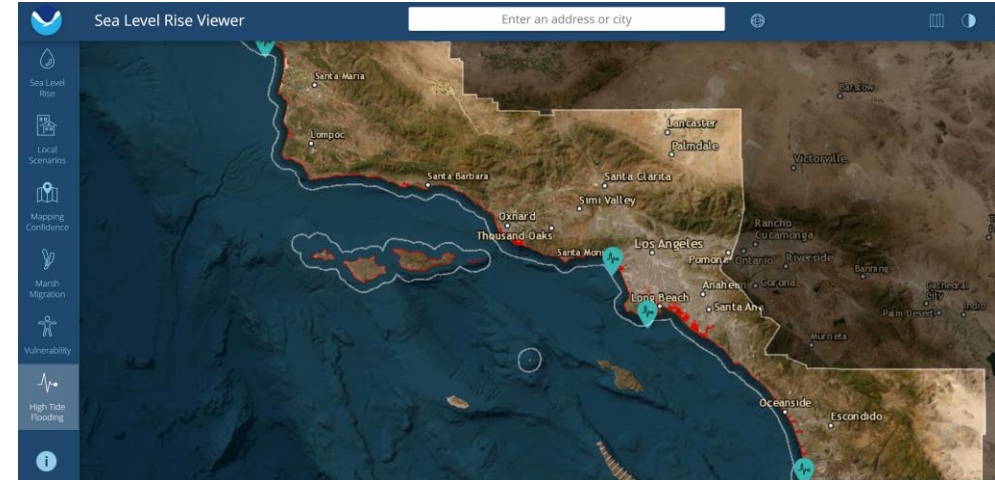


Climate Adaptation

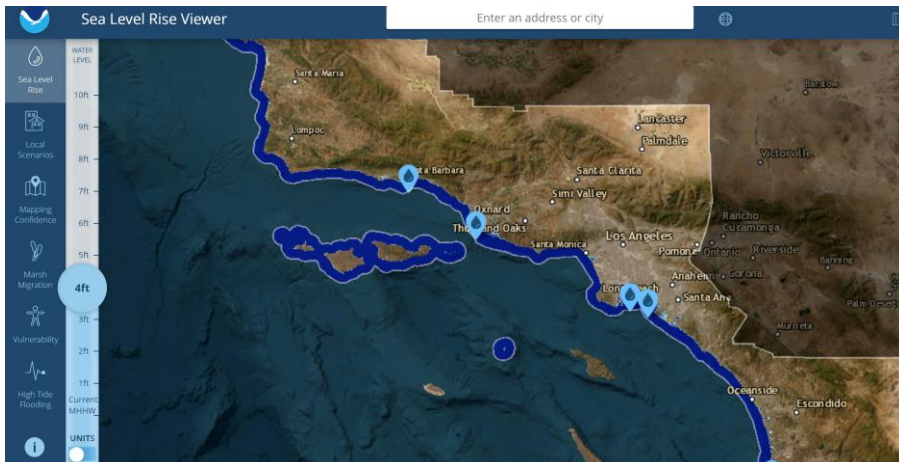
NOAA/NWS/NCEP/EMC Marine Modeling and Analysis Branch Oper H.R.
RTG_SST_HR Analysis (0.083 deg X 0.083 deg) for 10 Feb 2020



