DATA BUOY CO-OPERATION PANEL (DBCP)

Format for National Reports on Current and Planned Programmes

Country: **United States of America**

Year: **2020**

CURRENT PROGRAMMES:

Agency or programme	Global Drifter Program (GDP)	
Number and type of buoys	(a) deployed during the year	1100
	(b) operational as of 31 July	1537
	(c) reporting on GTS as of 31 July	all
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Global	
Vandalism incidents	(a) Number of incidents NONE If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

The Global Drifter Program (GDP) is the principle component of the Global Surface Drifting Buoy Array, a branch of NOAA's Global Ocean Observing System (GOOS) and a scientific project of the DBCP. Its objectives are to (1) Maintain a global 5x5 degree array of ~1300 satellite-tracked surface drifting buoys to meet the need for an accurate and globally dense set of in-situ observations of mixed layer currents, sea surface temperature, atmospheric pressure, winds and salinity, and (2) provide a data processing system for scientific use of these data. These data support short-term (seasonal to interannual) climate predictions as well as climate research and monitoring. For more information, see http://www.aoml.noaa.gov/phod/dac/gdp_objectives.php and http://gdp.ucsd.edu/ldl_drifter/index.html.

Due to the impact of COVID-19, a number of deployments in April-July 2020 were postponed or delayed. Other deployment opportunities were identified to continue deployments in high priority locations, including DART/TAO servicing cruises and Ships of Opportunity transects, that continued to operate during the pandemic. This allowed the GDP to maintain the array size and coverage to satisfy observing system metrics.

Agency or programme	US Interagency Arctic Buoy Program (USIABP)	
Number and type of buoys	(a) deployed during the year	9 Ice Trackers (IT) 3 IT-Barometer (ITB) 10 Ice Balls (IB, drogue-less SVP-Bs) 3 Ice Mass Balance (IMB) Buoys 13 Ocean Profilers 10 Other

		26 SVP-B 22 IT (MOSAiC) 11 IB (MOSAiC) 47 IB (co-owned with AWI in Germany)
	(b) operational as of 31 July	135
	(c) reporting on GTS as of 31 July	122
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Arctic Ocean, Bering and peripheral seas.	
Vandalism incidents	(a) Number of incidents NONE If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

The USIABP coordinates US contributions to the International Arctic Buoy Programme (IABP). Its objectives are to provide meteorological and oceanographic observations for real-time operational requirements and research purposes. For more information, see http://iabp.apl.uw.edu.

The US contributed many buoys deployed around the RV Polarstern and MOSAiC drift station.

COVID-19 cancelled all of our own field work, but we were still able to deploy most of our buoys using local collaborators, and by leveraging many of our other logistics-of-opportunity.

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Coastal Weather Buoys (CWxB)**	
Number and type of buoys	(a) deployed during the year	57
	(b) operational as of 31 July	99
	(c) reporting on GTS as of 31 July	99
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Atlantic and Pacific Oceans and Coastal Zone of the US, including the Bering Sea, Gulf of Mexico, and Great Lakes	
Vandalism incidents	(a) Number of incidents 31 (refer to vandalism report for details).	

The National Data Buoy Center (NDBC) Coastal Weather Buoy network (CWxB) is a principle component of NOAA's ocean observing system and a part of the Global Ocean Observing System (GOOS).The mission of NDBC's Coastal Weather Buoy network is to provide quality observation to further the understanding and predictions to changes in weather, climate, and oceans. To support this mission NDBC's moored buoys measure and transmit barometric pressure, wind speed and direction, wind gust, air temperature, relative humidity, and sea surface temperature. In addition, all CWxB measure wave energy spectra from which significant wave height, dominant wave period, and average wave period are derived. Even the direction of wave propagation is measured on many moored buoys. For more information, see http://www.ndbc.noaa.gov/mooredbuoy.shtml.

The NDBC CWxB network has experienced no significant impact as a result of the COVID-19 pandemic.

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Tsunameter Buoys**	
Number and type of buoys	(a) deployed during the year	37
	(b) operational as of 31 July	33
	(c) reporting on GTS as of 31 July	33
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Atlantic and Pacific Oceans and Gulf of Mexico	
Vandalism incidents	(a) Number of incidents 2 (refer to vandalism report for details).	

To ensure early detection of tsunamis and to acquire data critical to real-time forecasts, NOAA has placed Deep-ocean Assessment and Reporting of Tsunami (DART) buoys at sites in regions with a history of generating destructive tsunamis. Originally developed by NOAA, as part of the U.S. National Tsunami Hazard Mitigation Program (NTHMP), the DART Project was an effort to maintain and improve the capability for the early detection and real-time reporting of tsunamis in the open ocean. DART presently constitutes a critical element of the NOAA's Tsunami Program. NOAA's National Weather Service (NWS) is responsible for the overall execution of the Tsunami Program and NDBC is responsible for operating and maintaining the network of 39 tsunameter buoys. For more information on the NDBC tsunameter buoys see http://www.ndbc.noaa.gov/dart/dart.shtml.

The NDBC Tsunameter Buoy network has experienced no significant impact as a result of the COVID-19 pandemic.

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Tropical Atmosphere Ocean (TAO) Arrray**	
Number and type of buoys	(a) deployed during the year	51
	(b) operational as of 31 July	48
	(c) reporting on GTS as of 31 July	48
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[ ]
Main deployment areas	Equatorial Pacific Ocean	
Vandalism incidents	(a) Number of incidents 59 (refer to vandalism report for details).	

