



HYBAM – The observatory of the Amazonian rivers

*8th HYBAM conference
Environmental threats and climatic changes in the Amazon
Toulouse 2-6 Septiembre 2019*

www.so-hybam.org

THE HYBAM OBSERVATORY



- HYBAM : “Hydrology and Geochemistry of the Amazon catchment”
- **Created in 2003**, building on previous scientific and technical cooperation between IRD and Amazonian countries universities and hydrological services (J.L. Guyot)
- Labeled as **National Observation Service** since 2017
- **UNESCO-PHI working group** created in 2018 “Hydrogeomorphology of the Andes-Amazon catchment” (W. Lavado)
- French HYBAM team is based at **Géosciences Environnement Toulouse** Laboratory (GET)
- Funded by **Observatoire Midi-Pyrénées, CNRS/INSU and IRD**

THE HYBAM OBSERVATORY

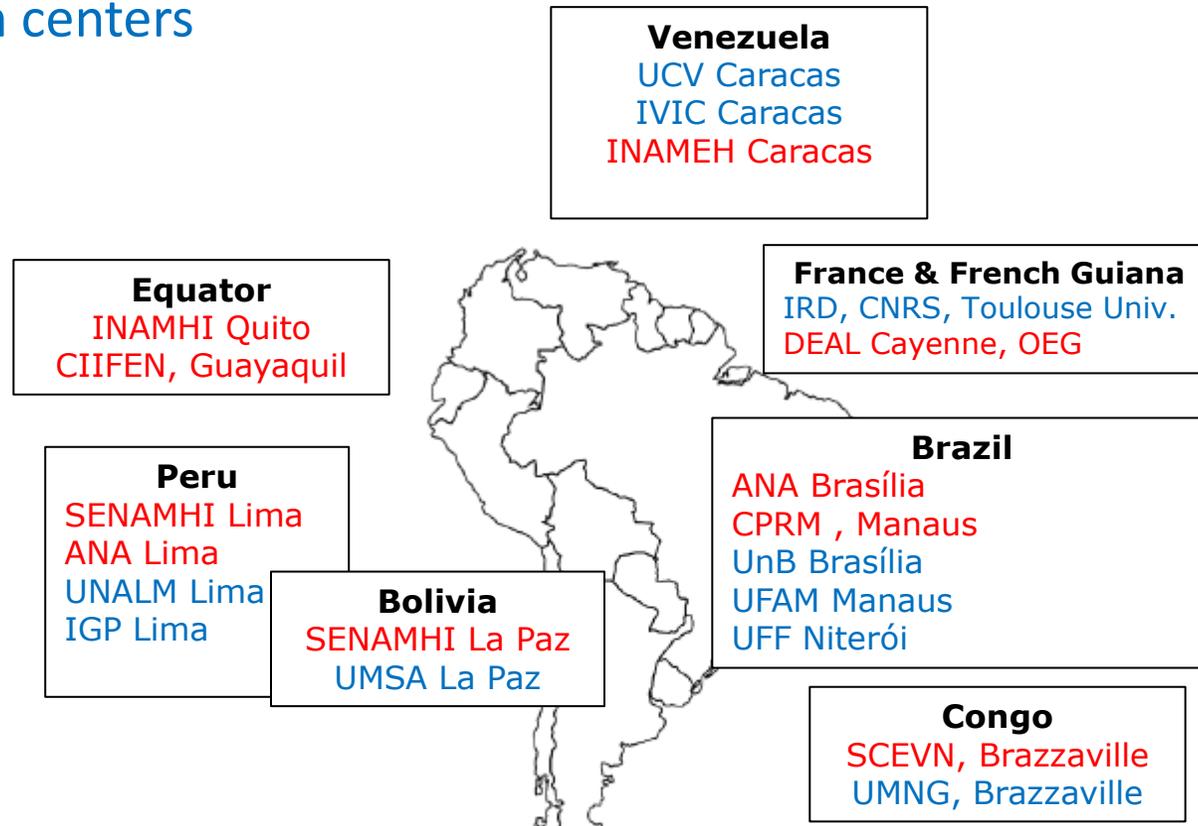


- International network between France and the Amazon basin countries:
Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela since 2003

- Stakeholders: **Universities/research centers**
& **national agencies**

- Additional stations on :

- Congo River (Congo)
- Orinoco River (Venezuela)
- Maroni River (French Guiana)
- Oyapock River (French Guiana)



OBJECTIVES



- Assessing how **climate, hydrology and geodynamic** control **erosion/alteration and mass transport** processes from the Andes to the Atlantic Ocean
 - Assessing the impact of **regional and global changes** on the water resources
- ⇒ Long-term data acquisition (> 15 years) through a network of sampling station
- ⇒ Open Data - Available at : www.so-hybam.org