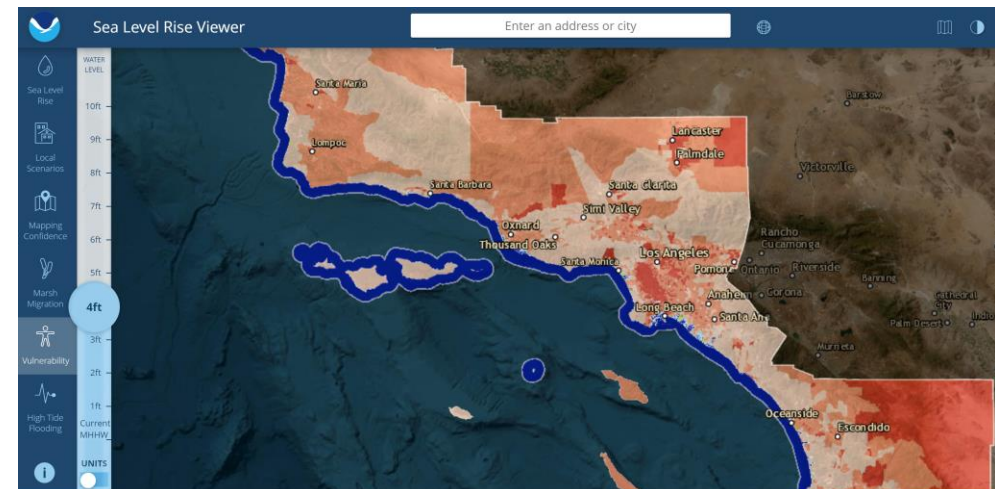
Sea Surface Warming



Flooding



Sea Level Rise

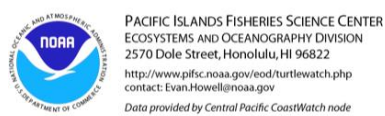
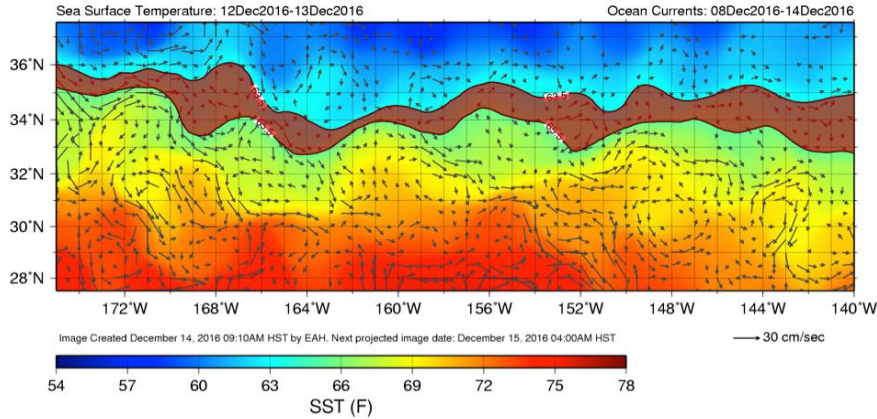


Coastal Vulnerability

Fisheries

EXPERIMENTAL PRODUCT

avoid fishing between solid black 63.5°F and 65.5°F lines
to help reduce loggerhead sea turtle interactions



