First DBCP Mediterranean Training Workshop on Ocean Observations and Data Applications
2-4 May 2023, Tunisia

WORLD METEOROLOGICAL ORGANIZATION

unesco
Intergovernmental Oceanographic Commission

Data Buoy Cooperation Panel and OceanOPS

Long Jiang (ljiang@ocean-ops.org, ljiang@wmo.int)

The Global Ocean Observing System

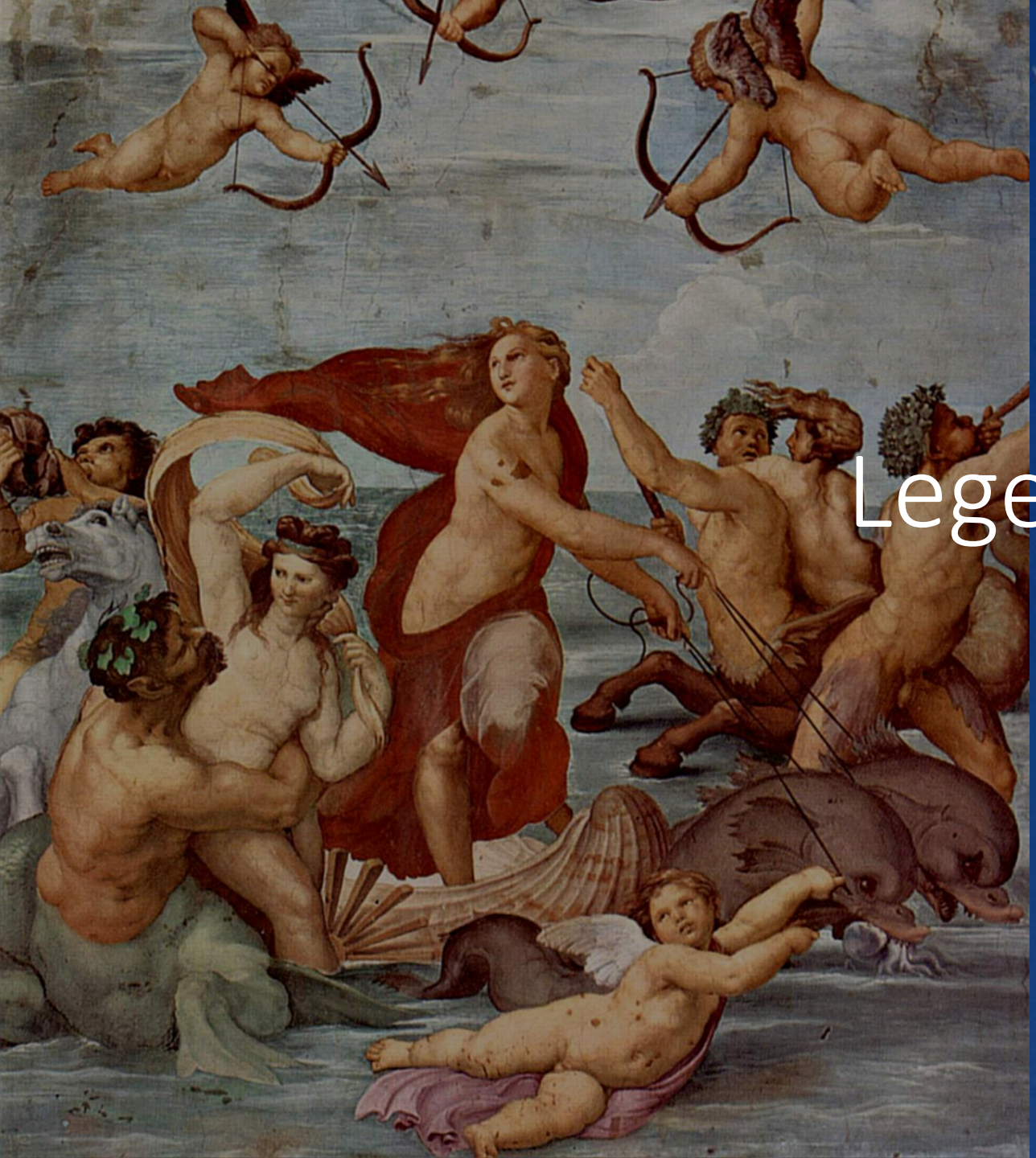
DBCP WMO - IOC DATA BUOY COOPERATION PANEL

OceanOPS

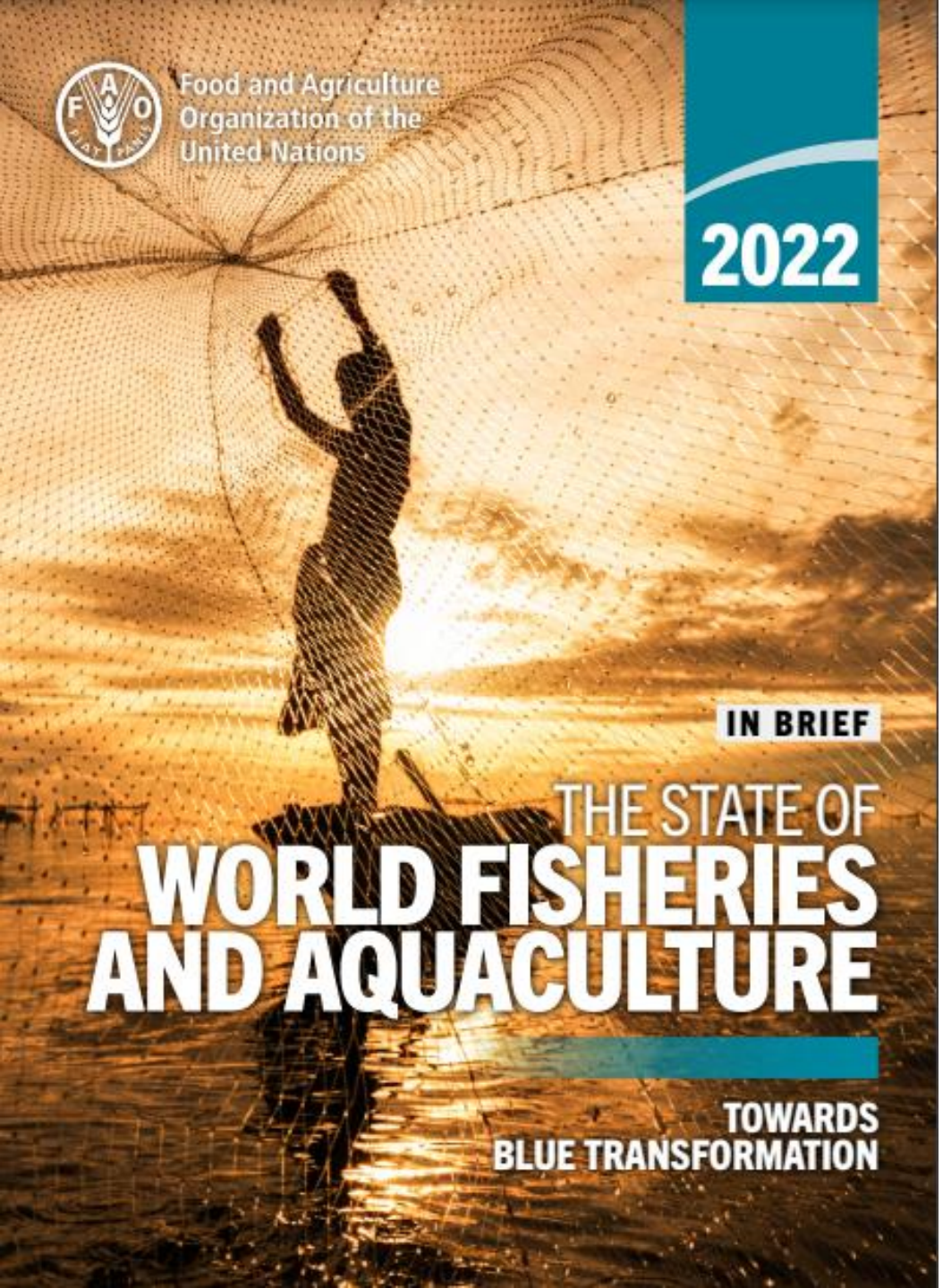
OUTLINE

- Why Ocean Observations
- Why Data Buoys
- How Buoys Are Manufactured and Operated
- How Buoy Data Are Managed
- Data Buoy Cooperation Panel and its organization
- Why Metadata and How Metadata Are Managed
- Ocean Observations in the Mediterranean

Legends



Shipping and trade



Fishery and food

Tourism and Recreation

Credit: A. Auriol/Team Malizia

2.5 Million People

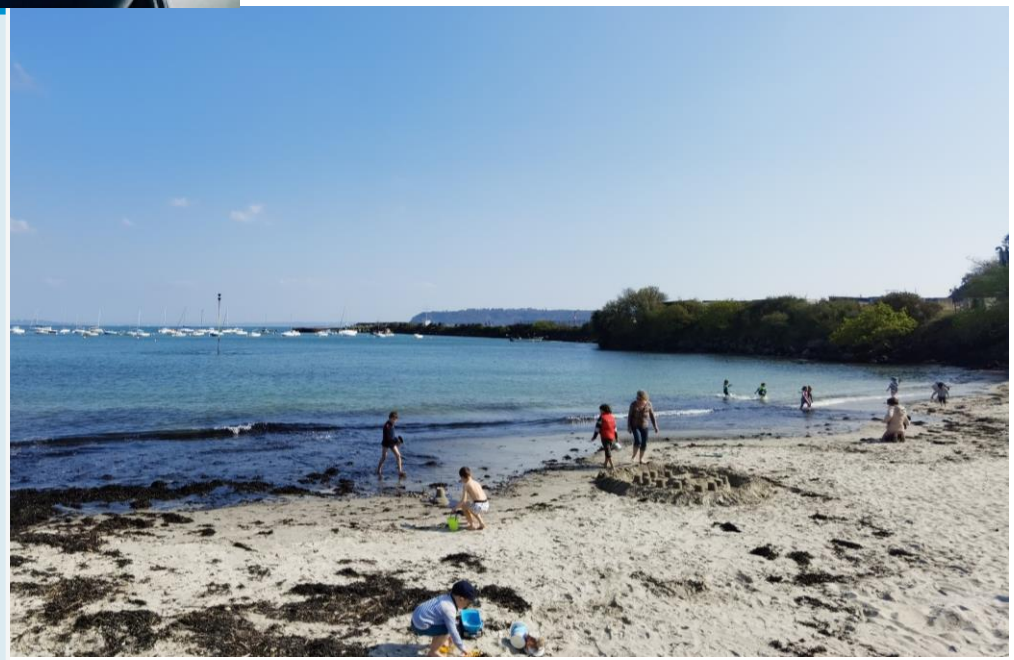
Almost 2.5 million people are employed by ocean-based tourism and recreation.

