

PIRATA-24b meeting report

(Virtual meeting via videoconference, May 13-14, 2021)

As the previous PIRATA SSG/PRB meeting (“virtual” 24a in 2020), the 24th PIRATA SSG/PRB meeting, 24b, also initially expected to be organized in Miami in person, was again due to Covid pandemic held via videoconference on May 13-14, 2021 at the end of the scientific PIRATA-24/TAV meeting on May 10-13), and organized by Greg Foltz & Renellys Perez (NOAA/AOML), James Todd (NOAA/GOMO) and Mike McPhaden (NOAA/PMEL) .

The agenda was as follows:

Thursday, May 13 all times EDT (GMT-4): reports presentation

13:35-13:55	U.S./PMEL PIRATA update (Mike McPhaden)	see p.2
13:55-14:15	France PIRATA update (Bernard Bourlès)	see p.12
14:15-14:35	Brazil PIRATA update (Ronald Buss de Souza)	see p.30
14:35-14:55	U.S./AOML PNE update (Greg Foltz)	see p.25
14:55-15:15	PRB updates (David Legler, Frédéric Marin, Philippe Dandin, Janice Trotte)	see p.36

Friday, May 14 all times EDT (GMT-4): discussions (suggested topics)

- PRB updates
- MOU Update and plans for final approval (invite Katie Geddes to join)
- Operational constraints and actions
- Vandalism, mooring loss, ship time constraints and plans to address them
- Budget outlook and actions
- Actions in response to national budget outlooks and constraints (e.g. US)
- TAOS Review
- Major take-away messages/recommendations
- Relationship of PIRATA to the “Tropical Atlantic Observing System”
- Possible other topics: SSG & PRB changes, collaborations with (and contribution to) other programs, piracy impacts
- EuroSea mission (fall 2021): Saildrones along 38W, 23W, 10W and CO2 sensors on 8N,38W and two 10W moorings.
- Membership and other PIRATA organizational business
- Plans for next PIRATA/TAV meeting?

Attendees for the SSG-PRB virtual session:

- SSG member participants:

Bernard Bourlès (IRD/LEGOS, France; co-chair); Moacyr Araujo (UFPE, Brazil; co-chair); Michael McPhaden (NOAA/PMEL, USA); Gregory Foltz (NOAA/AOML, USA); Paulo Nobre (INPE, Brazil), Hervé Giordani (Météo-France/CNRM, France), Fabrice Hernandez (IRD/LEGOS/Mercator Océan, France), Peter Brandt (GEOMAR, Germany), Leticia Cotrim (UERJ, Brazil), Christina Patricola (LBNL, USA), Regina Rodrigues (UFSC, Brazil), Adrienne Sutton (NOAA/PMEL, USA).

- PRB member participants:

David Legler (NOAA, USA, Chair); Janice Trotte-Duhá (DHN, Brazil); Frédéric Marin (IRD/LEGOS, France); Philippe Dandin (Météo-France/CNRM, France) ; Ronald Guss de Souza (INPE, Brazil)

Also attended: James Todd (NOAA/GOMO, USA), Katie Geddes (NOAA, USA), Renellys Perez (NOAA/AOML, USA), Kenneth Connell (NOAA/PMEL, USA), Jérôme Llido (IRD/LEGOS, France), Hervé Roquet (Météo-France).

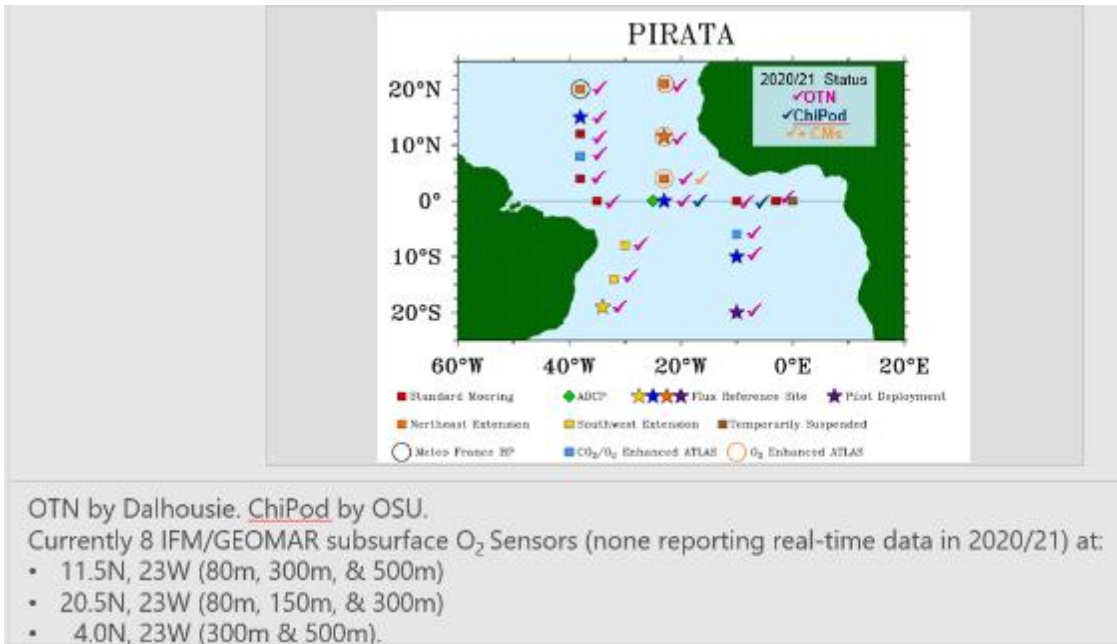
In the following, global and national reports are presented as simple copies of the slides.

PIRATA global and national status:

1) NOAA/PMEL PIRATA overall report (Mike McPhaden)

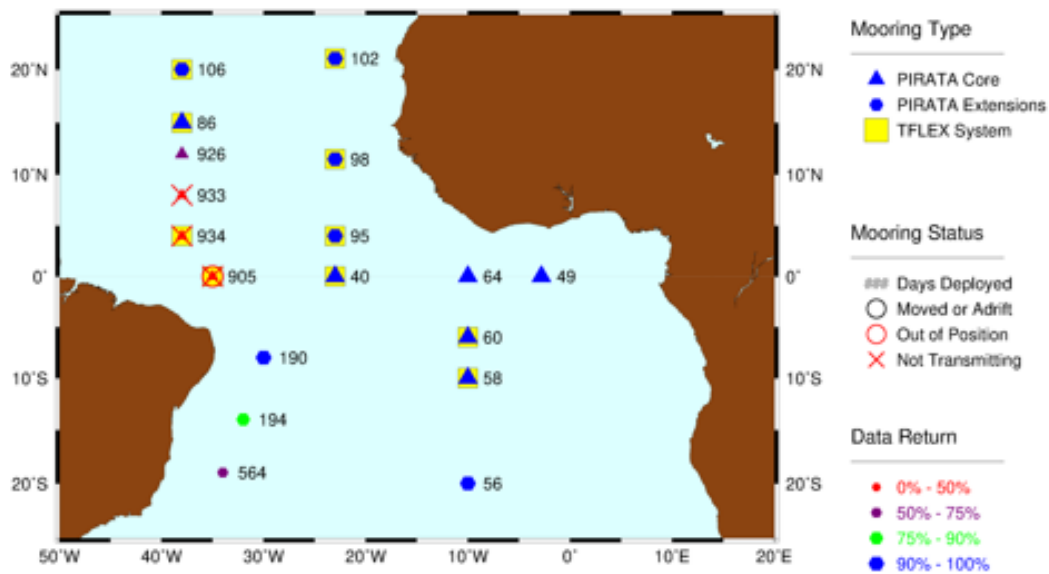
Mike McPhaden (MM) presented the current flavor of the PIRATA buoy network, progress from the last PIRATA-24a meeting (April 2020), and plans for 2021.

PIRATA network sensors status:

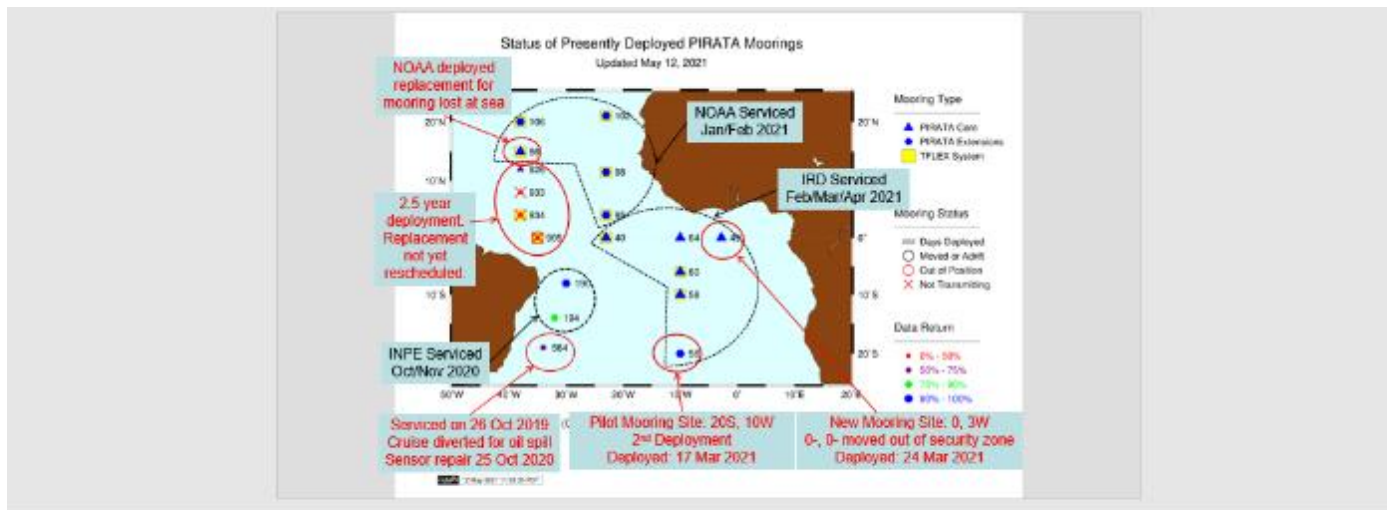


Status of Presently Deployed PIRATA Moorings

Updated May 12, 2021



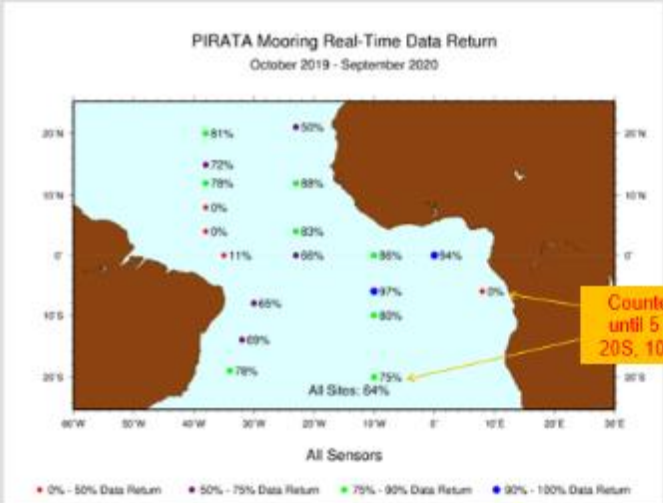
(Click Mooring Symbol for Summary)



Lost at sea:

15N_38W (Deployment PT025): Went adrift on 19 Sep 2020. Lost all data transmission from the drifting buoy from 15N, 38W on 28 Dec 2020. Lost on shores of Dominica. NOAA deployed replacement on 14 Feb 2021.

0_35W (Deployment PT026): Went adrift on 21 Apr 2020. Lost all transmissions on 21 Aug 2020.



Most recent 12 month real-time data return (October 2019 to September 2020).

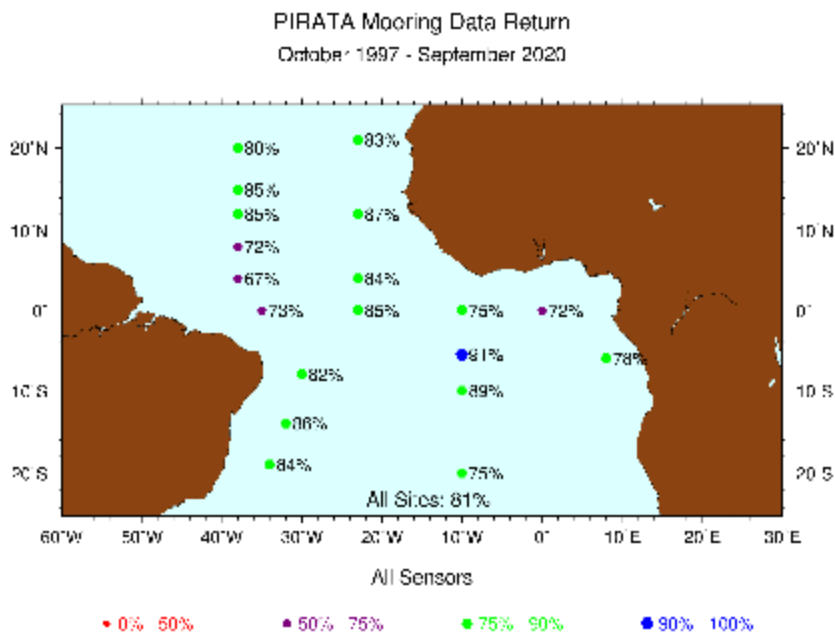
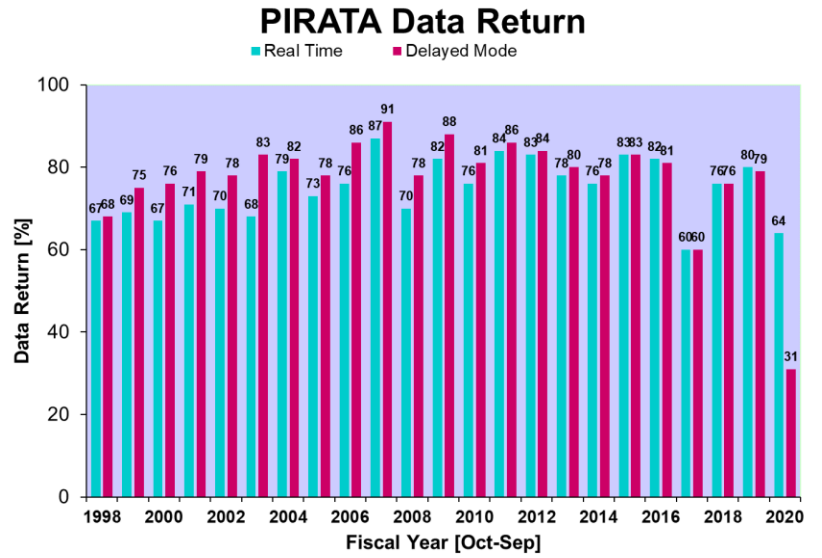
Moorings with less than 80% total data return Oct 2019 through Sep 2020:

