

JICAMARCA PORTABLE DIGISONDE

- GENERAL DESCRIPTION
- SYSTEM SPECIFICATIONS
- RECEIVE ANTENNA SUB-SYSTEM
- OBSERVED SIGNAL PARAMETERS
- SYSTEM SOFTWARE
- JRO DIGISONDE WEB Page

Radio Observatorio de Jicamarca
O.A.Veliz - Grupo CIELO

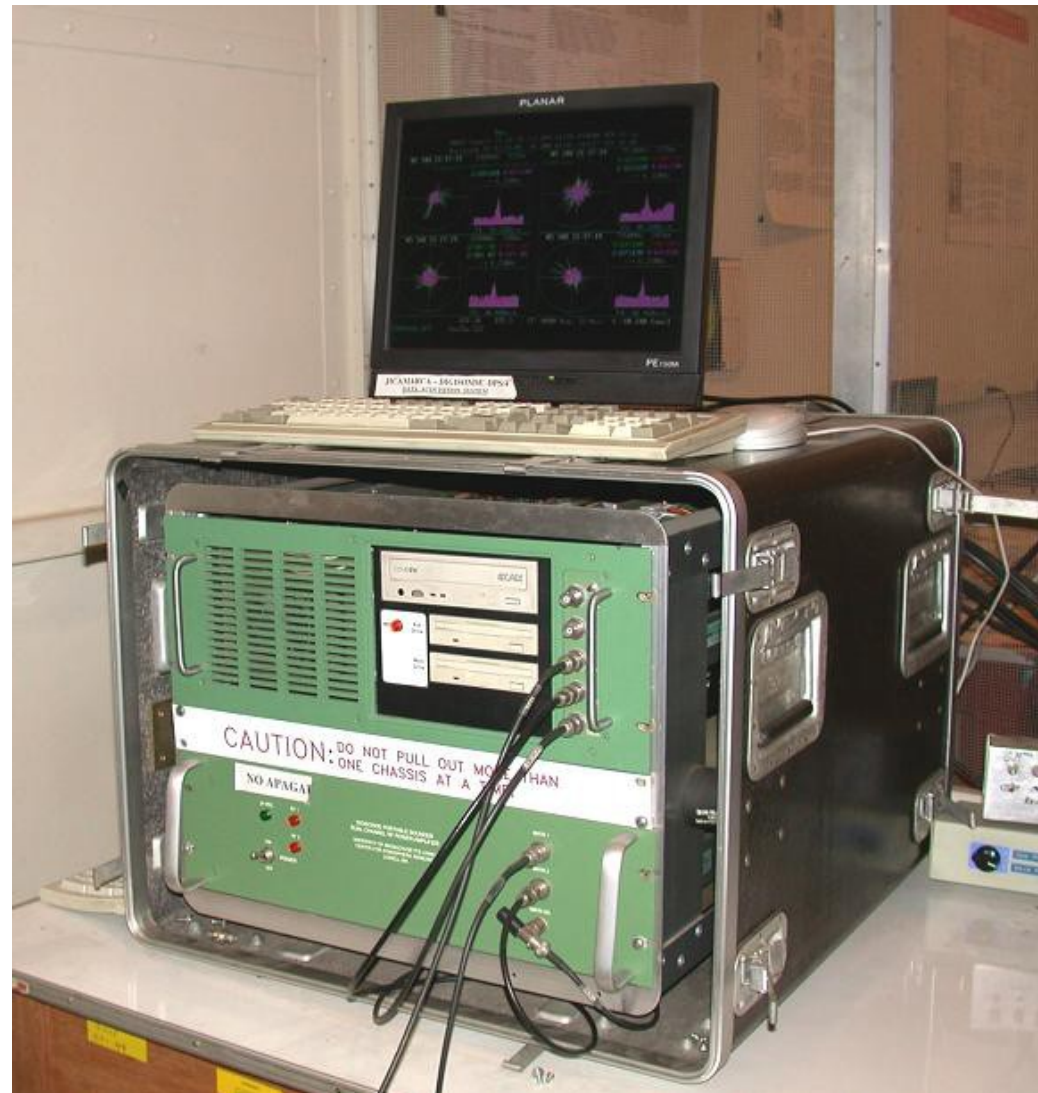
Jicamarca Noviembre 2013





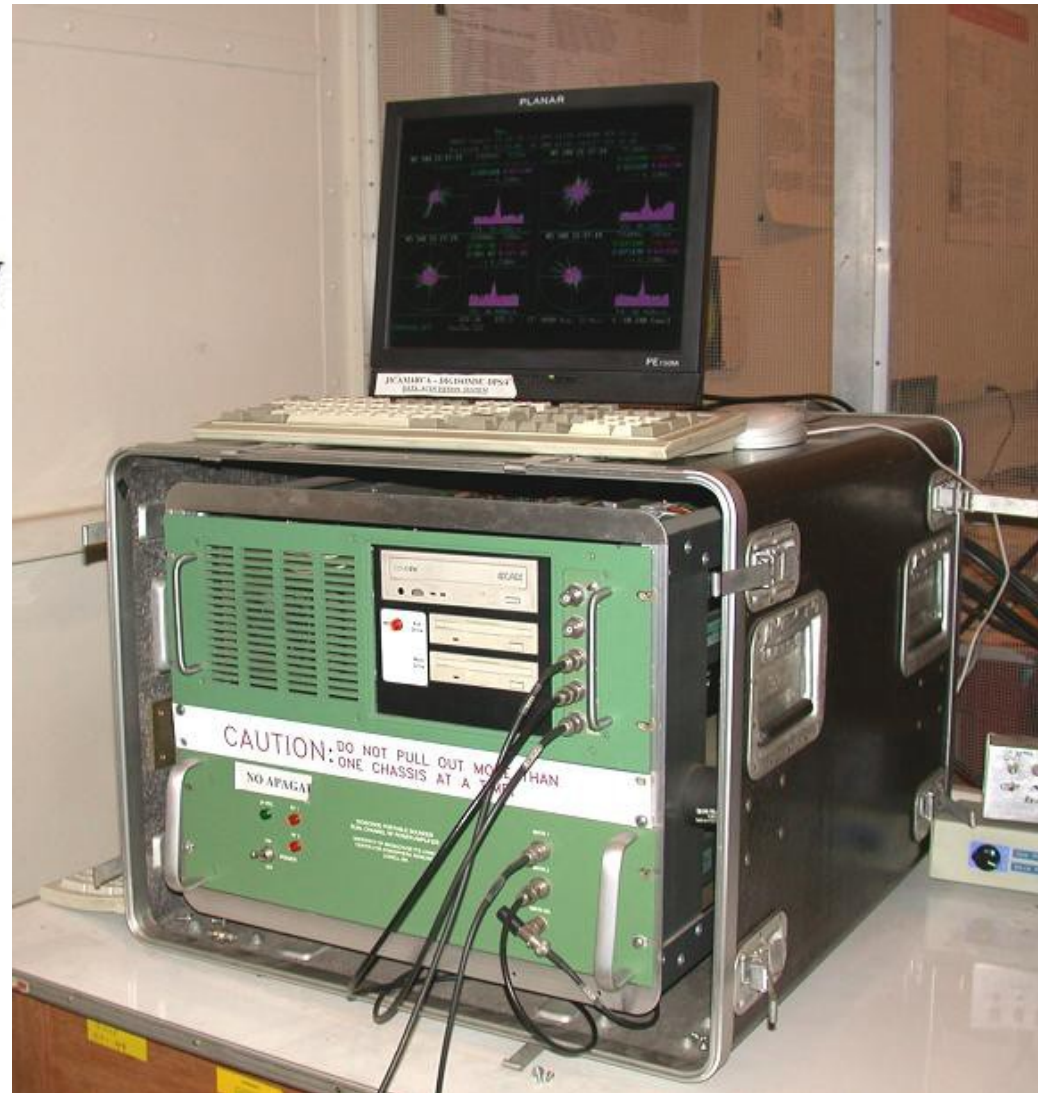
HISTORIAL REVIEW

- 1957-1958, IGY network
- 1964-1988, JRO C4
- 1992 Digisonde DPS-1 setup and start o continuos observations
- 2001, Digisonde upgrade from DPS-1 to DPS-4



OBSERVED PARAMETERS

- 1) Height profile of electron density
- 2) Frequency
- 3) Signal Amplitude
- 4) Wave polarization
- 5) Time delay
- 6) Doppler shift
- 7) Angle of arrival
- 8) Amplitude variations



JICAMARCA PORTABLE DIGISONDE

DPS GENERAL SPECIFICATIONS

TRANSMITTER ANTENNA

Antenna Type : Two Vertical Crossed Rhombic
Tower Dimensions : 20 - 60 m Height

RECEIVER ANTENNAS

Antenna Type : Active Crossed Loops - Turnstile antenna 1.5 m
Antenna Array : 4 antennas in 60m triangle
Preamplifier Sensitivity : -123 dBm

TRANSMITTER RF OUTPUT

Frequency Sweep : 1 - 45 MHz
Peak Pulse Power : 300 W (150 W x 2)

RECEIVER

Frequency Range : 1.0 - 45 MHz
Bandwidth : 34 KHz (5 Km pulse resolution)
Receiver Sensitivity : -130 dBm



JICAMARCA PORTABLE DIGISONDE

SIGNAL PROCESSING

Processors : Two Industrial x586 SBC and
One Texas Instruments TMS320C40 DSP board

Height Range : 0-2560 Km

Height Resolution : 5Km, (250m in high resolution)

Wave Polarization : O/X (right & circular) or linear

Amplitude resolution : 3/8 dB

Doppler Range : +/- 3 Hz to +/- 50 Hz

Doppler resolution : .0125 Hz

OPERATING MODES

Swept Frequency (Electron density profiles)

Multiplexed Swept Frequency (Finer doppler resolution)

Fixed Frequency (For gravity wave and absorption studies)

Plasma Drift (Direction and Velocities)

