



THE TRIMPI EVENTS DETECTION EXPERIMENT AT COMANDANTE FERRAZ BRAZILIAN ANTARCTIC STATION AND THE STATISTICAL ANALYSIS OF ITS SEASONAL VARIATION

J. H. Fernandez (1), L. Rizzo Piazza (2)

(1)-Doctor Degree Student, FAPESP, INPE, São José do Campos, SP

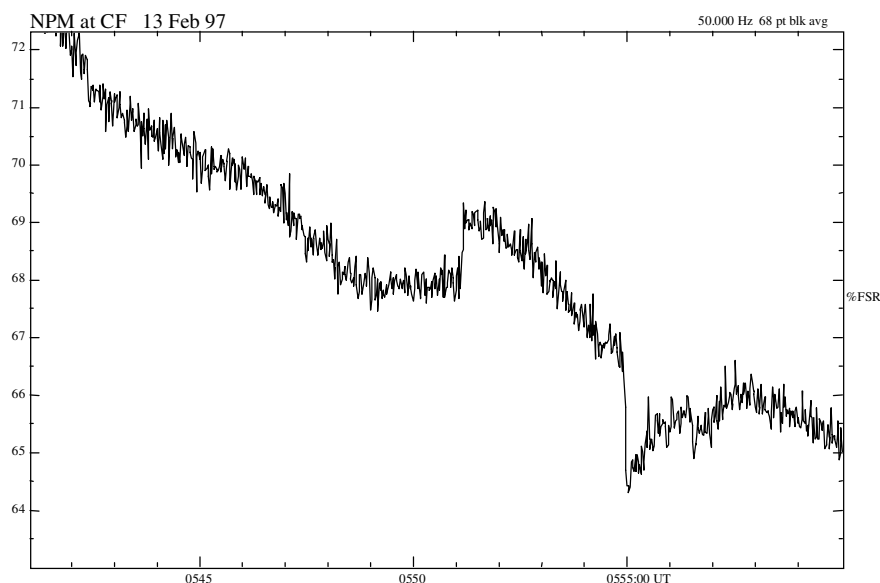
(2)-Centro de Rádio Astronomia e Aplicações Espaciais, CRAAE, SP, SP

Abstract

Since 1995 the Comandante Ferraz Brazilian Antarctic Station, located at King George Island ($62^{\circ} 34' S$; $58^{\circ} 23,5' W$), has participated of an International Programme in the Antarctica Peninsula with the objective of to image and to locate the local and ephemeral sub-ionospheric VLF disturbances induced by lightning in the opposite hemisphere, know as Classical Trimpri Events, in order to better understand its physical mechanisms. For this proposal was installed at C. Ferraz TVLF (Tuneable Very Low Frequency) receivers specially designed for Stanford University, CA, USA, to detect this phenomenon. The equipment is composed by two orthogonal loop antennas ($1.4 m^2$ area) connected to 6 TVLF narrow band receiver channels with 10 ms temporal accuracy. After the initials adjustments the system is in continuous operation since March 1996 with good noise/signal rates. The first Brazilian Trimpri data analysis for a complete seasonal variation period is presented here.

INTRODUCTION

The artificial electromagnetic waves propagation in the VLF radio spectrum (Very Low Frequency, 3-30 kHz) through the earth-ionosphere wave guide can be disturbed by variations of the physical characteristics in the propagator medium, in particular, by fast variations in the lower ionosphere plasma density. Some of these transient perturbations can be detected both in amplitude and phase of VLF wave, being characterized by a fast variation (~ 1 s) followed by a relatively long recovery ($t > 15$ s) to the quiescent levels. These signatures in the signal are known as Trimpri events. (Figure 1) These events are generated by wave-particle interaction, when trapped electrons in the Van Allen radiation belts interact at resonant conditions with eletromagnetic waves in the whistler mode, generated by lightning flashes in the lower atmosphere causing the electron precipitation in the upper atmosphere. The subject of this work was to collect and process data (creating a large data bank) and do the statistical analysis during a complete period of seasonal variation (April 1996 to March 1997) from the signal of the Hawaiian transmitter NPM (Lualualei, Oahu - $21^{\circ} 26' N$; $58^{\circ} 10' W$), received by a equipment specially designed to detect Trimpri events. This equipment was installed at Comandante Ferraz Brazilian Antarctic Station ($62^{\circ} 34' S$; $58^{\circ} 23,5 W$). The present study describes also the equipment instalation and operation, the data analysis system implementation and the methodology used.



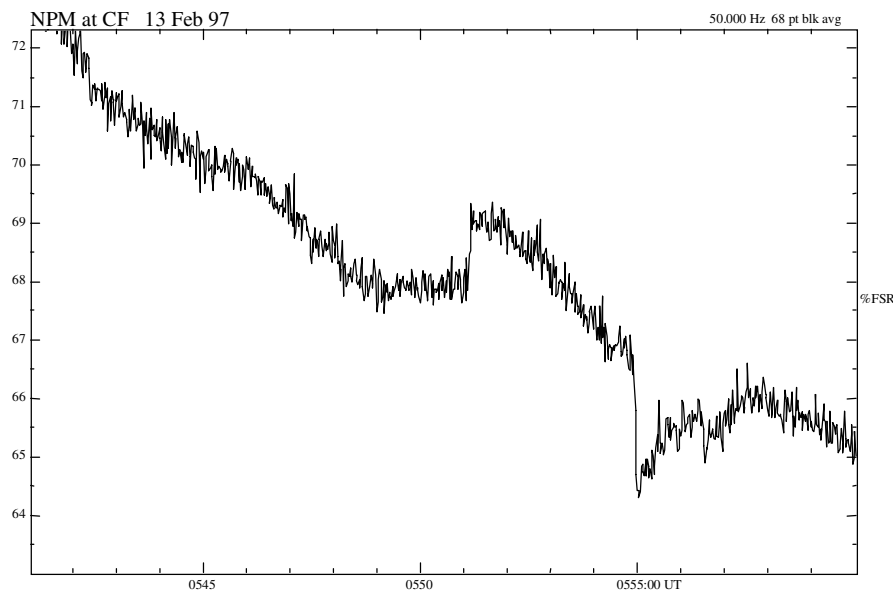


Figure 1 - Trimpi events detected at Comandante Ferraz (CF) Station. on 13th February 1997, like a NPM 21.4 kHz signal perturbation. We can see three well defined events, the first one is a positive event detected as a increase in the amplitude level

CONCLUSIONS

As a result of statistical analysis it is plotted the seasonal and time variation histograms, percentual distribution of the positive/negative events as well as the events particular characteristics on the NPM-Ferraz path. It is confirmed a strong incidence during the periods near the equinox and it was shown a cyclical variation around the year. As the Trimpi event is typically a night time variation the data were collected dialy between 00:00 and 12:00 UT and the analysis shown two periods for the incidence peaks: the first one centered at 07:00 UT and the second one centered around 10:45 UT.

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ACKNOWLEDGMENTS

We would like to thank STANFORD UNIVERSITY for the donation of the recording system. We are also grateful to CAPES and FAPESP for the financial support.