6S8E 0%

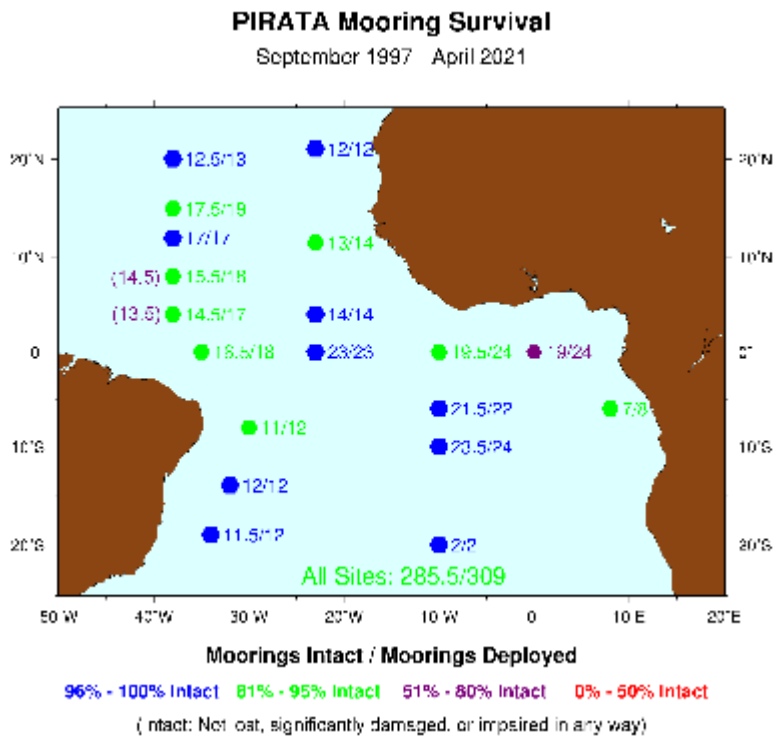
PIRATA Real-Time Data Return
Oct 2019 – Sep 2020

	Air T	SST/SSC	T(Z)	Wind
% Data Return	72	41/35	67	74
	RH	Rain	SWR	Salinity
% Data Return	66	73	80	55
	Currents (11 sites)	LWR (7 sites)	Atm Pres (8 sites)	All Sensors
% Data Return	55	85	87	64

FY 2020: October 2019 to Sep 2020 Real-time Data Return Summary by Sensor (Table View)
All PIRATA Sensors: 64%



Mooring Survival Data Return over past 24 years (1997 – 2021)
 Mooring is not counted as lost until confirmed. Numbers in parentheses indicate not confirmed but likely losses.

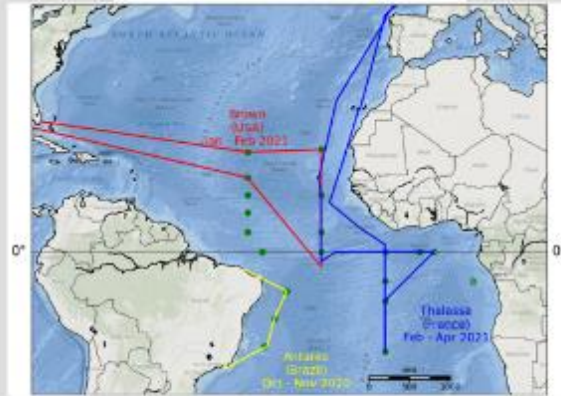


PIRATA Cruises Oct 2019 – Sep 2020

Completed PIRATA Cruises FY 2020

- Brazil PIRATA Cruise aboard the *Vital de Oliveira* partly completed but diverted to Oil Spill after 1 mooring.
- NOAA PNE cruise cancelled due to COVID-19
- French PIRATA cruise aboard the *Thalassa*, Feb/Mar 2020; Mindelo to Brest

PIRATA Cruises Oct 2020 – Sep 2021



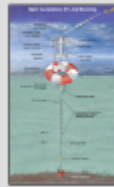
Completed PIRATA Cruises FY 2021

- Brazil PIRATA Cruise aboard the *Vital de Oliveira* partly completed but diverted for engine problems.
- Jan/Feb 2021 PNE cruise on *Ronald H. Brown* (Originally scheduled for May/June 2020; Miami to Key West)
- French PIRATA cruise aboard the *Thalassa*, Feb/Mar/Apr 2020; Brest to Brest

Field Work Summary

Oct 2019-Sept 2020

- Moorings Deployed: 7
4 ATLAS + 3 T-Flex
- Cruises: 49 days at sea



- *VITAL DE OLIVEIRA* (22 Oct - 5 Nov 2020): 12
- *THALASSA* (16 Feb - 30 Mar 2020): 37
- *RON BROWN* (Cancelled because of COVID): 0

- PMEL Person-days at sea: 0 (COVID-19)

Oct 2020-present

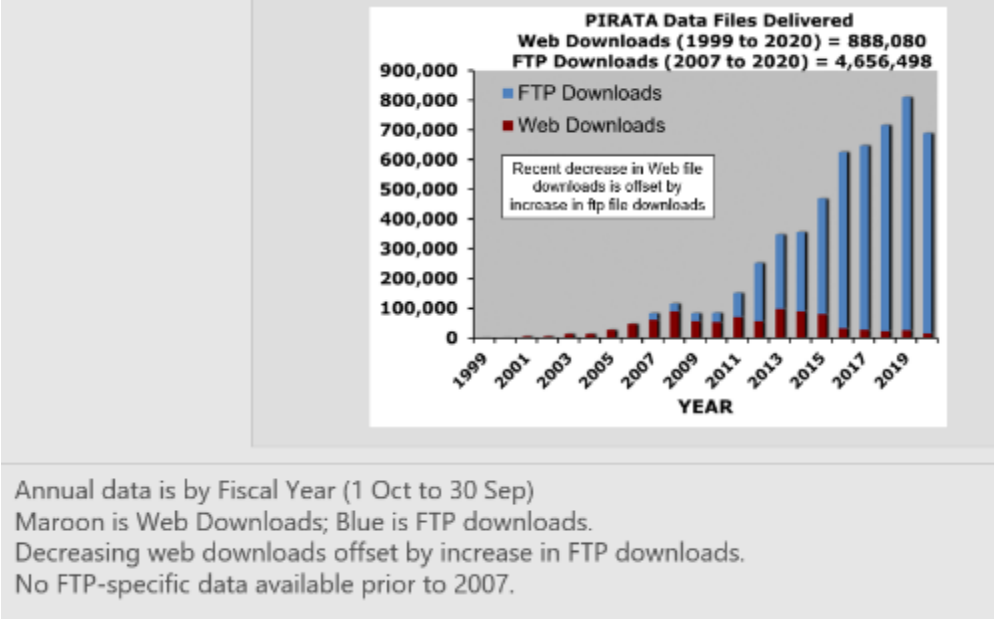
- Moorings Deployed: 13
5 ATLAS + 8 T-Flex
- Cruises: 120 days at sea

- *ANTARES* (21 Oct - 6 Nov 2020): 17
- *RON BROWN* (15 Jan - 24 Feb 2021): 41
- *THALASSA* (22 Feb - 18 Apr 2021): 62

- PMEL Person-days at sea: 82

Brazil cruise diverted for oil spill after servicing 1 ATLAS mooring in Oct-Nov 2019

Brazil cruise diverted due to ship engine problems after servicing 2 ATLAS moorings (at 14S, 32W and 8S, 30W) and surface sensor repair on 1 more (at 19S, 34W) in Oct-Nov 2020



FISHING ISSUES:

Slide from: **Guelson Silva** as presented at PIRATA-24 on Tue, 11 May 2021, 12:40 – 12:55 EDT:
[Fishing operations to catch tunas on aggregated schools at the vicinity of the PIRATA data buoys in the western Atlantic](#)

✓ Chronological development

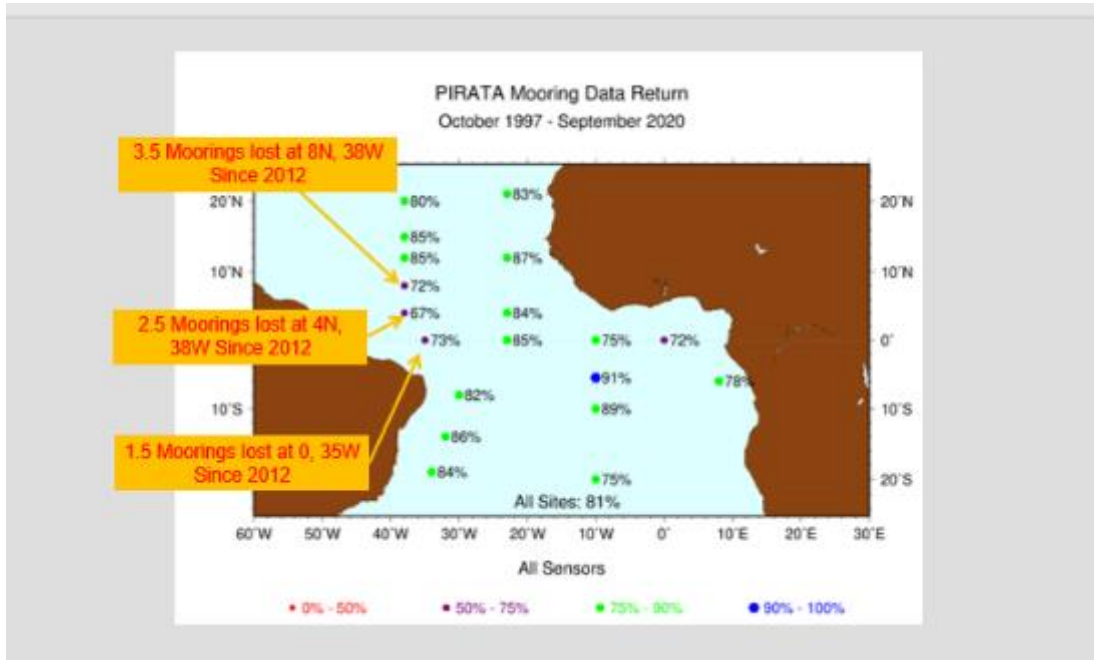
- 2009 – Fishers from Rio Grande do Norte, northeastern Brazil, discover the aggregations of tuna schools near data buoy starting to explore them.
- 2012 –The fleet expands to Ceará state, northeastern Brazil, with a rapid increase in the number of boats
- 2016 –The fleet expands to Espírito Santo state, southeastern Brazil
- 2018 – The Brazilian government recognizes this kind of fishery as legal

Guelson Silva
PIRATA-24
11 May 2021

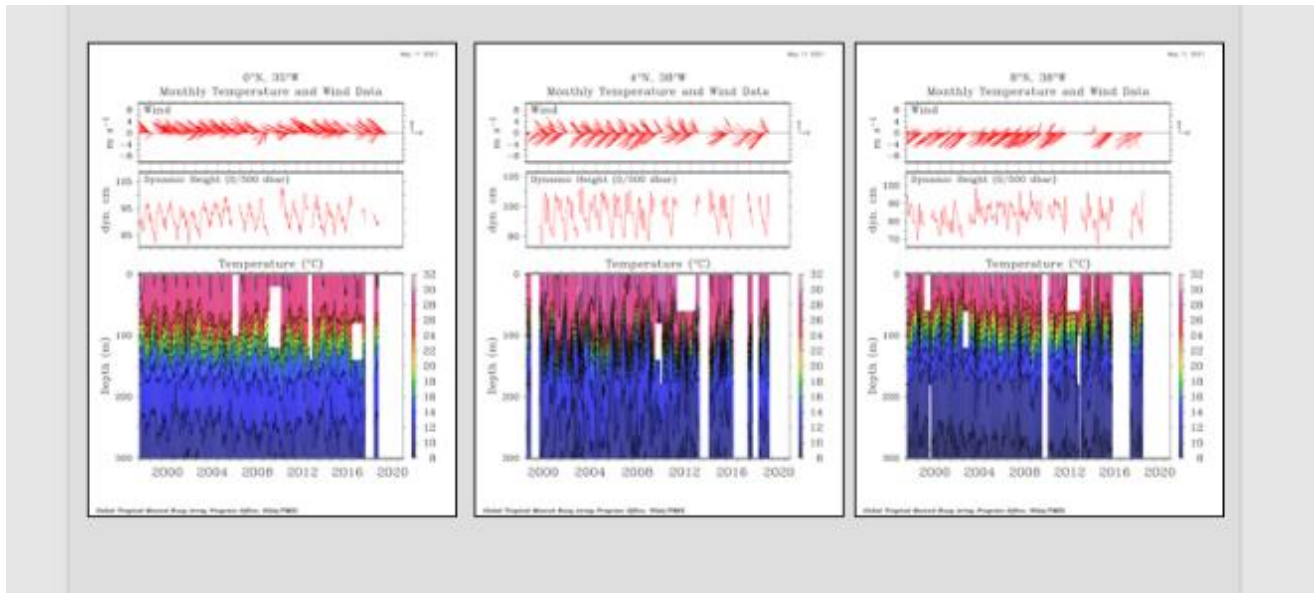
Year	RN	CE	ES
2010	~10	0	0
2011	~10	0	0
2012	~10	~10	0
2013	~40	~40	0
2014	~50	~100	0
2015	~60	~100	0
2016	~50	~110	~10
2017	~50	~120	~50

MOORING LOSSES :

7.5 mooring losses since 2012 as the three sites indicated. Mooring losses amount to over \$1M USD



There were data gaps before 2012, with a mooring loss at 4N, 38W in 1999-2000. But much greater data losses since start of organized Brazilian national fishing program after 2012.



