

# PIRATA-25 Meeting Report

(Porto de Galinhas, Brazil, Armação Conference Centre, 6-7 October 2022)

Prepared by F. Hernandez with material from all SSG and PRB members – v1 – 7/11/2022



The PIRATA SSG and PRB sessions were held the 6-7 October 2022, back-to-back and in parallel to the EU TriAtlas General Assembly and Scientific Conference, started Sunday the 2<sup>nd</sup> of October 2022.

**SSG members** present: Bernard Boulès (IRD/IMAGO, France, former co-chair), Hervé Giordani (Météo-France/CNRM, France), Fabrice Hernandez (IRD/UFPE, France, new co-chair), Mike McPhaden (NOAA/PMEL, USA), Renellys Perez (NOAA/AOML, USA, new), Gregory Foltz (NOAA/AOML), Peter Brandt (GEOMAR, Germany), Paulo Nobre (INPE, Brazil), Jérôme Llido (IRD/LEGOS, France, new), Julien Jouanno (IRD/LEGOS, France, new)

**PRB members** present: David Legler (NOAA, USA, chair), Frédéric Marin (IRD/LEGOS, France, remote), Clézio Marcos De Nardin (INPE director, Brazil, representing INPE PRB missing member during the meeting)

**Invitees:** Segen Estefen (INPO, Brazil), Marcelo Marcos Morales (MCTI Secretary, Brazil), Leonardo Bruto (UFPE, Brazil), Florent Gasparin (IRD/LEGOS, France), Janice Trotte Duha (Brazilian Navy, Brazil), Ann Christine Zinkann (NOAA, USA), Mariana Rocha de Souza (NOAA, USA), James Todd (NOAA, USA)

**Missing participants and excused:** Adrienne Sutton (NOAA/PMEL, USA, SSG), Moacyr Araujo (UFPE, Brazil, SSG former co-chair), Leticia Cotrim (UERJ, Brazil, SSG, new co-chair), Hervé Roquet (PRB Météo-France, France), Christina Patricola (LBNL, USA), Regina Rodrigues (UFSC, Brazil)

*Table of participants, as seen in the picture above, from left to right. Participants not appearing on the picture are written in blue.*

Name	Institution	Country	SSG/PRB/Invitee
Ann Christine Zinkann	NOAA	USA	Invitee
Renellys Perez	NOAA/AOML	USA	Invitee/New SSG
Mariana Rocha de Souza	NOAA	USA	Invitee

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Florent Gasparin	IRD/LEGOS	France	Invitee
Hervé Giordani	Météo-France	France	SSG
Jérôme Llido	IRD/LEGOS	France	Invitee/New SSG
Bernard Bourlès	IRD/IMAGO	France	SSG
Gregory Foltz	NOAA/AOML	USA	SSG
Mike McPhaden	NOAA/PMEL	USA	SSG
Clézio Marcos de Nardin	INPE director	Brazil	Representing Brazil at PRB
James Todd	NOAA	USA	Invitee
Marcelo Marcos Morales	MCTI Secretary	Brazil	Invitee
Fabrice Hernandez	IRD/UFPE	France	SSG
David Legler	NOAA	USA	PRB
Julien Jouanno	IRD/LEGOS	France	Invitee/New SSG
Janice Trotte Duha	Brazilian Navy	Brazil	Invitee/former PRB
Peter Brandt	GEOMAR	Germany	SSG
Paulo Nobre	INPE	Brazil	SSG
Segen Estefen	INPO	Brazil	Invitee
Frédéric Marin	IRD/LEGOS	France	PRB (remote)
Leonardo Bruto	UFPE	Brazil	Invitee

The SSG and PRB thank Pr. Moacyr Araujo (UFPE, vice-reitor, also PIRATA SSG member) to have supported the organization of the TriAtlas EU project General Assembly back to back to the PIRATA SSG and PRB meeting in Porto de Galinhas-PE, Brazil. Also thank Pr. Regina Rodrigues (UFSC, SSG member) for organizing and setting up the scientific agenda between TriAtlas and PIRATA committees. And thank particularly the local organizing committee from UFPE: Dr. Leonardo Bruto, Izabel Cabral and Claudia Von Sohsten Cavalcanti.

