

Observations 1: Overview

The Global Ocean Observing System

Meghan Cronin

NOAA Pacific Marine Environmental Laboratory

What are Observations used for?

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- **Observations for mapping fields, initiating or nudging models**
- **Observations for validation**
- **Observations for improving model physics, parameterizations and understanding of processes**

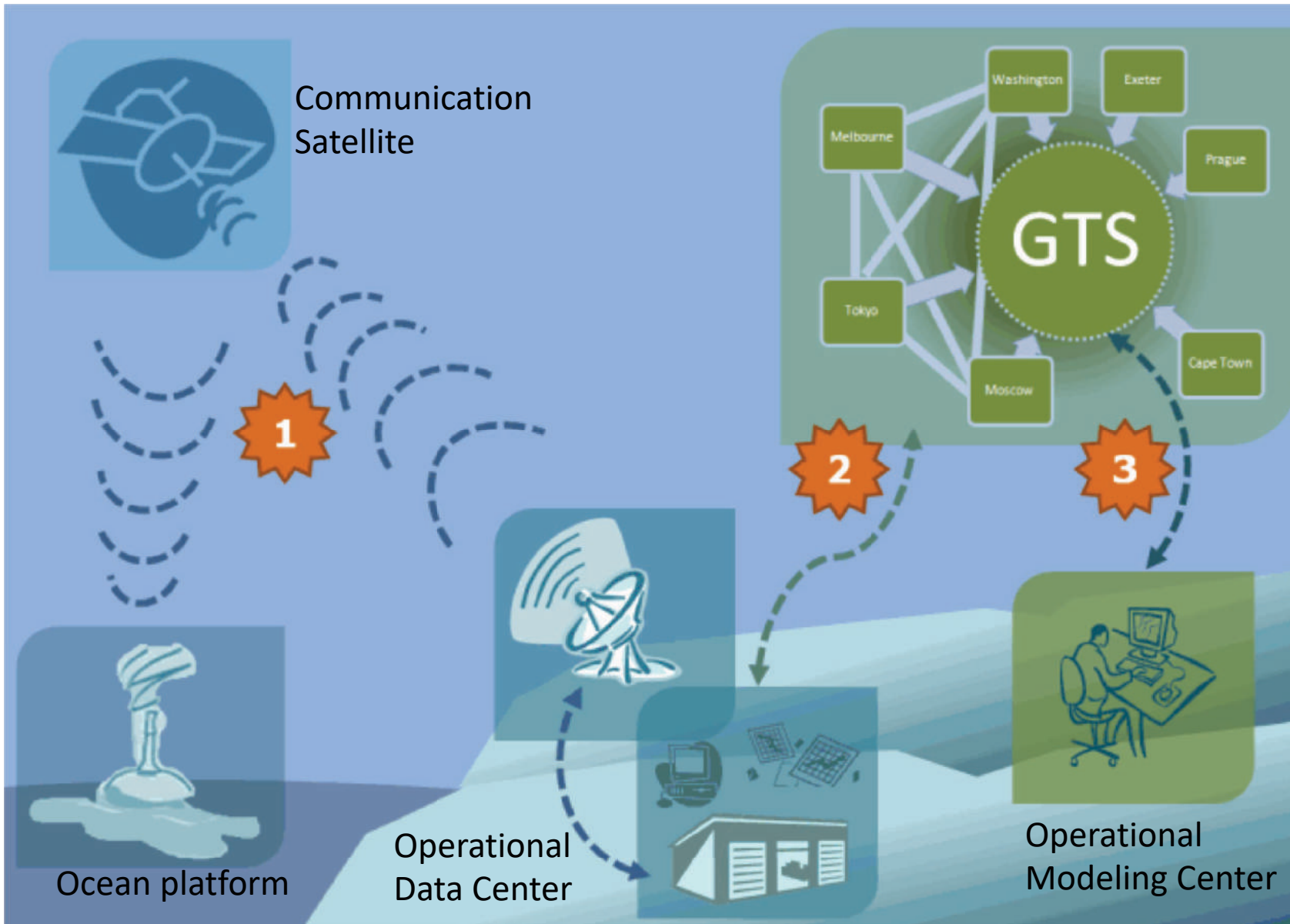
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 - Timely (available through the Global Telecommunication System (GTS) in near realtime)
 - Geographically distributed in coherent array, with known uncertainty and quality

What is the Global Telecommunication System (GTS)?



The 3 parts of the WMO telecommunications systems used for sharing real time ocean and weather data:

1. From ocean platform (e.g. buoy, drifter, float) to Satellite (e.g. Iridium), to National Data Centers.
2. From Data Centers to the GTS of WMO (WMO #, GTS bulletin format,...)
3. From the GTS to a downlink node and the data user (e.g. modeling center).

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 - Oversampled, high quality observations

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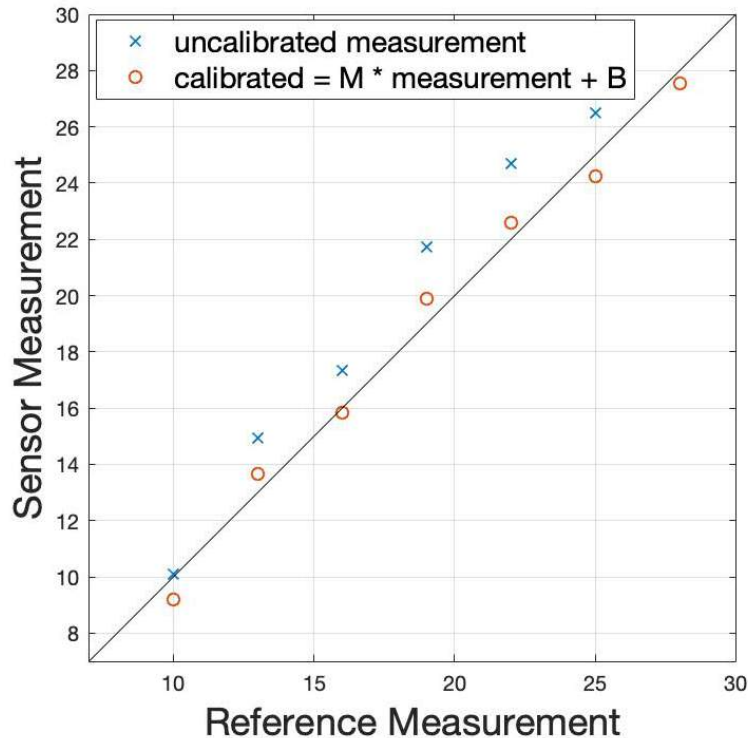
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 - **Oversampled, high quality observations**

How many errors can I have?

- Mistakes and Miscalculations
- Mean bias errors & Random uncertainty due to noise
- Systematic biases due to sampling issues
- Systematic biases due to field errors
- Systematic biases due to calibration errors, model physics errors, etc.

How many errors can I have?

- Mistakes and Miscalculations
- Mean bias errors & Random uncertainty due to noise



Bias error and scaling error can be minimized by calibrating (i.e. regressing) against a reference.

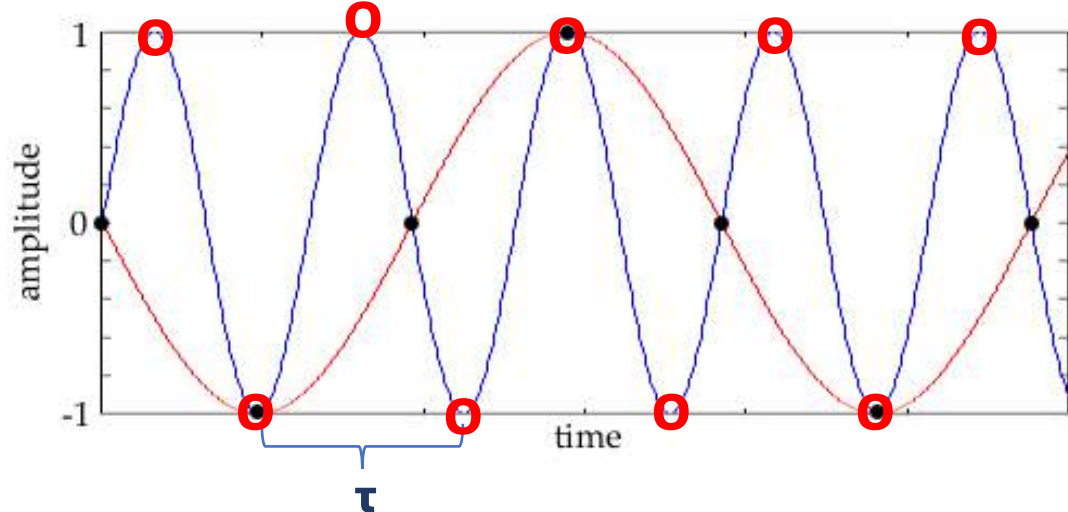
Sensor will still have an error due to random uncertainty.

$$\text{Standard Deviation} = \langle (y - y_{\text{ref}})^2 \rangle^{0.5}$$

How many errors can I have?

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- Mean bias errors & Random uncertainty due to noise
- Systematic biases due to sampling issues

Geophysical signal vs. Undersampled signal



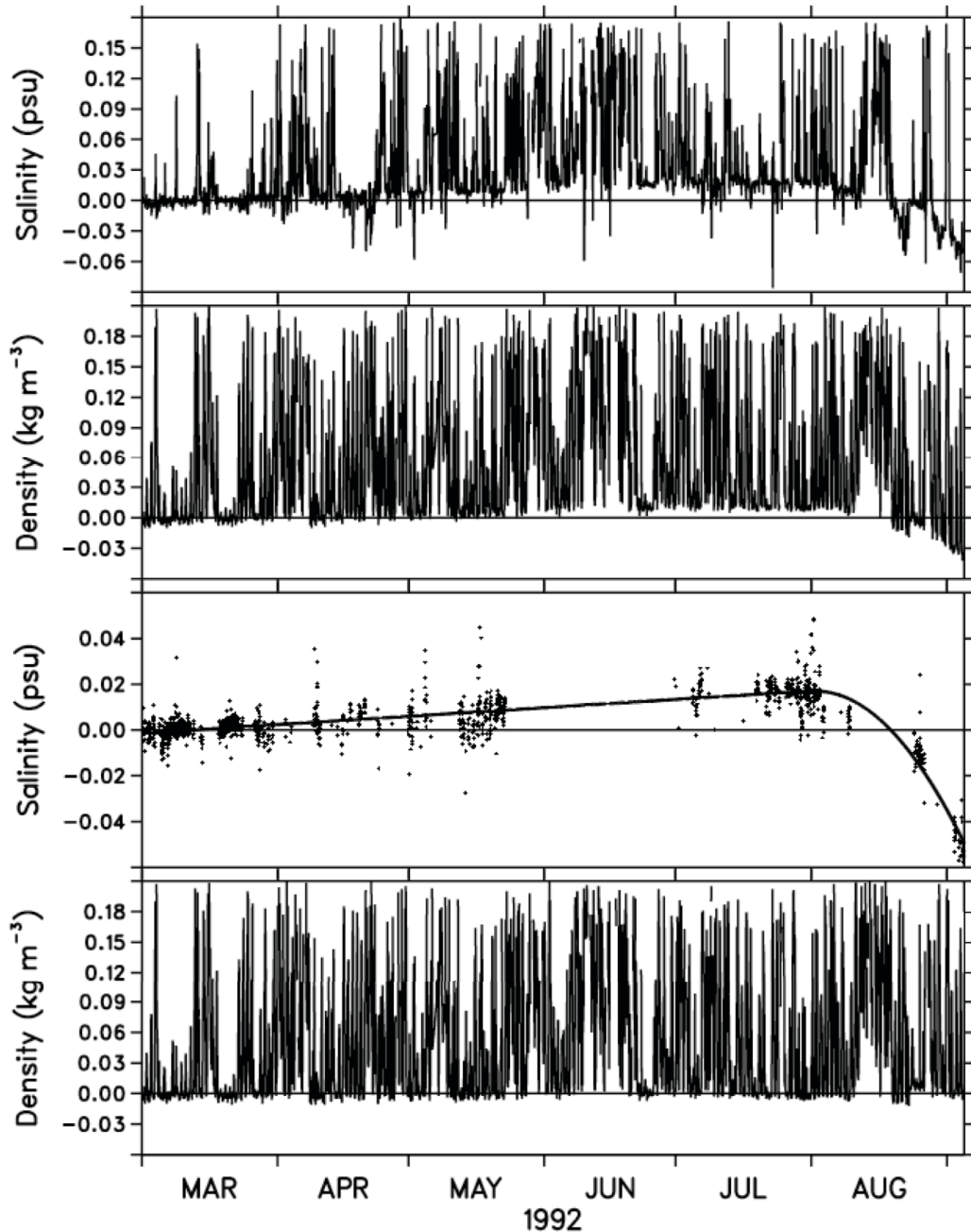
If a signal has a frequency $f_0 (= 1/\tau)$, then must sample at a rate more frequent than $2f_0 =$ “Nyquist Frequency”. Otherwise, will introduce lower-frequency aliasing.

○ samples at the Nyquist Frequency

How many errors can I have?

- Mistakes and Miscalculations
- Mean bias errors & Random uncertainty due to noise
- Systematic biases due to sampling issues
- Systematic biases due to field errors (e.g. sensor drift, biofouling, bird poop, radiative heating of sensor, clock errors, ...). **Quality Control: Flag if not in expected range. Some biases can be corrected in postprocessing.**

FU4: 0°,156°E: 11m – 1m



Salinity is subject to both a drift due to “scouring” of conductivity cell (will make salinity appear to be too fresh) and biofouling (will make salinity appear to be too salty).