GT MBA BUDGET :

GT MBA Budget Deficits*
FY2016-20

Fiscal Year	RAMA	PIRATA	Total
FY 2016	\$213K	\$119K	\$332K
FY 2017	\$447K	\$249K	\$696K
FY 2018	\$267K	\$147K	\$414K
FY 2019	\$454K	\$271K	\$725K
FY 2020	\$365K	\$225K	\$580K

Key Reasons: Flat budgets + inflation + higher overheads + RAMA Expansion + T-Flex

**Update of Presentation to PIRATA SSG in April 2020*

Q: Why is there a shortfall in the GT MBA funding?

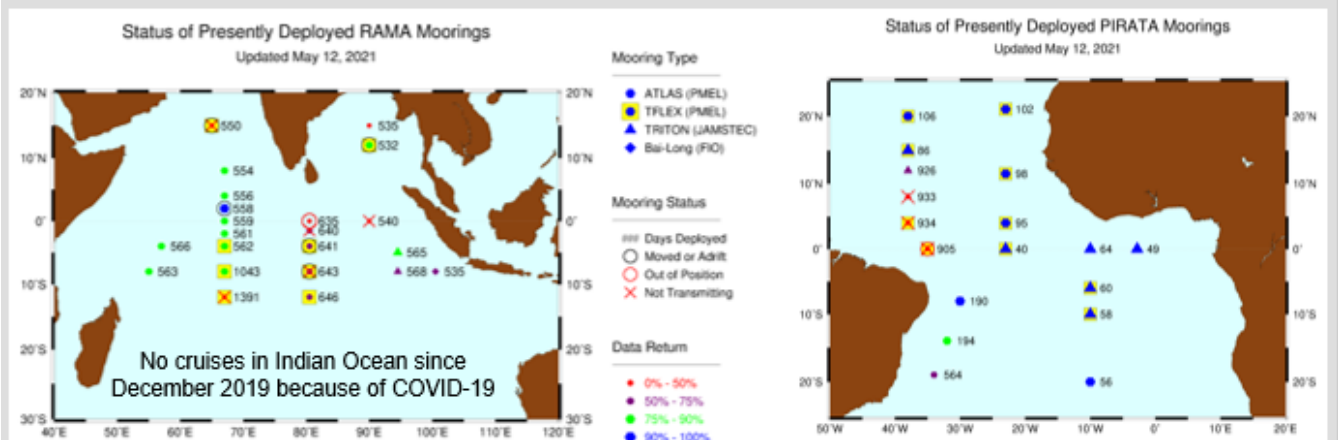
A: The shortfall in GT MBA funding is the result decade plus of flat funding levels combined with increasing expenses related to the following mounting pressures on the GT MBA budget:

- Growth of RAMA: 8 more Sites (17 → 25)
- T-Flex implemented (9 in RAMA, 11 in PIRATA):

More capable but more expensive (+\$50K) than ATLAS

- General inflation (\$1 in 2010 → \$1.20 in 2019)
- More corporate taxes (+\$200K in FY19 vs FY15)
- Heavy losses due to vandalism in past 2 years (particularly in RAMA: 4°N-12°N, 90°E and in PIRATA: 35-38°W & 6°S, 8°E)

Mooring Losses in RAMA and PIRATA



10 Lost Moorings:

7 Moorings Gone Adrift (Lost at Sea)

3 Moorings Not Transmitting (Presumed Lost)

4 Lost Moorings:

2 Moorings Gone Adrift (Lost at Sea)

2 Moorings Not Transmitting (Presumed Lost)

PMEL PIRATA budget for FY 2021 was finalized in late April 2021 (3rd quarter of fiscal year).

This was late and left few options for dealing with budget shortfall.

FY 2021 GTMBA Budget
As of May 7

NOAA cut \$430K (12%) relative to FY 2020

12% budget cut +
\$580K starting budget deficit +
14 mooring losses (@\$150K per mooring)

→PIRATA & RAMA in present form are not sustainable

BUT :

This week, NOAA provided +\$400K USD when realizing what the dire consequences would be to GTMBA. These funds allow us to continue to maintain PIRATA this year. However, the PMEL budget situation requires a significant boost in funding in FY2022 and beyond; otherwise, there will be hard choices to make about suspending measurements at some sites to fit within budget.

FY 2021 GTMBA Budget
As of May 11

NOAA cut \$30K (1%) relative to FY 2020

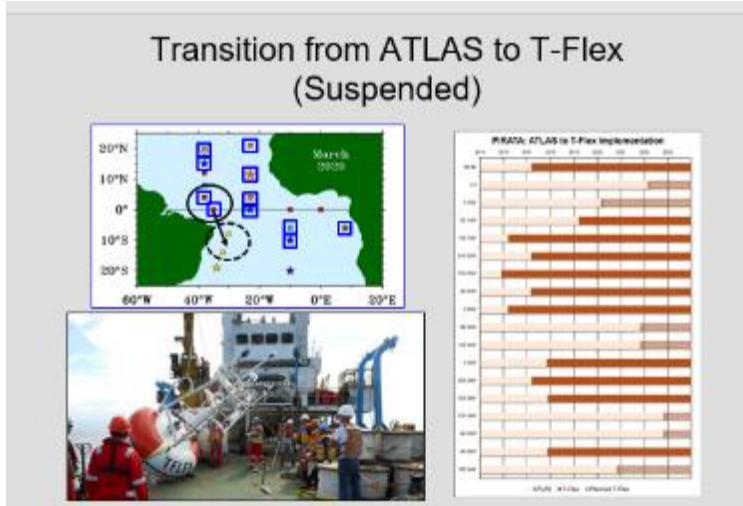
1% budget cut +
\$580K starting budget deficit +
14 mooring losses (@\$150K per mooring)

→PIRATA can be sustained for another year

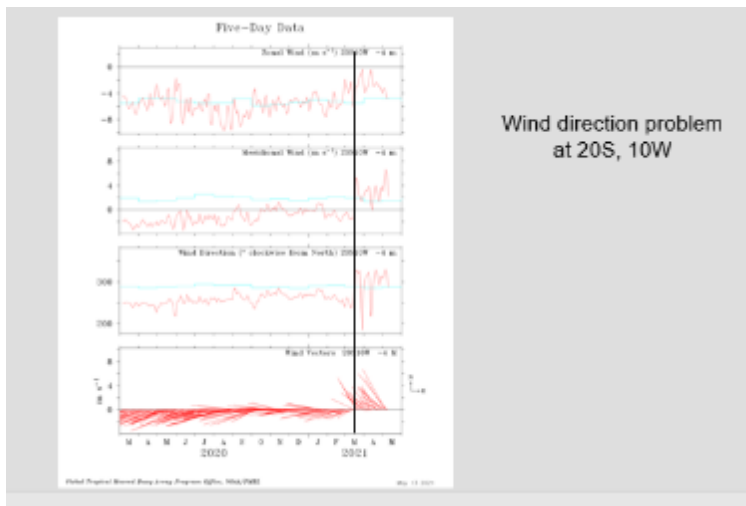
T-Flex issue :

PMEL has developed Tropical Flex, or T-Flex, to replace the ATLAS mooring. T-Flex incorporates new or updated commercially available sensors and uses Iridium for telemetry of higher temporal resolution data. Eight prototype T-Flex systems were deployed next to ATLAS moorings in RAMA and PIRATA over the past several years (2011-15) to test their performance and confirm equivalency of observations.

Currently (Oct 2019), there are 20 T-Flex systems deployed in RAMA and PIRATA combined, with **9 T-Flex systems deployed in RAMA** and **11 T-Flex systems deployed in PIRATA**.



20°S-10°W issue :



2) French PIRATA report (Bernard Bourlès)

PIRATA status in France:

- The PIRATA-France label as « National Observations Service for Ocean-Atmosphère » by CNRS allows and ensures vessel time every year. This label also commits national institutions to support & fund PIRATA (IRD, Météo France, National Oceanographic Fleet...)
- The 5 years convention between IRD and Meteo-France will be renewed (for 2021-2025).
- The French « national fleet scientific committee » proceeded to the scientific evaluation of the PIRATA-FR cruises series in 2020: Positive => the annual vessel time is guaranteed from 2022 to 2025.
- National attempt to better organize Open Oceans National Observations Services within an « Research Infrastructure », as are ARGO, Coastal Obs... (OHIS for In Situ Open Ocean Obs: results by fall 2021).

PIRATA Fr fundings & support:

- IRD: ~50k€/y
- METEO-France: 30k€/y
- OMP (Observatoire Midi-Pyrénées): ~3k€/y
- + National « Research Fleet » Service Unit (Ifremer, CNRS, IRD, ...) for vessel time > 1M€/y

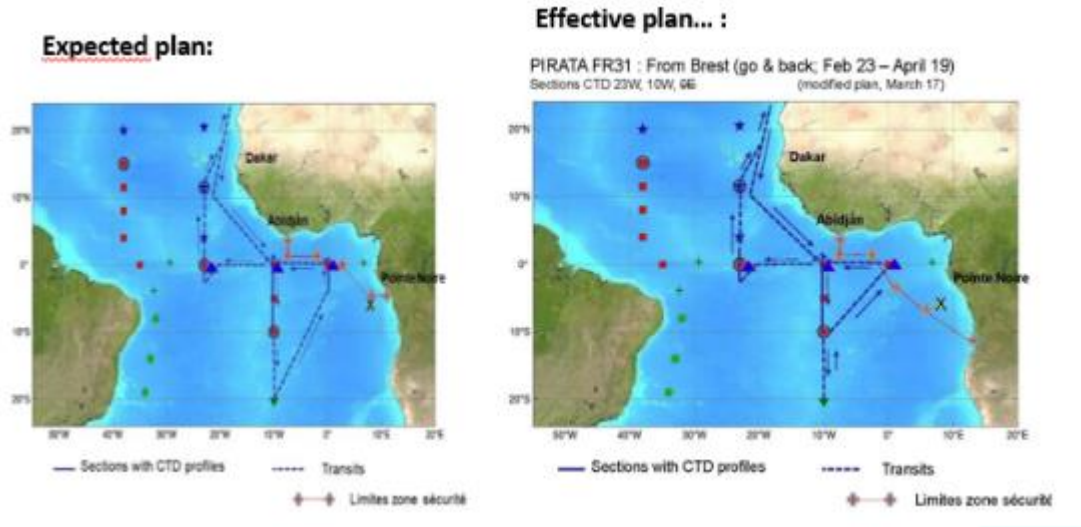
French PIRATA dedicated cruises : 31 cruises from 1997 to 2021 (=> >950 days at sea)

Nom de la campagne	Navire	Dates	Chef de mission
PIRATA FR1	ANTEA	09/09-16/09/1997	Jacques SERVAIN
PIRATA FR1 bis	ANTEA	30/01-03/02/1998	Jacques SERVAIN
PIRATA FR2	ANTEA	30/10-10/11/1998	Jacques SERVAIN
PIRATA FR3	ANTEA	23/01-01/02/1999	Jacques SERVAIN
PIRATA FR4- EQUALANT 1999	THALASSA	13/07-21/08/1999	Yves GOURIOU
PIRATA FR5	ANTEA	25/10-08/11/1999	Jacques SERVAIN
PIRATA FR6	SUROIT	08/03-19/03/2000	Jacques GRELET
PIRATA FR7 – EQUALANT 2000	THALASSA	23/07-21/08/2000	Bernard BOURLÈS
PIRATA FR8	ATALANTE	17/11-03/12/2000	Jacques GRELET
PIRATA FR9	ATALANTE	20/10-11/11/2001	Jacques GRELET
PIRATA FR10	ATALANTE	06/12-21/12/2001	Jacques SERVAIN
PIRATA FR11	SUROIT	17/12-03/01/2002-2003	Jacques GRELET
PIRATA FR12	ATALANTE	28/01-19/02/2004	Bernard BOURLÈS
PIRATA FR13	SUROIT	23/05 - 05/06/2005	Jacques GRELET
PIRATA FR14 – EGEE 1	SUROIT	07/06 - 05/07/2005	Bernard BOURLES
PIRATA FR15 – EGEE 3	ATALANTE	24/05 - 05/07/2006	B.BOURLÈS/Y.GOURIOU
PIRATA FR16	ANTEA	19/05 - 01/06/2007	Jacques GRELET
PIRATA FR17 – EGEE 5	ANTEA	04/06 – 09/07/2007	Frédéric MARIN
PIRATA FR18	ANTEA	01/09 – 06/10/2008	Jacques GRELET
PIRATA FR19	ANTEA	16/06 – 24/07/2009	Jacques GRELET
PIRATA FR 20	ANTEA	13/09 – 22/10/2010	Jacques GRELET
PIRATA FR 21	SUROIT	01/05 – 16/06/2011	B.BOURLÈS/J.GRELET
PIRATA FR 22	SUROIT	19/03 – 02/05/2012	B.BOURLÈS/J.GRELET
PIRATA FR 23	SUROIT	09/05 – 20/06/2013	B.BOURLÈS/J.GRELET
PIRATA FR 24	SUROIT	09/04 – 22/05/2014	B.BOURLÈS/Y.GOURIOU
PIRATA FR 25	THALASSA	18/03 – 16/04/2015	Bernard BOURLÈS
PIRATA FR 26	THALASSA	07/03 – 13/04/2016	Bernard BOURLÈS
PIRATA FR 27	THALASSA	27/02 – 03/04/2017	Bernard BOURLÈS
PIRATA FR 28	THALASSA	27/02 – 05/04/2018	Bernard BOURLÈS
PIRATA FR 29	THALASSA	28/02 – 05/04/2019	Bernard BOURLÈS
PIRATA FR 30	THALASSA	16/02 – 31/03/2020	Bernard BOURLÈS
PIRATA FR 31	THALASSA	22/02 – 21/04/2021	Bernard BOURLÈS

Works on the field :

The PIRATA FR30 cruise was from February 16 to March 31, 2020 (from Cabo-Verde to BREST due to Covid19) and already detailed in the Pirata 24a report (April 2020). Recall : all PIRATA meetings reports can be found on : <https://www.brest.ird.fr/pirata/reports.php>

The PIRATA FR31 cruise was from February 23 to April 19, 2021 (i.e. 55 days, from BREST to BREST due to Covid19). With several issues...



