

**REPORT OF THE SEVENTH MEETING OF
THE PILOT RESEARCH MOORED ARRAY IN THE TROPICAL ATLANTIC**

PIRATA-7

11-12 April 2000, Natal, RN, Brazil

(gathered by J. Servain)

SUMMARY

The seventh meeting of the PIRATA Scientific Committee (PIRATA-7), hosted by INPE/Natal and partially supported by IOC/GOOS, was held in Natal, RN, Brazil, on April 11-12, 2000. See the agenda of the meeting in *Annex 1*. The PIRATA-7 meeting was followed by the 1st meeting of the CLIVAR-Atlantic Panel. Most of participants to PIRATA-7 attended the first day of the CLIVAR-Atlantic Panel (see the list of the participants in *Annex 2*), with a total number of participants around to 35 for PIRATA-7 and close to 20 during the first day of the CLIVAR meeting. The local organizer for both meetings was INPE-Natal, under the responsibility of Dr. Adauto Motta, Director of INPE-Natal.

PIRATA-7 was mainly devoted to discuss the followings topics:

- Status of the national (Brazil, France, U.S.A.) past and present contributions to PIRATA, including mooring funding, ship-times, changes in cruises due to vandalism problems, refurbishment issues, shipping and customs problems...
- Evaluation of the first 30-month PIRATA data return, and its contribution in our knowledge of the climate variability of the region
- Continuation of the deployment and maintenance of the PIRATA array until the end of the pilot phase (mid 2001), including the associated instrumentation (tide-gauges, Met measurements)
- Discussions to reduce the original PIRATA array from 12 moorings to 10 moorings (due to excessive lost by vandalism in the eastern area) as a “back-bone” during 5 additional years (2001-2006) after the pilot phase. That will be the “consolidation” phase, such as it was proposed at Miami in May 1999 during PIRATA-6. The consolidation phase must be seen as a smoother transition to operational status, if warranted, under the GOOS auspices
- Arrangement between the three national partners (Brazil, France, USA) for a new partition of the geographical maintenance and a new mode of funding during the consolidation phase
- Initial discussion, under the CLIVAR-Atlantic Panel auspices, about a possible expansion of the responsibilities of the PIRATA-SC which could include the coordination of all the oceanic observing system in the Tropical Atlantic (PIRATA, drifters, XBTs-T/Ss, profiling measurements, ...)

- Reports and announcement of the three “pilot” extensions of the PIRATA array (PIRATA-SEE, PIRATA-NEE and PIRATA-WE), such as it was suggested during PIRATA-6, and with the collaborations of other nations and institutions interested by regional impacts of the climate variability, in synergy with a coherent sustained in-situ observing system on the tropical Atlantic region.

The notes which follow are only related to the Sessions 1 and 4 of the full meeting (see the Agenda in Annex 1), as well as to the executive meeting of the members of PIRATA-SC.

SESSION 1: PIRATA IMPLEMENTATION STATUS

(Notes recollected by P. Nobre, arranged by J. Servain)

In the first session of the PIRATA-7, after the presentation of the PIRATA international status by the Chairman of the PIRATA-SC, the representatives from France, Brazil and U.S.A. summarized the participation of each country during the year 1999 and beginning 2000, and their plans for the end of the pilot phase (currently 2001). Other issues concerning vandalism, data return, tide-gauges, meteorological buoy, ADCP and PIRATA web page were discussed.

A) INTERNATIONAL STATUS (up to April 2000) (J. Servain)

- 10 ATLAS moorings and São Tomé tide-gauge are operational in April 2000
- 2 ATLAS sites (0°N-0°W and 1°40S-10°W) are not operational, as well as tide-gauges and Met Stations at SPSPR and Atol das Rocas, and Met buoy at 44°W-Eq
- Western side of the array has (April 2000):
 - 3 ATLAS buoys with more than 2 years of data return;
 - 2 ATLAS buoys with more than 1 year and less than 2 years of data return;
 - 1 ATLAS buoy with less than 1 year of data return;
 - 1 lost system; 6 systems are operational
- Eastern side of the array has (April 2000):
 - 1 ATLAS buoy with more than 2 years of data return;
 - 2 ATLAS buoys with more than 1 year and less than 2 years of data return;
 - 2 ATLAS buoys with less than 1 year of data return;
 - 2 lost systems, 3 recovered systems after adrift, 4 systems are operational

Area of heavy tuna fishing is concentrated over the eastern equatorial Atlantic.