Assume these effects are reduced as go deeper in water column. **Good Assumption.**

Assume that any apparent longterm density “inversion” is due to biofouling of shallower sensor. **Excellent Assumption! Gravity works.**

Assume that any apparent nighttime stratification in the mixed layer is due to scouring of the shallow sensor. **Good Assumption is know how deep mixed layer is.**

Remove piece-wise fit to salinity differences.

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Global Ocean Observing System (GOOS)

Sponsored by:



Overlapping global satellite and in situ networks

VS.

A set of regional integrated observing systems that are each “Fit for Purpose”

Use <http://www.jcommops.org/> to help explore the GOOS

JCOMMOPS = WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology in situ Observations Programme Support Centre.

Check out the brand-new menu with improved search engine.

These shortcuts have been redesigned too. A new section for charts enters the stage.

Want to share something? Get a permalink to this dashboard here.

If you get lost, click the JCOMMOPS logo in upper left corner

Maps menu has two choices: "static" gives maps for different networks "interactive" allows you to click on the dot on the map to get more info



JCOMMOPS integrated perspective is being built on top of the monitoring capacity of each observing network.

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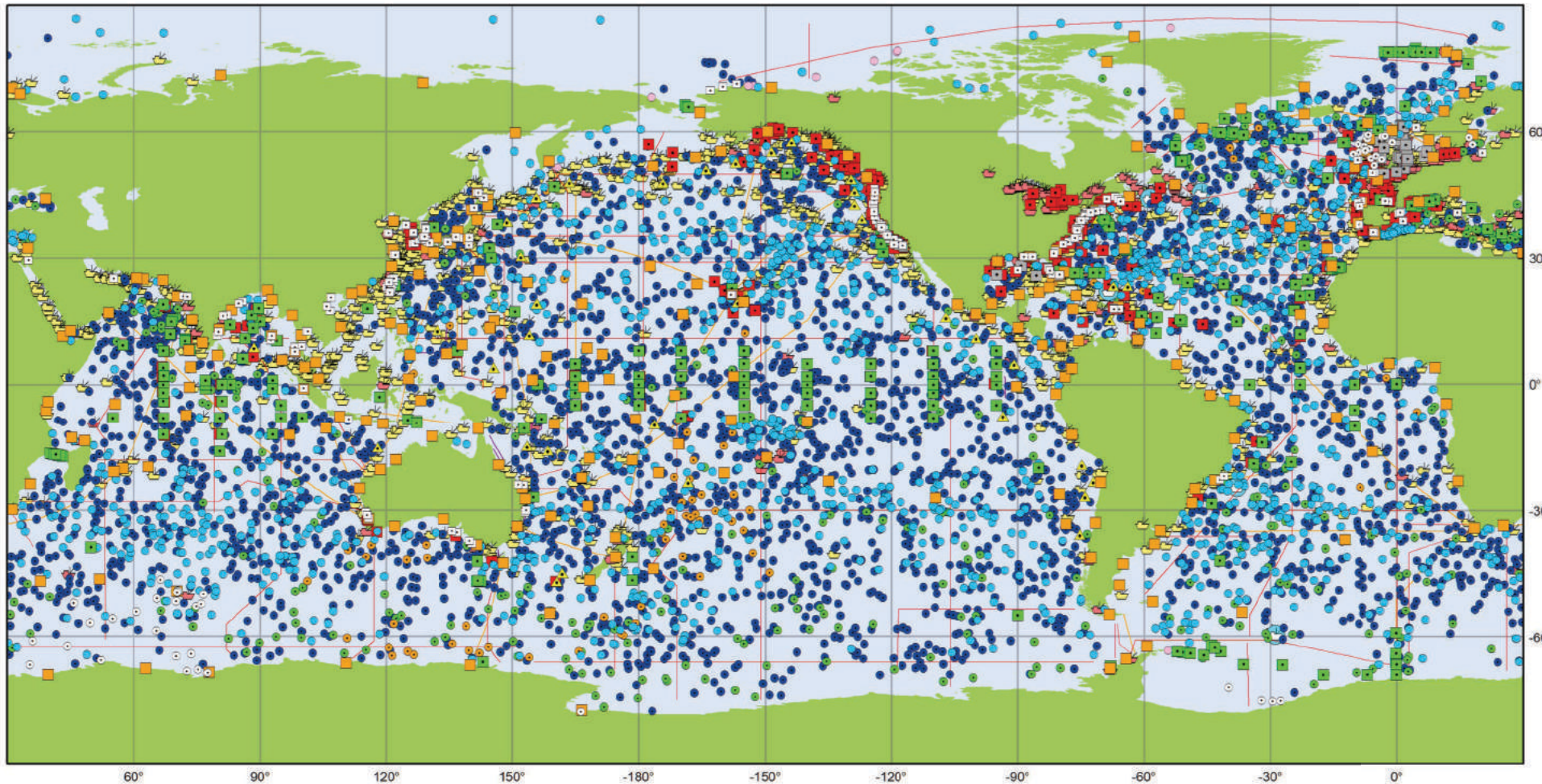


Click anywhere on the map to activate it

News panel showing system notifications: [DBCP] MF MB: new platform 6100002_016, 6100002_015, 6100002_014, 6100002_013, 6100002_012

<https://www.jcommops.org>

Along top bar, Select:
"Maps"
In pulldown menu Select:
"Static"



Main in situ Elements of the Global Ocean Observing System

April 2019

Profiling Floats (Argo)

- Core (3880)
- Deep (79)
- BioGeoChemical (352)

Data Buoys (DBCP)

- Surface Drifters (1444)
- Offshore Platforms (97)
- Ice Buoys (11)
- Moored Buoys (358)
- ▲ Tsunameters (38)

Timeseries (OceanSITES)

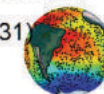
- Interdisciplinary Moorings (351)
- Repeated Hydrography (GO-SHIP)
- Research Vessel Lines (62)
- Sea Level (GLOSS)
- Tide Gauges (252)

Ship based Measurements (SOT)

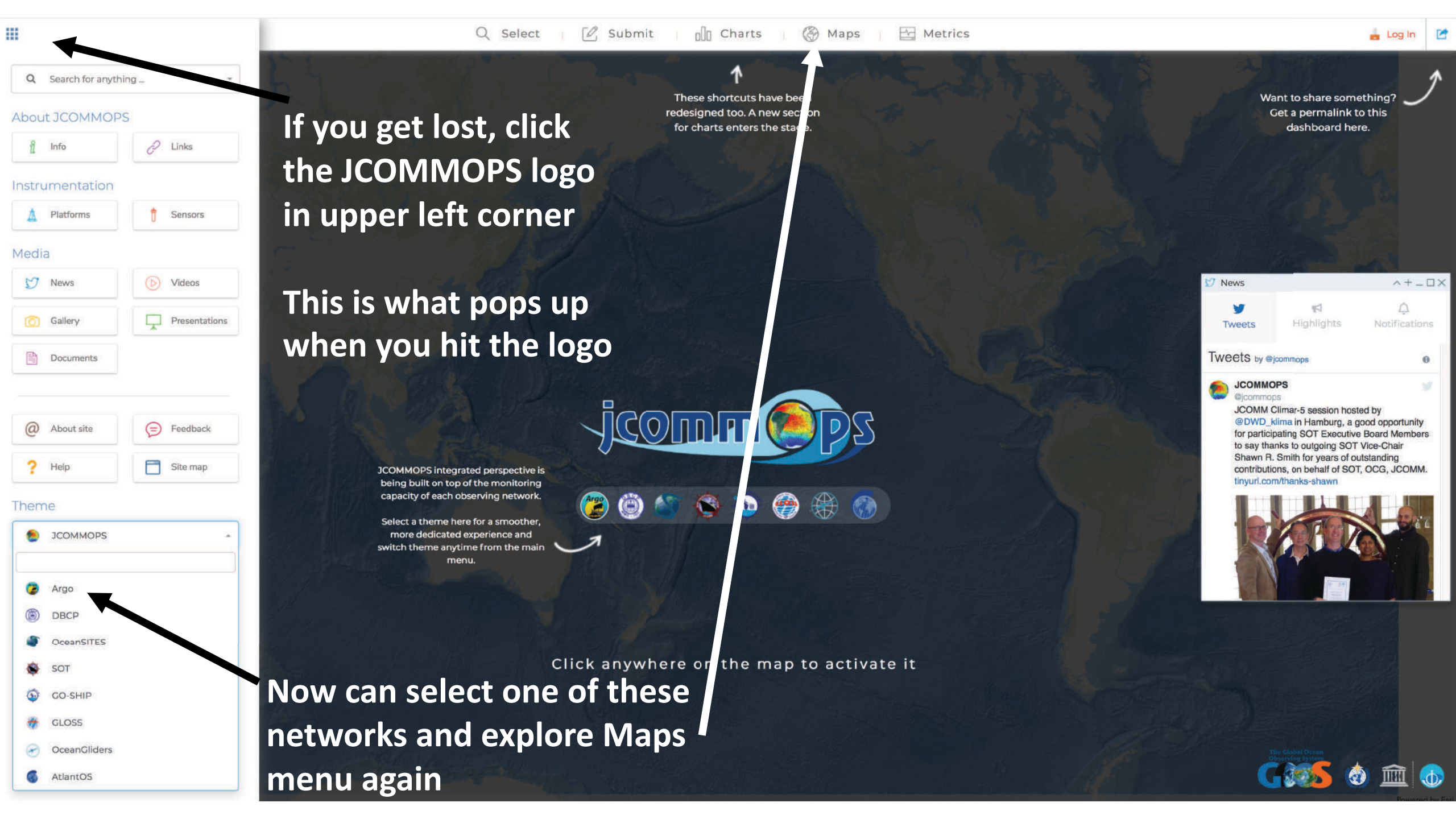
- Automated Weather Stations (257)
- Manned Weather Stations (1324)
- Radiosondes (11)
- eXpendable BathyThermographs (34)

Other Networks

- HF Radars (270)
- Animal Borne Sensors (53)
- Ocean Gliders (31)



Generated by www.jcommops.org, 14/05/2019

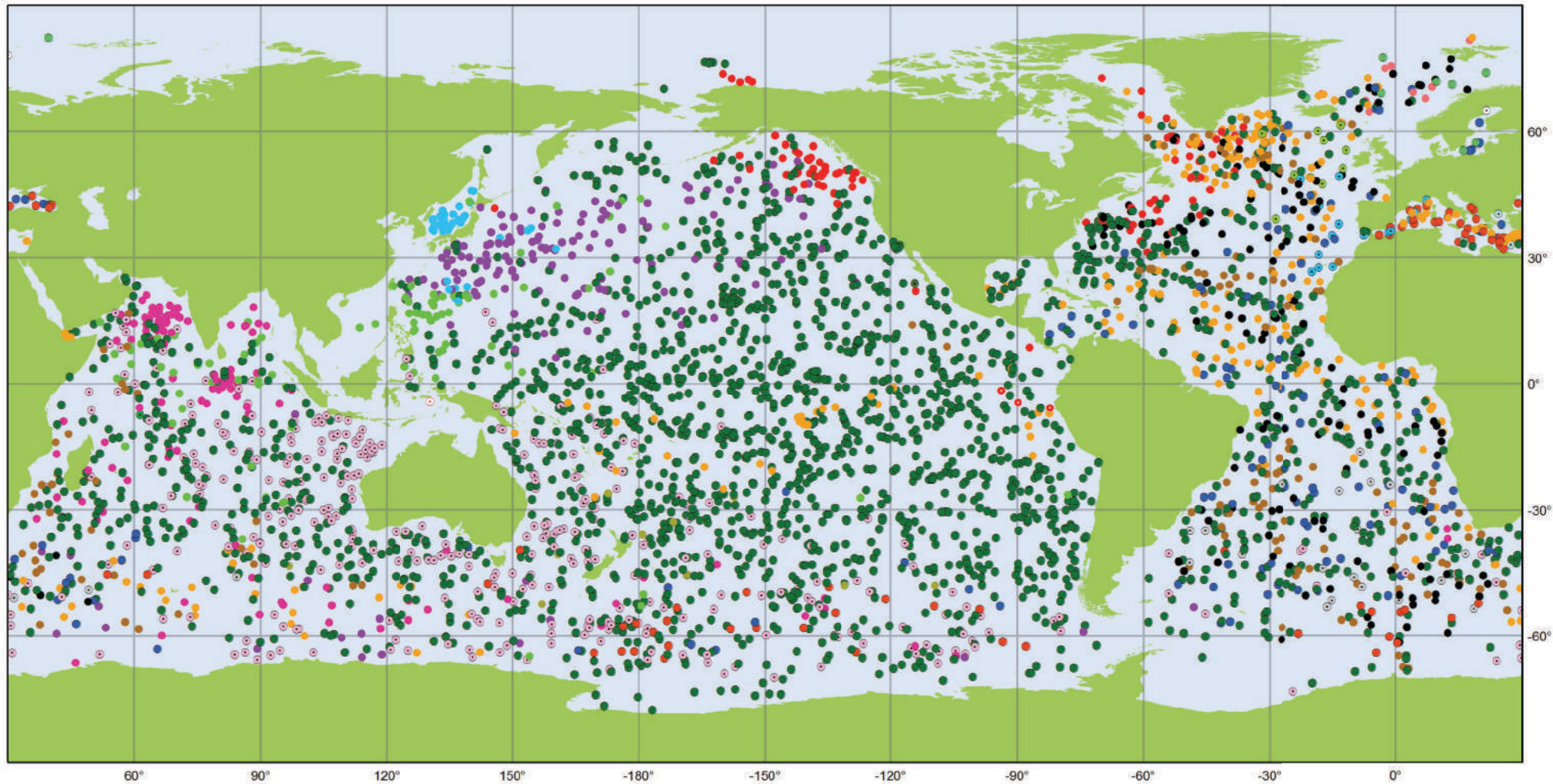


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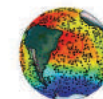