The Tropical Atmosphere Ocean (TAO) array consists of approximately 55 moorings in the Tropical Pacific Ocean with real-time telemetry of oceanographic and meteorological observations. The array is a major component of the El Niño/Southern Oscillation (ENSO) Observing System, the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS). Support for the array is provided by the United States (National Oceanic and Atmospheric Administration). For more information see http://tao.ndbc.noaa.gov/proj_overview/proj_overview_ndbc.shtml

The TAO array has experienced minor impacts as a result of the COVID-19 pandemic. These small impacts are related to business closures and longer than normal lead times for sensor refurbishments.

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ Pacific Marine Environmental Laboratory (PMEL) and Atlantic Oceanographic and Meteorological Agency (AOML) **Prediction and Research moored Array in the Tropical Atlantic (PIRATA)**	
Number and type of buoys	(a) deployed during the year	7 surface toroids
	(b) operational as of 31 July	15 surface toroids
	(c) reporting on GTS as of 31 July	15 surface toroids
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[ ]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Tropical Atlantic Ocean	
Vandalism incidents	(a) Number of incidents 2 If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

PIRATA is a multinational observation network, established to improve our knowledge and understanding of ocean-atmosphere variability in the tropical Atlantic. It is a joint project of Brazil, France and the United States of America. PIRATA is motivated by fundamental scientific issues and by societal needs for improved prediction of climate variability and its impact on the countries surrounding the tropical Atlantic basin. The overarching goals of the project are to (1) improve the description of the intra-seasonal to interannual variability in the atmospheric and oceanic boundary layers of the tropical Atlantic Ocean; (2) improve our understanding of the relative contributions of air-sea fluxes and ocean dynamics to variability in sea surface temperature and sub-surface heat content; (3) provide a set of data useful for developing and improving the predictive models of the ocean-atmosphere coupled system; (4) document interactions between tropical Atlantic climate and variability outside the region, such as ENSO and the North Atlantic Oscillation; and (5) design, deploy, and maintain an array of moored oceanic buoys and collect and transmit a set of oceanographic and atmospheric data, via satellite in near-real time, to monitor and study the upper ocean and lower atmosphere of the tropical Atlantic Ocean. For more information, see http://www.pmel.noaa.gov/pirata/.

The current array design for PIRATA calls for 18 surface buoys; this network is 100% completed. Future extensions and additions may be added, as demanded by research and operational needs.

Impacts from the COVID-19 Pandemic: Cruise delays, response and expected loss of data:

- April 2020 (postponed): *Vital de Oliveira* (8S_30W, 14S_32W, 19S_34W, 0_35W, 15N_38W, 12N_38W, 8N_38W, 4N_38W). Cruise rescheduling is to be determined (TBD). We expect a > 10 months delay before these sites will be serviced. We expect a > 7-month loss in T, S and surface met data and > 10-month loss in near surface current data.
- May 2020 (postponed): *Ronald H. Brown* (21N_23W, 12N_23W, 4N_23W, 20N_38W). Cruise rescheduling is to be determined (TBD). We expect a > 6 months delay before these sites will be serviced. We expect a > 3-month loss

in T, S and surface met data and > 6-month loss in near surface current data (U/V).

- Feb/Mar 2021 (tentative): *Thalassa* (0_0_, 0_10W, 6S_10W, 10S_10W, 20S_10W, 0_23W). We anticipate to proceed on schedule (i.e., 0 month delay) to service the following: 0_0_, 0_10W, 6S_10W, 10S_10W, 20S_10W, 0_23W - These six moorings were deployed in Feb/Mar 2020 immediately prior to COVID-19 constraints. We anticipate no gap in data.

Loss of hardware:

We anticipate complete mooring losses at 0_35W, 4N_38W, 8N_38W, and potentially others.

Project Deliverables and Education impacts:

PIRATA moorings have a 1-year (annual) service and maintenance design life. The delays in servicing these moorings will result in data losses due to battery failures and will increase the risk of equipment losses and high-resolution data losses due to extended deployment periods well in excess of the design life and impose additional risk by fishing activities and vandalism. These delays will therefore limit NOAA's capability to meet NOAA's mission.

We expect many educational aspects impacted since there are many students using these freely available PIRATA mooring data for research. PIRATA cruises provide training opportunities for students and early career scientists and engineers, and those opportunities will be greatly reduced this year and possibly next year.

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ Pacific Marine Environmental Laboratory (PMEL) **Research Moored Array for African-Asian-Australian Monsoon Analysis and prediction (RAMA)**	
Number and type of buoys	(a) deployed during the year	13 surface toroids, 1 subsfc moorings
	(b) operational as of 31 July	16 surface toroids, 5 subsfc mooring
	(c) reporting on GTS as of 31 July	15 (2 moorings are adrift)
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[ ]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Tropical Indian Ocean	
Vandalism incidents	(a) Number of incidents: 3 If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

RAMA addresses the needs for comprehensive, long term, high quality real-time measurements in the Indian Ocean suitable for climate research and forecasting. RAMA is targeted at understanding and prediction of the east African, Asian and Australian monsoons, and benefits nations outside the Indian Ocean region due to atmospheric teleconnections which influence the far field. For more information, see http://www.pmel.noaa.gov/tao/rama/.

The current array design for RAMA calls for 28 moored buoy sites, of which 23 (82%) are currently occupied by surface or subsurface toroids or developmental moorings. Future additions may be added, as demanded by research and operational needs.

