Hermanus Magnetic Observatory

A facility of the National Research Foundation

Magnetic Results 2008

Hermanus, Hartebeesthoek, Tsumeb and Keetmanshoop observatories

1. INTRODUCTION

The Hermanus Magnetic Observatory (HMO) operates four permanent geomagnetic observatories in Southern Africa, namely Hermanus and Hartebeesthoek in South Africa, and Tsumeb and Keetmanshoop in Namibia.

This yearbook presents the results of the magnetic measurements carried out at these observatories during 2008.

2. DESCRIPTION OF THE OBSERVATORIES

Observatory	Geographic Coordinates		Geomagnetic Coordinates		Elevation
	Latitude	Longitude	Latitude	Longitude	m
Hermanus	34° 25' 28" S	19° 13' 26" E	42° 25' S	83° 06' E	26
Hartebeesthoek	25° 52' 58" S	27° 42' 25" E	34° 27' S	96° 09' E	1555
Tsumeb	19° 12' 08" S	17° 35' 03" E	29° 43' S	87° 15' E	1273
Keetmanshoop	26° 32' 26" S	18° 06' 37" E	35° 41' S	85° 45' E	1065

Geomagnetic coordinates given are relative to a geomagnetic North Pole position of 84.2° N, 124.0° W, computed from the IGRF model (degree 13) at the epoch 2008.5.

3. ABSOLUTE MEASUREMENTS

At each observatory, except Keetmanshoop, absolute measurements are made in a single absolute hut. At Keetmanshoop there is a pillar with weather proof material built around it to protect against wind, sun and rain. Since 1st January 2000, absolute values of all geomagnetic elements are referred to a single standard pillar at each of the observatories. For continuity with previous data the differences between the new and old standards are quoted in the tables of annual mean values in the sense (old standard – new standard) for all elements of the geomagnetic field. Thus, annual mean values prior to 2000.5 can be referred to the new standard by adding the site difference to the old standard values.

3.1 DI-Flux

Absolute observations were carried out on a regular basis at each observatory by means of a DI-flux magnetometer for measuring the angles *D* and *I*. The total magnetic field intensity, *F*, was measured by means of either an Overhauser Magnetometer or Proton Precession Magnetometer or a dIdD. The absolute values *H* and *Z* were then derived from

$$H = F \cos I$$
$$Z = F \sin I$$

Where *H*, *Z* and *F* are field values at the time of the *I* measurement. Baseline values H_o, D_o and Z_o were then calculated for the vector magnetometer systems described in section 4 below.
The DI-flux consists of a ZEISS non-magnetic theodolite type THEO 010B (at Hermanus), a THEO 015B (at Hartebeesthoek and Tsumeb) and a single-axis fluxgate sensor mounted on top of the telescope and electronics from Bartington. At

Keetmanshoop, the DI-flux consists of a non-magnetic theodolite type 3T2KP-NM and a single-axis fluxgate sensor mounted on top of the telescope and electronics type LEMI 204. The DI-flux is considered to be an absolute instrument, which means that the angles measured by the instrument do not deviate from the true values *D* and *I*. This is achieved by using an observation procedure which eliminates the unknown parameters such as sensor offset, collimation angles and theodolite errors.

The following azimuth values were used at each observatory:

Observatory	Mark	Azimuth value
Hermanus	HMO Beacon	342° 20' 26"
Hartebeesthoek	Red-white pole	357° 45' 09"
Tsumeb	Max Planck	015° 55' 06"
Keetmanshoop	Mark against the wall	353° 38' 30"

3.2 Overhauser Magnetometer

The OVH is a GEM Systems type GSM-19 magnetometer. The sensor is installed in an East-West direction. The Electronic unit is powered by a 12V DC power supply via a 220V UPS. The signal levels are converted via two ADAM 4541 fibre optic converters to the computer's serial port. The OVH readings are fed into the computer for processing through an RS232 serial port. The PC serves as the instrument's controller and data logger. The instrument runs continuously and obtains a reading every 5 seconds. From these readings one-minute *F* values are derived. These are calculated by the computer and are available on the screen. A graphic display of the last 24 hours recorded data is also available.