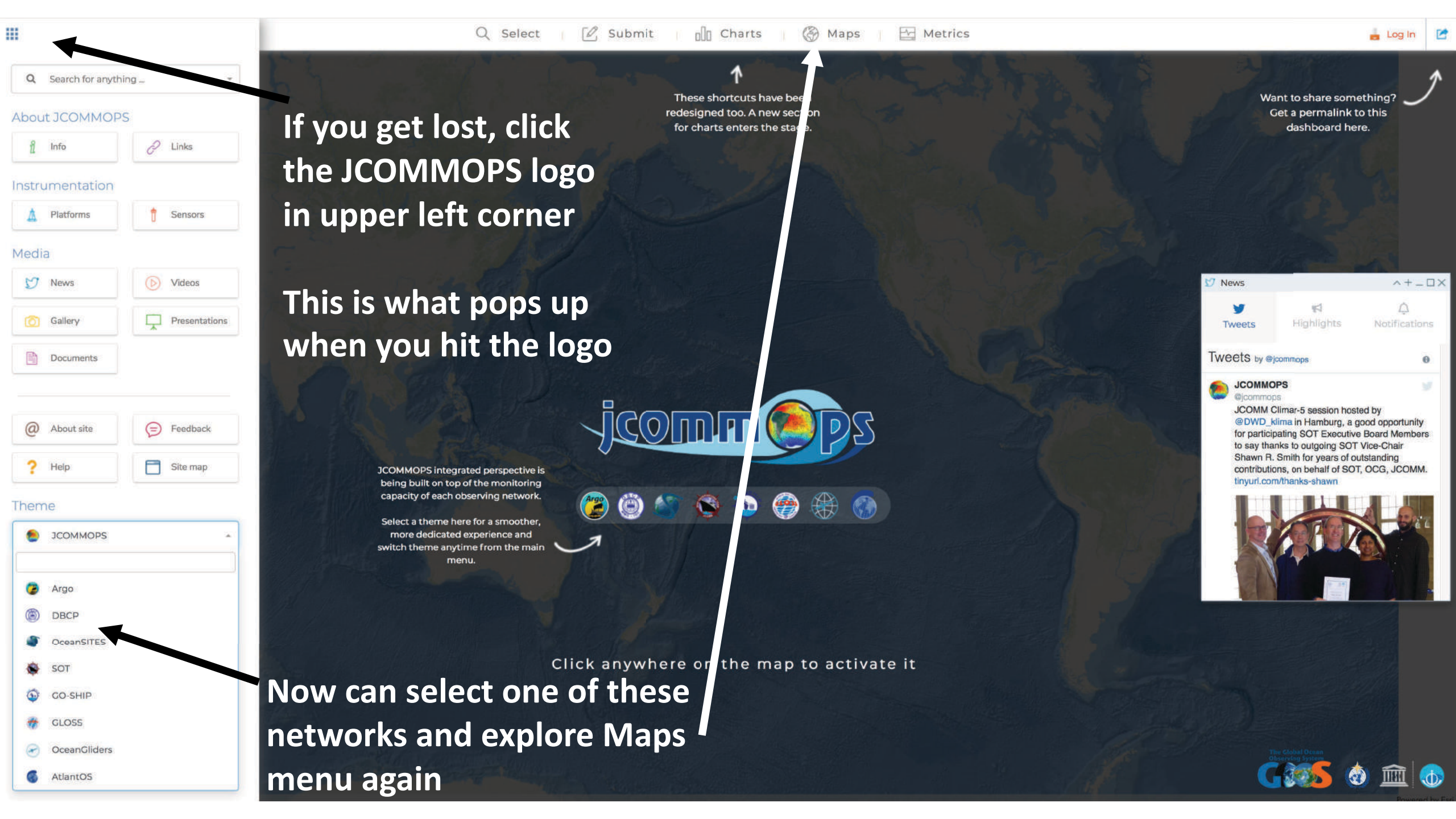
Argo

National contributions - 3884 Operational Floats
 Latest location of operational floats (data distributed within the last 30 days)

April 2019

○ AUSTRALIA (353)	● EUROPE (125)	○ GREECE (3)	● ITALY (76)	○ NETHERLANDS (23)	● POLAND (9)
● BRAZIL (1)	○ FINLAND (3)	● INDIA (121)	● JAPAN (157)	● NEW ZEALAND (11)	● KOREA, REPUBLIC OF (42)
● CANADA (92)	● FRANCE (284)	○ INDONESIA (1)	● KENYA (1)	● NORWAY (9)	● SPAIN (16)
● CHINA (93)	● GERMANY (150)	● IRELAND (11)	● MEXICO (1)	● PERU (3)	● UK (142)
					● USA (2157)





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Argo

DBCP

OceanSITES

SOT

GO-SHIP

GLOSS

OceanGliders

AtlantOS

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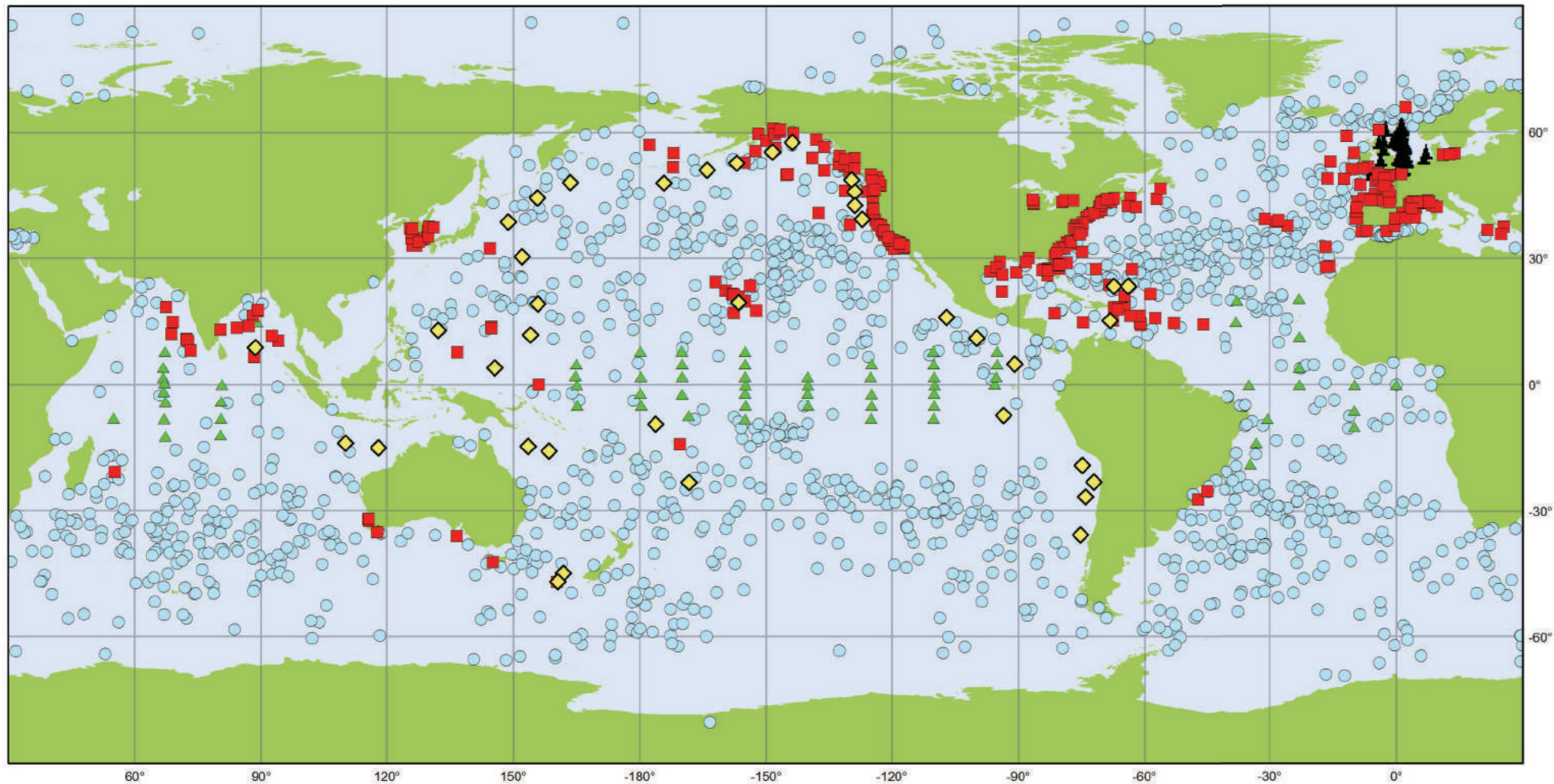
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Click anywhere on the map to activate it





Data Buoy Cooperation Panel

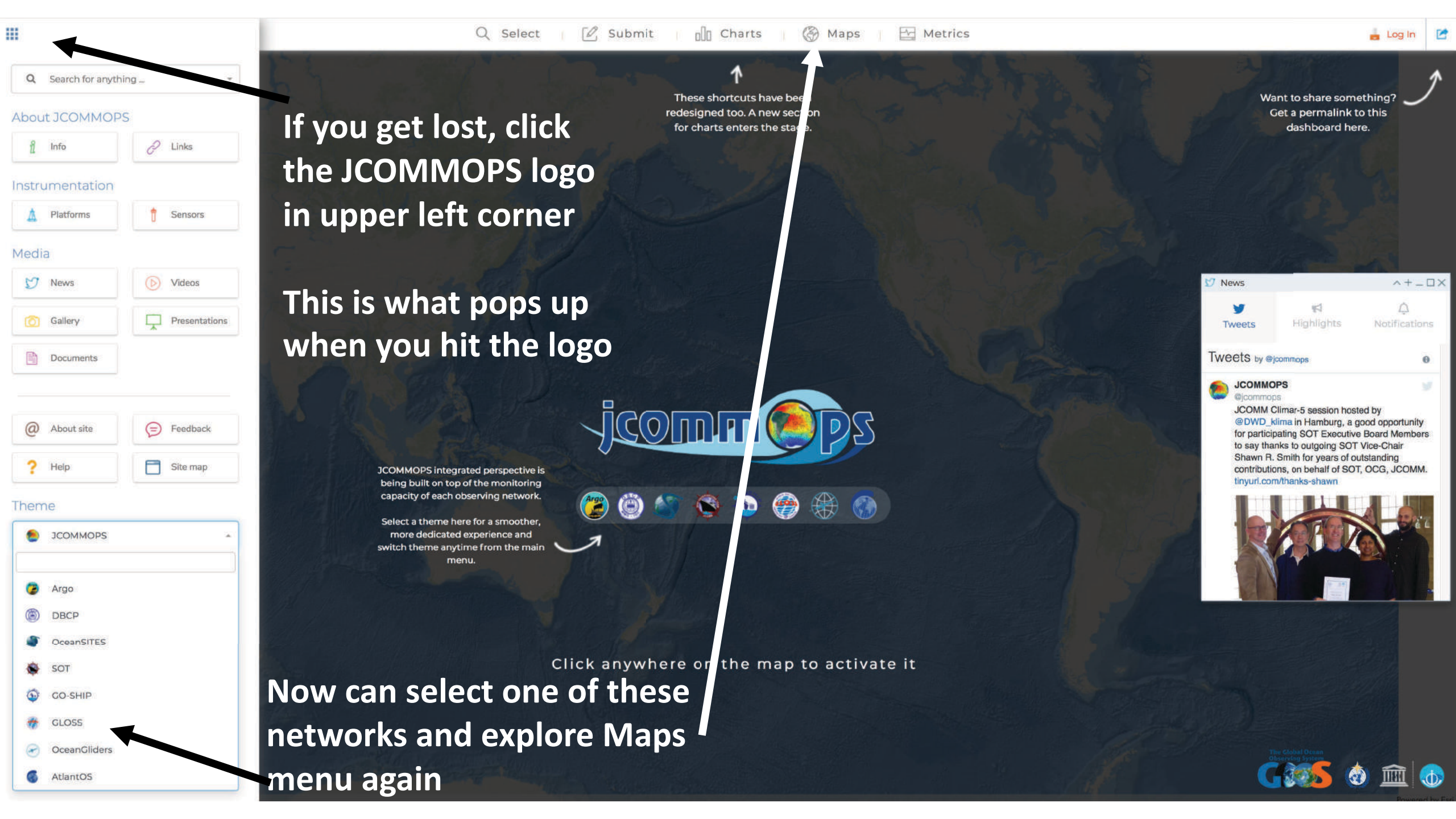
Operational Platforms

April 2019

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

- | | |
|-----------------------------|--------------------------|
| ◆ Tsunameters (38) | ▲ Tropical MB (68) |
| ■ Coastal/National MB (297) | ▲ Fixed Platforms (93) |
| | ● Drifting Buoys (1 505) |