### SSG National reports:

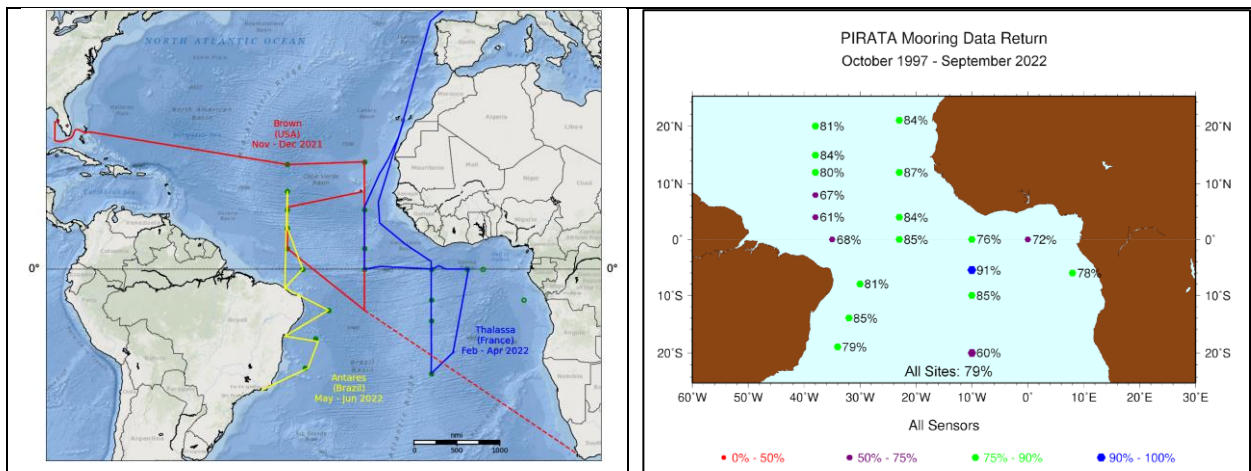
The session started with the presentation of the national reports, with presentations done by:

- Mike McPhaden (US):
  - Offered an historical overview, with pictures, of first PIRATA meetings
  - Presented the overall statistics of the array (see figure below), depicting the growing trend of data return after some previous disruptions to the array maintenance (e.g. COVID, mechanical problems in ships servicing parts of the array) were addressed, with overall data return for the entire PIRATA record presently at 79%. Low score moorings are also caused by fishing activities that damaged the moorings (not to talk about

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“vandalism”, term only used if it can be proved that damages were deliberately caused). Due to all these factors, 2021 witnesses one of the lowest data return. But after recent cruises, the data return in 2022 is reaching the highest % data return since 2016.

