The Global Ocean Observing System
www.goosocean.org

The Global Ocean Observing System
2030 Strategy, governance, and NOAA Implementation

GOOS Vision

A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity.

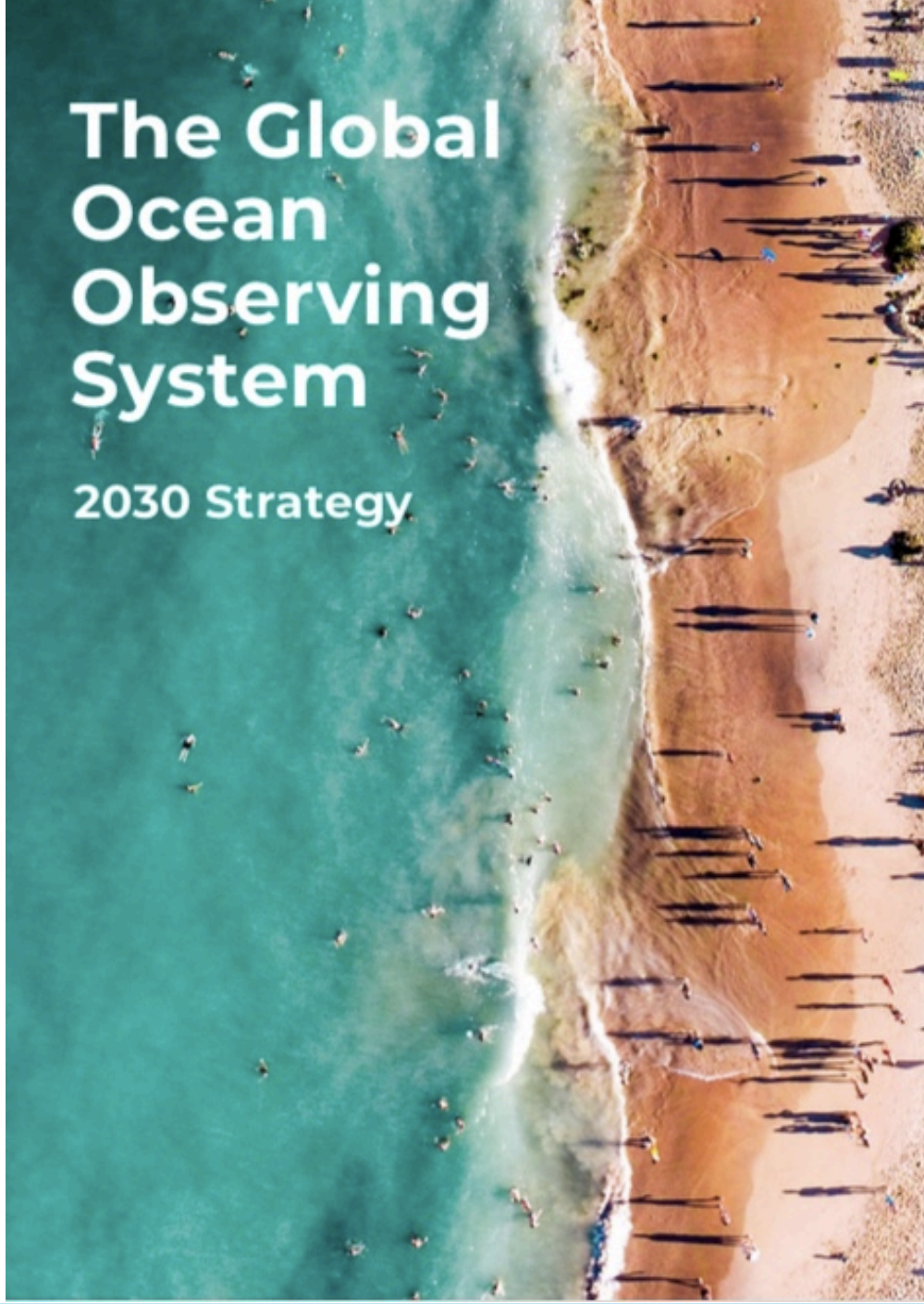
David Legler (slides from Albert Fischer and others)
Director, OAR/Global Ocean Monitoring and Observing

UNESCO IOC WMO UN environment International Science Council

GOOS 2030 Strategy

GOOS Mission

To lead the ocean observing community and create the partnerships to grow an integrated, responsive and sustained observing system.



