

The Rise of PIRATA

1995-2005

*An informal history of the first ten
years of the Pilot Research Moored
Array in the Tropical Atlantic*



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FROM TAO TO PIRATA (1994-1995)

At the third session of the TAO Implementation Panel (TIP-3) Meeting which held in 1994 at Seoul, South Korea, Michael McPhaden, Chairman of the TIP, reported that "Instituto Nacional de Pesquisas Espaciais" (INPE) and "Fundação Cearense de Meteorologia e Recursos Hidricos" (FUNCEME) in Brazil had offered to sponsor the 1995 meeting of the TAO Implementation Panel in Fortaleza, Ceará, Brazil. An Atlantic venue for the next meeting could stimulate discussion of possible future expansions of TAO into the tropical Atlantic as part of CLIVAR/GOALS and NOAA's Pan

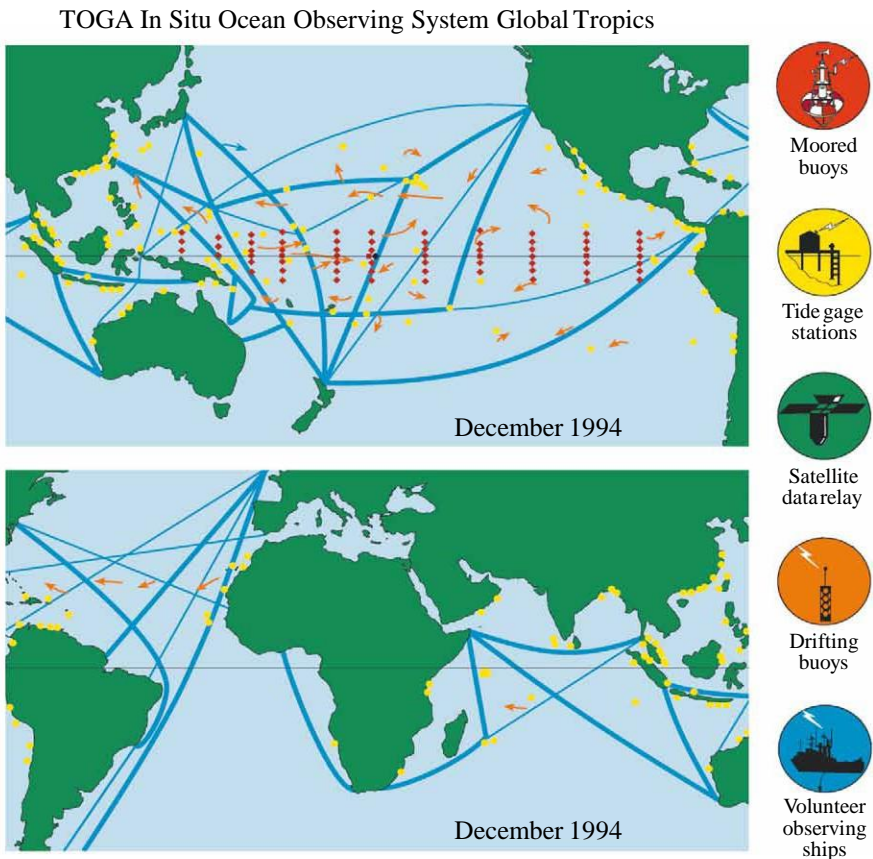


Figure 2:
In situ components of the TOGA Observing System at the end of the Program in December 1994. Symbols denote the different measurement technologies used. One orange arrow represents 10 drifting buoys. Note how underdeveloped the Atlantic and Indian Oceans were relative to the Pacific at the end of TOGA.

