CIELO

Cluster of Instruments for Equatorial and Low Latitude Observations

Multiple instruments from different institutions and researcher to observe the ionosphere

CIELO

1. LISN distributed observatory
2. Optical instruments
3. Geomagnetic instruments

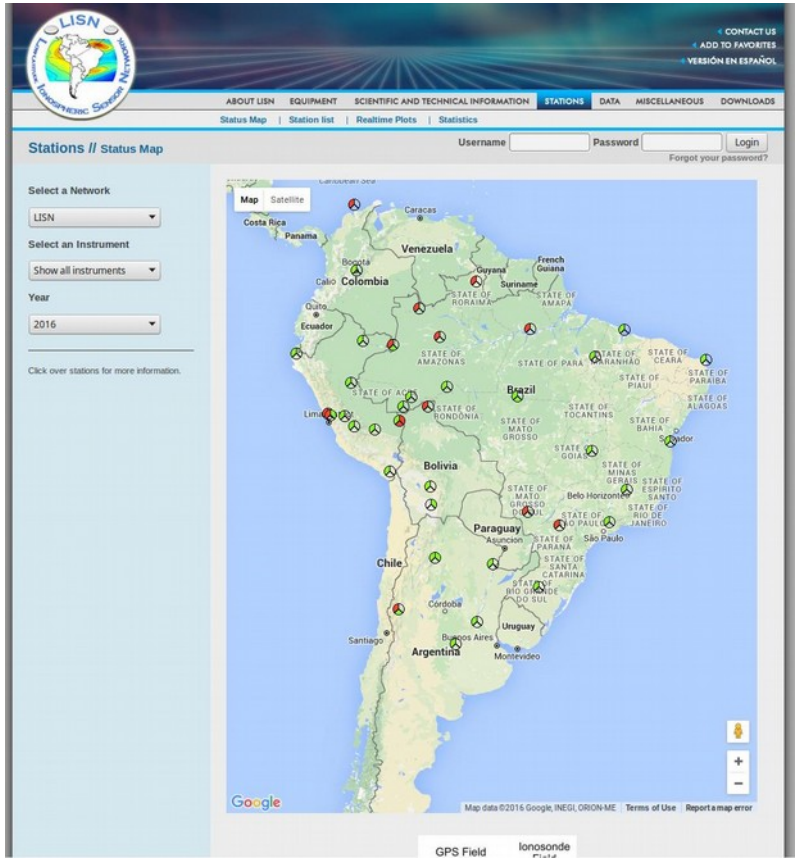
LISN

Low latitude Ionospheric Sensor Network

- Distributed observatory.
- International project, multi instrument (GPS, magnetometer, ionosonde), multi institution(universities, public and private institutions).
- Monitors the low, middle and high atmosphere in the equatorial region with the purpose of studying and forecasting the ionospheric phenomena, with special emphasis in dynamic and photochemical energy transport processes.

LISN

- LISN is a permanent array of new geophysical instruments in South America
  http://lisn.igp.gob.pe/

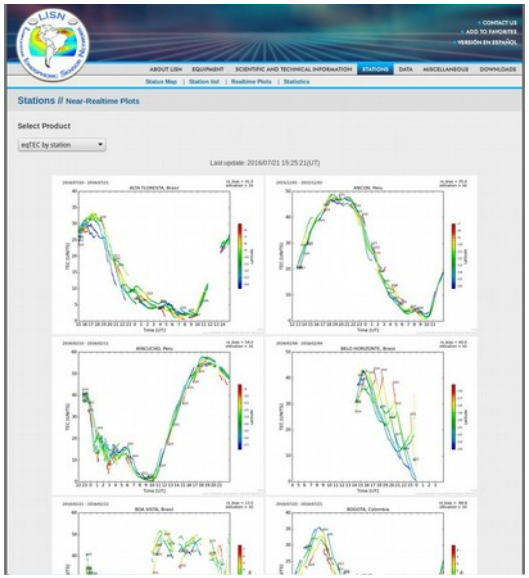


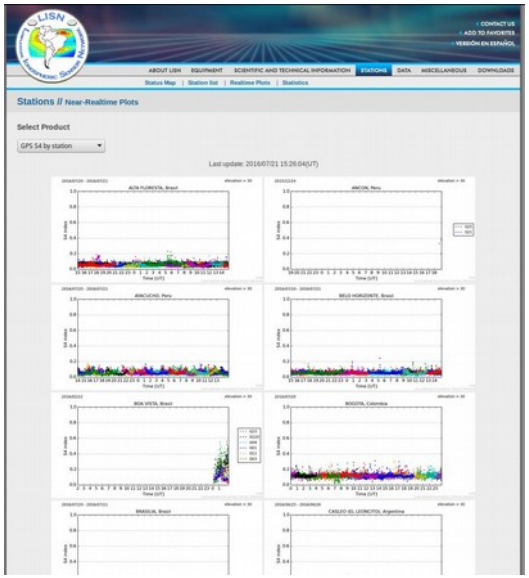
5 ionosondes
50 GPS
5 magnetometers

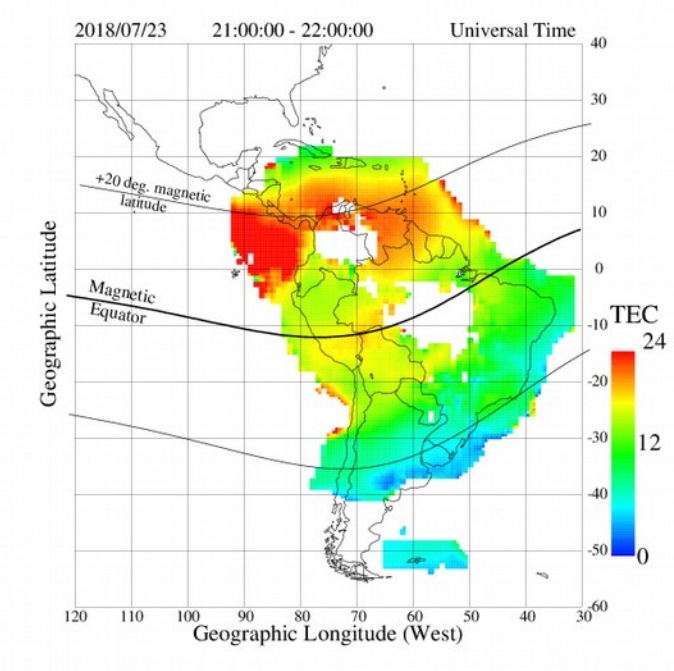
LISN

- GPS receivers

  Provide precise measurements of the **TEC** and amplitude and phase **SCINTILLATIONS.**

