



INSTITUTO DE
ASTRONOMIA,
GEOFÍSICA
E CIÊNCIAS
ATMOSFÉRICAS



IVIA Initiative for VLBI in Ibero- America

Jacques Lepine, Coordenador atual
em nome da equipe IVIA-Brasil

Equipe em crescimento rápido

em comum: sem recursos humanos e sem recursos financeiros

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IVIA

Capa sin nombre

-  Brasil - Embratel
- 
- Costa Rica - Radio Observatorio de Santa Cruz
-  Perú - Observatorio Sicaya
- 
- México - Estación Terrena de Tulancingo Telecomm
- 
- Portugal/Azores - Antena Marconi
- 
- Uruguay - Estación Terrena ANTEL
- 
- España - Observatorio de Yebes
- 
- Joint Institute for VLBI ERIC (JIVE)
-  Colombia - Chocontá

Iniciativa VLBI IberoAmericana (IVIA)



THE INICIATIVE STARTED THIS YEAR IN MEXICO

But in Africa is already going on
Ghana already did VLVI observations

- Instituto de Radioastronomía y Astrofísica, Universidad Nacional Autónoma de México: Laurent Loinard, Stan Kurtz, Gisela Ortiz León
- Centro de Investigaciones Espaciales, Universidad de Costa Rica: Carolina Salas Matamoros
- Observatorio Astronómico de Córdoba, Argentina: Carlos Valotto
- Facultad de Ingeniería Eléctrica y Electrónica, Universidad Nacional del Centro del Perú: José Kaname Ishitsuka Iba.
- Universidad ECCI, Bogotá, Colombia: Germán Chaparro
- Oficina Regional Andina de Astronomía para el Desarrollo, Bogotá, Colombia:
- Universidad de Sao Paulo, Brazil: Jacques Lepine
- Ministerio de Industria, Energía y Minería, Uruguay: Manuel Caldas
- Observatorio Astronómico de Quito de la Escuela Politécnica Nacional, Ecuador: Ericson López

Espanha, Portugal

- Instituto Geográfico Nacional, Ministerio de Fomento, España: Jose Antonio Lopez Fernandez
- Instituto de Telecomunicações, Aveiro, Portugal: Domingos Barbosa, Sonia Anton, Dalmiro Maia