Multi beam

Precision Group Height

Oblique Incidence sweep

JICAMARCA PORTABLE DIGISONDE

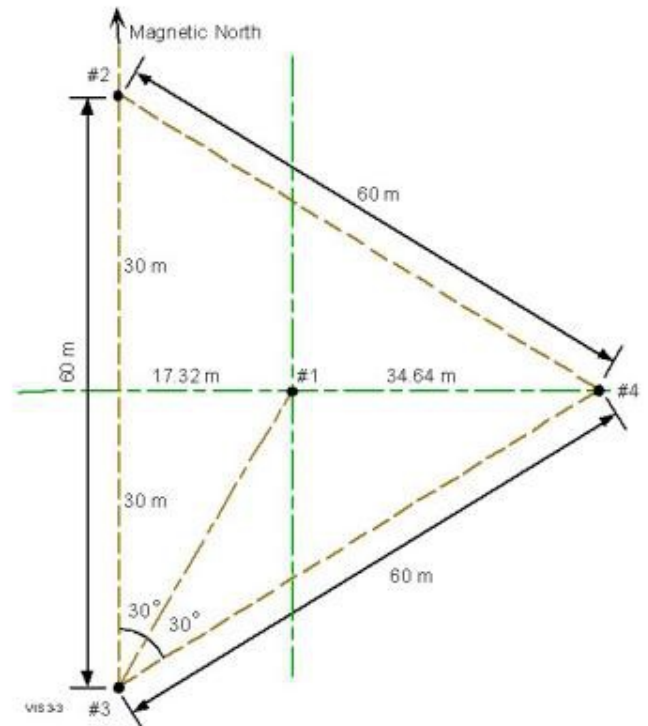
TRANSMITTER AND RECEIVER ANTENNAS



JICAMARCA PORTABLE DIGISONDE

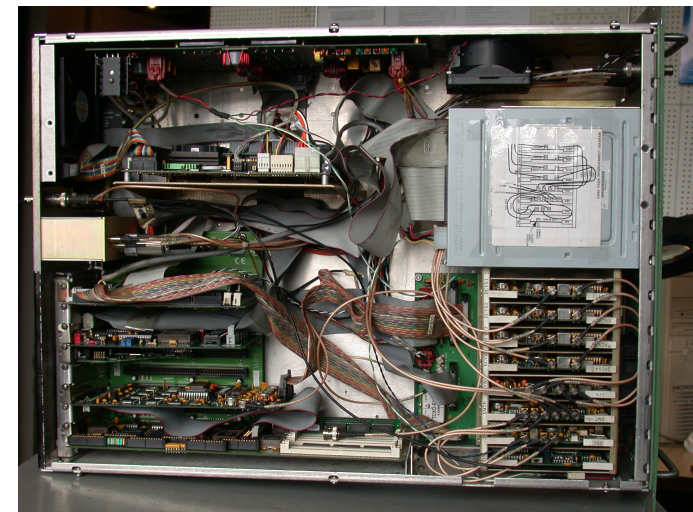
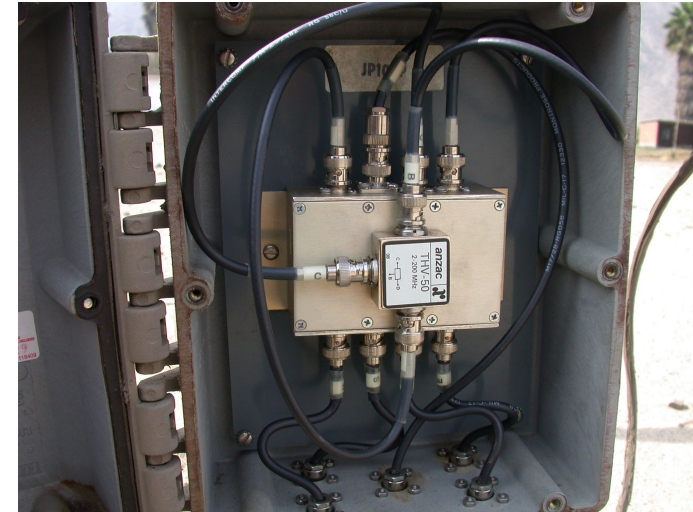
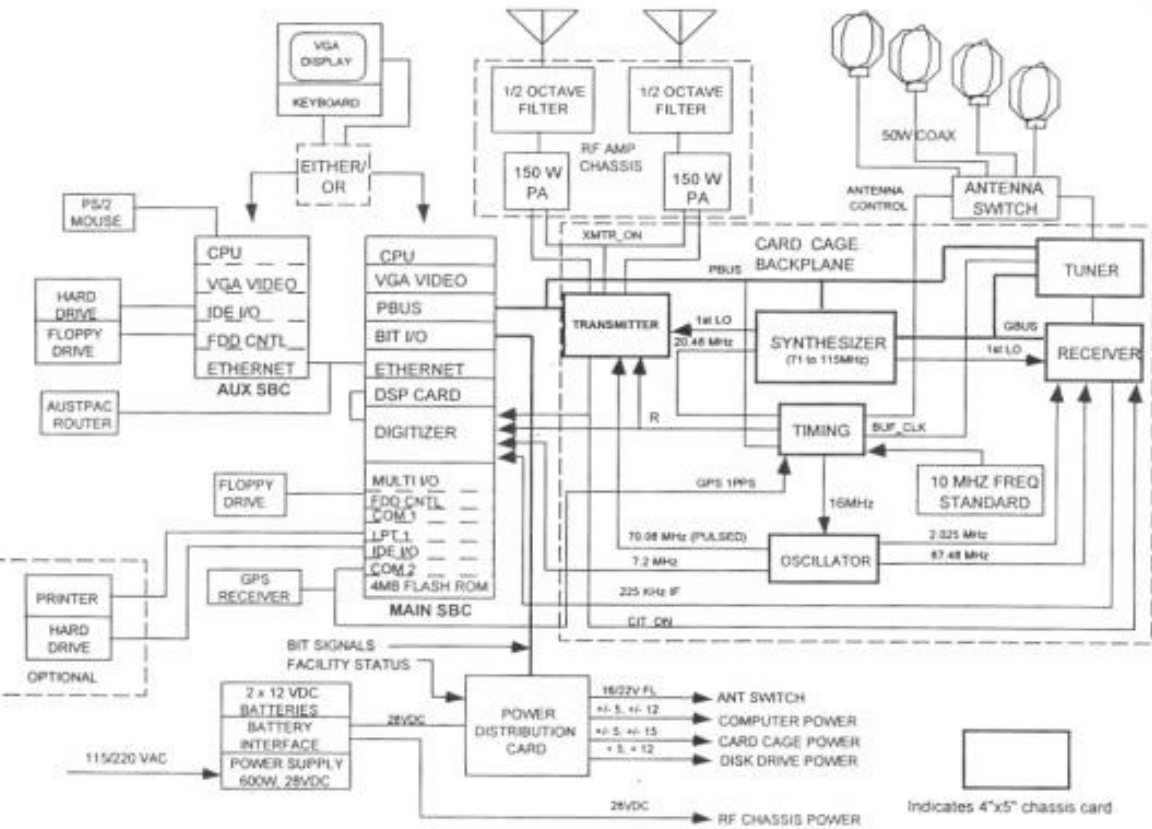


RECEIVE ANTENNA LAYOUT



JICAMARCA PORTABLE DIGISONDE

DIGISONDE SYSTEM DIAGRAM



JICAMARCA PORTABLE DIGISONDE

Jicamarca, Peru



Jicamarca
Radio
Observatory

Instituto Geofísico
del
Perú

DPS - 4
Digisonde Portable Sounder



University of Massachusetts Lowell
Center for Atmospheric Research

REAL-TIME AND RETRO DATA	SYSTEM STATUS AND CONTROL
▼ <i>Latest Ionogram</i> ▼ <i>Survey of previous ionograms</i> ▼ <i>SAO Database</i> ▼ <i>Daily Drift Velocity Plot</i> ▼ <i>Drift Velocity History</i> ▼ <i>Latest Skymap</i> ▼ <i>Skymap History</i> ▼ <i>Latest Directogram</i> ▼ <i>Directogram History</i> ▼ <i>Contact</i>	Storage status STORAGE STATUS Tue Nov 05 12:40:22 2013% Tape No Tape backup HD Tue Nov 05 12:40:22 2013% RMD Sat Nov 02 23:49:06 2013% ▼ <i>Program / Schedule Editor</i> ▼ <i>Dispatcher Screen Output</i> ▼ <i>Latest System Status (BIT)</i> ▼ <i>ARMENU Editor</i>

JICAMARCA PORTABLE DIGISONDE



Station YYYY DAY DDD HHMM P1 FFS S AXN PPS IGA PS
Jicamarca 2008 Nov01 306 2030 RSF 1 714 75 20+ A1

foF2 8.050
foF1 4.35
foF1p N/A
foE 2.82
foEp 2.87
fxI 8.40
foEs 3.10
fmin 2.00

MUF(D) 21.73
M(D) 2.72
D 3000.0

h'F 180.0
h'F2 320.0
h'E 95.0
h'Es 105.0

hmF2 341.7
hmF1 185.9
hmE 97.3
yF2 143.4
yF1 75.1
yE 13.5
B0 163.0
B1 1.93

C-level 11

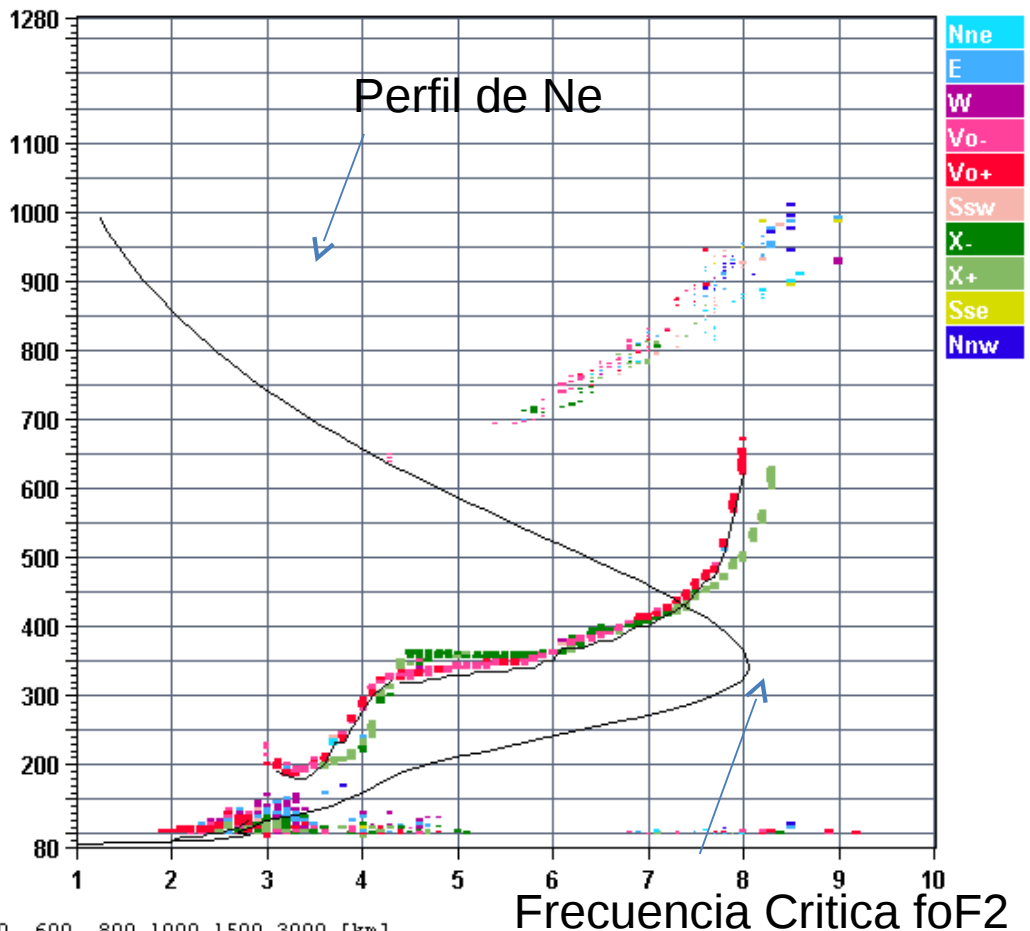
Auto:

Artist4

200207

D 100 200 400 600 800 1000 1500 3000 [km]
MUF 8.4 8.5 8.8 9.3 10.0 11.0 14.1 21.7 [MHz]