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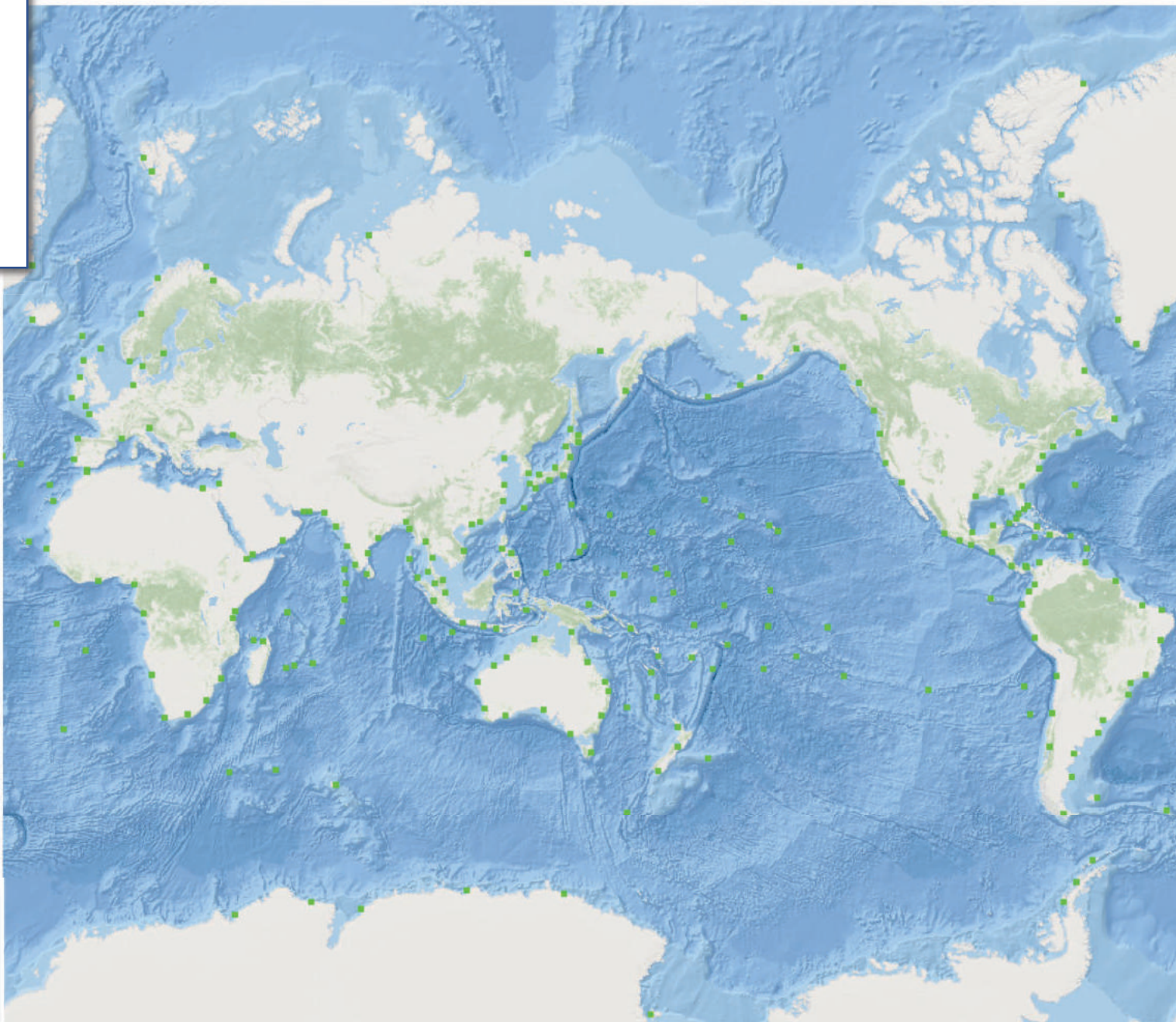
Help

Site map

Theme

GLOSS

Global Sea Level Observing System (GLOSS) website is much better than this for exploring network data



Global Sea Level Observing System (GLOSS) did not have a static map on this website

The Global Sea Level Observing System (GLOSS), a component of the Global Ocean Observing System (GOOS), is establishing a well-designed, high-quality sea level observing network to support a broad research and operational user base.



Sea level data are vital for



Research into sea level change and ocean circulation



Coastal protection during events such as storm surges



Providing flood warning and monitoring tsunamis



Tide tables for port operations, fishermen, and recreation



Defining datums for national or state boundaries

156: Tofino

49.150 °N, 125.917 °W

PSMSL Stations

[165: TOFINO](#), 49.150000 °N, 125.916667 °W

RLR Data: 1909-10 to 2017-12

Metric Data: 1909-10 to 2017-12

BODC Stations

Tofino, 49.150000 °N, 125.917000 °W

Latest data from 2010

UHSLC Stations

542: Tofino, 49.153000 °N, 125.913000 °W

[Fast mode](#): 1909-10-02 to 2019-01-31

[JASL](#): 1909-10-02 to 2016-12-31

VLIZ Stations

[tfbc: Tofino BC](#), 49.150000 °N, 125.910000 °W

2006-06-07 to 2019-04-29







[tofi: Tofino](#), 49.150000 °N, 125.910000 °W

2008-10-22 to 2012-06-31

GLOSS Core Network Station Availability

Last updated on 29 Apr 2019

[\(Guide to data sources\)](#)

-  PSMSL Data
-  UHSLC Delayed Mode Data
-  UHSLC Fast Mode Data
-  VLIZ Data
-  SONEL Data
-  BODC Data

Hide Key



Permanent Service for Mean Sea Level

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Data

- [Obtaining](#)
- [Supplying](#)
- [High-Frequency](#)
- [Bottom Pressure Records](#)
- [Other Long Records](#)
- [GLOSS/ODINAFRICA Calibration Data](#)

Guide to Other Data Sources

We have provided links to other sources of data that may be helpful. The criterion for choosing these links is that they are within 10 kilometres of our listed location.

The links are to a variety of different data types. Thus, one should be aware of differences in the data from these sources prior to using them. An extended description of the different data types can be found in the Global Sea Level Observing System (GLOSS) [Implementation Plan 2012](#), Chapter 6.2.

- **GNSS Stations from SONEL:** These links go to GNSS station pages at [Système d'Observation du Niveau des Eaux Littorales](#) (SONEL). The information can be useful to assess the vertical land motion at or near the tide gauge. In addition, if the GNSS receiver is co-located, the data can be used to find the time-mean geocentric height.
- **Real Time Stations from VLIZ:** These links are to the [Sea Level Station Monitoring Facility](#) hosted by Flanders Marine Institute (VLIZ). This is a real time sea level site that is useful for determining the current status of a station. While data is archived at the facility, it is not quality controlled. Thus, in general it should not be used in scientific analysis.
- **Fast Delivery Data from UHSLC:** The GLOSS Fast Delivery Center is operated by the [University of Hawaii Sea Level Center](#) (UHSLC), which has the responsibility for assembling and distributing a version of GLOSS sea level data sets that has undergone preliminary quality control by the data originators. "Fast delivery" implies posting of the data within 4-6 weeks. Note that this service includes some stations that are not part of the GLOSS network.
- **Research Quality Data from UHSLC/NOAA:** The Joint Archive for Sea Level (JASL) acquires hourly datasets that have received a final quality assessment from the data originators, and provides an independent check of the data. JASL then assembles a single hourly time series for each station, or a series of sub-records if datum changes occur over time. The JASL dataset therefore represents a "data product", as changes to the data are implemented by JASL analysts (e.g., level adjustments, timing shifts, outlier removal). These changes are documented in the metadata information. The data product is archived at UHSLC with the support of National Oceanic and Atmospheric Administration (NOAA) Ocean Data Center (NODC).



National
Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL



IOC



WORLD DATA SYSTEM



IGOS



IAG



British Oceanographic
Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL



NERC
SCIENCE OF THE ENVIRONMENT

Another way to see what is on GTS: <http://osmc.noaa.gov/Monitor/OSMC/OSMC.html>

In Situ Monitoring | **Observing System Metrics** | [Observing System Monitoring Center Home Page](#) | [Observing System Metric Reports](#) | [GOSIC](#) | [JCOMMOPS](#) | [State of the Ocean](#) | [Contact Us](#) | [Disclaimer](#) | [About OSMC](#)

Choose a Program: All Programs
Choose a Parameter: All Parameters
Choose a Platform: Tide Gauge Stations
OR enter a WMO ID:

FROM: 2019 May 14
TO: 2019 May 16
Choose a Country: All
Color by: Platform
Display: Latest Position only

Map Size: Small (1024x768)
Icon Size: Auto

Map Options:
 Detailed Ocean
 Detailed land
 10x10 graticule
 Political Boundaries
 Preserve 2:1 aspect ratio


Map Domain: Global
90
30 390
-90
Refresh Map





Print Image
Real Time Clock
View on Google Earth
Google Earth Animation
View on Google Maps
Platform Info

Platform Age Country

Drifting Buoys
Ships
Moored Buoys
Shore and Bottom Station
Argo Floats and Gliders
Pinnipeds
Unknown
Open Legend

Date: 14-May-2019 00:00:00 to 16-May-2019 23:59:59
Platforms: **378**
Observations: **967162**



SEA LEVEL TRENDS

Home/Map

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Global Stations

Trend Tables

Select

U.S. Trends Map

U.S. Regions

Select

Global Regional Trends

Anomalies

Select

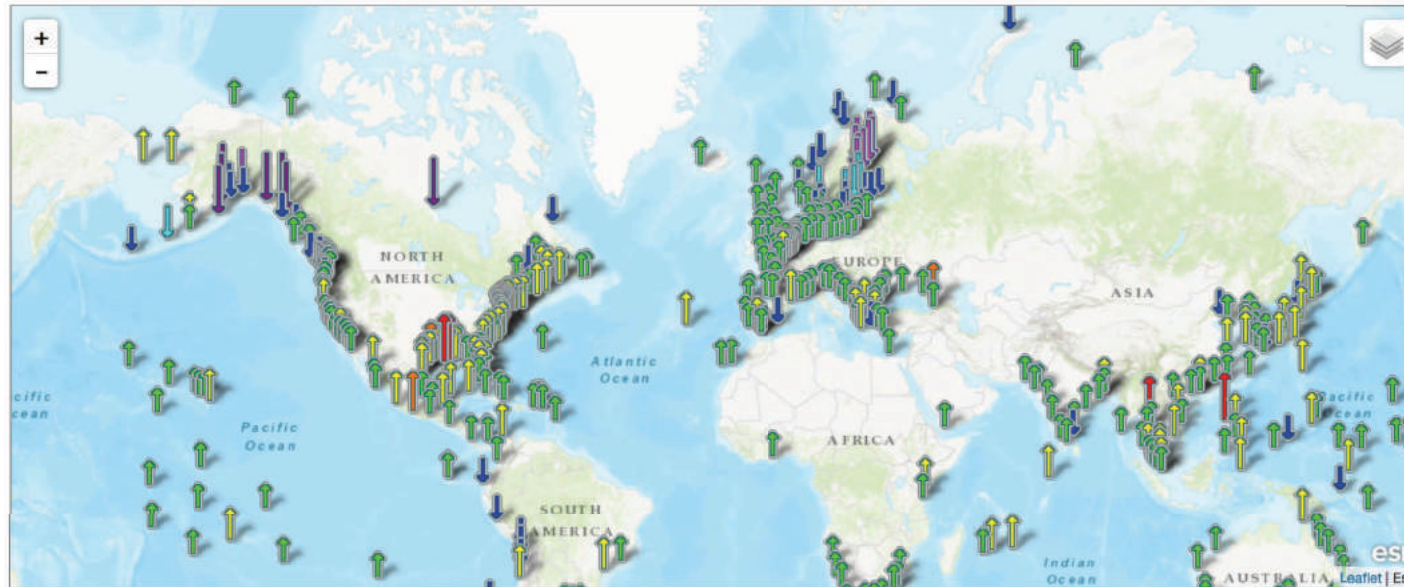


Sea Level Trends

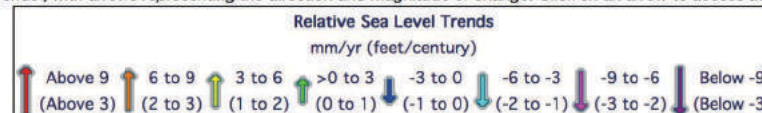
The sea level trends measured by tide gauges that are presented here are local relative sea level (RSL) trends as opposed to the global sea level trend. Tide gauge measurements are made with respect to a local fixed reference on land. RSL is a combination of the sea level rise and the local vertical land motion. The global sea level trend has been recorded by satellite altimeters since 1992 and the latest global trend can be obtained from NOAA's Laboratory for Satellite Altimetry, with maps of the regional variation in the trend. The University of Colorado's Sea Level Research Group compares global sea level rates calculated by different research organizations and discusses some of the issues involved.

East Coast West Coast Gulf Coast Alaska Hawaii Global

View in Google Earth



The map above illustrates relative sea level trends, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.



The Center for Operational Oceanographic Products and Services has been measuring sea level for over 150 years, with tide stations of the National Water Level Observation Network operating on all U.S. coasts. Changes in RSL, either a rise or fall, have been computed at 142 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month which removes the effect of higher frequency phenomena in order to compute an accurate linear sea level trend. The trend analysis has also been extended to 240 global tide stations using data from the Permanent Service for Mean Sea Level (PSMSL). This work is funded in partnership with the NOAA OAR Climate Observation Division.