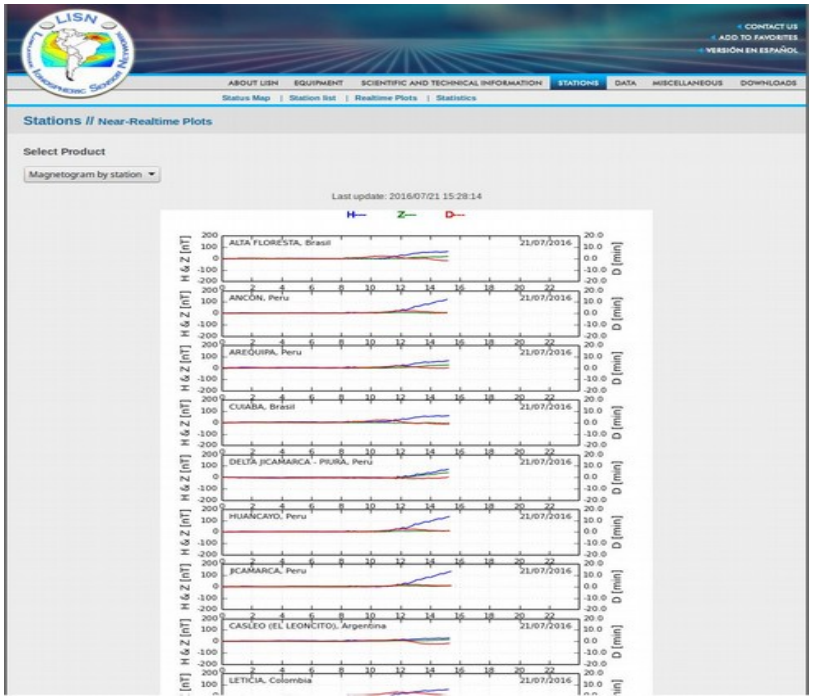






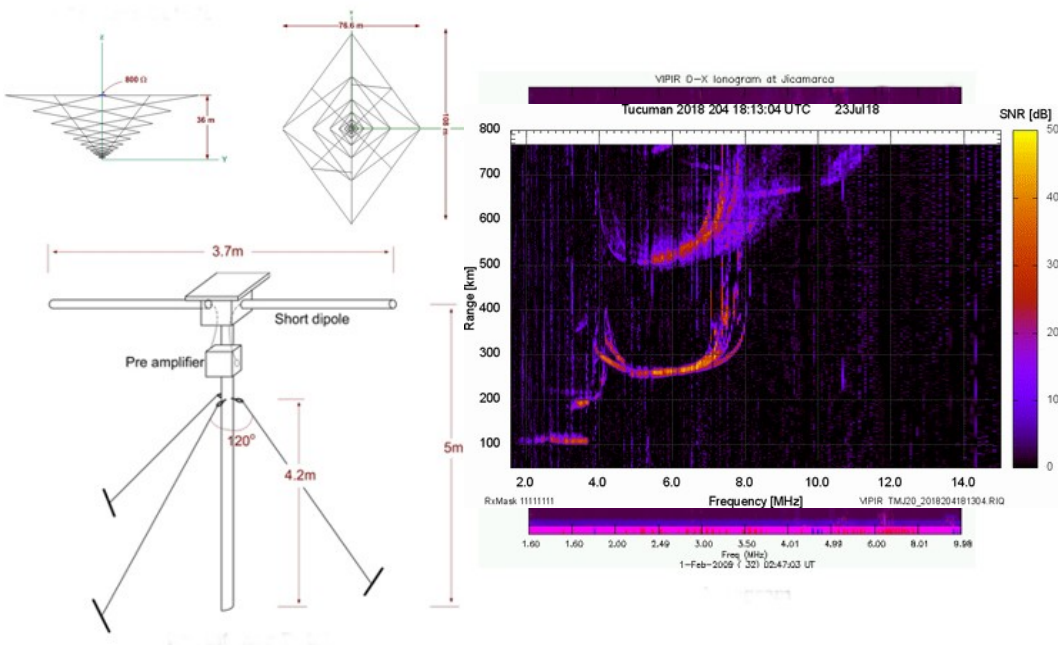
LISN

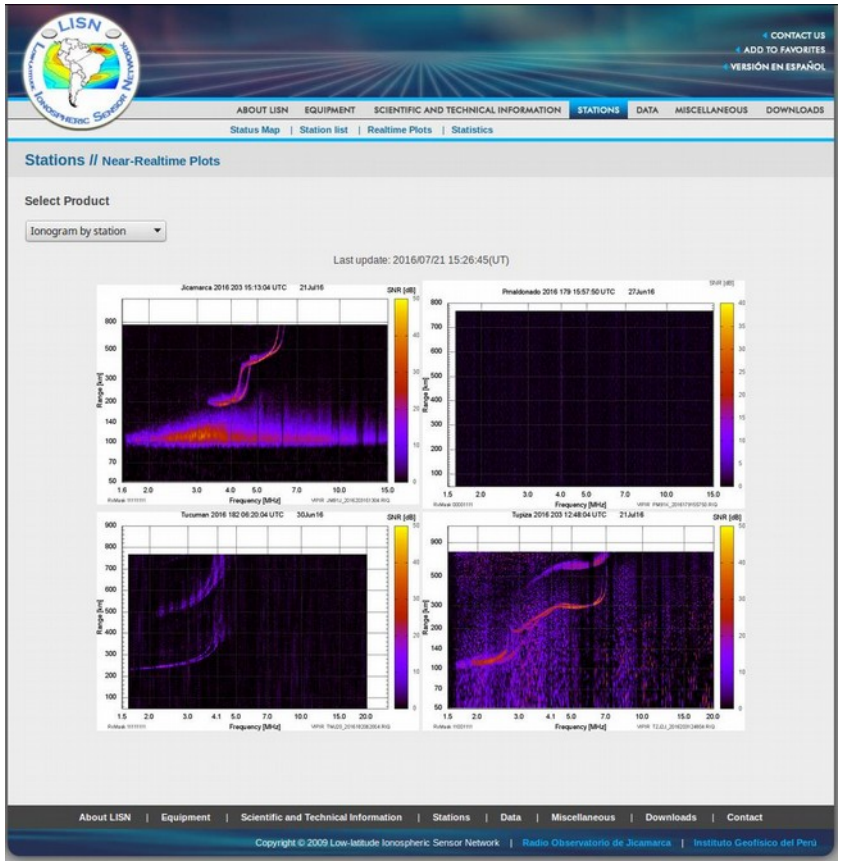
- Magnetometers
  Measure the strength of magnetic fields. Currently, LISN operates six magnetometers located in magnetic stations, near the magnetic equator.



