

# Astronomy in Peru

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Astronomy Division

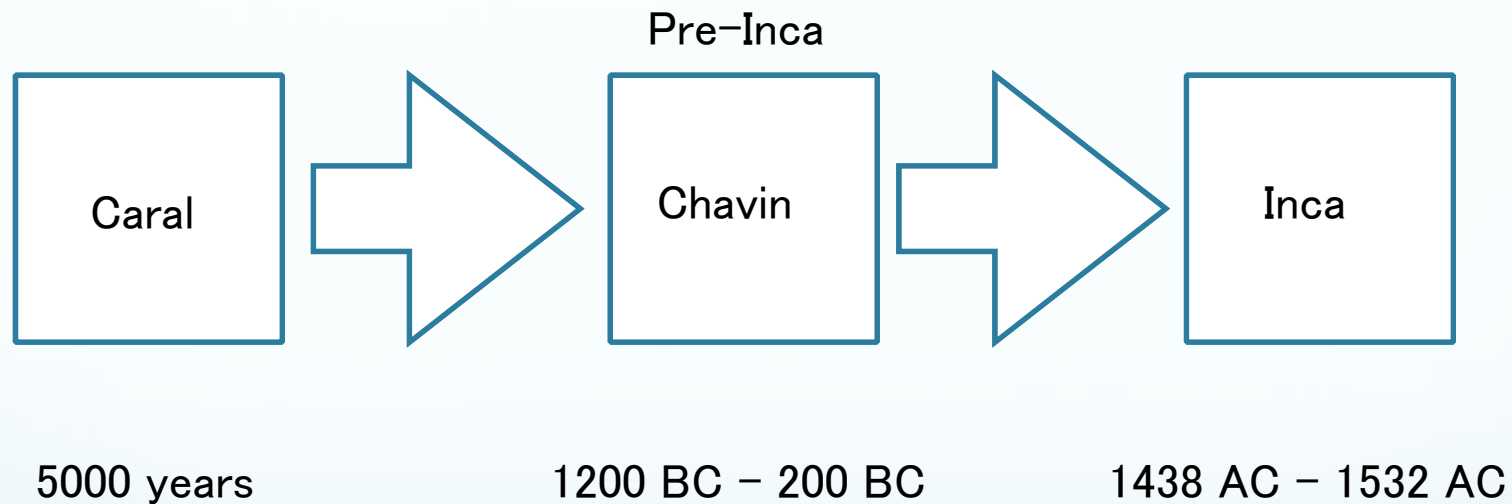
Director of Huancayo Observatory

Instituto Geofísico del Perú – IGP

# Contents

- × Ancient Astronomy
- × XIX century astronomy
- × XX century astronomy
- × Astronomy at Geophysical Institute of Peru
- × Astronomy Against Terrorism – APRM 2002

# Ancient astronomy



# Caral

✕ Was a society where there were not:

✕ 1. Wars

✕ 2. Sacrifices



✕ Perhaps, the most important person was a women astronomer.



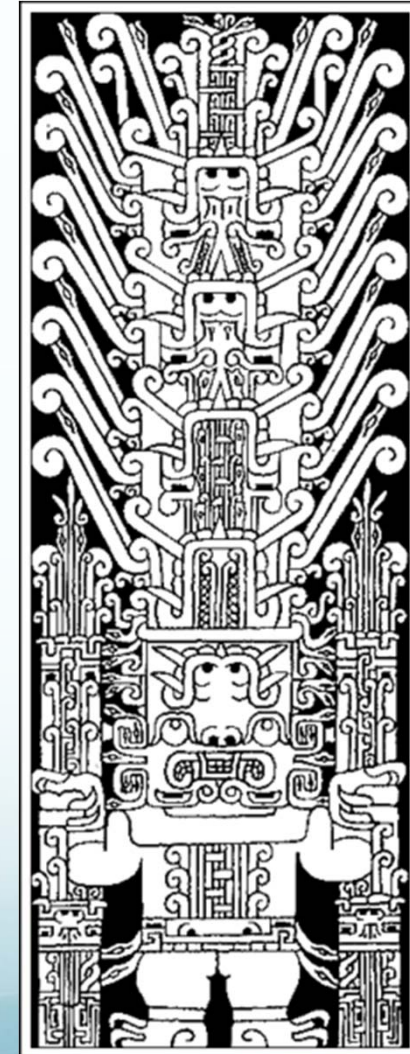
# Chanquillo

## Oldest solar observatory of America



2000 years old

# Human side and climate changes





# Stellar groups

- ✗ Since Caral culture, representative stellar groups were done.







# Amauta





# Harvard Astronomical Observatory in Peru

- ✕ In 1890, Bailey established the Boyden Station near Arequipa, Peru, and, between 1891 and 1927, astronomers used various telescopes and a meridian photometer to photograph stars in the southern sky and record their physical characteristics.