Protect



Forecast

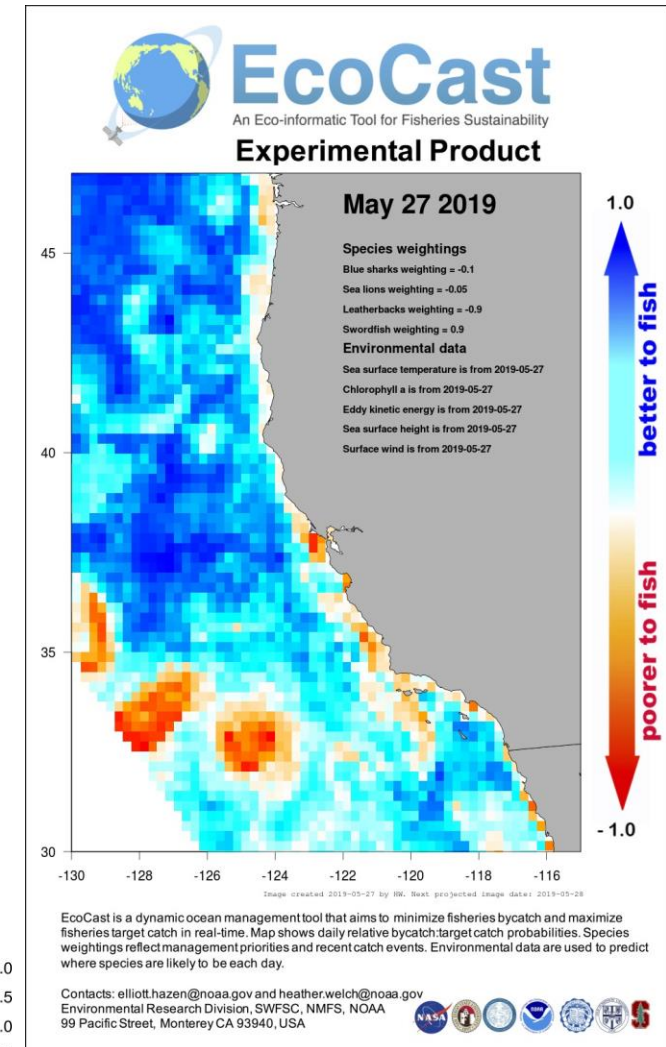
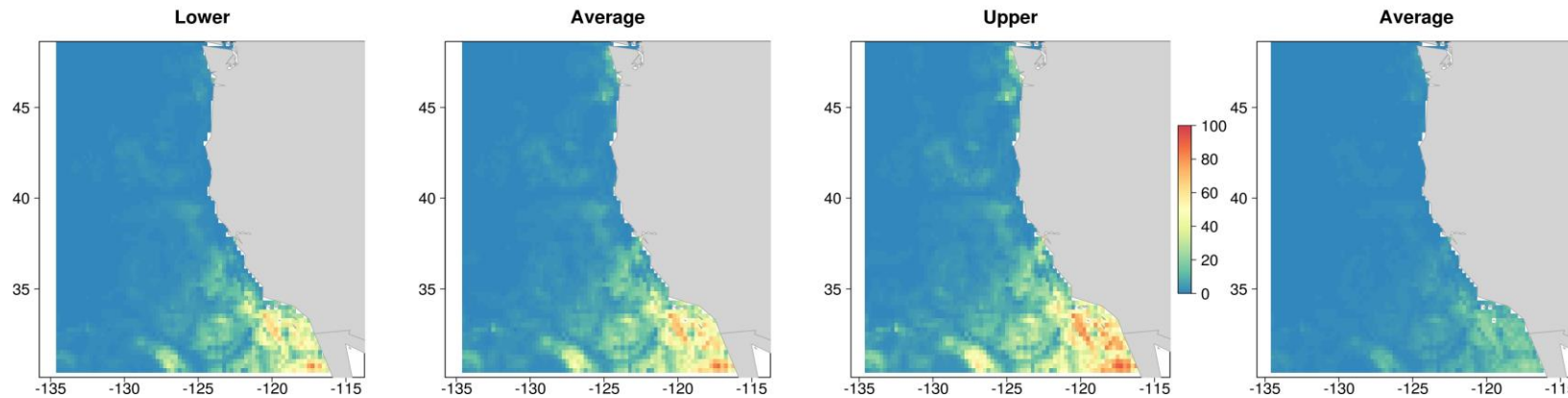


Biodiversity

1-Apr-2019 - 1-May-2019

Likelihood of Occurrence

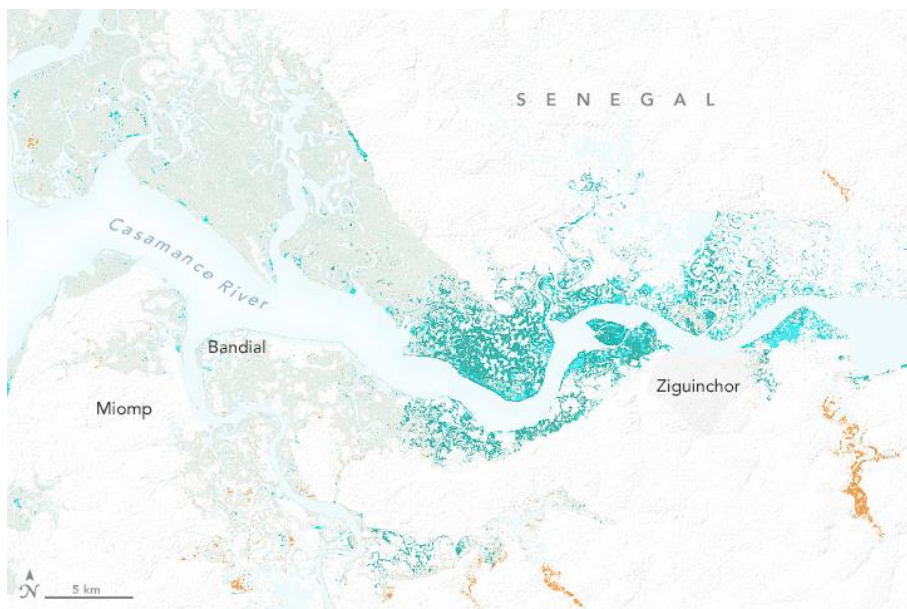
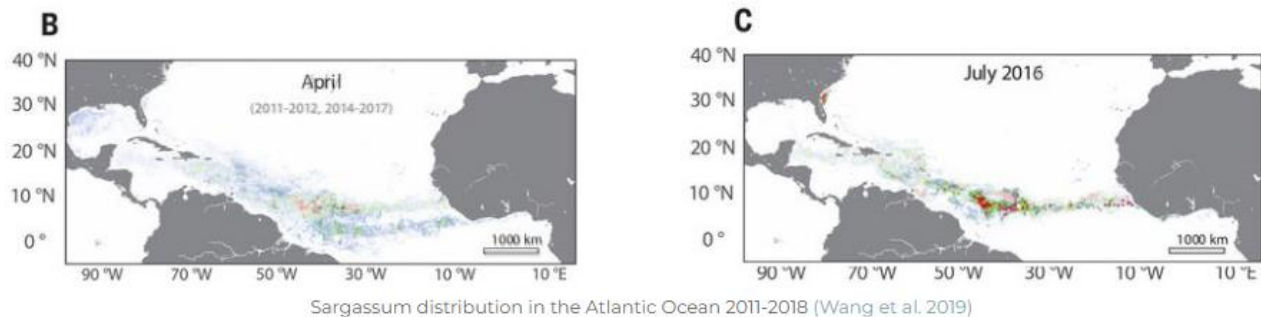
Number of Whales



