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**MAGNETIC OBSERVATORY OF TRELEW AND LAS ACACIAS
REVIEW OF TECHNICAL DESCRIPTION
HELIOPHYSICAL 2007 YEAR PROJECT**

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ABSTRACT. This technical report is a brief historical and up to day description of Trelew and Las Acacias Permanenet Magnetic Observatories. Their importance in the study of South Atlanatic Magnetic Anomaly and the results of the studies in the Solar – Earth conection and Space Weather relationship are displayed.

INTRODUCTION.

The Trelew (TRW, Lat.: $-43^{\circ}.27$; Long.: $294^{\circ}.62$) and Las Acacias (LAS, Lat.: -35.01 ; Long.: $302^{\circ}.31$) Magnetic Observatories was both founded by Dr. Leonidas Slaucitajs, TRW in 1957 and LAS in 1961. The firsts operators in both observatories was Profesors Hulda Hartmann and Oscar Sidoti, following in 1959 Prof. Angel Pelliciuoli in TRW up to 1994, and in LAS up to 1997 Oscar Sidoti. Actually the operator of TRW is the technician Sebastián Pelliciuoli, and in LAS are Professor Ezequiel García and Technician Nicolás Quaglino. TRW and LAS magnetic observatories a part of the Dept. of Geomagnetism and Aeronomy (DGA). The head of DGA is the Professor Julio César Gianibelli. In 1993 a convenion of cooperation was established by DGA and the Royal Meterological Institute of Belgium by the Professor Julio César Gianibelli (DGA) y Dr. Jean Rasson (RMI).

TRW and LAS magnetic observatories are in the geomagnetic South Atlantic Anomaly (SAA), is the most big anomaly in Total Magnetic Intensity of the Earth Magnetic Field. The focus of SAA lies in the region covered by the Brasil, Uruguay and Argentine countries. TRW, LAS and Vassouras Magnetic Observatory of Brasil (VSS.: Lat.: $-22^{\circ}.4$; Long.: 316.35), are in the focus of SAA. Figure 1 shows the position of VSS, LAS, and TRW observatories over the isodinamics map of the IGRF2000, In the year 2003 TRW was incorporated in the INTERMAGNET network. Figure 2 shows the Magnetic Observatories of this network.

THE HISTORICAL DATA.

TRW produced from 1957 to 2001, and LAS, from 1961 to 1999, magnetograms of Declination (D) and, Horizontal (H) and Vertical (Z) components, with absolute base line determinations by means of Quartz Horizontal Magnetometer for D and H components and Balance Magnetic for Z, in both Observatories. This magnetograms are in the DGA archives.

In 1993 Dr. Jean Rasson installed the first digital sensor in TRW. The sensors are in operation and consist of a flux-gate sensors for D and Inclination (I) and a absolute proton precession magnetometer for Total Magnetic Intensity F. The electronic was developed in the RMI with the direction of Dr. Jean Rasson. The temporal resolution is 1 min for all systems.



In 2000 Dr. Jean Rasson installed a second group of flux-gate variometer sensor of D, I, and F with the same temporal resolution, 1 min. The absolute measurement of base line are determined by flux-gate theodolite (See the Fig 10 on page 5), also produced by RMI.

Figure 3 shows an aerial view of TRW, and figure 4 the houses of sensors (big house in middle of figure 4) and absolute determinations at the side of figure 4.



FIGURE 3



FIGURE 4

The followings figures 5 and 6 shows the flux gate sensors of D and I, and for D, I and F respectively, all with a temporal resolution of 1 min.