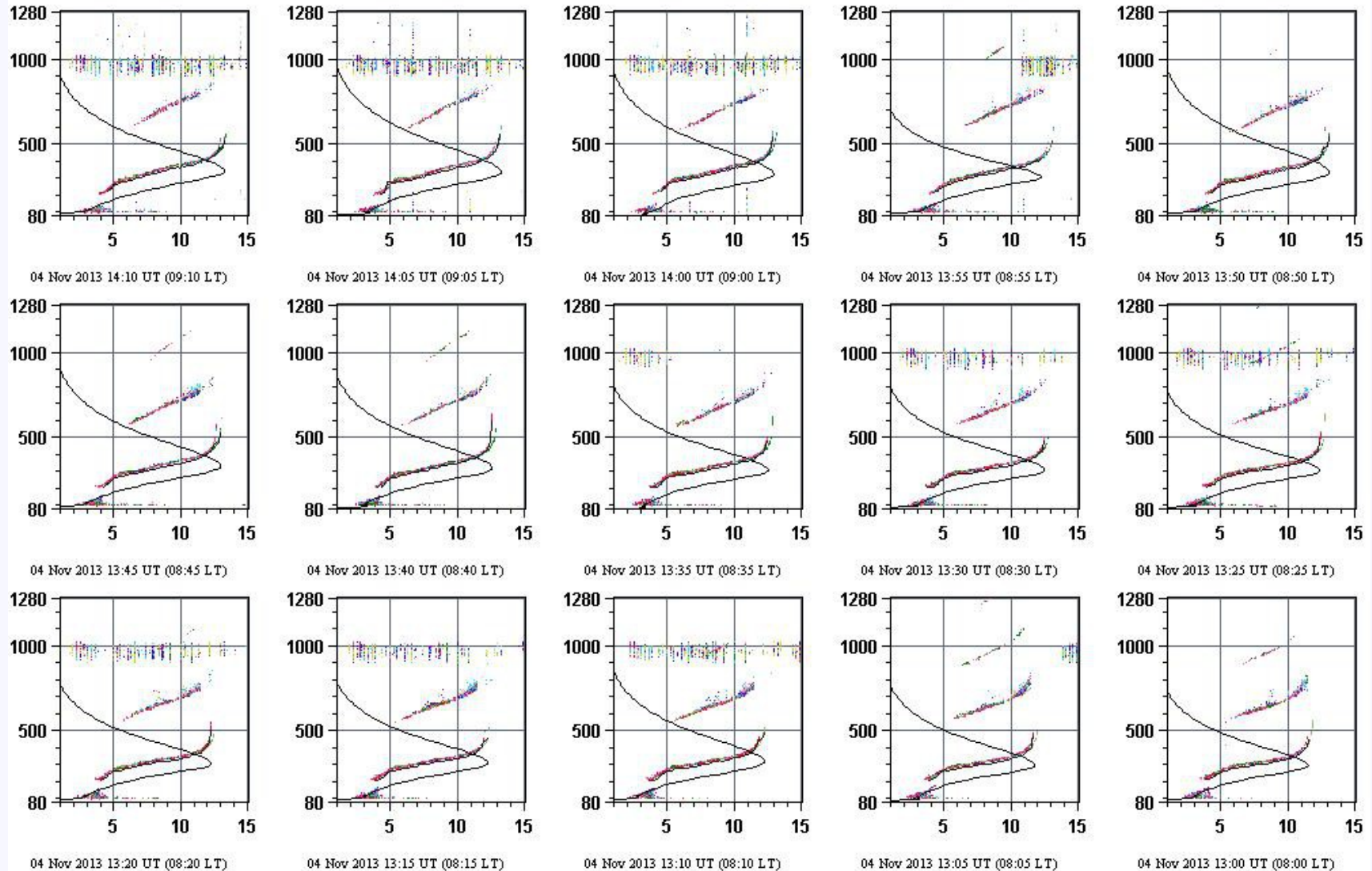
J191J_2008306203000.RSF / 90fx256h 100 kHz 5.0 km / DPS-4 J191J 012 / 12.0 S 283.2 E



Ion2Png v. 1.2.03

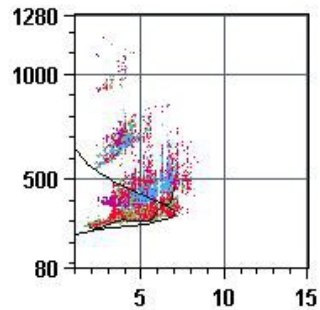
Digisonde Data at Jicamarca, Peru (GMT: -5)

[Latest: 5 Nov\(309\) 12:40 UT](#) * [Later: 4 Nov\(308\) 15:25 UT](#) * [Earlier: 4 Nov\(308\) 12:55 UT](#) * [Earliest: 2 Nov\(306\) 13:45 UT](#)

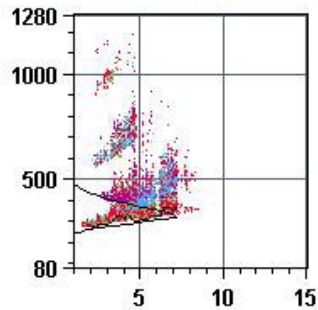


Digisonde Data at Jicamarca, Peru (GMT: -5)

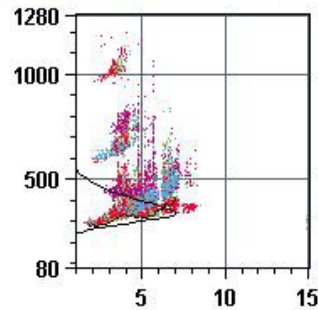
[Latest: 5 Nov \(309\) 12:40 UT](#) * [Later: 4 Nov \(308\) 05:25 UT](#) * [Earlier: 4 Nov \(308\) 02:55 UT](#) * [Earliest: 2 Nov \(306\) 13:45 UT](#)



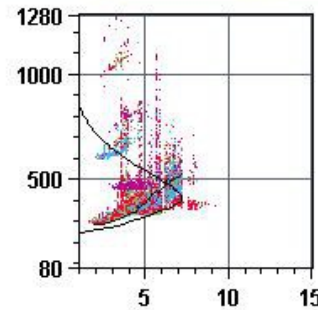
04 Nov 2013 04:10 UT (-23:10 LT)



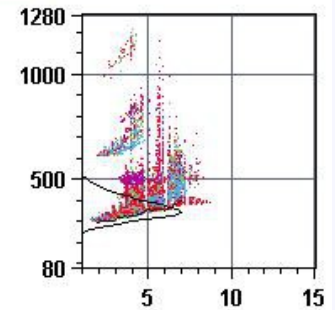
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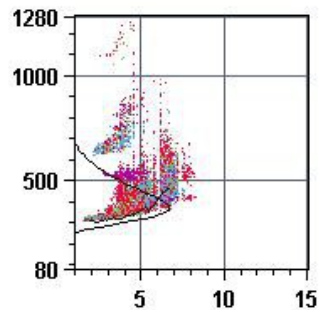
04 Nov 2013 04:00 UT (-23:00 LT)



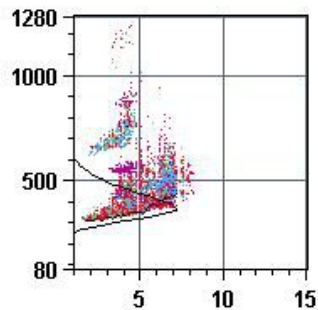
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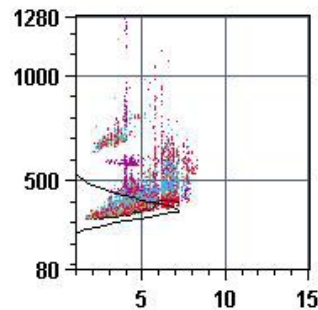
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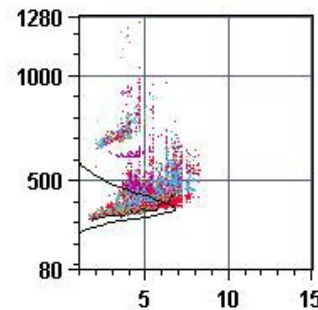
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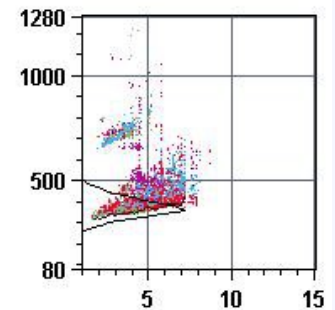
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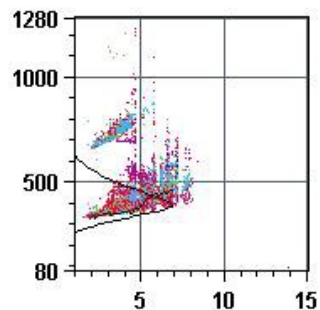
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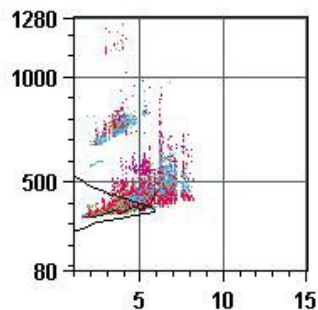
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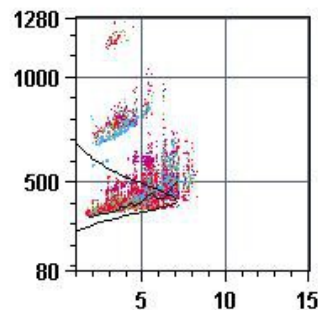
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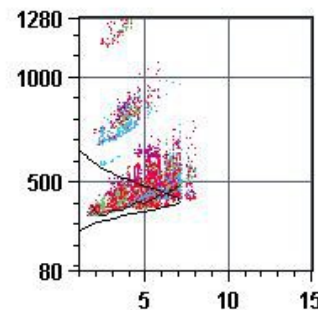
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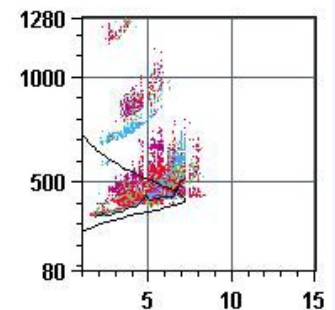
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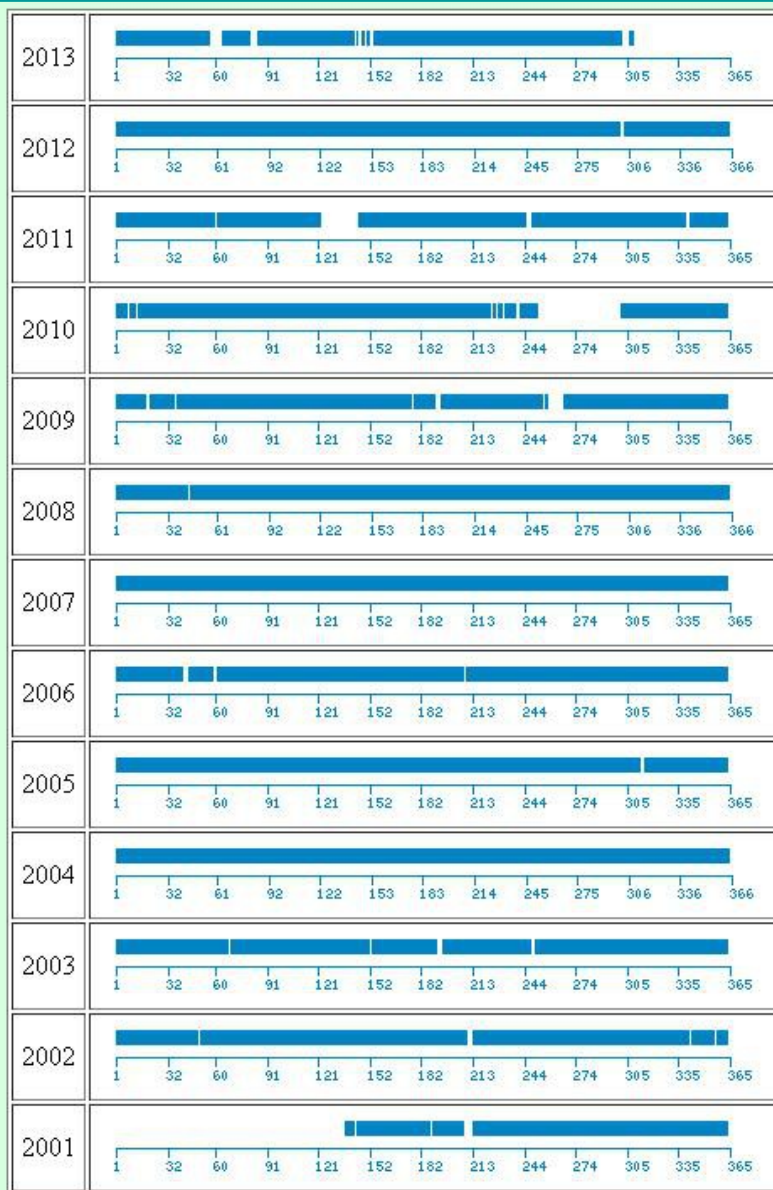