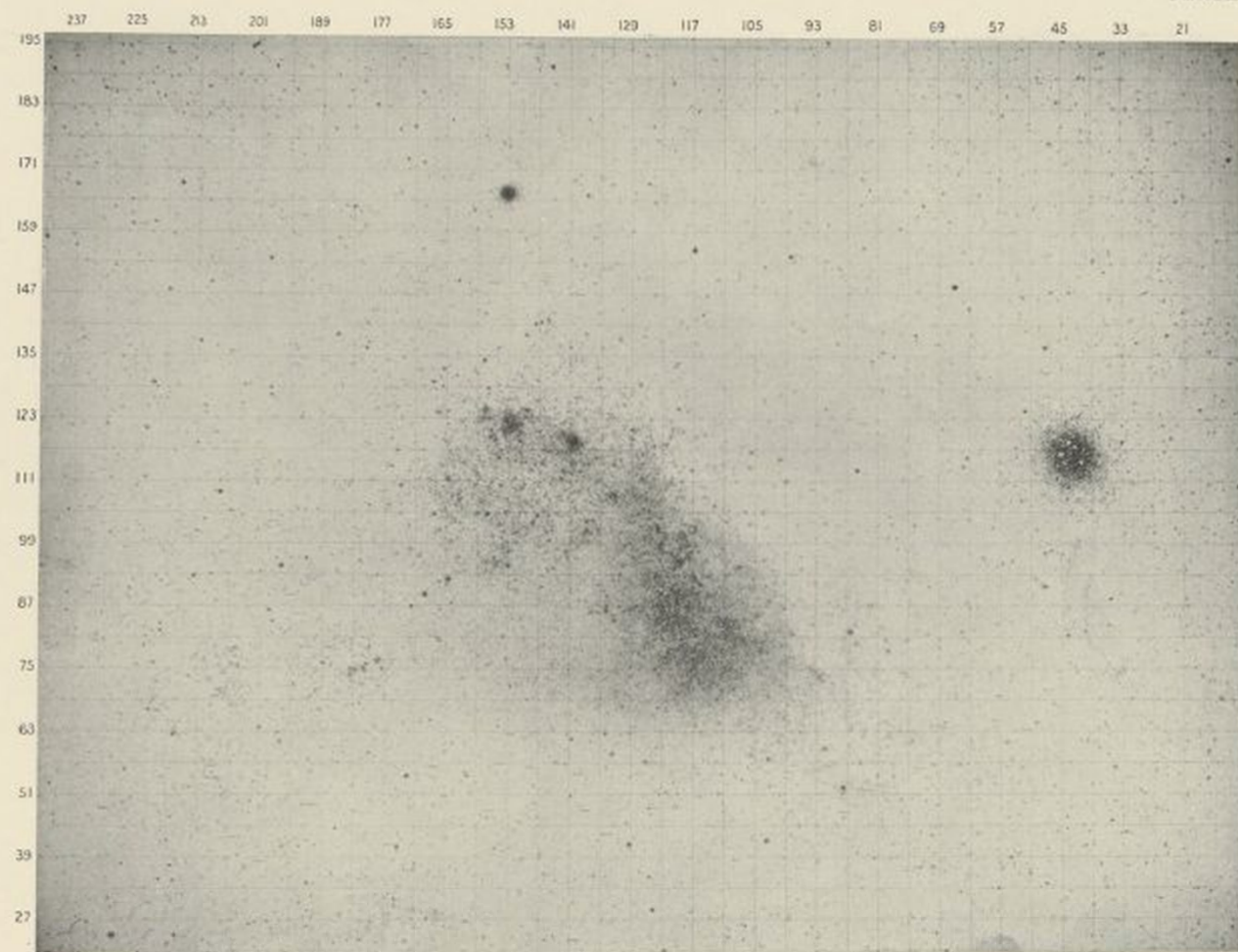


# Henrietta Leavitt

(July 4, 1868 – December 12, 1921)

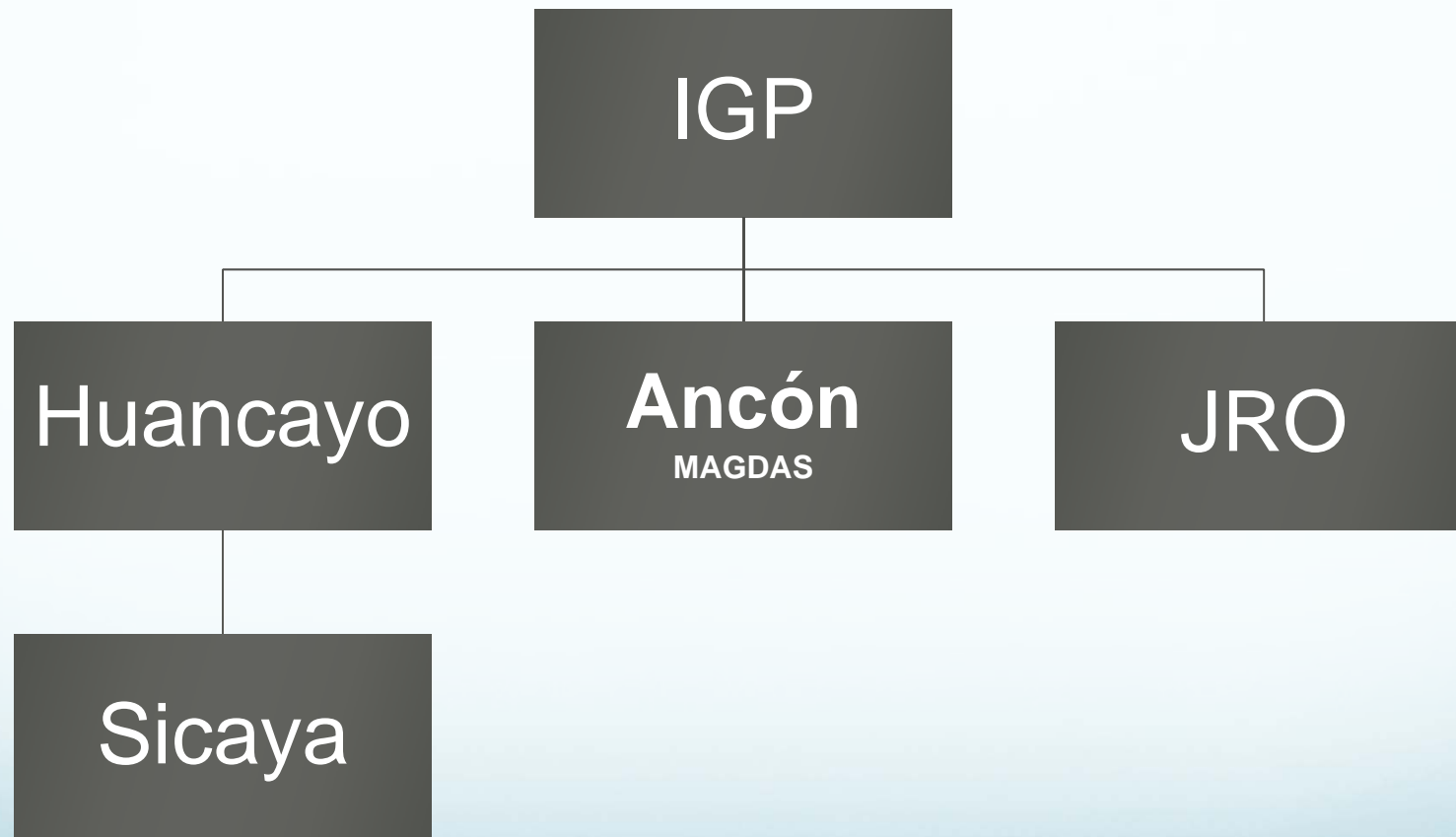
- × ‘the women that discovered how to measure the Universe’





SMALL MAGELLANIC CLOUD.