THE FIRST PIRATA MEETINGS (1996-2001)

In the few weeks after the TIP-4 Meeting of Fortaleza, the PIRATA-SSC decided to organize a first PIRATA Meeting to discuss about the design and the international collaboration of the future PIRATA Project. PIRATA-1 Meeting held at Natal in February 1996 decided that the PIRATA Project would be the responsibility of three nations: Brazil, France and the USA. According to a first principle of technical collaboration, the USA will have to yearly supply the totality of the ATLAS buoys and the two other countries will be responsible for their deployment and the annual maintenance. For evident reasons of strategy and historical links between France and some West African countries (Côte d'Ivoire, Senegal, ...) France would be responsible for the maintenance of the network on the eastern part of the tropical basin, while Brazil would take care of its western part, i.e. the nearest of their own coasts. With this collaboration principle in mind, the work during the PIRATA-1 Meeting at Natal essentially consisted in drawing a first network design of the moorings. As stated at the TIP-4 Meeting at Fortaleza in September 1995, an optimal system of observations of the



Figure4:
Participants of PIRATA-1 Meeting at Natal (RN, Brazil) in February 1996.
Five members of the first PIRATA-SSC are present (red circles from left to right):
(behind) Mike McPhaden and Tony Busalacchi,
(front) Marcio Vianna, Divino Moura and Jacques Servain.
Photo credit: unknown.

weather-ocean conditions in the tropical Atlantic had to take into account both the mode of variability along the equatorial as well as the dipole mode across the equator.

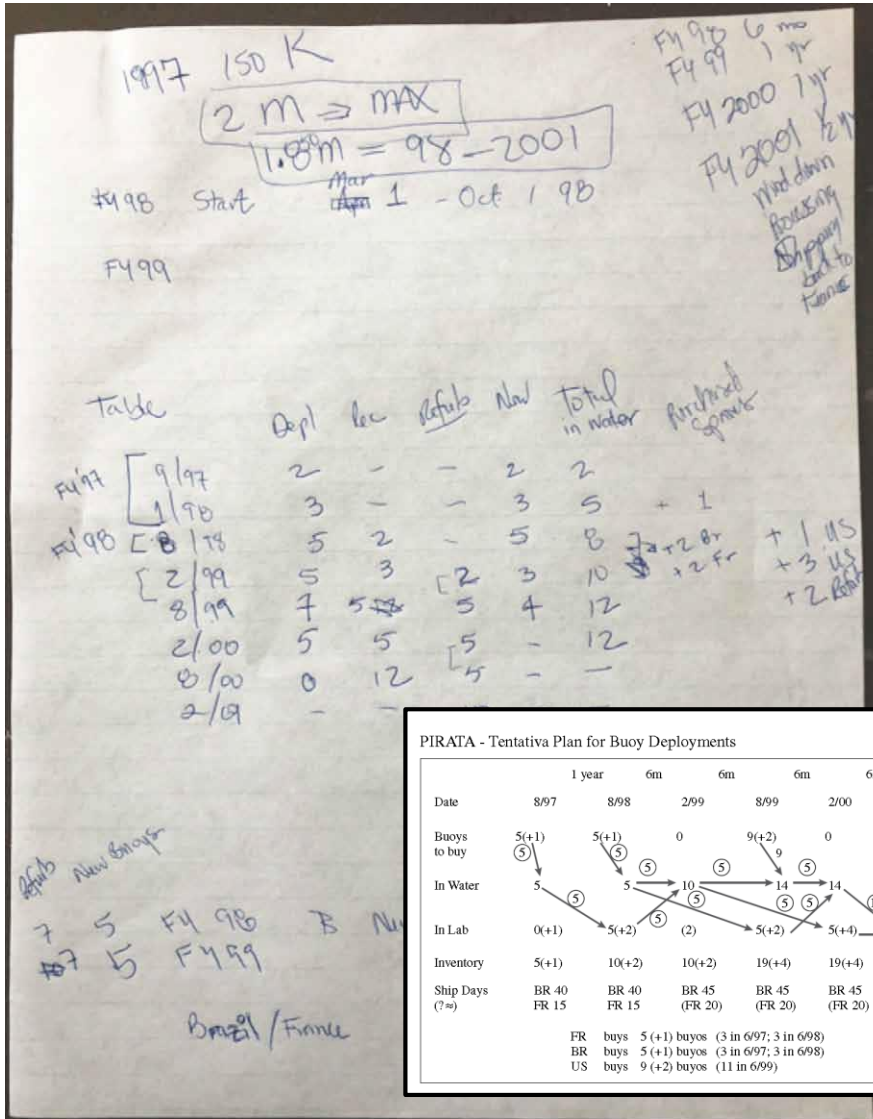
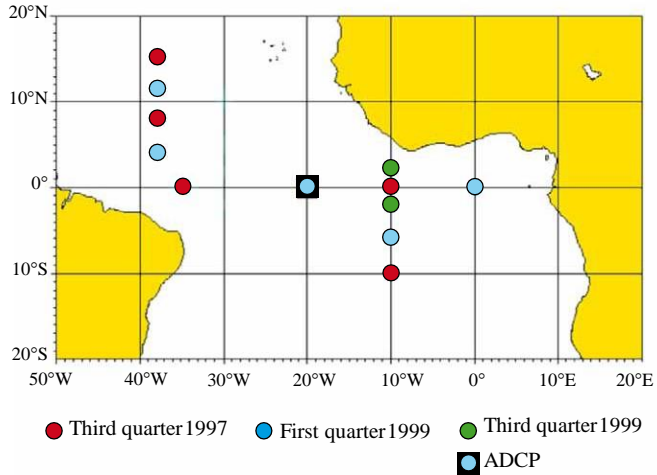