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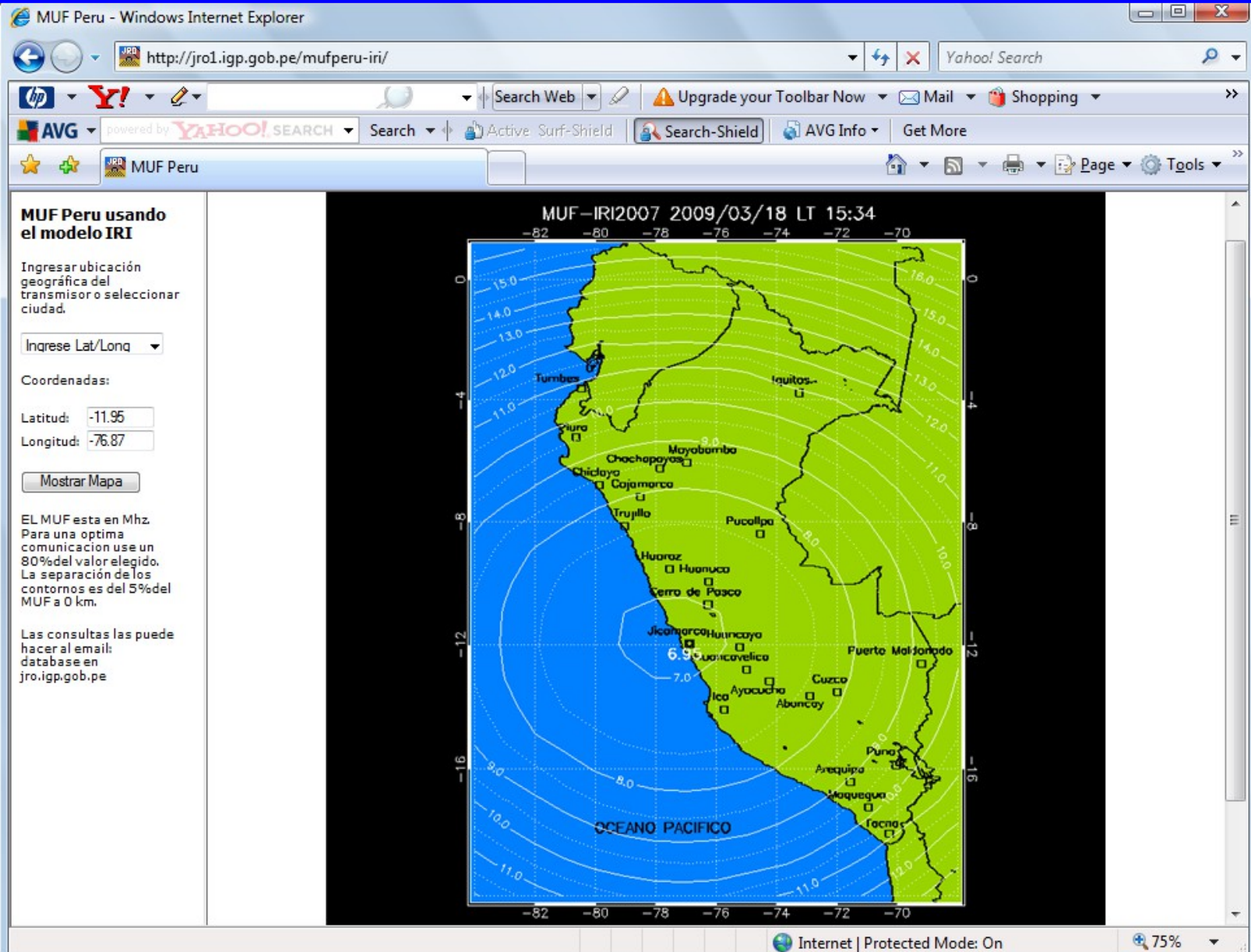
04 Nov 2013 03:00 UT (-22:00 LT)

DIGISONDE LOCAL SAO DATABASE

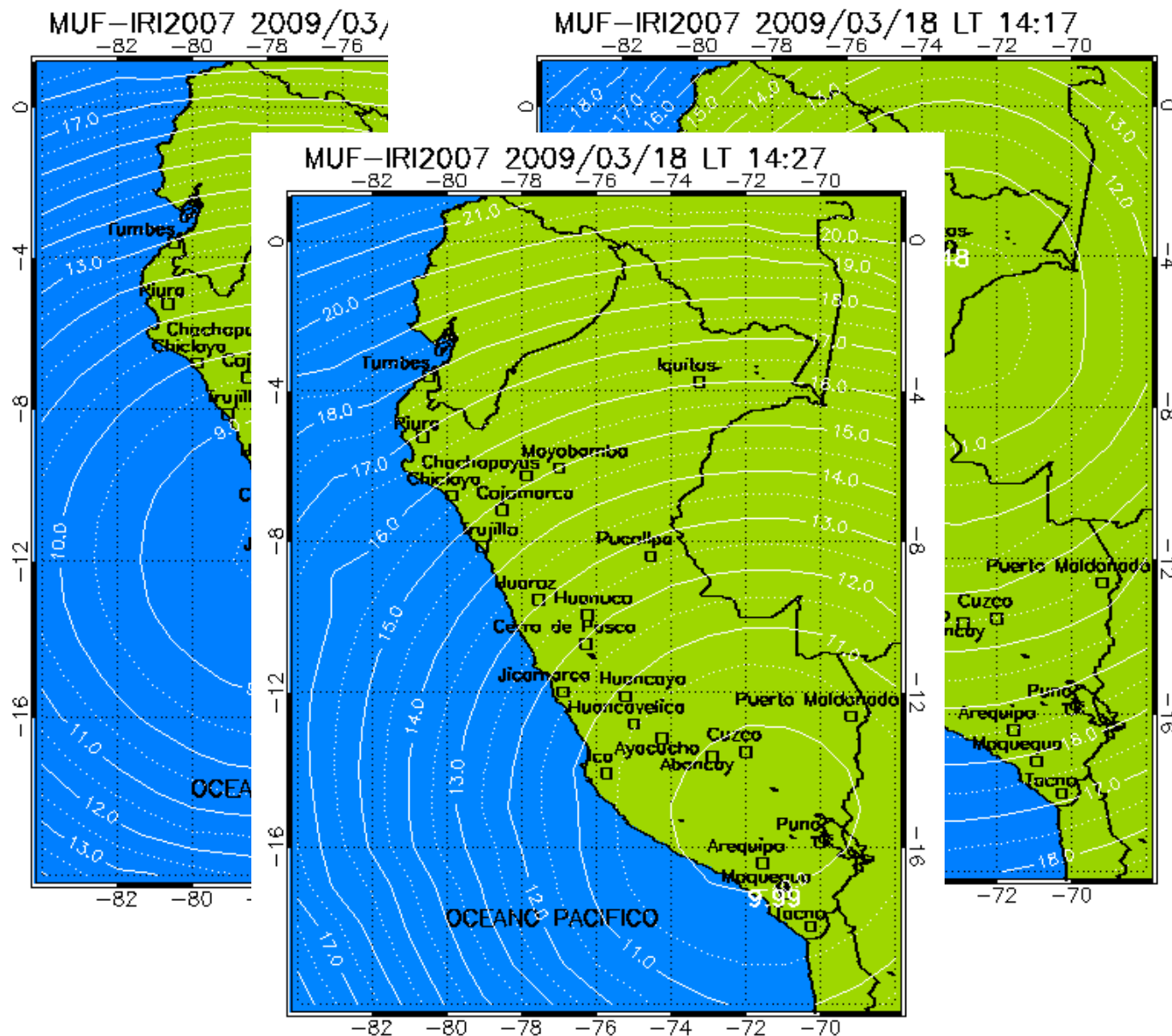


Apr 1 = Day 091-092
 May 1 = Day 121-122
 Jun 1 = Day 152-153
 Jul 1 = Day 182-183
 Aug 1 = Day 213-214
 Sep 1 = Day 244-245
 Oct 1 = Day 274-275
 Nov 1 = Day 305-306
 Dec 1 = Day 335-336

MUF Peru using IRI07



MUF Peru using IRI07



GEOMAGNETIC OBSERVATIONS 2013

PRESENT STATUS

- Observatory and stations network
- Instruments description
- Observational Projects
- WEB Database
- Instrumental developments

