

Baseline measurements of three Magnetic Elements (H, D & Z) by means of PPM and DIM

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ABSTRACT

Proton Precession Magnetometer (PPM) and Declination Inclination Magnetometer (DIM) have been installed in the absolute room of Magnetic Observatory at Tirunelveli (-0.67°&149.3°Geomagnetic coordinates) for baseline measurements of H, Z & D.

Observations of the three elements are taken once in the morning and another set in the evening. Baseline values of all three elements show clear consistency for the year 1996.

Absolute observations of H, D & Z are taken with Quartz-Horizontal Magnetometer (QHM) and Magnetometric Zero Balance (BMZ) respectively to control the baseline of Variometers. Both the instruments have been calibrated against the standards of Alibag Magnetic Observatory. Baselines of H,D & Z derived from PPM coupled DIM and QHM & BMZ observations differ consistently by 62nT, 9minutes and 17nT respectively.

INTRODUCTION

Izmiran II variometers with IIG control panel were installed and new magnetic observatory started functioning from 01-03-96 at EGRL, Tirunelveli(-0.67°&149.3° Geomagnetic coordinates)

Absolute observation for determining base line values. (BLV) of 'H' and 'Z' magnetograms are derived from the observed total intensity (F) by (IIG) PPM and from the observed inclination (I) by Declination Inclination Magnetometer (DIM) using the formulae $H = F \cos I$ and $Z = F \sin I$. Absolute observation for determining BLV of 'D' magnetogram is derived from the observed value of 'D' using DIM.

ADOPTED BLV

Adopted BLV of three elements, calculated from absolute observations taken on each day are plotted for the year 1996, in Fig.1(a,b&c for three elements). Base line changes are due to adjustments to variometers and accounted for, to the period before or after adjustments when the BLV consistency is good.

In Fig.1a, adopted BLV of H show base line changes (BLC) on 15th Mar (13nT), 16th Mar(33nT), 28th Mar(5nT), 29th Mar(6nT), 14th June(12nT),18th June (16nT), 10th Sep(4nT) and 27th Sep(17nT) and change in scale values from 1st July (1.38nT). BLC is accounted for and brought to the level of BLV of 16th Mar'96.

In Fig.1b, adopted BLV of Z shows BLC on 15th March (30nT), 16th Mar (46nT), 28th Mar (15nT), 29th Mar(31nT), 13th Aug(13nT) and 27th Sep(17 nT). BLC is accounted for and brought to the level of BLV of 27th Sep'96.

In Fig.1c, adopted BLV of D shows BLC on 14th June (1.48min.), 18th June(0.77min.) and 12th Sep(0.76min.) and change in scale value from 7th Aug (0.16min/cm). BLC is accounted for and brought to the level of BLV of 7th Aug'96.

In the plot, BLV of all three elements show clear consistency for the year 1996

ABSOLUTE VALUES AND CORRESPONDING ORDINATES

A total of 476 absolute observations have been taken for H, Z and D during the year 1996 with PPM and DIM.

Diurnal variations are larger in H (about 100nT on quiet day). As such, absolute values of H and the corresponding H ordinates during the time of observations are plotted. Very good correlation between absolute values (H in nT) and the corresponding ordinates (in cm) seen from the plot, is an indication of the consistency in the observations.

Scatter plot indicating the degree of relationship between absolute values (H in nT) and the corresponding ordinates (in cm) is shown in fig.2. The extent of correlation is evident. The correlation coefficient of these two has been calculated and found to be **0.9575**.