Figure 5: The above and following documents originate from the PIRATA-1 Meeting at Natal (CE, Brazil). The handwritten document, kept by Mike McPhaden, is a very rough draft of the implementation calculations for a proposal to NOAA to support PIRATA as a pilot for three years: 1997-2000. We would start with two moorings in September 1997 (upper left corner of table), have the full array in place by August 2000 (right column, fifth entry) and then recover the entire array after one year in August 2000 (second last line of table) on the assumption that the program would end. We estimated we needed 20 mooring systems to maintain an array of 12 moorings. This was less than the normal assumption of 2 x systems for each site since we assumed that recovered systems would be returned to PMEL quick enough to turn them around for the next cruise.

THE FIRST ATLAS LAUNCHINGS BY FRANCE AND BRAZIL (1997-2000)

The original PIRATA array consisted of 12 moorings, soon reduced to 10 ATLAS moorings, 4 spanning along the equator, and 8 spanning two meridional lines at 38°W and 10°W.

Figure 11:
The original PIRATA
"backbone" with
12 ATLAS moorings
such as it was designed
during PIRATA Meetings
1 to 3.



This specific configuration was chosen to provide coverage along the equator of regions of strong wind forcing in the western basin and significant seasonal-to-interannual variability in sea surface temperature (SST) in the central and eastern basin. The meridional arrays covered the regions of high SST variability associated with the SST anomaly dipole mode, with the northwestern meridional line cutting across the intertropical convergence zone (ITCZ) during most of the year. The variables measured are surface winds, SST, sea surface conductivity (salinity), air temperature, relative humidity, incoming short-wave radiation, rainfall, subsurface temperature (10 depths in the upper 500 m), subsurface conductivity (originally 3 depths in the upper 150 m, 4 depths in next moorings), and subsurface pressure (at 300 m and 500 m). A first acoustic Doppler current profiler mooring was proposed for 0°N, 23°W to monitor the vertical current profile variations in the central Atlantic where high zonal current variability occurs, close to the ATLAS mooring sited at 0°N, 23°W (the 20°W mooring previously chosen position had to be displaced to the west due to difficulties with local bottom topography).



Figure 12:
Photos during the PIRATA-FR1 cruise
in September 1997 on board of the R/V Antéa.
Photos J. Servain



HOW THE NAME PIRATA WAS CHOSEN

Fortaleza, capital of the Ceará's state, is worldwide known for its great beaches of fine sand, but also for its local music (called Forró) and its animated night life. Every night of the week there is a special place to party and dance the Forró in Fortaleza. For instance, Tuesday is the Oasis Club, Wednesday is the Parque dos Vaqueiros, Thursday is the Chico dos Carangueijos's place. Monday night, generally considered as the quietest night of the week, is however the only day of the week that the Pirata Bar is open. According to the New York Times, the craziest Monday in the world is at Pirata Bar. The Pirata Bar's 2000 square meters area is occupied by a stage, an outdoor dance floor, tables, service counters, and a boutique shop. Each Monday night about 3,000 people, of all ages and from all over the world, party from 9 pm until dawn. Its architecture alludes to a northeastern Brazilian village of colorful houses, with a pirate ship moored