$66 Billion Earnings

Workers in the ocean-based tourism and recreation sector earned about $65.6 billion in annual wages.

$143 Billion GDP

Ocean-based tourism and recreation contributes approximately $143 billion in gross domestic product to the national economy each year.



https://coast.noaa.gov/states/fast-facts/tourism-and-recreation.html

Stressors

The Mediterranean subject to multiple forms of pollution

SoED 2020
State of the Environment and Development in the Mediterranean

Insufficient contribution to the overall objectives of reducing CO_2 emissions
(produces around 2 Gt of CO_2 = 5% world emissions)

2/3
of Mediterranean countries exceed the global WHO recommended threshold for air pollution from particulate matter and ozone

Soil, Water and Sea Pollution

The Med is one of the world's most affected regions.
50% of marine litter on the seabed is plastic.
Concentration of microplastics on the surface of the Med Sea exceeds the maximum threshold and reaches more than 64 million floating particles per km²

Use of of fertilizers and pesticides above the world average in more than half of the Med countries

49%
of coastal water bodies in Mediterranean do not achieve good environmental status

184
million tonnes of solid waste/year
(i.e. 370kg/capita/year, with low recycling rates

Presence of "emerging contaminants" with poorly understood life cycles and impacts, potentially toxic and not treatable by conventional wastewater treatment plants (pharmaceuticals, cosmetics,flame retardants, plastic additives, etc.)

Noise pollution at sea is a danger for some species, such as cetaceans

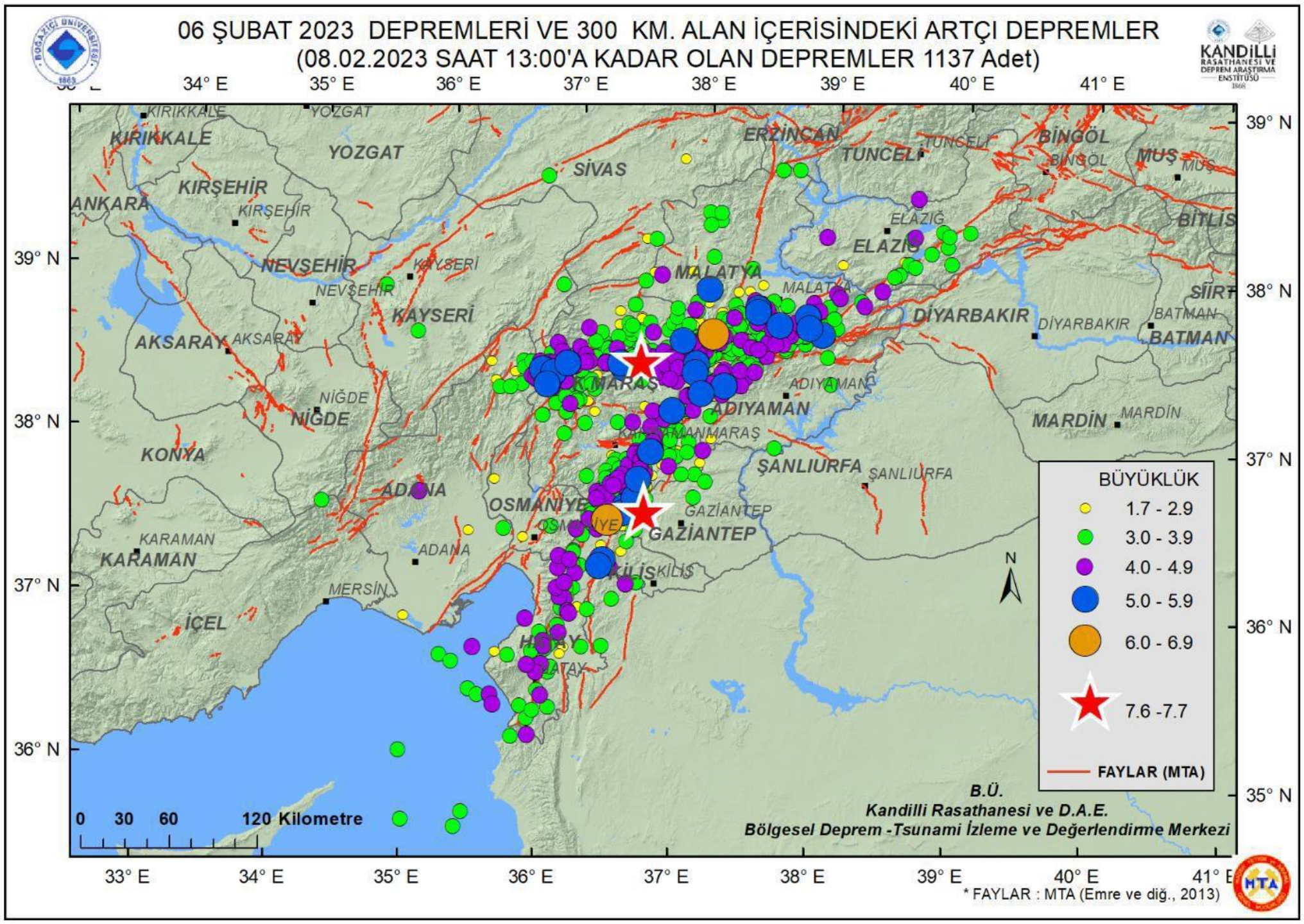
Pollution due mainly to heavy metals combined with the continuous discharge of treated and untreated wastewater, effluents from the production and processing of metals, energy production, treatment and production of pulp and paper,chemical industry, intensive farming and aquaculture

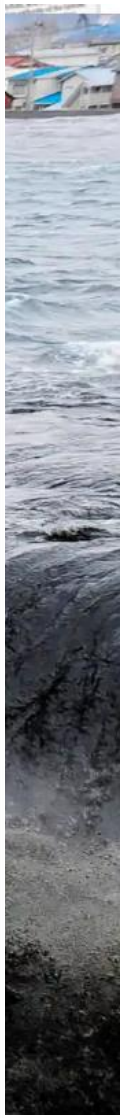
Air Pollution

Marine Pollution

https://www.unep.org/unepmap/resources/factsheets/pollution

Plan Bleu


06 ŞUBAT 2023 DEPREMLERİ VE 300 KM. ALAN İÇERİSİNDEKİ ARTÇI DEPREMLER
(08.02.2023 SAAT 13:00'A KADAR OLAN DEPREMLER 1137 Adet)
KANDİLLİ RASATHANESİ VE DEPREM ARAŞTIRMA ENSTİTÜSÜ
34° E
35° E
36° E
37° E
38° E
39° E
40° E
41° E
39° N
38° N
37° N
36° N
35° N
KIRIKKALE
YOZGAT
SİVAS
ERZİNCAN
TUNCELİ
BİNGÖL
MUŞ
BİTLİS
KIRŞEHİR
ANKARA
NEVŞEHİR
KAYSERİ
ELAZIĞ
MALATYA
SİİRT
DİYARBAKIR
BATMAN
AKSARAY
NİĞDE
ADIYAMAN
MARDİN
KONYA
ŞANLIURFA
ADANA
OSMANİYE
GAZİANTEP
KİLİS
KARAMAN
MERSİN
İÇEL
HATAY
BÜYÜKLÜK
1.7 - 2.9
3.0 - 3.9
4.0 - 4.9
5.0 - 5.9
6.0 - 6.9
7.6 -7.7
FAYLAR (MTA)
N
0 30 60 120 Kilometre
B.Ü.
Kandilli Rasathanesi ve D.A.E.
Bölgesel Deprem -Tsunami İzleme ve Değerlendirme Merkezi
* FAYLAR : MTA (Emre ve diğ., 2013)
MTA