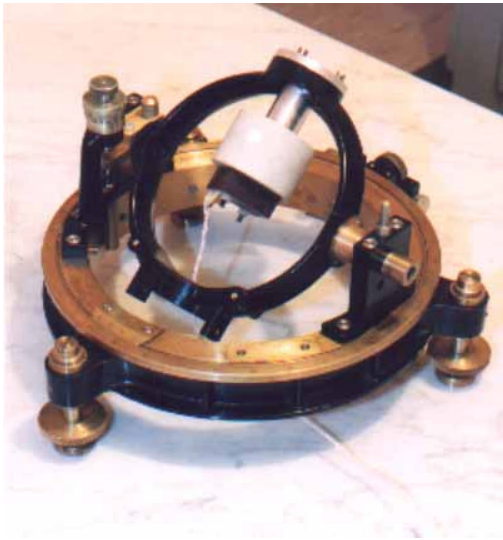


FIGURE 5

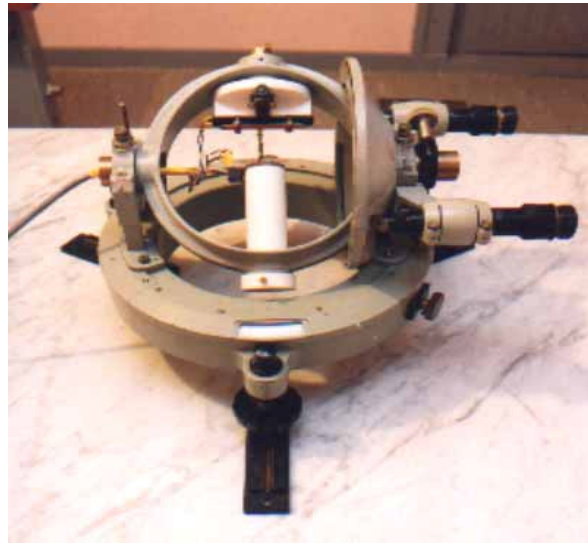


FIGURE 6

The LAS observatory begun in year 2003 the digital record of F by means of a proton precession absolute magnetic magnetometer, with a temporal resolution of 1 min. Figures 7 and 8 shows the house and the digital system respectively.



FIGURE 7



FIGURE 8

One proton precession absolute magnetic magnetometer is used as a variometer for field surveying. This instruments is similar to the LAS-F system. The mean life of batteries are 15 days or more if are supplied by electric recharge. Figure 9 shows this system.

The absolute measurements of D and I are made by a flux-gate theodolyte shown in figure 10. One are in TRW an the other are in LAS. This instruments are composed by a theodolite standart plus a flux-gate sensor attached over the telescope with the property of paralelism of their axis.



FIGURE 9

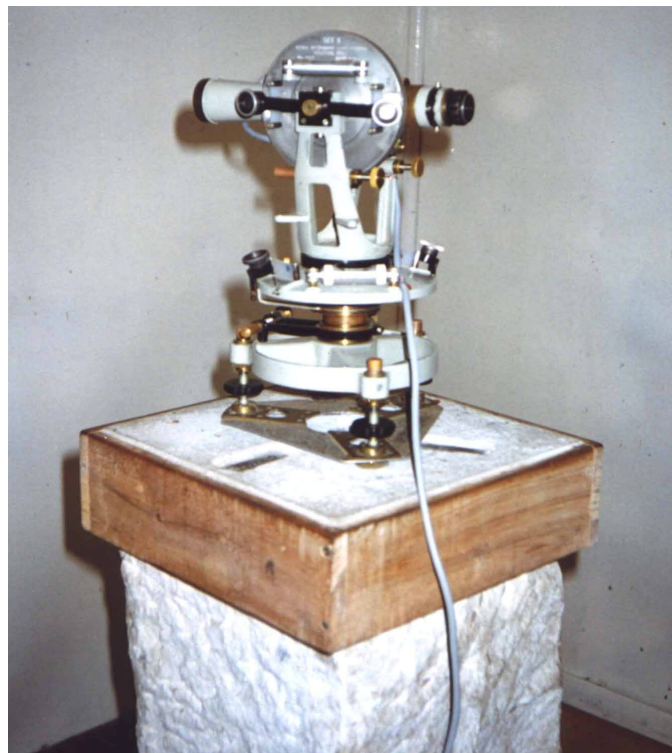


FIGURE 10

THE SUN-EARTH RELATIONSHIP, THE TRW AND LAS MAGNETIC OBSERVATORIES AND THE HELIOPHYSIC YEAR 2007.

