

## Evaluation of the Applicability of the Chapman-Miller Method on Variation of the Geomagnetic Total Intensity Field in Taiwan from 1988 to 2007

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### ABSTRACT

The solar (S) and lunar (L) variations of geomagnetic fields at the horizontal (H), declination (D), and the downward vertical component data (Z) are modeled by the Chapman-Miller method with four order harmonics. In this paper, we compare S and L variations of the geomagnetic total intensity field using a consistent method with 3-component data for seasonal variations (summer, winter, and equinox) for three distinct phases during the years 1988 - 2007. The results show that consistency in the S and L variations for geomagnetic total intensity indicates normal stations and discrepancies are occurred due to data quality. In application, consistent results also prove that the function of the magnetometers at TW was normal and that large anomalies were certainly in existence during the Chia-Yi earthquake.

Key words: Solar and lunar variations, Chapman-Miller method, Geomagnetic field

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### 1. INTRODUCTION

For observing the geomagnetic field surrounding Taiwan, a network of eight geomagnetic stations (listed in Table 1 and shown in Fig. 1) was installed at the beginning of 1988. During the period 1988 - 2001, the first phase of the geomagnetic survey was conducted at stations equipped with G-856 magnetometers (sensitivity = 0.1 nT) that had sampling rates of 5 or 10 min.; these stations routinely recorded variations in the geomagnetic total intensity field (Yen et al. 2004). Locations of the stations were chosen carefully away from populated areas to diminish interference from visible iron objects and power lines. Because Taiwan is located in the Circum-Pacific seismic zone, the stations are generally set in areas with high seismicity or crustal activity except for the reference station, Luning (LP), which is located in a seismically quiet zone. After the Chi-Chi earthquake, sur-

prising pre-earthquake anomalous phenomena were observed at the Liyutan (LY) and Tsengwen (TW) stations (Yen et al. 2004). Hence, since 2001 the new auxiliary Luning (LN) station was set about 10 m away from the sensor of LP to supplement its records providing a continuous reference source. During 2002 - 2004, the second phase of the geomagnetic survey commenced (Yen et al. 2008). New magnetometers were installed in the station network. Due to the close of the LP and LN stations, the Kinmen station (KM) was used as the new reference station. Meanwhile, from north to south, three new stations, Yeheng (YH), Shuanlung (SL), and Pingtung (PT) were established in central Taiwan to improve coverage. Consequently, for this phase, the geomagnetic network was comprised of 11 stations (listed in Table 1) and the sampling rate was dramatically shortened to one min. and after 2007, the sampling rate was modified to only 1 second for acquiring still more detailed data.

The geomagnetic research data observed by the network

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