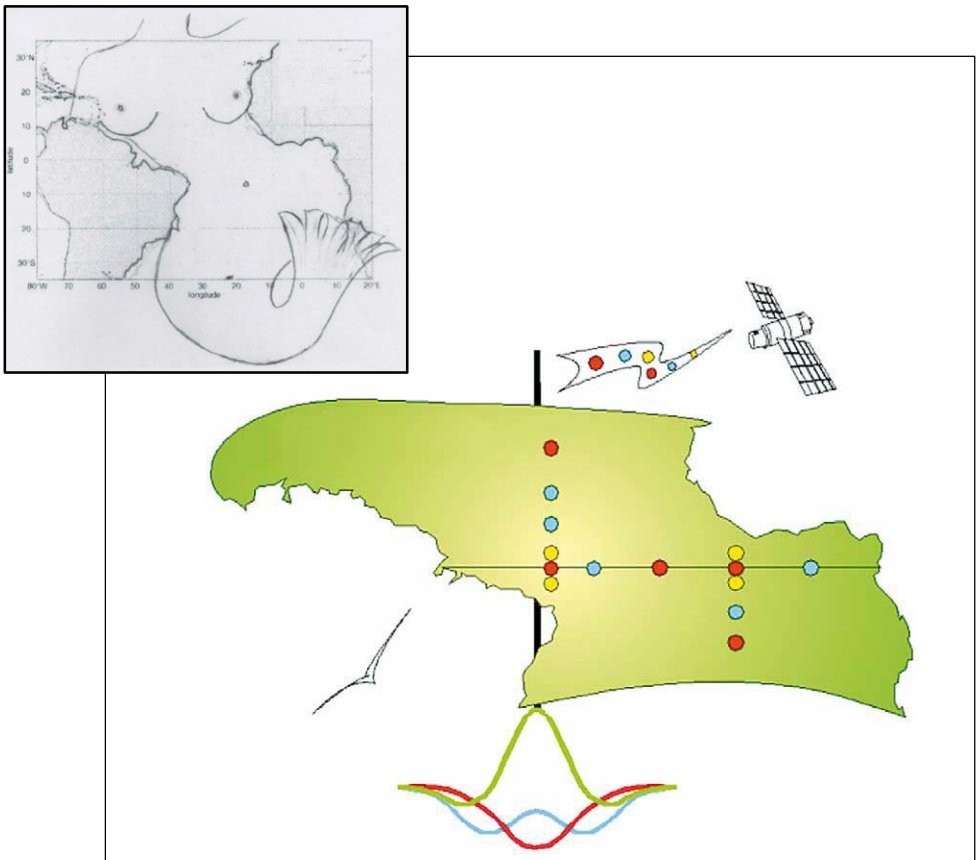


Figure 15:
Photos credit: PirataBar.

THE SYMBOLISM OF THE PIRATA LOGO

A first attempt of a logo placed a siren in the outline of the continents. Exploiting the idea of using the contour of the adjacent continents to the tropical Atlantic Ocean we adapted it to represent not a siren, but a sail. A sail that could be a pirate ship's sail. The sail is seen from the front, the ship rushing towards us. We see its mast in the middle of the sail. The hull of the boat (hence its bow) is symbolized here by the shape of Kelvin waves at the equator and the Rossby waves on both sides of the equator.