For Friday Harbor, WA, Check out:
<https://tidesandcurrents.noaa.gov/map/index.html?id=9449880>

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Media

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Interactive map (previous version)

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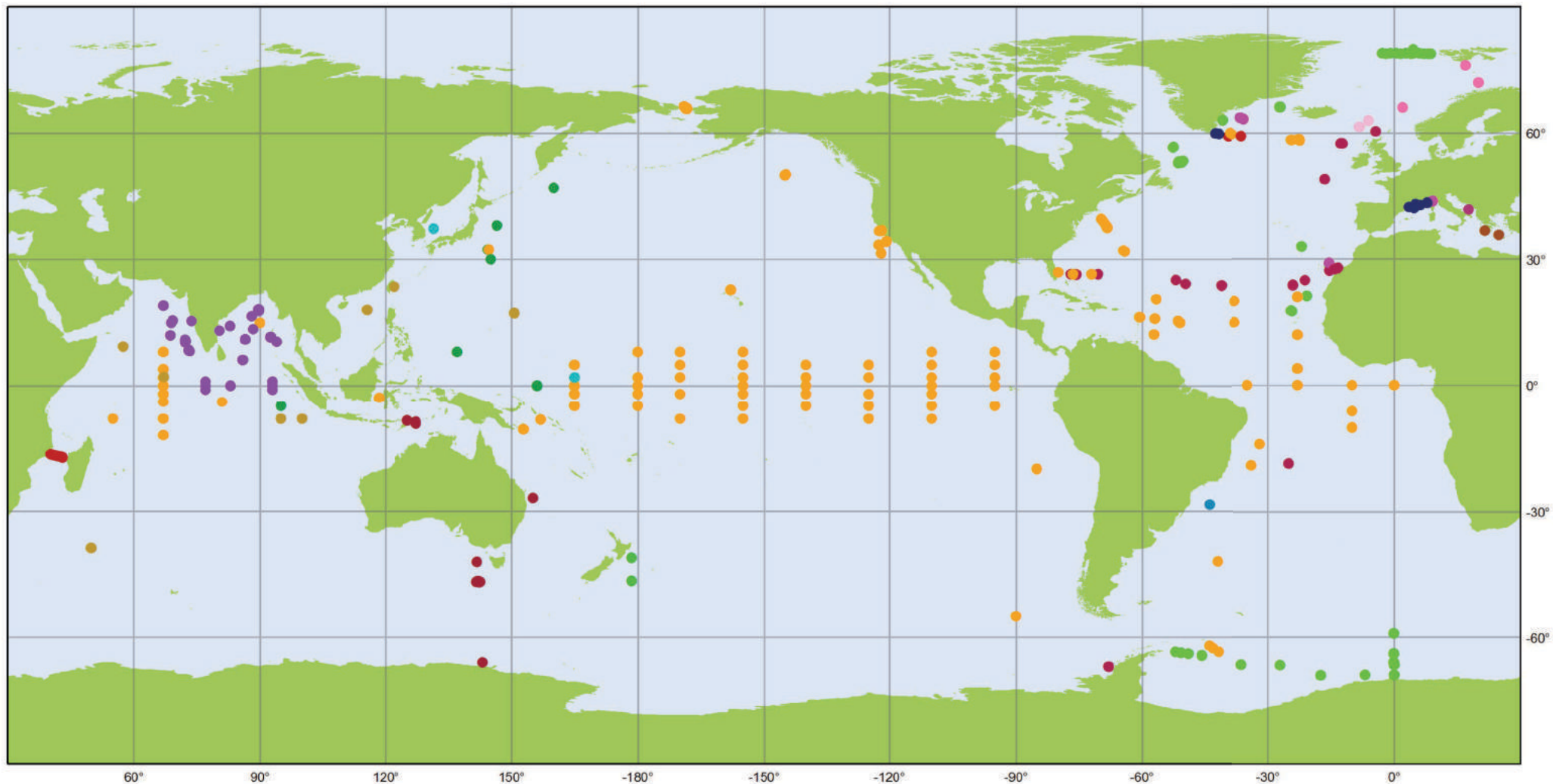
JCOMMOPS Highlights

OceanGliders/Regional Technical Coordinator position at JCOMMOPS

JCOMMOPS is looking for a OceanGliders/Regional Technical Coordinator. Deadline for application: January 31, 2019. Position description [here](#).

Click anywhere on the map to activate it

This time I selected the OceanSITES network and will explore Maps – “Static” and then “Interactive”



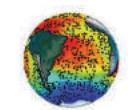
OceanSITES

Platforms by country

April 2019

Information received from the platform operators

- AUSTRALIA (11)
- BRAZIL (1)
- CANADA (1)
- CHINA (8)
- DENMARK (4)
- EUROPE (4)
- FRANCE (10)
- GERMANY (56)
- GREECE (3)
- INDIA (37)
- ITALY (1)
- JAPAN (8)
- KOREA, REPUBLIC OF (3)
- NETHERLANDS (9)
- NEW ZEALAND (2)
- NORWAY (3)
- UK (46)
- USA (138)





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Info Links

Instrumentation

Platforms Sensors

Media

News Videos

Gallery Presentations

Documents

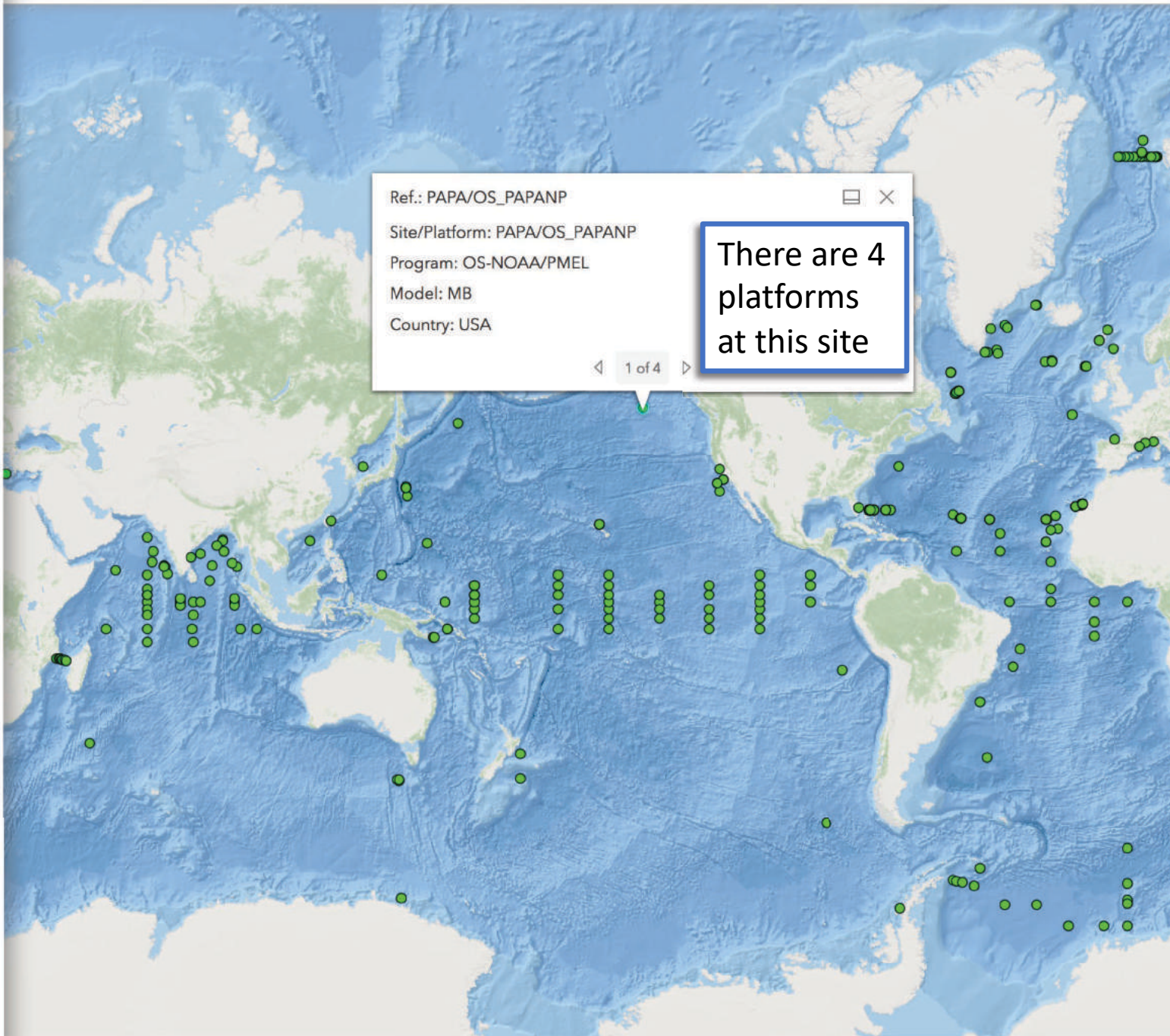
About site Feedback

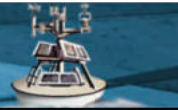
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Theme

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Interactive map (previous version)





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Data

Maps

Meetings

News

Documents

Publications

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Mission

The mission of OceanSITES is to collect, deliver and promote the use of high-quality data from long-term, high-frequency observations at fixed locations in the open ocean. OceanSITES typically aim to collect multidisciplinary data worldwide from the full-depth water column as well as the overlying atmosphere.

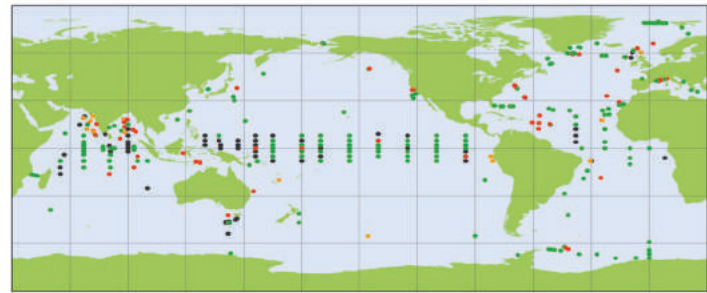
Rationale

Time series observations at critical or representative locations are one essential element of a global ocean observing system to complement a range of other approaches. They can provide: a unique view of the full temporal behavior of a system; accurate reference and long-time baseline data; and the maximum possible range of interlinked variables from the seafloor to the atmosphere while enabling shared resources.

Benefits of OceanSITES

[Link to the document](#)

OceanSITES Network



OceanSITES Platforms by status
Information received from the platform operators
● REGISTERED ● OPERATIONAL ● INACTIVE ● CLOSED
April 2019



OceanSITES is a worldwide system of long-term, open-ocean reference stations measuring dozens of variables and monitoring the full depth of the ocean from air-sea interactions down to the seafloor. It is a network of stations or observatories measuring many aspects of the ocean's surface and water column using, where possible, automated systems with advanced sensors and telecommunications systems, yielding high time resolution, often in real-time, while building a long record. Observations cover meteorology, physical oceanography, transport of water, biogeochemistry, and parameters relevant to the carbon cycle, ocean acidification, the ecosystem, and geophysics.

[Learn more about OceanSITES](#)

News

[EC1 mooring time-series since 1995](#) **NEW!**

[Publications](#)

GOOS webinar on OceanSITES' Unique Role in the Observing System
[Available here](#)

OceanSITES poster at EGU2015
[Poster 1](#)
[Poster 2](#)

Deep-Ocean T/S Challenge: Contribute a deep-ocean T/S Sensor!
[More information](#)

Upcoming Meeting

OceanOBS'19
Honolulu, USA
[More information](#)

OceanSITES 2018: Data Management and Steering Committee Meeting
Kiel, Germany 2-6 July 2018.
[More information](#)

50th International Liege Colloquium on Ocean Dynamics
Liege, Belgium - 28th May to 1st June 2018.
[More information](#)

OceanSITES Workshop at AGU Ocean Sciences 2018
Portland, Oregon, USA - 12 February 2018.
[More information](#)

Recent Meeting

OceanSITES 2016: Data Management and Steering Committee Meeting
25-29 April 2016 National

The JCOMMOPS website is intended to be used for data exploration.

For accessing the data, it is best to go to the network's website, e.g. www.oceansites.org or even the PI's project page, e.g. www.pmel.noaa.gov/OCS/

PI customer service is easier at the project level.

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OceanSITES Data Links

NetCDF Data Format

OceanSITES uses NetCDF (Network Common Data Form), a set of software libraries and machine-independent data formats. The OceanSITES data management team has developed an implementation of NetCDF for the data sets. Please consult the [Data Format Reference Manual](#) for details.

- ▶ [sample data set](#)
- ▶ [cdl file](#)
- ▶ [format checker](#)

Data Flow

The OceanSITES data flow is carried out through three organizational units: Principal Investigators (PI), Data Assembly Centers (DAC), and Global Data Assembly Centers (GDAC). In general, a PI provides the data and metadata information to a DAC, which formats this information into the OceanSITES file format and passes it on to the GDAC.

Data Users Guide

The OceanSITES data users guide was developed by Dr. Matthias Lankhorst at Scripps Institution of Oceanography, University of California San Diego. Full document is [here](#).

Global Data Assembly Centers

Ifremer Coriolis

- ▶ Ifremer FTP: <ftp://ftp.ifremer.fr/ifremer/oceansites/>
- ▶ Ifremer THREDDS Catalog: <http://ds0.ifremer.fr/thredds/CORIOLIS-OCEANSITES-GDAC-OBS/CORIOLIS-OCEANSITES-GDAC-OBS.html>

US NDBC

- ▶ NDBC OceanSITES Web Page: <http://dods.ndbc.noaa.gov/oceansites>
- ▶ NDBC FTP: <ftp://data.ndbc.noaa.gov/data/oceansites/>
- ▶ NDBC THREDDS Catalog: <http://dods.ndbc.noaa.gov/thredds/catalog/oceansites/catalog.html>

The GDACs are the primary portal for OceanSITES data and members of OceanSITES must eventually submit their data to a GDAC. Detailed information on each OceanSITE can be found by searching the map.

Data Policy

OceanSITES members adhere to the [CLIVAR data policy and principles](#):

1. Free and unrestricted exchange
2. Timely exchange
3. Quality control
4. Metadata
5. Preservation of data
6. Plan for reuse in reanalysis
7. Easy access
8. Use of existing national and international mechanisms and centres

Data Disclaimer

OceanSITES data are published without any warranty, express or implied. The user assumes all risk arising from his/her use of OceanSITES data. OceanSITES data are intended to be research-quality and include estimates of data quality and accuracy, but it is possible that these estimates or the data themselves contain errors. It is the sole responsibility of the user to assess if the data are appropriate for his/her use, and to interpret the data, data quality, and data accuracy accordingly. OceanSITES welcomes users to ask questions and report problems to the contact addresses.

The JCOMMOPS website is intended to be used for data exploration.

For accessing the data, it is best to go to the network's website, e.g. www.oceansites.org or even the PI's project page, e.g. www.pmel.noaa.gov/OCS/

PI customer service is easier at the project level.