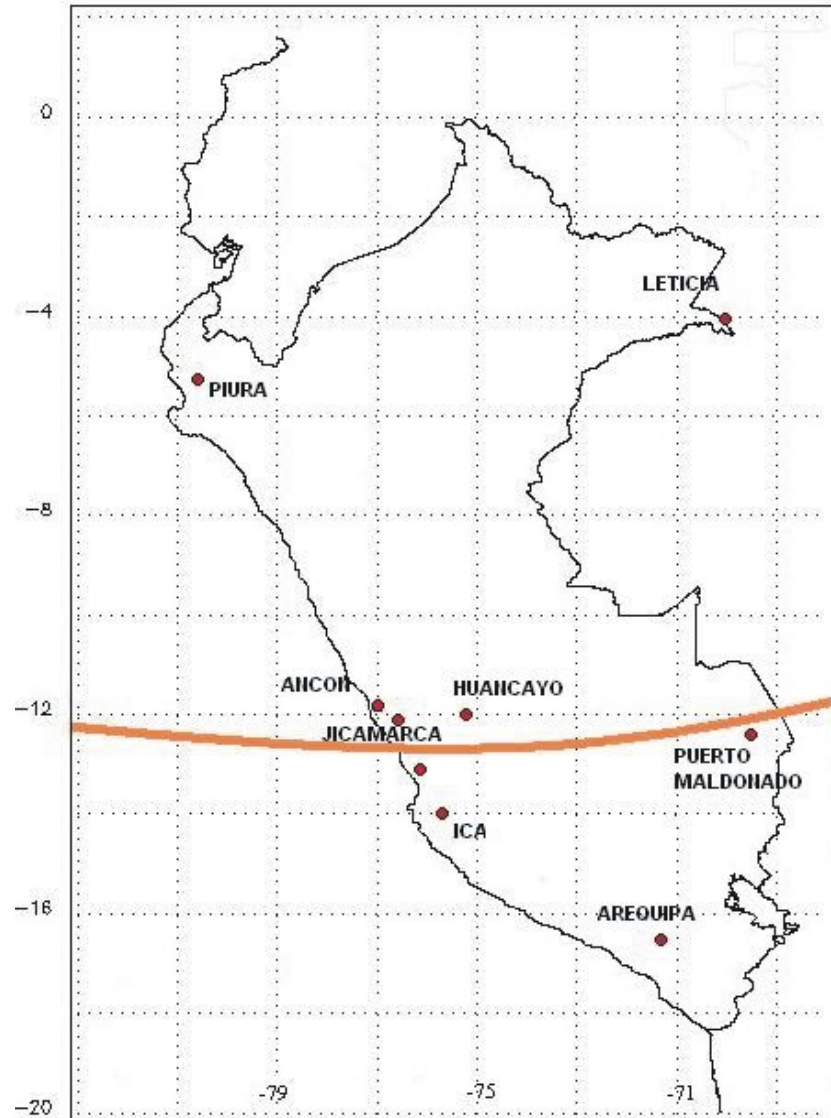
GEOMAGNETIC OBSERVATIONS

Geographical locations

Piura (-5.17 80.67)
Leticia (-4.16 -69.95)
Ancon (-11.77 -77.14)
Huancayo (-12.03 -75.32)
Jicamarca (-11.56 -77.03)
Canete (-13.11 -76.38)
Guadalupe (-13.98 -75.77)
Puerto Maldonado (-12.16 -69.18)
Arequipa (-16.46 -71.49)

Current special projects

MAGDAS Kyushu (Ancon 2002)
CPMN, Kyushu U. (CNT, GUA – 1994)
OHBM, ERI U. Tokyo, (HUA – 1997)
INTERMAGNET, (HUA. 2003)
SMALL, UCLA U. (Jicamarca 1997)
LISN, (Pto. Maldonado, Leticia, CASLEO), 2008
IGP DeltaH, (JIC-PIU) , 2000
 !



GEOMAGNETIC OBSERVATIONS

Station	Variation Instruments	Time	Absolute Instruments	Starting Date	Ending Date
Leticia (LET) (-4.19 - 69.94)	XYZ Fluxgate LISN	1 Sec.	N/A	March 2009	Operating at
Piura (PIU) (-5.17 - 80.67)	XYZ Fluxgate LISN	1 Sec.	N/A	September 2000	Operating at present
Ancon (ANC) (-11.77 -77.14)	XYZ Fluxgate MAGDAS HDZ Fluxgate (TKU)	1 Sec.	N/A	January 1991	Operating at present
Huancayo (HUA) (-12.03 -75.32)	HDZ Fluxgate (TKU) XYZ Fluxgate (OHBM) * PPM (OHBM) * INTERMAGNET	1 Hr. 5 Sec. 1 Sec. 1 Min.	Bartington, THEO 010 Barringer M320, PPM Scintrex Envi Mag, PPM 2/Week	March 1922 April 1997 July 1997	Operating at present
Jicamarca (JIC) (-11.56 -77.03)	XYZ Fluxgate UCLA	1 Sec.	Bartington Mag-01, DI Theodolite	January 1997	Operating at present
Pto.Maldonado (PMO) (-12.58 -69.18)	XYZ Fluxgate LISN	1 Min.	N/A	March 2008	Operating at present
Ica (ICA) (-13.98 -75.77)	XYZ Fluxgate MAGDAS (KYU)	1 Sec.	N/A	June 2010	Operating at present
Arequipa (ARE) (-16.46 -71.49)	H,D,Z La Cour , Photographic type, XYZ Fluxgate	1 Sec.	DI Fluxgate - Ruska Geometrics G816, PPM 1/Week	April 1957	Operating at present

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

GEOMAGNETIC OBSERVATIONS SECULAR VARIATIONS

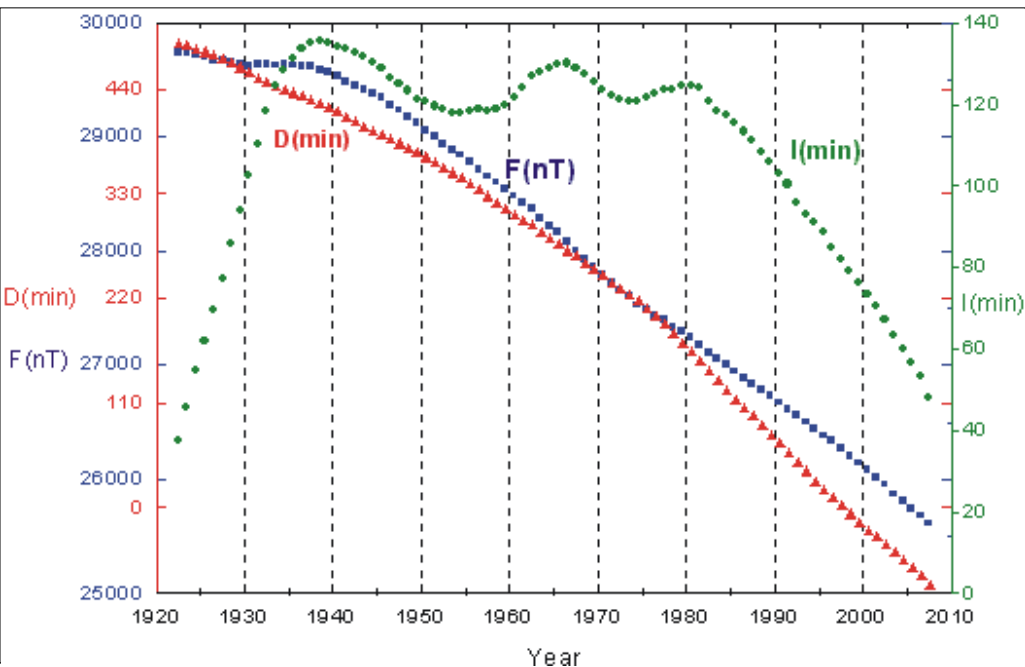
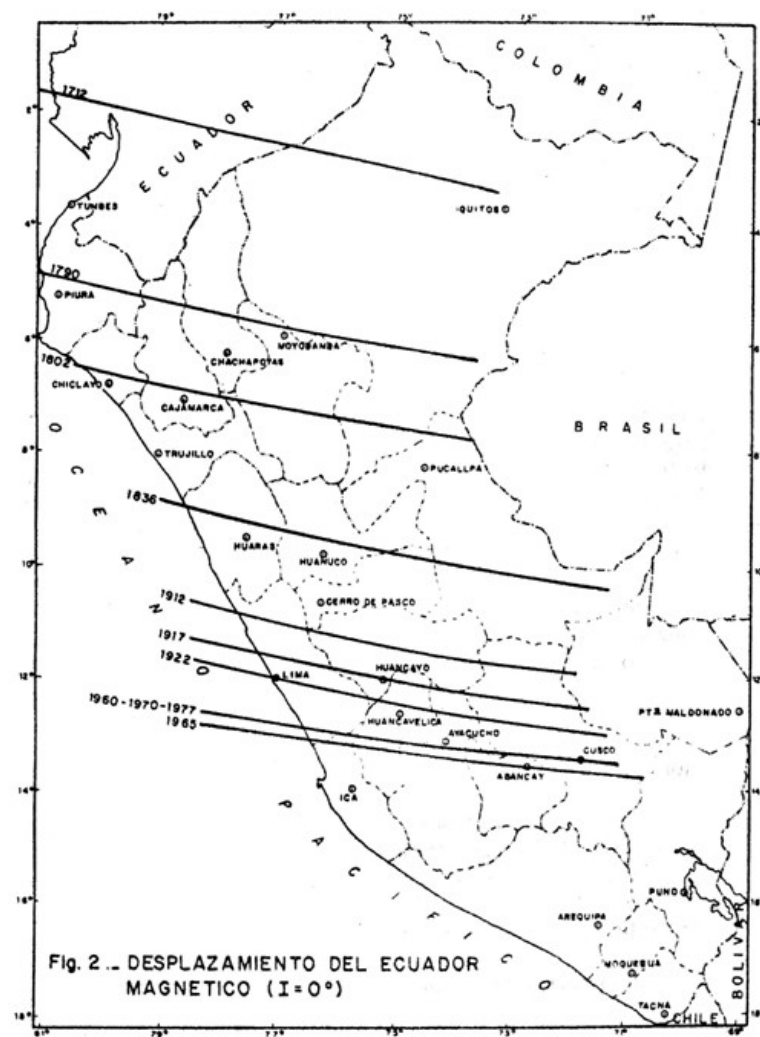


Figure 5. Secular variation observed at Huancayo geomagnetic observatory since its establishment in 1922. F and D components are decreasing continuously while Z and Inclination are decreasing since 1981.