3.3 F pillar corrections

At Hermanus *D* and *I* are measured on pillar no. 1 in the Absolute House, and *F* is obtained from an Overhauser sensor which forms part of the suspended dIdD vector magnetometer. At Hartebeesthoek, Tsumeb and Keetmanshoop *D* and *I* are measured in the so-called "Standard Huts", while *F* is obtained from an Overhauser sensor. Site differences were obtained at regular intervals at each observatory to enable the *F* measurements to be reduced to the standard pillar:

$$F_{\text{standard pillar}} = F_{\text{PPM/dIdD/OVH}} + \Delta F_{\text{pillar}}$$

The following are the adopted values for the year:

Site differences of ΔF_{pillar}							
Hermanus		Hartebeesthoek		Tsumeb		Keetmanshoop	
Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction
1 – 213	-2.1 nT	1 –180	88.0 nT	1 – 16	15.3 nT	1 – 366	4.5 nT
214 – 366	-0.7 nT	181-366	87.8 nT	17-366	17.5 nT		

4. VECTOR MAGNETOMETERS

4.1 FGE Magnetometer

A type FGE fluxgate manufactured by the Danish Meteorological Institute, Denmark is in operation at all four magnetic observatories.

The sensor unit consists of three orthogonally mounted sensors on a marble cube. In order to improve long-term stability these sensors have compensation coils wound on quartz tubes in order to obtain a sensor drift of only a few nT per year. The marble cube is suspended by two strips of crossed phosphor-bronze working as a Cardan's suspension to compensate for pillar tilting which might cause baseline drift.

The sensors may be set up to record either *X*, *Y* and *Z* or *H*, *D* and *Z* components. The latter orientation has been chosen to keep the continuity of earlier recordings.

The box containing the electronics is almost magnetic free and is placed about 3 meters from the sensor. At this distance it has no effect on the recordings. Temperature outputs for the sensor and the electronics are also available.
The recording rate is 1 second, but sampling is done every 5 seconds. And according to INTERMAGNET specifications a numerical filter is applied in order to obtain the final minute data series.

Technical specifications are:

Analogue output	± 10 volt
Dynamic range	3000 nT p-p
Resolution	0.2 nT
Scale value	150 nT/volt
Misalignment of sensor axis	< 7 min of arc
Long term drift	< 3nT/year
Temperature coefficient, sensor	< 0.2 nT/°C
Temperature coefficient, electronics	< 0.1 nT/°C
Band pass	DC to 1 Hz

4.2 Suspended dIdD Magnetometer

The Suspended dIdD is a vector magnetometer for continuous monitoring of the inclination, declination and total intensity of the Earth's magnetic field. It employs a mutually orthogonal coil system that measures one unbiased and four biased values of total magnetic fields. The axes of the coil are arranged so that the axes of the mutually orthogonal coils are themselves perpendicular to the Earth's magnetic field vector, F, in the geomagnetic horizontal and vertical planes.

Equal and opposite currents are sequentially introduced into the "Inclination" (*I*) coil, which is perpendicular to *F*. These deflection fields lie in the local geomagnetic meridian plane. The resultant deflected values of *F* (*I*+ and *I*-) as measured by the Overhauser magnetometer are logged. The undeflected value of *F* is also logged.

Then, equal and opposite currents are sequentially introduced into the "Declination" (*D*) coil, which is also perpendicular to *F.* The *D* deflection fields lie in the horizontal plane. The resultant deflected values of *F* (*D*+ and *D*-) as measured by the Overhauser magnetometer are also logged. A simple algorithm is used to determine the instantaneous angular differences between the coil axes and the direction of the earth vector, *F*. These angular differences are *dI* and *dD*. Adding *dI* and *dD* to baseline values of Inclination and Declination for the coil system gives the instantaneous Inclination and Declination values of *F*. The components *H* and *Z* are computed.

GEM Systems' advanced Overhauser design employs continuous radio frequency polarization and special sensors to maximise the signal-to-noise ratio.