A slide shows aggregation of about 40 tons of tuna around one ATLAS mooring (100 m deep, 200 m radius)

PIRATA Cruises:

1999 Cruises: with ATLAS systems deployed/recovered

- FR3:
 - 22/01 – 2/02: Valse, Java
- BR2:
 - 29/01 – 11/02: Forro, Reggae, Lambada
 - 17/02 – 25/02: Frevo, Samba
 - 02/03 – 12/03: Jazz

- FR4: canceled
- FR5:
 - 25/10 – 04/11: Gavotte, Rhythm, Blues
 - 08/11 – 15/11: Yoyo system (close to Java)

2000 Cruises: with ATLAS systems deployed/recovered

- FR6:
 - 08/03 – 19/03: Java, Valse, Rhythm, checking Yoyo
- BR3:
 - 19/02 – 02/03: Jazz
 - 09/03 – 22/03: Reggae, Forro, Lambada, Frevo
 - 26/03 – 30/03: Samba
- FR7 (scheduled during EQUALANT-2000):
 - 24/07 – 21/08: Soul, Blues

2001 Cruises (scheduled): with ATLAS systems deployed/recovered

- FR8:
 - Jan 2001?: Java, Valse, Rhythm, Gavotte, + removing Yoyo
- BR4:
 - Feb-Apr 2001?: Frevo, Forro, Reggae, Lambada, Samba, Jazz
- FR9:
 - Sept 2001?: Soul, Blues & Rhythm (removed)

PIRATA Meetings

- PIRATA-6: Miami, USA, 3 - 4/May/1999
- PRB-1: St Raphael, France, 21 Oct 1999
- PIRATA-SEE-1: Wilderness, South Africa, 22-26 Nov 1999
- PIRATA-NEE-1: Casablanca, Morocco, 29-31 Mar 2000
- PIRATA-7 + PRB-2: Natal, Brazil, 11-12 Apr 2000
- PIRATA-WE-1: Fortaleza, Brazil, 11-14 Sept 2000
- COSTA-2: Marrakech, Morocco, early 2001 (?)
- PIRATA-8: Toulouse, France, July 2001

PIRATA web addresses:

<http://www.pmel.noaa.gov/pirata/>

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

<http://www.cmcd.inpe.br/pirata/>

<http://www.ird.ci/pirata/>

B) NATIONAL STATUS

B1) Report of French participation and the status of the eastern array (J. Servain)

The French participation of PIRATA for the second half of 1999 (after PIRATA-6 at Miami) and 2000 is as follows:

- Refurbishment of Sao Tomé Tide-Gauge Argos system in June 1999. The real time data from this tide-gauge is available in the French PIRATA mirror Web page from September 1999.

- Partial funding of refurbishment + funding a new ATLAS (55K US\$) by IRD and Météo-France

- The fourth French PIRATA cruise (PIRATA-FR4), scheduled in two legs in July 1999, was cancelled due to engine problems on the R/V Antéa.

- Direct observations of turbulent air-sea flux were made along zonal and meridional transects from Salvador de Bahia (Brazil) to Abidjan (Côte d'Ivoire), using a meteorological instrumented mast aboard the French R/V "La Thalassa" during the French cruise EQUALANT-99 (July-August 1999). During that cruise, three 24/36-hour intensive measurements were done in the vicinity of three PIRATA equatorial sites (Samba, Jazz and Java). That particularly provides useful calibration for the turbulent air-sea fluxes obtained by ATLAS mooring via the bulk formula.

- The fifth French PIRATA cruise (PIRATA-FR5) with R/V Antéa was done in October-November 1999. During the first leg (25 Oct-4 Nov), two new moorings, Rhythm (1°40N-10°W) and Blues (1°40S-10°W), have been deployed, and Gavotte was replaced. During the second leg (Nov 8-15) a complex current measuring system has been deployed in the vicinity of Java (0°N-10°W) with an ADCP system (0-250 m) and a "Yoyo" system (250-1100 m, daily profiles), and classical current measurements (1000-4000 m) at two sites along 10°W, 0°45N and 0°45S.

- The sixth French PIRATA cruise (PIRATA-FR6) with the French R/V "Le Suroît" took place in March 2000 (08 March - Abidjan / 19 March - Port Gentil), during which Java and Valse have been replaced. Rhythm, adrift from a few weeks before the beginning of the cruise, and immediately recovered by a tuna-ship and dropped to Abidjan, was deployed for a second time. Again, a few days before the cruise, Blues was also adrift. It was recovered by the R/V "Le Suroît" during the cruise. The "Yoyo" system was visited (change of battery).

- France (IRD and Météo-France) are providing funding for refurbishment of 3 ATLAS moorings in 2000 (about 20 K US\$ from IRD and 25 K US\$ from Météo-France).

- PIRATA-FR7 is currently planned to take place in July-August 2000 with the new deployments of Blues and Soul. That maintenance will be done as a part of the French EQUALANT-2000 cruise on the R/V "La Thalassa".

- The Sao Tomé tide gauge will be serviced during the autumn 2000.

- PIRATA-FR8 is planned in January 2001, during which 4 ATLAS systems will be serviced.

- France (IRD and Météo-France) will provide (the last) funding for refurbishment of 3 ATLAS moorings in 2001 (about 20 K US\$ from IRD and 25 K US\$ from Météo-France).

- The ninth French PIRATA cruise (PIRATA-FR9), the last one for the PIRATA pilot phase, is planned in September 2001 (final removing of Rhythm and Blues; see below for the new arrangement in the PIRATA array).

- An IRD technical assistance will be proposed for the first NEE and SEE cruises, tentatively scheduled in 2001.

B2) Report of Brazilian participation and the status of the eastern array (J. Lorenzetti)

- The Brazilian PIRATA is under the responsibility of INPE with shiptime support of DHN. The crew of its research vessel ANTARES is very well trained for PIRATA mooring deployment operations.