The Latin-American Initiative in Radio Astronomy

Costa Rica, Colombia, Ecuador, Peru, Argentina, Uruguay, México, Brazil



Top: Sicaya Antenna, Peru

Right: antennas at Morungaba, São Paulo State





Chocontá

Colombia

El primer paso de Uruguay hacia la radioastronomía profesional

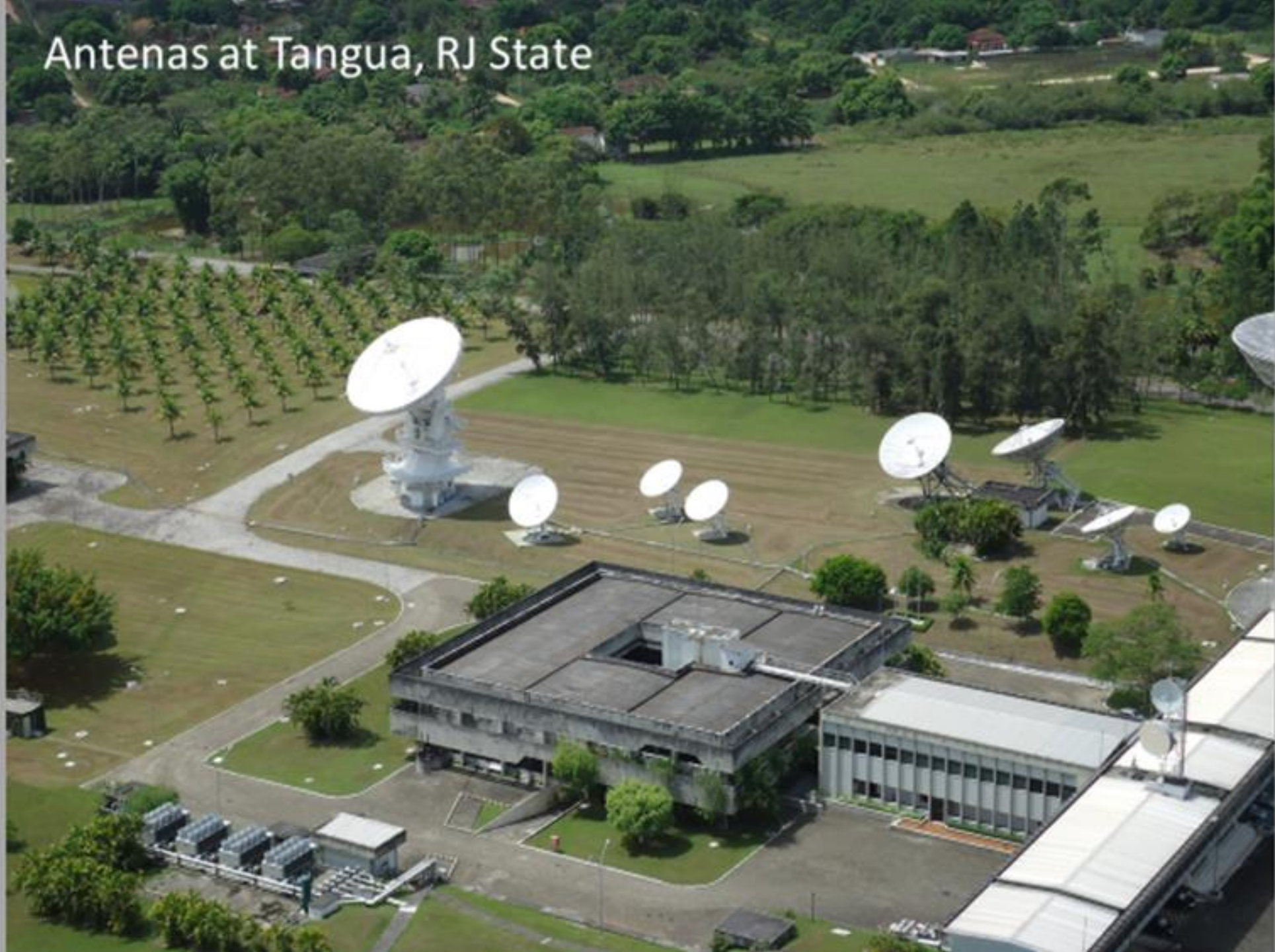
03/2019



México



Antenas at Tanguá, RJ State





Science case for single dish observations

- Radio Continuum Flux measurements (with wideband multi-channel radiometer); use known radio astronomy calibration sources for daily calibrations of receivers and also follow radio emissions from sources such as AGNs emitting gamma-ray flares.
- Pulsar Observations (with wideband multi-channel pulsar timer); monitor the behaviour of pulsars of interest over a long period of time, such as those producing glitches and intermittent pulsars, and hunt for fast radio burst sources.
- Emission Lines Spectroscopy (with narrowband multi-channel spectrometer); maser line monitoring of star forming regions, including hydroxyl masers (1612, 1665, 1667, 1720 MHz) and methanol masers (6668 MHz).

Main purposes: outreach and latin –american solidarity

Science case for VLBI observations

- Mapping Interstellar masers in star-forming regions in the Milky Way.
- Determining the distances to star-forming regions in the Milky Way through methanol maser parallax measurement.
- Using trigonometric parallax measurements to determine accurate pulsar distances as well as pulsar proper motions.
- Imaging active galactic nuclei (AGN).
- Resolving binary systems in extragalactic supermassive black holes.
- Searching for radio transients - long baselines provide discrimination against radio frequency interference.
- Imaging radio emission from X-Ray binary systems and relativistic jets.

First actions in Brasil

- get support from UFRJ, CBPF, ON, MAST, USP
- Discussion with company Star One (meeting with Director + 5 engineers in June **DONE** They agree with the use of na antenna
- We have to **organize a visit to Tanguá** and to **Morongaba** to see which antennas are in better condition)Morungaba are newer but stopped for a longer time
Mexican group had to make a similar choice and sent us the full description of decision procedure

First stage : just use antenna as single dish (1 year) 4 to 8 GHz

Second stage: install VLBI equipment (year 2)

Visit to the Embratel Earth Station Antenna 2 in Tanguá 17/09/2019

Fernando Roig – vice diretor ON
André Wiermann – vice Head of Geophysics Department. ON
Tania Dominici - MAST / MCTI researcher
Jean Pierre Raulin – Director of CRAAM
Jacques Lepine - IAG-USP
Rubens Hadano - technician CRAAM
Carlos Fermino - startup company eFe –Araraquara

Severino Lucena -engineer of Star One
Marcos Garcia - engineer of Star One



Some of the main remarks

- No problem of radio interference, because the the site is protected by mountains and protective laws.
- Tanguá 2, manufactured by the US company ITT, was inaugurated in 1972.
- The panels are in good condition but dirty. The problem is similar to that reported by Mexican colleagues for the Tulancingo antenna; it is easy to wash
- The light metal frame of the reflector plate features rusty beams, including a beam already detached on one side.
- The steel structure of the antenna has numerous points of rust. However, this rust does not endanger the structure



- It was reported by Star One engineers that the steel ring on which the antenna rolls for azimuthal motion has a depression at one point, because the antenna has been pointing to the same sky position for years. This defect does not appear at a simple glance
- Azimuth movement is performed by two sets of motors, i.e. at two points of the ring. Each “set” has two motors, one for higher speeds and one smaller for slower speeds or fine tuning. It would be necessary to do maintenance of the motors, replace bearings and brushes. Carlos Fermino thinks that smaller engines should be replaced by more modern ones;