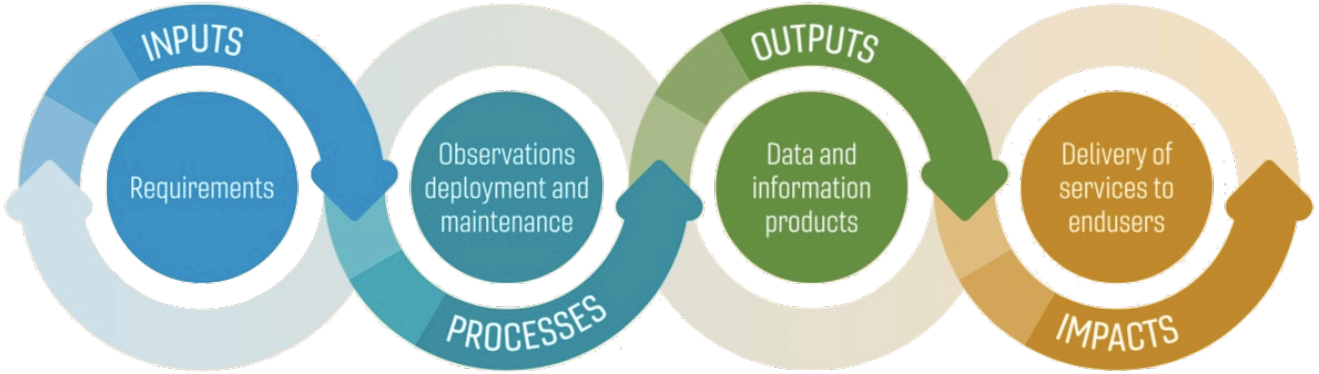
GOOS 2030 Strategy

Delivery across 3 target application areas

Climate

Operational services

Ocean health



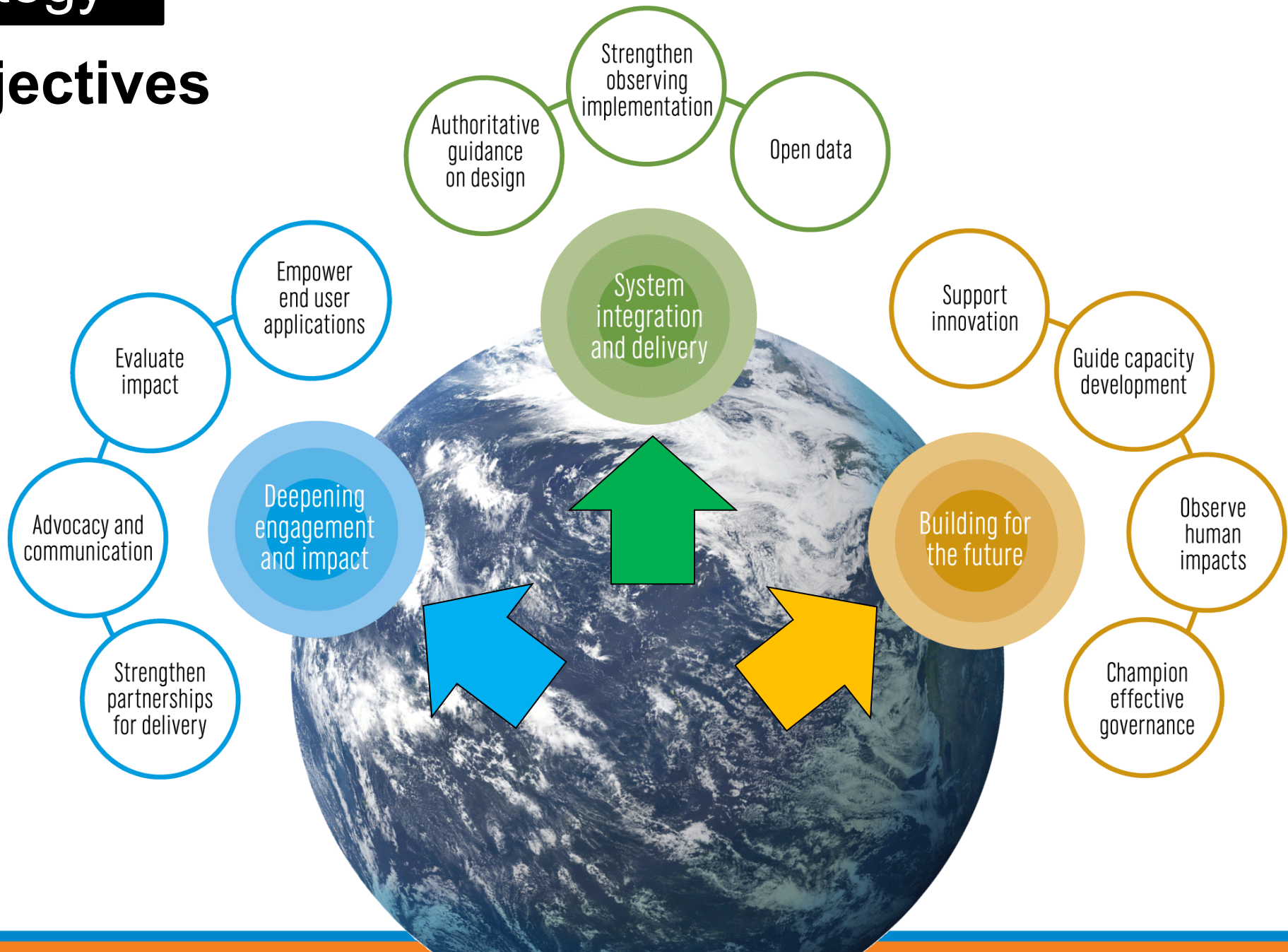
GOOS 2030 Strategy

11 Strategic Objectives

System integration and delivery

Deepening engagement and impact

Building for the future



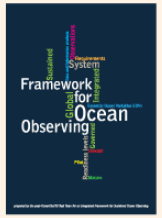
GOOS Today

Operational services

Climate

Ocean health

GOOS components



EOV's

Framework for Ocean Observing Process Diagram

Sponsors: IOC/UNESCO, WMO, UN Environment, ISC

GOOS Steering Committee

GOOS Office (distributed)

Requirements and evaluation

Physics & Climate Panel (GCOS-GOOS-WCRP OOPC)

Biogeo-chemistry Panel (SCOR-IOC IOCCP)

Biology & Ecosystems Panel

Evaluation cycles

Observations

Observations Coordination Group

GOOS Regional Alliances

JCOMMOPS

Observing networks

National observing systems

Opera-tional ocean forecast system

Projects

TPOS 2020

DOOS

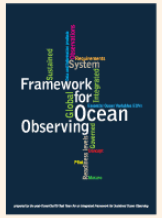
MESCAT

AtlantOS

GOOS Today

GOOS components

NOAA Leadership, Engagement



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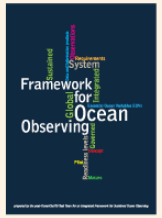

