



# 93 Years of Geomagnetic Data Acquisition at Huancayo Observatory

Ph.D. José K. Ishitsuka  
Astronomy Division  
Huancayo Observatory Director  
Geophysical Institute of Peru

# 93 Years of Geomagnetic Data Acquisition at Huancayo Observatory

- \* Department of Terrestrial Magnetism (DTM) of Carnegie Institution of Washington (CIW) decided to establish a Geomagnetic Observatory in Peru, in 1917. John A. Fleming from DTM began the search for an adequate place for it, from 1919 to 1921 Geomagnetic Observatory was constructed. Huancayo Geomagnetic Observatory began operations in march 1st of 1922. Since that, important contributions to human knowledge were taken place as Forbush decay, Equatorial Electro Jet, and thousands of scientists used and still using Huancayo's 93 years geomagnetic data. In 1946 DTM left the Observatory to Peruvian Government, and few years later Geophysical Institute of Peru was established, one of the most important scientific institution in Peru. Details of past and present activities of Geophysical Institute of Peru will be presented.

# Outline

---

- \* Aims of DTM in 1915
- \* Location of observatories
- \* Come into operation in 1922
- \* Important contributions
- \* Transfer to local governments
- \* After transfer
- \* And now

# Conclusions

---

- \* DTM initiative, after 93 year, lead to build the Peruvian most important scientific institution
- \* Government wrong decisions can destroy years of dedicated works
- \* Thanks to serious management of Alberto Giesecke M. And Mateo Casaverde R. during first years of IGP, we have the actual respectable IGP
- \* Thanks to CRL and ERI of Tokyo University, world scientific community had have geomagnetic data of Huancayo Observatory
- \* Thanks to WDC Kyoto that provided for a long time photographic paper for DTM CIW No. 2 magnetometer, this instrument could provide data continuously.

# Aims of Department of Terrestrial Magnetism (DTM)

---

- \* "to investigate such problems of world-wide interest as relate to the magnetic and electric condition of the Earth and its atmosphere, which are not specifically the subject of inquiry of any one country, but are of international concern and benefit"