Ecosystem extent

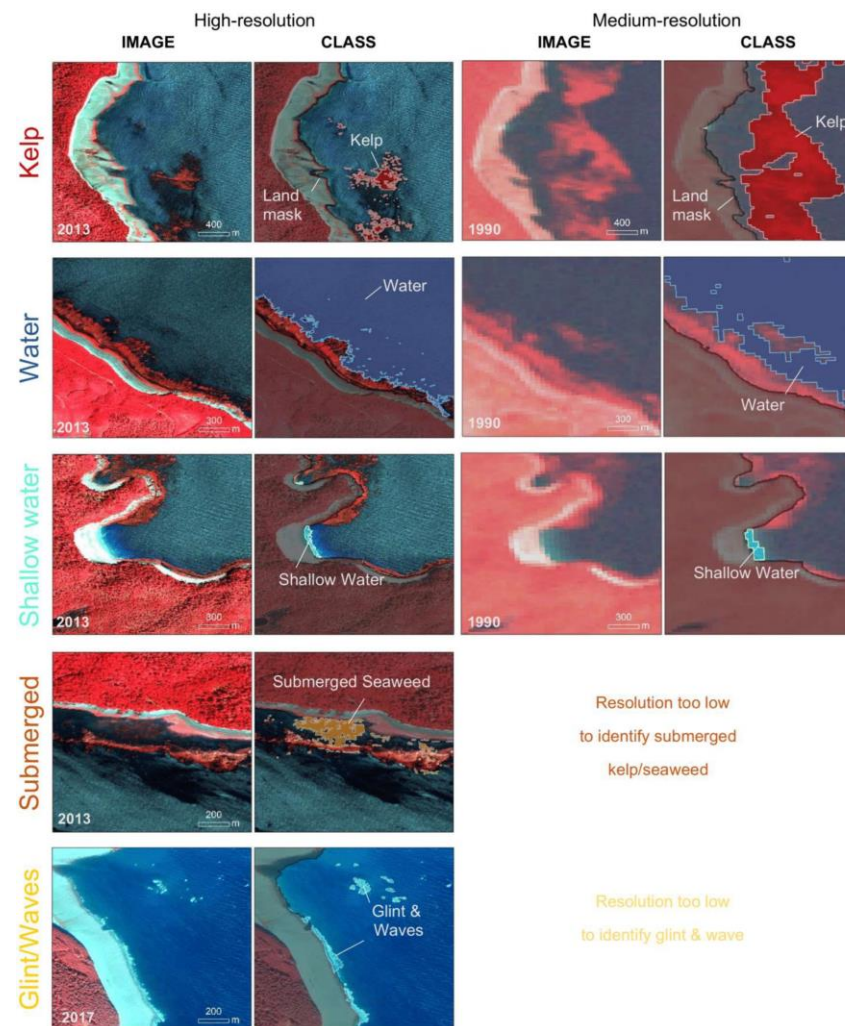
A Multi-Satellite Mapping Framework for Floating Kelp Forests

by Lianna Gendall^{1,*}, Sarah B. Schroeder¹, Peter Wills², Margot Hessing-Lewis^{2,3} and Maycira Costa¹