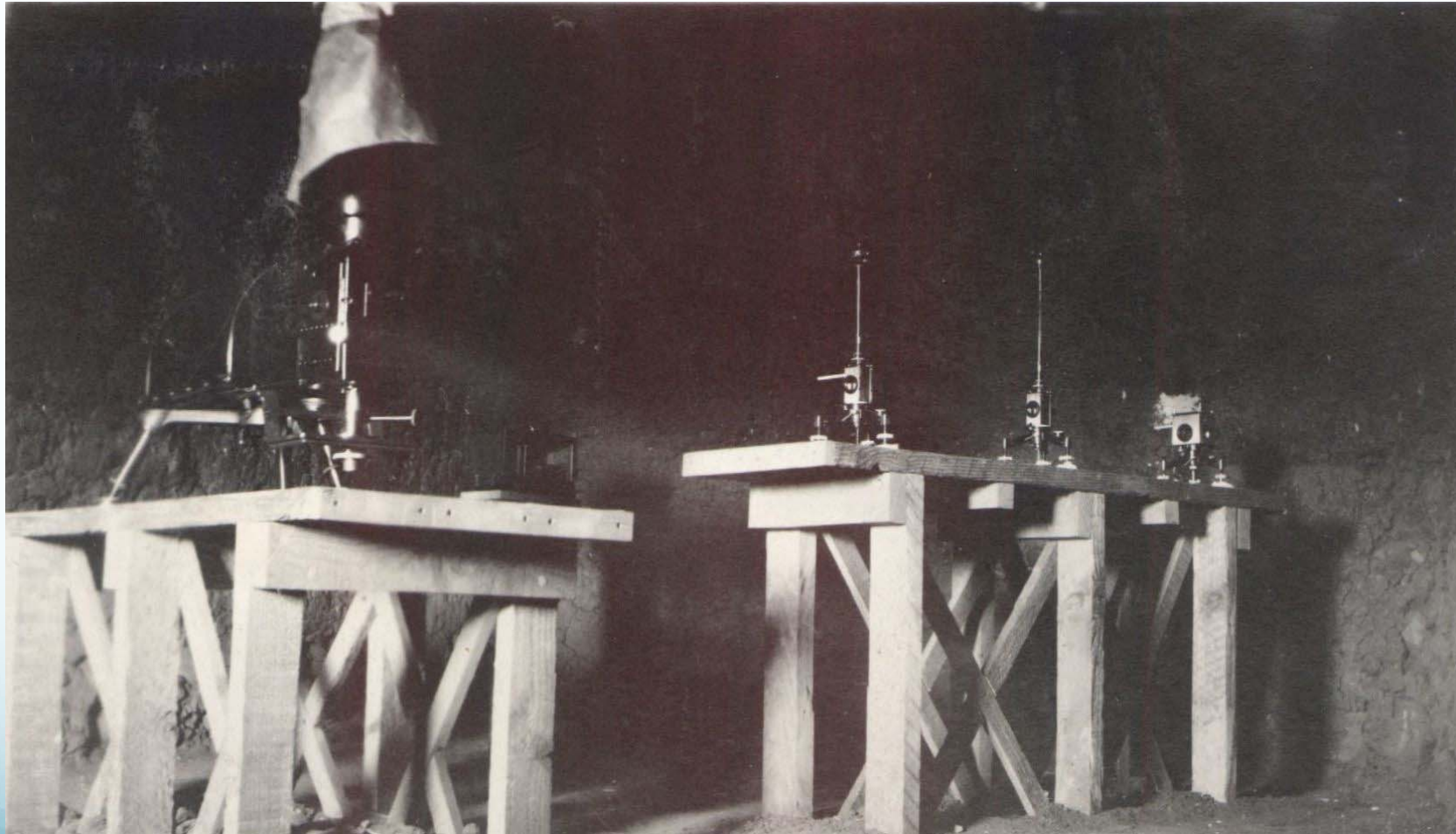
# Geophysical Institute of Peru Observatories







# Beginning of IGP





# Construction of the observatory



# Detector Forbush

- × Cosmic Ray observations begun with a Forbush detector that was installed in 1936
- × Unfortunately a fire destroyed electronics of detector



# Solar observations at Huancayo Observatory



- Huancayo Observatory was established in 1922 by Carnegie Institution of Washington
- A Hale Type Spectroheliograph was installed in 1936
- Mutsumi Ishitsuka made solar observations since July of 1957 to 1972



## Solar observations at Huancayo Observatory



- A new Coelostat replaced the Hale Type spectrohelioscope in 1960s, then a new era of solar observations begun

## A refurbished spectrohelioscope in Ica



- A fire damaged part of spectrohelioscope
- NAOJ provided some parts and a refurbished spectrohelioscope was installed in Ica University

# **Astronomy Against Terrorism**

## **The Educational Astronomical Observatory Project in Perú**

**Mutsumi Ishitsuka**

**Instituto Geofísico del Perú  
(IGP)**

**APRM - 2002**

# Coronagraphic Observatory

- The idea to build a Coronagraphic Observatory was borne in Kyoto University in 1951
- Professor Joe Ueta traveled to Huancayo Observatory in 1956, had success with coronagraphic observations
- I moved to Huancayo Observatory in 1957

# Huancayo Observatory



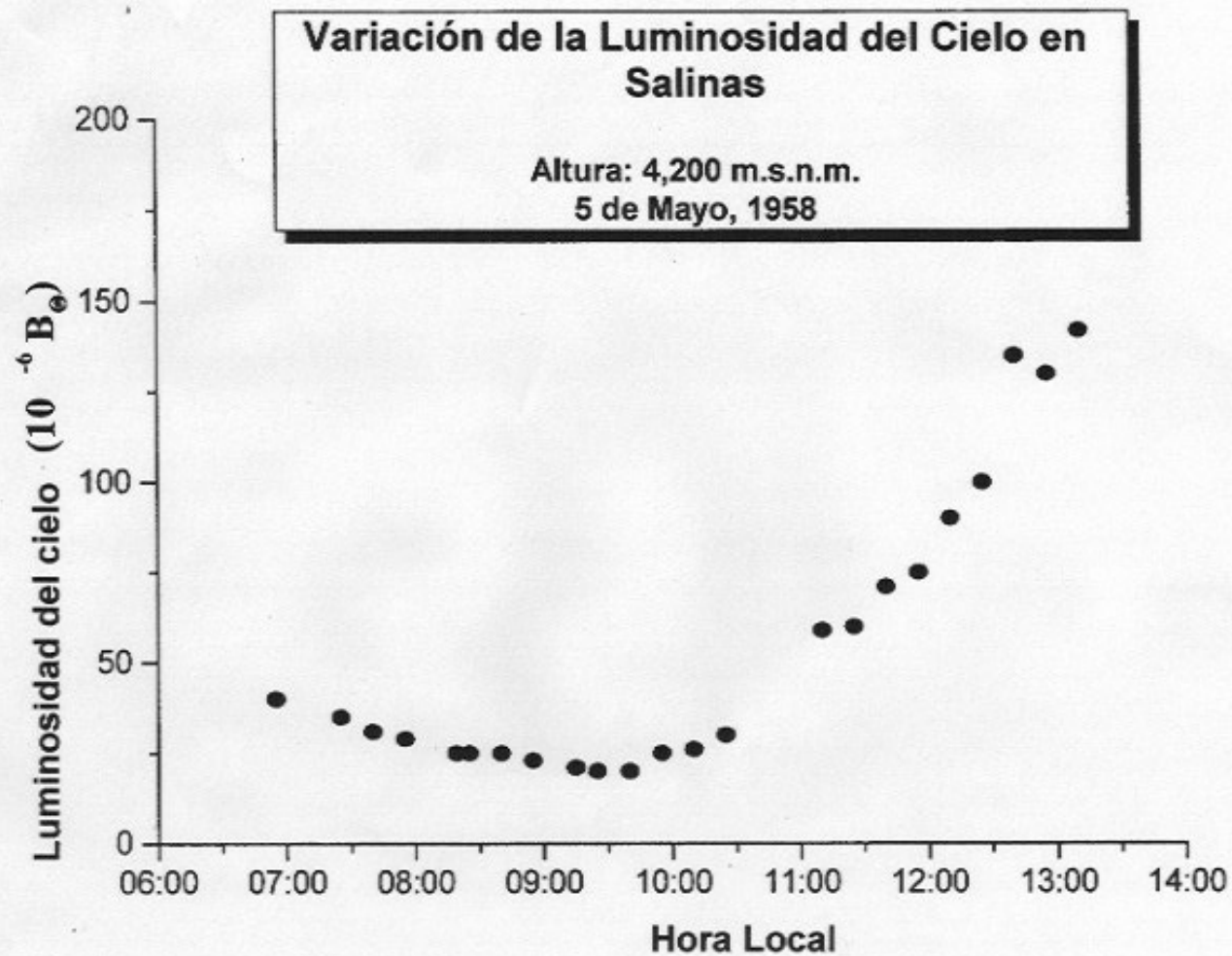
- Belongs to the Instituto Geofísico del Perú, Geomagnetic Observatory
- Altitude: 3200 m.a.s.l.
- Founded in 1922 by the Carnegie Institution of Washington