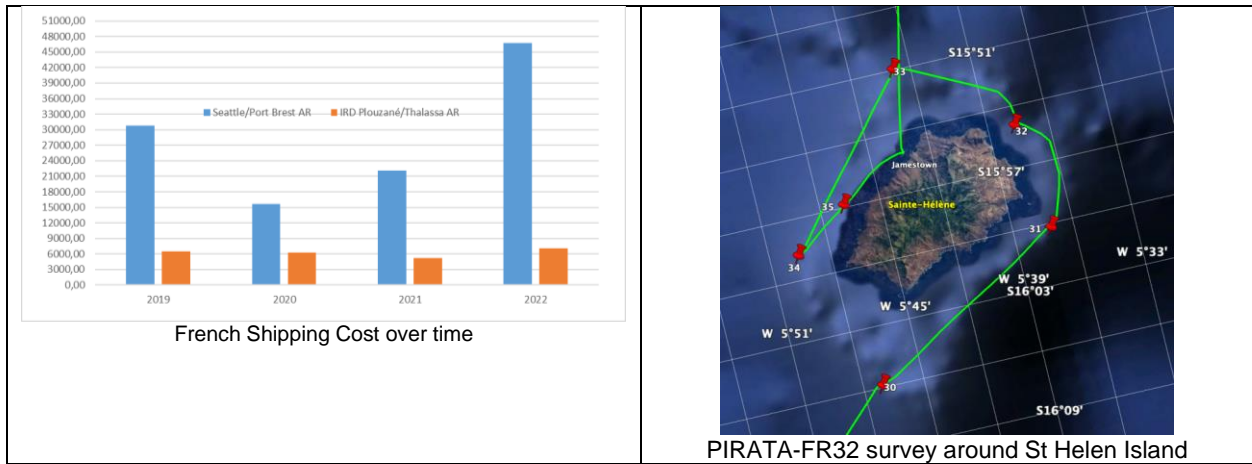
- Summarized the PIRATA cruises performed or scheduled in 2022 (120 days at sea, see plot below). Then presented the dates for the planned PIRATA maintenance cruises for 2023.
- Explained how the T-Flex available buoys were deployed in 2022. First the PIRATA-Br cruise could not re-deploy a buoy at the 4N38W mooring site. Then it was decided to switch the location of the T-Flex buoys (10 T-Flex over the 18 moorings): 4N38W and 0-35W are back to ATLAS, while T-Flex are now deployed at 8S30W and 14S32W. And since 2020, the 6S8E T-flex site is abandoned, replaced by the Atlas buoy at 20S10W. Then thanks to the USA Infrastructure Investment Act of 2021, 2.5 M\$ are awarded to recapitalize the 14 PIRATA and RAMA (4 for PIRATA) moorings lost during the COVID pandemic. Hence the plans for 2023 are still to deploy 10 T-Flex and 8 ATLAS buoys at PIRATA sites.



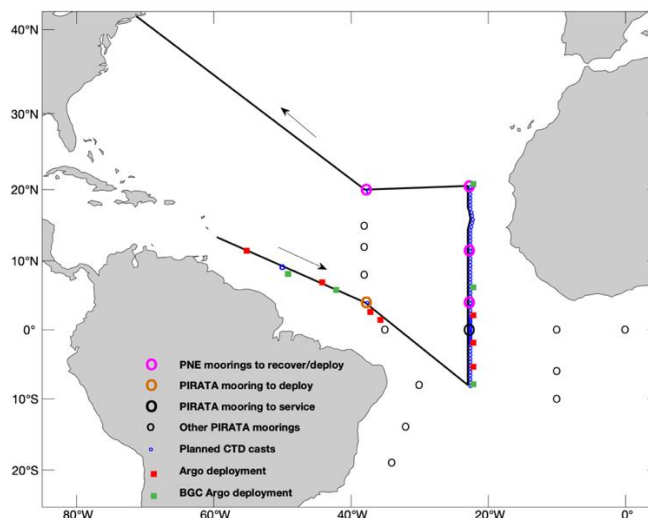
- Bernard Boulès and Jérôme Llido (France),
  - Presented the activities of the French PIRATA with the maintenance of the French portion of the array, detailing the sources of resources for the operation of PIRATA in France.
  - Reminded that thanks to the signature of the MOU French resources for PIRATA are secured until 2025. However, they stressed first the need to address the loss of technical expertise, as well trained technicians retire or otherwise move to other programs/activities (e.g., Jacques Grelet retired in October 2022). Moreover, 2022, due to the different crisis, is witnessing an increased cost of shipping that can become problematic in 2023.
  - Gave an overview of the French cruises since the start of PIRATA, accumulating more than 1000 days at sea after the PIRATA-FR32 on board the R/V La Thalassa last Feb-April 2022.
  - Highlighted scientific points of interest during the last French PIRATA cruises, in particular the implementation of 9 Xpods (instead 5) at 10°W and 23°W-Equator, measurements of pH along the 10W section, as well as a dedicated field work around the St Helene Island, contributing to their Management Plan Marine Protected Areas & their Marine Blue Belt program.

