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## MEMORANDUM OF UNDERSTANDING (MOU)

between

Instituto Nacional de Pesquisas Espaciais  
and  
Institut de Recherche pour le Développement and Météo-France  
and  
National Oceanic and Atmospheric Administration  
Office of Global Programs

for

### Implementation and Maintenance of the Pilot Research moored Array in the Tropical Atlantic – PIRATA A Partnership in Climate Research and Ocean Observation

The Instituto Nacional de Pesquisas Espaciais (INPE) of Brazil, the Institut de Recherche pour le Développement (IRD) and Météo-France of France, and the National Oceanic and Atmospheric Administration Office of Global Programs (NOAA/OGP) of the United States of America, hereinafter referred to as the "Parties", are interested in increasing the effectiveness of their activities in climate research and ocean observation through sustaining the Pilot Research moored Array in the Tropical Atlantic (PIRATA);

The parties recognize that collaboration in sustaining PIRATA can be to their mutual benefit, the mutual benefit of their countries, and the benefit of many countries in Africa, the Americas, and Europe;

The parties believe that efforts such as sharing of tasks, cooperation on facilities utilization, exchange of scientific and technical information, and sharing of costs and human resources can result in the effective and efficient accomplishment of mutually beneficial objectives;

Therefore, the Parties have reached the following understanding:

#### SECTION 1 SCIENTIFIC OBJECTIVES OF THE PIRATA PROGRAM

The purpose of the PIRATA program is to study the ocean-atmosphere interactions in the tropical Atlantic that are relevant to regional climate variability on intra-seasonal, seasonal, interannual, and longer time scales.

Specifically, the scientific goals of PIRATA are:

- To improve our understanding of the relative contributions of the different components of the surface heat flux, momentum flux, fresh water flux, ocean dynamics, and the surface and upper ocean thermal and haline structures to seasonal and longer time scale variability in the tropical Atlantic;
- To provide a data set that can be used to develop and improve predictive models of the coupled Atlantic climate system.



A full description of the Scientific Objectives is contained in the PIRATA Science and Implementation Plan, Annex 1.

## SECTION 2 TECHNICAL OBJECTIVES OF PIRATA

To reach the scientific objectives of the PIRATA Program, the Parties will deploy and maintain an array of ATLAS moorings in the tropical Atlantic. The ocean observations along with meteorological observations from the array will be transmitted to shore via satellite and will be available in near real-time on the Internet. These data can be assimilated in Ocean-Atmosphere Coupled General Circulation Models in order to implement seasonal climate forecasts and other applications with direct benefit to the Parties and other agencies in Brazil, France, the United States, and in other countries.

A full description of the Technical Objectives is contained in the PIRATA Science and Implementation Plan, Annex 1.

## SECTION 3 THE PILOT PHASE OF PIRATA

PIRATA was initially designed by a group of scientists involved in CLIVAR (Climatic Variability and Predictability) Program research, and implemented beginning in 1997 through this multi-national scientific collaboration. The project was built on the scientific success of the TOGA (Tropical Ocean and Global Atmosphere) Program and made use of the mooring technology established in the tropical Pacific where ATLAS moorings make up the bulk of the TAO/TRITON array now being operated multi-nationally as a contribution to CLIVAR, the Global Climate Observing System (GCOS), and the Global Ocean Observing System (GOOS).

PIRATA was originally conceived as a pilot study with a 3-year field phase (1997-2000) in support of CLIVAR, GCOS, and GOOS objectives. Technical, logistic and organizational issues associated with maintenance of the array were addressed within a research framework by the Brazil-France-United States scientific collaboration.

## SECTION 4 THE CONSOLIDATION PHASE OF PIRATA

Following the successful completion of the PIRATA array and evaluation of the scientific results during the pilot phase, representatives of the Parties, in consultation with international CLIVAR, GCOS, and GOOS, resolved to maintain the array through a consolidation phase from 2001 through 2005. The Parties wish to establish this MOU to strengthen the collaboration of the pilot phase and provide a stable framework under which PIRATA can continue through the consolidation phase. The MOU documents the partnership between the Parties and their intentions to contribute the resources necessary to sustain such a multi-national effort including provision of ship time, scientific instruments, ATLAS moorings, fabrication and maintenance, instrument calibration, logistics, delivery of data, training and technology transfer.