APPROACH



1. **To acquire environmental data** of good quality over a long period, in hydrology, sedimentology, water geochemistry
2. **Disseminating data and softwares** to process & interpret data
3. **Capacity building & training** for technical and scientific communities from the South
4. **Promote scientific activities in the region** through research articles, research programs and student training (Msc, PhDs)
5. **Technology transfer / Innovative solutions**

HYBAM NETWORK



17 stations providing full water monitoring (hidrology, sediment, geochemistry)

DATA BASE AND SCIENTIFIC USE

- **14 Millions** hydrological data
- **160 000** geochemical measurements
- **25 000** suspended sediment samples
- First observatory freely delivering hydrological data and water quality data from **satellite data** (G. Cochonneau)
- **First rainfall database over the whole Amazon** assembled from national service ground data (J. Ronchail et al.), available online
- HYBAM data are currently used for a large variety of application : fish migration monitoring, greenhouse gas emissions assessments, water quality, remote sensing, oceanography, etc ... (**> 500 peer-reviewed research articles published**)

BUILDING A COMMUNITY WORKING ON THE WATER RESOURCES OF THE AMAZON BASIN



Lima **2011**



Cusco **2015**



La Paz / Titicaca **2013**



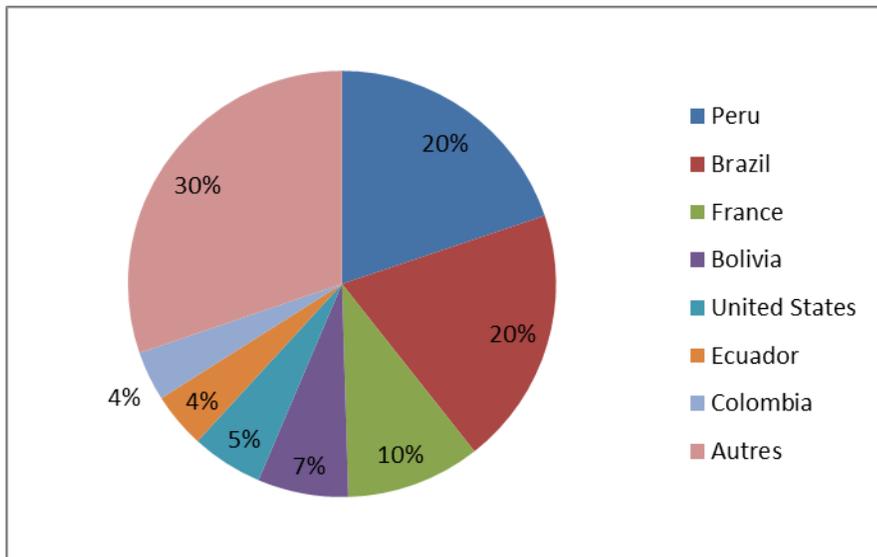
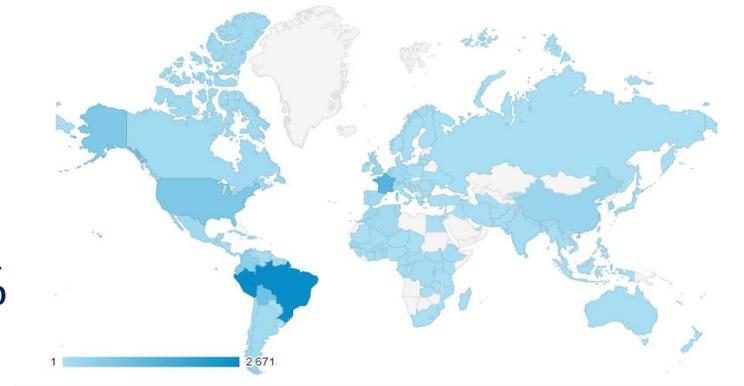
Rio de Janeiro / Niteroi **2017**