Impacts from the COVID-19 pandemic: Cruise delays, response and expected loss of data:

- June 2020 (postponed): *Isabu* (4S_67E, 8S_67E, 12S_67E). Cruise rescheduling is to be determined (TBD). We expect a > 10 months delay before these sites will be serviced. We expect a > 7-month loss in T, S and surface met data and > 10-month loss in near surface current data (U/V).
- June 2020 (postponed): *Baruna Jaya (*15N_90E, 12N_90E, 8N_90E, 0_90E). Cruise rescheduling is tentative for Feb/Mar 2021. We expect a > 6 months delay before these sites will be serviced. We expect a > 3-month loss in T, S and surface met data and > 6-month loss in near surface current data (U/V).
- July 2020 (postponed): *Sagar Nidhi* (15N_65E, 0_81E, 2S_81E, 4S_81E, 8S_81E, 12S_81E). Cruise rescheduling is to be determined (TBD). We expect a > 6 months delay before these sites will be serviced. We expect a > 3-month loss in T, S and surface met data and > 6-month loss in near surface current data (U/V).
- Oct 2020 (postponed): *Sagar Nidhi* (8N_67E, 4N_67E, 2N_67E, 0_67E, 2S_67E). Cruise rescheduling is to be determined (TBD). We expect a > 7 months delay before these sites will be serviced. We expect a > 4-month loss in T, S and surface met data and > 7-month loss in near surface current data (U/V).
- Oct 2020 (postponed): *Tethys Supporter* (4S_57E, 8S_55E). Cruise rescheduling is to be determined (TBD). We expect a > 7 months delay before these sites will be serviced. We expect a > 4-month loss in T, S and surface met data and > 7-month loss in near surface current data (U/V).

Loss of hardware:

We anticipate complete mooring losses at 0_81E, 8S_81E, and 12S_67E; We have confirmed subsurface mooring sensors lost at 8N_90E; and we anticipate other potential losses at sites that have been deployed > 1 year.

Project Deliverables and Education impacts:

RAMA moorings have a 1-year (annual) service and maintenance design life. The delays in servicing these moorings will result in data losses due to battery failures and will increase the risk of equipment losses and high-resolution data losses due to extended deployment periods well in excess of the design life and impose additional risk by fishing activities and vandalism. These delays will therefore limit NOAA's capability to meet NOAA's mission.

We expect many educational aspects impacted since there are many students using these freely available RAMA mooring data for research.

Agency or programme	Coastal Data Information Program (CDIP)	
Number and type of buoys	(a) deployed during the year	10
	(b) operational as of 31 July	73
	(c) reporting on GTS as of 31 July	all
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	US waters worldwide: Atlantic, Caribbean, Gulf of Mexico, Pacific, Alaska, Hawaii, Pacific Islands	
Vandalism incidents	(a) Number of incidents NONE If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

The Coastal Data Information Program (CDIP) is an extensive network for monitoring waves and beaches along the coastlines of the United States. Since its inception in 1975, the

program has produced a vast database of publicly accessible environmental data for use by coastal engineers and planners, scientists, mariners, and marine enthusiasts. The program has also remained at the forefront of coastal monitoring, developing numerous innovations in instrumentation, system control and management, computer hardware and software, field equipment, and installation techniques. CDIP operates out of Scripps Institution of Oceanograpy, La Jolla, CA. For more information, see http://cdip.ucsd.edu/.

Impact from COVID-19 had a minor effect on the operations of the CDIP wave measurement network. Most of the field operation teams were based on local support and adhered to local, state and federal mandates established for each region.

Agency or programme	Naval Oceanographic Office (NAVOCEANO)	
Number and type of buoys	(a) deployed during the year	104 Iridium floats 66 MetOcean Iridium iSVP drifters 31 MetOcean Iridium iSLDMB drifters
	(b) operational as of 31 July	48 Iridium floats 36 Iridium iSVP drifters 58 iSLDMB drifters
	(c) reporting on GTS as of 31 July	45 Iridium floats 2 Iridium iSVP drifters 6 iSLDMB drifters
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Global	
Vandalism incidents	(a) Number of incidents NONE If vandalism incidents have occurred during the year, please provide the details using the form in the annex.	

The purpose of NAVOCEANO deployments is to support US Navy operations globally. Deployment plans are dictated by operational needs.

Note: COVID-19 associated reduced manning and COVID-19 associated reduced deployment opportunities affected the number of instruments deployed.

PLANNED PROGRAMMES:

Agency or programme	Global Drifter Program (GDP)	
Number and type of buoys	planned for deployment in the next 12 months	1000 drifters (800 funded by NOAA; 200 by consortium partners)
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	global	

Agency or programme	US Interagency Arctic Buoy Program (USIABP)	
Number and type of buoys	planned for deployment in the next 12 months	20 SVP-B 10 Ice Balls (drogue-less SVP-Bs) 6 AXIB met. buoy 5 Ice Mass Balance (IMB) buoys 9 Ocean Profilers 10 Other
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Arctic	

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Moored Buoys (MET/OCEAN)**	
Number and type of buoys	planned for deployment in the next 12 months	67
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Atlantic and Pacific Oceans and Coastal Zone of the US, including the Bering Sea, Gulf of Mexico, and Great Lakes	

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Tsunameter Stations**	
Number and type of buoys	planned for deployment in the next 12 months	20
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Atlantic and Pacific Oceans and Gulf of Mexico	