- OceanSITES by DAC
 Select a DAC
 Select to Highlight
- Data Access
 Mobile Access
 Classic Maps
 Recent
 DART@
 Obs Search
 Ship Obs Report
 BuoyCAMs
 TAO
 DODS
 OceanSITES
 HF Radar
 OSMC
 Dial-A-Buoy
 RSS Feeds
 Web Widget
 Email Access
 Web Data Guide
 Maintenance Schedule
 Station Status Report
- Program Info
 TAO
 DART@
 IOOS@
- Publications
 NDBC PEA
 NDBC FONSI
 NDBC DQC Handbook
- FAQ
 Visitor Information
- USA.gov

The DODS site is now available only via HTTPS. Please update your bookmarks and/or links to use <https://dods.ndbc.noaa.gov/>.

OceanSITES Taking the pulse of the global ocean

Site [Platform(s)]: KE0 [KEO]

Institution: NOAA/Pacific Marine Environmental Laboratory (PMEL)
 Principal Investigator: Dr. Meghan F. Cronin
 Data Assembly Center: PMEL/OCS - Nathan Anderson (nathan.anderson@noaa.gov)

Mouse cursor coordinate: 32.57N, 144.34E

Esri, GEBCO, DeLorme | Esri, GEBCO, IHO-IOC GEBCO,...

Total of 142 sites with 37,177 indexed data files hosted by the OceanSITES Global Data Assembly Center as of 06/14/2018. Mouse over a site icon on the map to show data information and a single left click to show the site's datasets.

OceanSITES is an international system of long-term, open-ocean reference stations measuring dozens of variables and monitoring the full depth of the ocean from air-sea interactions down to the seafloor. It is a network of timeseries observations that fill a unique role by measuring many aspects of the ocean's surface and water column, and where possible, through advanced sensors and telecommunications systems, yield a long-term record of high resolution data, often in real-time.

Observations cover meteorology, physical oceanography, transport of water, biogeochemistry, and parameters relevant to the carbon cycle, ocean acidification, the ecosystem, and geophysics. Operational applications include the detection of events, initialization and validation of assimilation products, and reference data for forecasts. OceanSITES is an integral part of the Global Ocean Observing System. The network complements satellite imagery and other in-situ observation data by extending the dimensions of time and depth.

For more information visit [OceanSITES Project Office](#) or access the [NetCDF Data Files](#) at its Global Data Assembly Center (GDAC). Also see the [THREDDS statistics](#) and [FTP statistics](#) at NDBC.

This work is funded by the Climate Observations and Monitoring Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Use the DODs link to get to interactive map.

Hovering cursor over site gives pop-up info

Clicking on site brings you to DODS thredds catalog for accessing data

Catalog https://dods.ndbc.noaa.gov/thredds/catalog/data/oceansites/DATA_GRIDDED/KE0/catalog.html

Dataset	Size	Last Modified
KE0		
OS_KE0K7_200406_D_ADCP-1day.nc	573.8 Kbytes	2016-02-13T01:10:39Z
OS_KE0K7_200406_D_ADCP-1hr.nc	11.79 Mbytes	2016-02-13T01:10:43Z
OS_KE0K7_200406_D_ADCP-30m.nc	40.98 Mbytes	2016-02-13T01:10:53Z
OS_KE0_200406_D_SW_LW_32N145E_2m.nc	94.91 Mbytes	2019-05-15T02:04:12Z
OS_KE0_200406_D_TVMBP_32N145E_10m.nc	460.9 Mbytes	2019-05-15T02:07:18Z
OS_KE0_200406_M_TSVMBP_32N145E_dv.nc	5.390 Mbytes	2019-05-15T02:07:19Z
OS_KE0_200406_M_TSVMBP_32N145E_hr.nc	107.1 Mbytes	2019-05-15T02:07:42Z
OS_KE0_200709_D_V_32N145E_20m.nc	35.13 Mbytes	2019-05-15T02:07:52Z
OS_KE0_200909_D_SW_LW_32N145E_1m.nc	167.1 Mbytes	2019-05-15T02:09:23Z



[Kuroshio Extension Observatory](#)

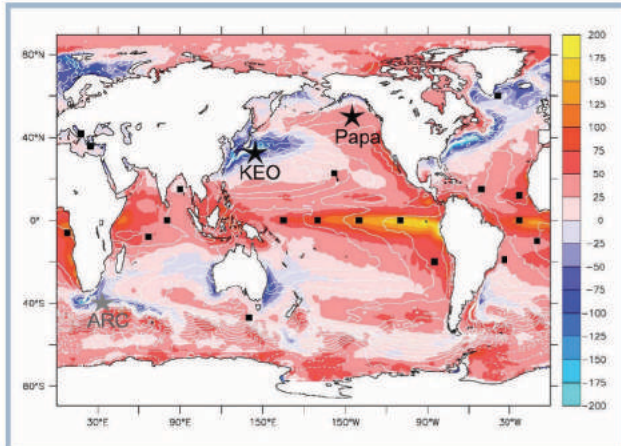
[Ocean Station Papa](#)

[Agulhas Return Current](#)

[Air-Sea Fluxes](#)

[Saildrone](#)

Mission



OCS mooring sites (stars) shown on a map of net surface heat flux (W/m^2). Other air-sea flux OceanSITES stations are indicated by black squares.

The mission of the Ocean Climate Stations Project (OCS) is to make meteorological and oceanic measurements from autonomous platforms. These reference time series and innovative measurements are used to improve satellite products and forecast models, and improve our understanding of air-sea interactions, and their role within the climate system.

With more than 70% of the Earth covered by oceans, global weather and climate are strongly affected by exchanges of heat and moisture between the ocean and the air. Improved understanding of the climate system will help society adapt to climate variations and changes. Improved, more physically realistic forecast models will help reduce society's vulnerability to weather and climate extremes, preparing a weather-ready nation.

The OCS program encourages broad use of the data and welcomes collaboration. Visit our [data pages](#), and [contact us](#) to learn more.

What's New

Unmanned Sailing Science Observatories Return Home After Eight Months at Sea



Back in San Francisco Bay after more than eight months at sea, this Saildrone carries scientific instruments, and lots of data.

May 21, 2018
After eight straight months of sailing in the Pacific Ocean, two Saildrones have made their way back to their home port in Alameda, CA, filled with scientific data.

These unmanned observing platforms were launched on September 1, 2017 on a mission to the equator and back. The purpose of the mission was to learn more about how Saildrones might be used to improve the Tropical Pacific Observing System (TPOS), which is used by the US and partner nations to forecast weather and climate.

Overall, the project scientists consider this to have been a very successful mission. Though still sorting out a few measurement glitches, the researchers are very pleased with the data so far. Initial findings show that the oceanographic and atmospheric measurements made by the Saildrones are high quality. This platform may be a good tool for providing key observations for long-term weather forecasts.

In fact, several interesting very abrupt temperature fronts were discovered during the mission. Scientists were surprised to see the temperature of the surface sea water change by about 1°C (1.8°F) in less than 1 km (0.62 mi).

They are now studying how these fronts impact the local meteorology and chemistry of the surface ocean. This is the sort of detail that can't be observed from satellites, but which may influence weather patterns forming in the area.

<https://www.pmel.noaa.gov/ocs/>

NOAA PMEL Ocean Climate Stations contribute to the OceanSITES network of time series reference stations

PI: Meghan Cronin

All data are freely available. Collaborative research is appreciated and welcomed.

Data

- Data Overview
- Mooring Data
- Computed Fluxes
- Partners Data
- Data Links
- Data Reports

Related

Sensor Specifica...
Sensors used on OCS moorings are listed in the following table, along with th

Sampling Rates
Data from OCS moorings are obtained from three different data collection syst

Measurement Heig...
The tables below describe the nominal heights of meteorological measurements,

Flux Documentati...
Documentation for Calculations of Air-Sea Flux

Mooring Data

<input checked="" type="checkbox"/> Shortwave Radiation	<input checked="" type="checkbox"/> Wind Speed	<input checked="" type="checkbox"/> Sea Surface Temperature	<input type="checkbox"/> Zonal Current	<input type="checkbox"/> Heat Content
<input checked="" type="checkbox"/> Longwave Radiation	<input type="checkbox"/> Scalar Wind Speed	<input checked="" type="checkbox"/> Temperature Profile	<input type="checkbox"/> Meridional Current	<input type="checkbox"/> Longitude
<input checked="" type="checkbox"/> Rain Rate	<input type="checkbox"/> Wind Direction	<input type="checkbox"/> Sea Surface Salinity	<input checked="" type="checkbox"/> Current Vectors	<input type="checkbox"/> Latitude
<input checked="" type="checkbox"/> Air Temperature	<input type="checkbox"/> Zonal Wind	<input type="checkbox"/> Salinity Profile	<input type="checkbox"/> Zonal ADCP	
<input checked="" type="checkbox"/> Relative Humidity	<input type="checkbox"/> Meridional Wind	<input type="checkbox"/> Sea Surface Density	<input type="checkbox"/> Meridional ADCP	
<input checked="" type="checkbox"/> Barometric Pressure	<input type="checkbox"/> Wind Vectors	<input type="checkbox"/> Density Profile	<input type="checkbox"/> Deep TSP	

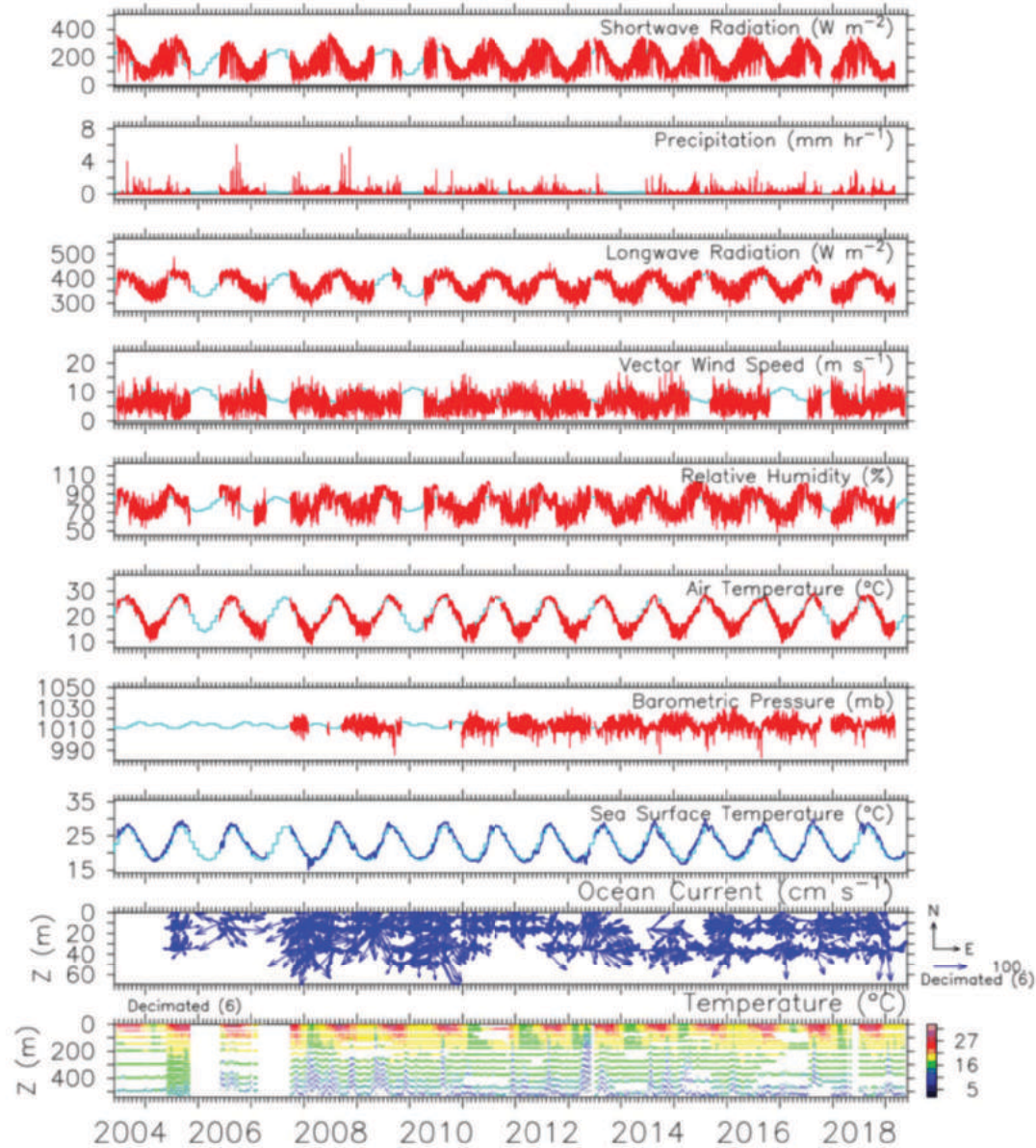
2004 JUN 16 2019 MAY 15 Daily

Instructions

To view plots or download data from the KEO, Papa and ARC moorings: Click a blue site button to select the mooring, and use the menus to define the time period of interest, and sample rate. Choose observations to display by clicking checkboxes. A gray box indicates that data are unavailable. Availability of observations changes as you change the time range and data frequency. Click the purple **Display** button to view plots. To deliver data, choose the file type (ASCII or netCDF) and the compression, and then click the red **Deliver** button. Light blue lines on plots are climatological averages.

Note: Please do not use your browsers 'Back' button. To clear selections click the orange **Clear** button.

KEO Daily Data



What are Observations used for?

- **Observations for mapping fields, initiating or nudging models**
 - Timely (available through the Global Telecommunication System (GTS) in near realtime)
 - Geographically distributed in coherent array, with known uncertainty and quality **(Satellite, Argo, DBCP drifters, GLOSS)**
- **Observations for validation**
 - Independent obs (e.g. not assimilated) **(OceanSITES)**
 - High quality, of known uncertainty that is smaller than error of model.
- **Observations for improving model physics, parameterizations and understanding of processes**
 - Oversampled observations **(OceanSITES, Process Studies)**

Global Ocean Observing System (GOOS)

Sponsored by:



Overlapping global satellite and in situ networks

VS.