BUILDING A COMMUNITY WORKING ON THE WATER RESOURCES OF THE AMAZON BASIN

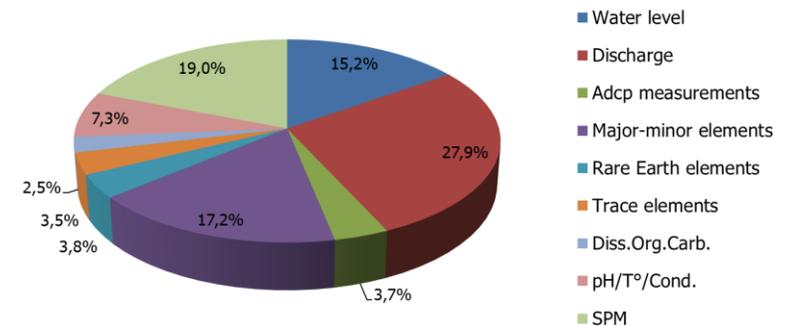


Data dissemination

- Website traffic : 70000 pages views / year (600 000 total)
- > 6000 times series downloaded / year (50 000 total)
- > 53 % of the users located in the Amazon basin countries
- River discharge 29 %, sediment 19 %, major elements 17 %

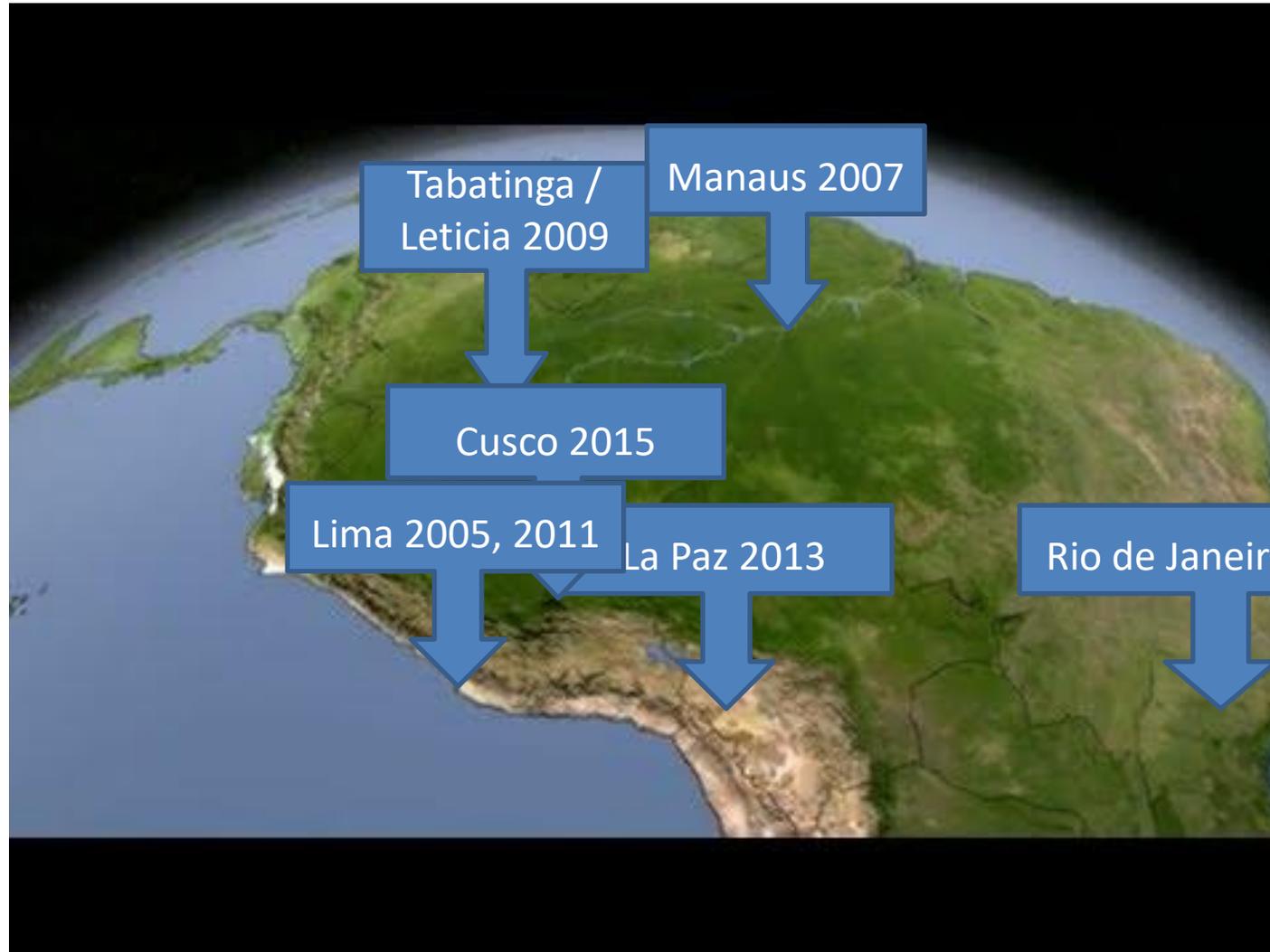


User's country of origin



Data type download

PREVIOUS HYBAM'S MEETINGS



Tabatinga /
Leticia 2009

Manaus 2007

Cusco 2015

Lima 2005, 2011

La Paz 2013

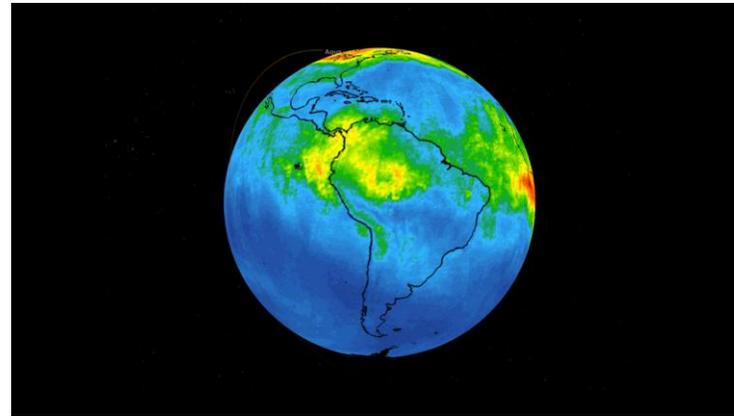
Rio de Janeiro 2017

SOME ACHIEVEMENTS

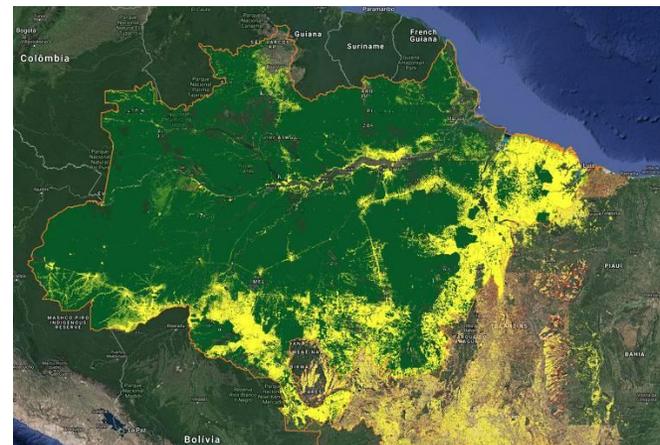


- HYBAM network has been the **first program to measure river water flows and sediment discharge** in the Amazon lowlands of Bolivia, Equator and Peru
- The HYBAM **geochemistry measurement network** is the only one operating at the catchment scale today
 - **Standardizing measurements protocols** to ensure data reliability and facilitate information sharing between 8 countries and for more than 15 years
- **Geochemical and sedimentary budgets** of the main Amazonian rivers (Orinoco, Congo and Fr. Guiana)
- **Isotopic composition** of Amazonian waters has been used to monitor **fish migration**
- Detection of a **Chlorine pollution** of the Amazon River induced by oil extraction
- +250 % increase in the Maroni River **sediment yield following increasing gold mining activities**
-

ENVIRONMENTAL CRISIS IN THE AMAZON REGION (AND BEYOND)



Atmospheric carbon monoxide levels retrieved from satellite during August 2019 (NASA)