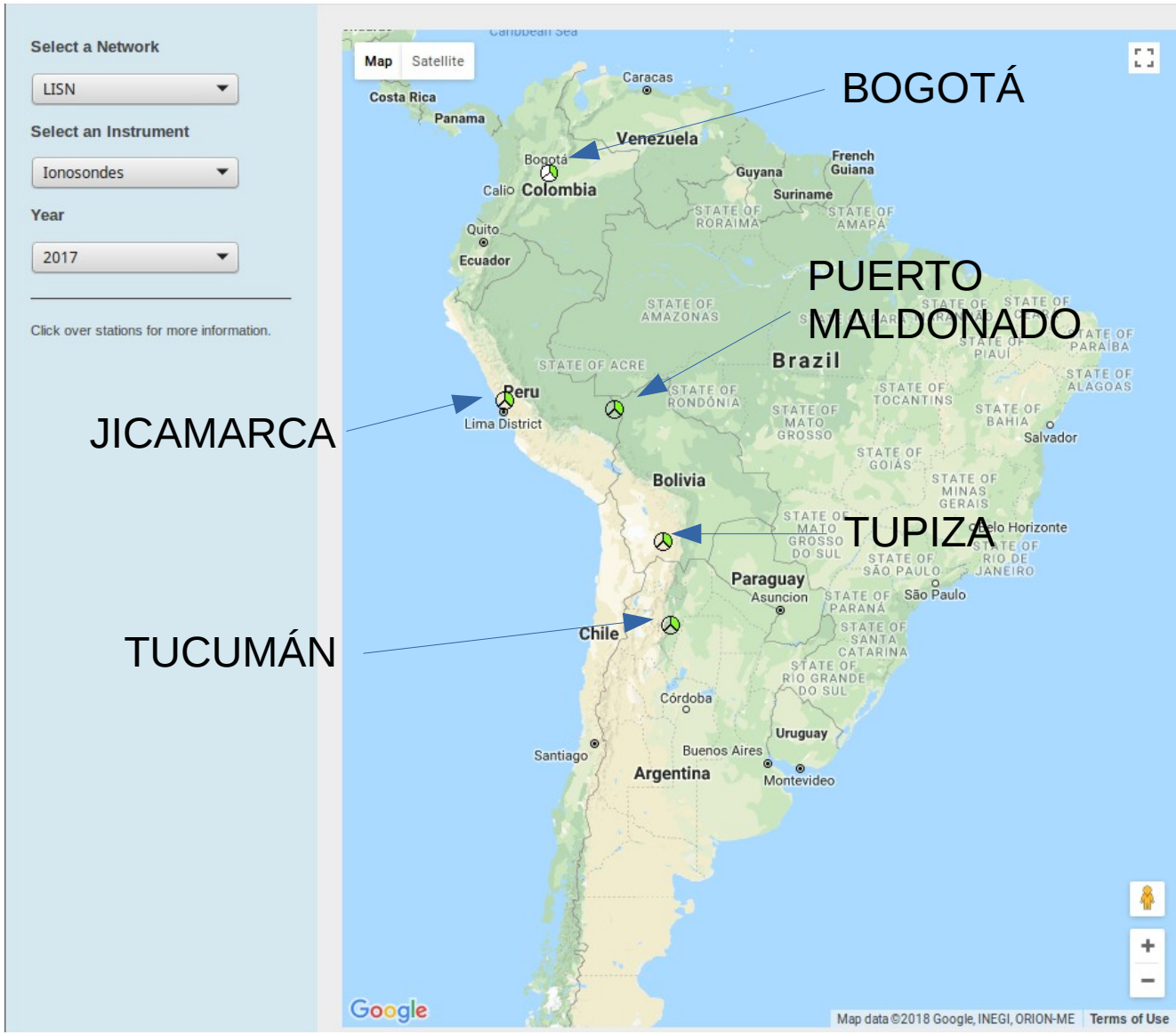
LISN

- Ionosondes
  The ionosondes provide **virtual height** information and density profile estimates from the bottom side ionosphere. They also provide information about **drifts**.



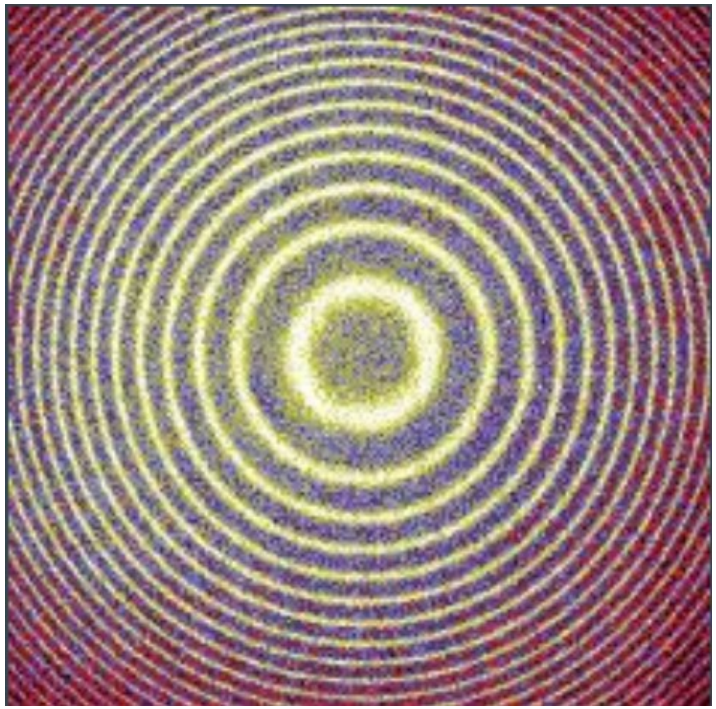


LISN

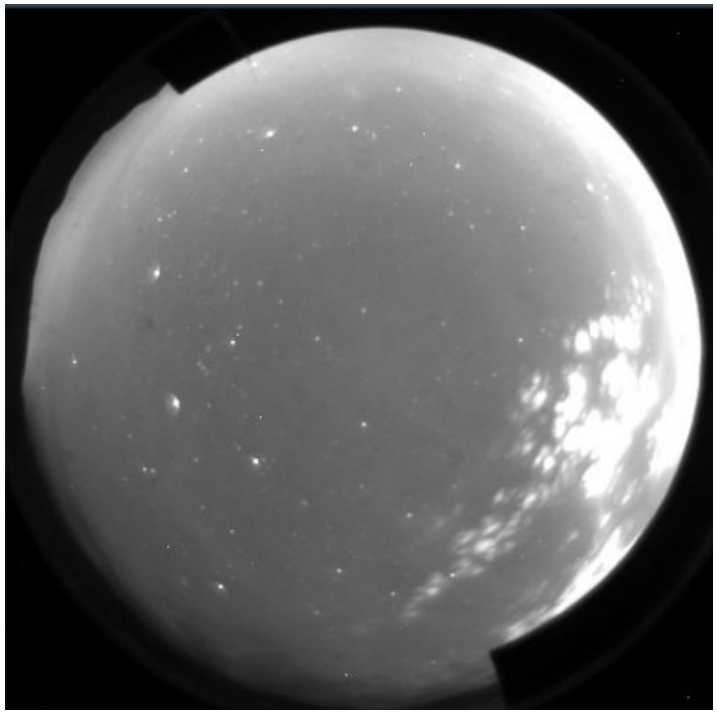

Select a Network
LISN
Select an Instrument
Ionosondes
Year
2017
Click over stations for more information.
Map
Satellite
BOGOTÁ
PUERTO MALDONADO
JICAMARCA
TUPIZA
TUCUMÁN
Caribbean Sea
Caracas
Costa Rica
Panama
Venezuela
Bogotá
Colombia
Cali
Guyana
French Guiana
Suriname
Quito
Ecuador
Brazil
Peru
Lima District
Bolivia
Salvador
Belo Horizonte
Paraguay
Asuncion
São Paulo
Chile
Córdoba
Uruguay
Santiago
Buenos Aires
Argentina
Montevideo
Google
Map data ©2018 Google, INEGI, ORION-ME
Terms of Use

OPTICAL INSTRUMENTS

- Fabry – Perot interferometers:
  Neutral winds and temperatures.



