Introduction

During the 1986-87 austral summer a geomagnetic observatory was installed at the Italian Antarctic Base Mario Zucchelli Station (TNB, geographic coordinates: 74.75°S, 123.4°E; corrected geomagnetic coordinates: 80.05°S, 307.7°E; magnetic local time MLT=UT-1). In the first years the measurements of the geomagnetic field were carried out only during summer expeditions. Since 1991 the recording was implemented with an automatic acquisition system operating through the year. More recently, after two short test surveys, from October 2004 a geomagnetic French-Italian observatory was installed on the Antarctic plateau (Dome C, DMC), very close to the geomagnetic pole (geographic coordinates: 75.1°S, 123.4°E; corrected geomagnetic coordinates: 88.85°S, 55.6°E; magnetic local time MLT=UT-1). In this work we present some results obtained from TNB observations coming from almost twenty years of observations and also the preliminary results obtained from the analysis of the first year of data from DMC.

The OBSERVATORIES

The figure at left shows the locations of Mario Zucchelli Station (TNB, Italy), Concordia station (DMC, France, Italy) and Dumont D’Urville (DRV, France) in the Antarctic continent and the auralc oval. During periods of geomagnetic activity BTN and DRV are inside the polar cap quite close to the auralc oval. Under similar geomagnetic conditions the stations are situated under the southern polar cap. Instead DMC is always inside the polar cap.

A comparison among the observatories

In three pictures, 1 minute plots for H and D from the three observatories (Terra Nova Bay-TNB, Dumont D’Urville-DRV and Dome C-DMC) are reported. An example of the monthly variation is presented as an example for each geomagnetic component. Even if their location is different with respect to the auralc oval, some peculiar features are common to these stations.

From the analysis of the whole data set available from the 1999/2000 campaign at Dome C (about a month of data) it was evident that amplitude of the daily variation varies from day to day and is closely related to the level of magnetospheric activity. A comparison with simultaneous data from TNB clearly showed that the solar wind speed control the diurnal cycle of the geomagnetic field fluctuation power. In very strict the polar cap and less important close to the polar cap (Ledip S., Cafarella L., Francesca P., Meloni A., Pajonk P. J. and Schott, Annals Geophysicae, 1, 291, 2921).

Mario Zucchelli Station

Variations in the Earth’s magnetic field are continuously measured by means of two three-axis fluxgate magnetometers using three orthogonal vector components oriented with respect to the geomagnetic meridian; the horizontal magnetic field intensity H-component (south-north), the horizontal-component (west-east, indicated as D in the following, used as an intensive element, expressed consequently in nT) and vertical intensity Z-component (positive increase inward). The intensity of the field F is measured by two independent overhouser magnetometers. Absolute measurements are performed only during austral summer.

Siculer variation plots at Mario Zucchelli Station in the time interval 1987-2001. Each value is compared with the corresponding value from the IRGDF model. F plot shows a significant intensity decrease of about 600 nT from 1987 to 2001 (a mean rate of about -43±7 yr). Mean daily variations of the geomagnetic H component in the hourly mean values during local summer from 1987 to 2000 are organized as a function of universal time (UT). It is evident a clear solar cycle modulation in the amplitude of the daily variation.

Concordia Station

In 1994 France and Italy started a program for opening a permanent scientific station on the high East Antarctic cratonic, at Dome C (DMC, latitude 75°06’S, longitude 123°23’E, about 950 km away from the coast). Domes are regions of high elevation on the Antarctic plateau (Dome C is at 3280 m). As a result of a joint French Italian agreement the national Antarctic Programs (IPYG and INRINA) respectively started logistic, technical and scientific activities at Dome C that were initiated with the realization of a summer camp. The permanent Base opened during 2005 winter expedition. The station is intended to provide support to a growing number of scientific research. The new station, called Concordia, is located 1200 km from Mario Zucchelli Station (Italy), 560 km from Vostok (Russia), 1100 km from Dumont D’Urville (France) and Casey (Australia).

A geomagnetic observatory works at Concordia station. Its operations started regularly at the end of 2004. Also in this case variations in the Earth’s magnetic field are continuously monitored by a three-axis fluxgate magnetometer along three orthogonal vector components oriented with respect to the local magnetic meridian. The intensity of the field is measured by two independent overhouser magnetometers. Absolute measurements are performed during the whole year.

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Mean daily variations of the geomagnetic H and D components during 2005, separately for positive and negative values of the interplanetary magnetic field Bz component. The amplitude of the variation is larger for Bz>0, when the high latitude current systems are more intense.

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