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS)/ National Data Buoy Center (NDBC) **Tropical Atmosphere Ocean (TAO) Project**	
Number and type of buoys	planned for deployment in the next 12 months	40 toroids, 3 subsurface moorings
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[x]
	(c) developmental	[ ]
Main deployment areas	Equatorial Pacific	

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ Pacific Marine Environmental Laboratory (PMEL) and Atlantic Oceanographic and Meteorological Agency (AOML) **Prediction and Research moored Array in the Tropical Atlantic (PIRATA)**	
Number and type of buoys	planned for deployment in the next 12 months	18
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[ ]
	(b) met / ocean research	[x]
	(c) developmental	[x]
Main deployment areas	Tropical Atlantic	

Agency or programme	National Oceanic and Atmospheric Administration (NOAA)/ Pacific Marine Environmental Laboratory (PMEL) **Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA)**	
Number and type of buoys	planned for deployment in the next 12 months	20 surface toroids, 2 subsurface ADCP moorings
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[ ]
	(b) met / ocean research	[x]
	(c) developmental	[ ]
Main deployment areas	Tropical Indian Ocean	

Agency or programme	Coastal Data Information Program (CDIP)	
Number and type of buoys	planned for deployment in the next 12 months	2
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Pacific Western, Atlantic, Gulf of Mexico, Gulf of Alaska, Carribean	

Agency or programme	Naval Oceanographic Office (NAVOCEANO)	
Number and type of buoys	planned for deployment in the next 12 months	~75 drifters ~75 floats
Purpose of programme *(check/uncheck boxes using [_] or [x] as appropriate)*	(a) operational	[x]
	(b) met / ocean research	[ ]
	(c) developmental	[ ]
Main deployment areas	Global	

TECHNICAL DEVELOPMENTS:

No new T-Flex systems were implemented in the past year and none are planned for the coming year. T-Flex data are reported on the GTS in BUFR format with Bulletin Header IOBX08 KPML. WMO numbers for T-Flex moorings take the 7-digit analog of the 5-digit code for the previous ATLAS system at the same site. For example, the WMO number for the first T-Flex mooring implemented (4°S 81°E in RAMA) will be 2300010 (vs 23010 for the previous ATLAS moorings at that site).

A new generation of mooring data acquisition system, named TELOS, is currently being tested with two prototype moorings deployed near Hawaii. These systems will offer increased flexibility for incorporating additional instrumentation and higher resolution real-time data transmissions.

A standard tropical mooring sensor suite includes sensors for measuring wind, air temperature, relative humidity, barometric pressure, longwave and shortwave solar radiation, precipitation, subsurface temperature, conductivity, pressure, and currents. In addition to the standard mooring observations, partner projects offer additional measurements including CO2, turbulence, and fish tracking. The Bay of Bengal Large Marine Ecosystem Project (BoBLME) supports a PMEL designed MapCO2 system for CO2 and ocean acidification observations at one RAMA site. Ancillary observations of turbulence are provided by Oregon State University employing thermal microstructure instruments (Chipods). GEOMAR provides sensors to measure subsurface dissolved oxygen (O2) in the Atlantic oxygen minimum zone. Two LOCEAN surface Carbon Dioxide (CO2) systems were deployed in FY 2020. Dalhousie University Ocean Tracking Network acoustic monitors are deployed on all RAMA and PIRATA surface moorings.

PUBLICATIONS:

Global Drifter Program:

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Roach, C. J., Balwada, D., & Speer, K. (2018). Global observations of horizontal mixing from Argo float and surface drifter trajectories. Journal of Geophysical Research: Oceans, 123, 4560–4575. https://doi.org/10.1029/2018JC013750

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SPECIAL COMMENTS (if any): None.

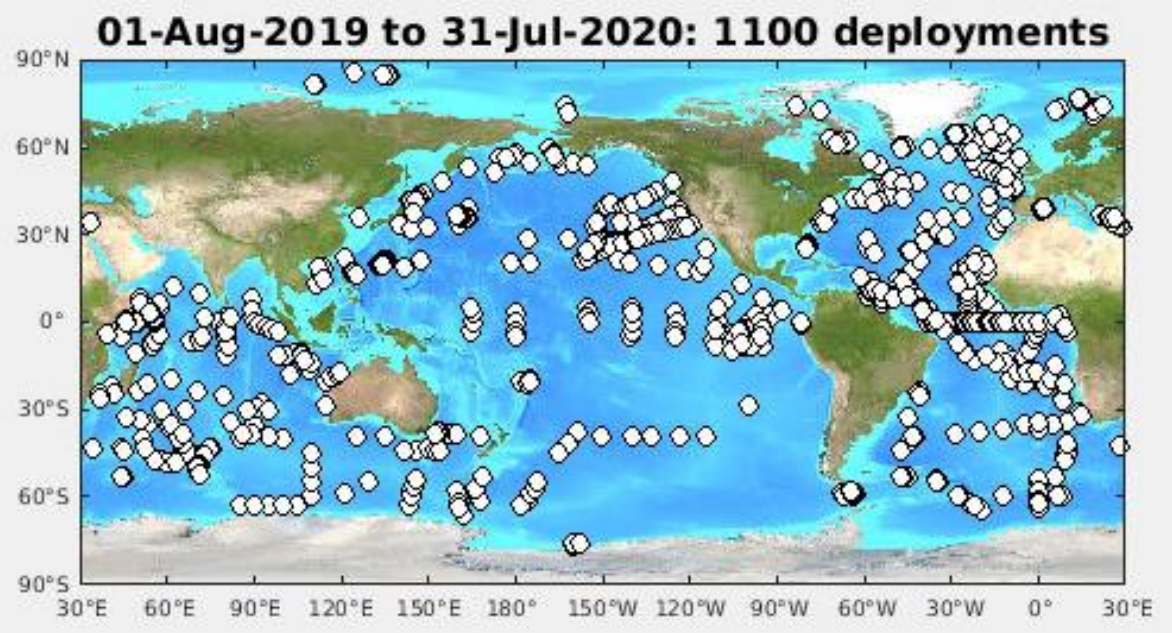

Fig. 1: Global Drifter Program deployment locations during the year.