- All Sky Imager:
  Gravity wave activity at mesosphere



OPTICAL INSTRUMENTS

- Fabry – Perot network:

GEOMAGNETISM

- Historical notes
- Stations network
- Observation projects
- Instruments development

GEOMAGNETIC EQUATOR

AUTOR.	AÑO.	INCLINACION.
Feuillée	1712	18.° 40′ 0″
Malespina	1790	12.° 22′ 30″
Humboldt	1802	9.° 54′ 0″
Duperrey	1823	8.° 33′ 0″
Fitz–Roy	1836	7.° 30′ 0″
Vaillant	1836	6.° 56′ 0″
Dupetit–Touars	1838	6.° 53′ 0″
Belcher	1838	6.° 14′ 0″

- Displacement of the magnetic equator line (Casaverde M, 1984)

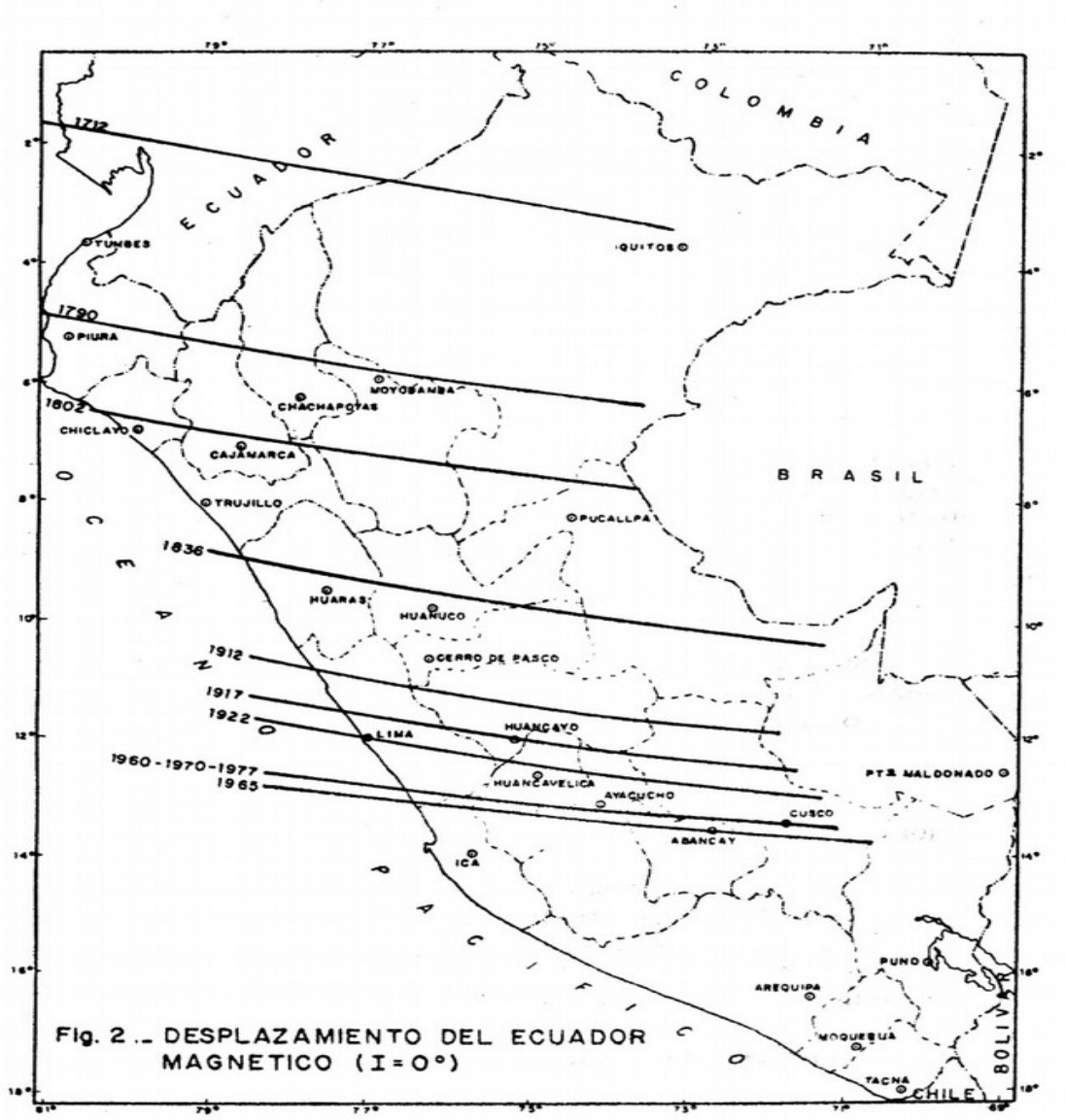
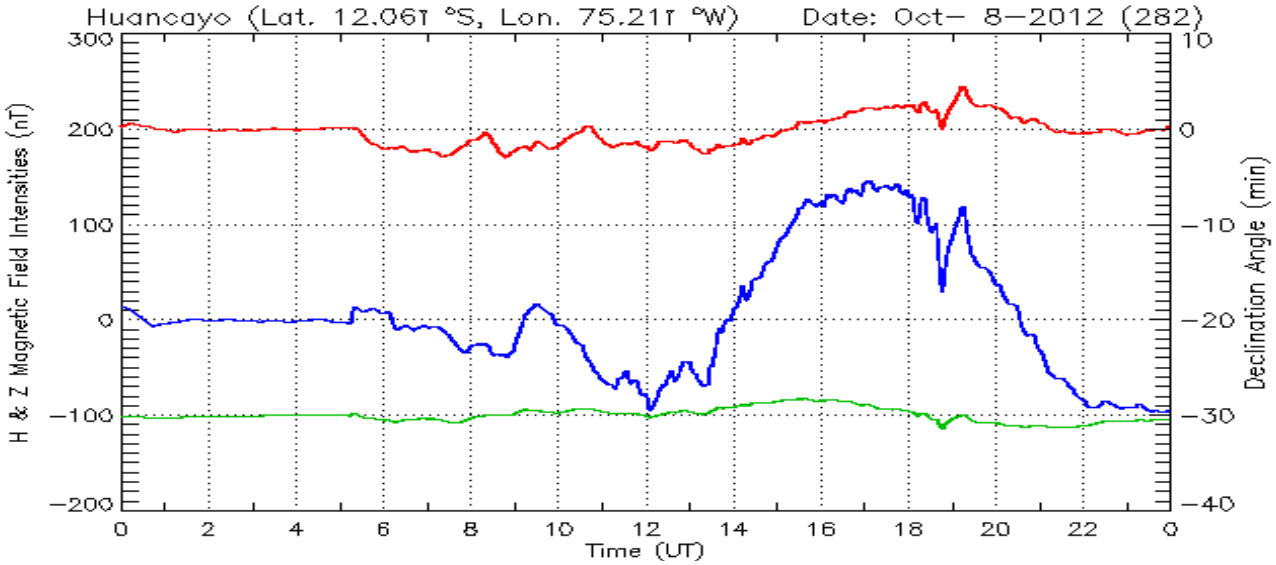


Fig. 2 .- DESPLAZAMIENTO DEL ECUADOR MAGNETICO (I = 0°)