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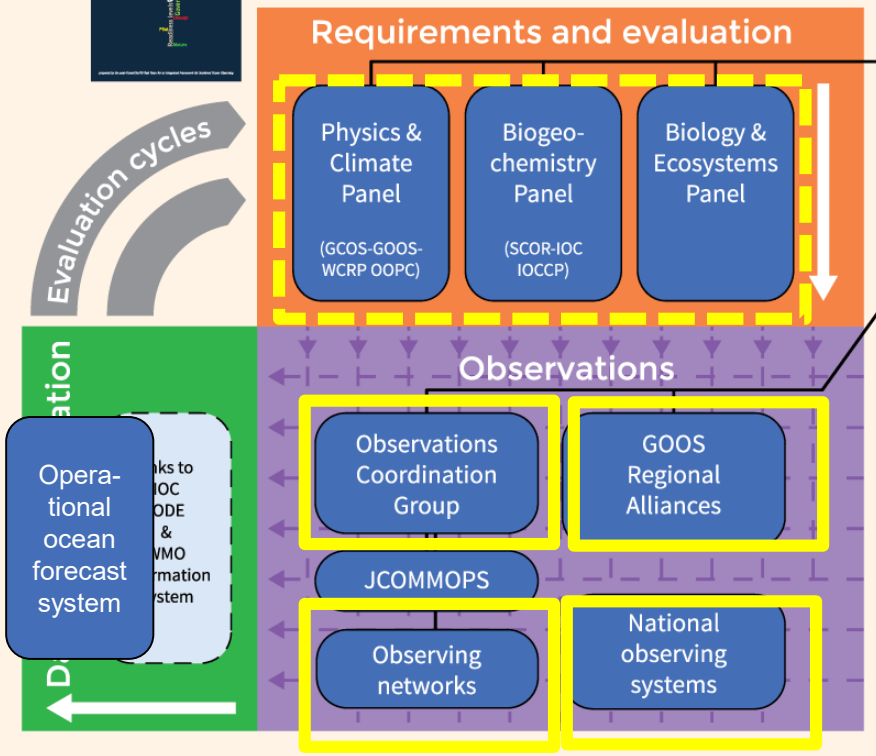
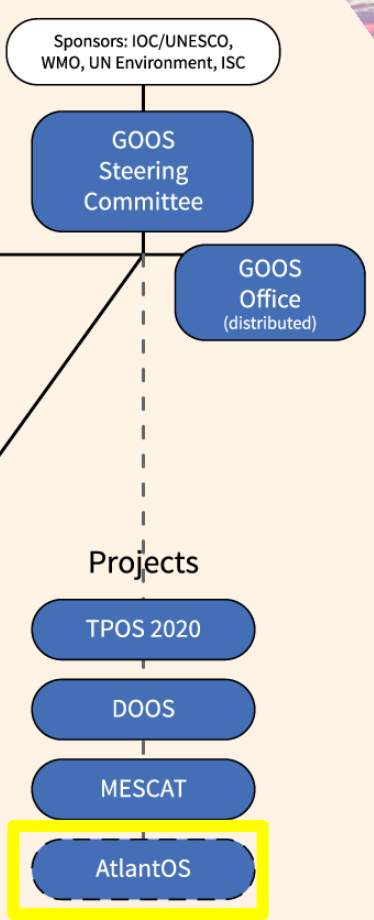
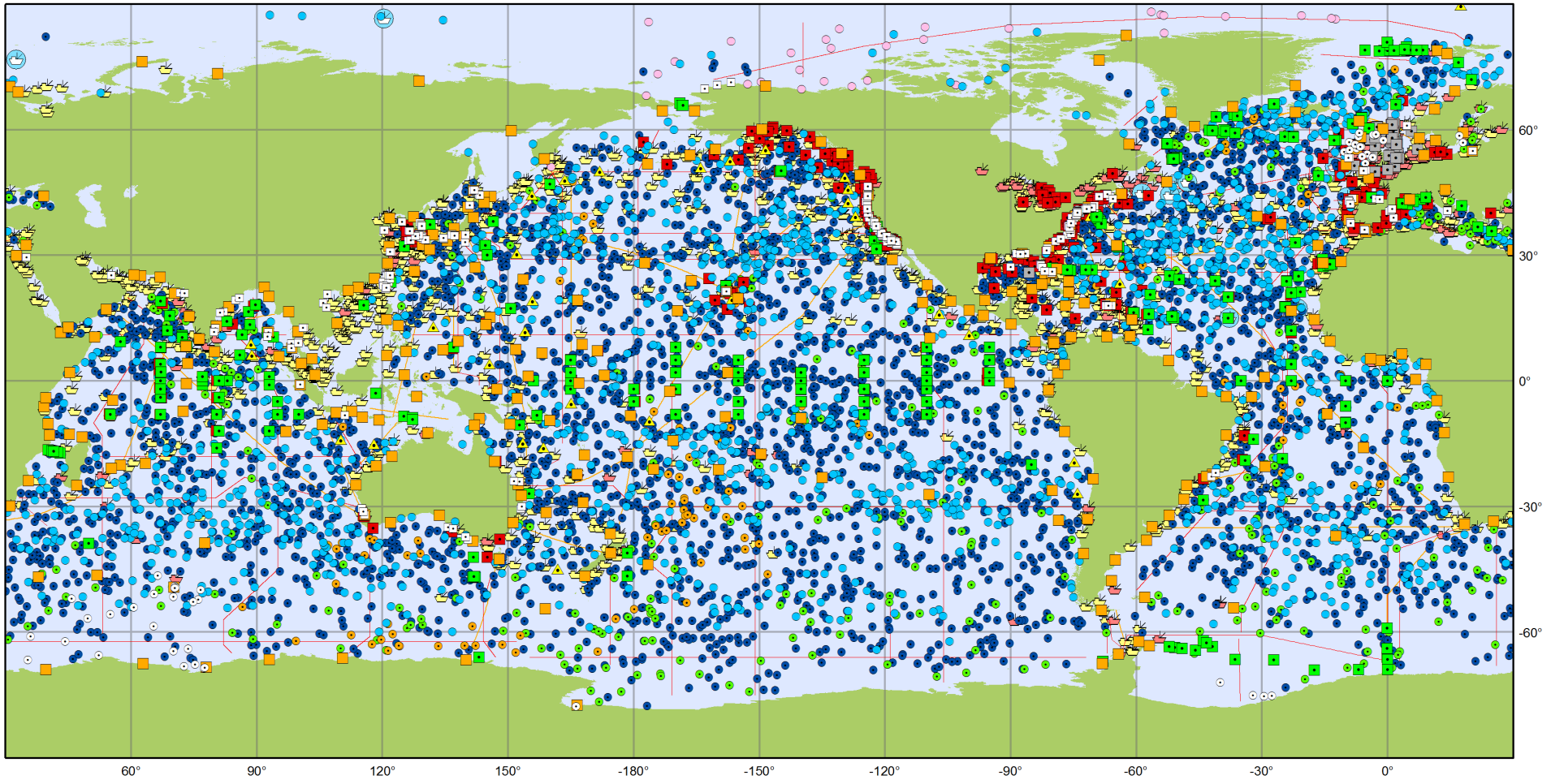






Main in situ Elements of the Global Ocean Observing System

November 2019

Profiling Floats (Argo)
- Core (3871)
- Deep (106)
- BioGeoChemical (364)

Data Buoys (DBCP)
- Surface Drifters (1520)
- Offshore Platforms (93)
- Ice Buoys (30)
- Moored Buoys (333)
- Tsunameters (32)

Timeseries (OceanSITES)
- Interdisciplinary Moorings (326)

Repeated Hydrography (GO-SHIP)
- Research Vessel Lines (63)

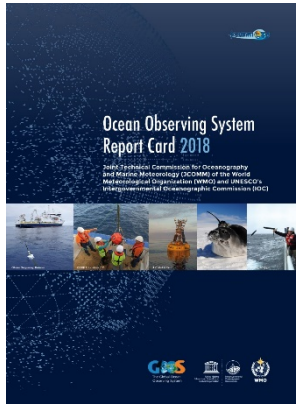
Sea Level (GLOSS)
- Tide Gauges (290)

Ship based Measurements (SOT)
- Automated Weather Stations (253)
- Manned Weather Stations (1279)
- Radiosondes (13)
- eXpendable BathyThermographs (34)

Other Networks
- HF Radars (270)
- Animal Borne Sensors (53)

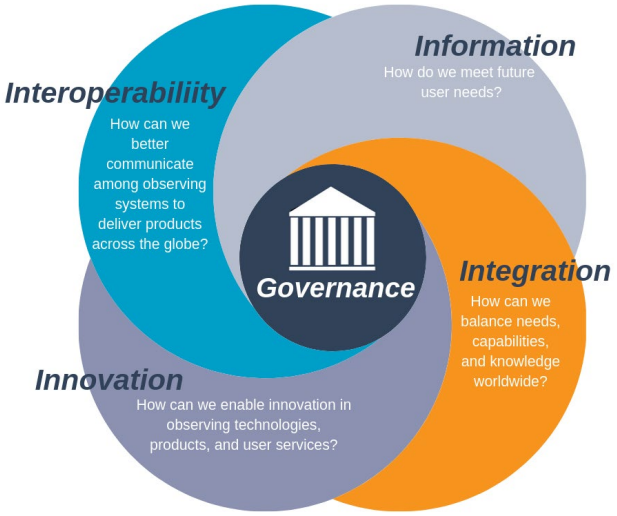
Generated by www.jcommops.org, 13/12/2019

jcommops.org/reportcard2019



OceanObs'19 – what we heard

- **Planning for impact**: codesign of the observing system, end-to-end, with stakeholders and users
- Core system **integration**: Democratization of data, best practice, integration of biological and ecological observations, and a growing emphasis on the coast
- Embracing **innovation** in technology and governance, and looking to the **#OceanDecade** as a vehicle for transformation



- **Governance** breakout: formation of a working group to make recommendations

Developing/Implementing GOOS in NOAA OAR Global Ocean Monitoring and Observing

- Observations beyond US EEZ carried out across every line office of NOAA
- Purposefully designed global scale sustained ocean observing programs are a subset (largely NESDIS and OAR)
- Many programs contribute time/energy towards the global ocean observing enterprise (e.g. IOOS engagement with other GOOS Regional Alliances, ATN..)