**SKY PHOTMOMETER AT HUANCAYO OBSERVATORY**

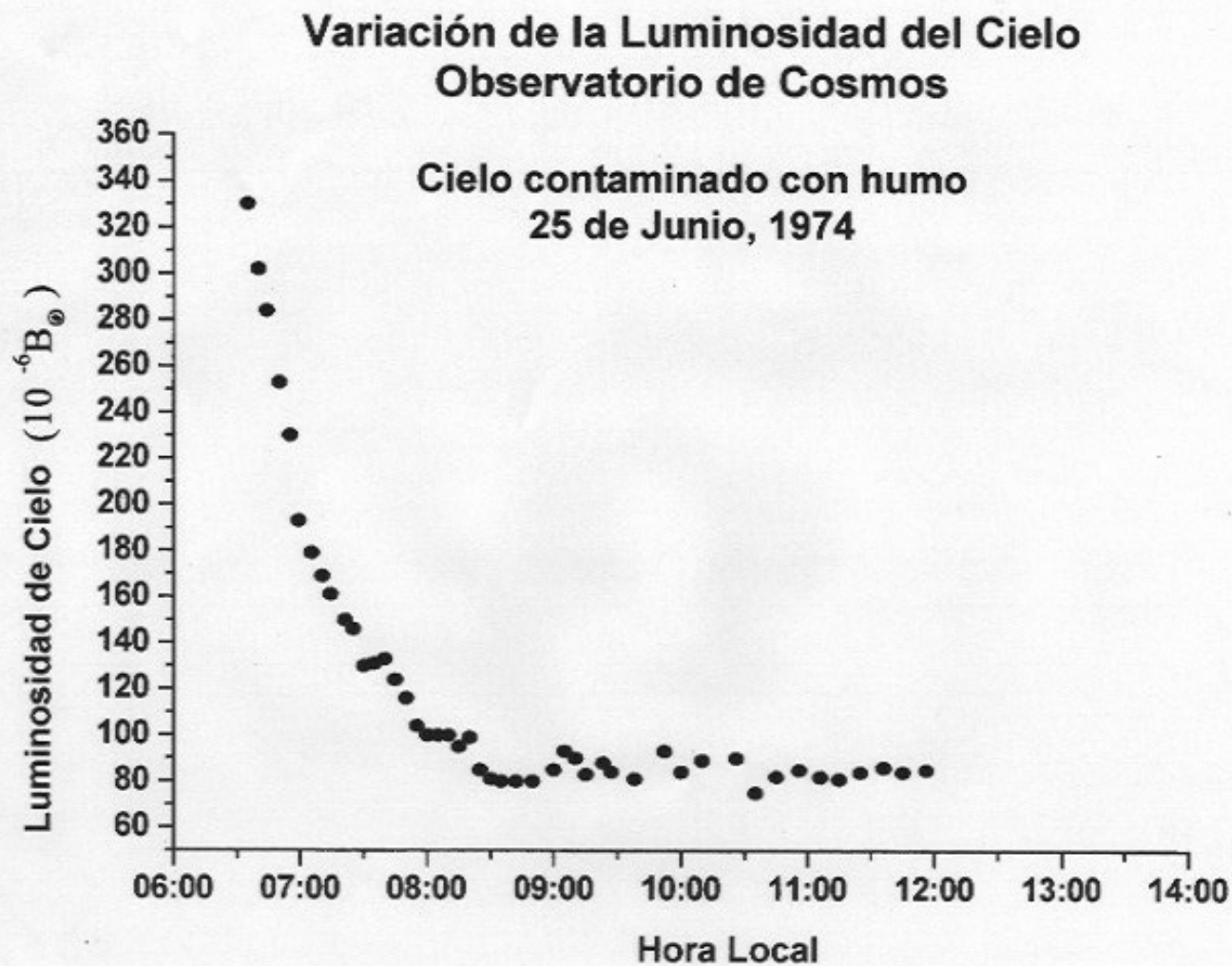


# Sky conditions at Salinas

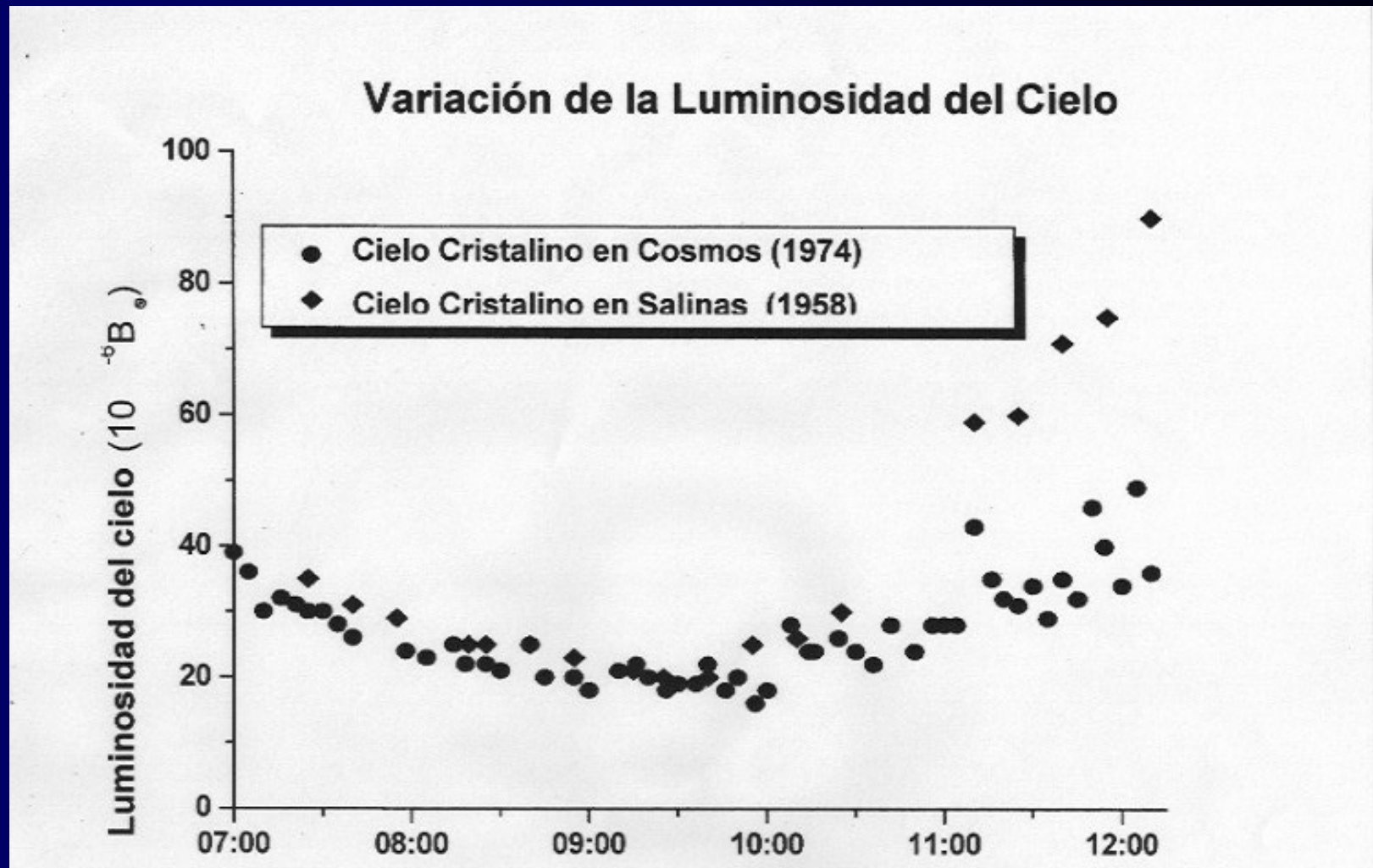




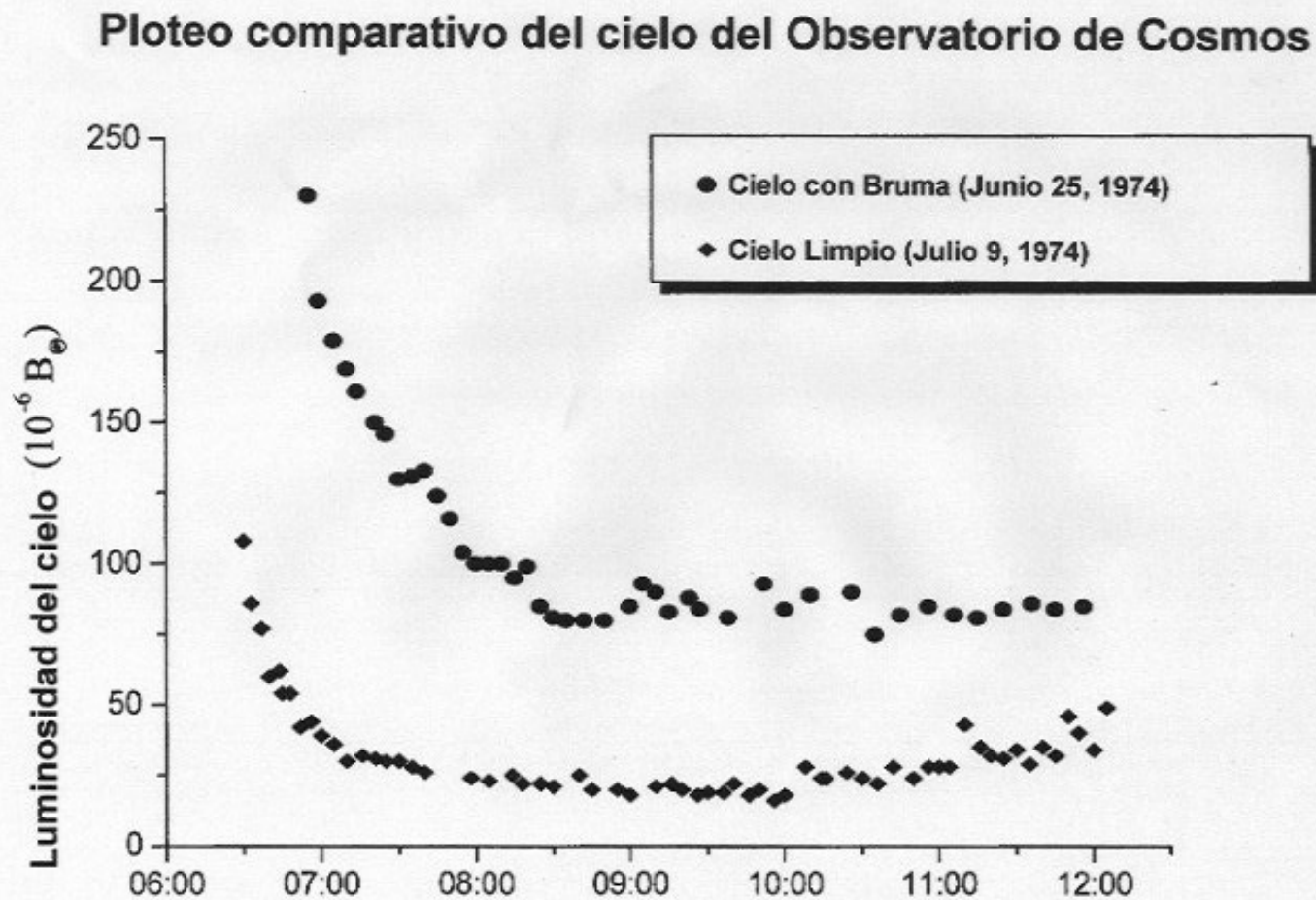
# Sky condition at Cosmos



# Sky condition on both sites



# Sky