Two major issues to deal with :

1): Tuna fisher's vandalism at 10S-10W:

March 14, servicing operations OK:

March 16: Bad data transmitted...



⇒ March 19: Back to the buoy => Fully beheaded
(one officer noted the presence of an Asian fishing vessel
deploying Fish Aggregating Device with AIS when leaving on March 14)



(recall: same happened at 0N23W on 2019/12/25)

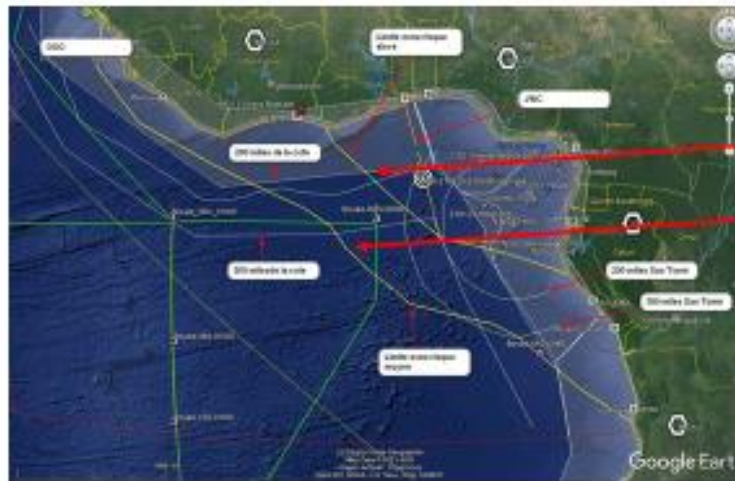


Surely made by « industrial » tuna fishers from Asia (see above). This event involved the cancellation of operations planned around St Helena Island for the local scientists and new potential collaborations.

Two major issues to deal with :

2): Piracy Security Area extended in the Gulf of Guinea

March 18, message from Ifremer/Genavir Security Office informing us about the new security zone, imposed after 2 piracy activities South of Benin :



Previous area limits

New area limits, extended by 200nm...

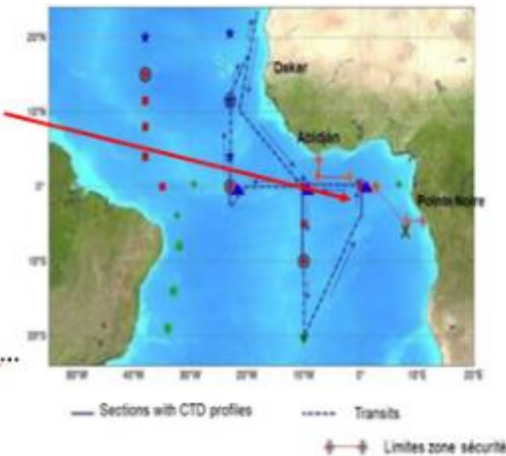
(certainly exaggerated, and without any concertation...).



⇒ Cancellation of the 0°E CTDO₂/LADCP section (from 4S to 1N)

⇒ After messages exchanges, and insisting explanations (data + ATLAS + ADCP moorings costs),

we finally got clearance to retrieve the moorings...



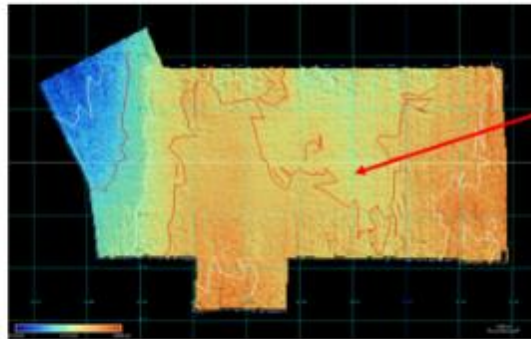
First hour of the moorings retrieval operations in presence of a French Navy vessel (the « Dixmude »)

Questions are:

- 1) how about 2022 & will one be able to go back to 0-0 ? (at now: wait & see!...)
- 2) Moving from 0E to 3W => Impact on predictions ?...

After consultation with SSG/PRB:

- => we decide to move the ATLAS mooring just out of the area (i.e. around 3°W)
- => Bathymetry survey (rather flat in the area, ~5100m depth)



ATLAS at 2°42'W



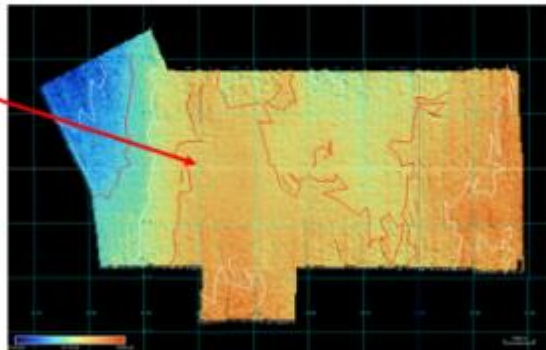
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About the ADCP mooring:

- It was not expected to replace it (no material onboard)...
- => there will not have data for the 2021-2022 period !

ADCP (in 2022)
around 2°45'W



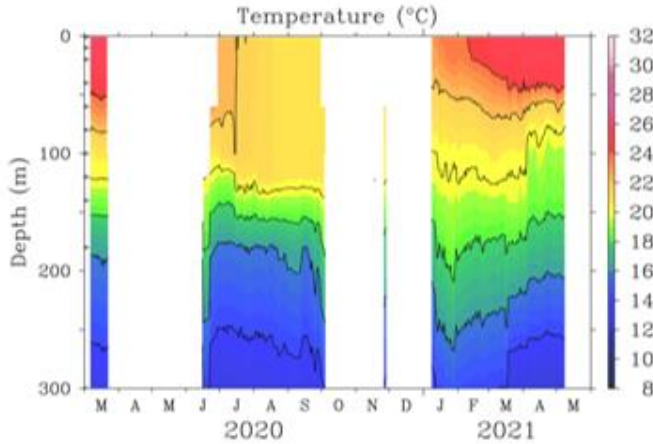
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Other infos about Pirata met-ocean moorings :

1) 10°W-20°S: No apparent fishing activities observed around (and no fishes...)

Why ocean data were transmitted irregularly in 2020-2021?



Seems OK from March 17 after serviced.

2) 23°W-0°N and Brazilian fishers

Other infos about Pirata met-ocean moorings :

2) 23°W-0°N:

3 Brazilian fishing boats (~15m size, 7 people onboard, traditionnal fishing (hand line);



We delivered food to one of them



-Some damages (cables & connectors cut => hanging; ropes & fishing lines into the bridle...)

-They stayed around (at a reasonable distance) during our servicing operations, but came back around;

-We attempted to inform them about the importance of the buoys (eg no hanging)



But relatively weak damages if compared with tuna industrial fishers... (refer to 1998-2008 years in the GG, off Congo in 2018-2019 & at 0N23W in 2019)

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The PIRATA FR31 cruise:

Pirata met-ocean moorings summary :

- 3 ATLAS systems serviced:
 - 0°N-10°W (equipped with CO2 & 5 Xpods); 20°S-10°W; 0°N-0°E replaced at 2°42'W.

Note 1: an Aquadopp has been added at 0°N- 2°42'W (2 devices purchased in 2020 with EU TRIATLAS funds & sent to PMEL in 2021)

Note 2: A fluorimeter has also been added at 0°N-10°W (purchased by IRD/LEGOS in 2020) at 55m depth (max fluo level)

- 3 TFLEX systems serviced:
 - 6°S-10°W (equipped with CO2); 10°S-10°W; 0°N-23°W (equipped with 5 Xpods)

- Material loss at 10°S-10°W: all met sensors & upper tripod => cost

- 5 Xpods at 10°W and 23°W, equator, replaced.

- 6 OTN acoustic receivers replaced at 200m depth on each buoy;

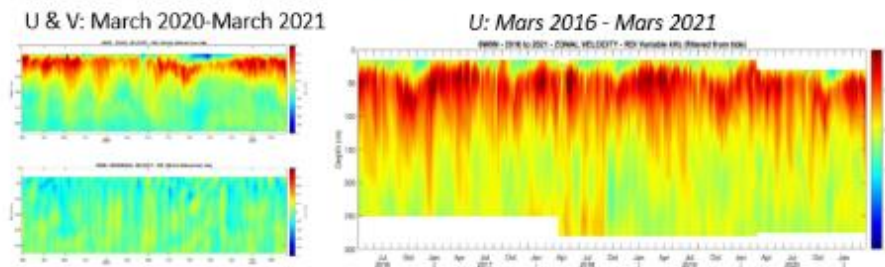


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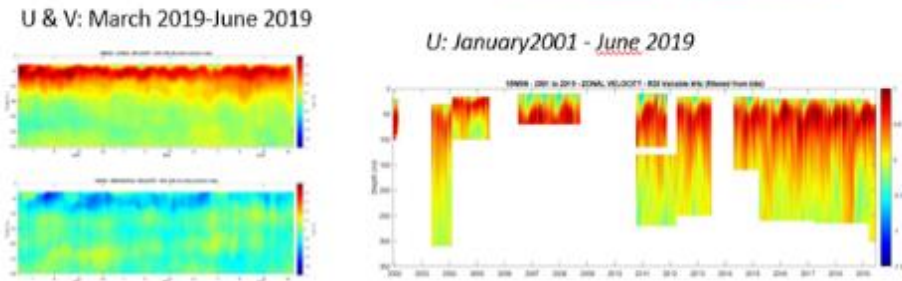


About ADCP moorings:

1): 0°N-0°E only retrieved... So, one year of data (2020-2021) but no 2021-2022 data....



2): 0°N-10°W : An other bad news! ONLY 3 months registred (instead of 2 years) due to batteries failure (pb with RDI ?...).



CTDO2/LADCP casts (in red on the map) :



- 78 profiles:**
 1x5000m : 0N-10W
 3x4000m : close to some Deep Argo
 38x2000m : 10W & 23W sections
 2x1000m : Guinea Dôme
 3x500m : sensors tests + Guinea Dôme
 31x200m : profiles every 3h during 48h duration stations at 10W & 23W, Equator

Sea water samplings for:
 S, O2, nutrients, Chlorophyll pigments,
 DIC/TA, DIC/C13, O18, POC and ADN



Sensors: 1 p + 2 (T/C, O2), 2 fluorimeters,
 + 1 transmissiometer Wetlab, 1 SBE35 (Precise T)
 + 2 LADCP: 300kHz upward, 150kHz downward

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Other profiles & samplings :

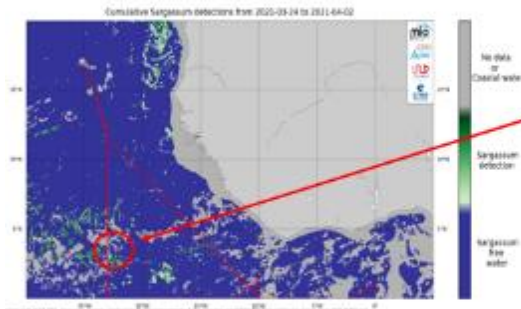


- 76 XBT profiles (in green on the map)
 +
 73 sea surface water samplings (S, nutrients,
Chl pigments, DIC/TA, DIC/C13, O18, POC)
 +
 751 biological samplings at the buoys:
Barnacles: 390 (for microplastics; 225 for isotopes)
 118 crabs, 15 worms, 3 bivalves,
 77 tuna pieces (for Hg analysis in the food chain)

The PIRATA FR31 cruise:

Other samplings :

Sargassum observation:



- 37 samplings on (only) one slick
 (within eastward NECC flow):
 - 3 for pollutants & ADN,
 - 30 for chimio-taxonomy,
 - 4 for seaweed

+ sea surface water samplings:
Nutrients, Chl, POC, ADN.

2 labs involved:
 LEMAR in Brest (V. Stieger)
 MIO in Marseille (T. Thibaud,
 V. Michotey, L. Berline, F. Ménard)



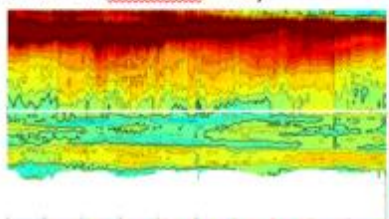
PIRATA 24 Meeting in videoconference, May 13rd, 2021



Continuous measurements :

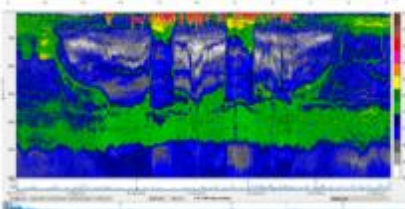
- S-ADCP: 38kHz, 150kHz and... 600kHz (but impossible to calibrate! So...).

Ex: U along the equator between 0 and 20W:



- Acoustic measurements (EK80, 6 frequencies):

Ex: Measurements at 0N23W during 48h:



+TSG, Ferrybox, meteo.

In contribution to other programmes & observation systems:

- 1) 23 SVP-B deployments (Meteo-France contribution to AtlantOS & DBCP)



8 were also expected for NOAA, BUT issue with Iridium price increase by the NOAA's private VAR... => canceled and SVP back to US

PIRAIA 24 Meeting in videoconference, May 13rd, 2021



- 2) ARGO profilers deployment: 12 (1DO, 5 ARVOR, 6 BGC)

⇨ contribution to ARGO through 3 other programmes...

- a) The SEANOX project (French funded LEFE; Pls: X.Capet -LOCEAN- & E.Machu -LOPS-):
(study of the O2 evolution from the Guinea Dome to West African coasts).

=> 1 DO (Oxygen) + 1 BGC (Biogeochemistry) in the Guinea Dome



PIRAIA 24 Meeting in videoconference, May 13rd, 2021



2) ARGO profilers deployment: 12 (1DO, 5 ARVOR, 6 BGC)

⇨ contribution to ARGO through 3 other programmes ...

b) The PODIOM project ((French funded LEFE; PIs: S. Cravatte -LEGOS- & F.Gasparin -MERCATOR-): (diurnal cycle influence on mixed layer etc.)

=> 5 ARVOR deployed at 10W & 23W, equator; profiles every 3h during 14 days.