A set of regional integrated observing systems that are each “Fit for Purpose”

Use <http://www.jcommops.org/> to help explore the GOOS

JCOMMOPS = WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology in situ Observations Programme Support Centre.



TPOS 2020 update

Meghan Cronin (NOAA PMEL)

Co-chair TPOS 2020 Planetary Boundary Layer Task Team

Contributing author to First and Second TPOS 2020 Reports

Science Steering Committee Meetings

2018 Backbone Task Team Face-to-Face Meeting

Others involved in TPOS2020 who are here: **Yolande Serra, Carol Anne Clayson,...**



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TPOS 2020 SECOND REPORT

[DOWNLOAD DRAFT HERE](#)



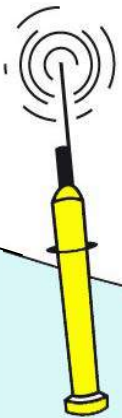
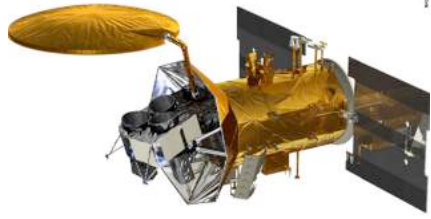
An integrated vision

Complementary “backbone” technologies:

- Satellites give global coverage, **horizontal** detail
- Moorings sample across **timescales**, allow co-located ocean-atmosphere observations, velocity sampling
- Argo resolves fine **vertical structure**, adds salinity, maps subsurface T and S, connects to subtropics

Assimilating models integrate diverse observations

TPOS data reaches our stakeholders primarily as
the output of an assimilation





Search GTMBA

Home

About

Publications

Data

Technical

Partners

Field Work

Data

Data Display and Delivery

Animations

Assorted Plots

Gridding Methods

Oceansites Flux Data

PIRATA Station Plots

RAMA Station Plots

Data Quality Control

Data Telemetry

GTS Data Distribution

WMO Numbers

GTS Data Transmissions

Historic TAO Data Return

Mooring Status Summary

Historical PIRATA Mooring

Status

Related



Indian Ocean - R...
Research Moored Array
for African-Asian-
Australian Monsoon
Analysis



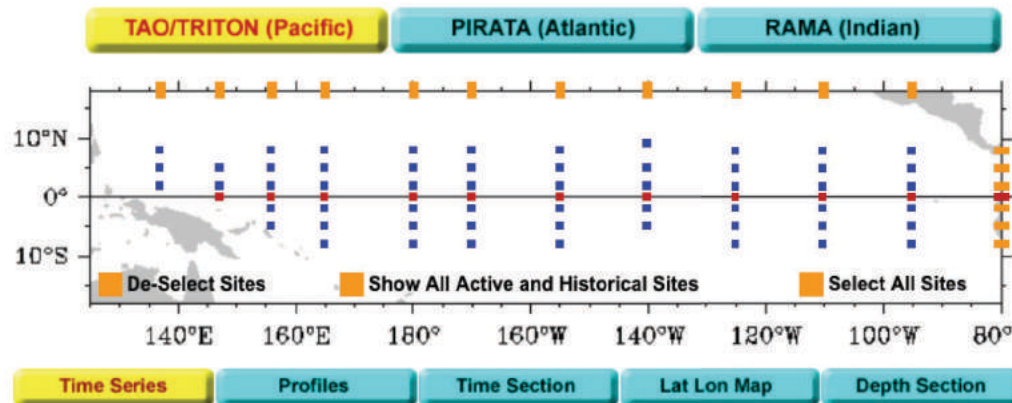
Atlantic Ocean -...
Prediction and
Researched Moored
Array in the Atlantic
(PIRATA)



Pacific Ocean -...
Tropical Atmosphere
Ocean (TAO)

Data Display and Delivery

[Show Instructions](#)



- One Variable One Site Separate Plots Overlay Subsurface Area Subsurface Lines
- SW Rad LW Rad Rain Wspd Uwnd Vwnd Wdir Wind Vec RH
- Air T SLP SST T(z) SSS S(z) SSD D(z) Heat
- Dyn Ht 20C Ucur Vcur Cur Vec Uadcp Vadcp Long Lat

1979 JAN 20 2019 MAY 19 5-Day

files by site ASCii Compression

Definitions Availability Clear Deliver Display

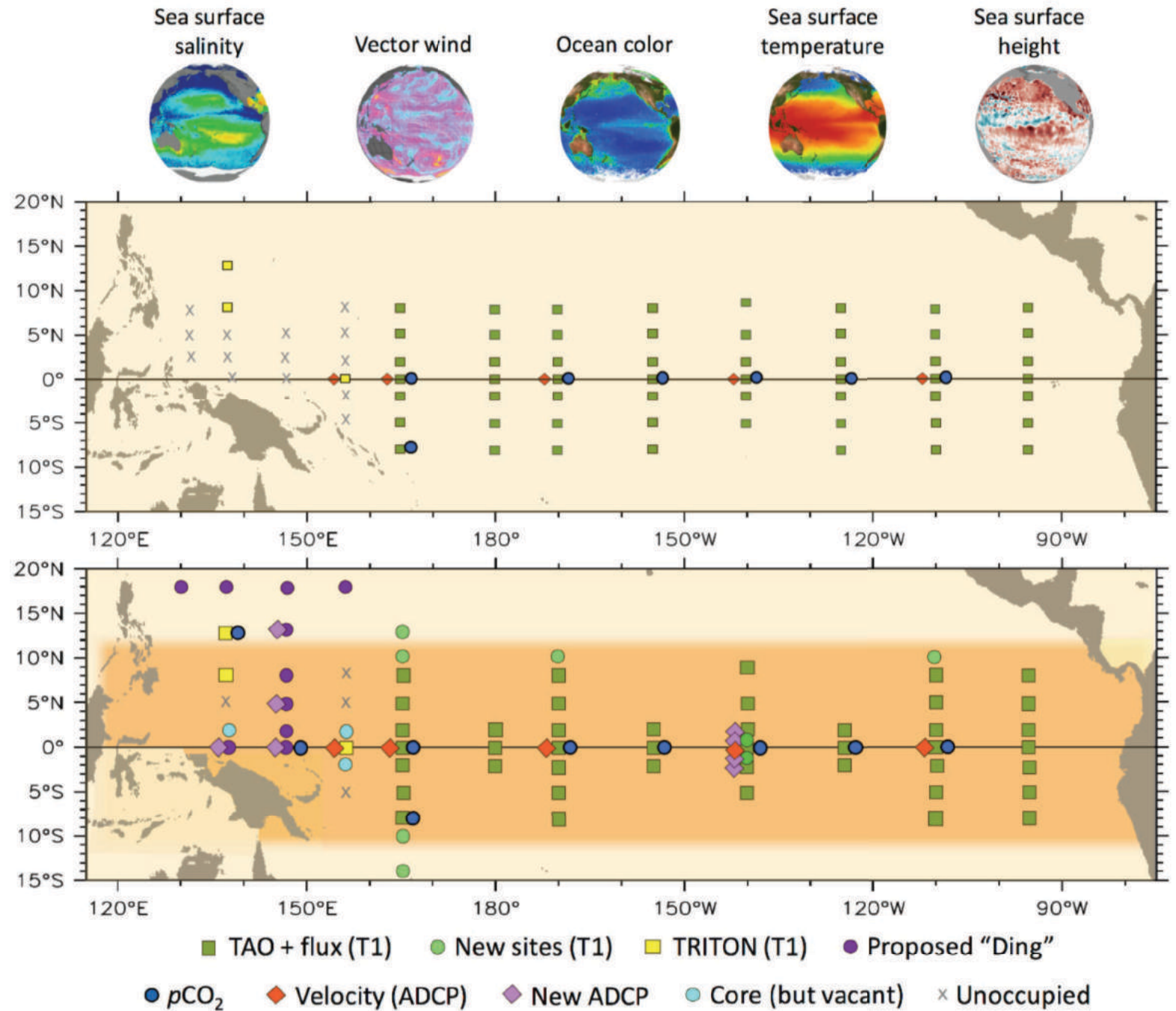
[FTP Access](#) [Acknowledgment for use of data](#) [Realtime High Resolution Data](#)
Send Questions to oar.pmel.taotech@noaa.gov

<https://www.pmel.noaa.gov/tao/drupal/disdell/>

Present Tropical Moored Array (TMA)

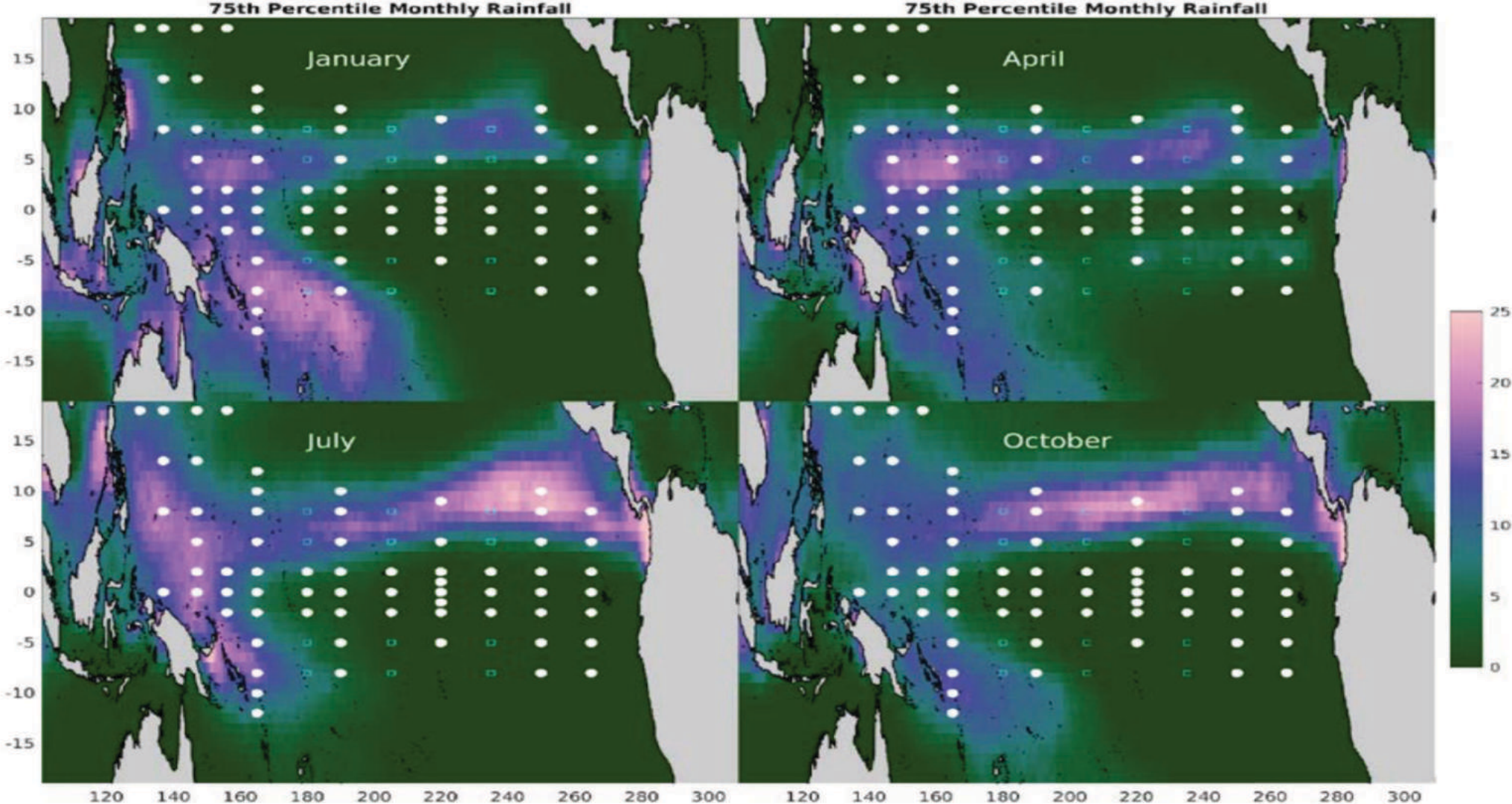
<https://www.pmel.noaa.gov/tao/>

Proposed TPOS TMA high priority sites and double Argo region (dark orange)