Sea level rise

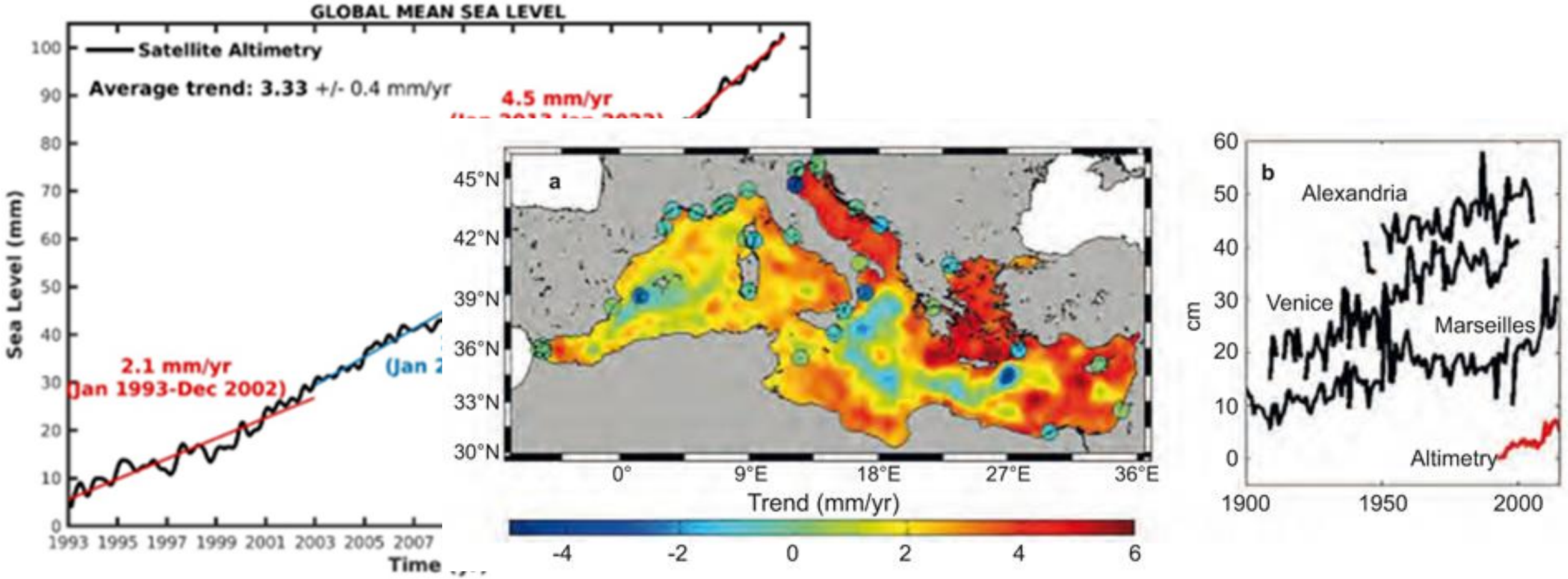
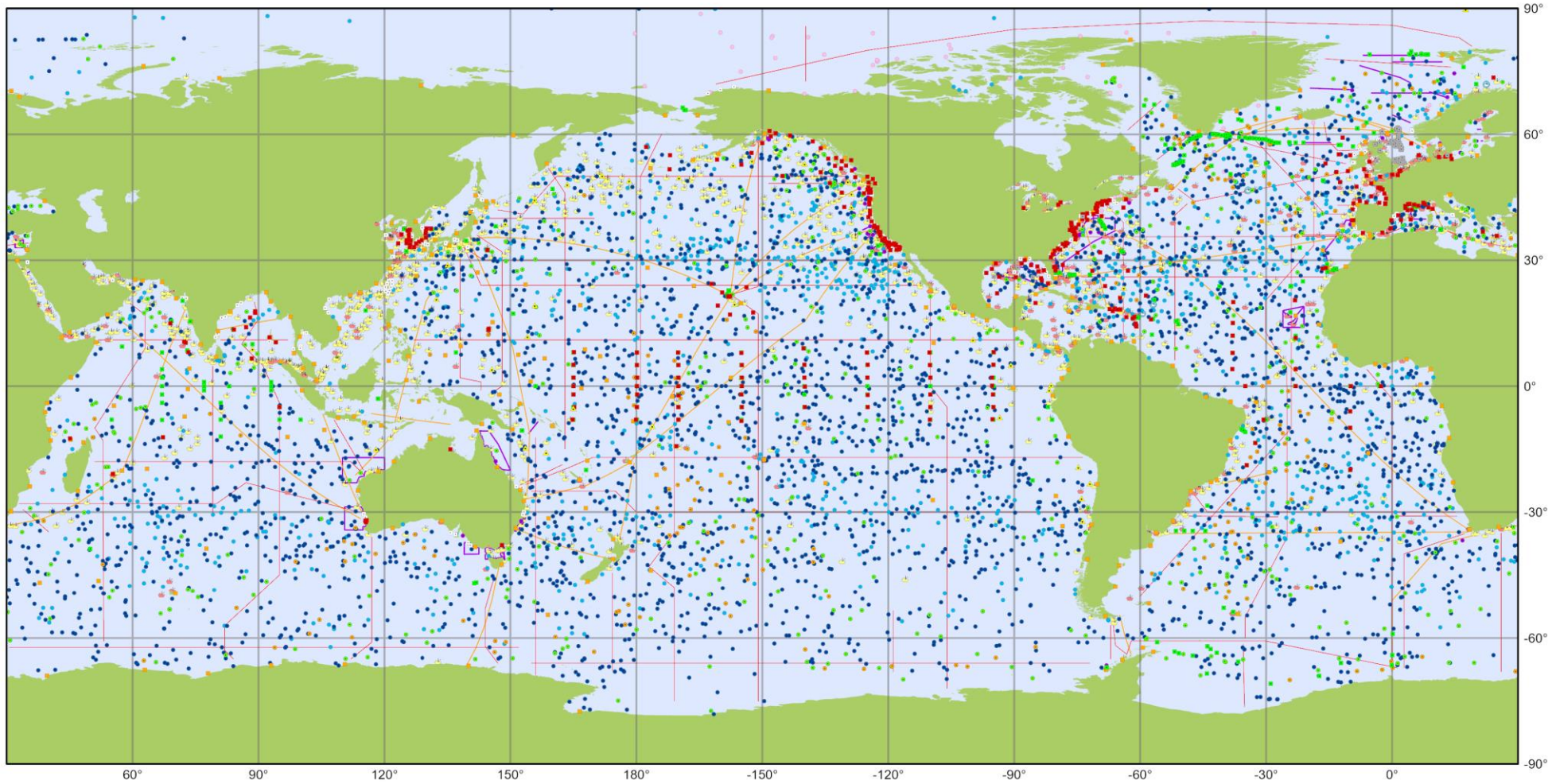


Figure 1. Sea-level rise since 1993 based on satellite measurements (WMO State of the Global Climate Report).

What to DO?

Figure 1. Graphical presentation of a Multi-Hazard Early Warning System (MHEWS)

Earth System Approach



Global ocean observing system

March 2023

In situ operational platforms monitored by OceanOPS

Mobile systems

- Core floats - Argo
- Deep floats - Argo
- Biogeochemistry floats - Argo
- Underwater gliders - OceanGliders
- Drifting buoys - DBCP
- Polar buoys - DBCP
- Animal borne sensors

Fixed systems

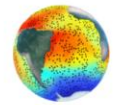
- Tsunameters - DBCP
- Offshore platforms - DBCP
- Moored buoys - DBCP
- Ocean reference stations - OceanSITES
- Sea level gauges - GLOSS
- High Frequency radars

Ship based measurements

- Manned weather stations - SOT/VOS
- Automated weather stations - SOT/VOS
- Radiosondes - SOT/ASAP

Reference lines and areas

- Repeat hydrography - GO-SHIP
- eXpendable BathyThermographs - SOT/SOOP
- Sampled sites - OceanGliders



Generated by ocean-ops.org, 2023-04-06
Projection: World Plate Carree (-150,0000)

Cal/Val

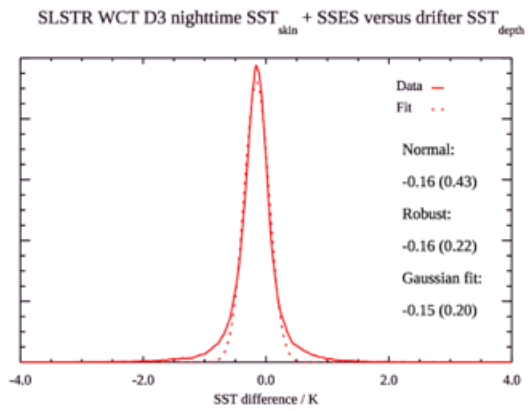
Global satellite Sea-Surface Temperature validation

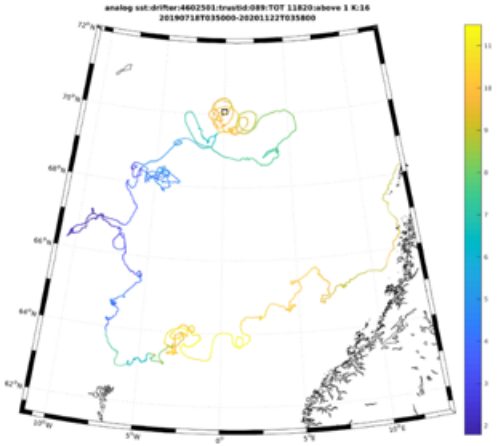
Reference data, such as drifting buoys, are essential for satellite SST validation

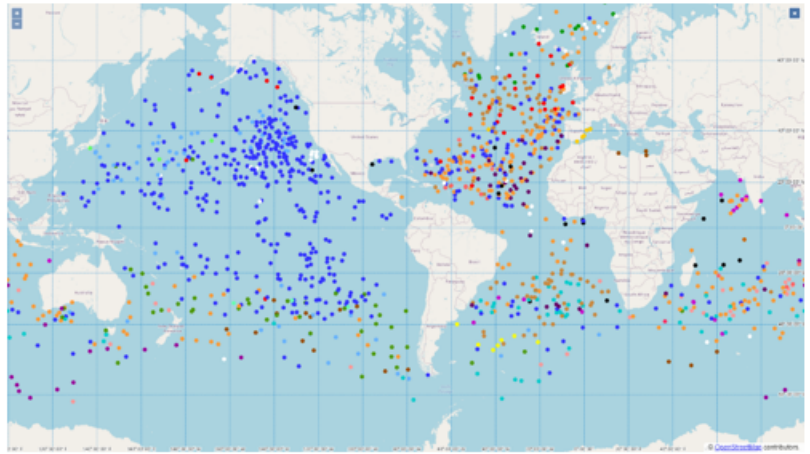
Validation activities crucial to assessing and maintaining SLSTR SST product quality