David Legler, Director| *David.Legler@noaa.gov*

RESEARCH
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

MISSION (from 2015 Strategic Plan):

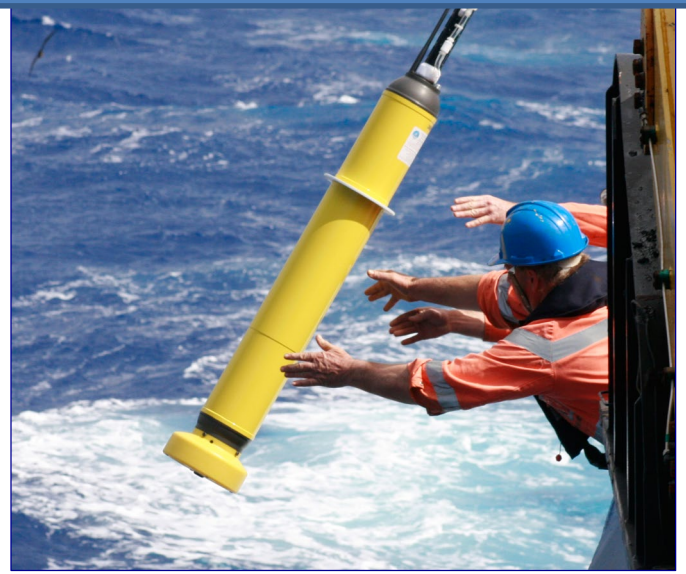
To provide high-quality long-term global observations, climate information, and products to researchers, forecasters, and other users to inform and prepare society for environmental challenges