48h fixed stations as a contribution to this program

PIRATA 24 Meeting in videoconference, May 13rd, 2021

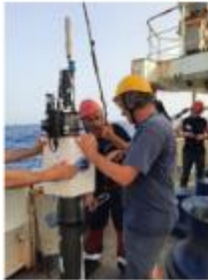


2) ARGO profilers deployment: 12 (1DO, 5 ARVOR, 6 BGC)

⇨ contribution to ARGO through 3 other programmes ...

c) The EU EUROSEA program (contribution of LOV, PI L.Coppola)

=> 5 BGC profilers deployed close to CO₂ equipped buoys and along the equator



48h fixed stations as a contribution to this program too

PIRATA 24 Meeting in videoconference, May 13rd, 2021



3) + 1 DEEP-ARGO profiler (unexpected) retrieval...

A « prototype » deep profiler, deployed in Dec 2020 with 3 different T/C sensors,
was no more under control through Iridium (Modem breakdown).

It was located NW of Canarias during our route back to Brest...

ONLY 15mn to find and retrieve it once its position transmitted and known...

A real « challenge » !

BUT WE DID IT...

(at least one good news!)



Works in the lab:

Actualized French PIRATA website:

<http://www.brest.ird.fr/pirata/>

⇒ Information about cruises

⇒ Pirata related reports, presentations & documents (SSG...).

⇒ Easy access to in situ Pirata cruises data sets through DOI:

- ⇒ DOI for all PIRATA-FR cruises (yearly actualized)
- ⇒ Acoustic data with DOI (J.Habasque et al., yearly actualized from 2020)
- ⇒ L-ADCP data set with DOI (P. Rousselot et al., yearly actualized from 2019)
- ⇒ Chemistry data sets with DOI (B.Bourlès, et al. yearly actualized from 2018)
- ⇒ S-ADCP data set with DOI (B.Bourlès, et al. yearly actualized)
- ⇒ ADCP moorings data set with DOI (B.Bourlès, et al. yearly actualized)
- ⇒ CTD-O2 data set with DOI (B.Bourlès, et al. yearly actualized)
- ⇒ **Water isotopes data set with DOI (G.Reverdin et al., NEW, 2021)**

PIRATA-FR data DOI : 10.18142/14

<https://campagnes.flotteoceanographique.fr/series/14/>

Some scientific activities (not exhaustive...):

⇒ Related (Pirata and/or Tropical Atlantic) publications:

- Assene, F., et al. From mixing to the basin scale circulation: how the inverse cascade is involved in the formation of the subsurface currents in the Gulf of Guinea, *Fluids*, 2020, 5, 147; doi:10.3390/fluids5030147.
- Radenac, M.H. et al., Physical drivers of the nitrate seasonal variability in the Atlantic cold tongue., 2020, *Biogeosciences*, 17, 529–545.
- Delpech A., et al. Influence of oceanic conditions in the energy transfer efficiency estimation of a micronekton model. 2020, *Biogeosciences*, 17(4), 833-850. <https://doi.org/10.5194/bg-2019-353> .
- Houndegnonto, O. J., et al. Seasonal variability of freshwater plumes in the eastern Gulf of Guinea as inferred from satellite measurements, *J. Geophys. Res.-Oceans*, 2021, doi : 10.1029/2020JC017041
- Alory, G., et al., Coastal Upwelling Limitation by Onshore Geostrophic Flow in the Gulf of Guinea around the Niger River Plume. 2021, *Frontiers in Marine Science*. 10.3389/fmars.2020.607216.
- Jouanno et al., Evolution of the riverine nutrient export to the Tropical Atlantic over the last 15 years: is there a link with Sargassum proliferation ?. 2021, *Env. Res. Letters*.
- Gévaudan, M., et al., Influence of ocean salinity stratification on the tropical Atlantic Ocean climate. 2021, *Clim Dynamics*.
- Berline L et al., Hindcasting the 2017 dispersal of Sargassum algae in the Tropical North Atlantic. 2021, *Marine Pollution Bulletin*.
- Lefevre, N., et al., Ocean Circulation Drives the Variability of the Carbon System in the Eastern Tropical Atlantic, *Oceans* 2021, 2, 126–148. <https://doi.org/10.3390/oceans2010008>.

Others (vulgarization):

- Bourlès, B., J. Uldo, F. Hernandez, H. Giordani, P. Dandin, Lancement de la 31ème mission océanographique de L'observatoire PIRATA, in « Metéo et Climat Info », Metéo-France, 2021.

Some scientific activities (not exhaustive...):

PhD:

- Manon Gévaudan, LEGOS (J. Jouanno & F. Durand), end in 2021. TA salt stratification & BL.
- Djoirka M. Dimoune, UFPE (M. Araujo, F. Hernandez), end in 2021. West Tropical Atlantic Circulation
- Houndegnonto, J.O., UBO (N. Kolodziejczyk, C. Maes), end in 2021. Fresh Water Plumes in the GG.
- Ngakala, R., UAC (Cotonou; G. Alory, C. Da-Allada). Cono upwelling (2020-2023),

Post docs:

- Dante Napolitano (Br, LEGOS): EUC and island effects in the GG
- Fanny Chenillat (LEGOS): Surface Chl and var. modes in the TA

Training periods :

- 2021 M2 Cotonou : Dame Gueye, Ocean dyn. Role on the North TA pattern (J. Jouanno)
- 2021 M2 Cotonou : vissi, F geo-ingeneering impacts on the SST seasonal cycle in the North GG, (C. Da Allada)
- 2021 M2 Cotonou : Dingong Atoukoh, T.G., Wave energy distribution in Gulf of Guinea (F. Bonou)
- 2021 M2 Cotonou : Houndefo, C., mesoscale eddies impact thermohaline structure (Y. Morel, A. Chaigneau)
- 2021 M2 Cotonou : Ngo Nola, M.D., BGC properties variability in the GG (F. Chenillat)
- 2021 M2 Cotonou : Nvemb Yegba, A.T., SST HF variability North of the GG (V. Kone, Z. Sohou)
- 2021 M2 Cotonou : Tope G.D.A., coastal water warming by the Niger River (G. Alory, C. Da-Allada, S. Djakouré)
- 2021 M2, Toulouse : Adrien Laval, F. Gasparin/Mercator; diurnal cycle & mixing
- 2020 M2 Cotonou: Agada, H.J., 2012 cold event North of the GG (C. Da Allada)
- 2020 M2 Cotonou : Capo-Chichi, E. (Cotonou), geo-ingeneering impacts on the BL North of the GG (C. Da Allada)
- 2020 M2 Cotonou : Kouogang Tchuenkam, F.C. (Cotonou), NBC rings : vertical decoupling (X. Carton)
- 2020 M2 Cotonou : Mongue Sissako R.S.J., (Cotonou), Angola Dome obs., (G. Alory, C. Da-Allada)
- 2020 M2 Cotonou : Tiam, M., (Cotonou) vertical large scale velocity in the Atl., (A. Lazar)

A few words about PIRATA & EU projects:

1) TRIATLAS:

80k€ available in 2020... changes in sensors demand accepted by ED (it was first for 6S8E the buoy & ADCP mooring...).

- 2 Aquadopp currentmeters for 0N-0E Pirata buoy: 20,000; => purchased.
- 6 T/C sensors SBE-37-IMP for 0N-0E and 6S-10W Pirata buoys: EUR 36,000;
- 2 SBE37-ODO (O2) sensors for 0N-10W buoy : EUR24,000 : => purchasing goin on (market)

2) EUROSEA:

IRD (Fabrice Hernandez), UERJ (Leticia Cotrim) and UFPE (Moacyr Araujo) are involved in the WP7 of the EU EuroSea project (www.eurosea.eu), aiming to demonstrate the interest of other CO2 platforms in the Tropical Atlantic ocean.

Process for purchasing a CARIOCA CO2 sensor is going on; to be implemented on the 8N/38W PIRATA-BR buoy.

The EU Blue Growth EuroSea project (2019-2023), like TriAtlas are legacy of the AtlantOS project.

New perspectives for PIRATA in France ?

1) The IRD Service Unit « IMAGO » (in Brest) provides the « human and technical » support for PIRATA with its engineers.

- Recrutement at IRD/US IMAGO of a « chemistry engineer » : Mr Thierry CARIOU joined IMAGO in Brest in October 2020; He will allow to maintain the nutrients analysis (F.Baurand will retire in 2022...) and could also propose additional types of chemical analysis from 2022.

- Jacques Grelet is supposed to make a 2 months visit in Recife in fall 2021 (for training about data acquisition, treatment etc... linked to PIRATA).

2) Strong contributions of PIRATA to other new nationale projects (as previously shown): SEANOX (LOPS, LOCEAN), PODIOM (LEGOS, MERCATOR), FORESEA (Sargassum), ALTIETAO (Gulf of Guinea) and with other labs. But also to TRIATLAS, EUROSEA, and EUREC4OA

=> One need more communications & collaborations between involved labs...

3) Florent Gasparin applies to 2 positions:

- Researcher at IRD (research project linked to PIRATA & Trop Atl)
- CNAP as support to PIRATA

(many thanks to Mike & Moacyr who provided support letters!). We cross the fingers... (responses expected by late June)

4) Changes in the SSG/PRB composition (as will be discussed tomorrow);

IRD: Frédéric Marin replaces Alexandre Ganachaud in the PRB

Météo France: Hervé Roquet replaces Philippe Dandin in the PRB

Jérôme Llido (now coordinator of PIRATA-FR) joins the SSG.

Bernard Bourlès stays for one (last) additional year before being replaced

ABOUT FISHERIES and vandalism:

Recall (info from 2020, already shown last year) :

Inputs (from Daniel Gaertner, IRD/MARBEC, Sète) about tuna fishing in the Atlantic

“in the case of Brazil this fishery concerns trolling and hand line fishing. It has increased in recent years and seems to be the cause of the very large increase in Brazil's bigeye catches (when the bigeye quotas were established by CPC at ICCAT Brazil was fishing less than the threshold established at the time, which enabled it to escape these measures and increase its catches; which of course is strongly criticized by the CPCs subject to the quota). Scientific contacts in Brazil are Paulo Travassos pautrax@hotmail.com & Gelson Da Siva : guelson@ufersa.edu.br .

I don't think the EU has a fisheries agreement with Gabon. On the other hand, it is likely that there are private fishing agreements and that the 2 professional organizations of Spanish purse seiners (OPAGAC and ANABAC) as well as the vessels of CPCs of convenience sheltering purse seiners belonging to Spanish shipowners (Guatemala, Salvador, Panama , Belize) fish in the Gabonese EEZ.

I do not think there is a resolution by ICCAT similar to that of the IOTC on the prohibition of fishing near an oceanographic buoy. However, this should be checked with the Executive Secretary of ICCAT: Camille Jean Pierre Manel : camille.manel@iccat.int

If not, and therefore considering asking for the same type of regulation as in the O. Indian, it is difficult that the Pirata program can directly request it from ICCAT. FAO, for example, should be the bearer of this request, unless it goes directly through the CPC Delegations, which have the possibility of proposing regulations during the ICCAT Commission meeting. Without excluding the first possibility, this second solution seems to me the most logical. Of the three countries carrying Pirata: France, Brazil, USA, only Brazil could have a measured opinion on this proposal. I can hardly see the USA opposing it and France either as a direct ICCAT CPC (under St Pierre and Miquelon) or as a member of the "European Union" CPC can put this on the table. In both cases (St Pierre and UE) you have to go through the Department of Fisheries and Aquaculture (DPMA) via Tristan Diefenbacher: tristan.diefenbacher@agriculture.gouv.fr & Benoit Archambault : benoit.archambault@agriculture.gouv.fr

It is not impossible that Gabon, which is not in favor of the development of purse seine fishing in its waters and in particular under FADs but which happily gives private fishing rights to armaments, supports this type of resolution as well as other African CPCs (contacts at the highest level of fisheries administrations are to be seen with the DPMA or DG Mare). In case of reluctance by CPCs, there is the alternative of NGOs which, although they cannot propose a resolution, speak orally and in writing during the Commission.

Before implementing all of this, the easiest way would be to send a letter / email to the representatives of the Professional Organizations of European armaments in the purse seine so that they can send this good practice information to their crews: Michel Goujon, Director Orthongel (mgoujon@orthongel.fr); for OPAGAC: Julio Morón (julio.moron@opagac.org) or his assistant Miguel Herrera (miguel.herrera@opagac.org); for Anabac I don't know who the director is but the email seems to be: anabac@anabac.org”

3) NOAA/AOML PIRATA Northeast Extension (PNE) report (Gregory Foltz)

PNE 2021a

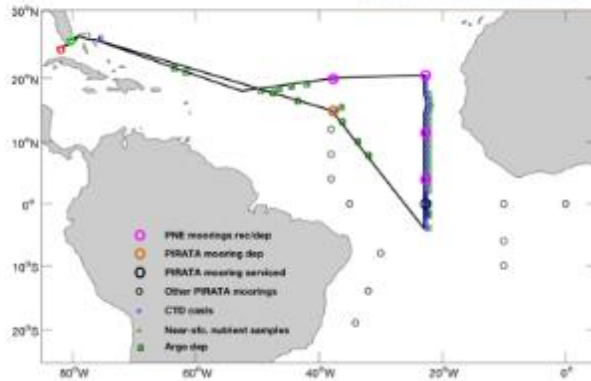
- Jan 15 – Feb 24: Miami Beach to Key West, FL
- Occurred ~22 months after PNE2019.
- Slightly reduced science due to loss of 2 days at sea.
- **5 moorings serviced:** 20°N, 38°W; 20.5°N, 23°W; 11.5°N, 23°W; 4°N, 23°W, 15°N, 38°W (dep. only).



Vessel: NOAA ship
Ronald H. Brown

Chief Scientist:
Greg Foltz,
NOAA/AOML

AEROSE (reduced),
Sargassum (new).



COVID complications/challenges:

7-day SIP in Miami required before boarding to load and before boarding for departure. Complicated equipment setup, added expense.

Positive COVID test of crewmember, had to be replaced; 2-day delay and 2-day reduction in DAS. Ship survey tech. had to drop out due to COVID contact; replacement found.

Long cruise (43 days planned, 41 actual) due to U.S. ports, requirement to stay within 500 nm of medical facility during first 7 days.

Relied heavily on volunteers for hydrography (3/5 of team), adding risk. Likely to continue due to budget limitations.