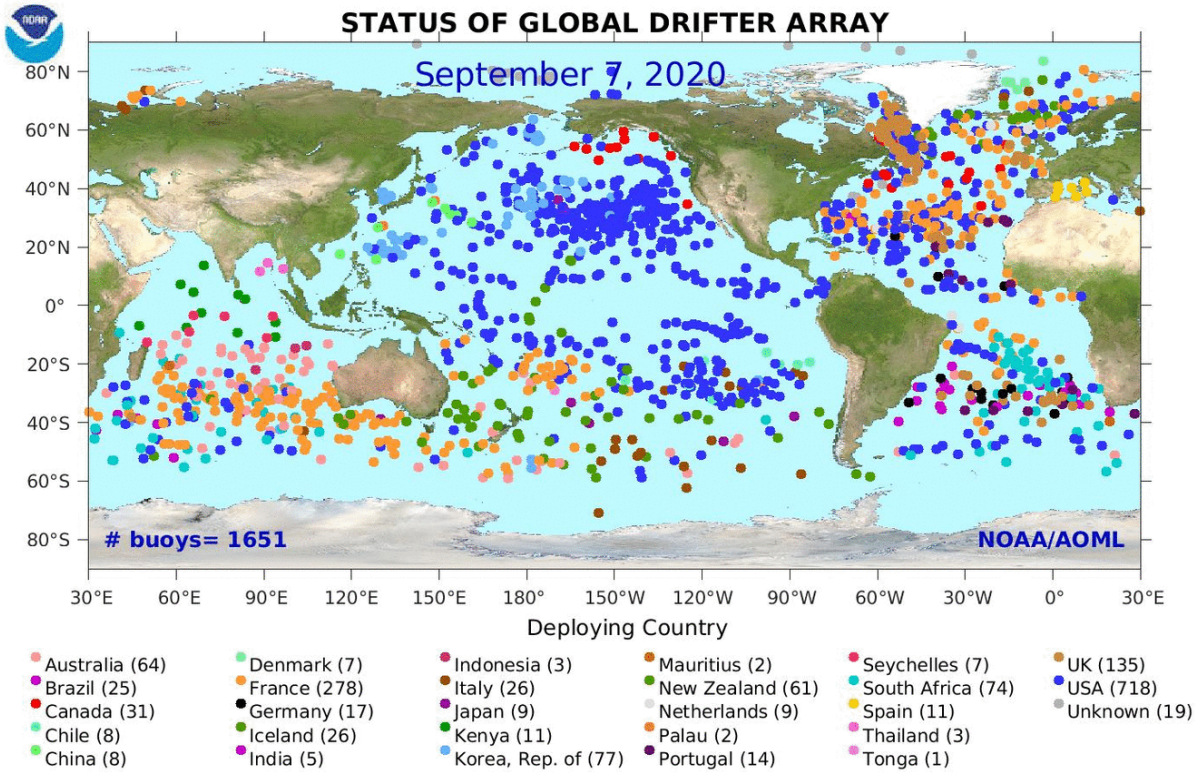

Fig. 2: Global drifter array status as of 7 September 2020. Figure from http://www.aoml.noaa.gov/phod/gpd.