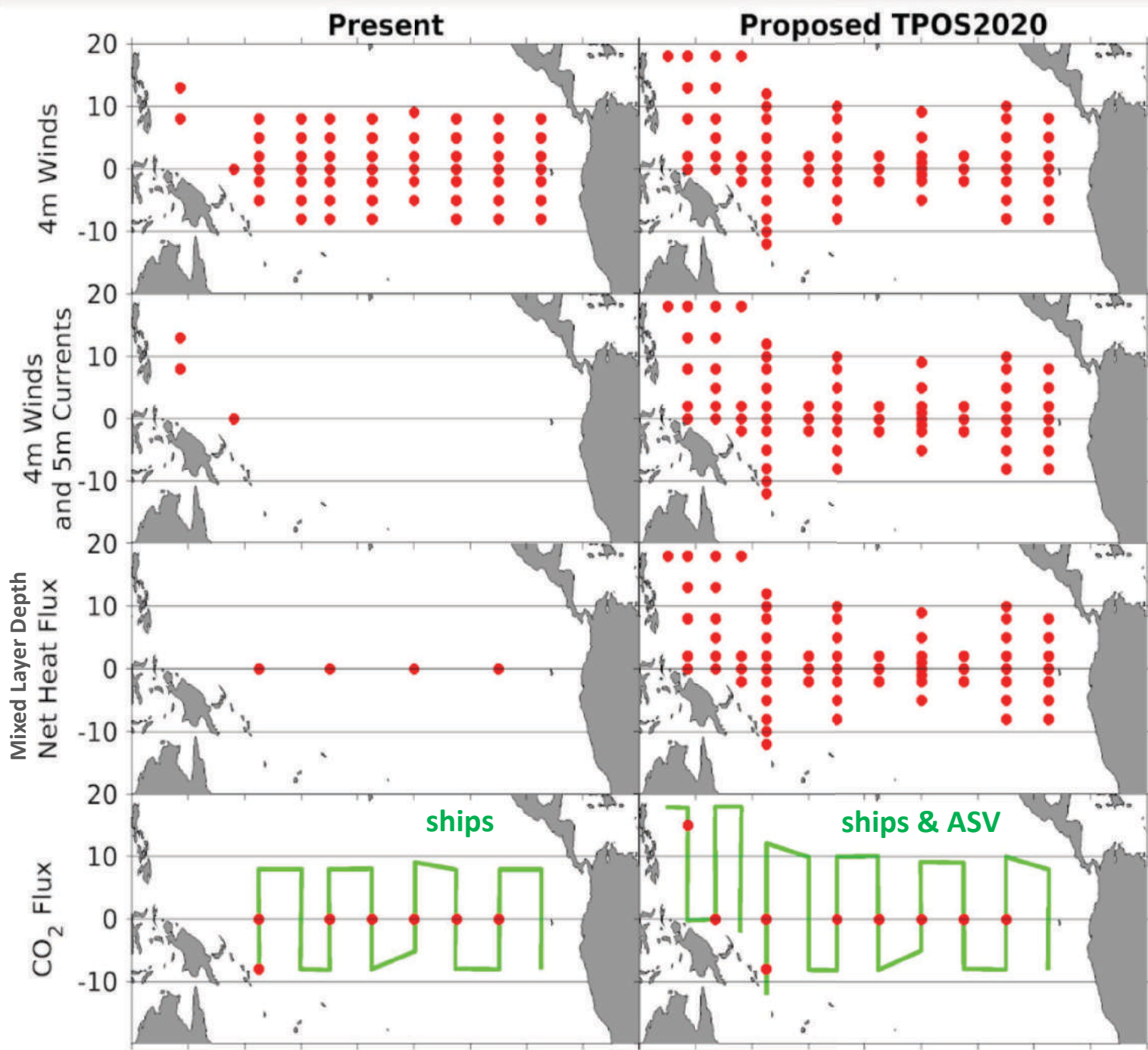
Better support the satellite products

---- better coverage for high rain regions



What are the differences?

-- Better air-sea interaction



What are the differences?

--Better air-sea interaction

How will it be done?

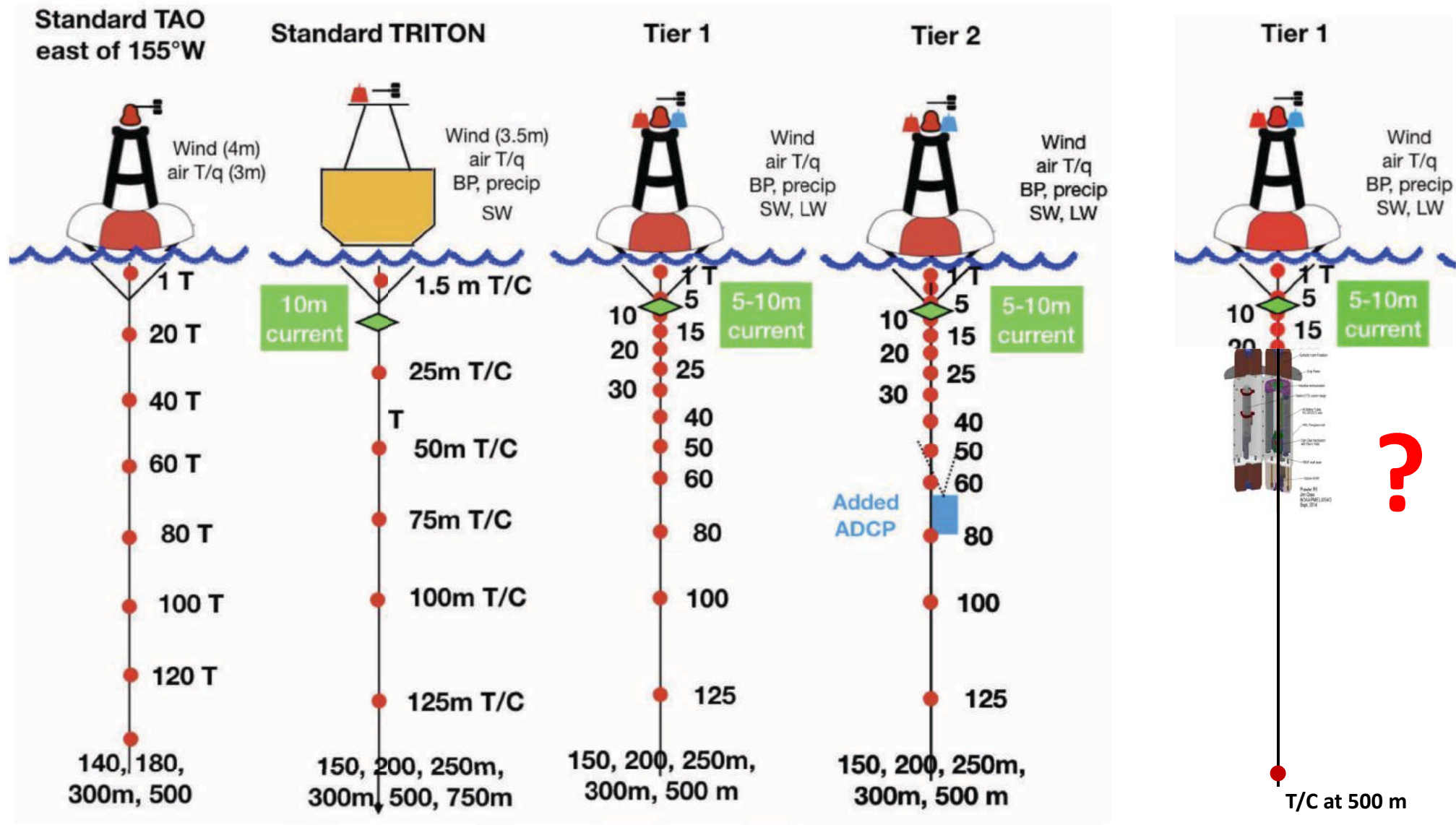
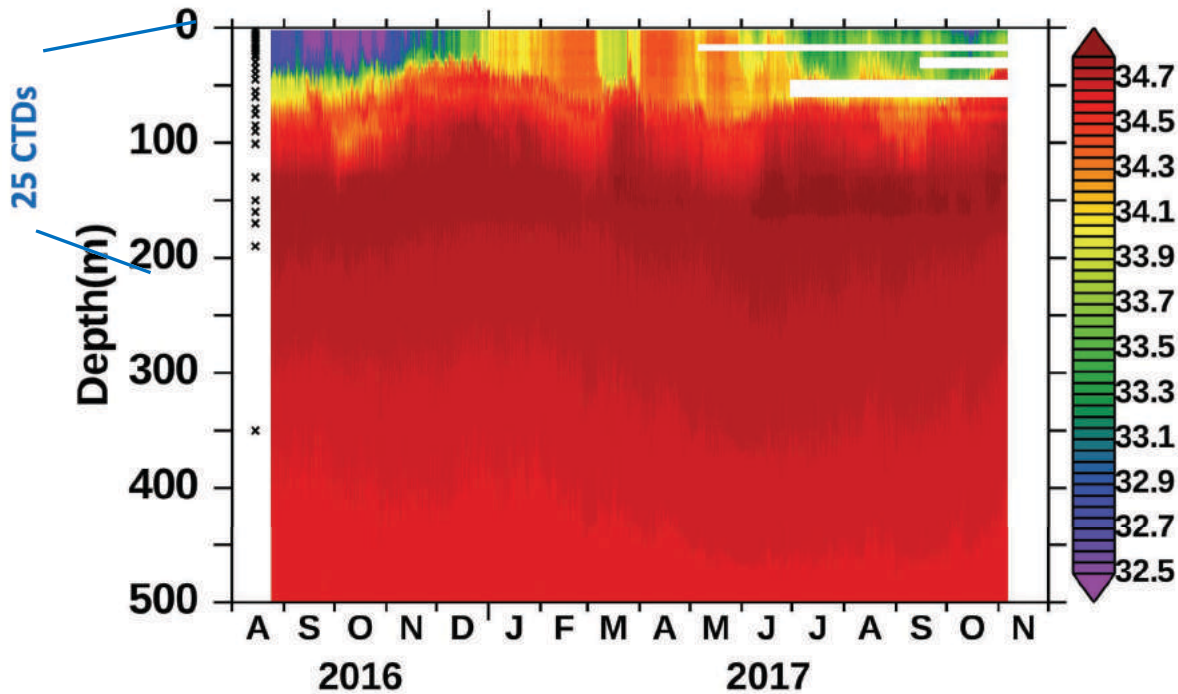


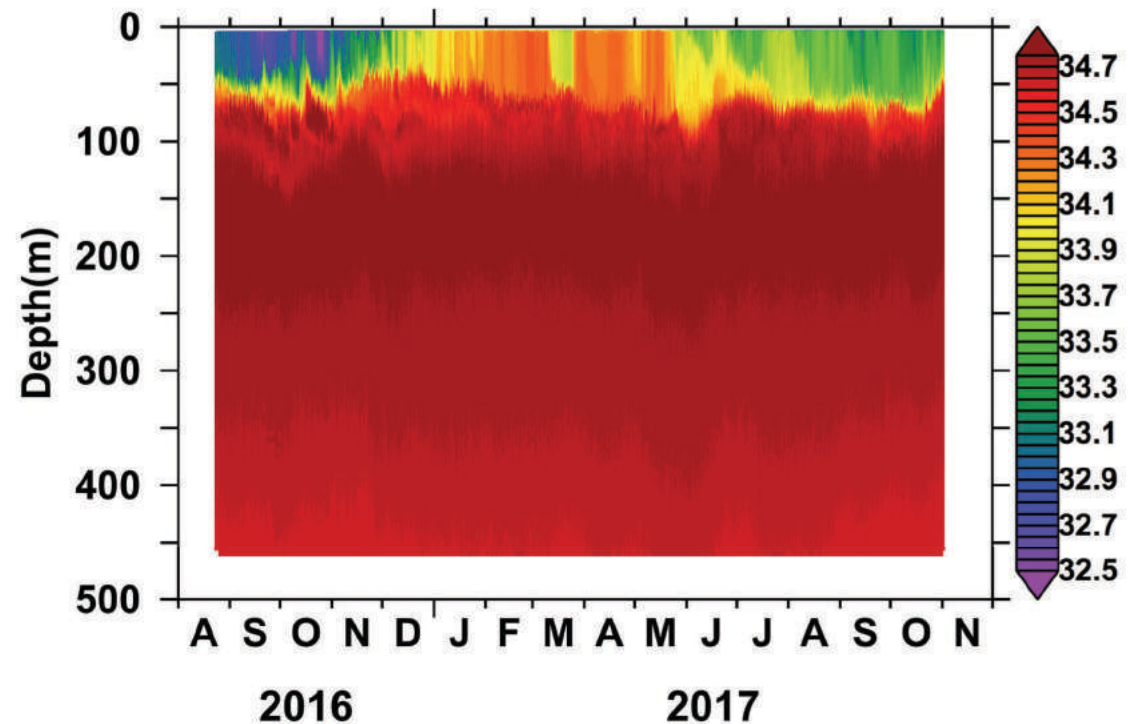
Figure 7.3: Schematics comparing the instrumentation of the current TAO and TRITON moorings- on the left, with those of the new enhanced TMA Tier 1 and Tier 2 - on the right. In the subsurface red dots and black text indicate the depths of temperature and salinity measurements, and green diamonds velocity measurements. Tier 2 moorings will have an upward looking current profiler (blue rectangle). Above the surface, parameters are noted as: Wind = wind speed, air T/q = air temperature and specific humidity, BP = barometric pressure, precip = rainfall, downwelling SW and LW = shortwave and longwave radiation respectively.

PMEL PRAWLER 14-month High Quality Measurements During SPURS-2

Salinity by 25+ WHOI CTDs 10°N, 125°N



Salinity by 1 PRAWLER CTD 9°N, 125°N



- High temporal resolution, every 5 minutes
- Available commercially
- **Lower Risk (failure → data gap at single depth), higher cost**

- Near-realtime telemetry, 2-way communication
- High vertical resolution; Settable 8-24 profiles/day, 20-30 minutes/profile (limited by battery: 8 profiles/day lasts ~ 14+ months)
- Available commercially
- **Higher risk (failure → loss of profile), lower cost**

NOAA OOMD funded 4 pilot studies of emerging technologies that may eventually be used in TPOS.

Saildrone TPOS pilot study will have another mission to equator this summer.



Beth Hame

Links discussed here

- <http://www.jcommops.org/> -- JCOMMOPS is good place to explore Global Ocean Observing system
- <http://osmc.noaa.gov/Monitor/OSMC/OSMC.html> -- NOAA Observing System Monitoring Center is good place to see what is on the GTS
- <https://www.gloss-sealevel.org/> -- Global Sea Level Observing System
- <https://tidesandcurrents.noaa.gov/sltrends/> -- interactive tide website
- <https://tidesandcurrents.noaa.gov/map/index.html?id=9449880> – FHL tide station
- www.oceansites.org – OceanSITES time series reference stations
- <https://www.pmel.noaa.gov/OCS> -- PMEL Ocean Climate Stations
- <http://tpos2020.org> – Tropical Pacific Observing System -2020 homepage
- <https://www.pmel.noaa.gov/tao/>