T-Flex mooring operations:

Mooring personnel: Steven Kunze (NOAA/PMEL), Tara Clemente (UW/CICOES)

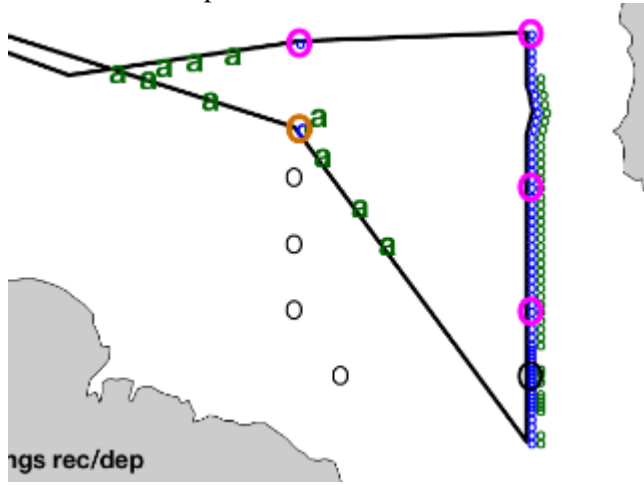
100% data return from all 5 buoys deployed.

Successful replacement of AT/RH sensor at 00° 23°W.



Hydrography: 61 CTD+O2+LADCP casts (1500 m)

- CTDs at 5 moorings, between 4°S and 20.5°N.
- ~ 300 water samples for NO3+NO2, Si, and PO4

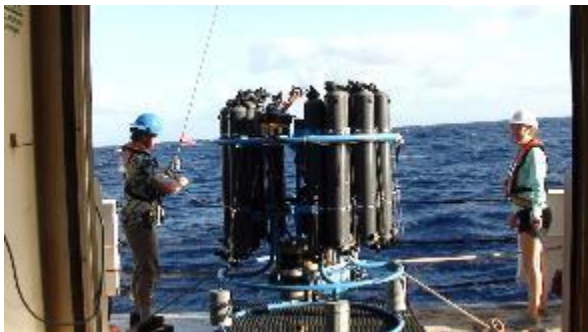


Ocean/atmosphere observations:

- 12 Argo floats deployed.
- Underway shipboard ADCP/TSG/pCO2/M-AERI data collected.
- AEROSE: measured aerosol optical depth and atmospheric carbon monoxide, ozone, and sulfur dioxide throughout the cruise.
- 6 undergrad/grad student volunteers (3 AEROSE, 3 AOML).

Sargassum:

- Fearless Fund team (Alyson Myers, Sarah Park) collected Sargassum with nets, made underwater video recordings.
- Collected samples for analysis (trace metals) and to observe organisms that co-locate in or near the biomass.
- ~ 300 water samples in upper 250 m for nutrient analysis (samples run at AOML).



- DOE ARPA-E (Advanced Research Projects Agency - Energy) MARINER (Macroalgae Research Inspiring Novel Energy Resources).
- Research to produce macroalgae at energy (or carbon dioxide removal) scale.
- Assist management, including sustainable harvest, of Sargassum that poses environmental and economic harm to coastal communities.



Sargassum sinking:

- Biomass degradation test.
- Fresh Sargassum placed in PVC container, attached to mooring line above release.
-
- Will be recovered during next PNE cruise.



PNE 2021b –TBD

- Scheduled on the R/V Ronald H. Brown Nov - Dec: / U.S. to U.S. (likely FL)
- Chief Scientist: Renellys Perez (NOAA/AOML).
- Science party: Interest from AEROSE, Fearless Fund.
- 4 PIRATA moorings; ~60-70 CTD/LADCP/O2

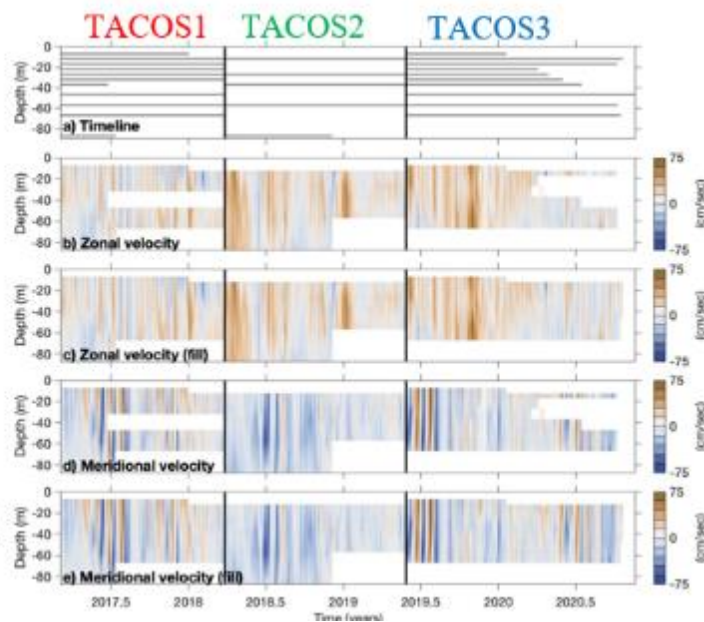
TACOS Update:

TACOS1 (4N, 23W):
Mar 2017 – Mar 2018
(10 AOML + 1 PMEL)

TACOS2 (4N, 23W):
Mar 2018 – May 2019
(5 PMEL)

TACOS3 (4N, 23W):
May 2019 – Nov 2020
(10 AOML + 1 PMEL)

TACOS4 (20N, 38W):
Nov 2021
(~15 AOML + 1 PMEL)

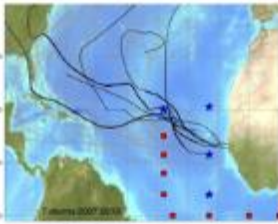
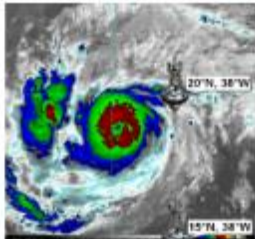


Next TACOS deployment: 20°N, 38°W

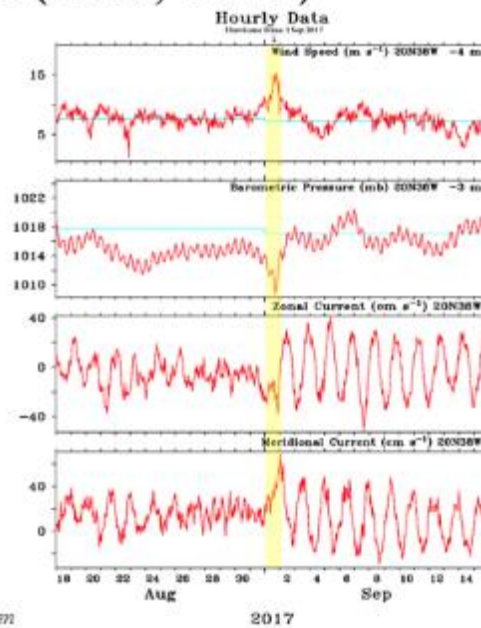


TACOS4 (20N, 38W)

Hurricane Irma in
September 2017



Content courtesy of K. Connell and M. McPhaden



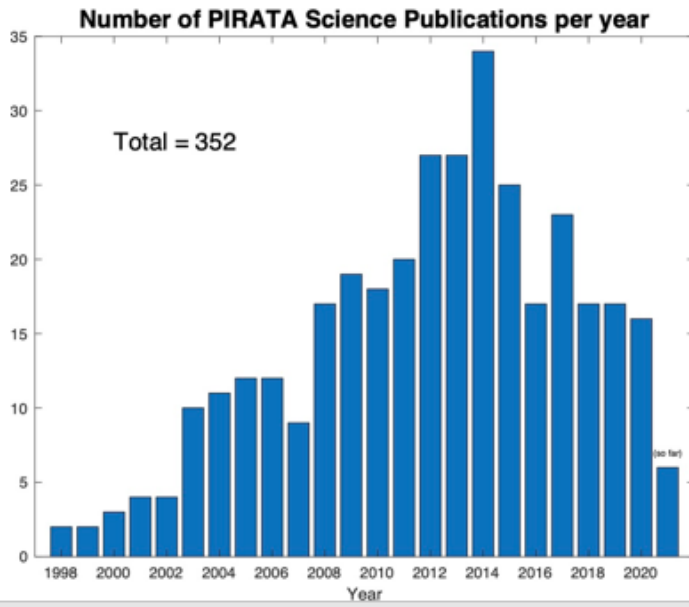
PNE web pages, PIRATA bibliography

PNE web pages maintained by Renellys Perez, please email bibliography updates to Renellys.C.Perez@noaa.gov.

Last updated 12
May 2021.

New webpage:
<https://www.aoml.noaa.gov/pirata-northeast-extension/>

Number of science
publications:
352 and growing



4) Brazilian PIRATA report (Ronald Buss de Souza)

Prepared by Ronald Souza & Paulo Nobre (National Institute for Space Research – INPE)
Contributed: Leticia Cotrim (UERJ), Moacyr Araujo (UFPE), Yaci Alvarez (UFF)

PIRATA – Brazil 2018-20 SUMMARY:

- PIRATA-BR XVIII on R/V Vital de Oliveira (Sep-Dec 2018)
- PIRATA-BR XIX on R/V Vital de Oliveira (Nov 2019)
- PIRATA-BR XX on R/V Antares (Nov-Dec 2020)

PIRATA-BR XVIII on R/V Vital de Oliveira:

13 September 2018 - 5 December 2018

Multiscience cruise, 4 legs, 68 sea days, total 85 days cruise
8 ATLAS buoys serviced
63 full depth CTDO2/nutrient stations
115 XBTs provided by NOAA
66 radiosondes provided by INMET/Brazil
Thermosalinographer, surface pCO₂, AWS
Microplastic sampling along all CTD stations
Biogeochemistry (GEOTRACES) and micrometeorology (P3 and P4)

Logistics:

Ocean shipment from Seattle to Santos.
79 scientists and students embarked. 9 institutions involved



PIRATA-BR XIX on R/V Vital de Oliveira:

22 October – 8 November 2019 (18 days at sea, although part of the time used to track the oil spill)

Multiscience cruise, aborted because of the oil spill incident in the NE coast of Brazil
Only one buoy serviced: 19oS, 34oW.

Logistics:

Ocean shipment from Seattle to Santos.



PIRATA-BR XX on R/V Antares :

7 October – 20 November 2020 (only 16 days at sea)

Core cruise, performed on COVID-19 health restrictions, aborted because of a serious engine failure in the ship

Only three buoys serviced:

- (1) 19oS, 34oW (only replacement of the temp/humidity sensor);
- (2) 14oS, 32oW;
- (3) 8oS, 30oW.

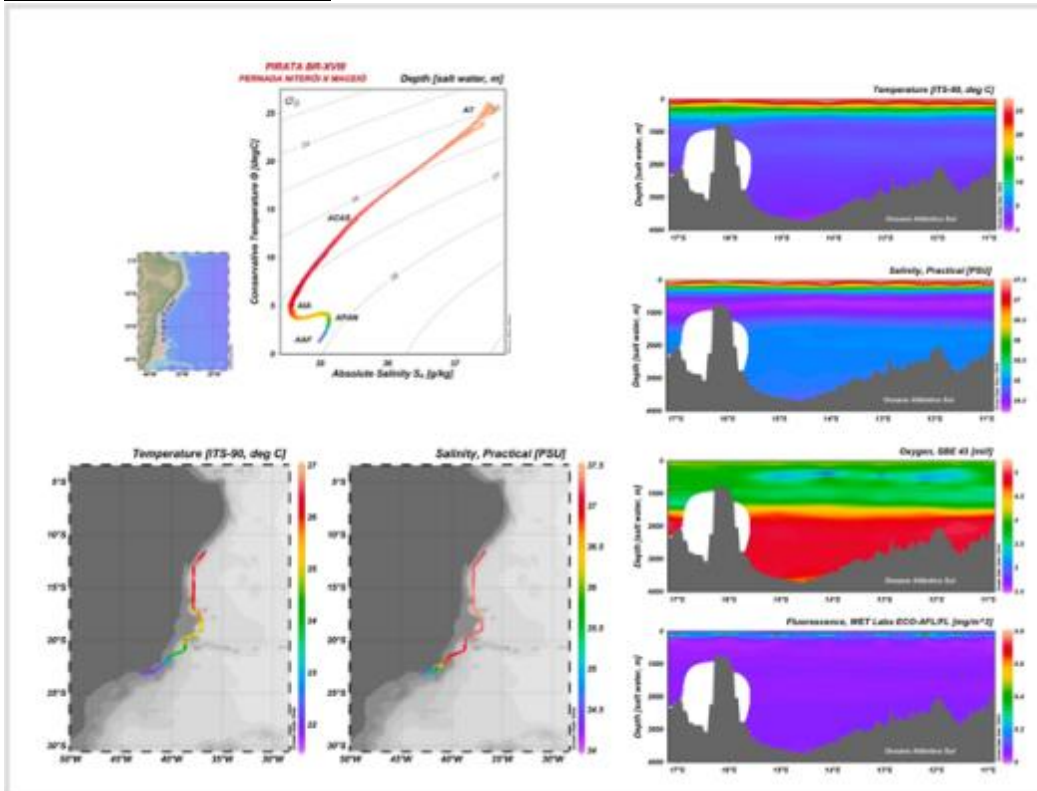
2 CTD profiles, thermosalinographer and AWS.