Deforestation map as of 2019



Fire detection for August 2019



The Amazon cannot be reduced to a problem of Greenhouse gas emission. It is vital for the whole biosphere regarding numerous aspects

- Biodiversity richness
- Cultural heritage
- **Water cycle :**
 - The size and the position of the catchment makes that the Amazon is an early indicator (“sentinel”) of the global changes
 - Positive feedback : The Amazon as a major source of humidity to the atmosphere and of sediment and geochemical fluxes to the Atlantic ocean
- **Current threats :**
 - Deforestation leading progressively to “savannization” risk
 - River damming unbalancing river dissolved and particulate fluxes, fauna
 - Pollution (cities, gas and gold extraction) impacting downstream the oceans
 - Intensification of the hydrological regime (catastrophic floods and longer dry period)



8TH HYBAM CONFERENCE: ENVIRONMENTAL THREATS AND CLIMATIC CHANGES IN THE AMAZON



- **Necessity to understand the water cycle globally** (critical zone approach) :
 - Natural processes (geodynamic, climatology, biology etc ...)
 - Anthropogenic-induced processes (climate change, deforestation, pollutions)
 - Past and present dynamic
 - Impact on the local population
- **Support research** and specifically develop scientific capacities **within the Amazon region** (capacity building)
- **Without independent monitoring, there is no management possible**
 - Develop the monitoring of the Amazon region
- **This conference** : What new observations might better constrain the water cycle processes in the Amazon basin ?
 - New questions, new observations, new approaches