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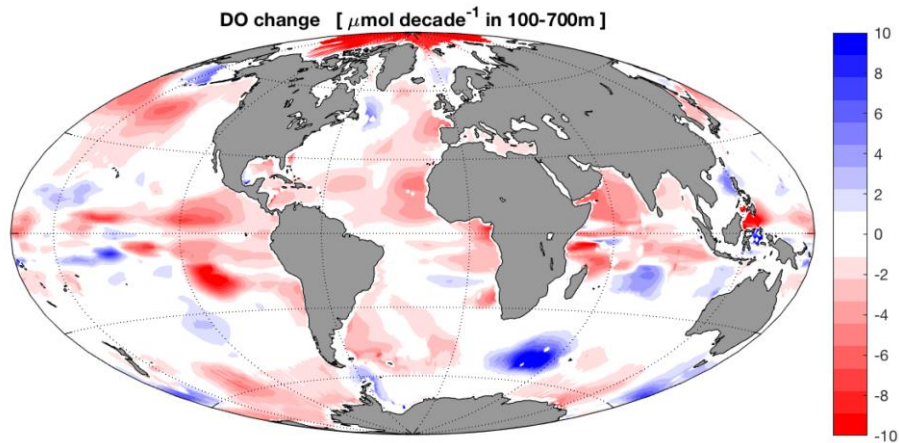
- Described specific aspect of the PIRATA-FR33 cruise scheduled in March-April 2023 from/to Mindelo, like additional T/C sensors at 6S10W, 0-10W, 0-3W.



- Gregory Foltz (US-PNE),
  - Presented details of the US PNE cruises during the year, mentioning the impacts of COVID on the reprogramming of the US cruises, the lack of resources and the support of volunteers for the cruise.
  - On the return of one of the PNE cruises, inspected the 38W portion of the Array, recovering an idle buoy at 12N.
  - Presented the planned activities for 2022/2023, with the planned servicing of the 4N, 38W site in November 2022 (figure below). In 2023, the R/V Ron Brown would not be available and NOAA will look after another ship for the PIRATA-US cruise scheduled at the end of 2023.
  - Highlighted scientific points of interest during the US PNE cruises. In particular, Sargassum samples were collected during this cruise.



- Peter Brandt (Germany),
  - Presented the German contributions to the PIRATA program, to characterize the EUC variability, the oxygen content (figure below) and its minimum in particular at 23W. The monitoring along this section will be continued in the future. The German program in the tropical Atlantic also focuses on the AMOC with western boundary moorings.
  - Informed that their 7-years collaboration with Mindelo will be carried on in the future
  - Informed that two German cruises are scheduled in 2023.



Long-term oxygen changes (Schmidtko et al. 2017)

- Paulo Nobre (Brazil)
  - Presented the details of the PIRATA-BR cruise during 2022 and budgetary expenses of the PIRATA-BR.
  - Described the last cruise on the NOc. Antares (15 May 2022 - 10 July 2022, 4 legs). Thanks to it, the whole of the western portion of the array came back to full functionality (4 ATLAS, 3 TFLEX Buoys replaced), with the exception of the 4N, 38W site that was not serviced (due to unexpected lack of mooring material during the cruise). Underway pCO<sub>2</sub> measurements were carried out (PI L. Cotrim), as well as Atmospheric Radiosounding and Marine Microbiotic (UFC). The pCO<sub>2</sub> CARIOCA sensors could not be installed at 8N38W due to failure of the instrument. Then the ATLAS buoy at 19S34W was drifting, recovered by the NOc. Cruzeiro do Sul.
  - Stated that the PIRATA-BR cruise in 2023 is expected to take place during the first semester of the year, and is intended to be a multi science cruise, repeating the full depth CTD profiling along the 38W meridian.