- Collocations with all drifting buoy SST (HRSST2)
- Inter-comparisons with other satellite SST
- Collocations with Fiducial Reference Measurements (e.g. radiometers, reference drifting buoys such as TRUSTED)

Matchup database (MDB) with satellite Sea Surface Temperature available on request from EUMETSAT



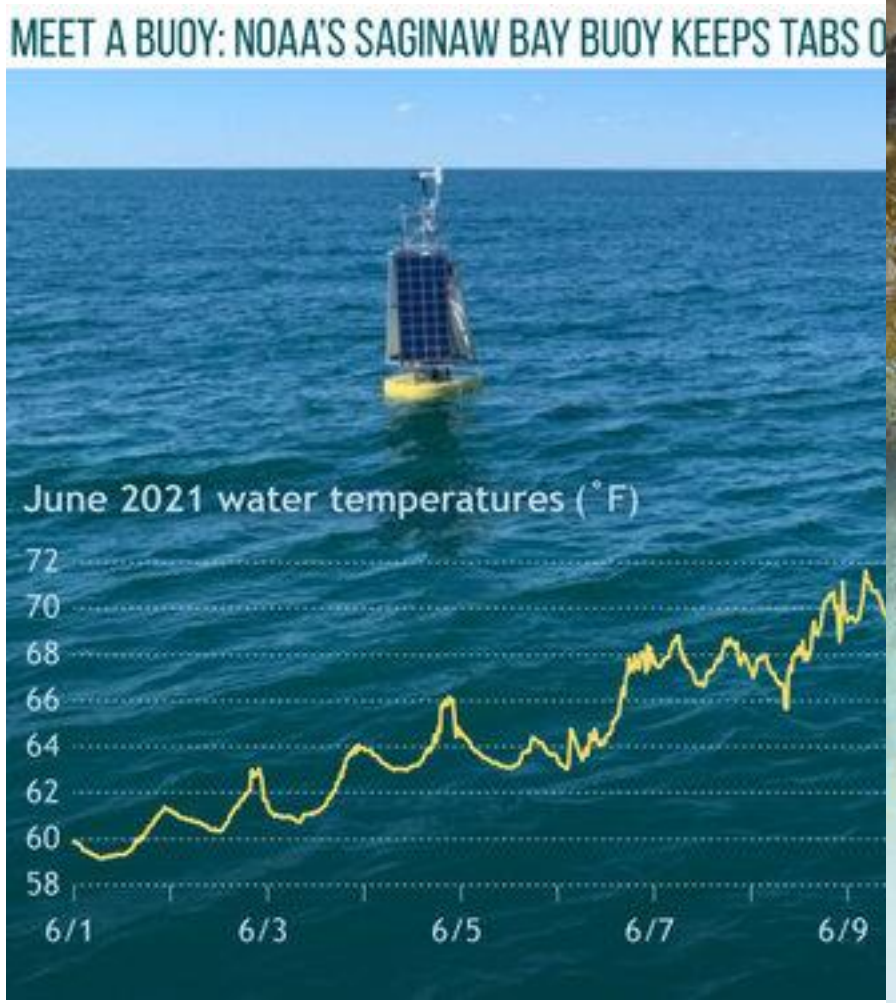


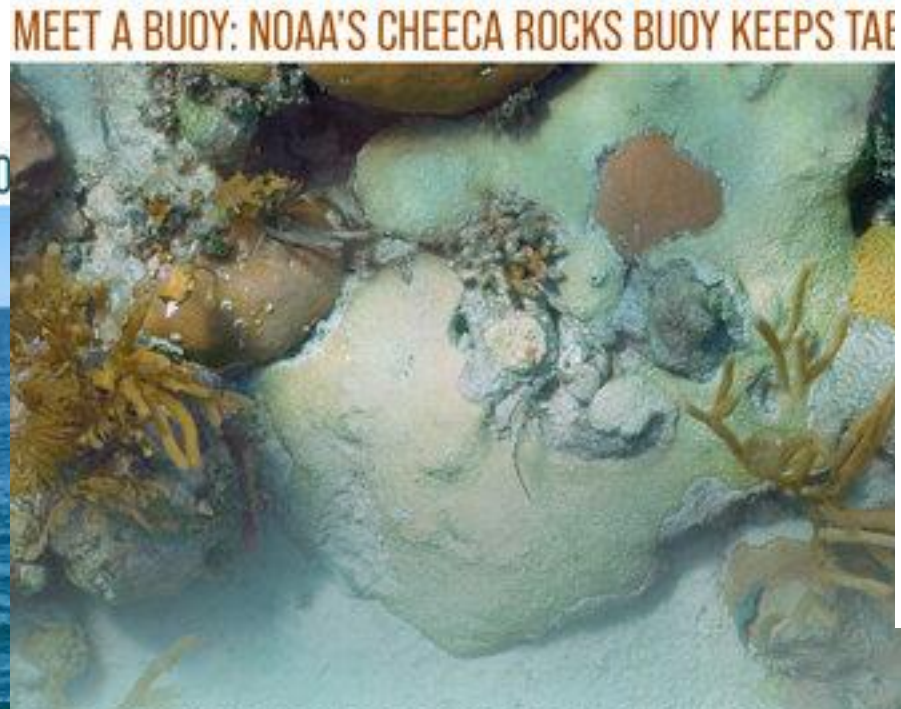


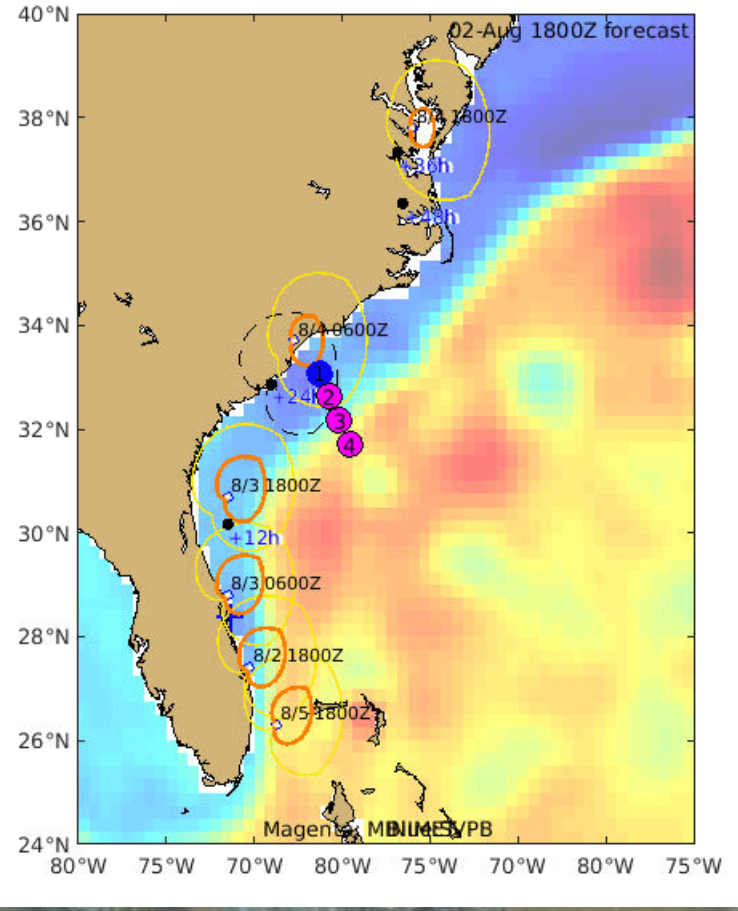
Global Drifter Programme array 4th May 2022
https://www.aoml.noaa.gov/phod/gdp/interactive/drifter_array.html

© Anne O'Carroll

Weather, Climate and Health







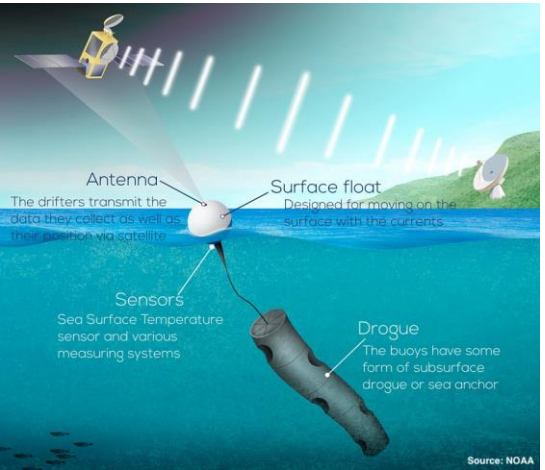
Evolution

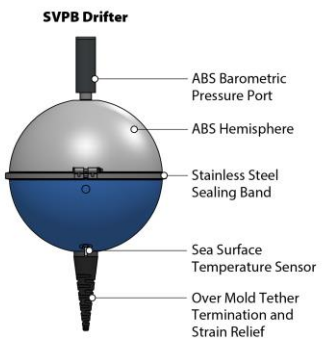
1974-1985

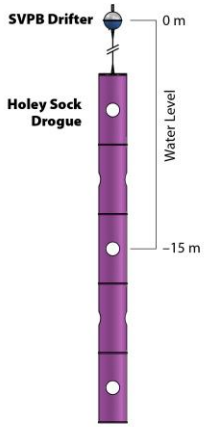
1985-1993-1999-2005

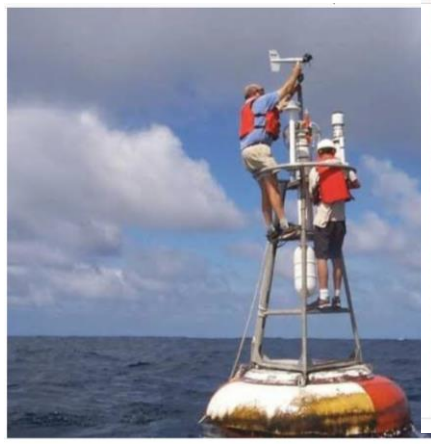
2005-2019

2019-









Manufacture and Operations

- Sensors and Instruments
- Deployment and Maintenance
- Vandalism
- Environmental Stewardship
- Recovery