# Imbalance in distribution of observatories

---

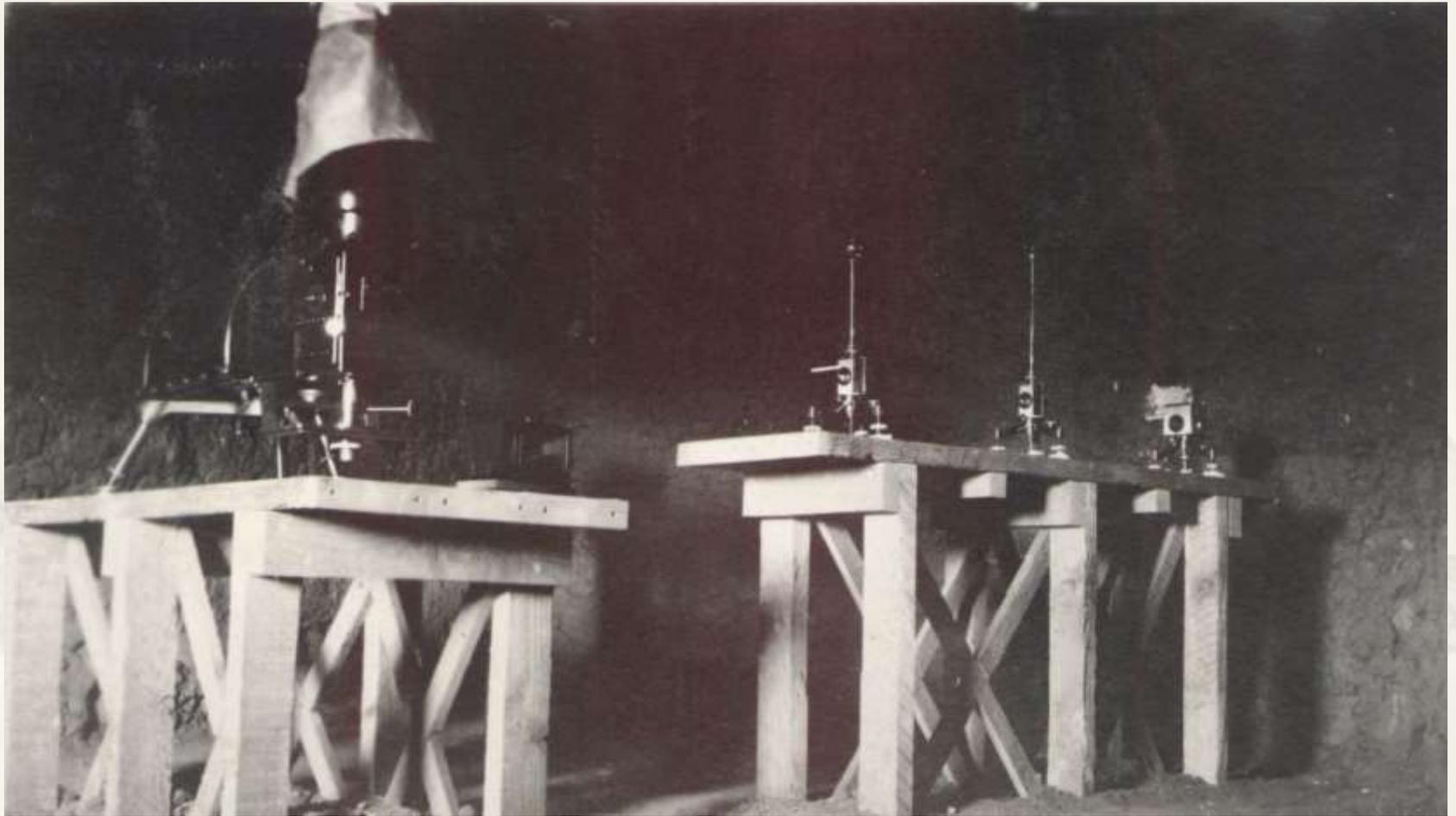
- \* In 1915 the Department set out to correct the severe imbalance in the distribution of observatories by establishing two in the southern hemisphere. In addition to magnetic measurements they were to study (1) variation in the fair-weather electric potential and conductivity of the air; (2) earth currents and their relationship to the geomagnetic field; (3) cosmic rays and their relationship to magnetic data; and (4) disturbances of the Sun's chromosphere. The general regions selected were the southwestern part of Australia and the Peruvian Andes. The former was selected to fill a gap between observatories at the same latitude at Melbourne and Mauritius (Indian Ocean); the latter because it would lie near the geomagnetic equator.

# Location of observatories

---

- \* Experience by other observatories had shown that for the post to be scientifically adequate certain criteria needed to be satisfied (1) the absence of any detectable local anomalies; (2) a location at least 10 miles from the nearest railroad; (3) isolation from present and future industrial activity; (4) a location at least 50 miles from the ocean; and (5) a situation on level, unforested ground. The last two requirements came from the need to measure earth currents, which required two buried cables about 15 Km long, one lying on a north-south geomagnetic meridian, the other on an east-west meridian.

# Beginnings of IGP



# New practices for construction

---

- \* For accuracy it was the practice of observatories to isolate the magnetic instruments from temperature variations to the best extent possible. Older practice had done this by using deep cellars, but these had generally proved to have troublesome moisture, so the two new posts would have surface enclosures of six walls between which were dead-air spaces and sawdust. This arrangement succeeded in reducing the diurnal variation to the order of 0.1 °C. Naturally, all construction had to be made with strict compliance in the use of non-magnetic materials. Nails were copper, requiring holes to be drilled for their use. (Copper nails were a standard product used in structures wherein explosives were stored or carried, as they reduced the danger of sparks.)