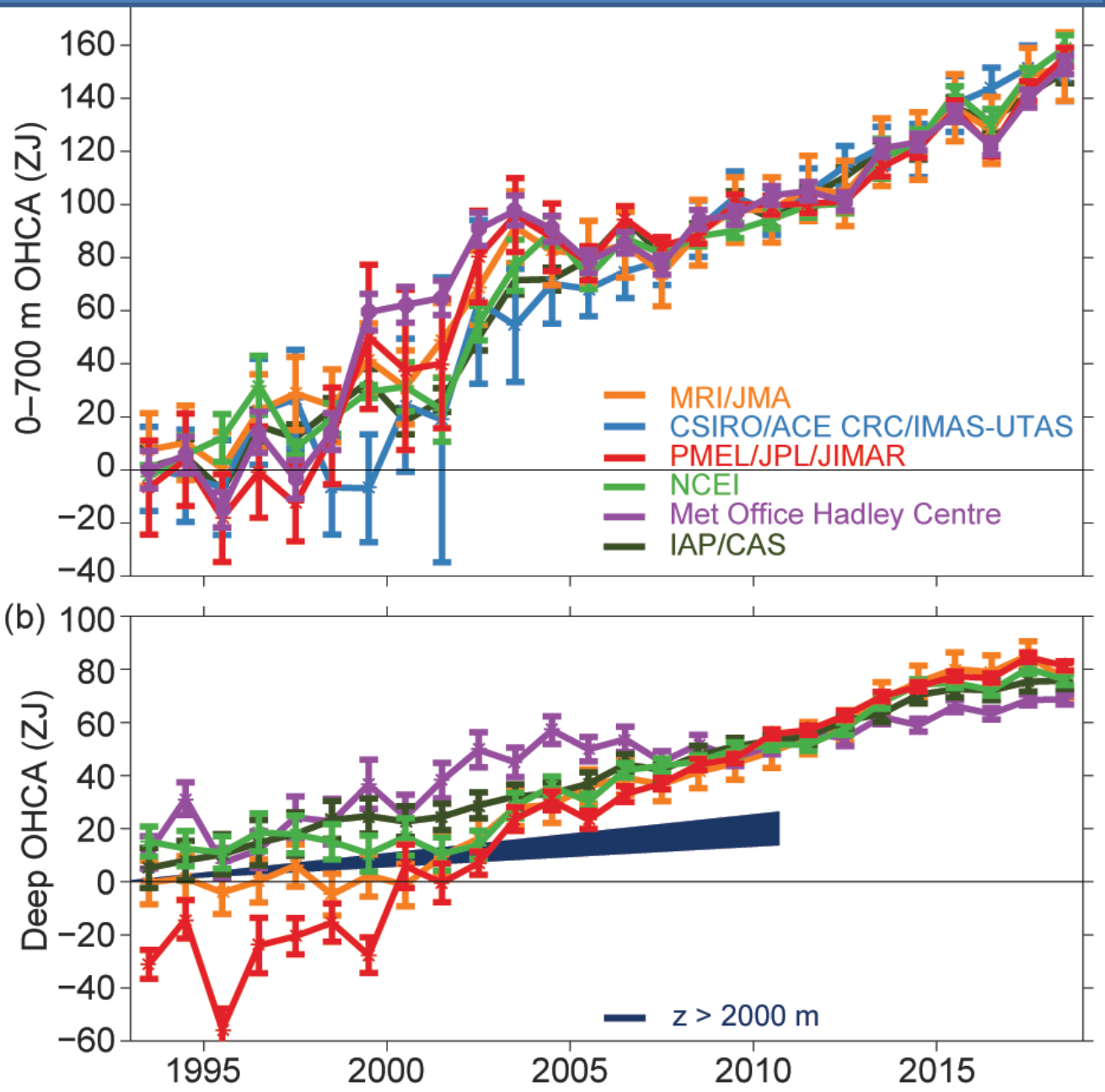


The Value of Global Ocean Observing - Climate



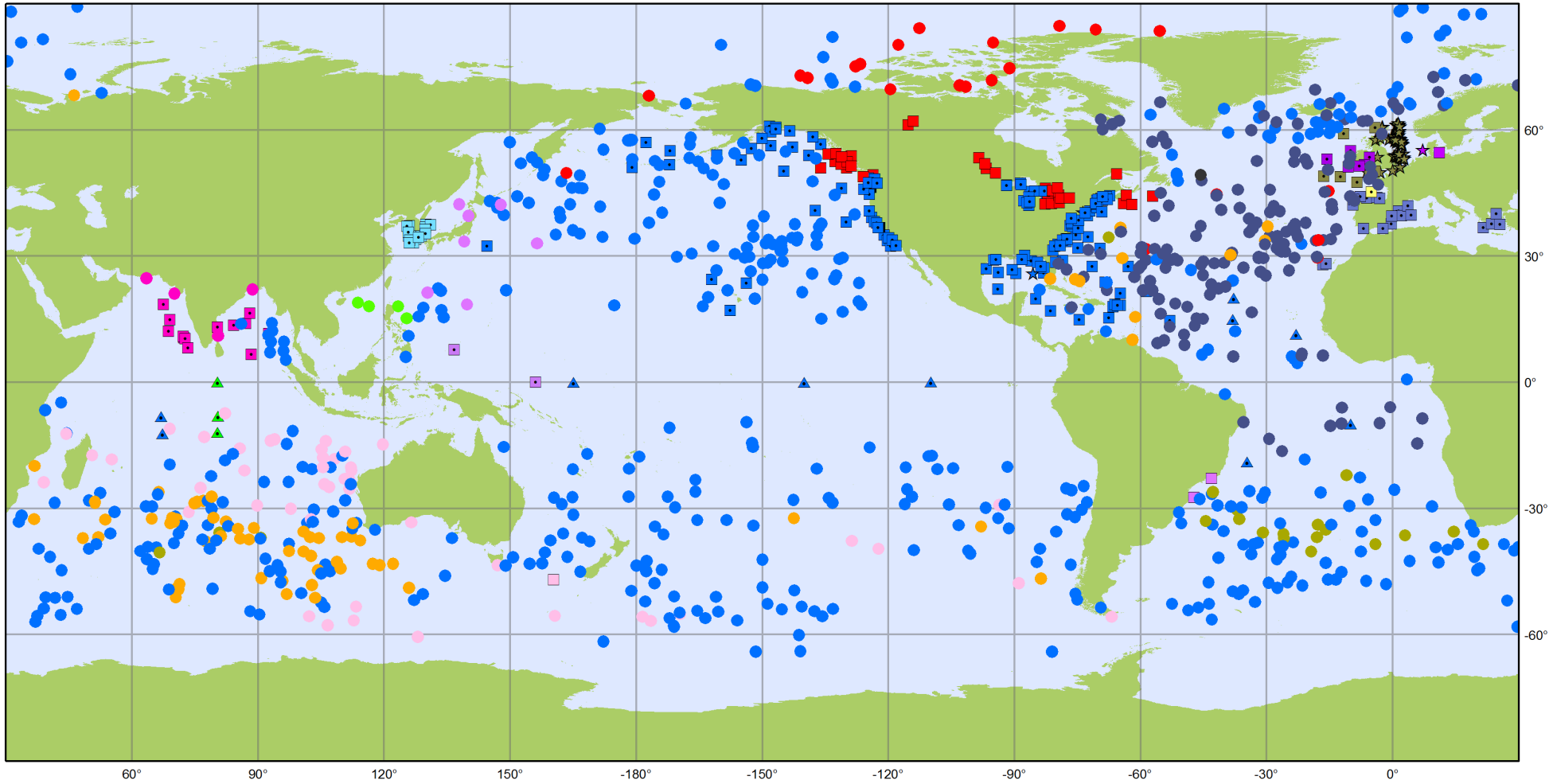
Argo

Argo
- Global scale, 2000m (6000m) depth T, S
- 30+ Countries



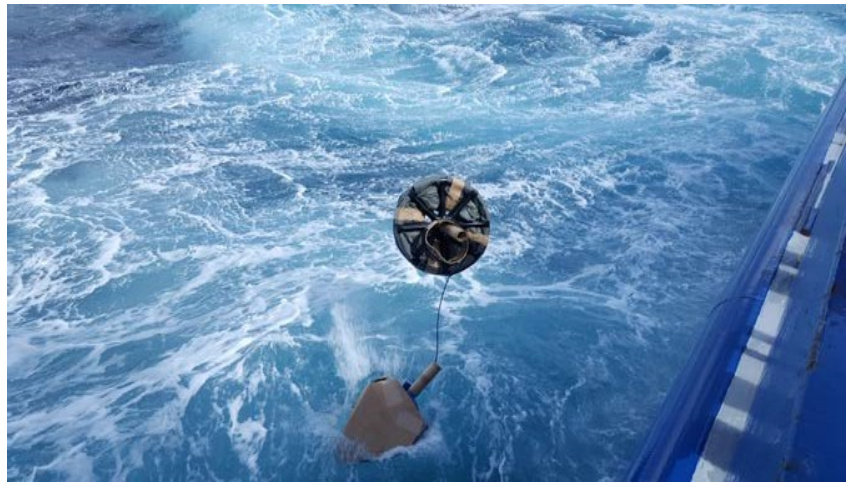
The Value of Global Ocean Observing – Weather