condition at Cosmos



# Cosmos Observatory

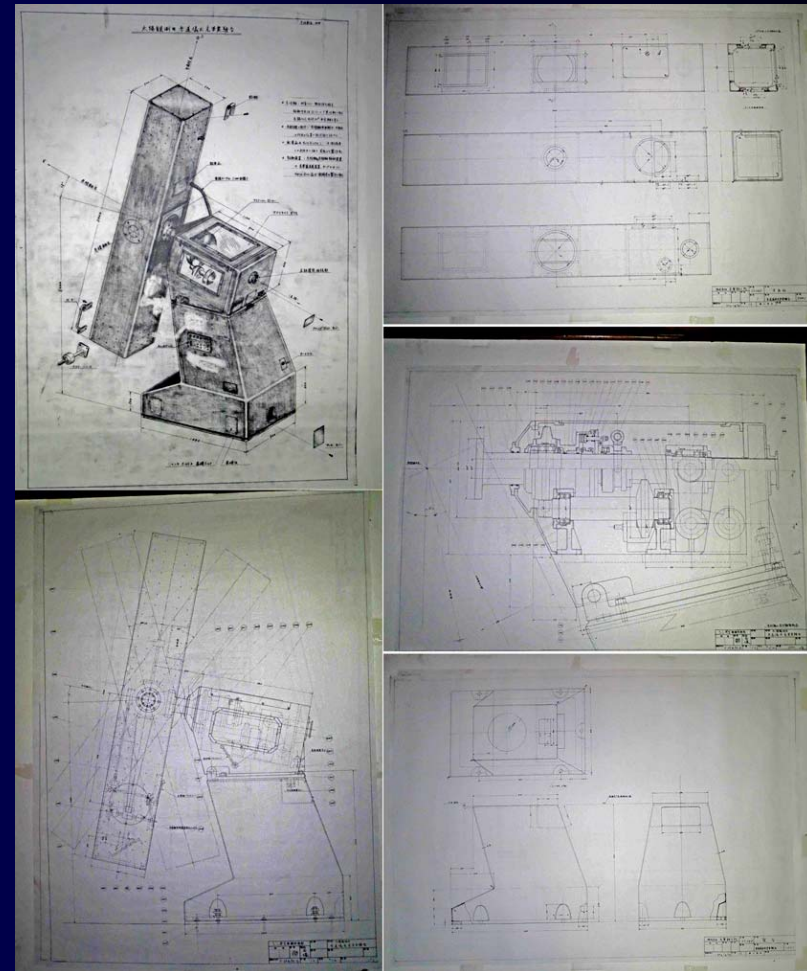
- Searched many possible places for the observatory in Perú
- A place named Cosmos, 70 km from Huancayo
- Altitude: 4,600 m.a.s.l.
- In 1972 begun the construction of the Cosmos Observatory