## SECTION 5 ORGANIZATION AND MANAGEMENT OF PIRATA

### PIRATA Resources Board:

A PIRATA Resources Board (PRB) is established with Terms of Reference (TOR) (see Annex 2). The initial members of the PRB are managers representing INPE, IRD, Meteo-France, and NOAA/OGP. Although the PRB is presently comprised of representatives from institutions only in Brazil, France, and the United States, the PRB will welcome other institutions and other nations if they wish to contribute to the PIRATA Program. The Chairman of the PRB is designated by the PRB members.

The principal tasks of the PRB are:

- To review the requirements for the implementation of PIRATA;
- To coordinate resources that may be applied to the Program;
- To encourage scientific and technological initiatives in the participating countries to meet the objectives of PIRATA;
- To report on its activities to the Heads of the institutions providing resources.

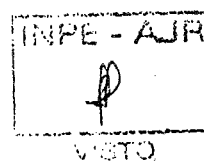
The PRB is guided by the scientific objectives and research strategy formulated by the PIRATA Scientific Steering Group (PIRATA-SSG), which is regarded as the main scientific and operational body to advise the PRB.

### PIRATA Scientific Steering Group:

A PIRATA Scientific Steering Group (PIRATA-SSG) is formed by researchers, managers, and operational representatives of the Parties or other institutions who are recognized as scientific and operational experts in the area of the tropical Atlantic climate. Members are nominated by the PIRATA-SSG in consultation with appropriate international sponsoring bodies participating in GOOS, GCOS, and CLIVAR, and are approved by the PRB. The Chairman of the PIRATA-SSG is designated by the SSG members.

The principal tasks of the PIRATA-SSG are:

- To ensure accomplishment of the scientific and technical objectives as described in the PIRATA Scientific and Implementation Plan, 1998 (PIRATA-SIP98), and as accepted by the Parties;
- To coordinate the technical and logistic support necessary to maintain the array;
- To ensure the rapid dissemination of PIRATA data (in real-time where possible) to serve both research and operational applications;
- To promote the utilization of PIRATA data in national and international climate research and operational prediction programs;
- To evaluate, encourage, and promote pilot extension projects that could build upon the original PIRATA array;
- To coordinate with other ongoing and planned observational efforts in the tropical Atlantic region;
- To invite collaborations with other nations and institutions interested in implementing a sustained climate observing system in the tropical Atlantic;
- To cooperate with international organizations such as the CLIVAR Ocean Observation Panel (COOP), the GOOS/GCOS/WCRP Ocean Observations Panel for Climate (OOPC), the Tropical Moored Buoy Array Implementation Panel (TIP), and the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) to ensure an integrated approach to observing the climate system in the tropics;
- To report regularly on the status of the PIRATA array and scientific results to the PRB, GCOS, GOOS, and CLIVAR.



#### PIRATA National Coordinators:

INPE serves as the coordinator of PIRATA in Brazil. The support of the Diretoria de Hidrografia e Navegação (DHN) is critical to the success of PIRATA. The support of DHN is arranged through INPE. A national coordinator is indicated by INPE to be the representative of PIRATA-Brazil. The national coordinator is a member of the PIRATA-SSG.

IRD serves as the coordinator of PIRATA in France, in association with Météo-France. A national coordinator is indicated by IRD to be the representative of PIRATA-France. The national coordinator is a member of the PIRATA-SSG.

NOAA Pacific Marine Environmental Laboratory (PMEL) serves as the coordinator of PIRATA in United States. The programmatic support of the NOAA Office of Global Programs (OGP) is critical to the success of PIRATA. A national coordinator is indicated by NOAA/PMEL to be the representative of PIRATA-United States. The national coordinator is a member of the PIRATA-SSG.

