GEOMAGNETISM AT EBRO: PRESENT AND FUTURE

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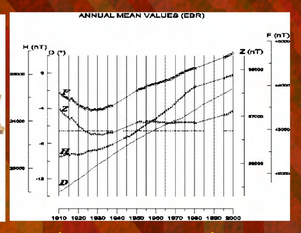
Summary

Nowadays, many activities of research and servicies are performed at the magnetic section of Ebro Observatory. This work displays some of them.

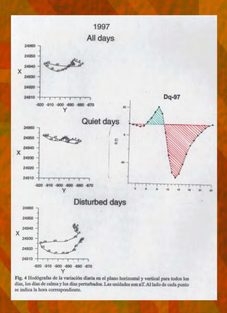
* Studies of Sq asymmetry
* Detection of rapid magnetic variations
* Automatic detection of SSC
* Modelling solar flare and eclipse effects
* Reference model for Antarctica.
* Characterisation of magnetic variations in Antarctica

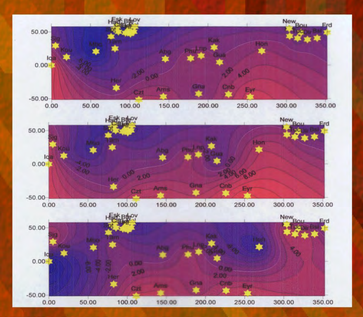
Most of the scientifc projects are related to Solar-Terrestrial Physics. Latest projects focused on Antarctic continent.

EBRO OBSERVATORY, 100 years measuring the geomagnetic field



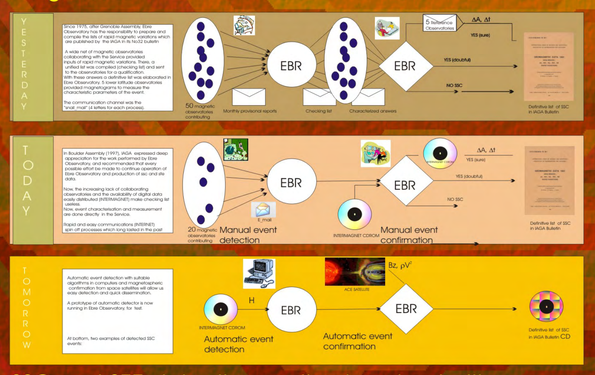
Founded in 1904, Ebro Observatory measured magnetic variations in normal and rapid run recorders. Its long series of data is a reference for main field modelling





INTERNATIONAL SERVICE OF RAPID MAGNETIC VARIATIONS

Ebro Observatory, since 1975, is the base of these Service whose aim is to provide a reliable list of events as sudden storm commencements or magnetic solar flare effects

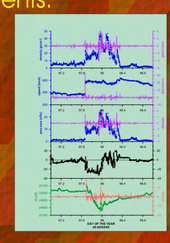


SSC and SFE detection method evolved with the time looking for a more precise description of the physical processes involved in these phenomena.
The availability of X ray, Hα, solar wind and magnetospheric parameters opened us a window to a more accurate classification.
Automatic detection is the next challenge.

SSC AUTOMATIC DETECTION

A new method of SSC detection based on an automatic analysis of digital geomagnetic field data has been proposed. It detects these events:

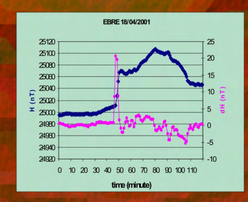
1) analyzing some morphological parameters of the sudden variation in the H component of the magnetic field and the solar wind pressure (speed and density)



This method has been tested for Ebro geomagnetic data during the period 1999-2002 producing satisfactorily results:

A events 94%
B events 87%
C events 82%

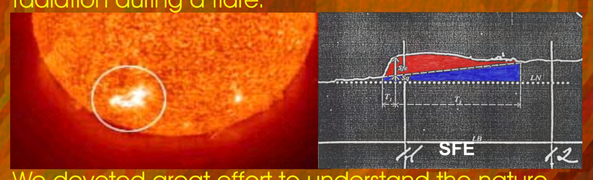
2) complementary, a wavelet analysis on the derivative of this component for the same set of data is performed. Doing this, noise is neglected, allowing a rapid detection of these variations.



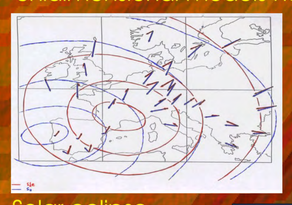
We obtained good results, especially for SSC's A and B types because of their sudden and clear variation.