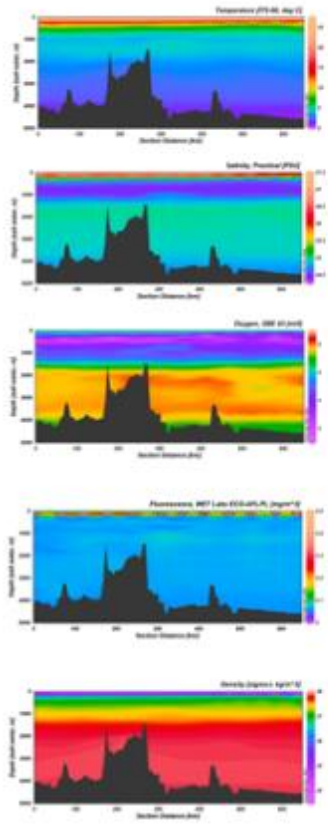
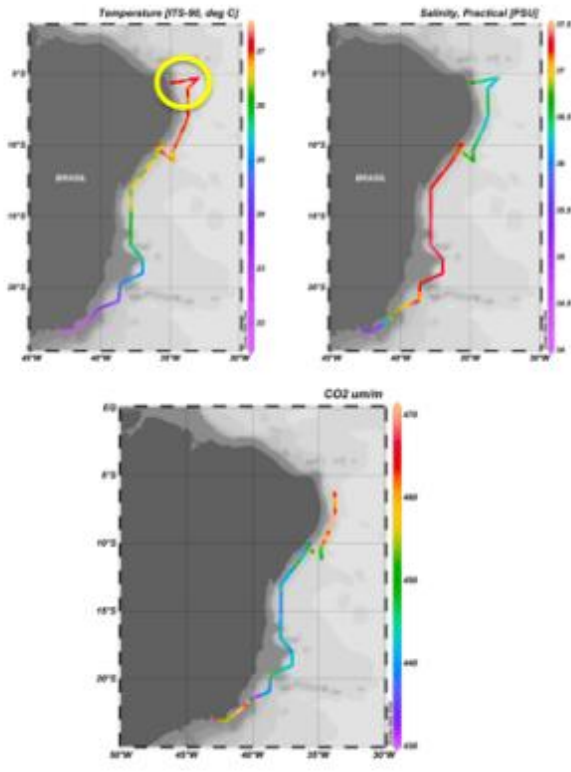
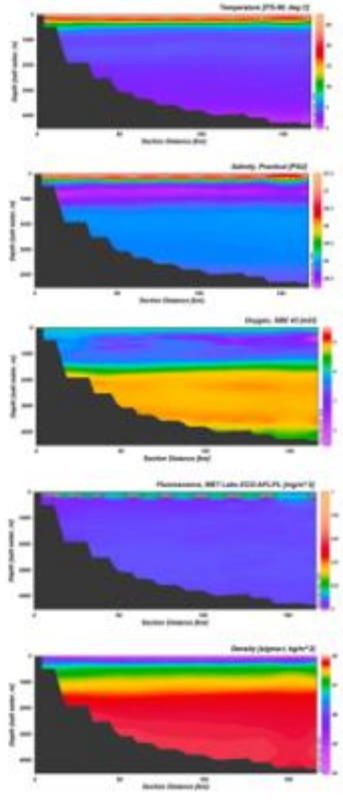
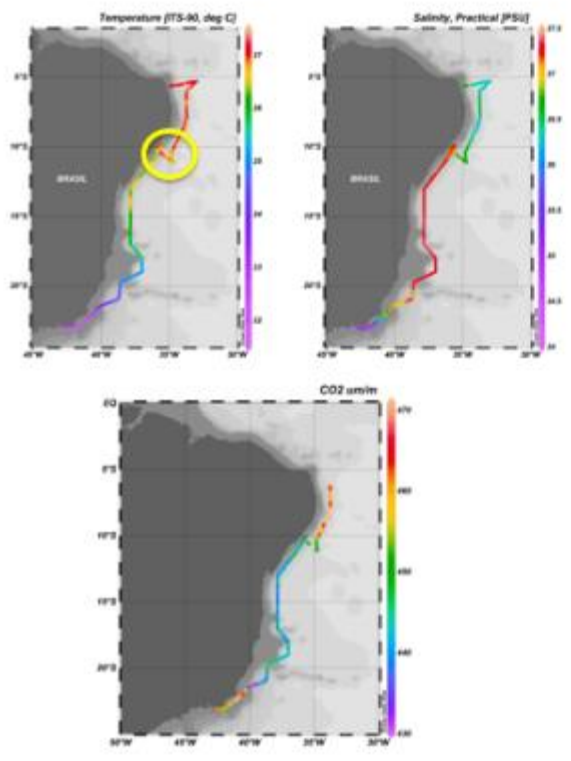
Logistics:

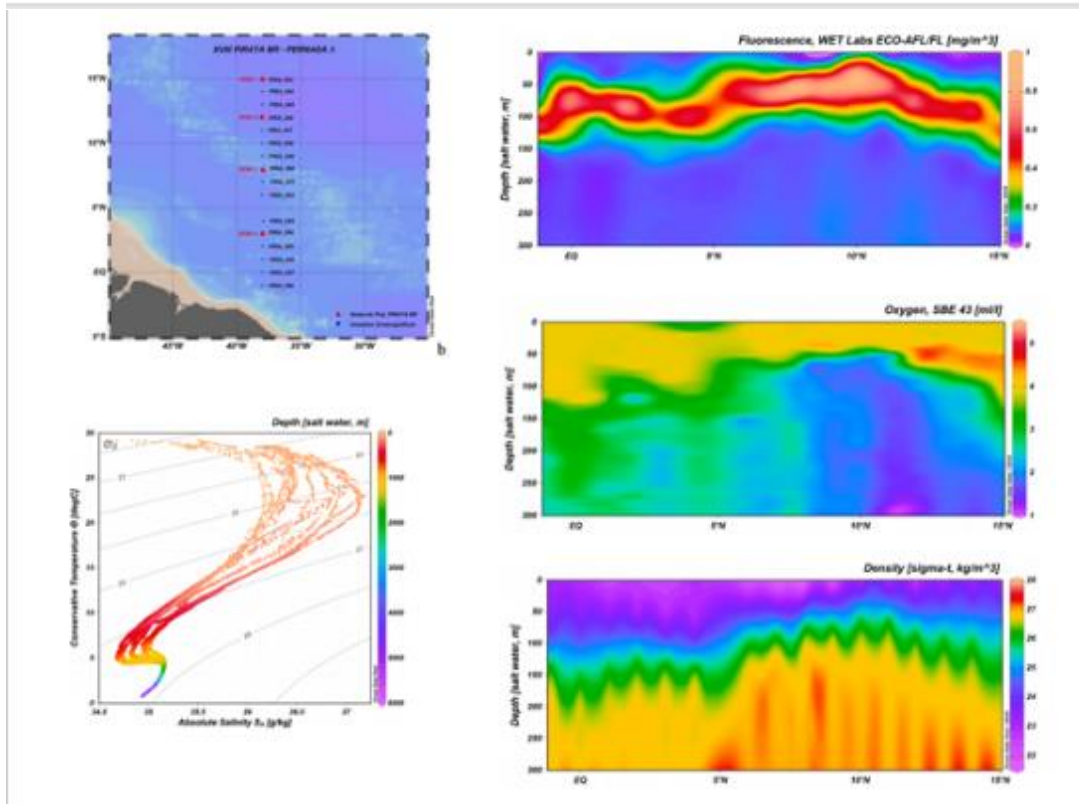
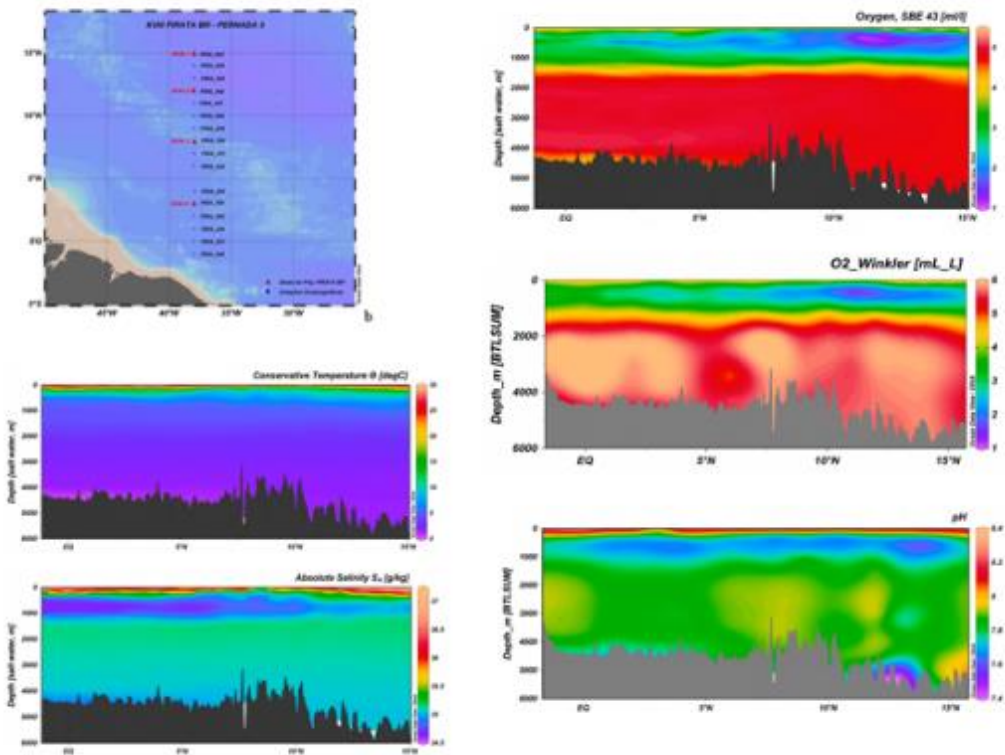
Buoys already available from the previous year, except 3 toroids that were destroyed by fire.

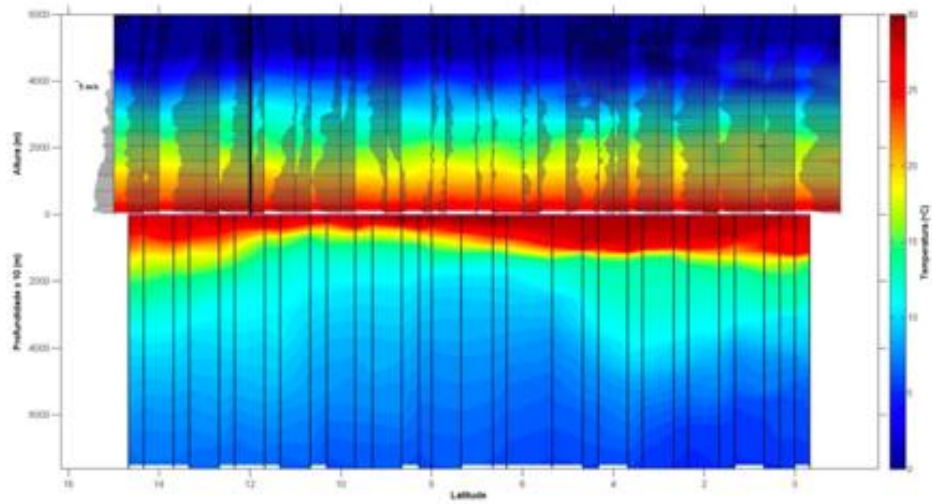
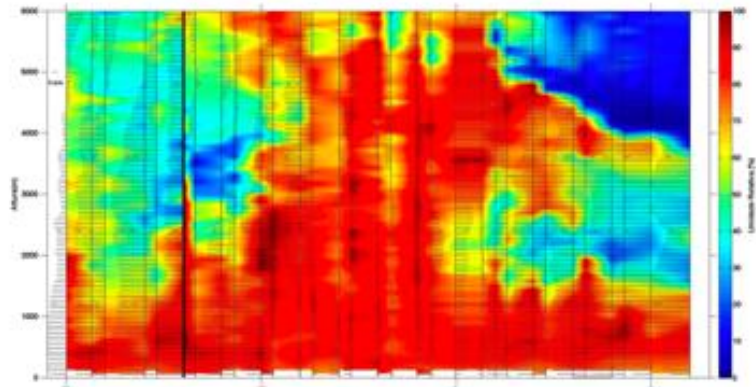
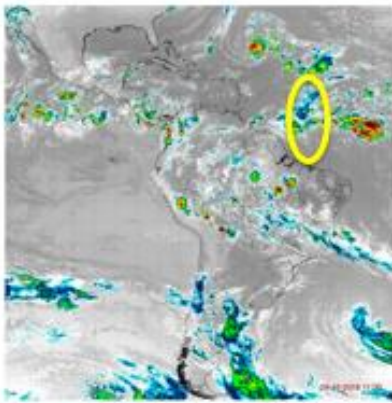


PIRATA-BR XVIII results:









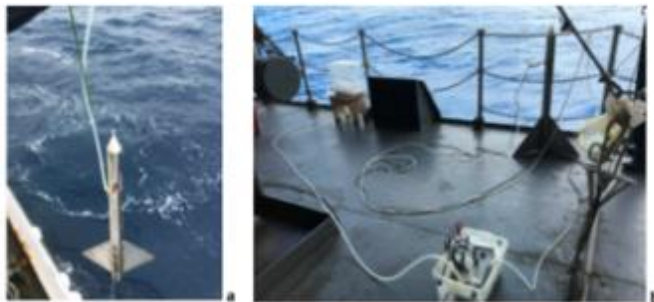


Figura 5. Sistema Fish: (a) Lançamento para a amostragem de água superficial; (b) bomba peristáltica.

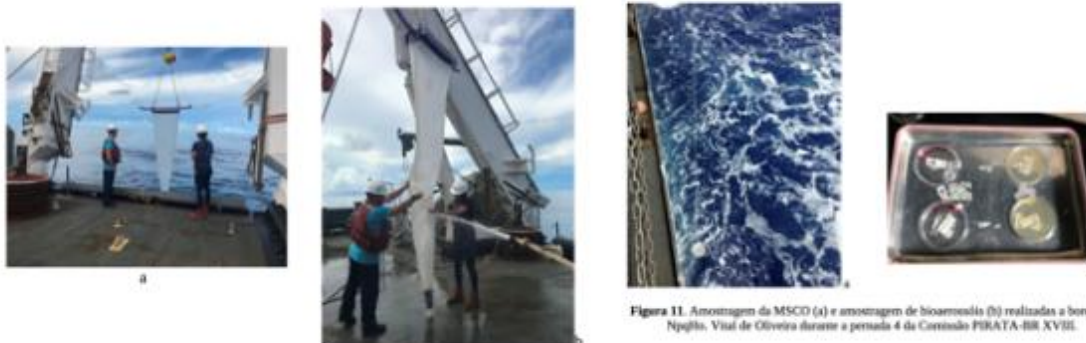


Figura 7. (a) Rede de Neuston sendo lançada para a coleta de microplástico e (b) sendo lavada após o arrasto.

