One century of data from Vassouras Magnetic Observatory (1915-2015)

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Introduction

Vassouras Magnetic Observatory (VSS) was the first observatory in Brazil, starting its measurements in 1915. VSS plays an important role in monitoring of the magnetic field in the south hemisphere mainly because is located in region of Southern Atlantic Magnetic Anomaly (SAMA). VSS is part of the INTERMAGNET since 1999 because of its high data quality and transmission in real time.

This work presents the history of VSS as well as the centennial dataset (1915-2015). We explore the comparison of VSS data and results of IGRF model, present a day Solarquiet and storm data as well the main characteristics of the secular variation in VSS and the possible geomagnetic jerks occurring in this period.

History (1915 - 2015)

In 1915 the director Morris of the observatory choose the ideal place for installing of the Vassoura Magnetic Observatory.

VSS

Figura:

- **Least Square Method (LSM)**
- **Fit by spline interpolation**

The secular variation of X,Y and Z compontents were fitted using an algorithm of linear fit by spline method:

$$f(x) = f(x_{n-1}) + t_{n-1}(x - x_{n-1}),$$

for $x_{n-1} \leq x \leq x_n$

- **Root Means Square (RMS)**

We calculated the erro between the model IGRF and the data from VSS using RMS:

$$e_{RMS} = \frac{1}{N}\sqrt{\sum_{i=1}^{N}(m_i - d_i)^2},$$

the RMS can be view in the legends of figures.

Sq and Storm days

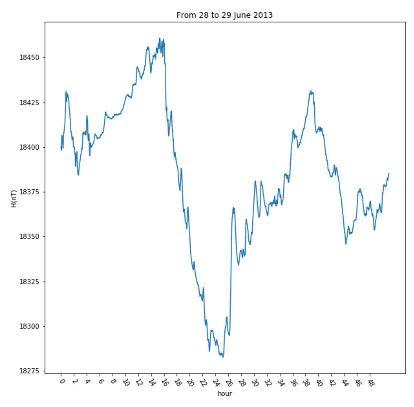

Figura: 8.

Geomagnetics Jerks

Possible ocurrence of geomagnetic jerks.
Analyzing the X, Y and Z components:

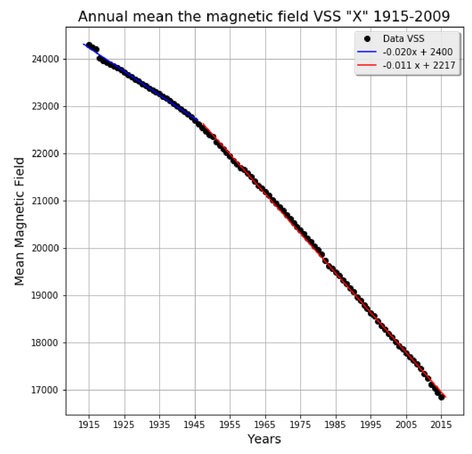

Figura: 9.

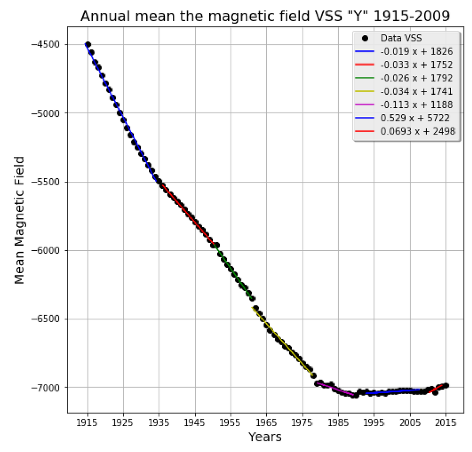

Figura: 10.

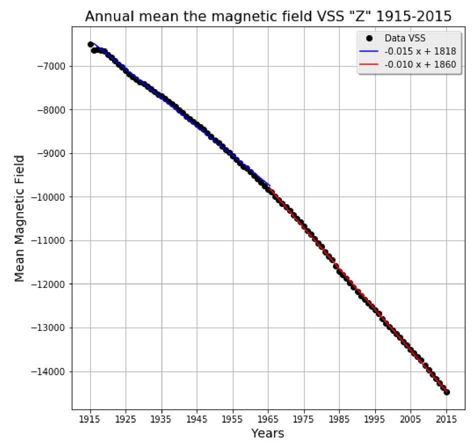

Figura: 11.

Analyzing the secular variations for spline fits:

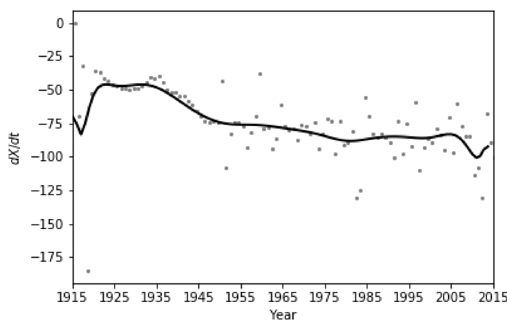

Figura: 12. Secular variation to X component

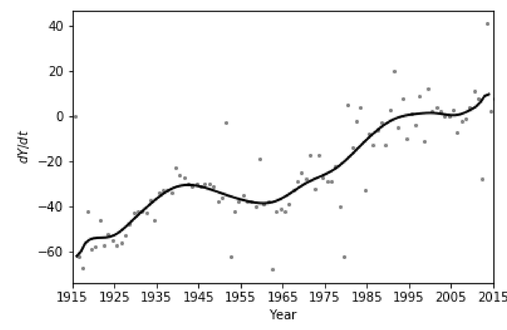

Figura: 13. Secular variation to Y component.

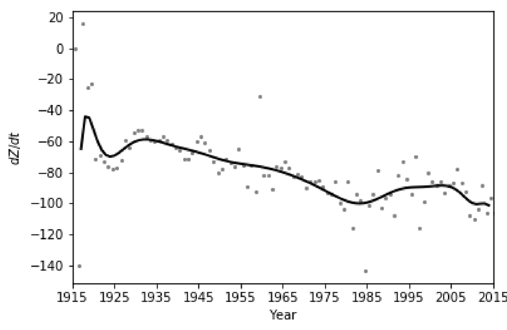

Figura: 14 Secular variation to Z component.

VSS

	Change/year		
	VSS (nT)	IGRF12 (nT)	WMM2015 (nT)
Total intensity	-22,7	-3.0	-7.8
X component	-74,7	-98.0	-93.3
Y component	24,9	2.2	5.4
Z component	-79,8	-91.6	-94.1
H component	-64,7	-85.3	-88.2
I component	-0 14' 13"	-0 19' 15"	-0 19' 5"
D component	-0 7' 2,28"	-0 6' 25"	-0 5' 59"

Referencias