# Thermometer

---



# Absolute building



# Operation March 1st of 1922

---

- \* A second location was found in the western cordillera of the Peruvian Andes about 8 miles west of the town of Huancayo, specifically at  $12^{\circ} 03'$  south latitude,  $75^{\circ} 20'$  west longitude, and 10600 feet altitude. Purchase of the tract of 25 acres presented some difficulty because of the many owners but was eventually completed in September 1919. Transport of building materials proved very difficult, and it was not until March 1922 that the station was put into operation. Huancayo had, in addition to the standard equipment, seismographs operated for the US Coast and Geodetic Survey and a receiver for recording variations in the intensity of signals from a distant radio transmitter.

# How it looks now



# Last week photo



# Monument at Huayao Village



# Geomagnetism at Huancayo

---

- \* Staff: Mr. Domingo Rosales
  - Mr. Erick Vidal
  - Mr. Oscar Véliz (JRO)
- \* Equipments:
  - \* Eschenhagen magnetograph DTM CIW No.2
  - \* Diflux and Proton magnetometers
  - \* Fluxgate magnetometer of GRL of University of Tokyo
  - \* Fluxgate RFP-523 of ERI University of Tokyo
- \* Data:
  - \* INTERMAGNET (June 9<sup>th</sup> of 2003)
  - \* WDC of Kyoto, Edinburgh and Copenhagen



# Digitized DTM Magnetometer



# GRL Magnetometer



# Spectrohelioscope

---

- \* The Department furnished the instruments for magnetic and electric measurement. Variometers recorded declination and intensity continuously with optical links and photographic film moving at a speed of 20 mm/hour. The Mount Wilson Solar Observatory furnished spectrohelioscopes for examination of the chromosphere. In 1932 the Department provided radio-echo apparatus for monitoring the height of the ionosphere, and by 1936 continuous recording of cosmic-ray fluxes was begun. Both stations made fundamental meteorological observations regularly, primarily for the benefit of local authorities.

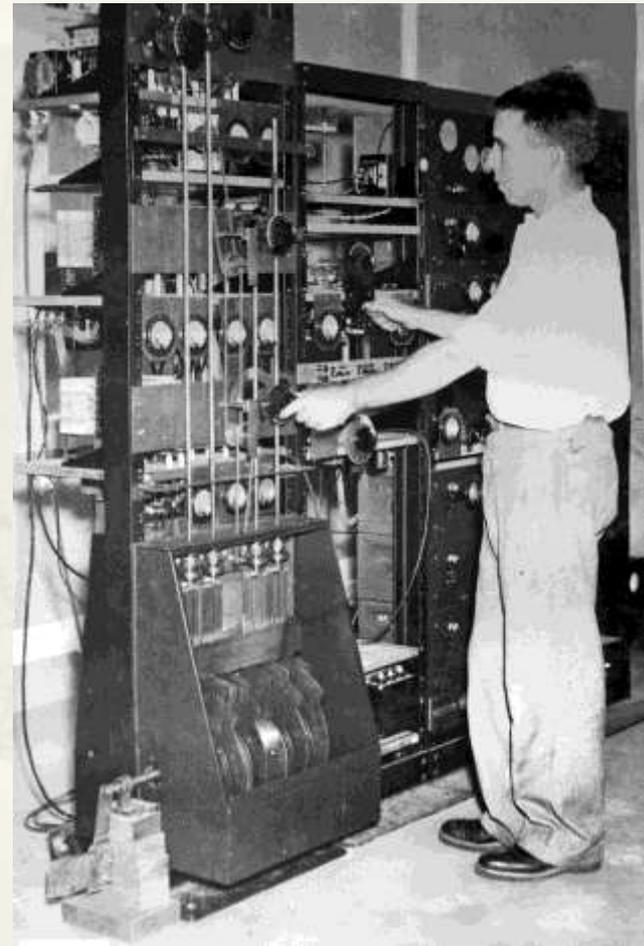
# Compton-Bennett detector

- \* Cosmic Ray observations begun with a Compton-Bennett meter was installed in 1936
- \* Discovering of Forbush Decrease of Forbush Effect
- \* A fire destructed electronics of detector



# Ionosondes

- \* DTM installed one ionospheric sounder in Huancayo in 1937 and one in Watheroo in 1938
- \* **H. Bucker discovered an anomaly, known as Spread F, 40 years latter Ronald Woodman could explain that anomaly**



# Solar Physics at Huancayo Observatory



- Furnished by Mount Wilson Solar Observatory
- A Hale Type spectro helioscope was installed in 1936.
- Mutsumi Ishitsuka made spectroscopic observations from 1957 to 1972.