# コロナグラフの設計

- 架台部分の図面はシンポ工業(現日本電産シンポ株)の図面に書かれており、話には聞いていたのですが、図面を見るのは初めてです。
- 私がシンポに入社する前の話なので、どんな物かぜんぜん知りませんでした。一度会社で資料が残っていないか調べて見たいと思いますが・・・
- 図面からするとリングコーンの技を使って駆動している様なのですが？追尾精度などはどの様なものか興味が有ります。





**CEREMONY TO CELEBRATE THE COMPLETION OF THE CORONAGRAPH  
IN JAPAN  
MAY 1965**



**RECEIVING THE CORONAGRAPH IN HUANCAYO  
SEPTEMBER 1966**



**SKY PHOTOMETER AT THE INSTALLATION SITE OF THE  
CORONAGRAPH**

**MAY 1967**





**SET UP OF THE ECUATORIAL OPTICAL BENCH SEPTEMBER 1978**



## CONSTRUCTION OF THE SLIDING ROOF

1975 - 1977





**OPENING CEREMONY OF THE  
“COSMOS SOLAR OBSERVATORY”  
OCTOBER 22, 1978**





**CORONAGRAPH AND THE SLIDING ROOF**



**TUNE UP OF THE TELESCOPE  
OCTOBER 1976**



**IDEALISTIC PANTINGS ON THE WALLS OF THE  
LABORATORY AT COSMOS  
OCTOBER 31, 1988**



**EQUATORIAL OPTICAL BENCH**

**COMPLETELY DESTROYED**

**OCTOBER 31, 1988**





**PARTS OF THE SLIDING ROOF  
OCTOBER 31, 1988**





**AND MORE DESTRUCTION ...**

# A New Observatory

- In 1995 the Ministry of Education of Peru proposed to construct an Educational Astronomical Observatory
- Must be near the capital Lima





# The Site



- Distance to Lima: 270 km
- Altitude: 396 m
- Distance to the Pan-American road: 7 km
- Place: Jahuay Hill
- Area: 9 km<sup>2</sup>
- 45% of the year, clear sky

# Other projects



- A new planetarium for Lima, a Japanese government donation, thanks to Professor Masatoshi Kitamura



# Acknowledgements



- Would like to acknowledge the people that worked to build COSMOS, also the governments of Peru and Japan
- Thanks to the people in Japan for their contributions to build the new educational Observatory

- I want to recognize the great resistance, for many years of Peruvian people, against the terrorism.
- Their heroic attitude will be retained in my soul and heart, forever.
- Popularization of Astronomy is a powerful means to avoid violence.



**COSMOS CORONAGRAPH  
and  
Mutsumi Ishitsuka**

Last visit to Cosmos  
Mutsumi Ishitsuka  
2003年11月



# 天文学の普及と教育

天文学も科学が無いペルーには観測装置だけを設置するのでは国の為にならない。

✧ 子供の頃から天文学の面白さと楽しさを知らせる必要がある、そして大人になってからも天文学を愛して科学の重要性が分かる様になる。

✧ 子供達を教育する先生達も同時に天文学の教え方を教える必要がある。

✧ 日本の天文学教育のレベルは高いのもっと世界に羽ばたいて欲しい。



# FMT Telescope

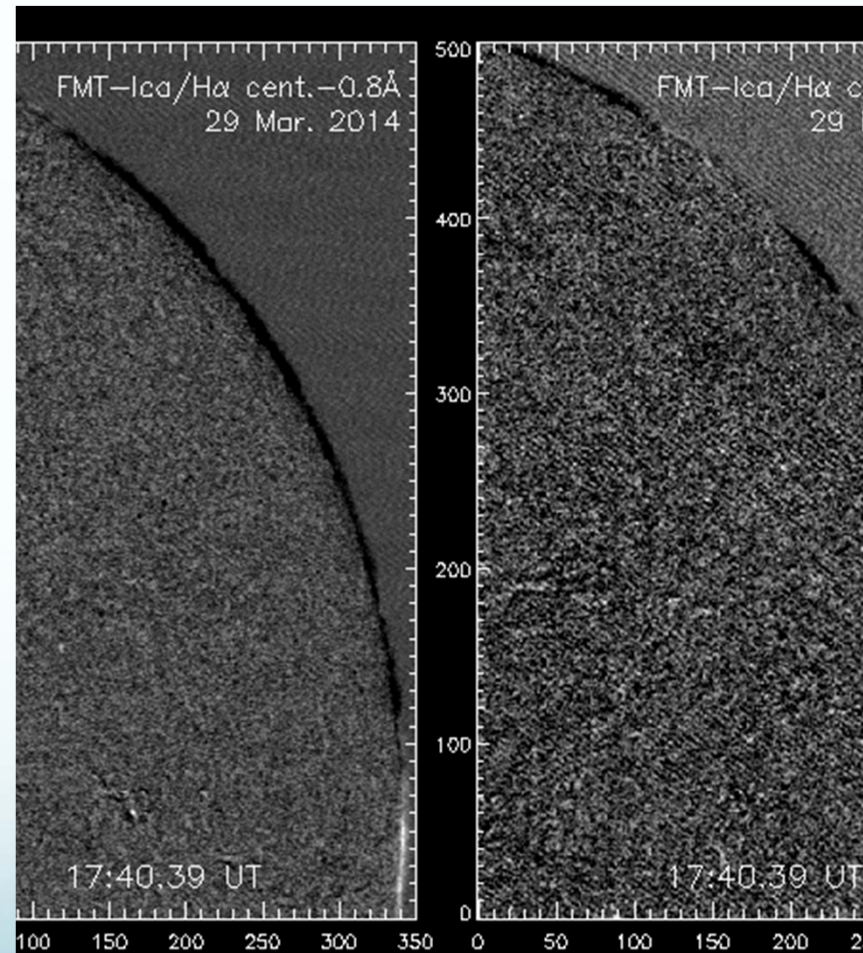
- ✕ Flare Monitoring Telescope from Hida Observatory to Solar Observatory of Ica National University – 2010
- ✕ Data Analysis WS in Peru and Japan
- ✕ Papers to publish from data taken in Peru

Two students of Ica University are doing master degree in Brazil



# First Moreton Wave 2014

- ✕ First Moreton Wave detected in Peru, March 29th 2014



# Astronomy

- ✗ A 60 cm telescope was donated to Peru, is the biggest in the country
- ✗ Installed temporally in Ica University in 2013
- ✗ Will be part of the Educational Astronomical Observatory at Jahuay Hill