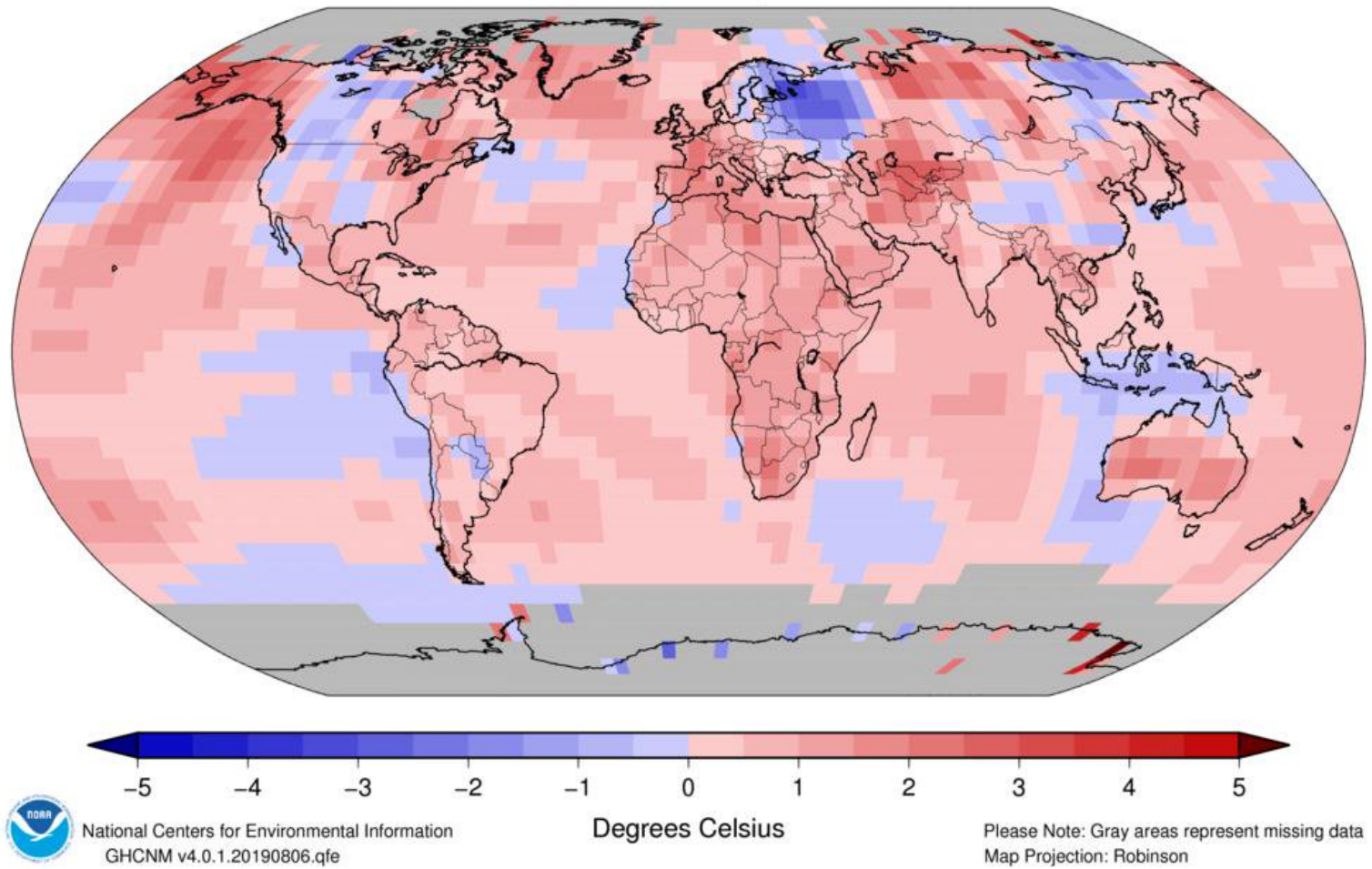
Drifter Sea Level Pressure



The Value of Global Ocean Observing – Satellite Validation

Drifter SST

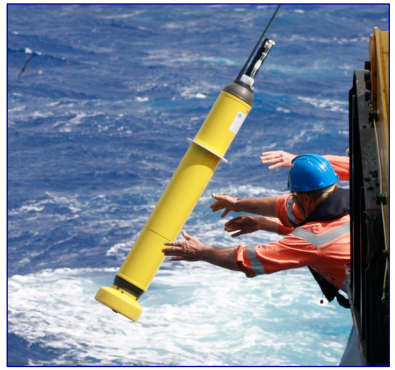


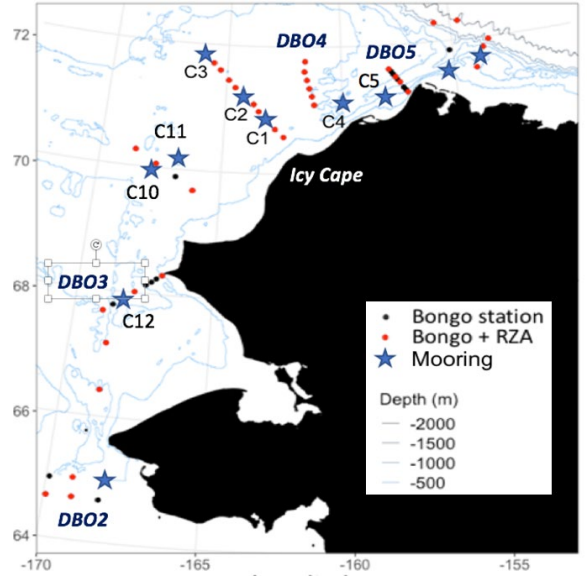


OOMD Sponsored Observing Networks

Argo, surface drifters, RAMA, PIRATA, Oceansites, GLOSS Tide gauges (int'l and US), SOOP/XBT, gliders, SOCONET, GO-SHIP, …

Arctic: DBO, Sea Ice Buoys, Saildrone



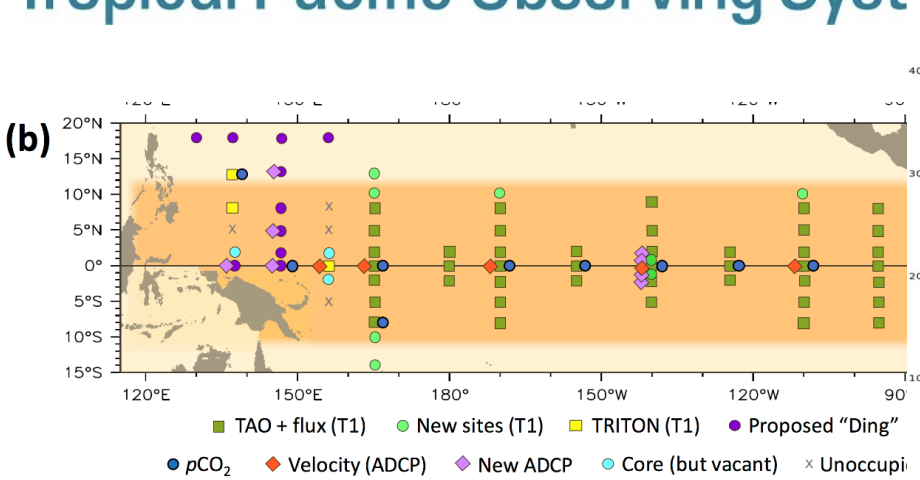


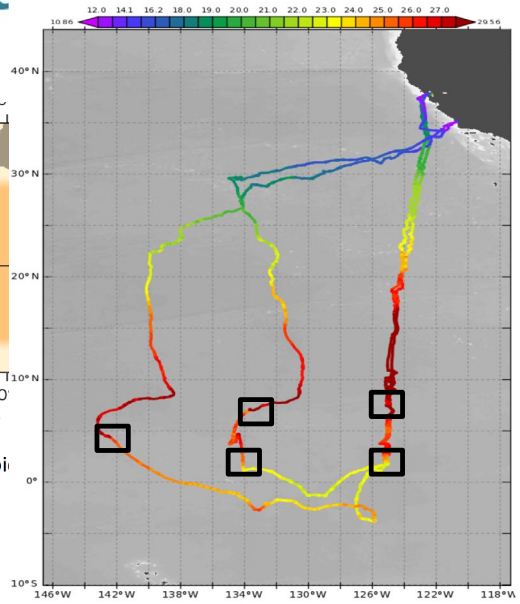
The Future – Partnership Opportunities

Regional Observing Planning

TPOS 2020

Tropical Pacific Observing System





Arctic Ocean Observing

AtlantOS

The Future – Expansion Biogeochemistry and BIO

Biogeochemical Observing Platforms

- **Argo**: Oxygen, nitrate, pH, particulates *chlorophyll*
- **OceanSITES/Moorings:** *p*CO_2, oxygen, nutrients, particulates, *phytoplankton, chlorophyll*
- **Gliders/Saildrone:** Oxygen, chlorophyll, pCO_2
- **GO-SHIP:** DIC, TAlk, pH, oxygen,nitrate, phosphate, silicate, *chlorophyll, primary production*

Next steps: Incorporation of Biological Essential Ocean Variables (EOVs) (e.g., biological standing stock, diversity, biological rates and fluxes).

Newly Supported BGC Argo Initiatives $4M

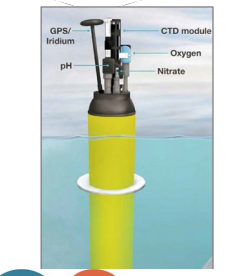
Four new projects were funded in 2019:
Two projects partner with technology companies, Sea Bird Scientific and MRV, to refine biogeochemical (BGC) Argo float designs and deploy ~20 floats in the Tropical Pacific, an important region for understanding the ocean's role in the global carbon cycle.

Two pilot projects to deploy BGC Argo floats and use the resulting information to describe ocean chemistry changes in the California Current Large Marine Ecosystem and northwest Atlantic ocean — both significant areas for fisheries.

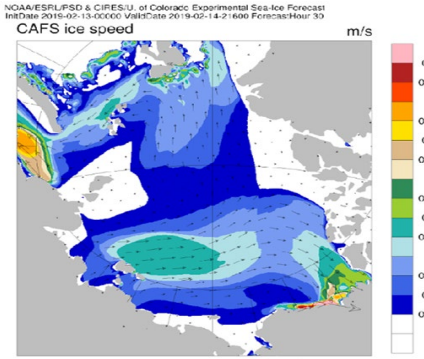
Potential Foci of the Future…of interest to IOOS

Global Ocean Observing and Monitoring (GOMO)

- Expansion of biogeochemical measurements
- Global-coastal ocean connections (e.g. boundary currents)
- Regional/basin-scale observing/prediction
- Extremes – hurricanes, heat waves, etc.
- Deep
- Improving NOAA modeling enterprise (data accountability, ODA)



TPOS 2020
Tropical Pacific Observing System



Thank You!