Technical specifications are:

Dynamic range	20,000 to 120,000 nT
Sensitivity	0.01 nT
Resolution	0.01 nT
Absolute accuracy	0.2 nT
Operating temperature	-40°C to + 55°C
Temperature coefficient	< 0.1 nT/°C
Long term drift	< 2 nT/year

A cycling time of 1 sec was used which corresponds to a reading every 5 secs. From these readings one-minute values were derived.

The data is logged by the DIMARK data acquisition system supplied by the Eötvös LoràND Geophysical Institute, Hungary.

5. PRESENTATION OF RESULTS

5.1 Base-line values

The observed and adopted base-line values are shown in a graphical form. The Hartebeesthoek, Tsumeb and Keetmanshoop base-line values show fluctuations different from Hermanus that can be attributed to the fact that fewer absolute observations are done at these 3 observatories. The adopted base line values were computed applying the technique of cubic spline fitting on the observed base-line values.

For Tsumeb observatory, due to failure of the Fluxgate and Overhauser magnetometers there were no recorded data for the periods 3 March – 8 May 2008 and 10 November – 31 December 2008.

For Hartebeesthoek observatory, due to failure of the Fluxgate and Proton magnetometers there were no recorded data for the period 1 January - 28 February 2008. There are no observed base-line values for the period 1 March – 25 April 2008. The adopted base-line values are the results of the interpolation of one measured base-line value in February and the observed base-line values in the last 5 days of April.

For Keetmanshoop observatory, due to failure of the Fluxgate and Overhauser magnetometers there were no recorded data for the period 11 - 21 February, and 27 November - 5 December 2008.

5.2 One-minute mean values

One-minute mean values, centred on the minute, were calculated by applying the Gaussian coefficients to a series of 19 samples of 5-second data. For a filter output value to be centred on the minute; the first coefficient was applied 45 seconds before this minute and the last coefficient was applied 45 seconds after the minute.

5.3 Hourly mean values

Hourly mean values, centred on the UT half hour, are computed from the one-minute values. A value is not computed if there are more than 6 one-minute values missing. The data presentation is *XYZF* rather than *HDZF* as it is more convenient for the user who is interested in certain events to compare component values.

5.4 Daily mean values

Daily mean values, centred on the UT half day, are computed from the one-minute values. A value is not computed if there are more than 144 one-minute values missing.

5.5 Monthly mean values

Monthly mean values are calculated from the daily mean values of *H*, *D* and *Z*. Monthly means are not computed if there is any missing daily value. The mean values of *X*, *Y*, *F* and *I* are calculated from the corresponding mean values of *H*, *D* and *Z*. Annual mean values are also calculated from the daily mean values. Monthly and annual mean values are also calculated for the five international quiet and disturbed days in each month.

5.6 Mean annual values

Mean annual values since the start of each observatory are presented in a separate table. The values are centred on the middle of each year. Graphical presentations of mean annual values are also included, but only for *D*, *H*, *Z* and *F*. Site differences were taken into account when the data were plotted.

6. INDICES

6.1 K-indices

K-indices are only computed at the Hermanus Magnetic Observatory. The index values are determined from the *H* and *D* data. The LRNS-method is used and the K9 limit is 300nT. K-indices are sent twice a month to "*Service International des Indices Geomagnetiques*", Paris.

6.2 *am* Indices

The Hermanus K-indices are also used in deriving the *am* index, a further planetary activity index.

6.3 Dst indices

The Hermanus Magnetic Observatory also supplies one-minute data to the World Data Centre for Geomagnetism, Kyoto in Japan, for the generation of the Dst ring-current index, which is the most commonly used measure of geomagnetic storm intensity.