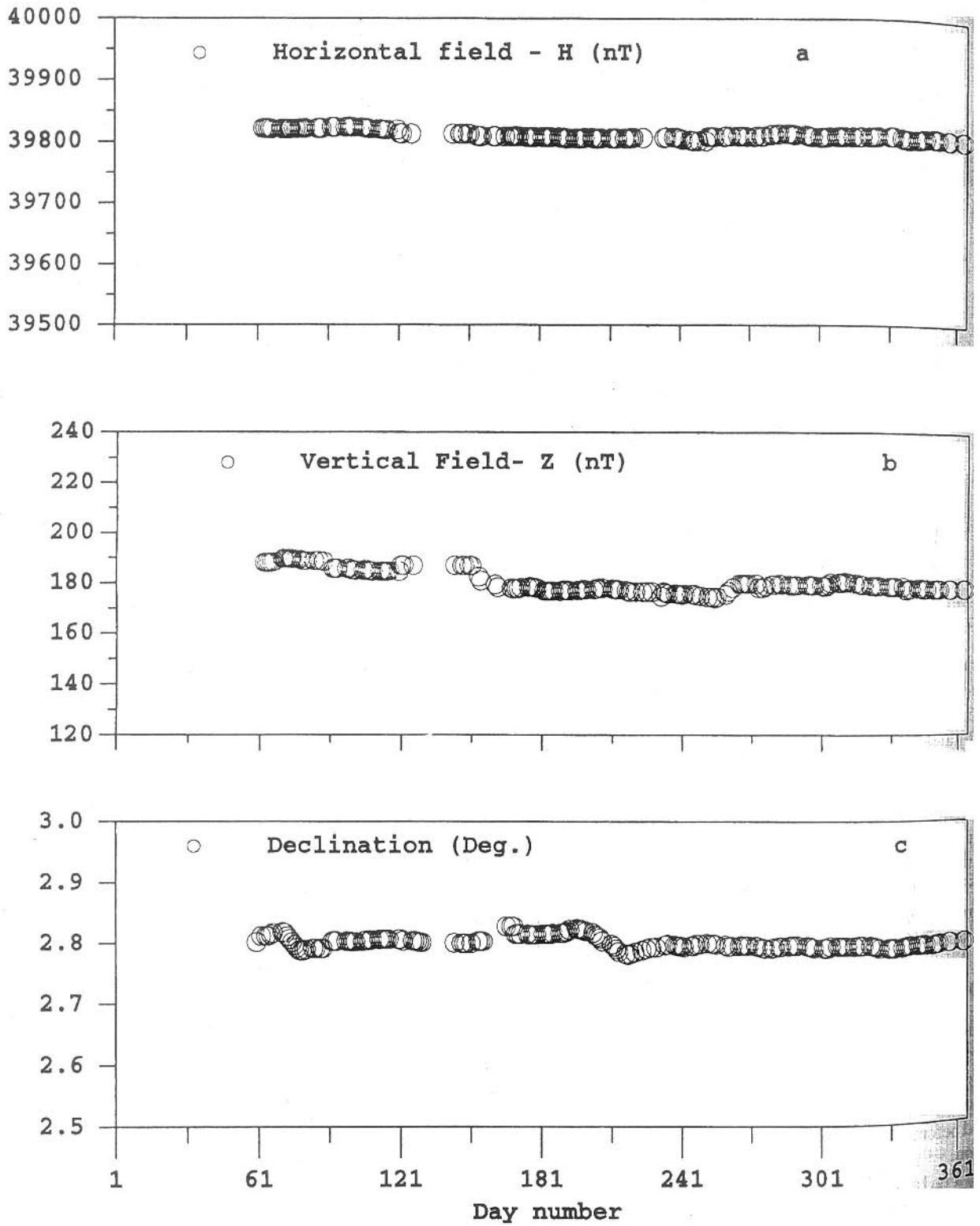


Figure 1. Baseline value of H, Z and D with DIM & PPM (1996)