## SSG discussions:

Following, the questions of primary concern for observational expansion and the maintenance of the PIRATA array were discussed:

- Oxygen sensors to be added to the PNE sites: collaboration between Peter Brandt, Gregory Foltz and Renellys Perez
  - Renellys, Greg, and Peter can continue a dialogue about this prior to the 2024 PNE cruise. The PMEL mooring team will be an essential part of this discussion.

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- Data collection best practices
  - The SSG stressed the need for all hydrography obtained during the PIRATA maintenance cruises to follow consolidated Data Acquisition Best Practices.
  - During 2022, IRD has provided a comprehensive training for technicians of the Federal University of Pernambuco to perform the whole cycle of ocean data acquisition and quality control.
- Anticipated opportunities for ship time support among the PIRATA national programs:
  - US shall have its main RV in drydock starting in May 2023, for up to fifteen months, affecting the forthcoming capacity of maintenance of the PNE portion of the Array. The need to contract shiptime for the 2023 US PIRATA cruises is anticipated.
  - French portion of the program anticipated possible shortage of funding to support the French cruises in 2024.
- PhD, Postdoc programs
  - It was agreed by the SSG members present to develop a coordinated effort to establish an incentive to attract PhD students and Postdocs to the PIRATA program.
  - Actions pertaining to the item above are (among others):
    - Elaboration of a brochure indicating a number of Graduate Programs in the US, France, and Brazil supporting the initiative;
    - Establishing the funding for fellowships for the program, in each country.
  - The SSG recognizes the significance of outreach activities, such as producing books aimed at young ages to develop the interest in ocean sciences.
- Autonomous vehicles and automation for observation of the oceans
  - It was discussed that while sophisticated observational techniques, like the use of gliders, can bring significant improvement to process oriented research, such techniques require a very intense and skillful team of technicians to operate them.

## SSG recommendations after discussion carried out the 6/10/2022

### Recommendation on cruise data processing:

- We need someone in Brazil to quality control the cruise data (TSG/CTD/ADCP) in a timely way, make the data available on a public website, and a custodian to be responsible to do that job. They can be trained in France/US.
- Suggest the formation of a dedicated team in Brazil tasked with the shipboard data treatment, data acquisition using appropriate techniques, and quality control of the data. Required to have a data manager that can be the point of contact. Responsible person to make sure that the data is collected using techniques that follow PIRATA best practices.
- We also need to provide similar access to quality controlled data from previous Brazil cruises.

### Recommendation instrument calibration, following best practices:

- Ensure Brazilian shipboard CTD sensors are calibrated before and after every cruise. One option is to send Brazilian shipboard CTD sensors along with PMEL mooring sensors for pre and post cruise calibration.

### Recommendation on PIRATA cruises scheduling:

- We need regular cruises on one year intervals by all partners. Data return dramatically decreases the longer the moorings go without servicing, and risk of instrumentation/mooring loss greatly increases. Design lifetime of the mooring is one-year. Impacts are that numerical weather, marine,

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and climate forecasts will degrade without this crucial data for initialization, assimilation, and validation. *We need PIRATA cruises to be prioritized by all partners each year. This is imperative for the operational users of PIRATA data and for continuity of the data records which is important for research.*

Shiptime is a continued limitation for the PIRATA program. The NOAA Ronald H Brown R/V will go offline starting in May 2023 for fifteen months, so there will be one year where we need to find another ship for the US PIRATA cruise. Potentially, there could be funds available if we can charter a ship.

- Recommendation: Hold a discussion between US, France, and Germany about chartering a ship for the 2023 US-PIRATA cruise.

### Recommendation on PIRATA mooring evolution:

- We suggest continuing the process of adopting the next-generational mooring technology (TFlex, Telos).

T-Flex mooring can accommodate less expensive pressure sensors. Meteo-France has been buying pressure sensors for the Indian and Atlantic Ocean, and might be able to increase their contribution to PIRATA T-Flex moorings in this way. It is approximately a \$40,000 capital investment to instrument those ten moorings with enough spares to exchange every year.