Small colored disks placed on the sail, along the equator, and along the 38°W and 10°W axes represent the positions of the ATLAS buoys of the PIRATA backbone. The different colors of the disks symbolize the



THE PIRATA MUSICAL BUOYS

Doing good science does not prevent having humor. We have already seen it before about the choice of the name of PIRATA (see §5). Because the PIRATA project is a tri-partite project Brazil, France and USA, we came up with the idea that the buoys that sway over the waves, could dance some of the musical rhythms of these three countries. We thus gave a name to the first twelve ATLAS buoys of the original PIRATA backbone. In the eastern side of the PIRATA network, maintained by France, we gave names of music or dances most common in France (Java), Central Europe (Waltz) or a French region, the Brittany (Gavotte). For the western side of the network serviced by Brazil, names of Brazilian regional rhythms such as Forro (Fortaleza, CE), Lambada (Natal, RN), Frevo (Recife, PE) or even Samba (Rio de Janeiro, RJ) were assigned. The northernmost ATLAS system at 38°W was named Reggae, and the remaining four buoys, along the equator had names reminiscent of the USA's music: Jazz, Soul, Rhythm and Blues.

On the very first version of the web page of PIRATA France, when we clicked the buoys one could hear a brief musical extract according to the name of the buoy. Those were fun years!

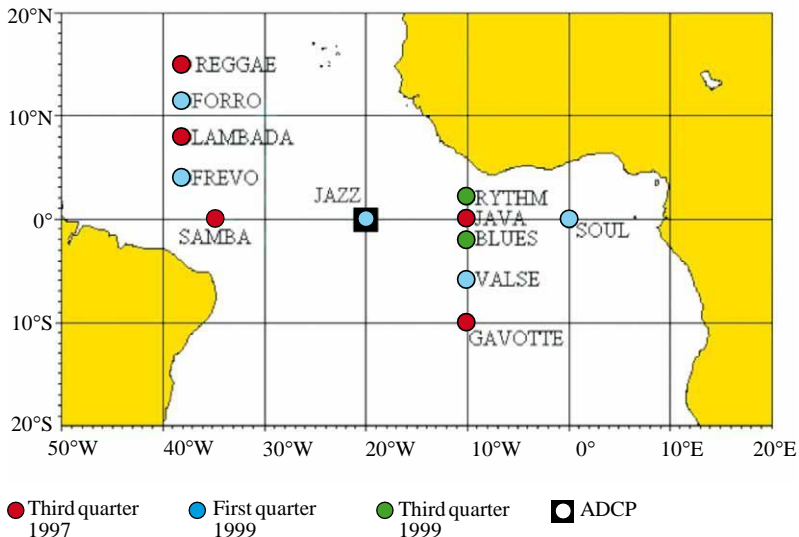


Figure 21: The 12 "musical" buoys of PIRATA backbone, with the scheduled dates of first deployments.

TUNA FISHING, VANDALISM AND A REPULSION DEVICE

Certainly, one of the biggest challenge we had to face during the pilot phase of the PIRATA program (1997-2005) was the vandalism mainly due to the tuna fishing around the moorings. Any devices anchored or drifting in the tropical waters, especially in the upwelling areas, are rapidly colonized by pelagic species. Indeed, around an ATLAS mooring buoys there may be up to 100 tons of fish, mostly tuna.

Three tuna fleets work regularly in the Gulf of Guinea. The tuna seiners are mainly European (Spanish and French), but also Ghanaian. Asian longliners are mainly from Taiwan and Japan. A third flotilla, registered under flags of convenience, are pirate ships that practice illegal fishing.

The practice of purse seining consists of encircling a school of tuna close to the surface by unfolding around it a large net, which is then closed by the base to form a pocket from which the fish cannot escape. The ATLAS systems, fixed by an anchor, could be potentially a boon to these fishermen. However, scientific buoys are not of great interest to these vessels: not only is seine maneuvering impossible around an anchored buoy, but most have for many years their own fish attraction systems. Their drifting rafts are launched in potentially interesting areas and then recovered after a few days/weeks by the seine. In addition, French tuna ships are aware of the existence and interest of these weather-ocean buoys.