Figura 11. Amostragem da MSCD (a) e amostragem de bioamplóides (b) realizadas a bordo do Npqlho. Vital de Oliveira durante a pernoite 4 da Corridão PIRATA-08 XVIII.

PIRATA Brazil Budget, 2018-20

Discrimination	R\$	US\$
PMEL import/export	R\$190,000.00	\$50,000.00
To be used in 2021	R\$190,000.00	\$36,000.00
Logistics	R\$500,000.00	\$95,000.00
Expendables	R\$50,000.00	\$9,500.00
NPqHo Vital de Oliveira	95 days at sea	
Noc ANTARES	17 days at sea	
Grand Total in the present (no personel)	740,000.00	141,000.00

5) PRB reports, SSG issues and discussion (SSG / PRB common meeting):

- About the MoU:

Katie Geddes (KD) provides some info about the MoU renewal and signatures status. The process toward the MoU approval is moving forward, and the mailing process started. The process seems well in advance of the deadline which expires July 27th and no issues are expected from signatory parties. 4 original copies will circulate for signature: NOAA → MeteoFrance → IRD → INPE. One copy sent to each partner. Janice Trotte (JT) do not anticipate difficulties for signing the MOU.

- PRB reports:

David Legler (DL, NOAA):

- Relatively flat budgets for PIRATA, but got additional costs (see Mike's presentation) due to Covid/sheltering in place;
- In particular 4 M\$ increase in price for Iridium communication costs, but hopefully this isn't an issue for next year;
- Change in administration... The Federal administration is more interested for climate issues (crisis), tracking the carbon (role of the carbon), social equity (different impact) and resilience; And we don't yet have an idea on possible implication on budgets;
- Rick Spinrad nominated for NOAA administrator;
- NOAA can be a focus of the new administration, to help meet their climate goals.

Frédéric Marin (FM, IRD):

- FM replaces Alexandre Ganachaud as IRD representative, and Alexandre Ganachaud returns to work in the Pacific (in Nouméa, New Caledonia). He confirms that Ms Valérie Verdier, new IRD Presidente/Director from early 2020, will ensure a continuous support of PIRATA by IRD. The dedicated research contract between IRD and Météo-France is on renewal process.

Philippe Dandin (PD, Météo-France):

- Hervé Roquet (HR) replaces Philippe Dandin this year as Meteo-France representative. Météo-France will continue its support to PIRATA (refer to contract with IRD).

Janice Trotte (JT, DHN representative and MCTI)

- Exceptional difficulties from two years: Oil Spill in 2019, COVID from early 2020... and dealing with increasing Maritime traffic through South Atlantic "dark ships" (pirates; OCDE report)!
- In 2021, this year federal budget for science is still going to be very difficult (-34%), but PIRATA is safe...
- Presently, for Brasil PIRATA is still the most important program for tropical and south Atlantic, with a strong support from NOAA;
- INMAR is out of the paper: it is a Federaly Founded Institute with ongoing plans to define its structure (e.g., like Ifremer ? NOAA ?)...See: <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/noticias/2021/05/mcti-institui-comissao-para-selecao-social-de-apoio-a-pesquisa-oceanica>

- Mentions that Rick Spinrad (new NOAA administrator) is a big friend of PIRATA ;
- Messages from the TAV workshop can be channeled to help with Brazilian continued funding of PIRATA and communications coming out of workshop (Greg Johnson is the NOAA POC) ;
- Criticism that PRB was not involved on PIRATA-24/TAV agenda (in particular for Brasil presentation related to fisheries...) and PIRATA SSG/PRB should make recommendations.
- Paulo Nobre is one of the speakers for Brasil.
- About an US-Brazil oil-spill workshop

- **About vandalism:**

Vandalism on buoys by fishers becomes more and more a concern due to its budget and data loss impacts. These impacts become also more and more important in the Western part of the basin, due to Brazilian fishing activities. Some refer to one presentation done during the TAV meeting (Guelson Silva et al., “Fishing operations to catch tunas on aggregated schools at the vicinity of the “PIRATA data buoys in the western Atlantic”) and raise concerns about its potential outcomes. Actions begin to be done in Brazil for education that is very important toward fishers.

Regina Rodrigues (RR) is in contact with the Secretariat of Fishery. Several ideas: How about tracking system associated with Brazilian Navy? Could one make the PIRATA sites as an exclusive zone for fishing (100 m away from the buoy) using the tracking system (PREPS) or create Protection Areas around the buoys? What could be the limits: out of the Exclusive Economic Zone? And only for Brazilian fishing boats? Can one use of mobile Phone technology to track boats or tracking with WMO (David Legler, DL)? Put camera on buoys (they would be destroyed by fishermen + issue of power) ? Put trash bags over them ? Kenneth Connell (KC) says that more recent camera images take photos of the inside of trash bags, and the sole Ecuadorian ship was prosecuted in 2012. What can one do in international waters ? There is no rules of punish overseas vehicles... How about prosecution? That is a hard avenue ...

It is clear that there is no easy ways to solve this issue. Mike Mc Phaden (MMP) agrees to target Brazilian fisheries, who “are the causes of the vandalism”.

Bernard Bourlès (BB) recalls that there is two forms of vandalism (see his slides) and that one have to clearly distinguish vandalism by i) small boats from brazilian fisheries (with generally limited damages; see page 16; presently, Brazilian fishermen need these buoys, as they are a fishing resource! They have no interest to destroying them and damages are generally due to shocks when hanging...) and ii) large industrial tuna fisheries, mostly by Asian and certainly EU fishers (with full damages of the moorings...see page 13). BB recalls some exchanges with Daniel Gaertner (see page 24) about these issues and that one have to sensibilize ICCAT (through PIRATA and partners) and FAO (through ICCAT). BB ask to Brazilian colleagues to work together with Paulo Travasso. Fabrice Hernandez (FH) offered to help involve those communities of Brazilian fishers, as could be also part of a contribution of the IJL (IRD International Joined Laboratory) TAPIOCA. Moacyr Araujo (MA) confirms that these are outreach activities in the scope of the IJL-TAPIOCA (<https://tapioca.ird.fr/category/extensao/>). It appears very clear that Brazil is conscious of the problem!

BB will provide some testimonies & pictures/movies to Paulo Travasso. BB also says that industrial tuna fishers could also have begun fishing in the western basin; this could also explain buoys going adrift, along with fittings worn after long period without servicing.

Other suggestions: i) Deploy Atlas moorings that cost less in regions that are heavily vandalized! ii) Make more desirable fishing areas closer to land! iii) Use the UN Ocean decade to work with community and make reserves/preserves to protect moorings.

Presently: “Resource that is there unless you stop damaging”...

Vandalism due to fishing activities clearly illustrates the strong need to service buoys every 12+ months...

But vessel time is a big issue.

Paulo Nobre (PN) asks about the feasibility to organise ship time among the 3 countries (common plan for boat surveys) in case of emergency, *i.e.* above the normal schedule plans. DL says that it is difficult to change plans for the next engaged 18 months. It would be a big challenge for NOAA. In US, one needs to understand demands on the Ronald H. Brown in 3-5 year time frame, and also time to understand the impact of the 2023-2024 mid life repairs. In France, BB precises that The PIRATA cruises valuation by the National Fleet Programmation was successful in 2021, that guarantee to have a vessel like Thalassa for the next 5 years. However, no additional vessel time would be easy...

- **About budget :**

The budget status and perspectives at NOAA/PMEL are not so good (see page 10)...

BB recalls the PMEL commitment in replacing 2 buoys per year on MOU, and that budget issue is first a PRB issue; SSG cannot solve it, and that we should not merge PIRATA and RAMA program/funding. MMP precises that costs are well separated between RAMA and PIRATA, but that RAMA and PIRATA share equipment pool. This year 4 buoys were lost in the Atlantic (and 70% lost in the Indian ocean). It is announced that with limited resources some sites in RAMA will be suspended (3 RAMA sites suspended this year). PIRATA provides more return on investment, so PIRATA is prioritized and for now there is not suspending mooring plans for PIRATA.

JT recommends an Excel spreadsheets with expenses to share the excel sheet between PRB ? This would provide a clear picture of the cost paid by each countries for PIRATA. MA says that this needs an internal exercise to keep the Excel spreadsheet updated (with prospective on cost and budget).

Also, what if we reach out to WMO about PIRATA’s need for help? Could one imagine a crowd funding in PIRATA, like Argo that is a crowd effort... PD adds that Argo works with many countries contributing, each country, or institute, can pay for one float. He knows the comparison does not apply automatically but could one search for other contributors? For example, would ECCC (Canada) be interested by the benefit brought by the PIRATA buoys (e.g. for predicting extra-tropical cyclones) ?

In case of budget issues, why not ask for European funding through TAOS ?

- **About TAOS and PIRATA :**

MA says that the TAOS review was very clear concerning the future of PIRATA sites/measurements. There is a particular interest of FUNCEME to keep the 20°S/10°W buoy.

Can we define some planning to achieve future extension in the NW for Caribbean seas for hurricane zone? Renellys Perez (RP) precises that Eric Blake talked about the frequency of the data from the moorings and how hourly, three-hourly data would be helpful for hurricane prediction, and how for them that would be more helpful than measuring new EOVS/ECVs (although those would be nice as well). Web site provided by DL: <https://www.godae-oceanview.org/science/task-teams/observing-system-evaluation-tt-oseval-tt/>

BB says that TAOS is just a recommendation. Other PI sensors are welcomed. PIRATA is an opportunity for additional programs, as far as we can do our best.

MMP: TAOS recommendations are consistent with the PIRATA BAMS and Frontiers papers. A good point is the fact that TAOS review is the initiative of GOOS and CLIVAR that gives more feasibility to PIRATA! Thus, it would be a win-win situation if new guys come onboard...

Peter Brandt (PB) says that other possibilities, like surface velocity measurements, calibration efforts... give possibility to bring other community. It is clear that PIRATA is the backbone of the Tropical Atlantic.

Paulo: BGC is part of climate change, and still difficulties to represent the mixed layer dynamics (refer to E.Remy and M.A. Balmaseda presentations during the TAV meeting). Assimilation community needs some help and one needs to approach modeling communities for their support/weight => Need to engage with BGC community and add more BGC sensors. Also, need for surface velocity/shear and additional mixed layer measurements. What is the first thing we would all agree to do?

At least, one needs to equip every mooring with one velocity sensor, and before expanding to new sites, add more velocity at the sites we already maintain.

FH suggests taking the action to liaise with OceanPredict OSEVal about TAOS recommendations. DL asks who is the audience of the TAOS review ? Do any other groups take some actions (e.g., Argo...)? MMP says this review is for OOPC. But there is no clear view on which body (institution) takes the lead on promoting! Regina Rodrigues (RR; member of the CLIVAR Atlantic Panel) says that Sabrina Speich is moving to GCOS and leading this. RP: the CLIVAR Atlantic Panel is spinning up a "CLIVAR AMOC Task Team". Maybe something like that could happen? DL clarifies: one needs promoting among stakeholders in the Atlantic, like is ongoing for TPOS, and maybe push for making tropical Atlantic a GOOS region, or a dedicated GOOS action (under IOC+WMO). Leticia Cotrim (LC) says that there is a link between the CLIVAR-AMOC team to the newly GOOS-supported initiative AtlantOS, which she is involved in (see atlantos-ocean.org/). Maria-Paz Chidichimo is on CLIVAR-AMOC and on AtlantOS.

JT recalls that PRB is here to discuss on SSG propositions for the future implementations. MMP: GOOS website does not show a unique GOOS association for the Atlantic ocean. JT says that GOOS-Atlantic did not succeed... And nowadays GOOS alliances in the Atlantic are not successful. MA reminds the difficulties, like for instance the Argentina and the Malvinas... so not try to merge all this diversity with

different levels of implementation! Could one benefit of the UN decade proposals? Suggestions for workshops : Ocean Predict, GODAE Ocean View (US operational community is behind in this space), or holding a half-day meeting with reanalysis and forecast community to get more direct information.

Several related open questions:

How to move on from TAOS review? Who is TAOS speaking to other than PIRATA? CLIVAR? OOPC? How are we going to work as an integrated community to decide what implementations will go forward? What is happening in the Indian Ocean, TPOS going forward? Indian Ocean regional panel, IndoOS? E.g. WIGOS make TPOS it's own regional "OOS"/panel...

But in the Atlantic, story is different: PIRATA was first, and more programs grew from PIRATA...

SSG recommends actions to understand the landscape.

- Other topics :

PB evokes an idea to better study the carbon fluxes : mission of saildrones (pCO₂/CO fluxes ; framework H2020 EuroSea) and/or other platforms in collaboration with PIRATA. Measurements can/must be done collaboratively to enhance observing system.

FH and LC work on the re-implementation of a CO₂ system (NKE, funded through H2020 Eurosea) on the 8°N-38°W buoy. Maybe they will have ready in time for the next PIRATA-BR cruise. About pCO₂ it would be relevant to compare different pCO₂ systems.

Does PIRATA do enough to increase diversity?

It is noticed that a new generation of scientists was clearly present and efficient during the PIRATA-TAV; it was nice to see such younger scientists. Several efforts are carried out from years in this way: Master program in Benin and related PhDs (from 2008); several efforts made at AOML: multiple undergrad/graduate interns, routinely take young volunteers on PNE cruises, outreach at local schools. There is a Lapenta intern working at AOML this summer on PIRATA data analysis. PIRATA clearly open to the idea of creating opportunities for early career scientists. Summer schools (as the PIRATA summer school in Fortaleza in 2017) are good experiences, and short course for students or summer schools and early career session are recommended before the next meetings (even a lot of efforts). One also could include early career scientists in organizing committee for each meeting. Suggested that PIRATA Ph.D. program could be the legacy of PIRATA.

About the SSG:

SSG could change and become more proactive/scientific !

SSG has to bring ideas to PRB and could meet more often ; every 6 months is suggested.

Next meeting in Brazil (even virtual).

BB announces that 2021-2022 will be his last year on the SSG; Jérôme Llido (as new coordinator of PIRATA in France) will be part of SSG. Also Julien Jouanno could be part.

MA will also leave the SSG as well. LC could be part.

by BB & discussion notes by FH, RP, GF and BB.

March 2022, onboard the R/V Thalassa