GEOMAGNETIC OBSERVATIONS AT HUANCAYO

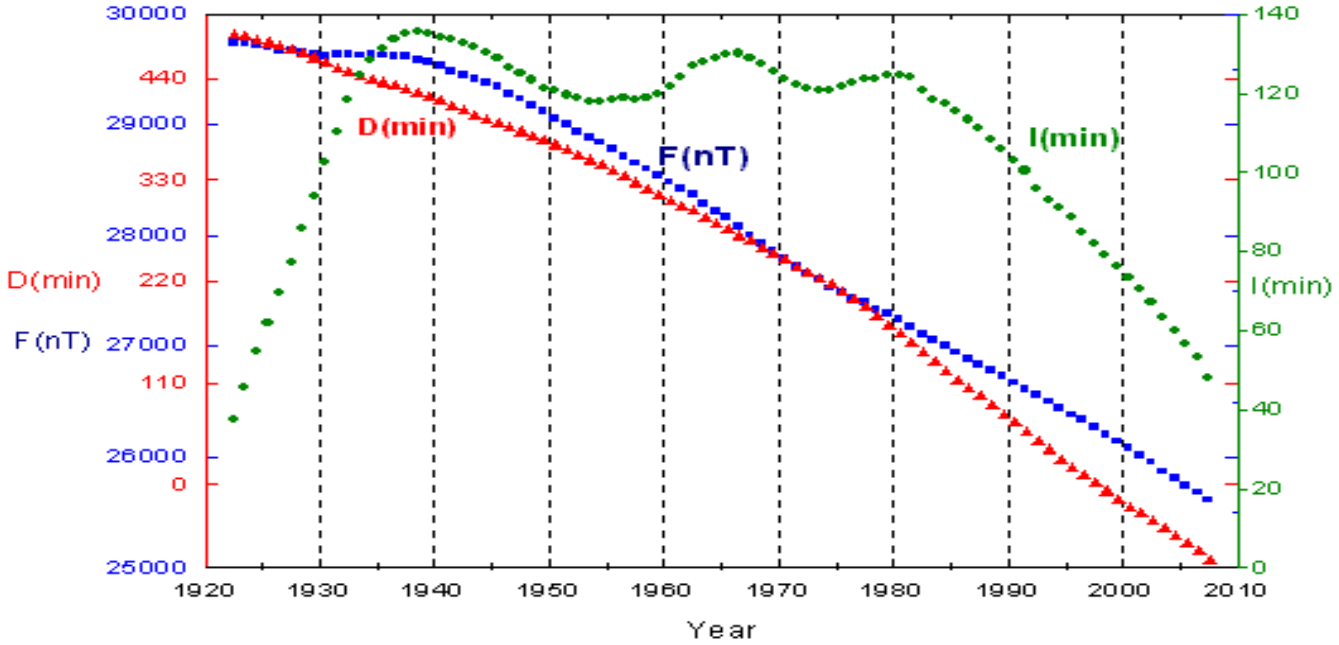
DIURNAL VARIATIONS

Diurnal variations show an increased amplitude of the H component due to the equatorial electrojet.



SECULAR VARIATION

Curves of secular variation of the magnetic declination (D), magnetic inclination (I) and total force (F) from 1922.



OBSERVATORIO GEOMAGNETICO DE HUANCAYO

UBICACION

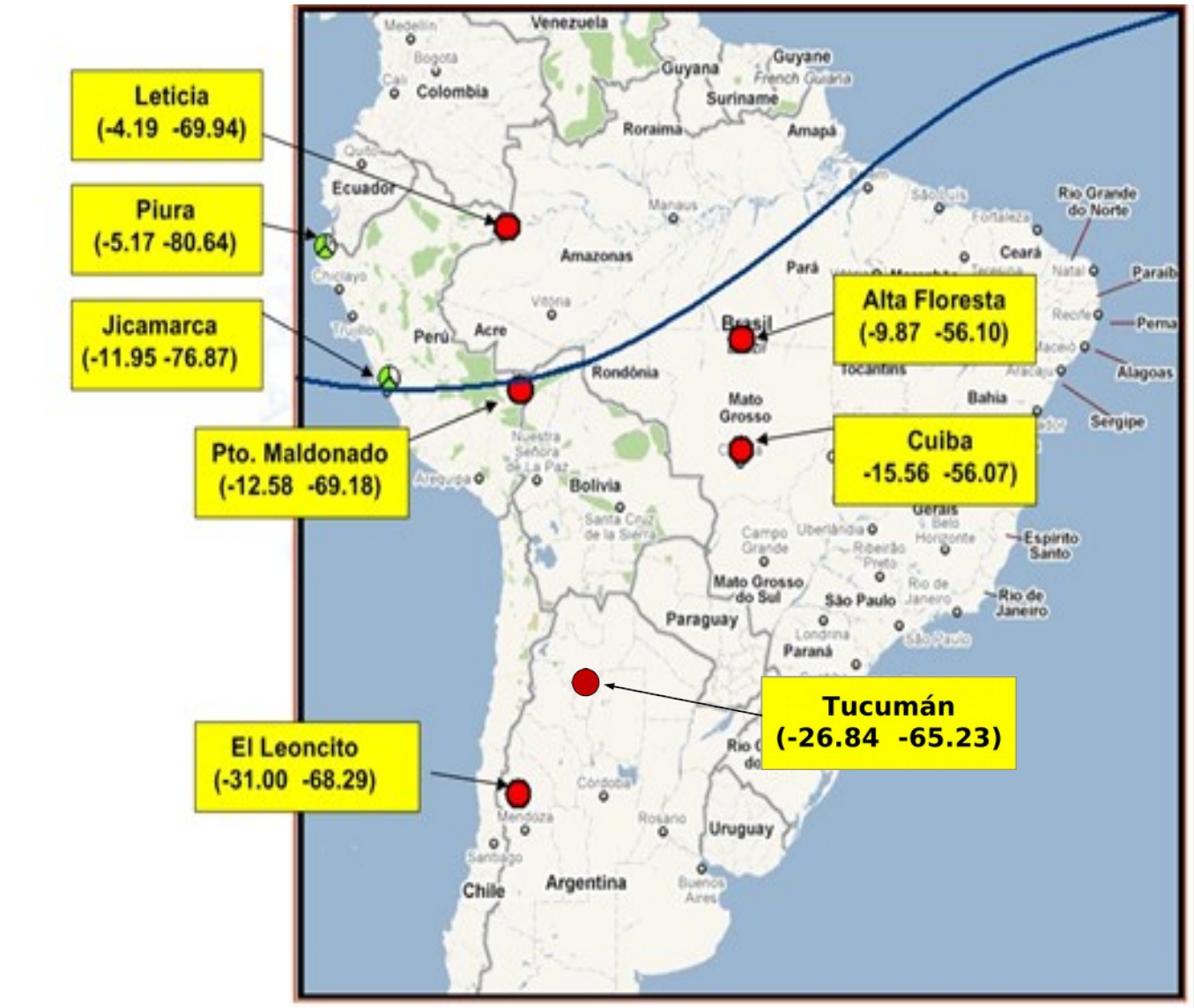
Lat. -12.04° S, Long. -75.82° W
Gm.L(2005). -2.07° Gm. Lg(2005):356.97°