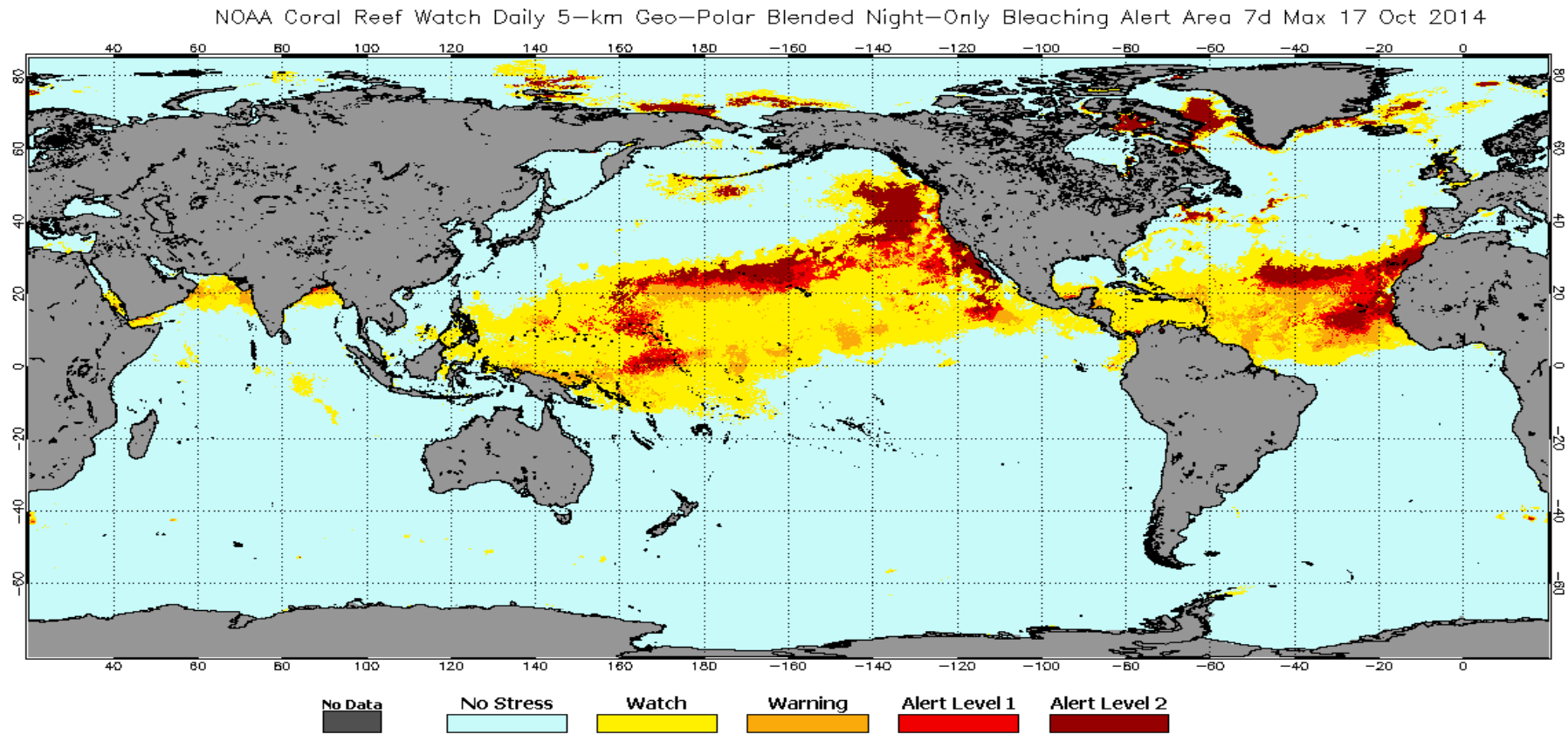


Mangrove Forests (2000-2016)