- Recommendation: Sea level pressure at every mooring is incredibly useful for numerical weather prediction (Centurioni et al. 2017; Poli, 2018), and should be added to PIRATA moorings in key regions if not at all locations. Recognizing that the most cost-effective approach of instrumenting all of the T-Flex moorings with sea level pressure sensors. We can be strategic about where we add them based on where they will have the most impact for the operational forecasting (both weather and climate).

### Recommendation on PIRATA role in the TAOS:

- Announcement of PIRATA cruises as a platform for other science groups to submit proposals/ideas to participate on PIRATA cruises, respecting the tempo of cruise operations (on a not to interfere basis).

### Recommendation for friendly-use of the PIRATA website:

- Upgrade the PIRATA mooring webpage in order to provide more easily identifiable link to cruise data. Chance to re-evaluate the accessibility of the PIRATA webpage and that all of the links are operable.

### Recommendation for involvement of early career professionals:

The SSG expressed a desire to increase the participation of early career researchers in the PIRATA program to grow the next generation of scientists and aid in succession planning.

- Invite early career professionals to join the SSG for a limited-term (two-year) appointment. Each country (Brazil, France, US, Germany) could search for an early career person and have someone already on the SSG to serve as a mentor for that early career professional. The early career appointees could have a specific tasks assigned to them.
- Create shadowing opportunities for early career professionals on PIRATA research cruises and increased involvement in PIRATA data processing, science, and logistics.
- Idea/recommendation: Explore the development of a new PIRATA postdoctoral program. New resources would be needed.

Recommendation for general public information:

- Revisit the children's book with Diane Stanitski. A list of questions should be compiled for Mike McPhaden to pose to Diane, and Mike will have a conversation with Diane. Some funds may be available through Blue School.

Recommendation for PIRATA future budget:

Flat budgets and increased shipping and covid-related costs are posing a challenge to PIRATA operations.

- PIRATA-France needs to have some budgetary relief from increasing supply chain and covid-related costs.
- Specific avenue to explore: Construction/manufacture of anchors in each of the partner countries to reduce shipping costs which could reduce the number of containers sent to France and Brazil from two containers to one.

Recommendations for SSG membership:

- Bernard Bourlès proposes Fabrice Hernandez to take over the SSG co-chair.
- Paulo Nobre informs that after internal discussion, the SSG Brazilian members proposed Leticia Cotrim da Cunha to take over Moacyr Araujo as SSG co-chair
- The PIRATA-Fr team proposes Jérôme Lido and Julien Jouanno to become members of the SSG
- The PIRATA-US team proposes Renellys Perez to become SSG member and for Christina Patricola to rotate off.

Recommendation for next meeting, organized by France

- Proposition of venue: [Banyuls-sur-Mer, France](#)
- Format: Mostly PIRATA, but invite more European participation (Spain, Germany, atmospheric science & forecast community) Require some early advertising and have invited speakers from communities that we want to engage with PIRATA (modelers, users of data, stakeholders, technician teams, Copernicus marine service). Perhaps a technical workshop/training pre-meeting associated with the PIRATA meeting. Post-TAOS follow up, to assess how we are doing on meeting TAOS recommendations. Engage with the overturning circulation and biogeochemical community more fully.
- Timeline: Late September or mid-to-late October, 2023, and examine other meetings that might conflict with that timing.

## PRB Meeting summary the 7/10/2022

David Legler (NOAA, PRB chair) organized the discussion. Frédéric Marin (PRB, IRD/France) attended remotely. Hervé Roquet (PRB, Météo-France) was excused. Marcelo Marcos Morales (Secretary of Research and Scientific Education from MCTI/Brazil) was invited to participate. Clézio Marcos de Nardin (INPE Director/Brazil) was representing INPE and Brazil at PRB during this meeting (could not attend sessions on 7/10/2022).