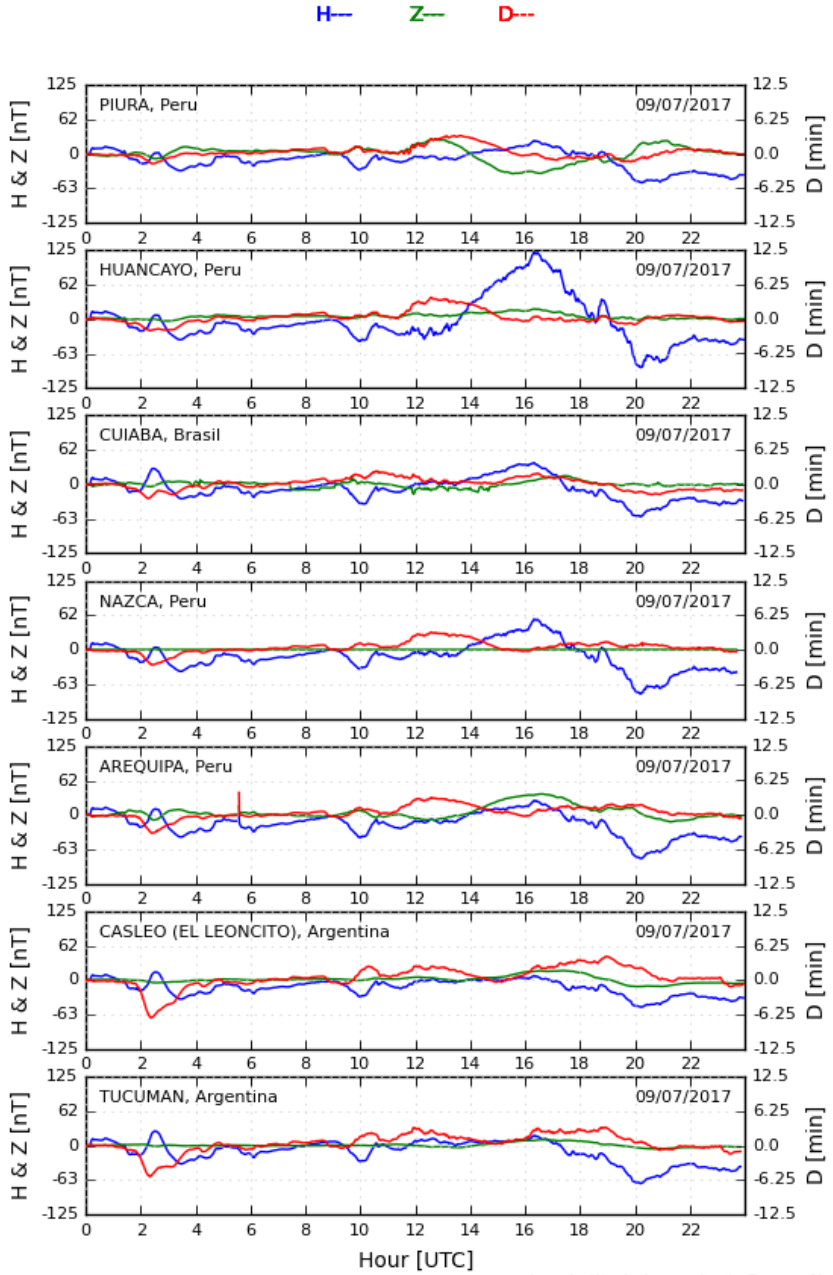
OBJETIVO

Observacion continua de la actividad del campo geomagnetico y observaciones absolutas de las variaciones diurna y secular desde 1922

Variation Instrument	Time Res.	Starting Data	Ending Data
HDZ Fluxgate INTERMAGNET	1 Sec	July 1997	Operating and data is available in real time
XYZ Tokyo-ERI	1 Sec.	July 1997	Operating , data is available in real time Earthquake Research Institute of Japan
Eschenhagen DTM CIW No. 2 Variometer	1 Sec	1922	Operating at present, data is available in real time

LISN (LOW LATITUDE IONOSPHERIC SENSOR NETWORK)





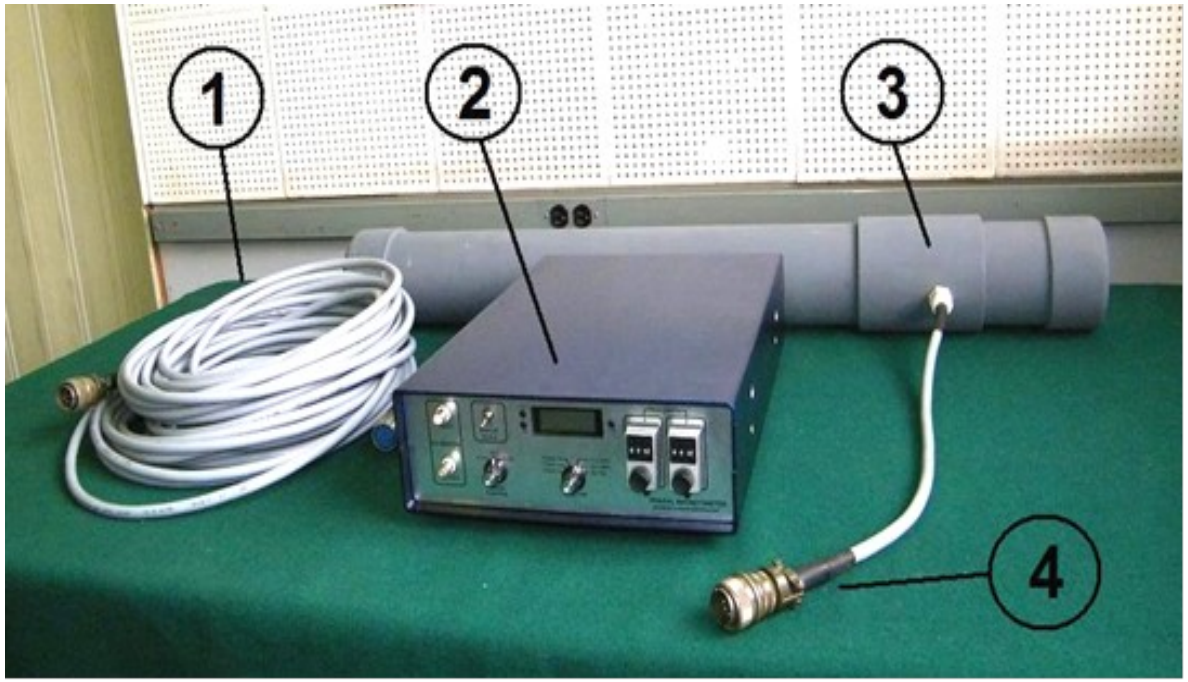
The first requests of construction:

LISN MAGNETOMETERS

2006-2008 Development of 5 units for the LISN distributed observatory.

EMBRACE MAGNETOMETERS

2009-2014 Development of 15 units for the EMBRACE network from Brazil.



SENSOR UNIT

The detector is based on a Barington Fluxgate sensor, inserted in a heavy PVC tube, with double cylinder with a high precision leveling system.