Sensors and Instruments

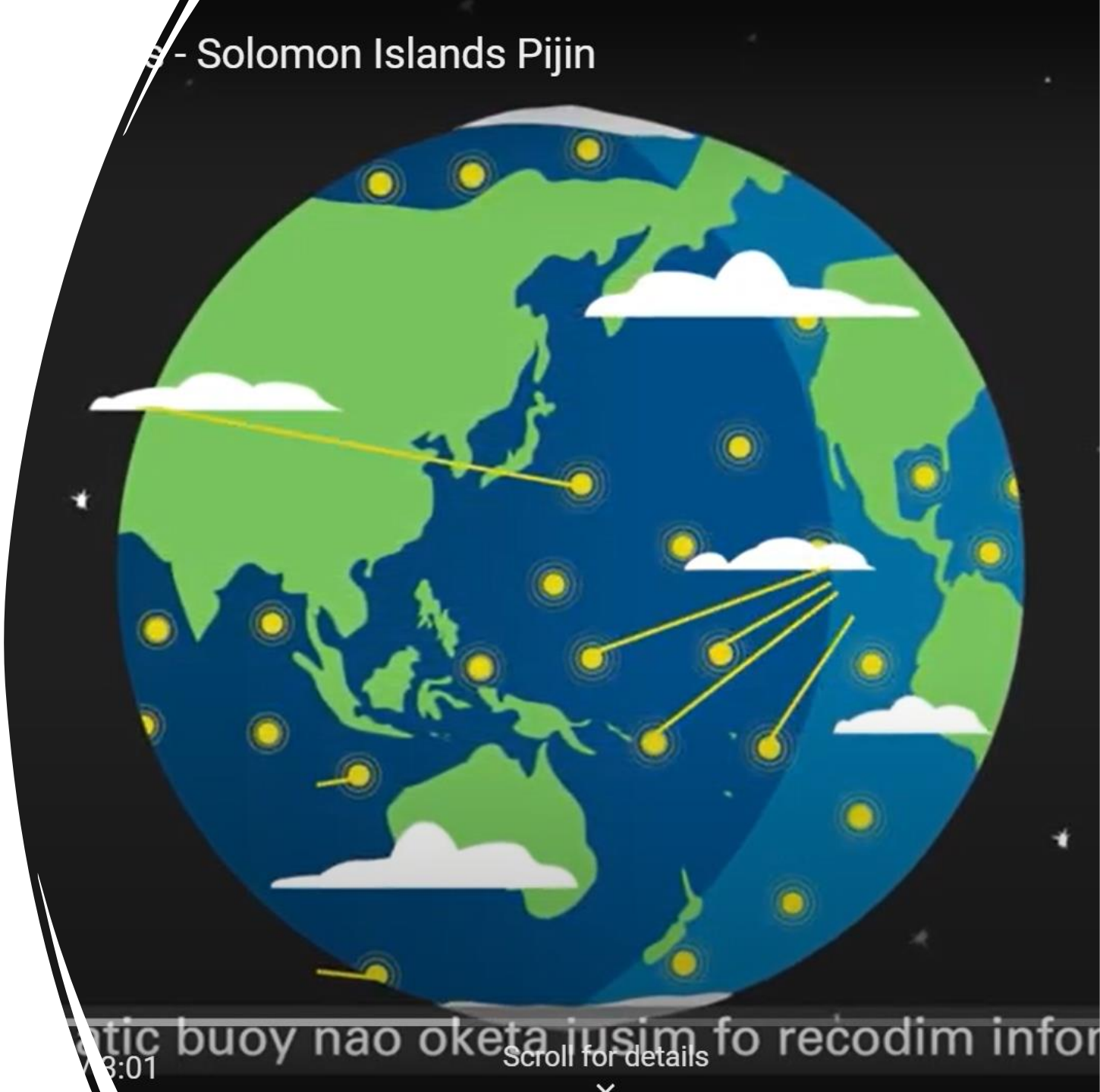
Sensor Characteristics					
Sensors/Technique	Thermistor on hull	Barometer	Sonic anemometer / wind vane WOTAN (Wind Observations Through Ambient Noise)	Salinometer	Surface velocity (Hull+Drogue)
Measured variables (+ sub variables)[10]	SST	Sea level atmospheric pressure	Wind vector	Salinity	Location (GPS, Argos, Iridium) Drogue detection
Random uncertainty estimates (one standard deviation).	0.1 deg C (HRSST drifters to 0.05 deg C)	0.6 hPa			
Uncertainty in bias (one standard deviation)					drifter-derived seasonal climatology of global near-surface currents
Supporting variables[11]	Location (GPS, Argos, Iridium)	Location (GPS, Argos, Iridium)	Location (GPS, Argos, Iridium)	Location (GPS, Argos, Iridium) Conductivity Temperature Depth	
Derived products[12]					Surface velocity
EOV's (measured or derived)	Sea surface temperature			Sea surface salinity	Surface currents
Standard/commonly used sensor[13]					
Readiness of sensor or technique[14]	mature (8)	mature (8)	pilot (5)	pilot (5)	mature (8)

Composition of the Global Drifter Array on 24-Apr-2023:

DBi : 392
Pacif.Gyre: 353
SIO : 134
Metocean: 108
Unknown: 43
NKE : 21
Marlin Yug:4
TOTAL: 1055

Vandalism

- Working Group
- Documentation: https://www.ocean-ops.org/dbcp/deployments/anti-vandalism.html
- Videos: https://www.youtube.com/watch?v=nGEAdjYWYp0&list=PLNaX-uTWSWrHr554n5hLdemL-idLcefMq



Environmental Stewardship

- Task Team

https://www.ocean-ops.org/dbcp/community/environmental.html

- Survey and Baseline Study
- Recovery pilots

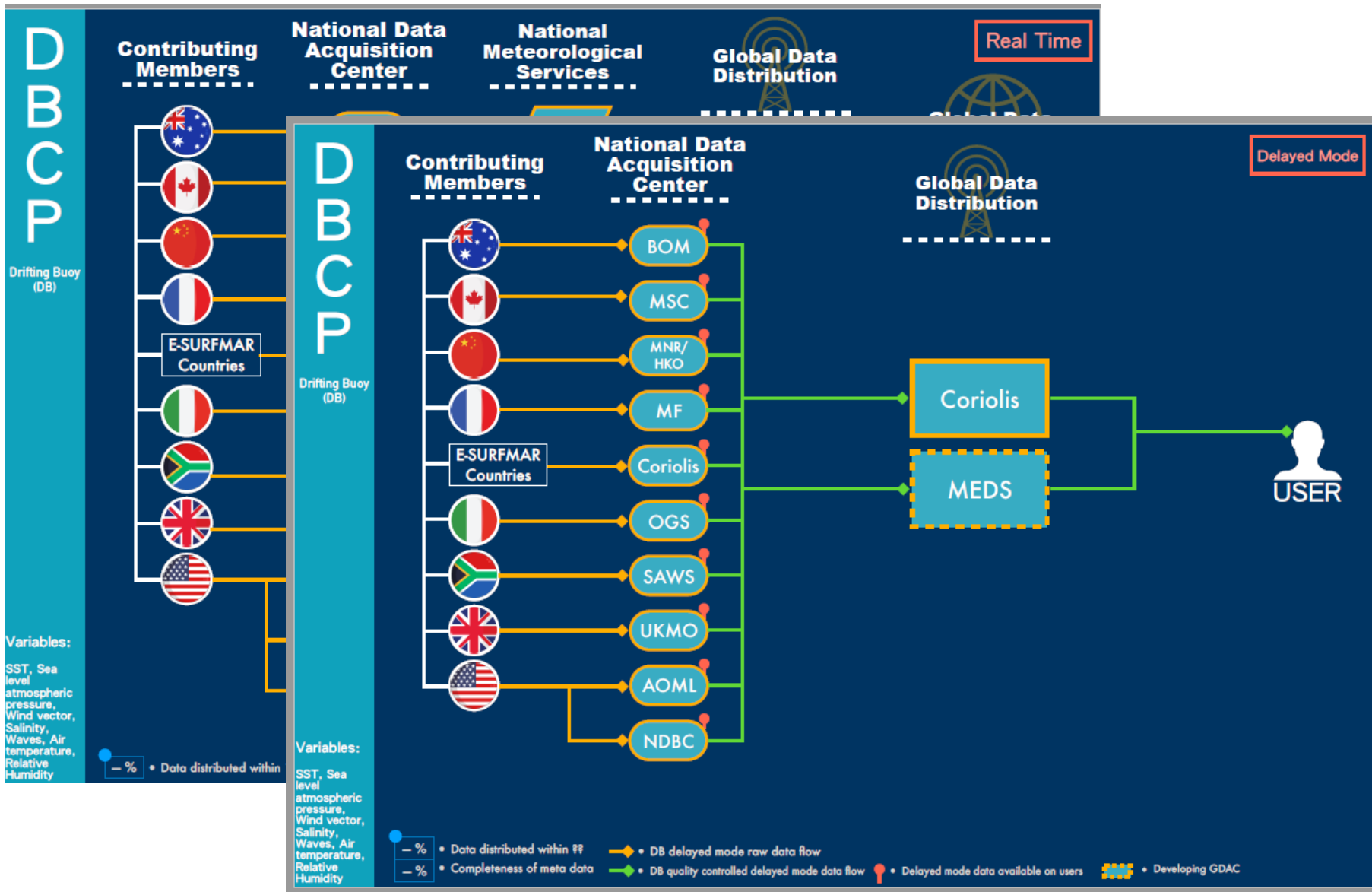
Survey on Environmental Stewardship of DBCP Observations

The benefits of ocean observing systems to climate, water and weather predictions are well known but the environmental impact of these observing system have not been a significant consideration for network design and planning, operations, or the decommissioning processes to date. The recently ratified WMO Global Basic Observing Network (GBON) outlines the requirements for distance between observations, frequency of observations and international sharing of observations. To support the implementation of GBON, the World Meteorological Organization (WMO) Commission for Observation, Infrastructure, and Information Systems (INFCOM) has committed to promote the development and adoption of cost-effective strategies and technologies which are both operationally and environmentally sustainable.