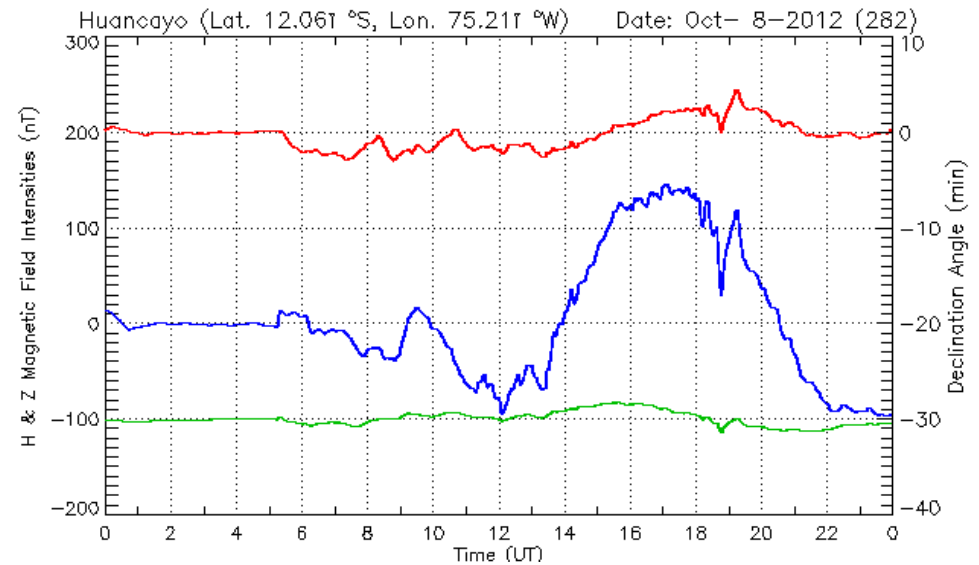
Magnetic Equator displacement 1712-1965



GEOMAGNETIC OBSERVATIONS AT HUANCAYO

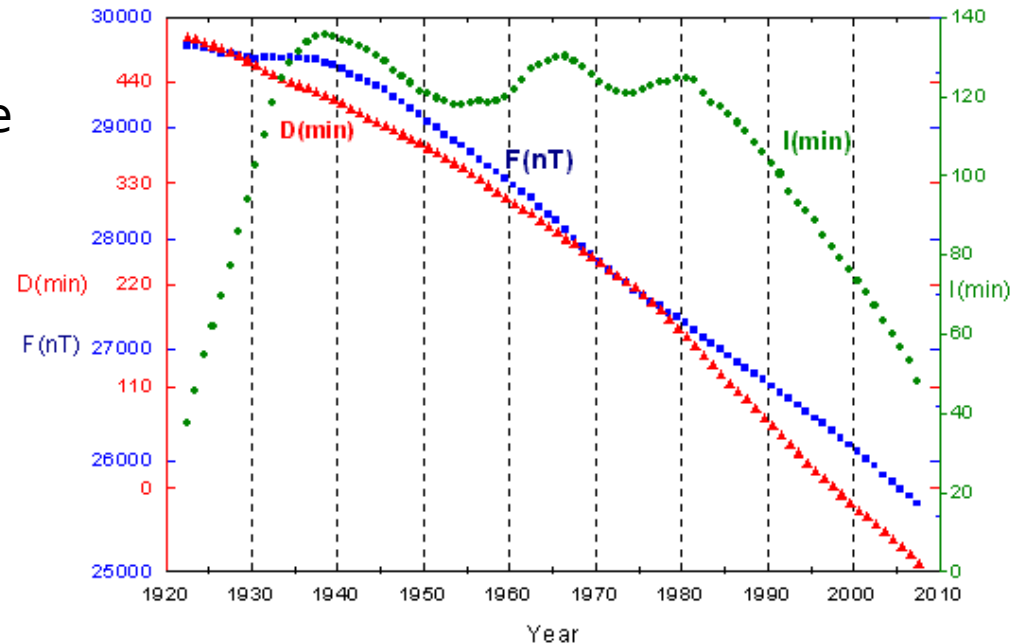
DIURNAL VARIATIONS

Comportamiento de la variación diurna mostrando el incremento de la amplitud de la componente H por efecto del Electrochorro Ecuatorial



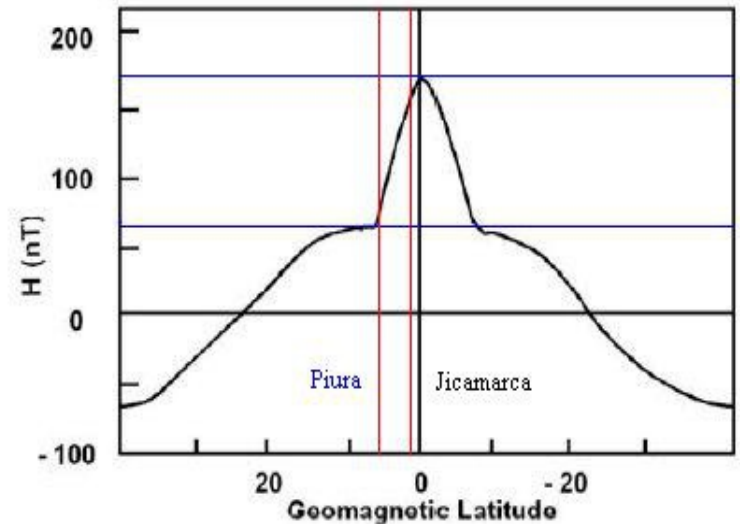
SECULAR VARIATION

Curvas de variación secular de la Declinación magnética (D), Inclinação magnética (I) y Fuerza Total (F) desde 1922 a la actualidad



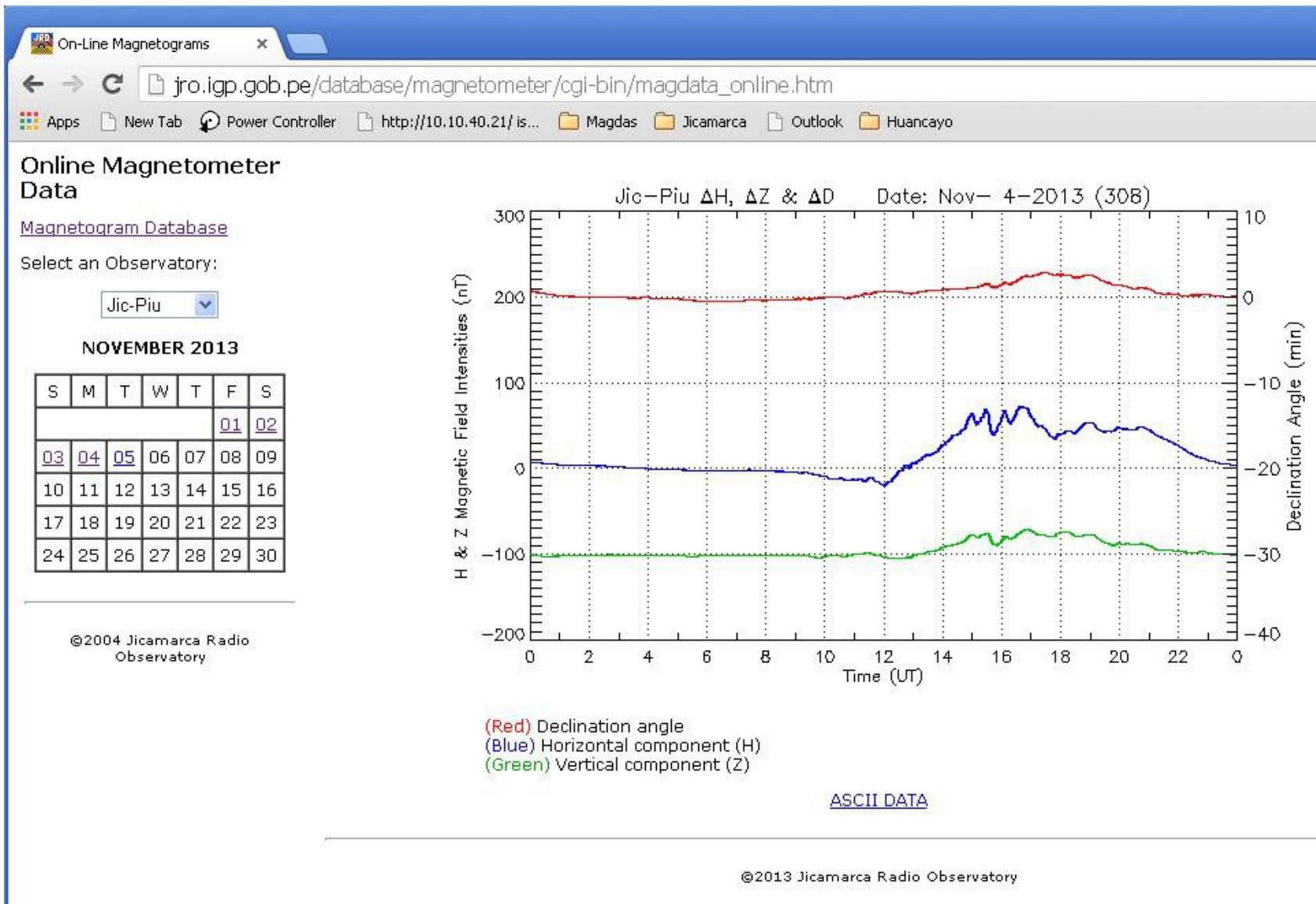
Delta H Observations JIC - PIU

- Amplitud cerca del ecuador se superpone a la variación global y disminuye gradualmente en un rango de 6° .
- Sustraer la amplitud desde la observada entre 6° y 9° alejado del ecuador magnético
- La diferencia está directamente relacionada con la contribución del electrochorro.
- El valor de ΔH resultante es relativo a las corrientes ionosféricas del electrochorro; por tanto relativo al campo eléctrico Este-Oeste.