- During the last cruise Feb-Mar 2000 (with three legs), 4 buoys at 38°W and 2 buoys at the equator were serviced, with 5 buoys retrieved, 5 buoys replaced, and one missing buoy at 4N deployed.

- Clearing the buoys from customs:

- Clearance of PIRATA equipment from customs continued to be a major difficulty, as it has been the case during the previous missions. Sensors for the three northernmost buoys arrived from customs only at the day of the final deadline for the departure of the mission for leg II, as established by DHN.

- Data for all buoys for the western part of the array, under the responsibility of INPE/DHN, were shown. The data return for the buoys have been as follows:

* 15°N-38°W (Reggae): time series almost complete.

* 12°N-38°W (Forro): 1 month of missing data for T & S; no gaps for the wind data.

* 8°N-38°W (Lambada): buoy stopped transmitting Jul/99. It has been vandalized; it is operating again since Feb/2000.

* 3.5°N-38°W (Frevo): data lost from June/99; it was not found in place; replaced last March/2000.

* 0°N-35°W (Samba): almost one year of wind data lost; other variables mostly complete; it is operating normally since March/00.

* 0°N-23°W (Jazz): wind data lost due to anemometer failure from Feb/99 through Feb/00; the mooring is operating normally since Feb/00.

- A tide gauge has been installed in SPSPR by DHN in 1999, but it did not start transmitting, and is awaiting for a crew to start it up. Another one was installed at Atol das Rocas in November 7, 1999, which has been operational, giving good hourly data up to February 8, 2000, but is temporarily inoperative due to technical problems caused by a major storm surge at that day. Data from these tide gauges are normally transmitted via Service Argos. The data from Atol das Rocas is available via the Web and can be obtained from the University of Hawaii Sea Level Center by clicking at the Fast Delivery Data Set. The data is being also inserted into the INPE PIRATA web page for distribution.
- The CTD/XBT data sets obtained from the BR1 and BR2 cruises will be placed on the INPE PIRATA web page. A ADCP data set obtained during the BR2 cruise is still being processed, and is planned to make it likewise available.
- 3 Met stations are planned to be obtained in the current year to be installed in SPSPR, at Atol das Rocas, as well as at 0°N-44°W. The delay in meeting these objectives was due to unexpected cuts in the INPE funding and new legislation on bidding procedures for imported goods, which occurred between mid 1998 and 1999.
- Contingency planning for these actions is presently in discussion at INPE
- 2 ADCPs bought by INPE are expected to be installed at Jazz (one ADCP is to be used as a spare)

Brazil has all the intentions to continue to participate in PIRATA, in concert with INPE and DHN

• *Questions & Answers:*

J. Lorenzetti: according to estimates given by DHN and the expenditures done by INPE, Brazil has already spent approximately one million US\$ for servicing the western PIRATA array

J. Servain: USP and FUNCEME are putting a project to measure meteorological data at Atol das Rocas; it would be interesting to put it in the context of PIRATA

M. Vianna: Funding problems are still delaying the acquisition and installation of the met stations. Costs for the three satellite transmitting met stations is ~ US\$60 K. As to USP and FUNCEME related to Atol das Rocas, there are still logistic (Atol is a biological reserve crowded with birds) and scientific problems to be discussed, including the fact that the Atol, behaving like a “frying pan”, seems to be inadequate for studies of parameterizations of ocean turbulent fluxes, which is the main objective of the project.

J. Servain: New generation of ATLAS buoys have 6 ADCMs, 6 m vertical spacing each; 1 sensor costs 10 K US \$), 13 levels of temperature measurements (present ATLAS = 10 levels); 6 levels for salinity (4), and SLP and IR sensors

C. Hansen: Brazilian Navy (DHN) has been engaged on PIRATA cruises with

R/V "ANTARES" ; for the next year and for the consolidation phase it will use the vessels NF ALMIRANTE "GRAÇA ARANHA" or NF "BARÃO DE TEFFÉ" (both lighthouse tender vessels).

B3) Report of USA participation and the status of the data return (M. McPhaden)

- Data return is affected by fishing vandalism, instrument problems, ship time. Data return is maximum in the regions where ocean is not biologically productive
- Low data return over the heavily fished areas
- Instrument failure or vandalism & infrequent visits compounded for low data returns
 - * Sep 1997 – Mar 1998: 68% data return
 - * Mar 1998 – Mar 1999: 73% data return
 - * Mar 1999 – Mar 2000: 62% data return
 - * All years: 66% data return
- Systems Inventory (April 2000):

| | <u>West of 20°W</u> | <u>East of 20°W</u> |
|-----------------------------|---------------------|---------------------|
| Operational | 6 | 4 |
| Lost | 1 | 3.5 |
| Stand by (Natal or Abidjan) | 2 | 3 |
- NOAA/PMEL participation for BR and FR cruises:
 - Personnel: 11; Personnel x day: 162
- 20 m and 40 m temperature sensors have a modular heating problem. Diurnal cycle is in error due to heating of the black casing of the sensor, which is heated by direct sunlight.
- 10 m salinity records also have erroneous noise, which must be smoothed out.