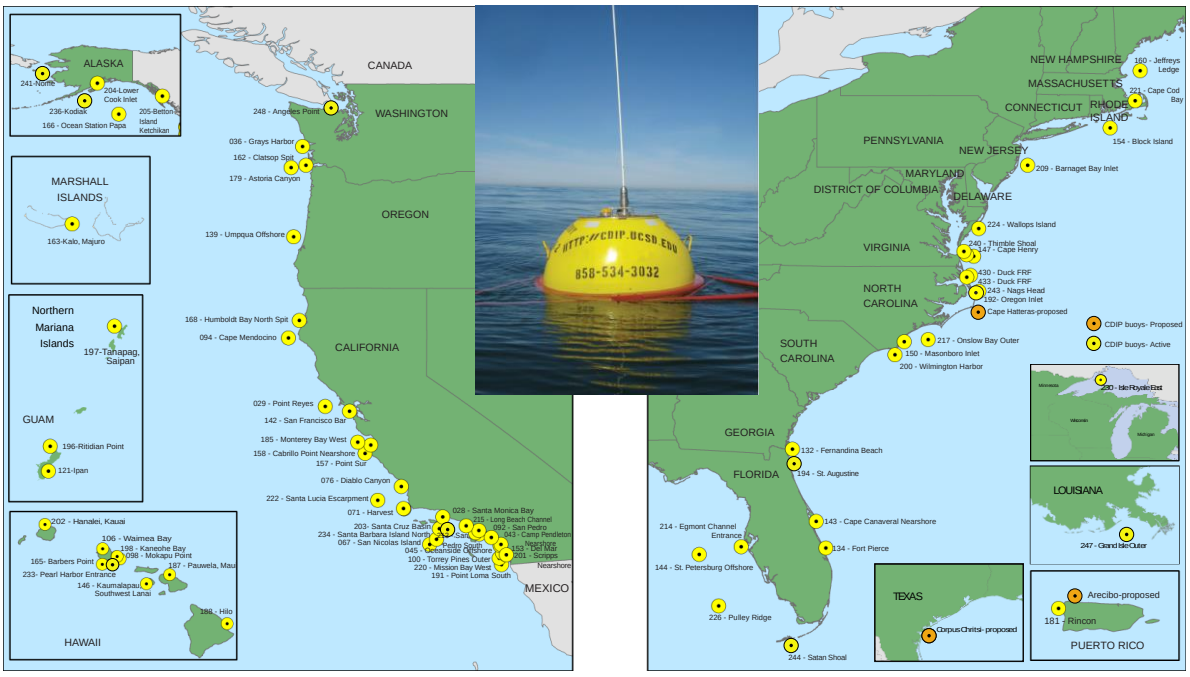

Fig. 3: Coastal Data Information Program (CDIP) monitoring locations.

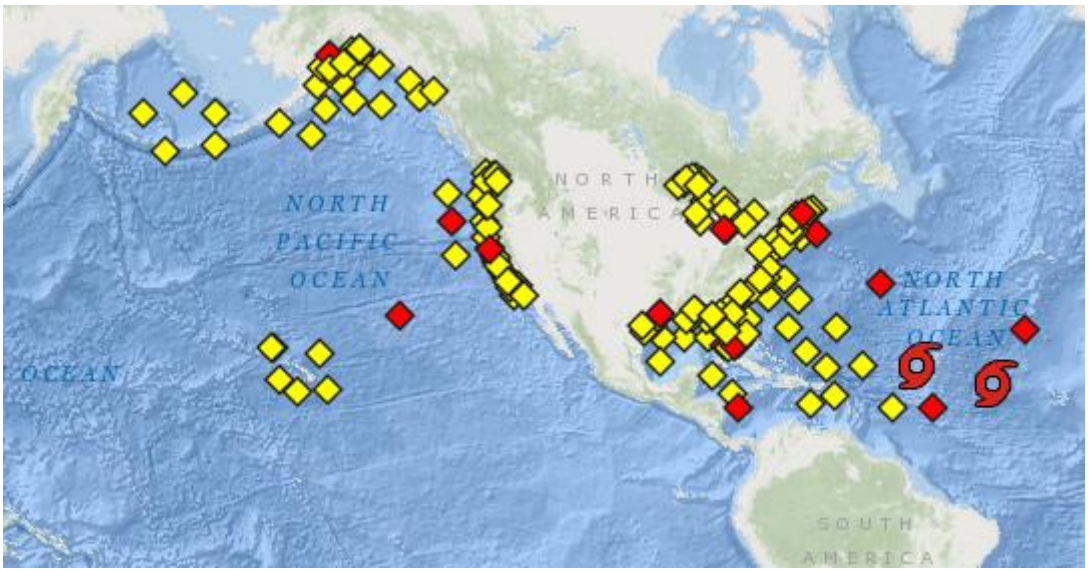

Fig. 4: NDBC Moored Buoys (MET/OCEAN), showing stations reporting in the last 8h (yellow) or not (red). Figure from http://www.ndbc.noaa.gov/obs.shtml. This image is for 10 September 2020.

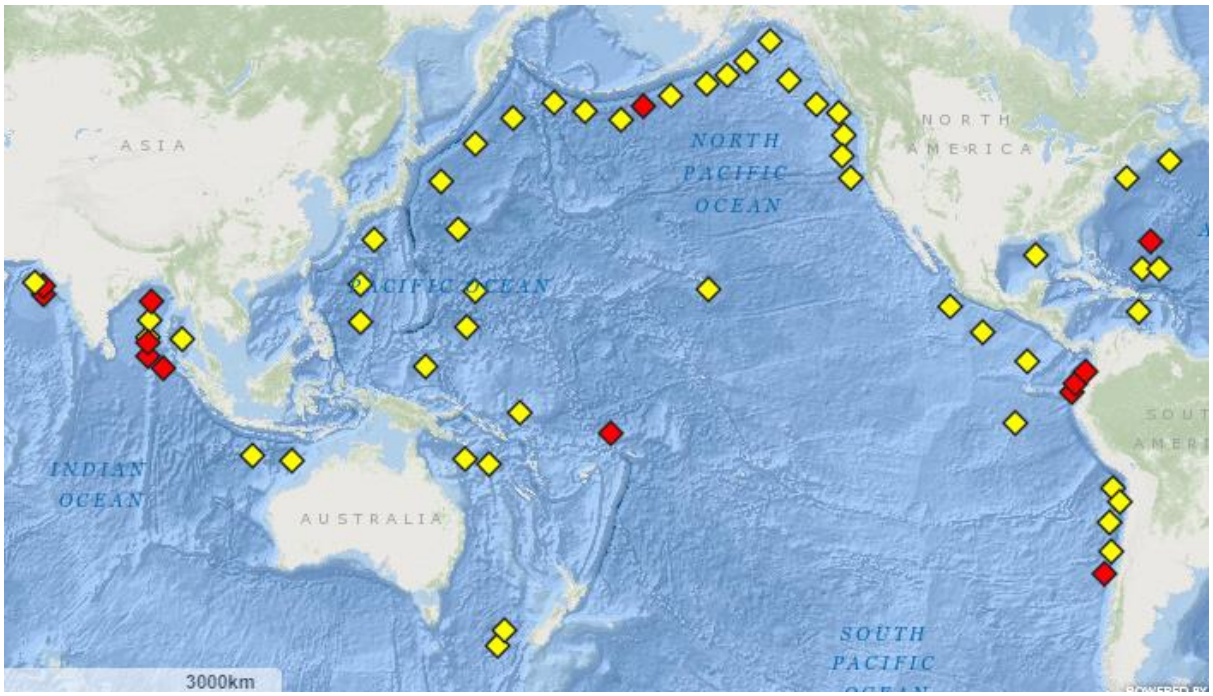

Fig 5: International Tsunami Network status, showing stations reporting in the last 24h (yellow) or not (red). Figure from http://www.ndbc.noaa.gov/obs.shtml. This image is for 10 September 2020.