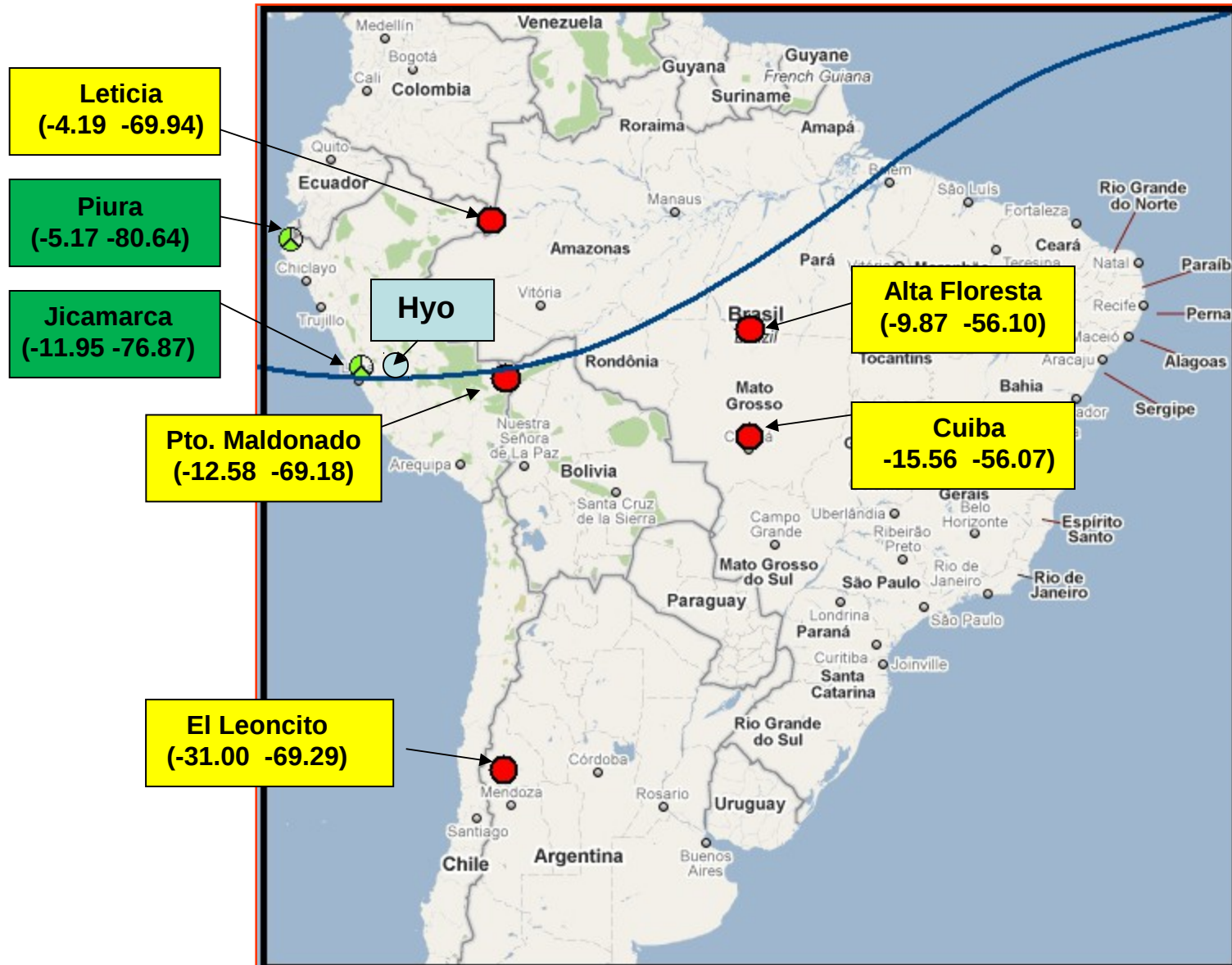


Richmond, 1973

Delta H Observations JIC - PIU



LOW LATITUDE IONOSPHERIC SENSOR MAGNETOMETERS NETWORK



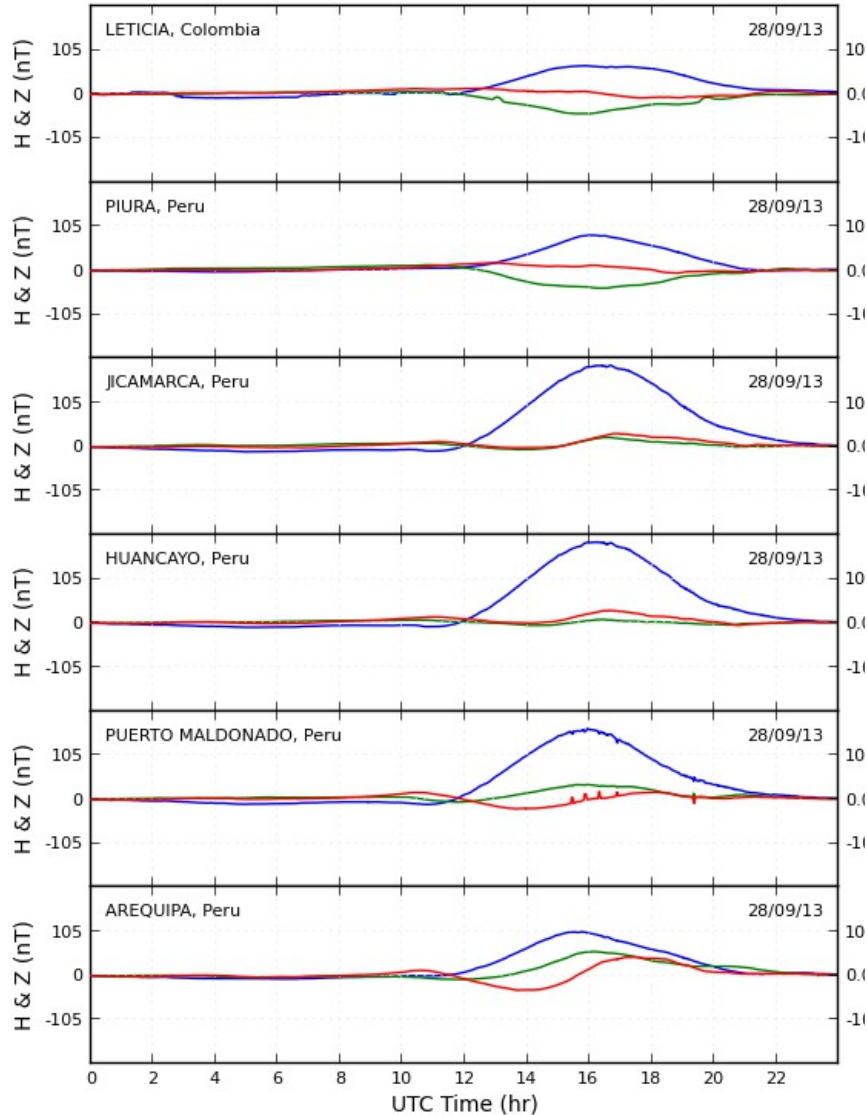
LOW LATITUDE IONOSPHERIC SENSOR MAGNETOMETERS NETWORK

OPERATING STATUS (As of August 2013)

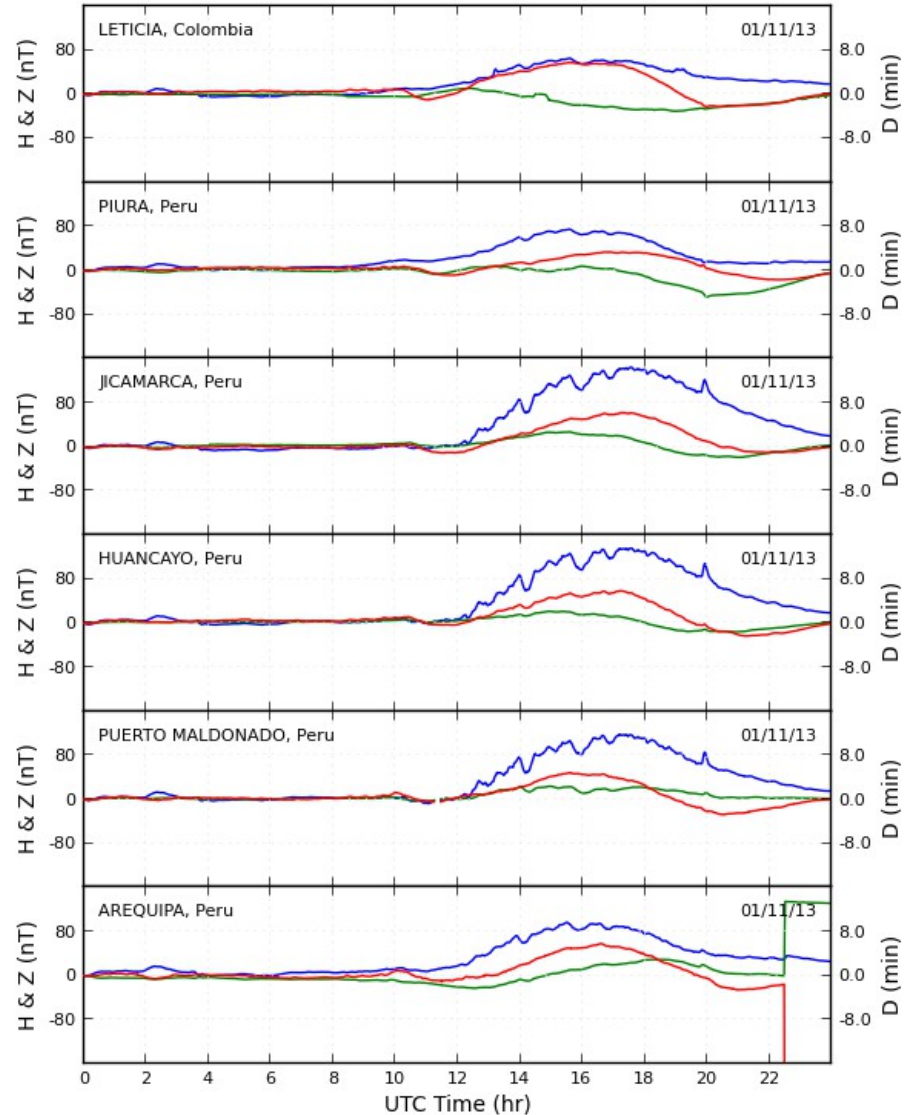
Station	Variation Instrument	Time Res.	Starting Date	Operating Status
Leticia (LET) Colombia (-4.19 -69.94)	HDZ LISN Magnetometer	1 Sec.	April 2009	Operating at present
Puerto Maldonado (PMO) - Peru (-12.58 -69.18)	HDZ LISN Magnetometer	1 Sec.	March 2008	Operating at present
El Leoncito (LEO) Argentina (-31.00 -69.29)	HDZ LISN Magnetometer	1 Sec.	September 2008	Operating at present
Alta Floresta (ALF) - Brasil (-9.87 -56.10)	HDZ LISN Magnetometer	1 Sec.	November 2010	Operating at present
Cuiba (CBA) Brasil (-15.56 -56.07)	HDZ LISN Magnetometer	1 Sec.	November 2010	Operating at present

LISN Data Collection and Monitoring

H--- Z--- D---

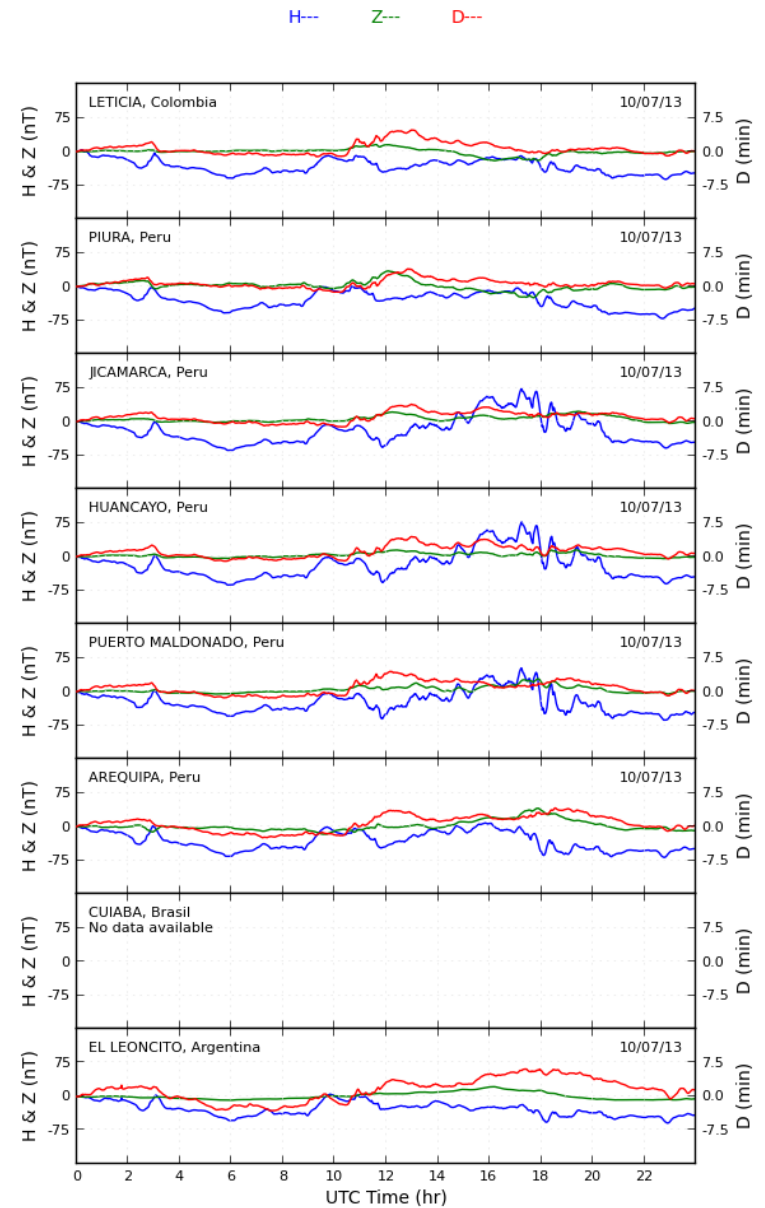
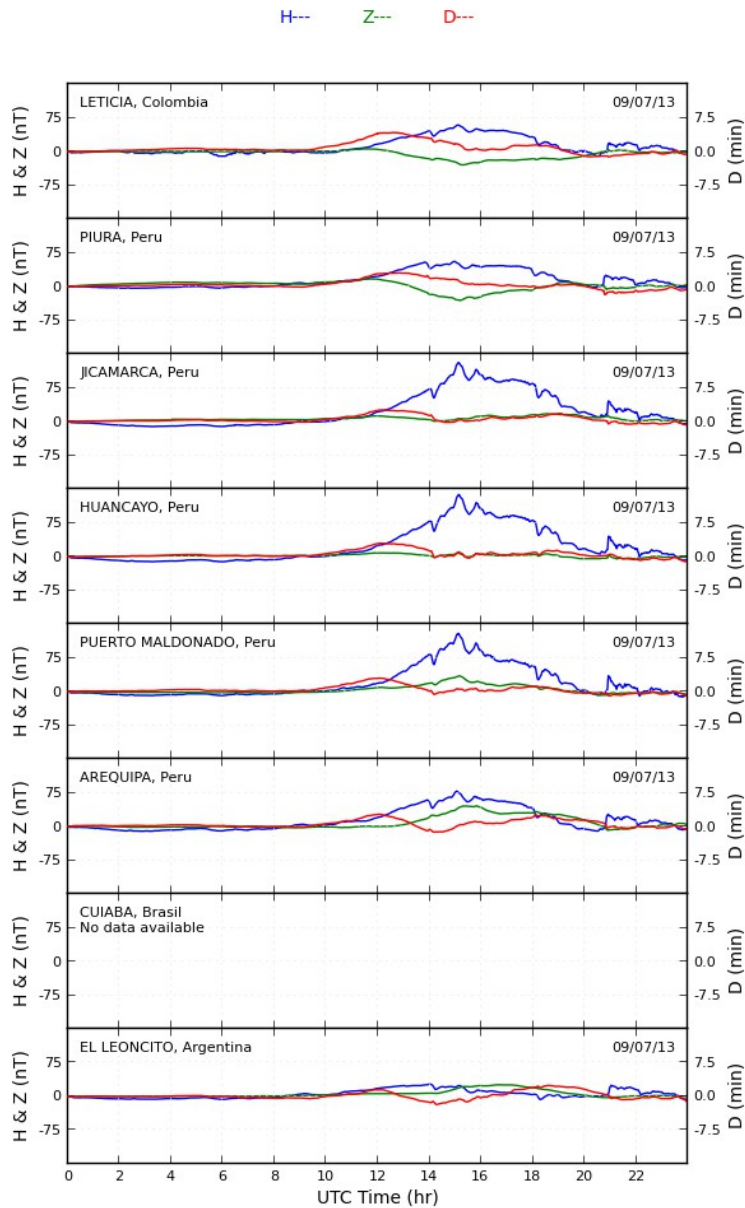