# A new coelostat for Huancayo Observatory



- A new coelostat of 32 cm of diameter arrived to Huancayo Observatory in 1960
- A fire destroyed partially the spectro helioscope
- NAOJ helped to refurbish and actually is installed at Solar Station in Ica University.

# Past solar telescopes of 1960s

\* Radio Polarimeter



\* Monochromatic Heliograph





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



**EQUATORIAL OPTICAL BENCH  
COMPLETELY DESTROYED  
OCTOBER 31, 1988**

# Gift to Peruvian Government - 1946

---

- \* It had been foreseen that these two posts would be maintained through at least one solar sunspot cycle and, when the major objects of the research had been accomplished, would be terminated or continued by the local authorities. In 1946 the Australian and Peruvian governments, stimulated by the importance of these studies as demonstrated during World War II, accepted the two stations as gifts and agreed to support their continued operation.

# Pioneers

**Ing. Alberto A. Giesecke Matto (97)**  
**President of IGP 1947 - 1981**



**Ing. Mateo Casaverde R. (94)**  
**Vice President of IGP**



# OBSERVATORIO DE HUANCAYO

JOHN A. FLEMING

## INSTITUTO GEOFÍSICO DEL PERÚ

SECTOR AMBIENTE

|          |              |                  |       |                        |
|----------|--------------|------------------|-------|------------------------|
| LATITUD  | GEOGRÁFICA   | : 12° 02' 28.69" | SUR   |                        |
| LONGITUD | GEOGRÁFICA   | : 75° 19' 14.11" | OESTE |                        |
| LATITUD  | GEOMAGNÉTICA | : 2° 9' 36"      | SUR   | IGRF 2013              |
| LONGITUD | GEOMAGNÉTICA | : 2° 48' 00"     | OESTE |                        |
| ALTITUD  |              | : 3314 m.s.n.m.  |       | 3,314 m is 10,873 feet |

FUNDADO EL PRIMERO DE MARZO DE 1922.

# Important dates after DTM

---

- \* 1947: Instituto Geofísico de Huancayo
- \* 1960: Jicamarca Radio Observatory – JRO (CRPL of NBS)
- \* 1961: Ancon Minitrack Observatory (NASA)
- \* 1962: Instituto Geofísico del Perú – IGP
- \* 1969: Transfer of JRO and Ancon Observatory to IGP
- \* 1978: Inauguration of Cosmos Coronagraphic Observatory
- \* 1988: Terrorists destroyed Cosmos Observatory
- \* 1992: Peruvian Government reduced personnel of Huancayo Observatory (32 employees to 5), Nightmare of 90s!

# Huancayo Observatory Staff



# Main Observatories of IGP



# Main Observatories of IGP



# Magnetometers at Ancon Observatory

- \* First magnetometer, Askania Variograph was installed in 1966, because of Total Solar Eclipse of November 12 nd.
- \* Fluxgate magnetometer of GRL (1987 Huancayo, 1988 Ancon), Kyoto WDC improved the magnetometer
- \* Fluxgate magnetometer of GRL (1984 Huancayo, 1990 Ancon)
- \* In case Huancayo would be attacked by terrorists, magnetometers were installed in Ancon by Mutsumi Ishitsuka, donation of Japanese Government
- \* MAGDAS was installed in October 13<sup>th</sup> of 2006