The longliners fish for bigger tuna several dozen meters deep using long lines stretched horizontally between 30 and 300 meters deep and equipped with thousands of hooks arranged at regular intervals. These lines are not anchored to the bottom and therefore drift according to the currents. Not targeting schools of tuna, this type of fishing is less dependent on attracting objects such as buoys, close to which large individuals can however be more abundant. Laying lines too close to the buoys can cause them to become entangled, possibly damaging the underwater sensors and the mooring line. This is what was observed on one of the buoys recorded in 2004 during a PIRATA-FR cruise. But this interaction linked to the fishing operation cannot explain the disappearance of buoys or electronic equipment. French fishermen having visited an Asian ship in the port of Abidjan thus testified to having seen a beautiful RM Young anemometer (the model used on the buoys) serving as a clipboard on the commander's desk!

Pirate ships fish in contravention of international law (exclusive economic zones) and resource management regulations. Their catches are transhipped at sea on refrigerated freighters or other fishing vessels.

However, the good thing is that it was possible, before removing of the buoy, to make miraculous fishing. The crews of the French ships fished to their heart's content, and we, the scientists, were very happy to enjoy incredible tuna treats with all sorts of cook preparation.



Figure 28:
Examples of fishing of tuna (top), sea bream or maïe-maïe (left) and black mackerel (right) by the crews of the French R/V before each ATLAS removing.
Photos J. Servain.

THE NOR-50

ST Research Vessel Feature

NOR-50: Fast Research Vessel For Operational Oceanography

Implementing PIRATA & Argo Programs in the Tropical & South Atlantic in a Practical, Economic Way

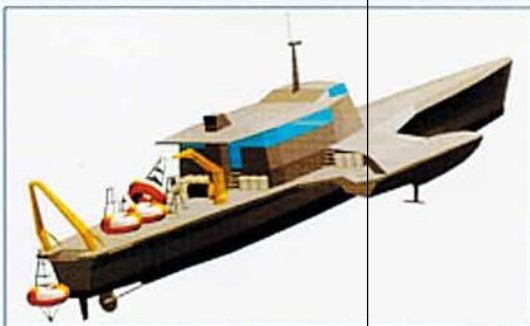
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A new frontier on the edge of the 21st century, operational oceanography (OP/OC), intends to provide real-time predefined oceanic information to its users. Among the numerous OP/OC objectives (i.e. survey of the quality of the environment, assessment of stocks of fishes, seasonal climatic forecast) this article addresses climatic variability of the oceanic domain. To answer the global need for *in-situ* and space-born observations, an international organization, related to the GOOS (<http://oc.unesco.org/goos/>) and Argo (<http://www.argo.ucsd.edu/>) programs, is gradually being set up. After a brief description of the missions and requirements of OP/OC, we propose that the principal way to accomplish this OP/OC is based on a "new concept" of research vessel (R/V) dedicated to the Tropical and South Atlantic Ocean.

After describing the technical characteristics of this vessel (NOR-50), a quantitative comparison is done for two types of missions (PIRATA and Argo) with a classical type of R/V and the NOR-50. An assessment of the workload is provided, and some tracks for the financing are suggested.

Tropical & South Atlantic

The PIRATA program, an experimental network of *in-situ* met-oceanic observations in the Tropical Atlantic region, was established at the end of



1997 at the international level (Brazil, France and United States) under joint sponsoring of CLIVAR (<http://www.clivar.org/>) and GOOS. The initial PIRATA observing network consists of 12 moored ATLAS buoys, genuine met-oceanic weather stations which measure various parameters of the energy transfer between the atmosphere and the mixed layer in key points of the tropical Atlantic Ocean. The initial PIRATA network, now midway between the research mode and the operational mode, will be gradually completed by a series of extensions toward the African and American coasts. The PIRATA program as a whole is intended to become totally operational by the year 2005.

Between recovering and refurbishment, the nominal lifetime of an ATLAS mooring at sea is about one year; therefore, roughly once per year, each ATLAS mooring must be raised, except



Deployment of an ATLAS buoy aboard classical R/V La Thalysse (bottom)

A NOR-50 general overview of starboard aft (top)

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THE THREE PHASES OF PIRATA, THE PRB AND THE MOU

The pilot phase of PIRATA started in 1997 with the launching of the first mooring in September 1997. Initially programmed for a 3-year phase (1997-2000), which actually finished in 2001. A PIRATA Resources Board (PRB) was established in 1999 with Mike Jonhson (NOAA) as the first Chairman and representative of USA. Other members were representatives of France (Jacques Merle for ORSTOM/IRD and Daniel Cariolle for Météo-France) and representative of Brazil (Volker Kirchoff for INPE). During June-December 1999, with the help of some PIRATA-SSC members, these PRB members drafted Terms of Reference for the 5-year (2001-2006) consolidation phase of the PIRATA "backbone".