In the 2007 year possibly will begin the minima between of 23 to 24 solar cycle. Different solar processes are important in the systems Sun-Earth. The geomagnetic observatories network is one of the different systems for detect the phenomena at surface levels of processes in the magnetosphere cavity, ionosphere and their coupling with solar wind. The SAA have a particular interest because different processes take a place and we can observe them. The slowly change of focus, the low value of total magnetic field intensity observed at the surface and the effect of ecuatorial electrojet, are the phenomena continuously detected in the geomagnetic observatories in the SAA. Superposed to these effects, we can observe other phenomena, as coronal mass ejection (CME), flares and fast solar winds borning in the coronal holes.

Recently, on January 20 to 22, 2005, we observed in the digital records (1 min of temporal resolution) of VSS, LAS, and TRW, the magnetic storm effect of a CME.

The solar wind parameters detected by the SOHO sonde, characterized by velocity and proton density, between January 20 and 22 of year 2005, corresponding to this coronal mass ejection are shown in figure 11. From this figure one can observe in order that to produce an appreciable effect due to the coronal mass ejection on digital records of the Earth Magnetic Field, both velocity and proton density must have a coincident maximum.

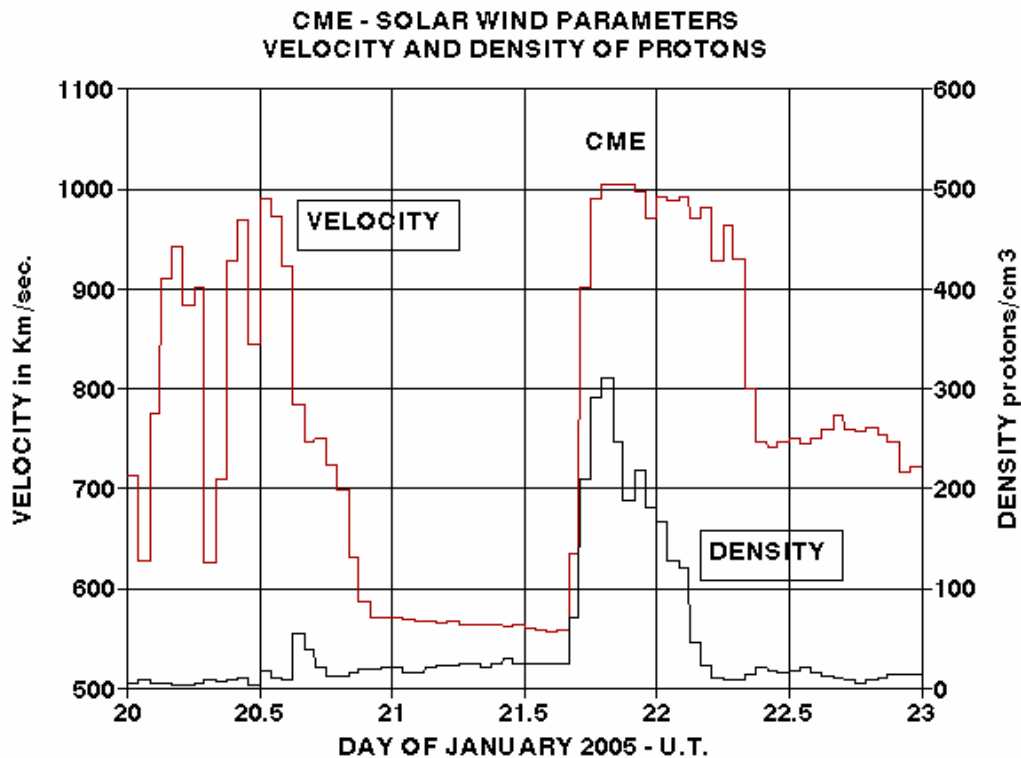


FIGURE 11

The magnetic storm recorded at VSS, LAS and TRW during January 2005 is shown in figure 12. The absolute amplitudes of this geomagnetic event are the followings: VSS: 236.6 nT, LAS: 205.4 nT and TRW: 205.2 nT, presenting VSS an amplitude 15 % larger than LAS and TRW. This possibly are due to ionospheric-Van Allen Rings coupling systems allowing a deeper penetration of particle flow over the SAA region. The SAA effect is important, since would be expected smaller values while we move to subpolar latitudes (Lat. < -60°), place where then increases notably . It is observed the amplitude not decreases at TRW Observatory , indicating a behavior which will be studied with detail, since TRW is located in the focus of Sur Hemisphere ionospheric currents system.