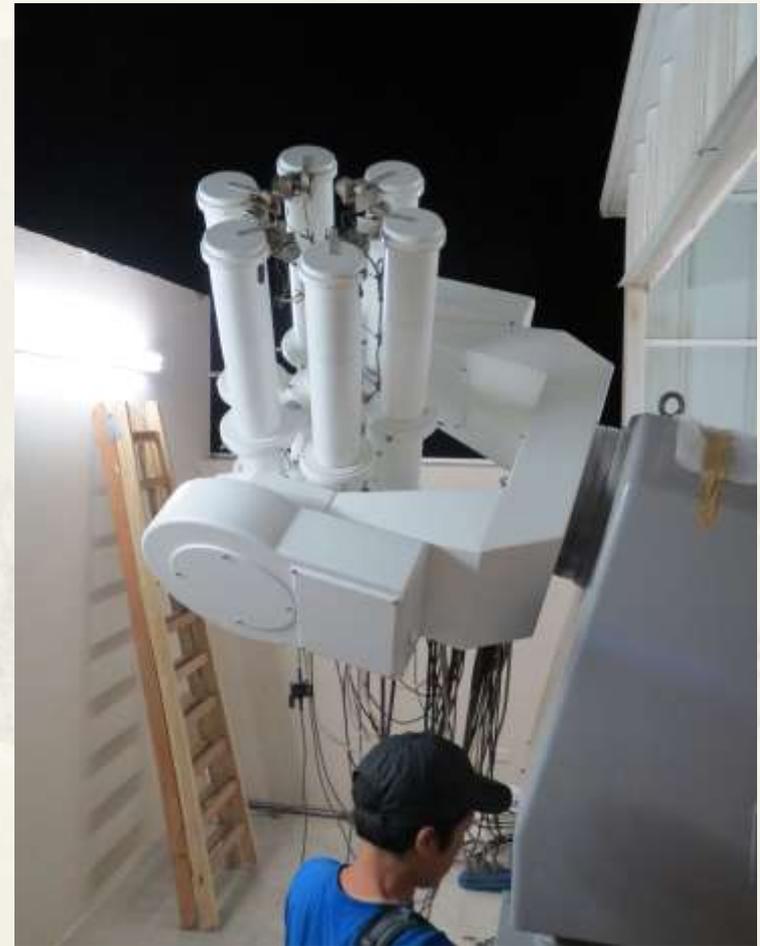
# Sicaya Radio Astronomical Observatory

- \* A satellital dish used for telecommunication was trasformed into a radio telescope, a 32 m telescope to observe methanol maser at SFR.
- \* Lack of scientific instruments in Peru, it will be a good tool to educate new scientists and technitians