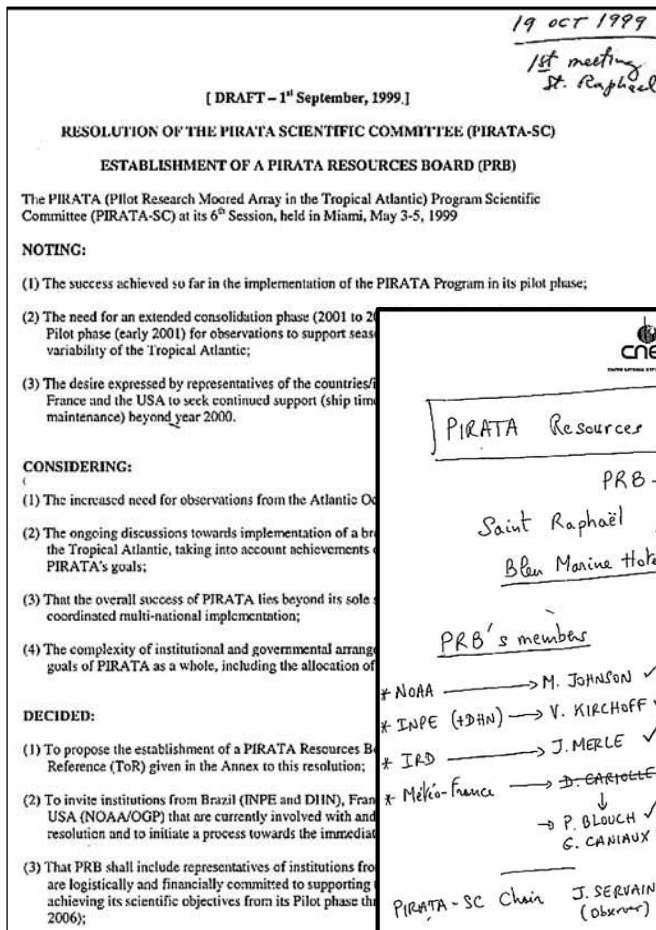


Figure 32: Draft of a Resolution prepared by the PIRATA-SSC to create the PIRATA Resources Board (PRB).

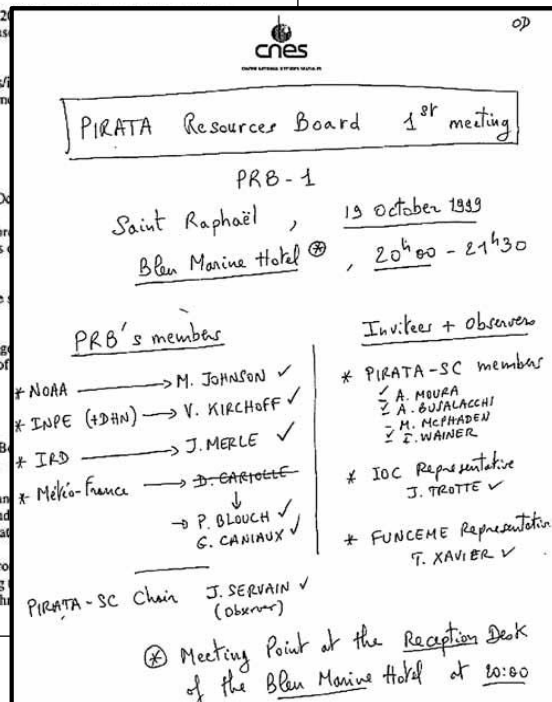




Figure34:
 The participants of the Meeting PIRATA-11 at Natal in 2006 during the preparation of the article "The PIRATA Program: History, Accomplishments, and Future Directions".
 With (front from left to right) Paulo Nobre, Tony Busalacchi, Jacques Servain, Mike McPhaden, and (behind, from left to right) Edmo Campos, Janice Trotte, Divino Moura and Bernard Bourlés.
 Note that this picture was taken exactly at the same place as the picture of the Meeting PIRATA-1 ten years before.
Photo J. Servain.