H--- Z--- D---



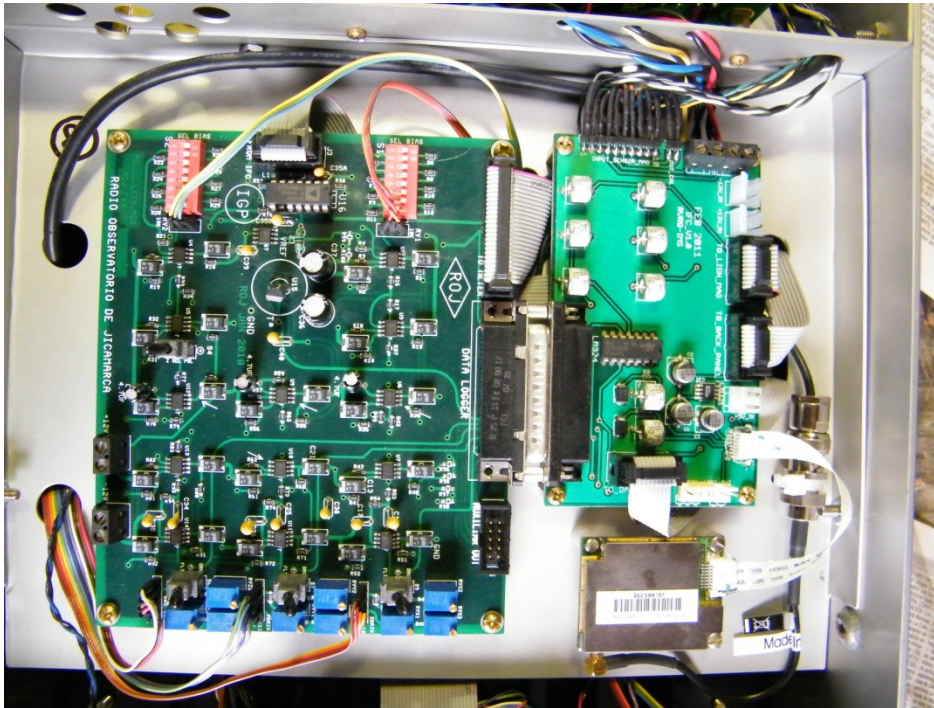


LISN Data Collection and Monitoring



JRO Instrumental Developments

JROMAG Digital Magnetometer



- XYZ Fluxgate sensors
- 0.1 nT Resolution
- 1 Second recording time
- +/- 70000nT range



JRO GEOMAGNETIC WEB DATABASE



Online Magnetometer Data

[Magnetogram Database](#)

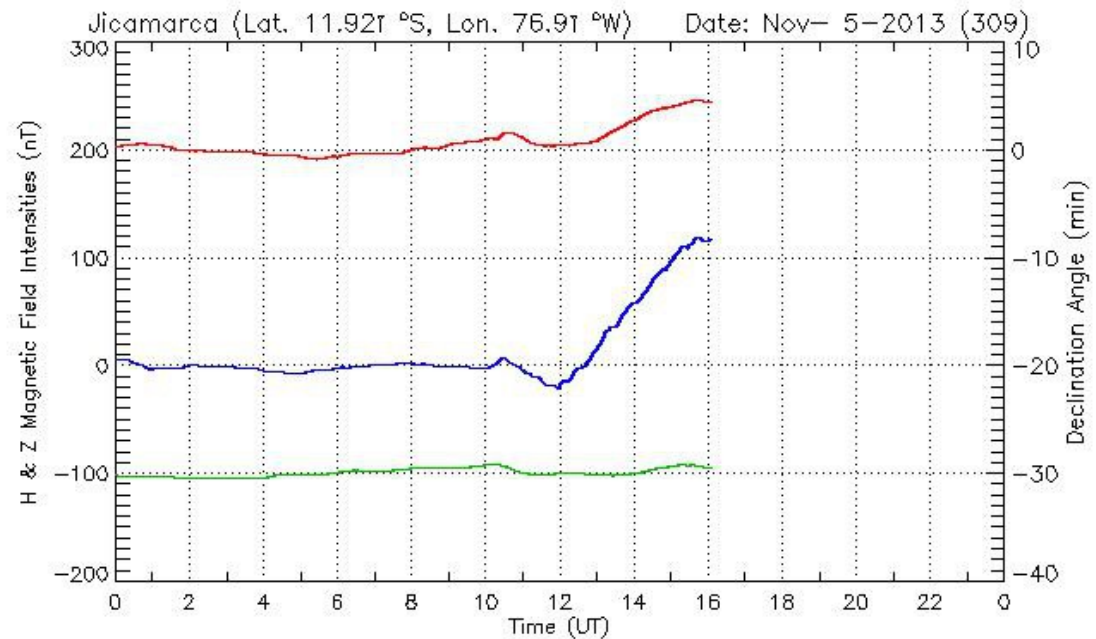
Select an Observatory:

Jicamarca

NOVEMBER 2013

S	M	T	W	T	F	S
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

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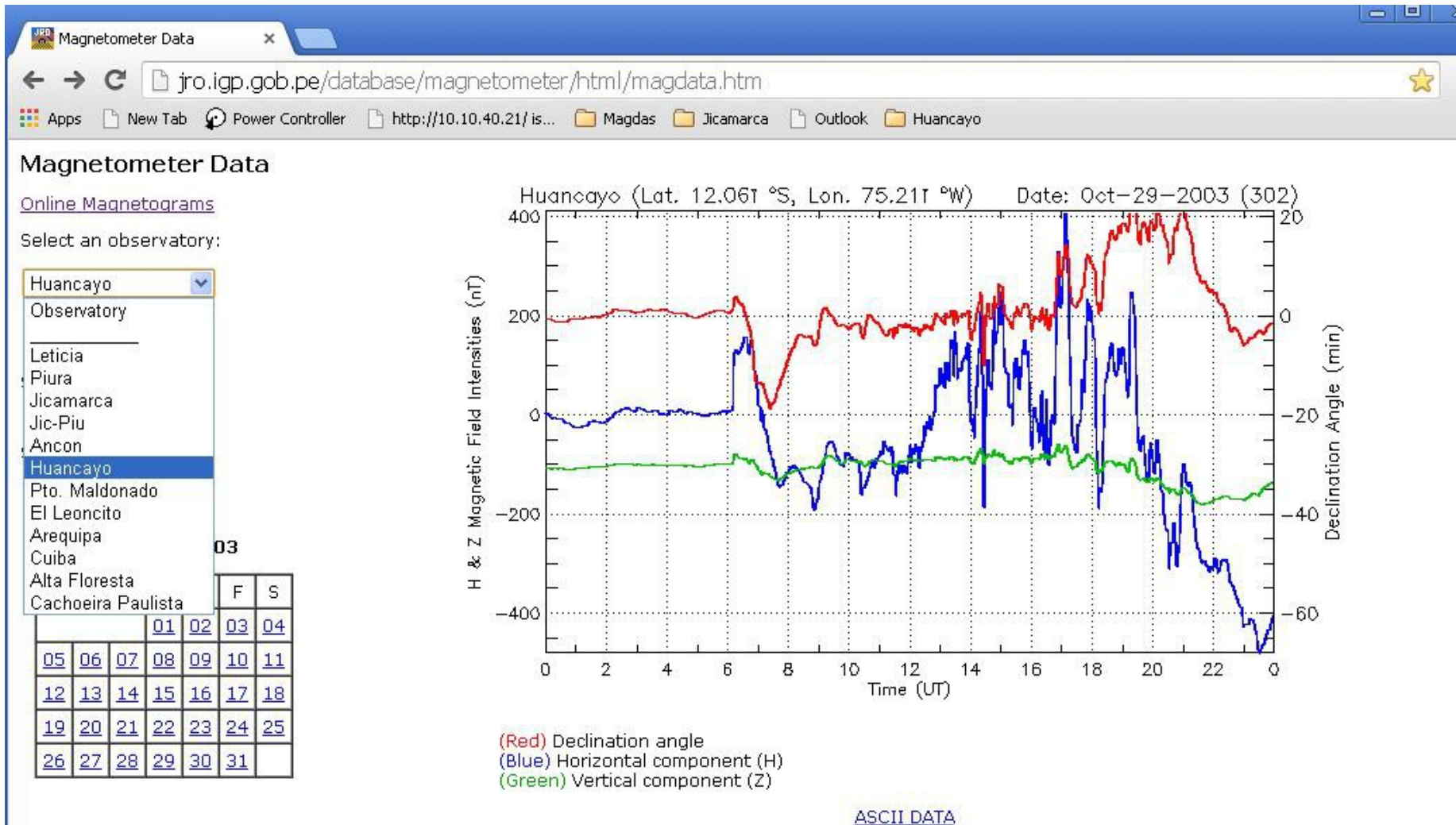


(Red) Declination angle
(Blue) Horizontal component (H)
(Green) Vertical component (Z)

[ASCII DATA](#)

Jicamarca's magnetometer will reload in seconds.

JRO GEOMAGNETIC WEB DATABASE



JRO GEOMAGNETIC OBSERVATIONS

MUCHAS GRACIAS !!!