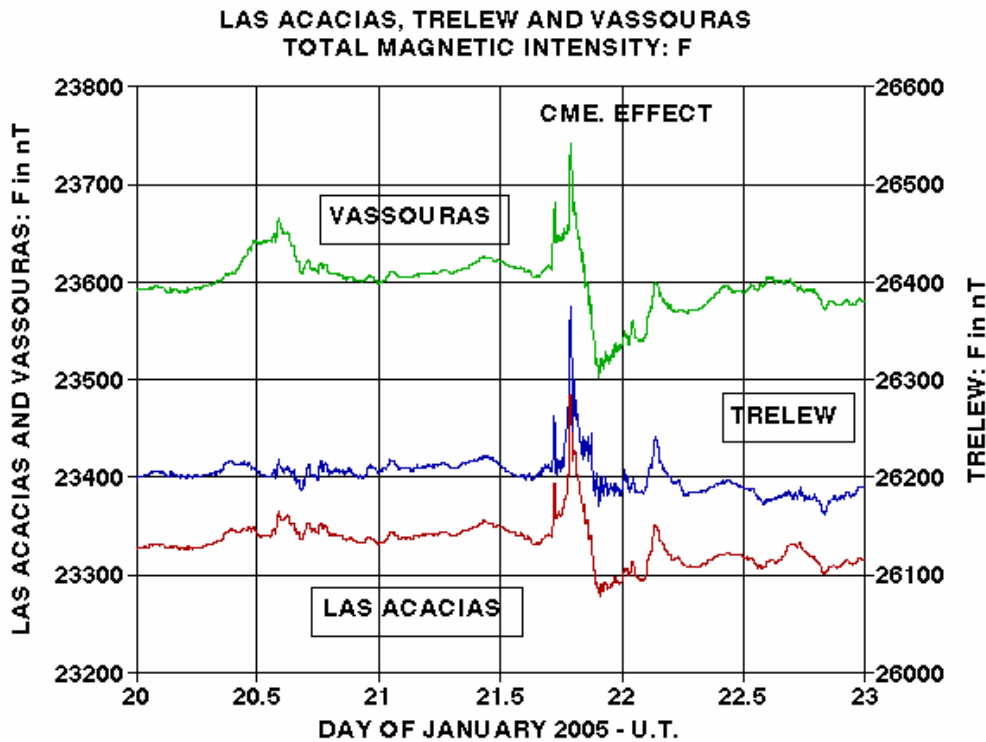


FIGURE 12

Other important results of the figure 12 is the absolute value of F at LAS, which is less than VSS, detected by the model of Geomagnetic Reference Field, IGRF (International Geomagnetic Field 2000 model) for the epoch January 22-23, 2005, but not in the same amount, VSS = 23386 nT; LAS = 23377 nT; and TRW = 26283 nT. The bias was in VSS = +212 nT, in LAS = -45 nT and in TRW = -81 nT.

At this moment, there are two very important questions to answer:

- The DGRF 2000 (Definitive Geomagnetic Reference Field) representation have sufficient adjustment for the observed bias?
- The following model IGRF 2005.0, for the interval 2005-2010, adjust in a better form the observation data, or it's necessary to extend to 14th order the Spherical Harmonics model?

THIS REPORT WAS PREPARED BY JULIO CESAR GIANIBELLI AND NICOLAS QUAGLINO.

La Plata, March 6-2007 ALL FURTHER INFORMATION PLEASE SEND A E-MAIL TO:

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