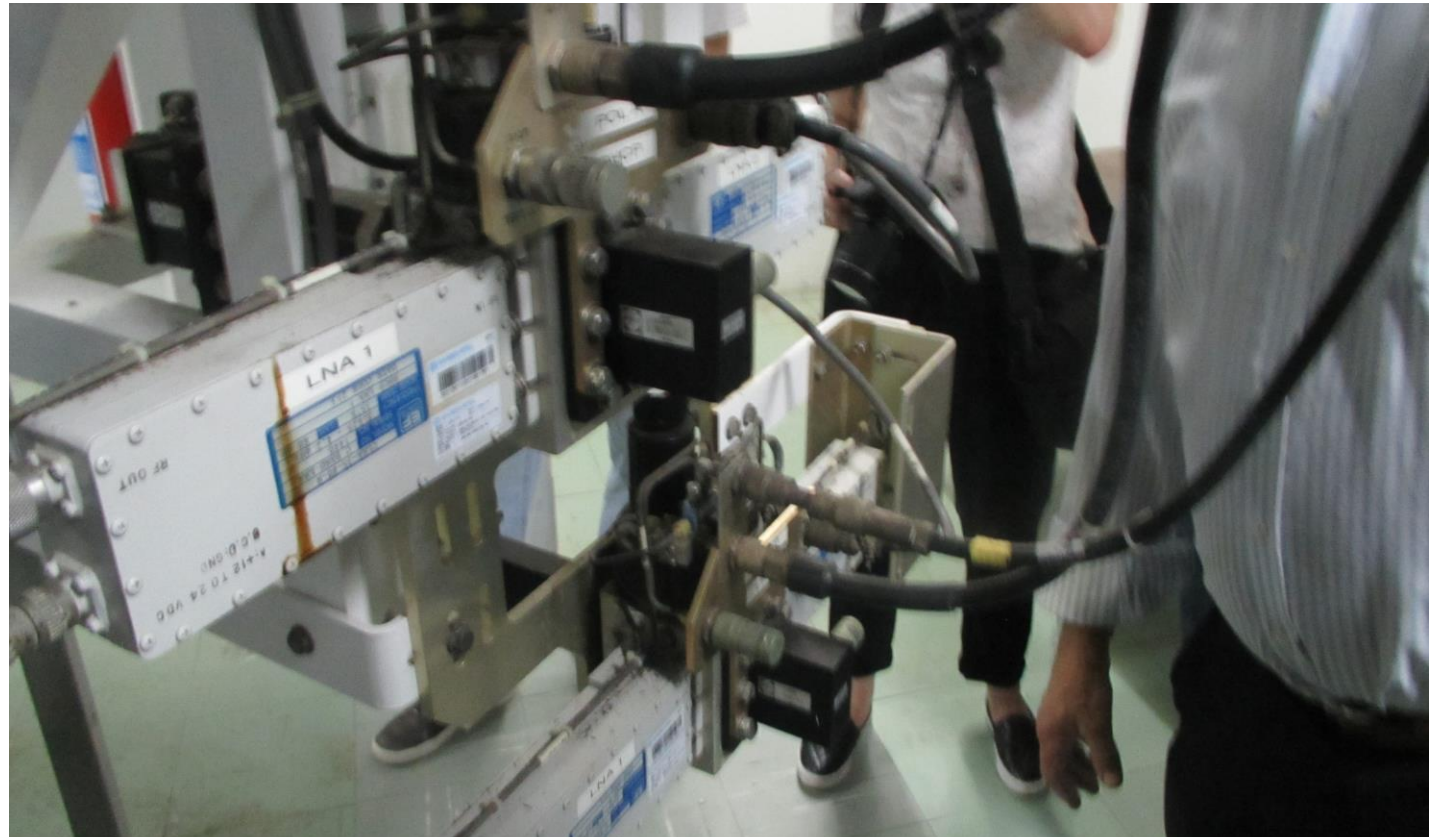
- Elevation handling is ensured by a gear system which does not present serious damage, only surface oxidation. Only engine maintenance is required
- There is an encoder on each axis. We didn't see the azimuth encoder. Carlos Fermino believes it should be replaced. The Encoder resolution is $1/1000$ degrees, or 3.6 arc seconds, which is quite sufficient.
- The wave is carried from top to bottom with 4 reflections. It would be necessary to evaluate the optics / mirrors. There arrives LHCP and RHCP (2 circular polarizations)





Caminho do feixe, com várias reflexões

Espaço no andar em baixo da antena,
Bastante confortável e espaçoso



Future

Tanguá or Morungaba?

Brazil will have access to low frequencies (BINGO, IVIA) intermediate 22-45 GHz (Itapetinga) and high frequencies (LLAMA) 100-600 GHz

IBR (Instituto Brasileiro de Radioastronomia

Do we need a new kind of organization? Maybe a kind of Virtual Institute of Radioastronomy (low cost)

Future: VLBI with South Africa will certainly happen, as well as with Latin America.