Issues:

1 – Wrap-up of pilot phase is proposed by PMEL for late 2000 (see after for another date, current 2001, accepted after discussion with the French side):

- Final cruise/recovery
- Inventory
- Distribution of assets
- Data archived

2 – Consolidation:

- Reaffirm basic commitments: ship time
- Array design
- Inventory maintenance
- Ship schedules
- Shipping
- Data processing/archived
- Relationship to extensions

Every buoy in the Pacific is scheduled to be maintained at every 6 months, and that would be the same in the Atlantic

• *Comment and suggestion:*

J. Servain: for the point of view of France, all the ATLAS systems which have been deployed during the pilot phase of PIRATA have no specific owners (neither France or Brazil or USA). The real “owner” of these systems is all the PIRATA community. France proposes it will be the same way for the consolidation phase.

C) INTERNATIONAL SUPPORTS OF PIRATA

C1) IOC/GOOS Support (J. Trotte)

- GOOS creation & sponsorship:
 - * Called for by Agenda 21 and by the second World Climate Conference;
 - * Created by IOC Assembly 1991
 - * Sponsored by IOC OF UNESCO, WMO, UNEP, ICSU
 - * Part of integrated UN strategy for global observations with GCOS and GTOS
- GOOS operational activities
 - * Data collection network
 - * Data and information management
 - * Data analysis, preparation and dissemination of products
 - * Numerical modelling and forecasting
 - * Training, technical assistance and technology transfer
- The conceptual Global Ocean Observing System was presented, showing the network of profiling floats, tide-gauge stations, moored buoys, VOS lines and drifting buoys.
- The Global Ocean Observing System (GOOS)
 - There are 4 GOOS design modules for monitoring, assessment and prediction: Climate; Coastal; Living Marine Resources; and Health of the Ocean.
- GOOS is designed to provide information about the present and future states of the sea and to provide the basis for predicting climate change. It is analogous to the WWW, that underpins all weather forecasts and totally relying on cooperation
- For the period of July 1999 to May 2000: Shall improve the design of the observational network, its regional enhancements and further development of numerical modelling

- IOC/WMO GOOS support to PIRATA at the design level:
 - * Open ocean GOOS: Weather and climate forecasting implemented through TAO, PIRATA
 - * OCEANOBS 99 – A revisit of the original Ocean Observing System for Climate
 - Coastal GOOS: High density system of observations addressing issues such as management of resources, marine pollution
 - * Being implemented through GLOSS, GCRMN, etc.

- The Global Ocean Observing System (GOOS) timetable:
 - 1999-2000: Develop tools; system trials
 - 2000-2020: Progressive implementation
 - 2003-2005: GODAE full scale experiment
 - 2010: System fully operational
 - 2010+: Progressive refinement

- IOC/WMO GOOS Support to PIRATA: Regional developments:
 - * IOCARIBE-GOOS, for the greater CARIBBEAN;
 - * NearGOOS, northeastern Asian countries
 - * MedGOOS, Mediterranean countries;
 - * EuroGOOS, consortium of European agencies
 - * PacificGOOS, southwest Pacific Island States
 - * PIRATA is a major GOOS pilot project that extends the TAO array to the Atlantic
 - * IOC/WMO co-sponsoring planned discussions for the transitional [consolidation] phase

- * PIRATA-SEE-1: 01-day meeting in Wilderness, South Africa, as part of SAMSS-2000, Nov 1999
 - * PIRATA-NEE-1: 03-day meeting in Casablanca, Morocco, March 2000
 - * PIRATA-WE-1: 03-day meeting in Fortaleza, Brazil, Sept 2000
- Global Ocean Data Assimilation Experiment – GODAE
 - *Planned to prove the concept of improved forecasting capacity by the integration of space
 - * Based and in situ observations
 - * To demonstrate the power of model assimilation and the value of a global system working in real time
 - ARGO: aiming at conducting real-time geostrophic measurements in the upper ocean (3K drifting floats).
 - Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology – JCOMM
 - * Fusion of several long-standing independent bodies into a single operational unit to provide a fully integrated coordinated mechanism for the global management of an operational ocean observing system
 - * Will further develop the observing networks
 - * Preparation meeting in St. Petersburg, held in July 1999
 - * First meeting planned to be held in Iceland, Spring 2001
 - Vandalism has been a major limitation to the setting up of PIRATA and other observing system
 - * Resolution IOC-EC-XXX1.4, June 1999
 - * Paper A/54/429 submitted to the 54th Session of the UN General Assembly, Sept 1999
 - * 15th Session of DBCP recommended WMO to write to IHO requesting the promulgation of navigational warnings regarding moored buoys, Oct. 1999
 - * Director-General of UNESCO is preparing a proposal to be presented to the UN Assembly, which:
 - i) Addresses the problem of vandalism of oceanographic equipment, in particular by fishing vessels;
 - ii) Encourages appropriate action within UNCLOS as well as national legislation of member states regarding unattended equipment in their EEZ;
 - PIRATA has a leading role for observing systems in the Atlantic:
 - * Funds requiring a new strategy from co-sponsors
 - * Stronger liaison with programs like CLIVAR Atlantic
 - * Proof of concept exercise on the value of PIRATA

“It is important to view the Ocean as a place with as much weather as the Atmosphere”

- *Comments:*

- *J. Servain:* Thanks Janice for her very fine job for taking good care of PIRATA project.
- *C. Hansen:* The Naval Training System could teach about 11k people per year (e.g. fishermen and sailors) about drifter and moored buoys, in order to avoid or reduce vandalism of these equipments.