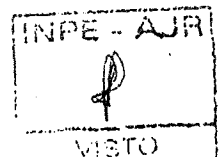
The coordination between the Parties is ensured jointly through the PRB and the PIRATA-SSG, especially through the Chairmen of these two committees and the national coordinators.

### SECTION 6 NATIONAL COMMITMENTS OF THE PARTIES IN PIRATA

In planning for future resources in support of the PIRATA Program, it is recognized that the Parties are dependent upon year-to-year funding allocations from their governments, and thus commitments for future funding and logistical support can not be guaranteed. Given this proviso, the Parties affirm that PIRATA is a high priority for Brazil, France, and the United States, and that the institutions are making plans for continued support as follows:

INPE (in cooperation with DHN), IRD, Météo-France, NOAA/OGP (in cooperation with NOAA/PMEL) will maintain the PIRATA array through the Consolidation Phase, from 2001 to 2005, as it is presently configured (Annex 3) or as the array may be modified by agreement of the PIRATA-SSG and the PRB in order to meet scientific or operational requirements. In particular:

- NOAA will refurbish moorings of the initial consolidation phase inventory until facilities in Brazil and/or France/African countries are prepared to take over refurbishment tasks. The initial inventory of 15 moorings for the consolidation phase consists of ATLAS moorings left over from the pilot phase.
- NOAA will supply up to two replacement ATLAS mooring systems each year if required because of damage or loss.
- NOAA will provide existing plans and specifications to INPE and IRD for ATLAS moorings and instrumentation in order for Brazil and France to develop refurbishment and construction capabilities in-country. It is noted that the ATLAS system is constantly being improved as technology advances. INPE and IRD are invited to send regularly PIRATA technicians to Seattle in order to observe and learn PMEL new techniques, procedures, and developmental work, and to obtain a copy of the latest available documentation. Travel costs related to these visits are the responsibility of INPE and IRD.
- NOAA will provide primary data delivery and processing of the ATLAS measurements.
- NOAA will pay Argos data processing costs for the ATLAS system measurements.
- NOAA will provide a PIRATA web site at PMEL.



- INPE will assume responsibility for the logistics required to transport PIRATA equipment between Seattle and Brazilian depots.
- INPE will take the necessary actions so that adequate ship time is available to maintain the PIRATA array on the Brazilian side (INPE works with DHN to provide the ship time). The Brazilian side includes the five ATLAS moorings in the western tropical Atlantic, from 15°N to the equator along 35°-38°W, besides possible future moorings as part of a western extension (WE) south of the equator.
- Shipboard ADCP and CTD data collected during PIRATA operations on the Brazilian side will be archived and disseminated by INPE.
- INPE will provide for the deployment, maintenance, and the real-time delivery of the data (including the Argos costs) of one meteorological buoy anchored close to 0°-44°W, as planned in the PIRATA-SIP98.
- INPE will provide for the deployment, maintenance, and the real-time delivery of the data (including the Argos costs) of a tide-gauge located at Fernando de Noronha archipelago, and of a meteorological station located at St. Peter & St. Paul archipelago.
- A mirror PIRATA web site will be maintained by INPE with additional national contributions and information.
- IRD and Météo-France will assume responsibility for the logistics required to transport PIRATA equipment between Seattle and French/African country depots.
- IRD will ensure that adequate ship time is available to maintain the PIRATA array on the African side. The African side includes the five ATLAS moorings in the eastern tropical Atlantic, in the region 0° to 10°S, and 0° to 20°W, and the ADCP mooring close to 0°, 20°W.
- Shipboard ADCP and CTD data collected during PIRATA operations on the African side will be archived and disseminated by IRD.
- IRD will provide for the deployment, maintenance, and the real-time delivery of the data (including the Argos costs) of one tide-gauge located at São Tomé Island, as planned in the PIRATA-SIP98.
- A mirror PIRATA web site will be maintained by IRD with additional national contributions and information.

It is recognized that successful climate observation requires continuity in measurement programs for many years. The Parties are committed to sustaining the ocean observing system in the Atlantic Ocean over the long term and will work during the consolidation phase, together and with other institutions, to plan for the future. The Parties will consider options for making PIRATA operations more efficient and effective, such as further consolidation of facilities, services, and ship support as experience and capabilities advance. Possibilities might include unification of the PIRATA operational depots and a dedicated ship to service the entire tropical Atlantic domain, besides the participation of other countries/institutions that could provide ship time necessary for complete functioning of an enhanced PIRATA array.