EXTRA

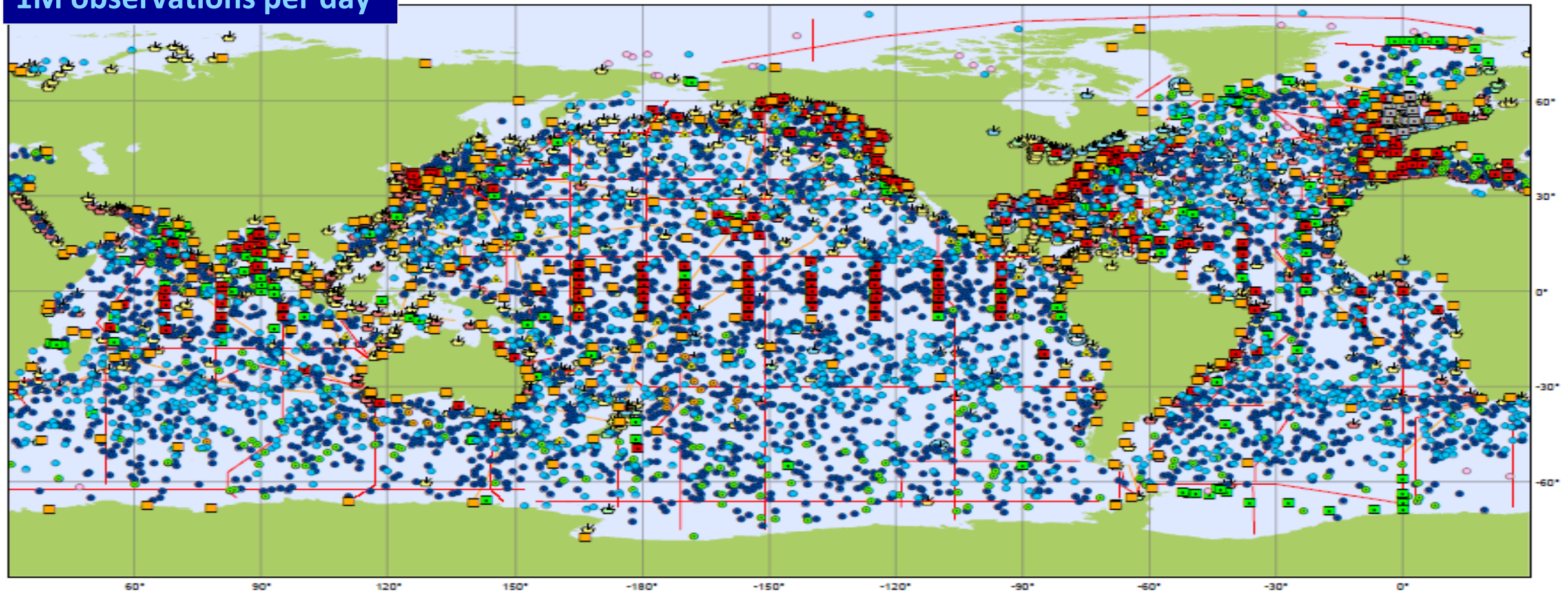
Attributes: maturity level

Mature Developing Pilot

	Global	Sustained	Community	EOV / ECV	Data delivery	Mission / targets	Best Practices
Argo	● ●	●	●	● ↑	●	●	●
DBCP moorings	●	●	●	●	●	●	●
DBCP drifters	●	●	●	● ↑	●	●	●
SOT VOS	●	●	●	●	●	●	●
SOT SOOP	●	●	●	●	●	●	●
GLOSS	●	●	●	●	●	●	●
OceanSITES	●	●	●	●	●	●	●
GO-SHIP	●	●	●	● ↑	●	●	●
OceanGliders	●	●	●	● ↑	●	●	●
HF Radar	●	●	●	●	●	●	●
Animal Borne Sensors	●	●	●	●	●	●	●