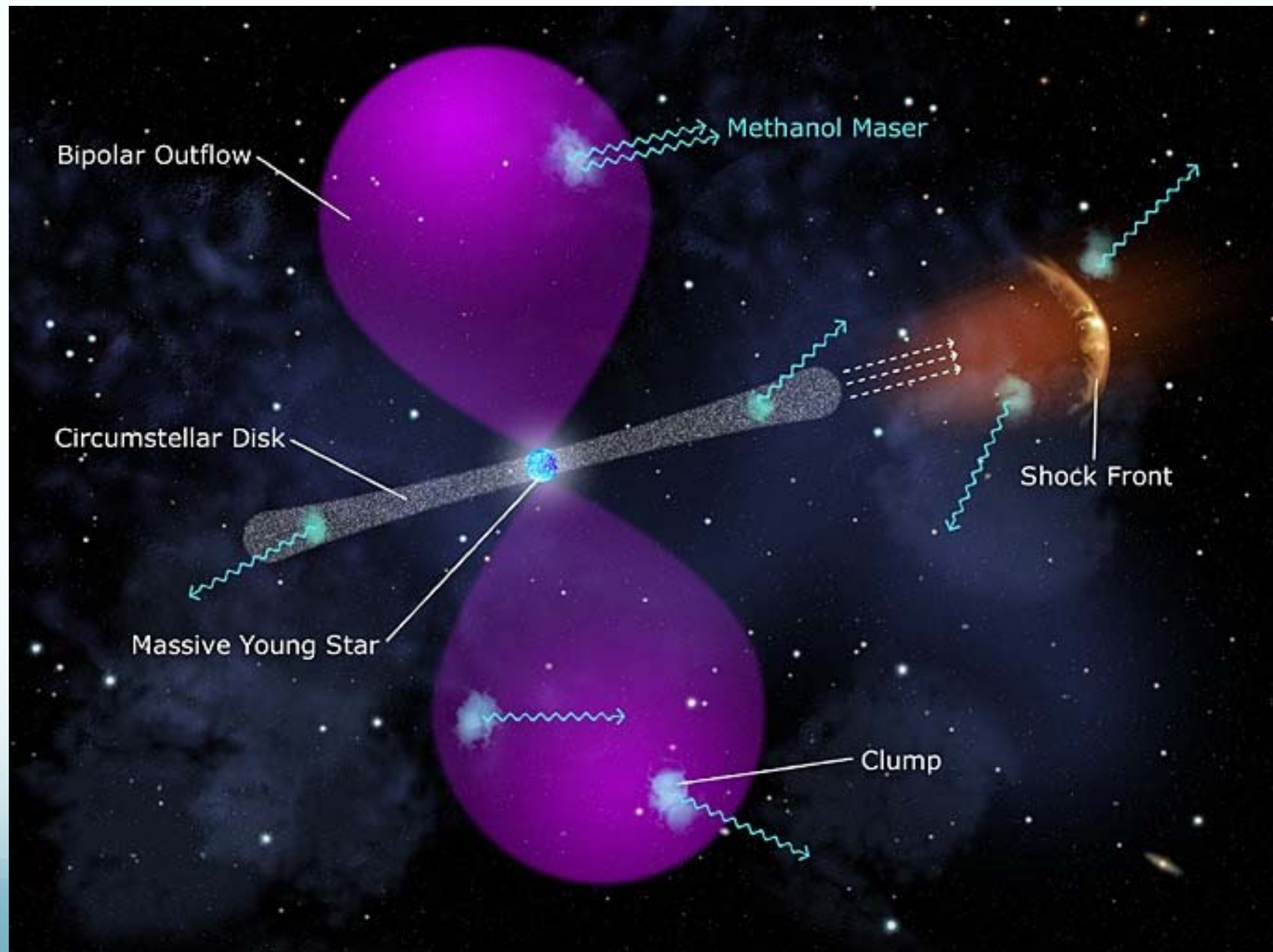


PHOTO CREDIT: Yvonne Kei-Nam Tang (Cornell University)



# Radio Astronomical Observatory Sicaya



# First Wave

ROAS.COM

No. 0001

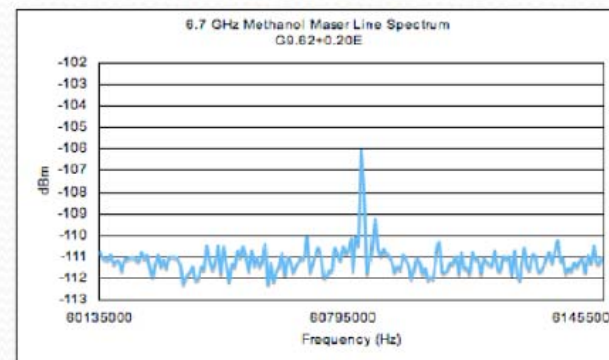
## Primera Señal

El Radio Observatorio Astronómico de Sicaya (ROAS) del Instituto Geofísico del Perú cuenta con un Radio Telescopio de 32 metros de diámetro que es capaz de recibir señales de los objetos estelares jóvenes, zonas donde están naciendo las estrellas.

El receptor de 6.7 GHz fue desarrollado en colaboración entre el Instituto Geofísico del Perú y el Observatorio Astronómico Nacional del Japón. Este receptor que fue instalado en el radio telescopio a finales del 2010, luego de diferentes pruebas, el 25 de febrero a las 12:03:51 de la tarde recibe la primera señal de una fuente estelar con emisión de maser de metanol. Hecho trascendental por que marca el inicio de las observaciones que conducirán a investigaciones científicas de estos fenómenos estelares.

### **Instituciones Colaboradoras**

- National Astronomical Observatory of Japan - NAOJ
- Japan Aerospace Exploration Agency - JAXA
- National Institute of Information and Communications Technology - NICT
- Yamaguchi University
- Hosei University
- CSIRO Astronomy and Space Science



### **Colaboradores**

Dr. Jorge Chau, Ing. Darwin Córdova y  
Ángela Calle del JRO  
Ph.D. José Ishitsuka, Mario Flores, Ing. Antonio Dalmau  
Sandra Villanueva, Lita García, Erick Vidal, Susan Flores,  
Telésforo Rojas, Armengol de la Cruz y Aquiles Camargo

Sicaya, 26 de febrero del 2011



# Electricity happenings

March 20 of 2012



April 26 of 2012



# Radio Astronomy in Peru

- ✗ Having a big radio telescope in Peru is almost imposible
- ✗ Telephone Company donated to IGP in 2008
- ✗ Will be a good instrument to educate new scientists, capacity building:
  - Astrophysics
  - Instrumentation
  - Data Analysis