#### SECTION 7 THE RELATIONSHIP BETWEEN THE PARTIES AND FUTURE PIRATA EXTENSION PROJECTS

The commitments of the Parties described in this MOU do not apply to PIRATA extension projects that may be implemented during the consolidation phase by countries other than Brazil, France, and the United States. However, the Parties are supportive of scientifically sound extension projects and look forward to working with other institutions and countries as they seek to develop their plans. Amendments to this MOU may be signed between the parties, or with new

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partners, to coordinate activities related to the implementation and operation of extension projects that have been approved and recommended by the PIRATA-SSG to the PRB.

## SECTION 8 COOPERATION WITH INTERNATIONAL IMPLEMENTATION PANELS

The Parties are committed to working cooperatively with the international implementation panels of the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO) to implement the Atlantic component of GCOS and GOOS. These panels include the Data Buoy Cooperation Panel (DBCP), the Global Sea-Level Observing System (GLOSS), the Ship of Opportunity Implementation Panel (SOOPIP), the Tropical Moored Buoy Implementation Panel (TIP), and the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM).

## SECTION 9 EXCHANGE OF INFORMATION

The activities specified under this MOU involve the collection and exchange of environmental data which are not intended to be protected. The Parties support the widest possible dissemination of the information resulting from the PIRATA Program. Each participant should have the right to use, disclose, publish, or disseminate such information for any and all purposes. Information transmitted between Parties or developed jointly under this MOU will be accurate to the best knowledge of the Parties. The Parties do not assure the suitability of the information transmitted for any particular use or application by the receiving Party or by any third party.

## SECTION 10 GENERAL PROVISIONS

This MOU is between institutions – the Parties – and is not intended to, and does not, obligate the governments of the countries of Brazil, France, or the United States. This MOU is not intended to, and does not, create any binding obligations under international law. Nothing in this MOU is intended to affect other cooperation or collaboration between the Parties. All activities under this MOU will be in accordance with the applicable laws of the respective countries.

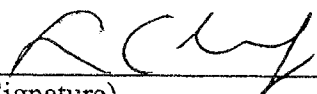
All questions related to the MOU arising during its term will be settled by the Parties by mutual agreement.

This MOU will enter into effect upon the signature by all Parties and remain in effect for two years, renewable for another term if agreed by the parties. The MOU may be amended or extended by mutual written agreement, and may be terminated at any time by any of the Parties upon six months written notice to the other Parties.

This MOU may be referenced as the "PIRATA MOU."

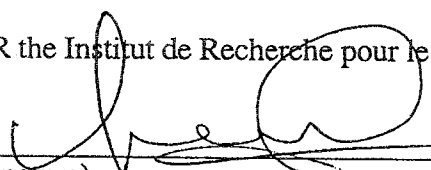


FOR the Instituto Nacional de Pesquisas Espaciais

  
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LUIZ CARLOS M. MIRANDA  
(Printed Name)


26/02/2002  
(Date)  
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(Title)

FOR the Institut de Recherche pour le Développement

  
(Signature)  
JACQUES MERLE  
(Printed Name)

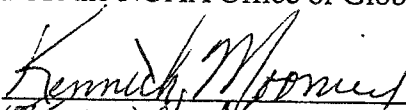
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OLIVIER MOCH  
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(Date)  
Director général adjoint  
(Title)

FOR the NOAA Office of Global Programs

  
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Kenneth Mooney  
(Printed Name)

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Deputy Director, NOAA OGP  
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- 1) Em vigor até 26/02/2006;
- 2) Provisions still apply, including PIRATA Extensions that are led by the Parties
- 3) Amendment to Section 7 to include South Africa (VCT 2) and any eventual provision that may be found deem by the Parties, with regard to BR, FE + USA.  
(minha posição: nada a modificar, antes de 2006).