Global In-Situ Sustained Ocean Observing

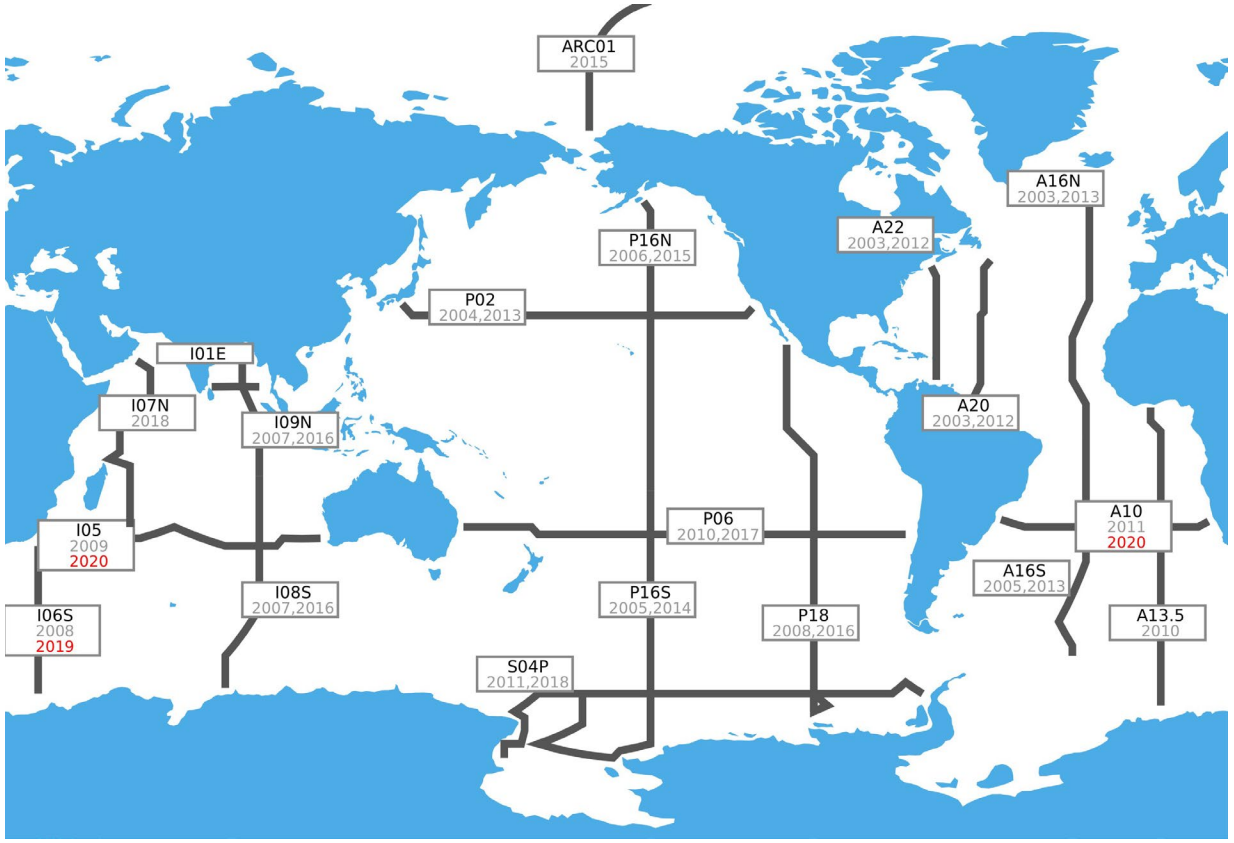
1M observations per day

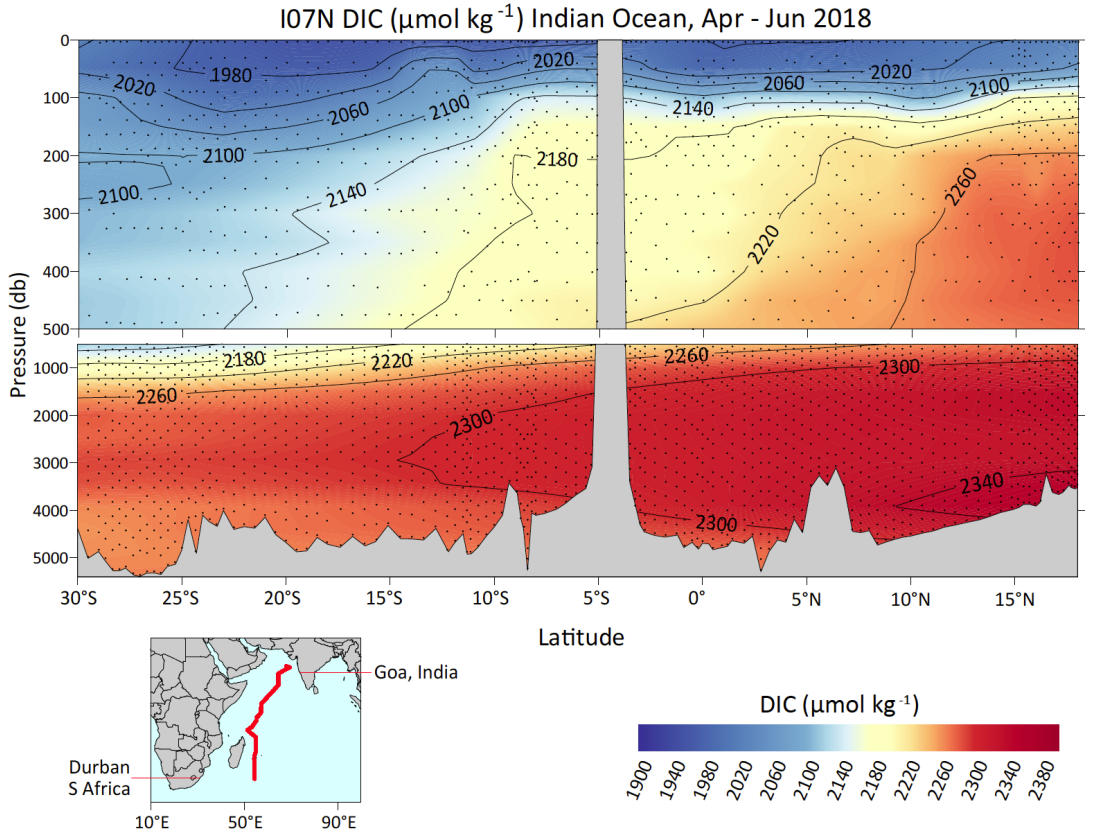


FOCUS: Beyond the continental shelf

The Value of Global Ocean Observing

Reference Measurements of the Water Column





What's New

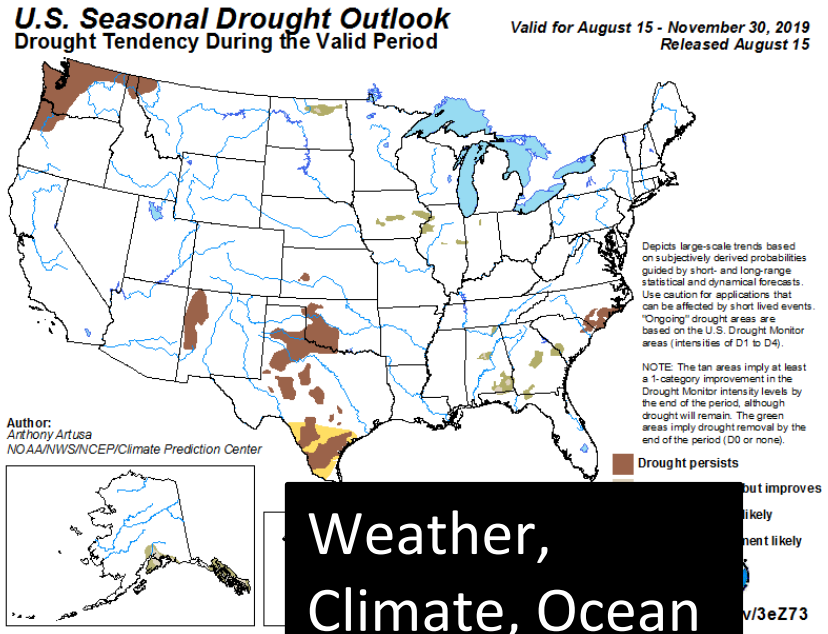
Wave Drifters

Directional Wave Spectra from drifters

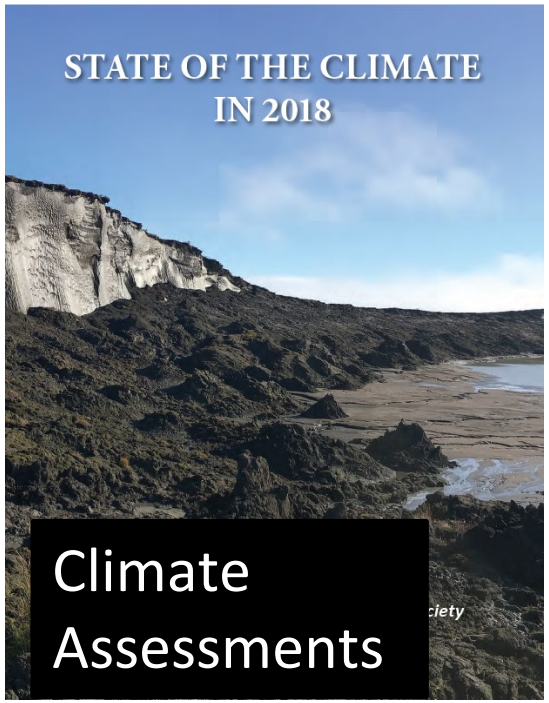
Global Ocean Data: Foundation for Key Products and Services

Essential ocean variables:

temperature, salinity, sea –level, currents/circulation, carbon/pH, sea-ice, air-sea fluxes, waves, ocean acoustics, and surface meteorology



Weather, Climate, Ocean Forecasts



Climate Assessments

ICOADS

SOCAT · SURFACE OCEAN CO_2 ATLAS ·

World Ocean Database

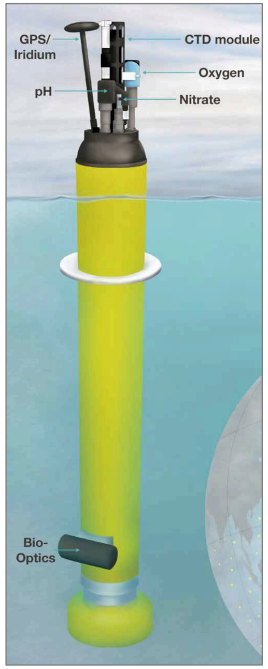
What's New in FY19

Biogeochemical Argo

$4.2 New (FY19) funding

2 regional pilot studies

- California Current
- Bermuda Atlantic Time Series



PLUS: Improving BGC float technology

- 15-20 floats for TPOS2020

TPOS 2020
Tropical Pacific Observing System

We need a **step change** in ocean observing

We will need :

- Growing **integrated** observing capacity
- Proliferation of output systems
- Improved connection from observations to users

We struggle to get the recognition and support required to build and sustain the ocean observing, data and information system the world needs.

Value chain

Requires feedback loops to ensure the system is fit for purpose and sustained