Environmental Stewardship is the responsible use and protection of the natural environment through conservation and

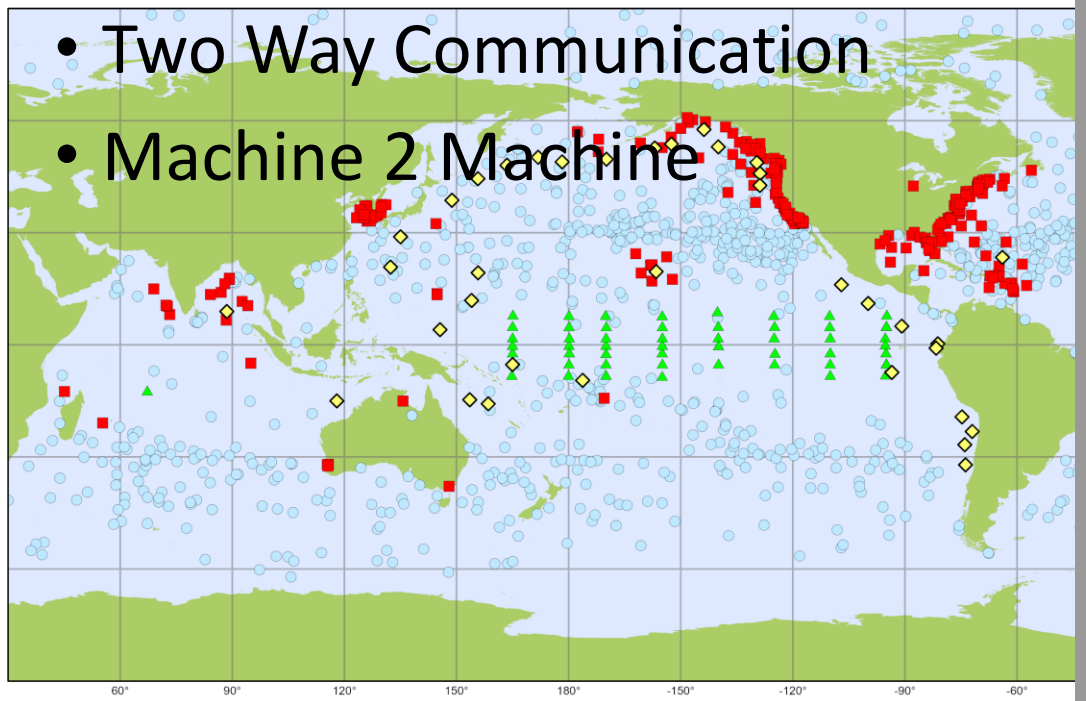
Data Management

- Collection
- Quality Control
- Sharing
- Archival
- Applications



Metadata

- Definition
- Standardization and Integration
- Two Way Communication
- Machine 2 Machine

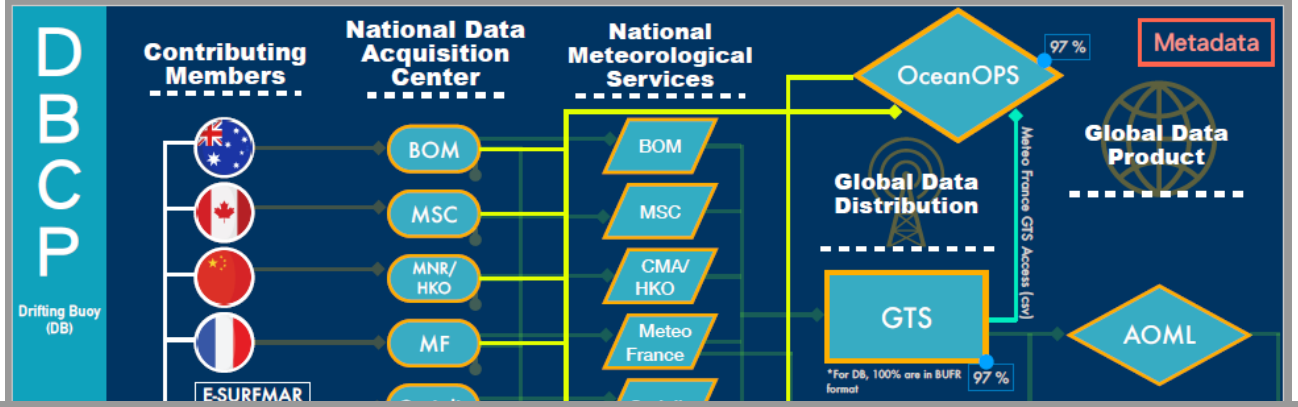


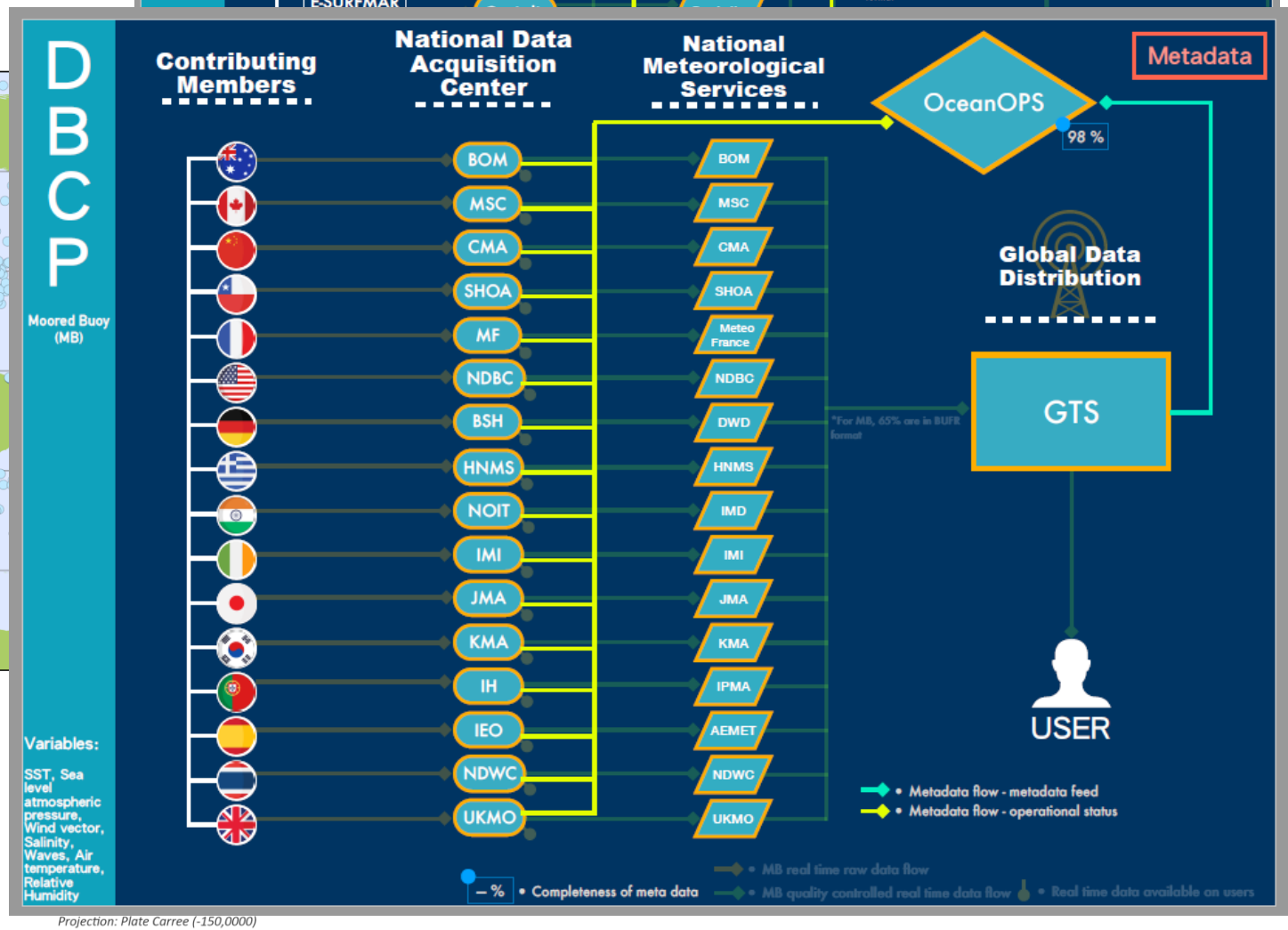
Data Buoy Cooperation Panel

Operational Platforms

Platforms operational during the month. GTS data as received by Meteo France.