C2) The IRI Presentation (A. D. Moura)

- Description of IRI origin and goals: End to End solutions from basic research, data, forecast products, and applications
- IRI can support PIRATA on capacity building
- IRI depends on PIRATA for seasonal climate forecasting
- The question of SST forecast PIRATA brings information needed to understand Atlantic SST variability
- Can help with regional modeling for the region – It is elaborating a project to support FUNCEME to do regional modeling/forecasting

- *Comment:*

- *D. Moura:* Capacity building does not include electronics and data decodification.

D) PIRATA REGIONAL EXTENSIONS

D1) The PIRATA South-East Extension (PIRATA-SEE) (M. Rouault)

- PIRATA-SEE-1 was hold in Wilderness, South Africa, 26 Nov 1999
- Representatives of PIRATA-SC, French EQUALANT Program, IOC
- Participating countries: Angola, Namibia, South Africa
 - * Phase 1 – Lobby for PIRATA
 - * Phase 2 – Funding (feasibility and cost/benefits studies)
- Action Committee created, chaired by Mathieu Rouault (Oceanography, Univ. Cape Town) with Representatives of BENEFIT, CLIVAR-Africa, GOOS-Africa, ...
- PIRATA-SEE is going to be founded at 300~400 K US\$, but there is a lack of personnel resources
- Scientific rational: Warm events on the Benguela current may cause heavy death of fishes on the Benguela Bay

- *Comment:*

- *J. Servain:* The scientific rational is the same as for the NEE extension.

D2) The PIRATA North-East Extension (PIRATA-NEE) (J. Trotte)

- PIRATA-NEE-1 was hold at Casablanca, Morocco, 29-31 Mar 2000
- Hosted by the Government of Morocco
- Regional countries participating (Cabo Verde, Côte d'Ivoire, Guinea, Mauritania, Morocco, Sénégal) + France, Portugal and Spain (included Canaries)
- Minimum one Met and one Ocean representatives from each country
- WMO, IRD, PIRATA-SC, Medias, IOC and ISPRA representatives
- Moroccan Minister of Fisheries addressed the Opening Ceremony
- Objective = to define a strategy of participation in PIRATA, coastal zone and boundary conditions
- Zones and issues where variability studies are greatly expected to study:
 - * Guinea dome
 - * Ocean variability and SST anomalies
 - * Coastal upwelling off Mauritania and Morocco
 - * NAO and equatorial influences
 - * Coastal climatology

- * Northern and Southern limits of the subtropical gyres
- * Climate prediction in West Africa
- * Frontal oceanic system off Cabo verde
- * Influence of ITCZ variability
- * Canaries current
- * Interactions with NAO and ENSO

- Action Committee created, chaired by Director of Météo-Maroc, Vice-Chaired by Head of Oceanography Dept. of INRH (plus Representatives from Cabo Verde, Guinea, Mauritania, Sénégal and Spain/Canaries)

“JCOMM concept widely practiced in Casablanca”

- The mission of the PIRATA-NEE Committee is:
 - * To perform feasibility studies for those areas of scientific interest;
 - * The definition of the resources in place locally, and required from exterior countries and international institutes
 - * The scientific definition of the NE Extension PIRATA Program, to be presented to the PIRATA-SC within one year (Mar 2001)
 - * The elaboration of proposal to be presented to the EU, GEF and World Bank
- Work to be performed half fundamental research, half applied forecasting, with a strong capacity building component
- Scientific output to have economic impact over management of natural resources, especially fisheries
- Good asset to IOC/WMO strategy towards presentation of proposals to GEF and setting up of observing systems

“Chances to having extra funding for PIRATA from regional countries is likely to increase of national interests are considered”

D3) The PIRATA West Extension (PIRATA-WE) (I. Wainer)

- Announcement of the PIRATA-WE-1 meeting in Fortaleza, CE, Brazil, 11-14 September 2000, with two main topics:
 - * Discussion on the western extension of the PIRATA array (from West Indies to Argentina)
 - * Presentation of seasonal forecast experiments on the Americas, especially using the fast delivery oceanic observations like the PIRATA data

SESSION 4: PIRATA THROUGH THE CONSOLIDATION PHASE (2001-2006

(Notes recollected by I. Wainer, arranged by J. Servain)

- M. Johnson, Chair of PRB, makes a report of PRB-1, hold in Saint Raphaël, France by 19 October 1999:
 - * Draft of Terms of Reference (ToR) between BR, FR and US
 - * Welcome to other partners/countries for consolidation phase
- Recall that PIRATA is a high priority for all:

- * Brazil: INPE committed through 2006; DHN needs a 5-year requirement from PIRATA-SC ; Necessity of longer lead-time for shipments of mooring parts
- * France: IRD committed through 2006 ; IRD will secure necessary ship-time ; Météo-France supportive
- * USA: NOAA supportive through 2006 and looking towards for long-term commitment

GENERAL DISCUSSION:

- *M. Johnson*: Suggestion to use agenda items 1, 2, 3 for a same discussion
- *M. McPhaden*: Wrap-up of the pilot phase (initially planned from late 1997 to late 2000)
 - Final cruises/recoveries
 - Inventory assessment
 - Distribution of assets
 - Data achieving
- *J. Servain*: Recall (see before) that from the point of view of France, even if a PIRATA inventory assessment is necessary to be done at the end of the pilot phase, the PIRATA material which will remain at the end of the pilot phase has not (necessarily) to be dispatched between the three partners (Brazil, France, USA), but must be considered as initial material used in the consolidation phase
- *M. McPhaden*: Important to know when pilot phase ends and consolidation phase begins because the way of operating is different
- *J. Servain*: For France, the pilot phase ends after 1 year with all the buoys in the water (i.e. mid-2001)
- *M. McPhaden*: Argues that pilot phase ends late 2000, when all buoys have been deployed
- *M. Vianna*: Pilot phase for Brazil should end early 2001 after next Brazilian cruise

A consensus is founded: The pilot phase ends early 2001 in the western basin (after PIRATA-BR4), and ends mid-2001 in the eastern basin (after PIRATA-FR9)
- *J. Lorenzetti*: Consolidation phase has to be worked differently. There is a ***need for a formalization of operations*** (memos, signed documents, ...).
- *M. McPhaden*: A suggestion on a new design of the PIRATA array in the eastern basin, due of too much vandalism and consequently loosing systems; Go to 10 moorings instead of 12; Concentrate on a subset of the sites and propose to get a 2 (twice) a year maintenance; PIRATA is one component of the observing system and we have to make sure we get good data return
- *J. Servain*: Try one more time to maintain Soul (0°-0°). Take to C. Provost (Yoyo mooring) if she can maintain subsurface current mooring just north and south of the equator close to Java (0°N-10°W) after 2001.
- *M. McPhaden*: 5-year program with limited resources; maybe reducing the number of moorings is desirable to guarantee data return. There is a limited level of resources.
- *P. Nobre & J. Lorenzetti*: Why not try to find alternative positions of moorings? Suggest to have the 15°N buoy (Reggae) moved or taken care by another partner.
- *J. Servain*: Cannot move too much because of initial scientific objectives
- *T. Busalacchi*: does not agree with the re-design of the original array without rigorous (scientific) arguments; Ground rules: maintain the original configuration; Furthermore, the extreme latitudinal systems (Reggae at 15°N and Gavotte at 10°S) are the systems with the best data return
- *J. Servain*: Proposes (from the beginning of the consolidation phase) to remove Rhythm (1°40N-10°W) and Blues (1°40S-10°W) and proposes that France maintains Jazz (0°N-23°W) with, perhaps, a new eastern position of Jazz (around 18-19°W) depending of

the deep geography. Another French suggestion is that Brazil (INPE) transfers 2 of its ADCPs to IRD. These ADCPs were funded by INPE-PIRATA and were previously scheduled to be installed at Jazz. They could be installed on the 2 subsurface current moorings, presently located at 0°45N-10°W and 0°45S-10°W (C. Provost's Yoyo system), with current measurements 0-300m. The proposal of France of taking over the maintenance of Jazz and the transfer of two ADCP bought by INPE to IRD (as a temporary loan) for using at that mooring **was accepted by INPE.**

Further in the discussion a suggestion was debated then accepted: A re-think of the essential elements of the (consolidation phase) array, including ADCP mooring deployments, will be discussed during an 1/2-day PIRATA-SC meeting (PIRATA-7.5) on afternoon September 14, 2000, just after the end of PIRATA-WE-1 at Fortaleza. C. Provost will be invited to participate to this meeting.

- *J. Trotte:* Calls attention of other observing systems and initiative of possible decisions regarding the eastern part of the array
- *M. McPhaden:* Comes back on optimizing data return requires 6-month interval maintenance. We need 2 cruises/year. ***A program that does not bring back adequate level of data return is not (scientifically) viable***
- *J. Lorenzzetti:* At the present level of ship time support, 2 cruise/year is not feasible for the Brazilian side
- *M. Johnson:* Current assets are enough to maintain systems at no lost rate
- *J. Servain:* Requests more information from PIRATA-Brazil about other measurements within PIRATA (Met. Stations and tide-gauges in Atol das Rocas, SPSP Rocks + Met. buoy at 44°W-Eq)
- *M. Vianna:* Presented the situation of tide-gauges and Met. Stations and claims that it will be done this year
- *M. Vianna:* Suggests PIRATA-7 should write up a statement/recommendation requesting Brazil to acknowledge the importance of the tide-gauges and Met. Stations in the western basin within the PIRATA array
- *M. Vianna:* For the ADCP at Jazz, need of 60.000 US \$ for install it.
- *J. Servain:* An alternative suggestion should be to use brand new ATLAS generation with current(s) sensor(s)

It would be valuable to have current measurements!!