Cover Regeneration Gain Loss



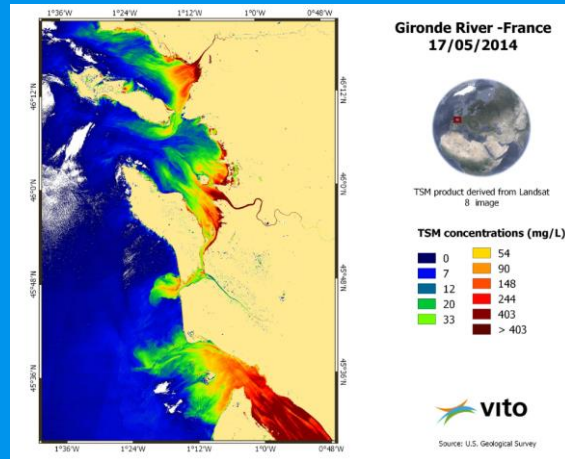
Ecosystem stressors



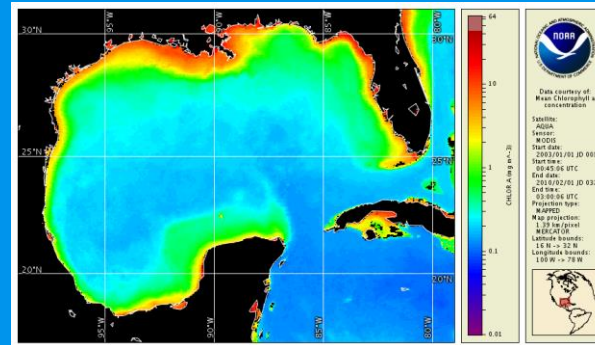
NOAA Coral Reef Watch

Water Quality

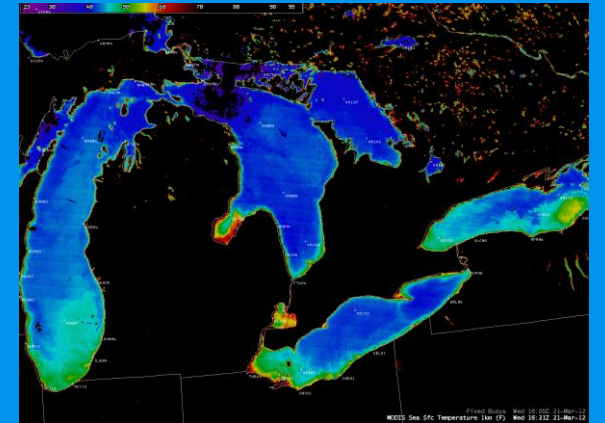
Turbidity, suspended solid



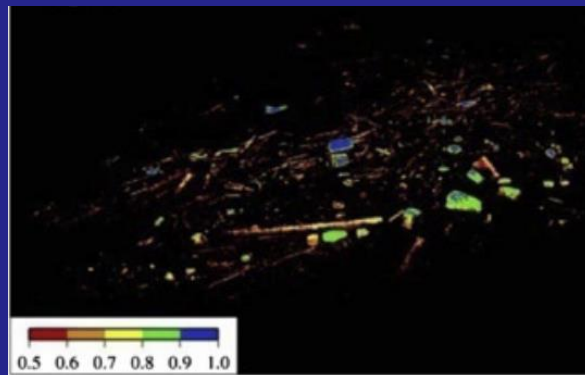
Chlorophyll-a, CDOM



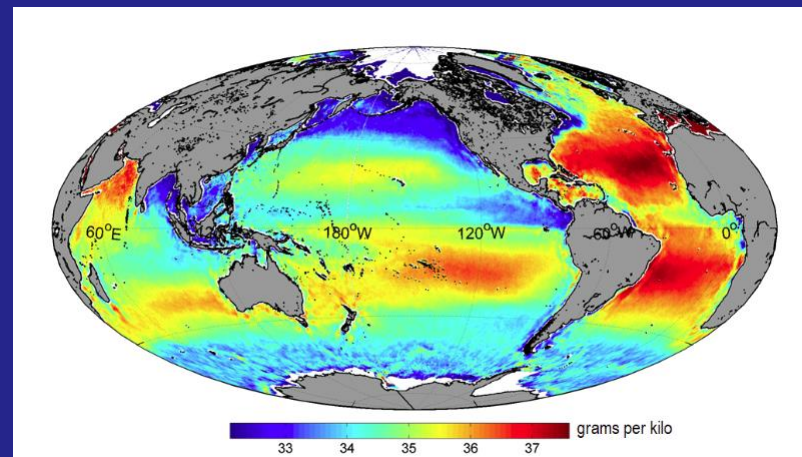
Surface Temperature



Macro-debris