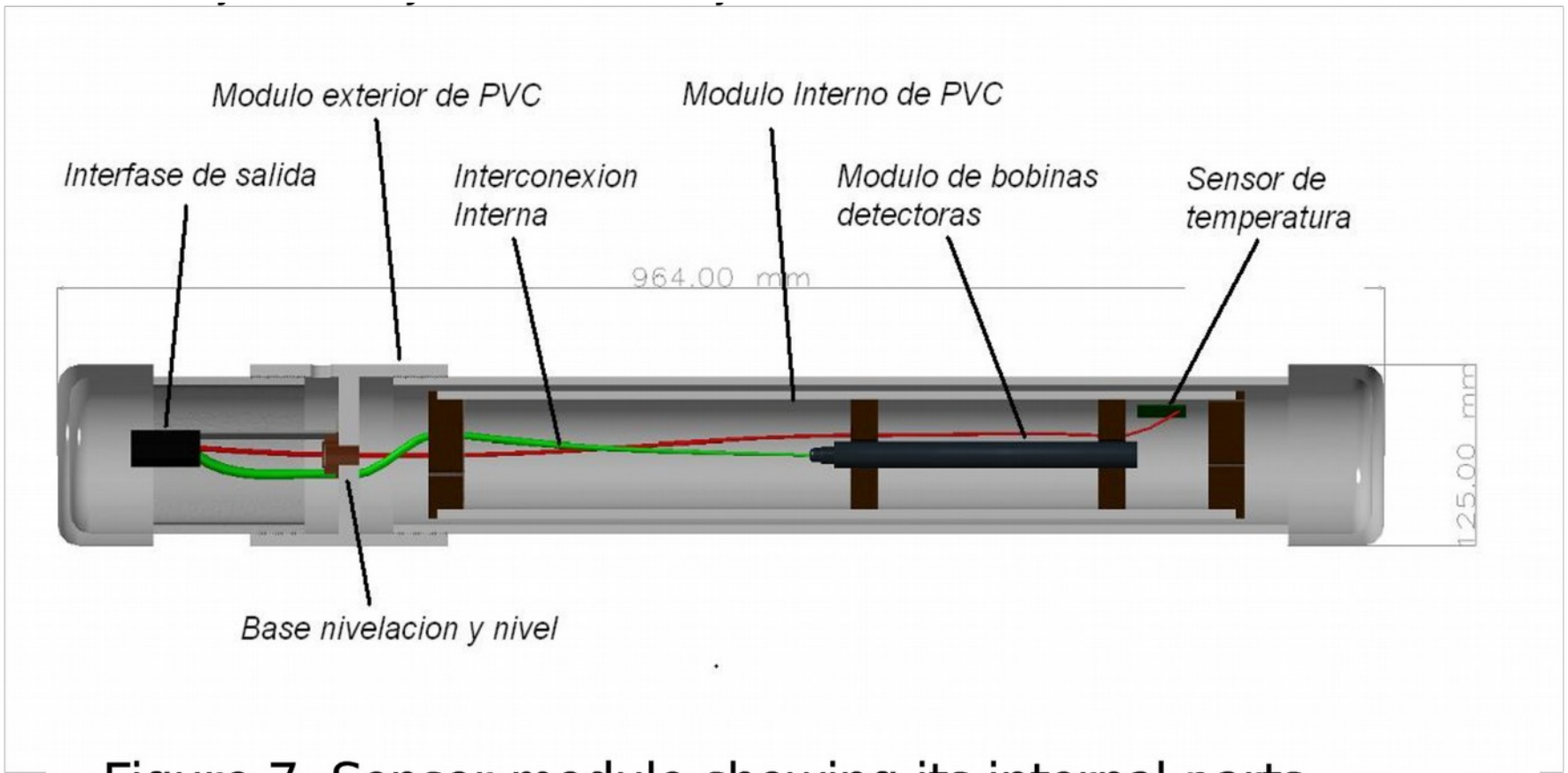
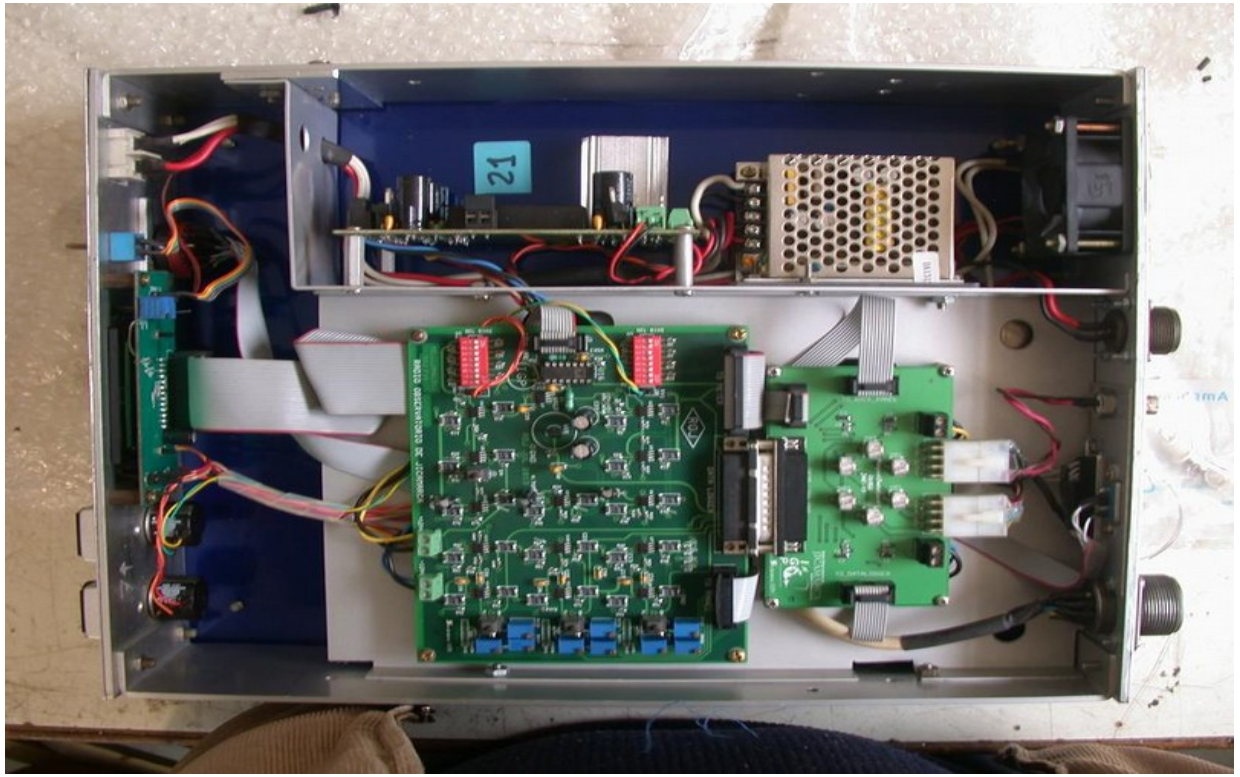
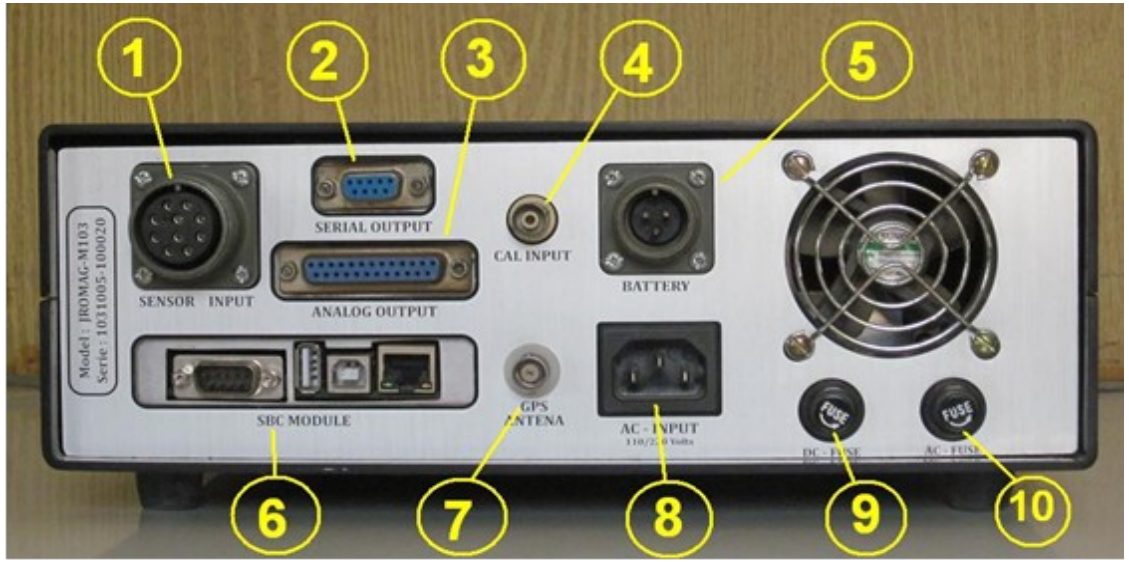