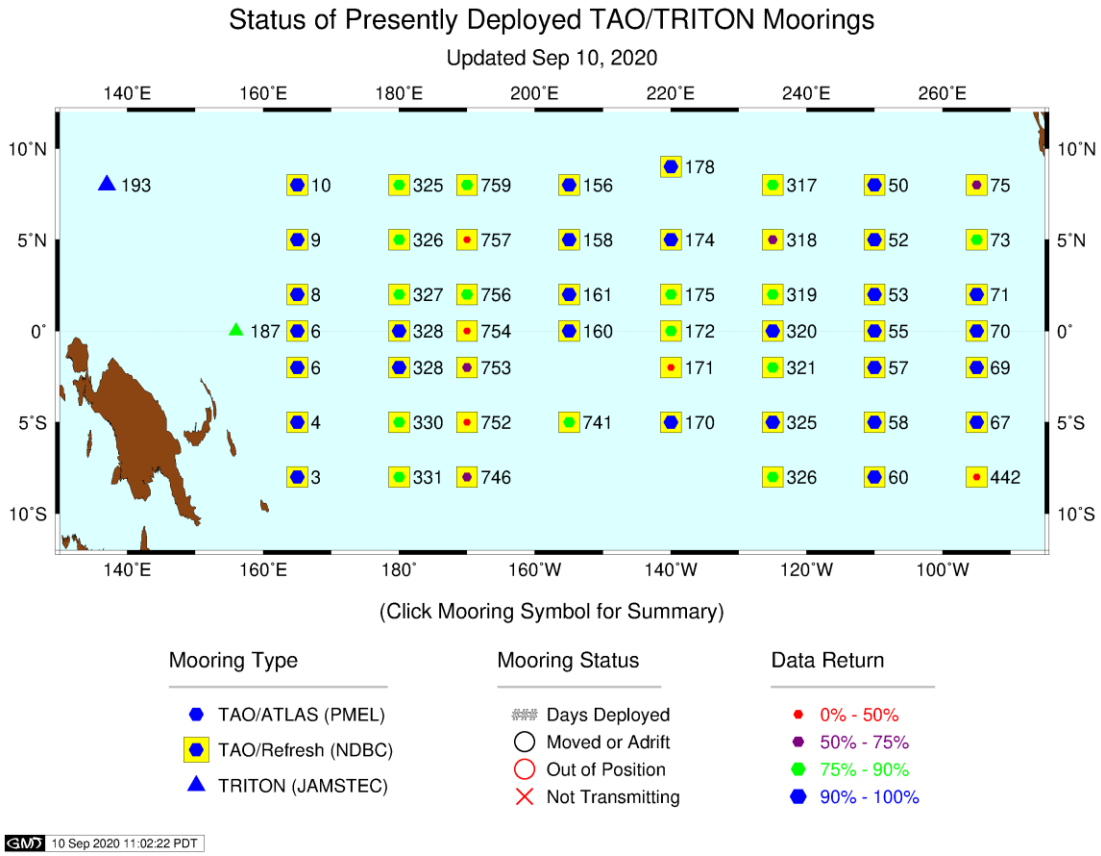

Fig. 6: NDBC Tropical Atmosphere Ocean (TAO) Array and TRITON Array status on 10 September 2020. The numbers indicate how many days have passed since last servicing (ideally <365). Figure from http://www.pmel.noaa.gov/tao/global/status/.