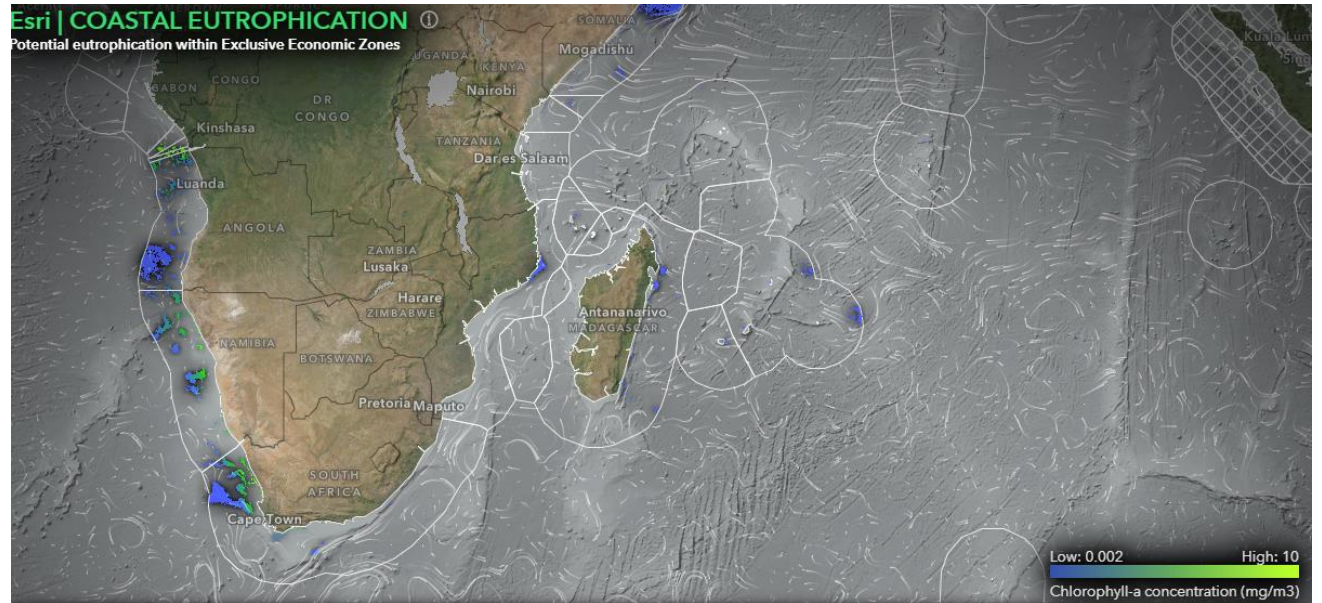
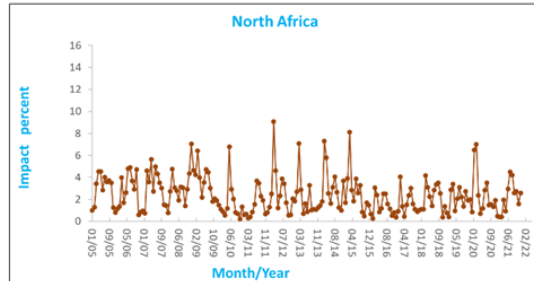
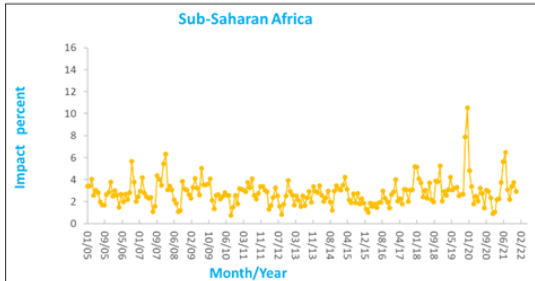
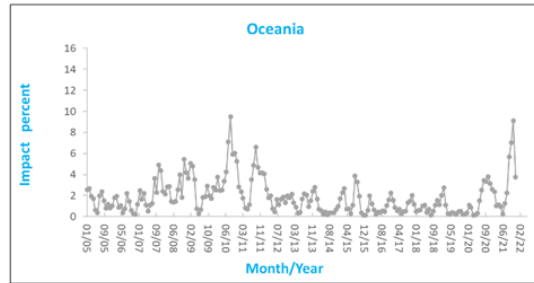
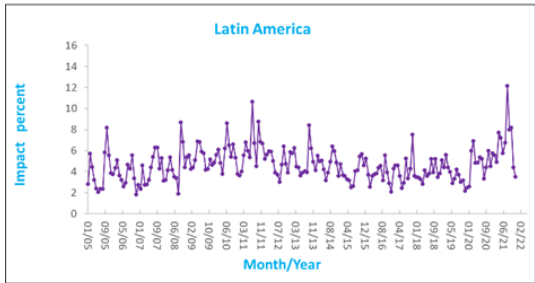
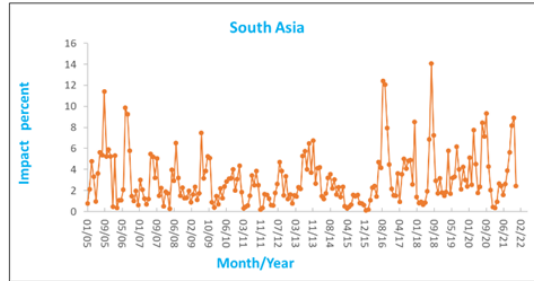
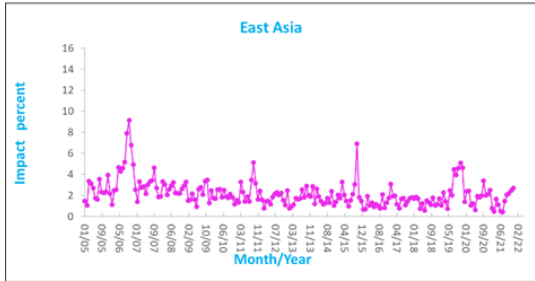
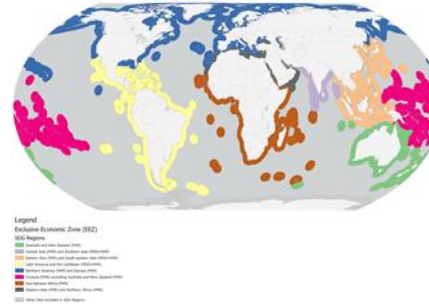
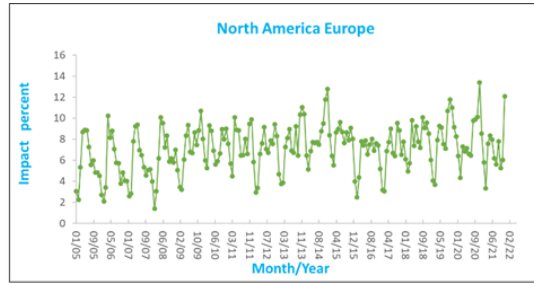