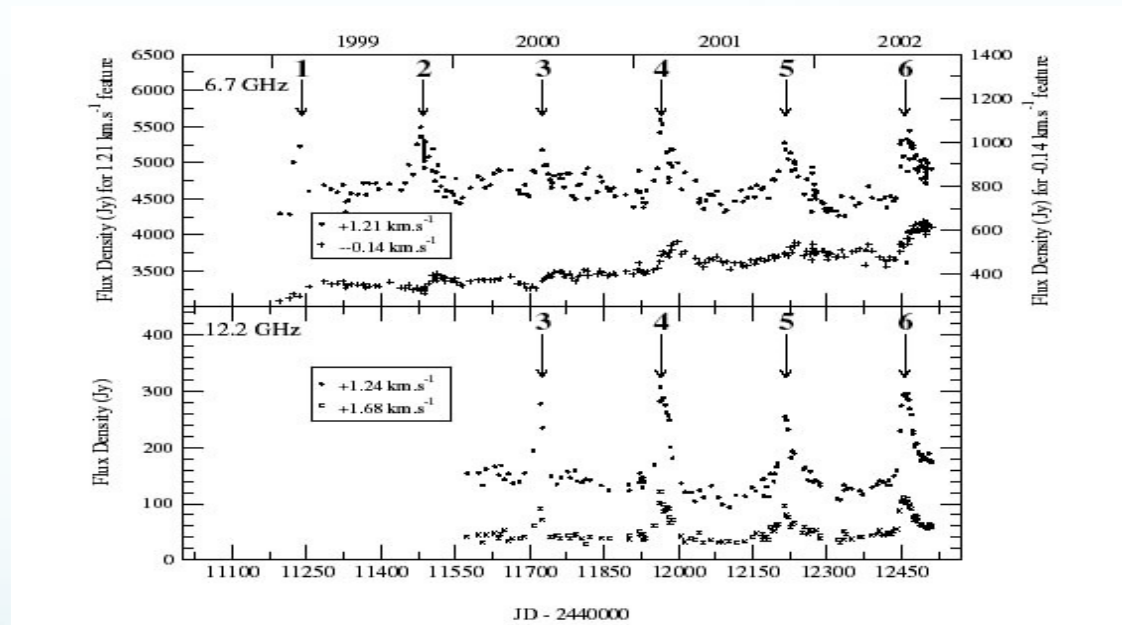


# Radio Astronomy in Peru

- ✗ Running cost is high, and funds for it are not available
- ✗ Possibly Science Foundation of Peru (Concytec) will implement National Facility funds in the future.
- ✗ National Astronomical Observatory of Japan collaborate to begin operations



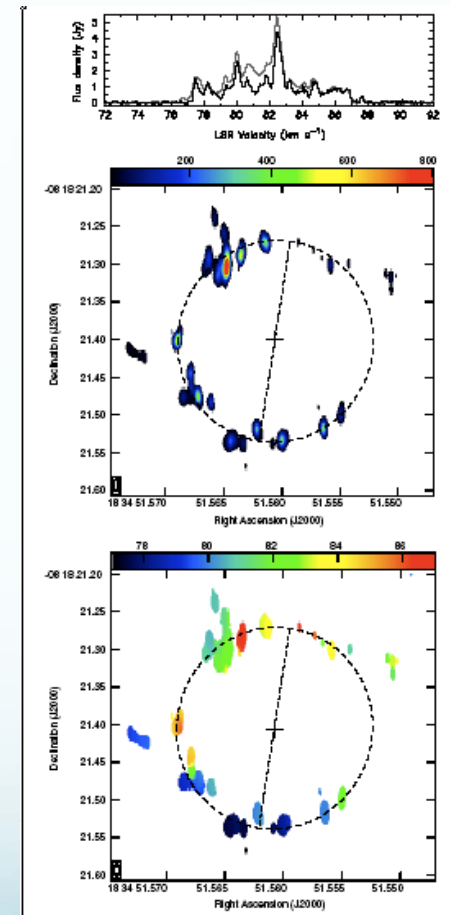
# Variabilidad de emisiones maser



S. Goedhart et al. (2003), Telescopio HartRAO 26m

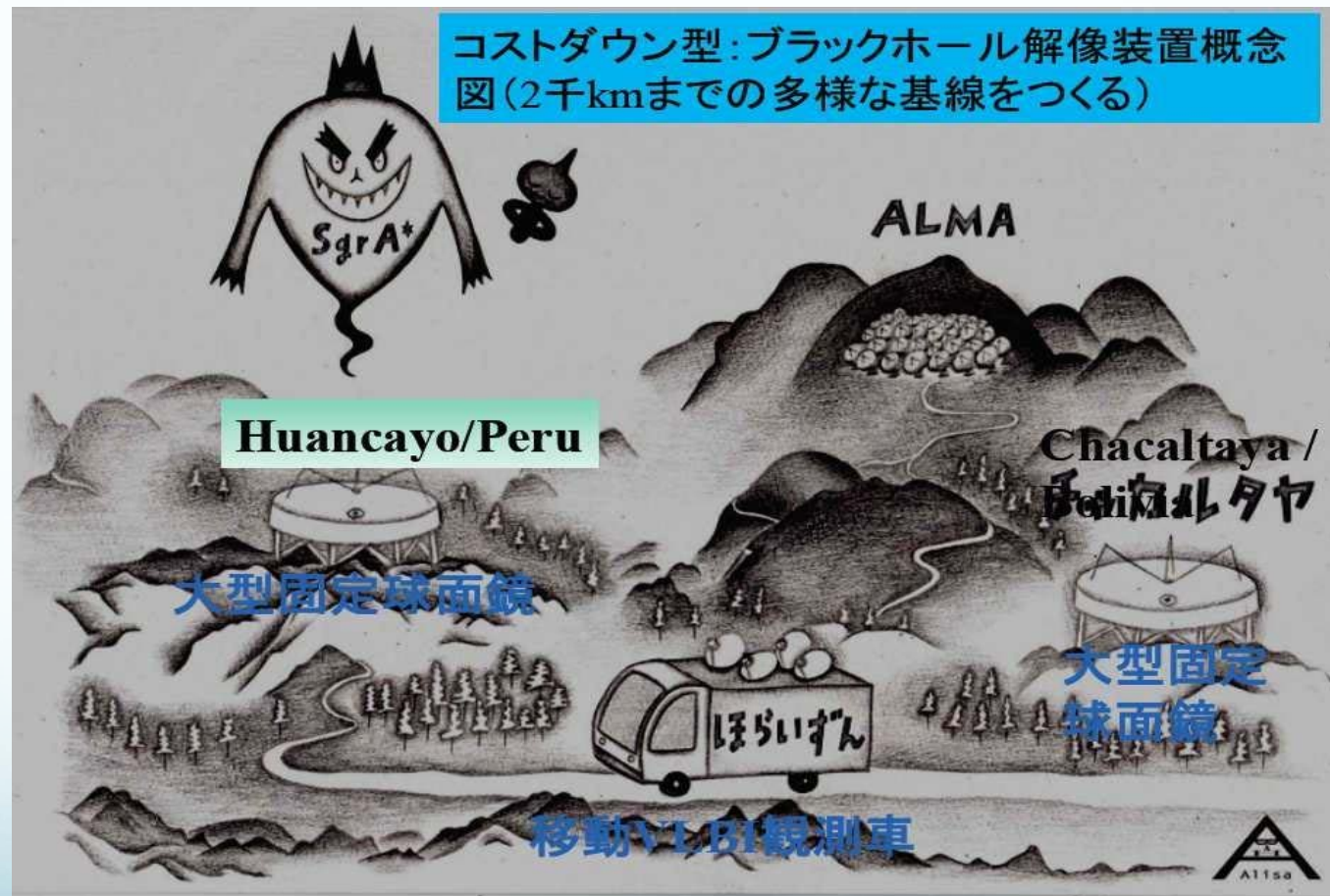
# Potential for the future

- × Very Long Baseline Interferometry (VLBI)
- × Interferometry within South America
- × Caravan-SUB



(Bartkiewicz, A. et al. 2005)

# Caravan-sub Project





# NASE – Network for Astronomy School Education



- ✗ In 2014 we teach how to teach astronomy to 100 school teachers
- ✗ To monitor if teachers learn how to teach, we visited 24 schools with our 3D system and telescopes. Almost 5, 000 could enjoy astronomy.

# Reflections

- ✗ To avoid unnecessary destructions and robbing, we have to make people feel proud of their institutions, then they will protect observatories.
- ✗ To make people proud of their institutions, we have to make, since they are young, to understand importance of science and the best way is trough astronomy education.

# Gracias por su atención

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# Observatorio Wanka