Figure35:
 Cover of the BAMS, Vol. 89, N° 8, published in August 2008 with inside the Article "The PIRATA Program: History, Accomplishments, and Future Directions" by B. Bourlés *et al.*



During the yearly PIRATA meeting in 2013, the MoU which was ending in July 2014 was extended for an additional five-year period (until July 2019) through an amendment.

PIRATA IN THE MEDIA

Several large public articles, published in various daily newspaper, weekly or monthly magazines, have been published during the first years of PIRATA, mainly in France, and sometime in Brazil. For instance, the scientific reporter S. Huet from the French national newspaper "Libération" was invited by J. Servain to attend the PIRATA-5 Meeting which took place in Abidjan in November 1998. He wrote an article entitled "L'Océan Maître du Temps", published in "Libération" in 1st December 1998. Following the article published by S. Huet in "Libération", the producer of the French documentary series "Thalassa" contacted J. Servain to report at of a PIRATA cruise. "Thalassa" is a very popular broadcast, weekly programmed on prime time on the French TV channel FR3, which is dedicated to various maritime activities. The appointment to participate in the mission PIRATA-FR3 in January 1999 from Abidjan was made. Three people from the French television (a reporter, a cameraman and a soundman) embarked on the R/V Antéa and they filmed the all launching operations of two ATLAS buoys. The 30-min documentary "La mer vue du ciel" went on the air of FR3-TV in June 1999.

Invited by J. Servain to attend his lecture at the University of Paris 6 in February 2001 about the presentation of the NOR-50 Project, S. Huet published a second article in "Libération" entitled "Un trimaran au secours des bouées".

Other articles were published in various newspapers and magazines as "O Povo", "Le Marin", "Le Monde Interactif", "Sciences & Avenirs", "Hebdo Micro", etc.



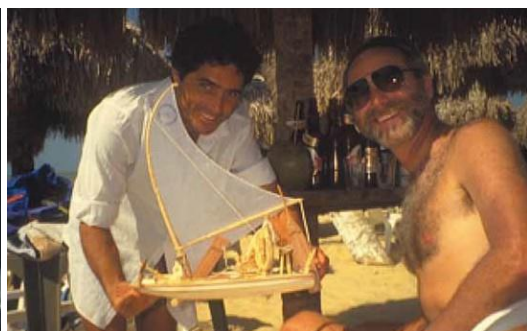
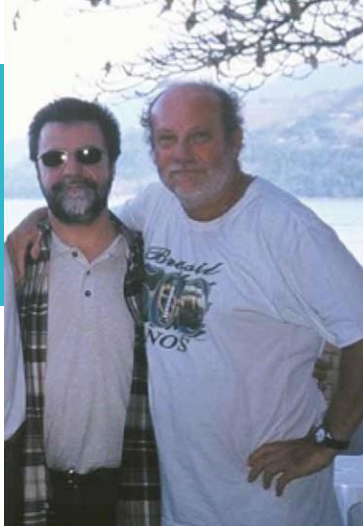
PIRATA'S BOUTIQUE

It was of tradition during the first PIRATA meetings that some personalized souvenirs were edited, most of the time in the effigy of the PIRATA logo. That were for instance T-shirts, caps, pirate cards, mugs, placemats, etc ...



Figure 37:
Some souvenirs edited
during the first years of PIRATA.

PHOTO GALLERY



LINK OF « THE RISE OF PIRATA »

[http://www.brest.ird.fr/pirata/pdf/PIRATA
%201995-2005.pdf](http://www.brest.ird.fr/pirata/pdf/PIRATA%201995-2005.pdf)