- Tsunameters (37)
- Coastal/National MB (292)
- Tropical MB (77)
- Fixed Platforms (88)
- Drifting Buoys (1 240)





Projection: Plate Carree (-150,0000)

How DBCP Works

Executive Board

Chair

Environmental Stewardship

Technology Innovation

Diversity and Inclusivity

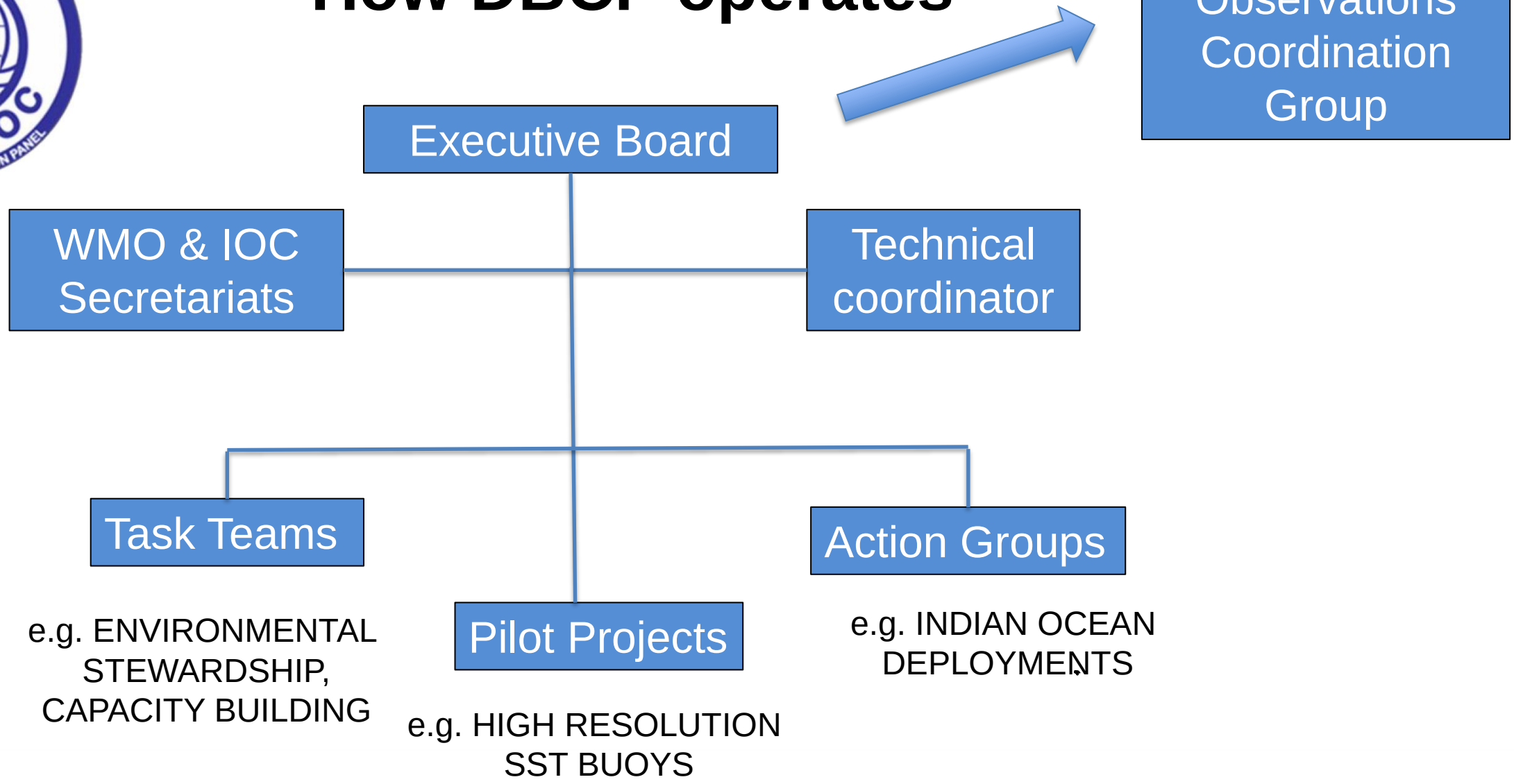
Impact and value

Scientific Excellence

International cooperation partnerships

Operational excellence

How DBCP operates

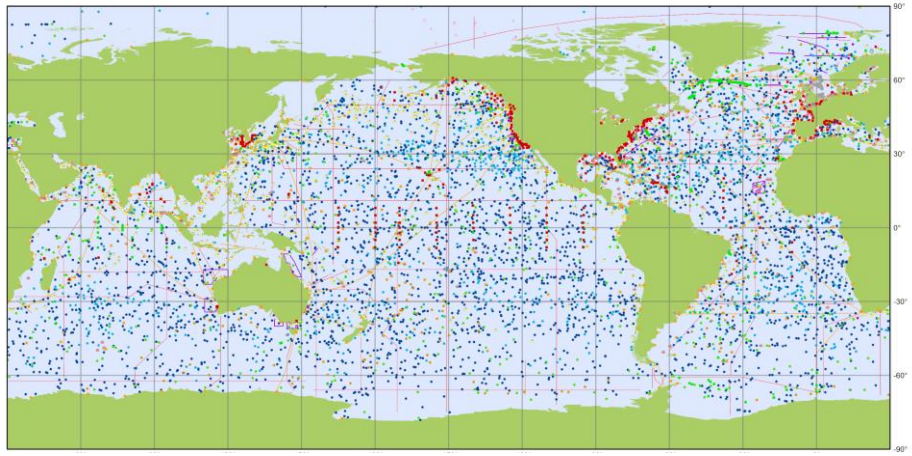


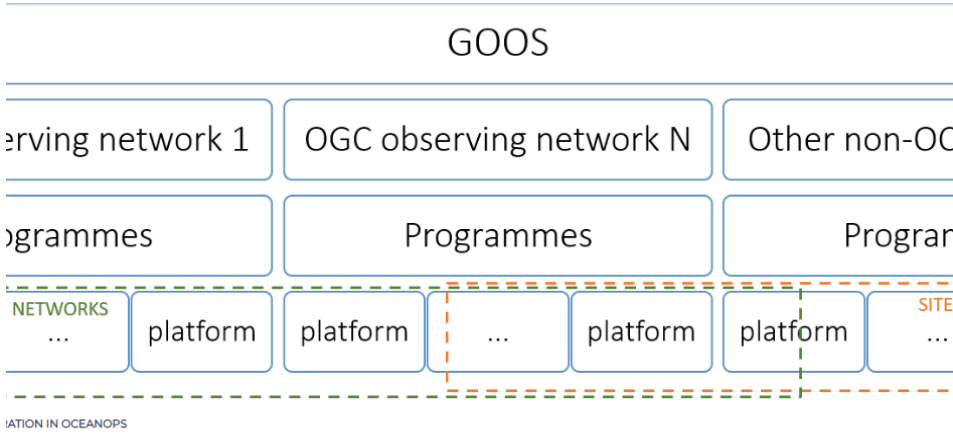
Where to FIND?

- FAQs: https://www.ocean-ops.org/dbcp/overview/FAQs.html
- Documents: https://www.ocean-ops.org/dbcp/community/documents.html
- Metadata: https://www.ocean-ops.org/board?t=dbcp
- Events: https://www.ocean-ops.org/dbcp/community/meetings.html
- Contacts: https://www.ocean-ops.org/dbcp/community/contacts.html
- More to contact: Ljiang@ocean-ops.org

OceanOPS

- Overall Structure
- Metadata
  - ✓Definitions
  - ✓Reference table
  - ✓Inputs and Outputs





ATION IN OCEANOPS

2.4. Concept definitions

The following tables list the main concepts composing OceanOPS' metadata model. They include the default name of the concept, a description, known aliases and any code table to that concept and mapped at OceanOPS (not necessarily used as it, but mapped). This list is not exhaustive and will be completed over time.

(**) Auto calculated/derived metadata

2.4.1. Implementers

As described below, the definition of this environment must be done only once (or to be updated when for new contact information, ...)

Entity	Description	Known aliases	Code tables
Agency	An agency is an organization, a manufacturer, a data centre, POGO member, etc. A role can be dedicated to each one (program/agency, platform/agency). Agencies can be regrouped under 'POGO'. ▪ Agency role values	Organization, platform_maker	EDMO
Program	A program defines a group of platforms or cruises managed by the same lead agency (generally national). It materializes the implementing, operating, and responsible team. A program is bound to: ▪ one and only one country, ▪ to one or several agencies (including one lead agency) with defined roles, ▪ to a set of contact points with defined roles. Some particular cases such as EuroArgo (European Research Infrastructure Consortium), or E-SURFMAR (EUMETNET, grouping of European National Meteorological Services) use a multinational agency and "Europe" as country.	Institution, project_name	WIGOS 2-02
Country (**)	The country list used by OceanOPS is a union of the member state lists of the IOC-UNESCO and the WMO, plus 'Europe'. ISO 3166-1 is used to identify them.	Member State (IOC-UNESCO), Member Territory (WMO)	C32 (International Stan Organisation countries