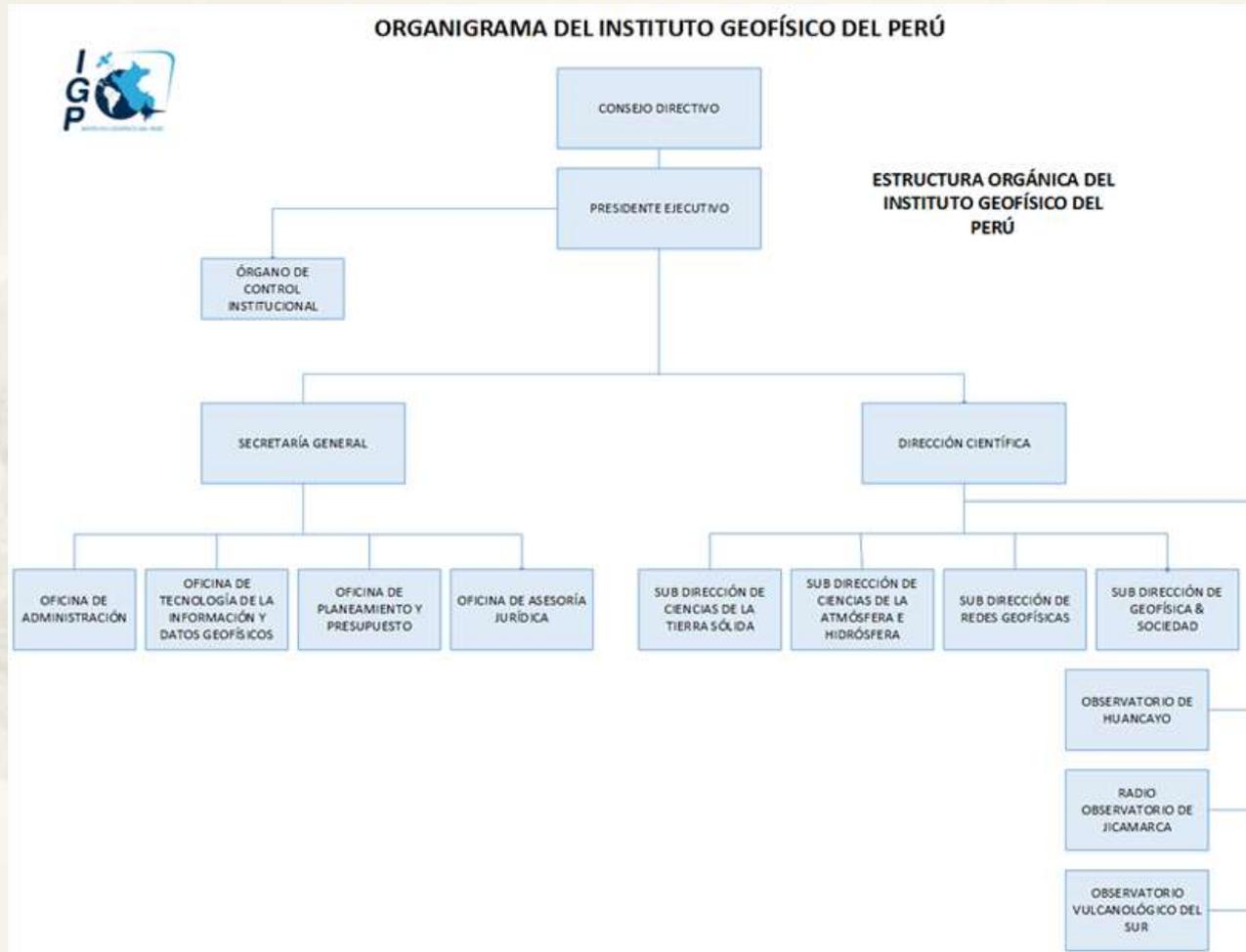


# Ica University Solar Observatory

- \* Solar observations with FMT begun in 2010 at Ica National Observatory
- \* Capacity Building
- \* Papers are in preparation
- \* First detection of Moreton Wave



# Organization of IGP



# IGP now

| DTM   | IGP now                             |
|---|-------------------------------------|
| <b>Seismomological station</b> (US Coast and Geodetic Survey) | Solid Earth Sciences                |
| Metheorological station                                       | Atmosphere and Hydrosphere Sciences |
| <b>Ionospheric sounder</b> (DTM of CIW)                       | Upper Atmosphere Sciences           |
| <b>Seismomological station</b> (US Coast and Geodetic Survey) | Volcanology                         |
| <b>Spectrohelioscope</b> (Mount Wilson Solar Observatory)     | Solar Physics and Astronomy         |
|   |                                     |

# Research

| Field                               | Observatory   |
|-------------------------------------|---|
| Solid Earth Sciences                | Huancayo Observatory and Ancon Observatory                              |
| Atmosphere and Hydrosphere Sciences | Huancayo Observatory  |
| Upper Atmosphere Sciences           | Jicamarca Radio Observatory, Ancon Observatory and Huancayo Observatory |
| Volcanology                         | Arequipa Volcanological Observatory                                     |
| Solar Physics                       | Ica University Solar Observatory  |
| Radio Astronomy                     | Sicaya Radio Astronomical Observatory                                   |