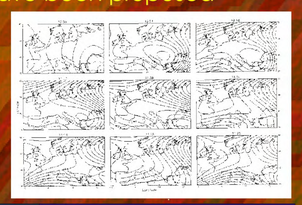
SFE & SOLAR ECLIPSE STUDIES

Solar flare effects on the geomagnetic field are related to intensification of the ionizing solar radiation during a flare.

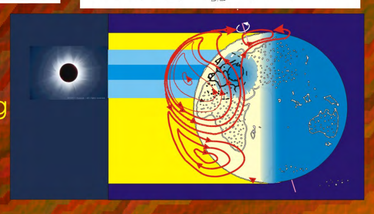


We devoted great effort to understand the nature of especial events as inverse Sfe's.
Unidimensional models have been proposed

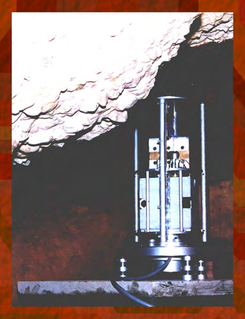




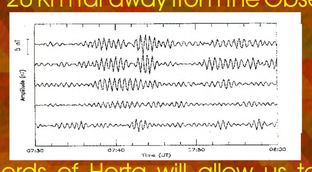
Solar eclipse signature on magnetic records was predicted using a radiation model deduced from ionospheric data



HORTA, A NEW VARIOMETRIC STATION



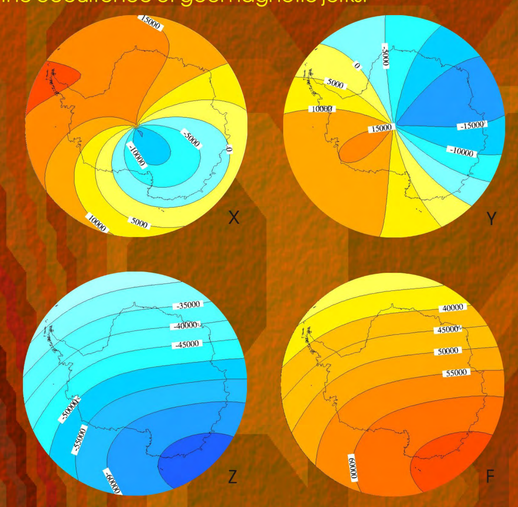
Due to electromagnetic noise produced by railway electrification, Ebro records became not appropiate. Recently, with the help of the Instituto Geográfico Nacional, we deployed a new variometric station in Horta, about 20 Km far away from the Observatory.



Cleaner records of Horta will allow us to go on with magnetic pulsation detection.

ARM, a new model for ANTARCTICA

ARM has been compared to the existing global magnetic models, demonstrating its utility to reduce magnetic field surveys carried out in Antarctica from 1960 to present, and also the possibility to study features of the magnetic field like the occurrence of geomagnetic jerks.



In the figure, X, Y, Z and F values (nT) obtained by ARM and reduced to the epoch 2000.0 for the spherical cap used by the model.

GEOMAGNETISM IN ANTARCTICA

The Livingston Island geomagnetic Observatory (LIV) (South Shetland Islands, Antarctica) is managed by the group of Geomagnetism of Ebre Observatory. Its data have been used to reduce magnetic surveys performed in the highly anomalous volcanic zone of the Bransfield Strait.

Magnetic field elements are measured once per minute with the help of a δD/δI vector magnetometer based on Helmholtz coils. Collected data are stored in a disk and afterwards spread all over the world via Meteosat Satellite.

During summer surveys biases in the variometer are corrected with the help of the absolute measurements of a Diflux.

Processed data are published in the annual bulletins.

An ensemble of secular stations has also been deployed at the surroundings of LIV Observatory in order to verify spatial significance around the main station. Their occupation must be made at least once per year.

Many results and studies have been obtained using LIV and secular stations data: Sq diurnal variation, magnetic indices, reductions, anomaly mapping, etc.

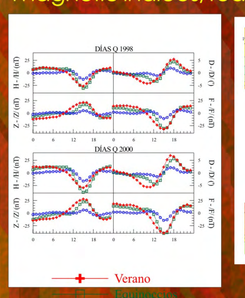


Fig. 1: Diurnal variation in LIV

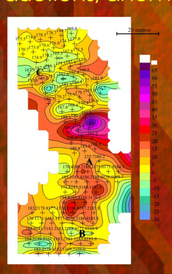


Fig. 2: Study of local gradients around LIV

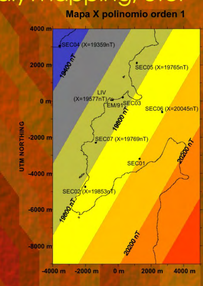


Fig. 3: Polynomial fit of secular stations data around LIV Observatory