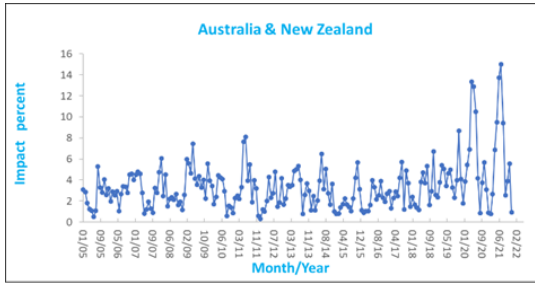
Salinity

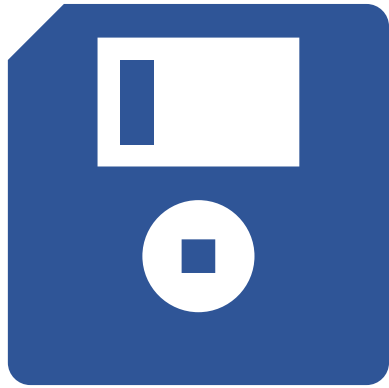


Slicks



Eutrophication indicator for SDG 14.1.1a





Earth Observations
can provide vast
amounts of data



Data can be used to
develop products and
tools for ocean &
coastal Monitoring



Information from
tools can contribute
to the sustainable use
of ocean and coastal
resources



**THANK
YOU!**