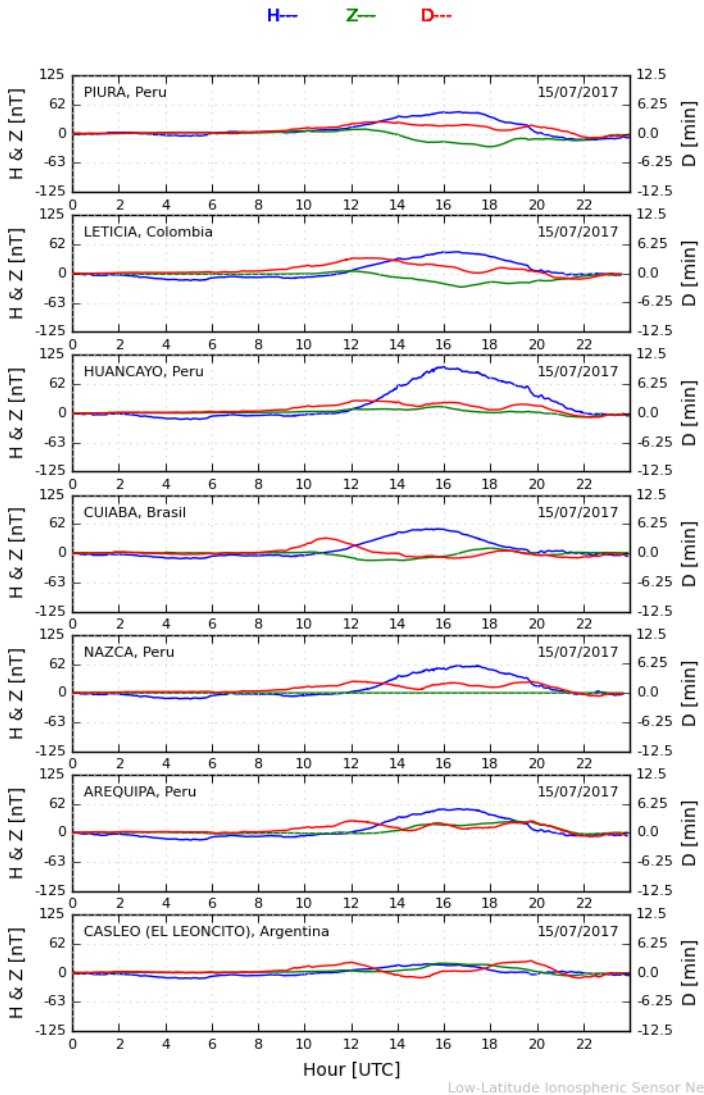
Figure 7. Sensor module showing its internal parts distribution and the locations of the coils.

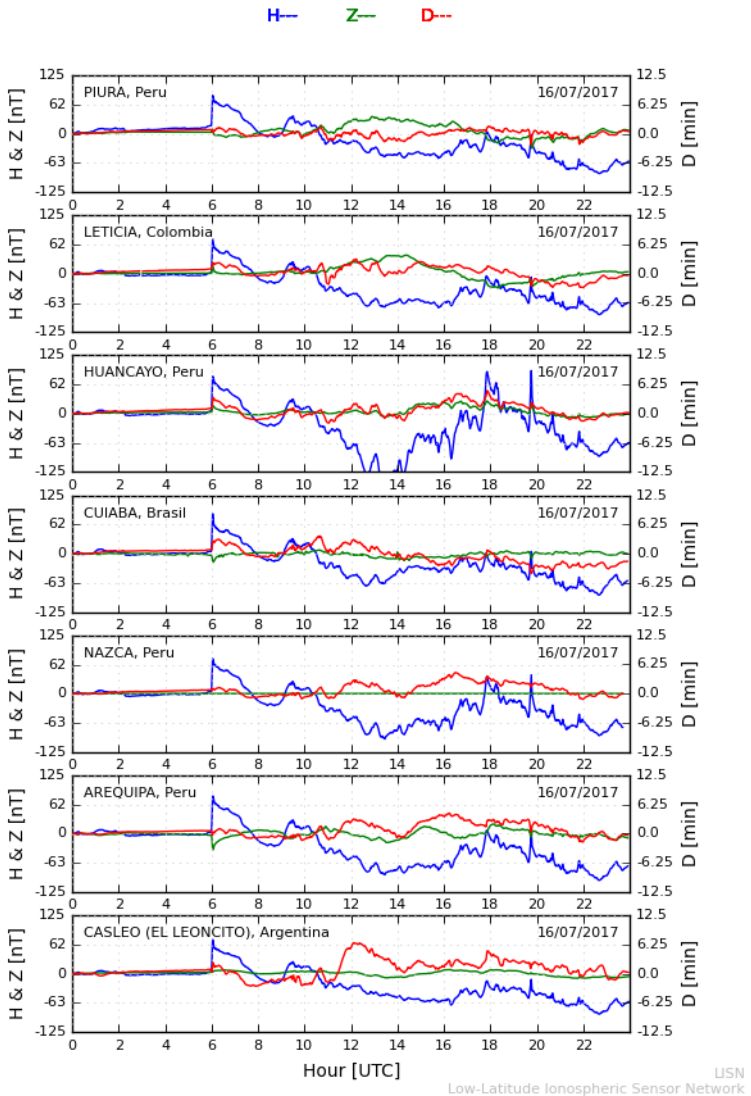
NEW MAGNETOMETER CONTROL UNIT





LISN Network (LOW LATITUDE IONOSPHERIC SENSOR NETWORK)





http://lisn.igp.gob.pe/stations/realtime.php?type=mag