The PRB and SSG thank Janice Trotte Dunha for her past commitment in PIRATA, and actions as a PRB member from Brazil. She supported since 1995 the concept of the PIRATA program, while working at IOC/UNESCO in Paris, convincing the Brazilian Navy to provide shiptime for the western side of the array. Back in Brazil, working for the MCTI, the IOC/UNESCO Rio GOOS Office, hosted by DHN, or the Brazilian Navy, she worked hard as part of the PRB to allow the PIRATA SWE, and making possible the renewal of the MOUs and Brazil's commitment in PIRATA for almost 25 years. She was also convinced of the



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importance of PIRATA for Brazil and young generations, and contributed actively to inform and teach the importance of observations at sea for Brazil, promoting and contributing to summer schools, and by writing various articles and books for all types of audiences.

The Brazil's PRB representative will be proposed by INPE's Director, Clézio Marcos De Nardin.

### Actions/Decisions:

- Brazil needs a message on the importance of these data; and collaboration to work with Brazil to bring this capability to Brazil.
- Similar message about ship and shiptime priorities
- Letter from PRB acknowledging the presence of the Secretary Morales of MCTI, and his engagement, and we are willing to work with him to make this happen.
- PRB recommends announcements of future PIRATA cruises that could accommodate extra research projects (without adding additional days at sea) be posted on the PMEL PIRATA web site (and consider posting this on their home page. Additionally, Ocean-OPS can share this information widely through their social media outlets.
- PRB agrees with the initiative to bring on early career ocean professionals to become a part of the SSG. The PRB will consider, and generally supports, travel costs for these persons to travel to SSG meetings.
- PRB understands the increased costs of shipping, and associated costs of shipping anchors, that endanger PIRATA functioning mostly in France. The PRB will consider these costs, push other institutions to support PIRATA (particularly in France) and try to address them in the next years.
- In recognition of the US challenges to find a ship for the 2023 PIRATA cruise, the PRB encourages the US to talk with PIRATA partners about the possibilities of using/chartering another ship.
- PRB acknowledges that the US and France have postdoc programs that are currently supporting PIRATA research. We encourage all partners to consider this important activity to help develop scientific expertise and advance PIRATA-related research activities.
- The PRB welcomes early planning and scoping of the 2023 PIRATA meeting in France. We also applaud the planned focus on engaging users (e.g. modelers, satellite community, etc) of PIRATA data/knowledge to better describe the impacts of PIRATA and identify opportunities for PIRATA improvements that would strengthen the support for PIRATA.
- PRB recommends PIRATA engage with potential users (e.g. operational forecast centers) regarding locations of new atmospheric pressure measurements. A joint assessment would be very helpful to guide any new investment of pressure measurements.
- PRB thanks MCTI/Secretary Marcelo Marcos Morales for his participation in the PIRATA meetings. His presentation on MCTI Ocean/Antarctic programs was very exciting and led to a discussion of potential synergies of PIRATA to other MCTI activities.
- PRB congratulates Brazil on creation of INPO and welcomed Dr Segen Estefen's presentation on this new ocean institute.
- PRB discussed the need for a 10-yr PIRATA strategy (motivated in part by MCTI Secretary Morales who recommended/demanded such a 10yr strategy). The PRB agreed with this recommendation and will seek further advice from Brazil on scoping such a strategy.
- PRB/SSG also noted concerns about increased salary costs and recruitment challenges. Flat budgets in the face increased inflation will slowly erode capabilities and limit new investments in the program.
- Finally the PRB recognized and approved SSG membership changes. The PRB salutes Dr [Bernard Bourlès](#) on his 21 year tenure as an SSG member and 18 years as co-chair. He has been

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at the center of PIRATA for several years, promoting PIRATA and coordinating multi-national efforts at the heart of PIRATA. Beyond his strong involvement as the scientific and technical coordinator of PIRATA in France, he played a key-role in getting funds from European research program. He has been at the heart of the involvement of the European tropical Atlantic community through the AMMA, PREFACE, AtlantOS, TriAtlas projects, from which he contributed to large scientific advances, and many successful building capacity initiatives in Africa. With also the benefit to enhance the PIRATA program with additional sensors (ADCP, T/C, O2..) and the south-east extension mooring.