# Huancayo Observatory Staff - 2015

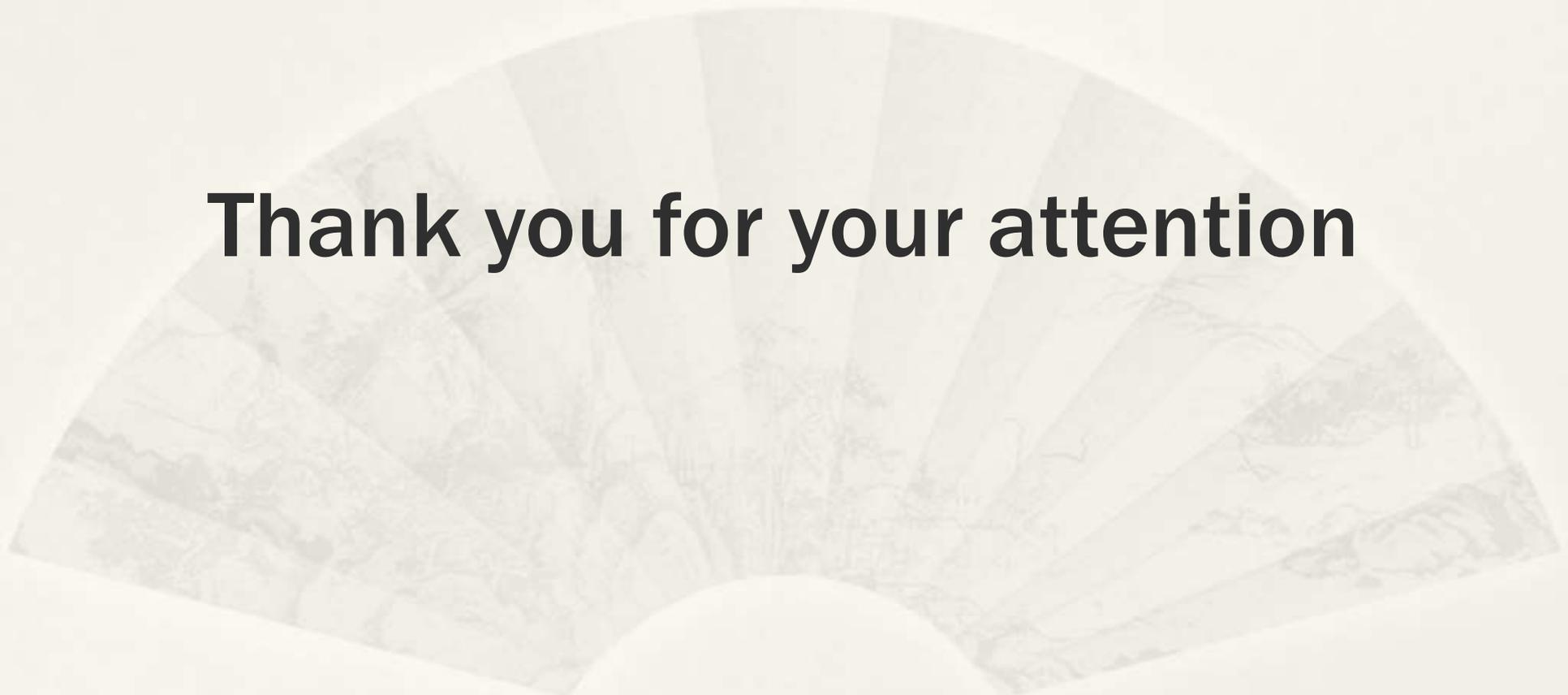


# Conclusions

---

- \* DTM initiative, after 93 year, lead to build the Peruvian most important scientific institution
- \* Government wrong decisions can destroy years of dedicated works
- \* Thanks to serious management of Alberto Giesecke M. And Mateo Casaverde R. during first years of IGP, we have the actual respectable IGP
- \* Thanks to CRL and ERI of Tokyo University, world scientific community had have geomagnetic data of Huancayo Observatory
- \* Thanks to WDC Kyoto that provided for a long time photographic paper for DTM CIW No. 2 magnetometer, this instrument could provide data continuously.

---



**Thank you for your attention**