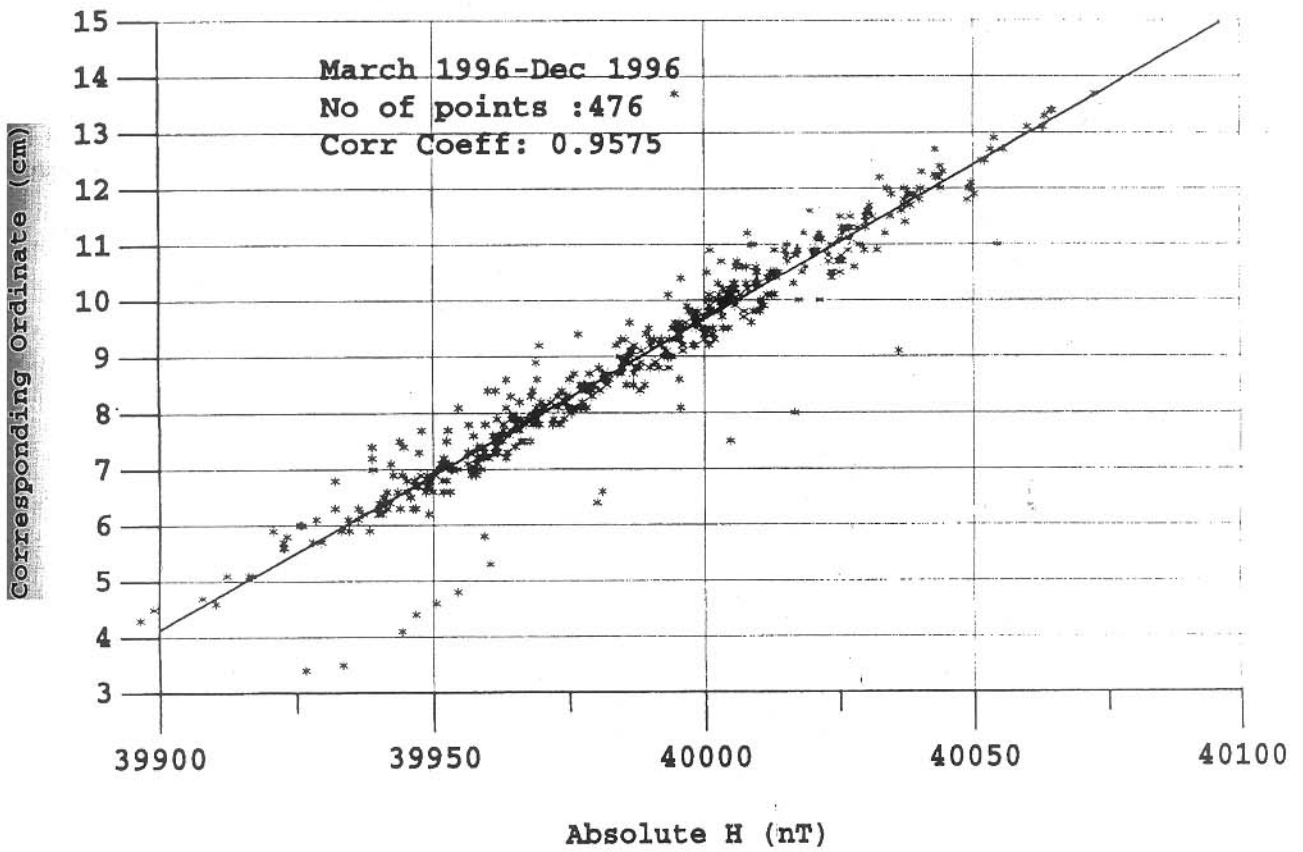


Figure 2. Correlation Plot

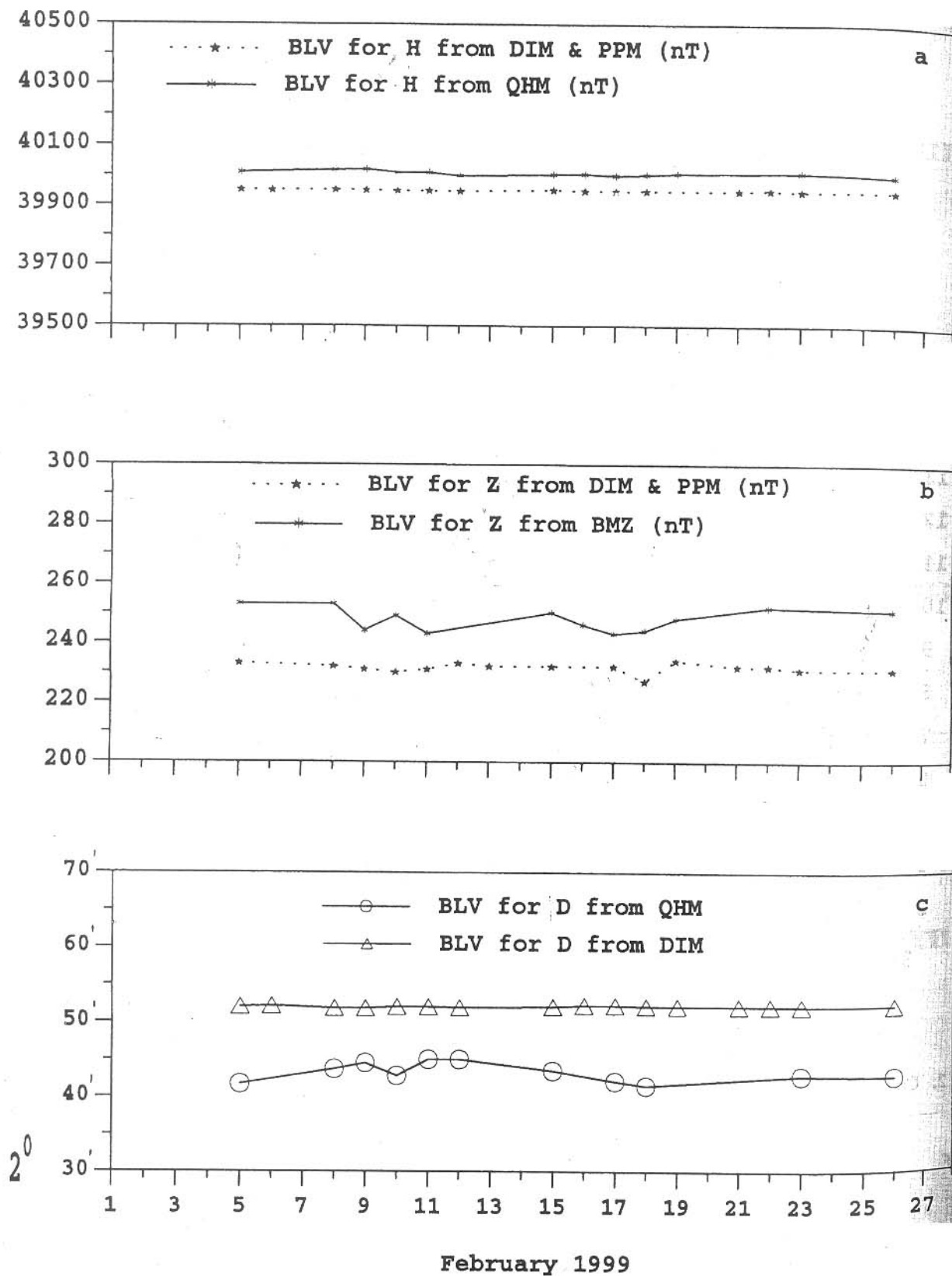


Figure 3. Baseline value comparison of H, Z and D

COMPARISON OF BLVS

Quartz Horizontal Magnetometer(QHM) and Balance Magnetometer Zero(BMZ) were installed at the absolute room, keeping a safe distance from PPM sensor and DIM. The absolute observations of horizontal force, Declination and vertical force at the Observatory were taken with QHM and BMZ respectively from Feb'99 for determining and to have a control of BLVs for H, Z and D (Wienert,1970). Adopted BLVs are obtained after taking running mean of 7 observations.

Adopted BLVs of all three elements derived from QHM and BMZ observations (Feb'99) are compared with BLVs determined from DIM and PPM observations (Nagar,1970). This is given in Fig.3, and they are found to be in good agreement. The differences of baselines derived from the observed H,Z and D from PPM & DIM and QHM & BMZ are found to be consistent (about 63nT for H, 15 nT for Z and 8.5' for D) and are the difference between the instruments.

CONCLUSION

BLVs of all three elements (H, Z and D) derived from PPM and DIM at M.O., Tirunelveli for the year 1996 show a clear consistency and the ranges of variations in BLVs for the above period are 7nT in H, 3nT in Z and 0.5 mins in D. Further the BLVs worked out, have been compared with the BLVs determined from the other standard instruments. BLVs obtained from PPM and DIM observations are more consistent, accurate and stable than QHM and BMZ instruments.

REFERENCES

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