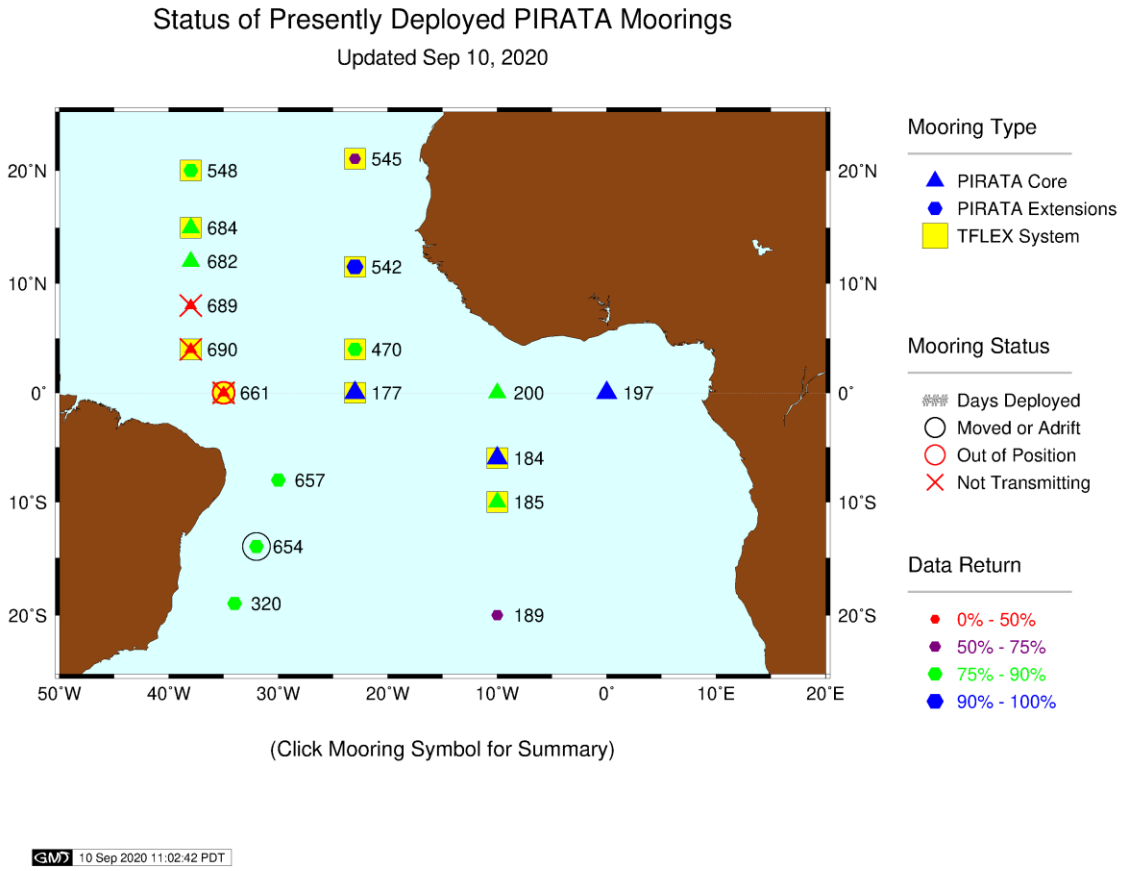

Fig. 7: PIRATA Array including PMEL/AOML Northeast Extension status on 10 September 2020. The numbers indicate how many days have passed since last servicing (ideally <365).). Figure from http://www.pmel.noaa.gov/tao/global/status/.

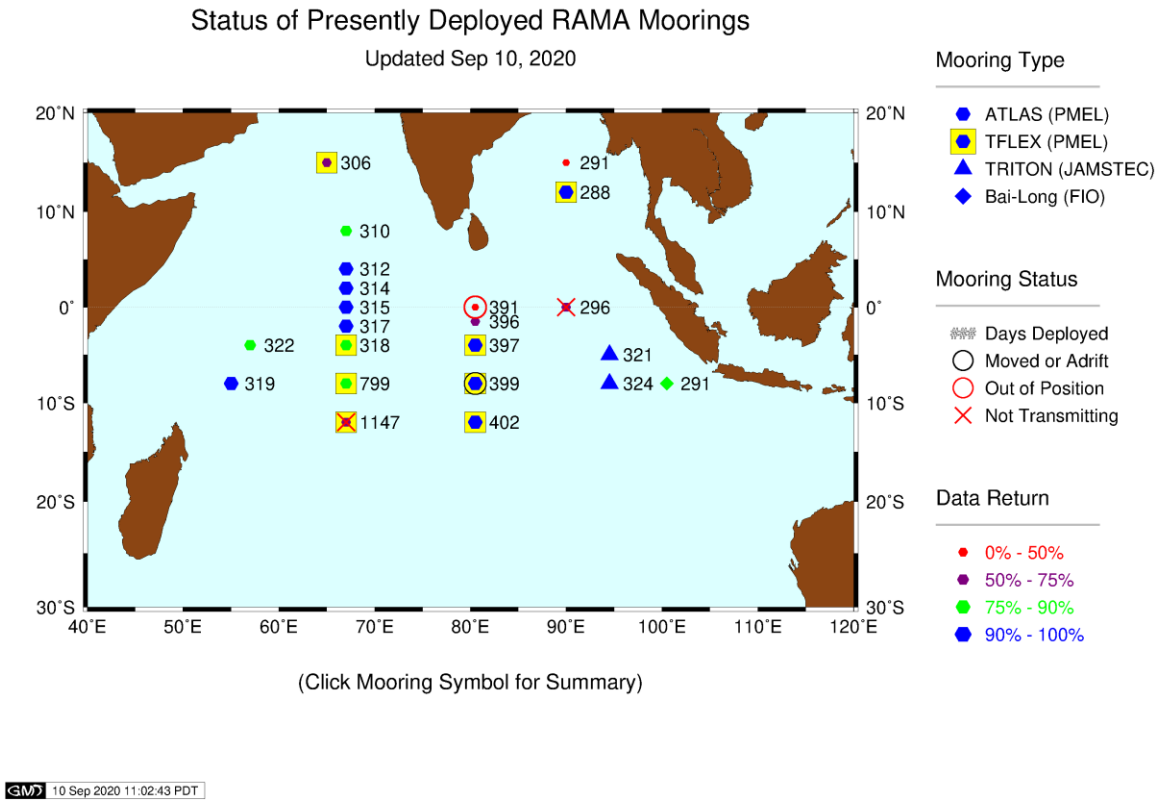

Fig. 8: International RAMA Array status on 10 September 2020. The numbers indicate how many days have passed since last servicing (ideally <365). Figure from http://www.pmel.noaa.gov/tao/global/status/.