OceanOPS

- Monitoring GOOS networks
  - Metadata system

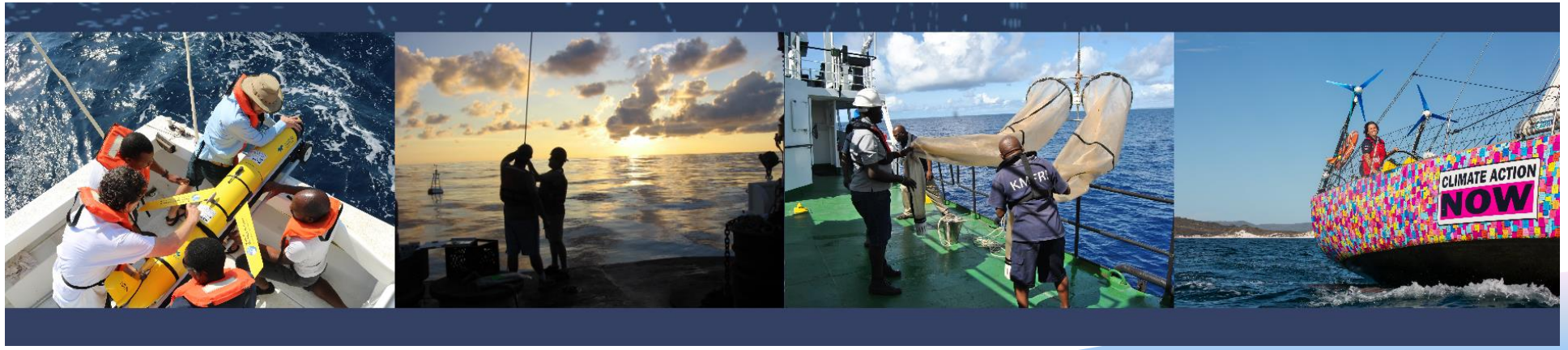
  https://www.ocean-ops.org/metadata
  - WMO ID allocation

  https://www.ocean-ops.org/api/1/help/#about-the-api
- Annual report card

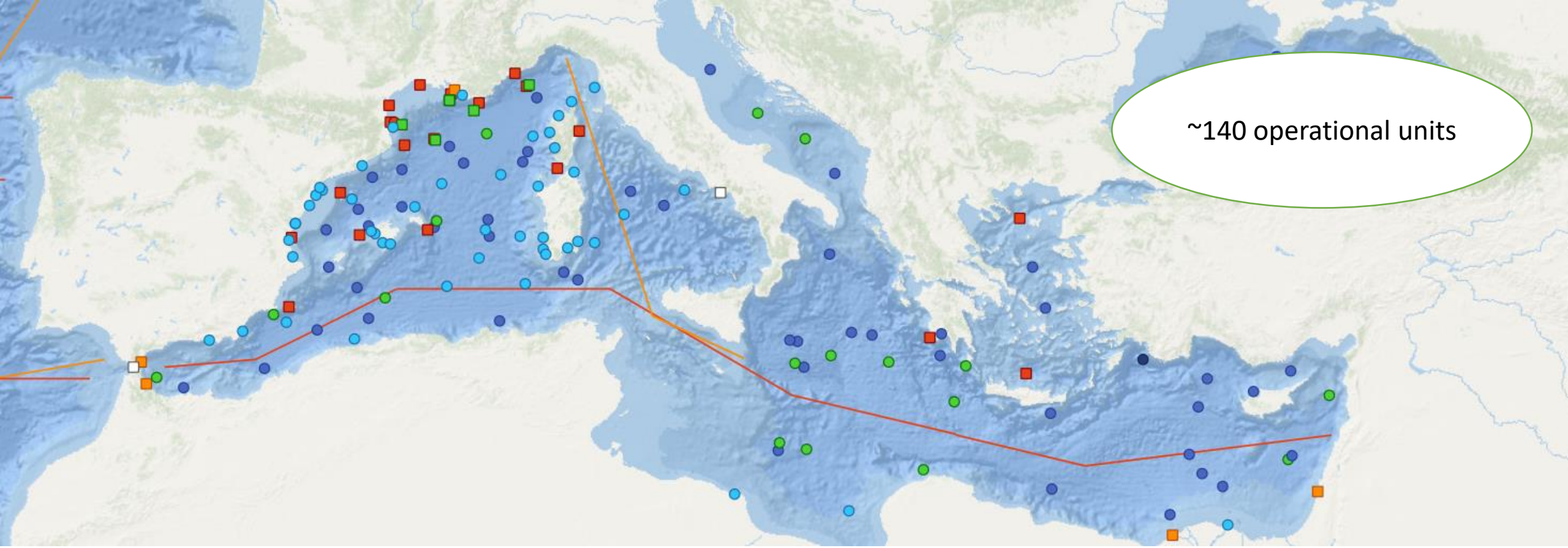
  https://www.ocean-ops.org/reportcard
- Facilitate global and regional coordination
- Facilitate new data stream and deployment initiatives

GOOS *in situ* networks[1]	Implementation STATUS[2]	Data & metadata REAL TIME[3]	Data & metadata ARCHIVED DELAYED MODE[4]	Data & metadata META-DATA[5]	Best practices[6]	GOOS delivery areas[7] OPERATIONAL SERVICES	GOOS delivery areas[7] CLIMATE	GOOS delivery areas[7] OCEAN HEALTH
Ship based meteorological - SOT	★★☆	★★☆	★★☆	★★☆	★★☆	✓	✓	
Ship based oceanographic - SOT	★★☆	★★½	★★★	★½☆	★★☆	✓	✓	
Repeated transects - GO-SHIP	★★½	Not applicable	★★★	½☆☆	★★★		✓	✓
Sea level gauges - GLOSS	★★½	★★☆	★★★	★☆☆	★★☆	✓	✓	
Time series sites - OceanSITES	★★☆	Not applicable	★★½	★★☆	★★☆		✓	✓
Moored buoys - DBCP	★★½	★★★	★★★	★★☆	★★½	✓	✓	✓
Tsunami buoys - DBCP	★★☆	★★★	★★★	½☆☆	★★★	✓		
HF radars	★½☆ Emerging	★½☆	½☆☆	★☆☆	★★★	✓	✓	
Drifting buoys - DBCP	★★★	★★½	★★½	★½☆	★★★	✓	✓	
Profiling floats - Argo	★★★	★★★	★★★	★★★	★★☆	✓	✓	
Deep & biogeochemistry floats - Argo	★☆☆ Emerging	★★½	★★½	★★★	★★☆	✓	✓	✓
OceanGliders	½☆☆ Emerging	★★☆	★☆☆	★½☆	★★☆	✓	✓	✓
Animal borne sensors - AniBOS	½☆☆ Emerging	★☆☆	★★☆	½☆☆	★★☆	✓	✓	✓

(1) More information at www.goosocean.org (2) Status: status of the implementation compared to the community widely adopted targets when it exists; network self-assessed status when target doesn't exist. (3) Real time: data freely available, without any restriction, on Global Telecommunication System of WMO and internet. (4) Archived delayed mode: data of the highest quality available for scientific analysis (*e.g.* climate studies). (5) Metadata: information required by OceanOPS. (6) Best Practices: community reviewed and easily accessible documentation encompassing the observations lifecycle (7) See Network Specification Sheets: www.goosocean.org > Observations > Network Specification Sheets. More information on networks status & indicators definition at: ocean-ops.org/reportcard2022

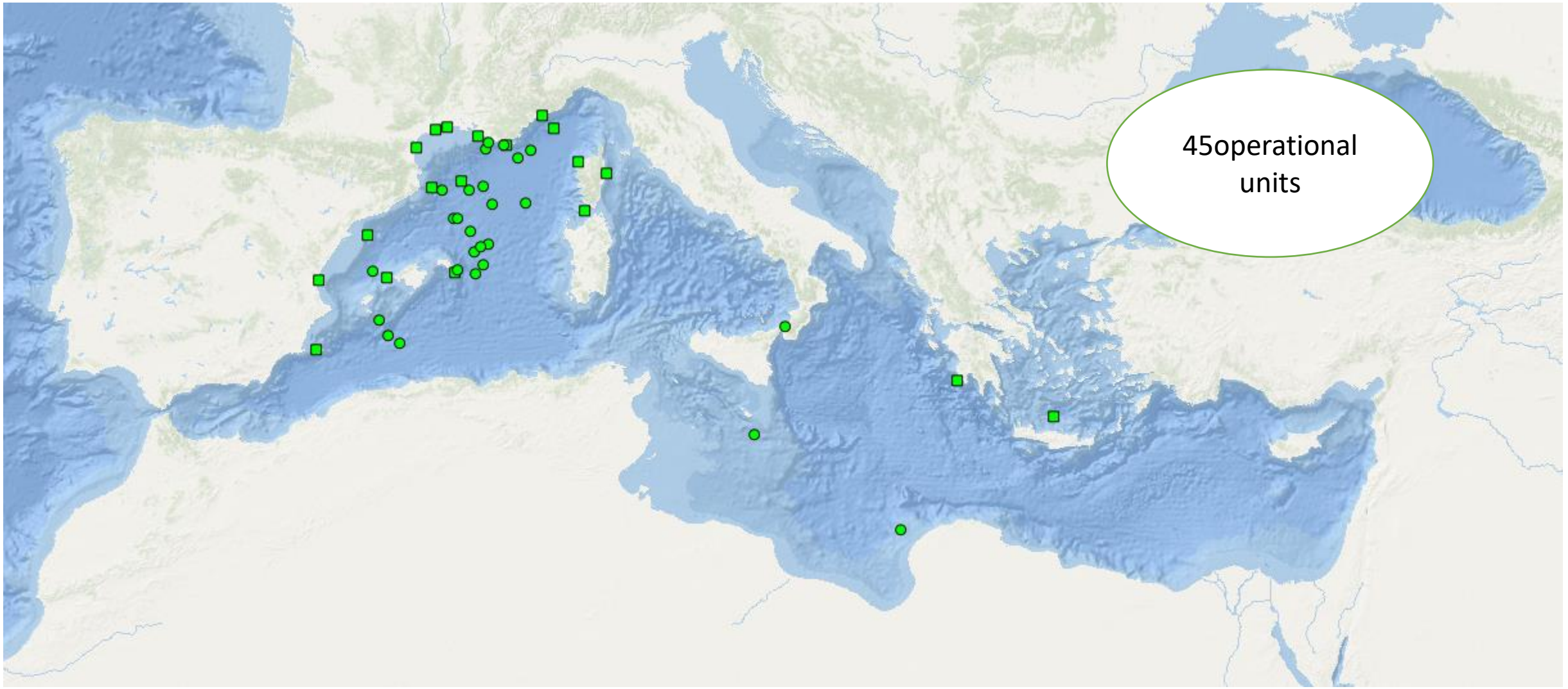


- https://www.ocean-ops.org/reportcard/reportcard2022.pdf



Ocean Observations in Mediterranean

- Overview of all monitored networks
- Contributors (8)
- Gaps and issues


45operational
units

Thank You
&
Questions?