- *M. McPhaden:* Which FR ship is going to use for the consolidation phase?
- *J. Servain:* Maybe Antéa, not sure ...depends on the IRD programs happening off the coast of Africa
- *J. Merle:* PIRATA has priority in the use of Antea
- *J. Lorenzzetti:* An internal committee was set up by INPE to handle PIRATA issues. As head of this committee, he passed to J. Servain a document elaborated by that committee stating the terms that Brazil deems necessary for its continued support of PIRATA. A copy of this document is attached. Among other issues, INPE and DHN would like to use PIRATA to capacitate itself in open ocean buoy deployment. INPE envisions INPE-Natal as a potential place to develop a Center for technology and scientific exchanges in Oceanography and Climate studies and for logistic support of PIRATA .
- *M. McPhaden:* Agrees and says that PMEL is open to training and capacity building
Question: What is the BR ship that will be used in the consolidation phase?
- *J. Lorenzzetti:* Barão de Teffè or Graça Aranha
- *M. McPhaden:* Graça Aranha is unsuitable for mooring work (question of safety) unless the Graça Aranha changed after the report done by McPhaden in 1996
- *J. Lorenzzetti:* we need to discuss this issue in more depth with DHN and try to have Antares back to PIRATA ->**Action item for PRB**

Issue: Relationship of PIRATA and Pilot Extensions during the consolidation phase

- *M. Johnson*: Extensions have to come with their own resources
- *M. Rouault*: South Africa (Benguela Program) needs feasibility studies and cost/benefit analysis to convince the fisheries community
- *J. O. De Aragão* (Univ. of Recife): Wants to add a buoy with University resources. There is a pool of Universities (and Institutes) in the Nordeste that wants to become part of the PIRATA program (about 10 institutes). He announces a first meeting in July to prepare PIRATA-WE-1
- *M. McPhaden*: PMEL will be able to provide moorings as long as the costs are covered
- *J. Servain*: Question of Argos costs?
- *M. McPhaden*: A little premature to start discussing for Argos

Final comments:

- *M. Johnson*: To deal with end of pilot phase by PIRATA-SC and PRB
- *J. Lorenzetti*: Emphasizes need for discussion of document presented by PIRATA INPE Group

PIRATA-SC EXECUTIVE MEETING

(Notes recollected by J. Trotte, arranged by J. Servain)

- The Chairman opened up the session at 17:00 h, dealing with the issue of representation and rotating out of members
- As a result of that, Marcio Vianna stepped out and João Lorenzetti became the third Brazilian representative to the actual PIRATA Scientific Committee. Volker Kirchhoff, INPE's Deputy-Director and Jacques Servain, the PIRATA Chairman, thanked Marcio Vianna for his participation in PIRATA over the past three years
- The eight other members of the PIRATA-SC remain the same: T. Busallachi, P. Chang, M. McPhaden, D. Moura, S. Planton, G. Reverdin, J. Servain (Chair), I. Wainer
- Discussions on the possibility of changing PIRATA peerview so as to encompass other observations in the tropical Atlantic took place. There were also discussions on the importance of having the CLIVAR Atlantic Panel taking part in the scientific vetting process of PIRATA
- Two main issues were raised, as part of this discussion:
 - a) it is clear that PIRATA has an international vocation to become the umbrella programme for a system of ocean observations for the tropical Atlantic, that would include measurements assigned to activities related to other observational programmes, such as Argo, GLOSS, DBCP etc. That would ultimately deliver complementary operational data that are necessary for climate observations, prediction and forecasting in the region
 - b) despite the opportunity of having PIRATA leading the setting up of those additional observing systems, discussions are still required, in what concerns internal structure, internal business, resource availability, institutional relations etc.
- Both issues are to be tackled and fully discussed during the consolidation phase of PIRATA
- It was agreed that the PIRATA pilot phase will end in mid-2001, after the end of the last PIRATA cruise, to be carried out on board a French vessel, in Aug/Sept. 2001.
- Turning into the issue of co-sponsors support, the Group acknowledged the efforts that have been made by both IOC/UNESCO and WMO, by helping organise workshops for the discussions on possible PIRATA extensions, and therefore facilitating the participation of more interested coastal States in the region
- There should be continued support from IOC towards the development of actions to mitigate vandalism of unattended oceanographic equipment at sea that plagues the eastern side of the PIRATA array. Data recovery has been below the critical level and the system is already in danger. In addition to further approval of resolutions seeking juridical approach to the problem within the UN-system organisations, it was recommended that IOC/UNESCO provide extra help in educational procedures that would ultimately be required from member States towards reduction of vandalism by fishing vessels.
- It was suggested and decided that the PIRATA-SC will meet (PIRATA-7.5) in Fortaleza just after the PIRATA-WE-1 meeting (14 September, afternoon) with the following issues:
 - Decisions about the new array design during the consolidation phase
 - Decisions about the deployments of current measurements (including the Brazilian ADCP's and the French classical moorings)
 - Discussions on the Brazilian R/V's used in the consolidation phase
 - Other relevant topics (Tide-gauges, Met measurements and Met Buoy, capacity building,)
- PIRATA-8 (regular) meeting is scheduled to be hold in Toulouse, France, during the first half of July 2001, and will be hosted by Météo-France. Because it will be the last regular PIRATA meeting of the pilot phase, it was suggested that this meeting will be somewhat

larger as the previous ones (a 4-day meeting?) with scientific communications which will be submitted through an invited scientific journal. An investigation will be done in the next months around the large PIRATA community to study the potentiality of such objective.

ANNEX 1

Agenda PIRATA-7

Hotel Praia Visual
Ponta Negra, Natal, Brazil

11-12 April 2000

Tuesday 11 APRIL (only afternoon)

SESSION 1: PIRATA Implementation Status

Chair : Joao Lorenzetti

- 14:00 Welcome (A. Motta, V. Kirchoff, J. Lorenzetti, J. Servain)
- 14:15 Status of PIRATA-International + Status of PIRATA-France (J. Servain)
- 14:45 Status of PIRATA-Brazil (J. Lorenzetti, C. Hansen)
- 15:00 Status of PIRATA-USA (M. McPhaden)
- 15:15 Status of PIRATA Data Return + Data Dispatching (M. McPhaden)
- 15:30 IOC/GOOS Support (J. Trotte)
- 15:45 IRI Support (D. Moura)
- 16:00-16:30 : *Coffee*
- 16:30 PIRATA-SEE Proposal (M. Rouault)
- 16:45 PIRATA-NEE-1 Report (J. Trotte)
- 17:00 PIRATA-WE-1 Announcement (I. Wainer)

SESSION 2: Scientific and Institutional Reports

Chair: J. Servain

- 17:15 Climatic Variability Impacts in the Tropical Regions: A Focused Interest by IRD (J. Merle)
- 17:30 EQUALANT-99 Oceanic Data (J. Servain)
- 17:45 EQUALANT-99 Meteo Data (G. Caniaux)
- End at 18:00*

Wednesday 12 APRIL (morning)

SESSION 3: Scientific Presentations

Chair : P. Nobre

- 08:30 J. Servain et al. (Observed Subsurface Variability in the Tropical Atlantic 1979-1999; Role of the Freshwater Budget on the Ocean Variability)
- 08:55 I. Wainer (Scales of Variability in the Tropical Atlantic as Inferred from the PIRATA Array)

- 09:20 A. Lazar (Subsurface Telecommunication Between Eastern Subtropics and Western Tropics in an Atlantic OGCM: A Process Study)
- 09:45 P. Nobre et al. (A hybrid coupled experiment over the tropical Atlantic: local & remote responses)
- 10:15 *Coffee*
- 10:45 R. Murtugudde (Decadal Variability in a Simulation of the Tropical Atlantic Ocean)
- 11:10 T. Inui (Wind Stress Effect on the Subtropical-Tropical Circulation in the Atlantic)
- 11:35 R. Sutton (The Elements of Climate Variability in the Tropical Atlantic Region)
- 12:00 A. Clarke et al. (Implementing CLIVAR in the Atlantic)

Wednesday 12 APRIL (afternoon)

SESSION 4: PIRATA through the Consolidation Phase (2001-2006)

Chair : M. Johnson

14:00-14:20 PRB-1 Report (M. Johnson)

14:20-16:00 General Discussion:

1. Scientific Objectives
2. Resources, Logistic and Operational Support
3. The Other PIRATA Measurements (Tide-gauges, Met. Stations, ADCP, ...)
4. Connections with the PIRATA Pilot Extensions (NE, SE, W)
5. Inputs of other Brazilian Supporting Institutes (ex. FUNCEME, Univ. Recife, ...)

SESSION 5: PIRATA and CLIVAR (a bridge to the following meeting)

Discussion Leader : T. Busalacchi

16:00-16:30 General Discussion

16:30-17:00 *Coffee - Formal end of PIRATA-7*

17:00-18:00 Meeting of the PIRATA-SC Members (with Special Invitees: P'BS + PRB's Members)

ANNEX 2

Attendees of PIRATA-7 Meeting and CLIVAR Atlantic Panel 1st Meeting

| | NAME | Country of origin | Institute | e-mail |
|----|----------------------------|-------------------|-------------------|--|
| 01 | Adauto Gouveia Motta | BRAZIL | INPE/NATAL | motta@crn.inpe.br |
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| 04 | Antonio Divino Moura | USA | IRI | amoura@iri.lldgo.columbia.edu |
| 05 | Carlos Hansen | BRAZIL | DHN | 07coi@dhn.mar.mil.br |
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| 07 | Guy Caniaux | FRANCE | CNRM/METEO-FRANCE | caniaux@meteo.fr |
| 09 | Ilana Wainer | BRAZIL | USP | wainer@usp.br |
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| 24 | Michael McCartney | USA | UCAR | bjackson@ucar.edu |
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| 26 | Paulo Nobre | BRAZIL | CPTEC/INPE/CP | pnobre@cptec.inpe.br |
| 27 | Raghuram Murtugudde | USA | NASA | ragu@seetha.gsfc.nasa.gov |

| | | | | |
|----|---------------------------------------|--------|---------------|--|
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