7. DATA AVAILABILITY

Tables of hourly mean values of the magnetic elements are no longer published in this series of publications. Final digital one-minute values and hourly values are available through the World Data Center for Geomagnetism, Edinburgh:

http://www.wdc.bgs.ac.uk/catalog/master.html

The data are also published on the annual INTERMAGNET CD-ROM. More information is available from:

http://www.intermagnet.org

8. CONTACT INFORMATION

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Magnetic Results 2008

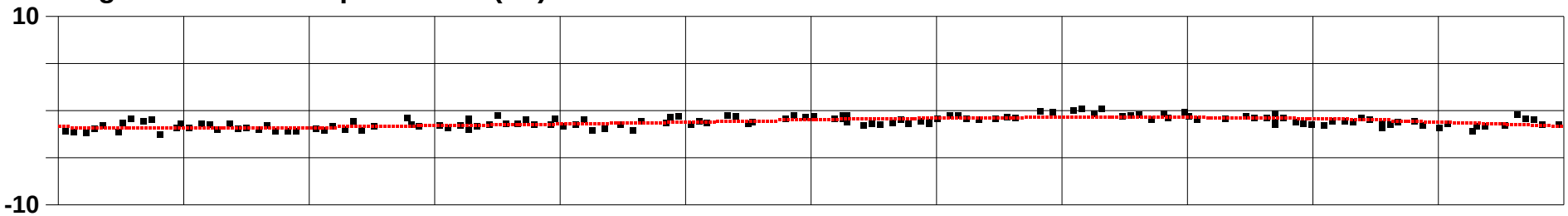
Hermanus

Observed and Adopted Baseline Values, HER 2008

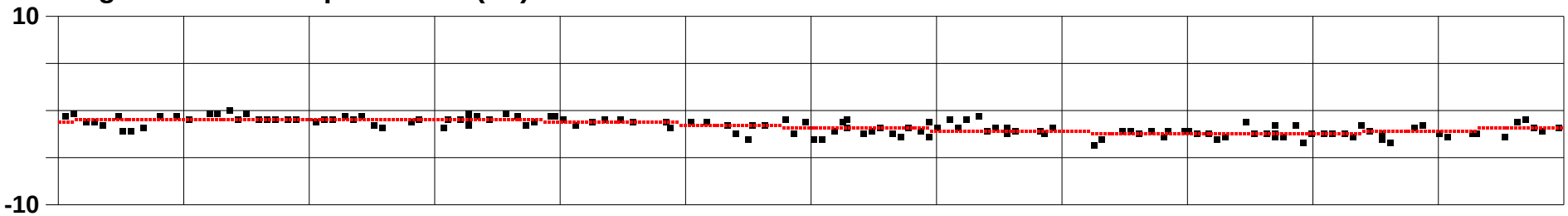
LAT: 124.425 LONG: 19.225

INSTITUTION: HMO INSTRUMENT: LC

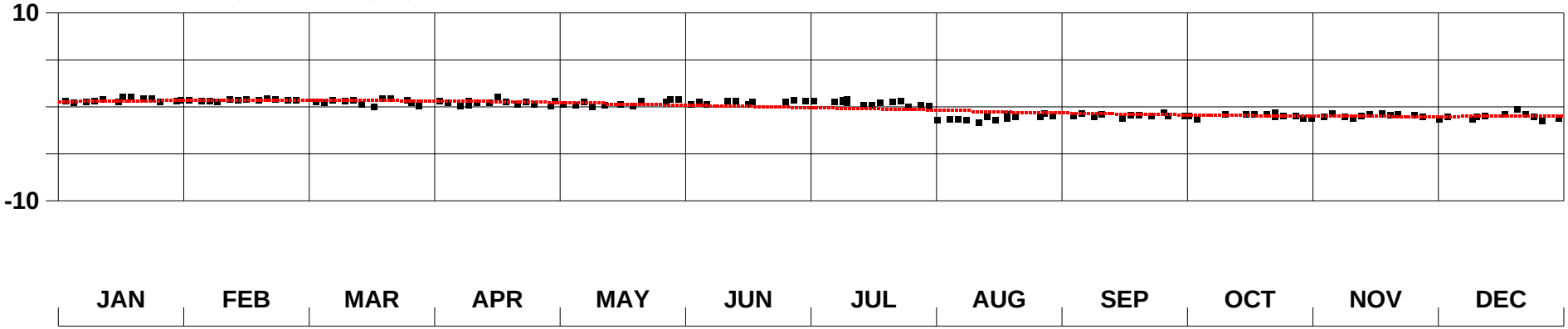
Magnetic North Component HN (nT)

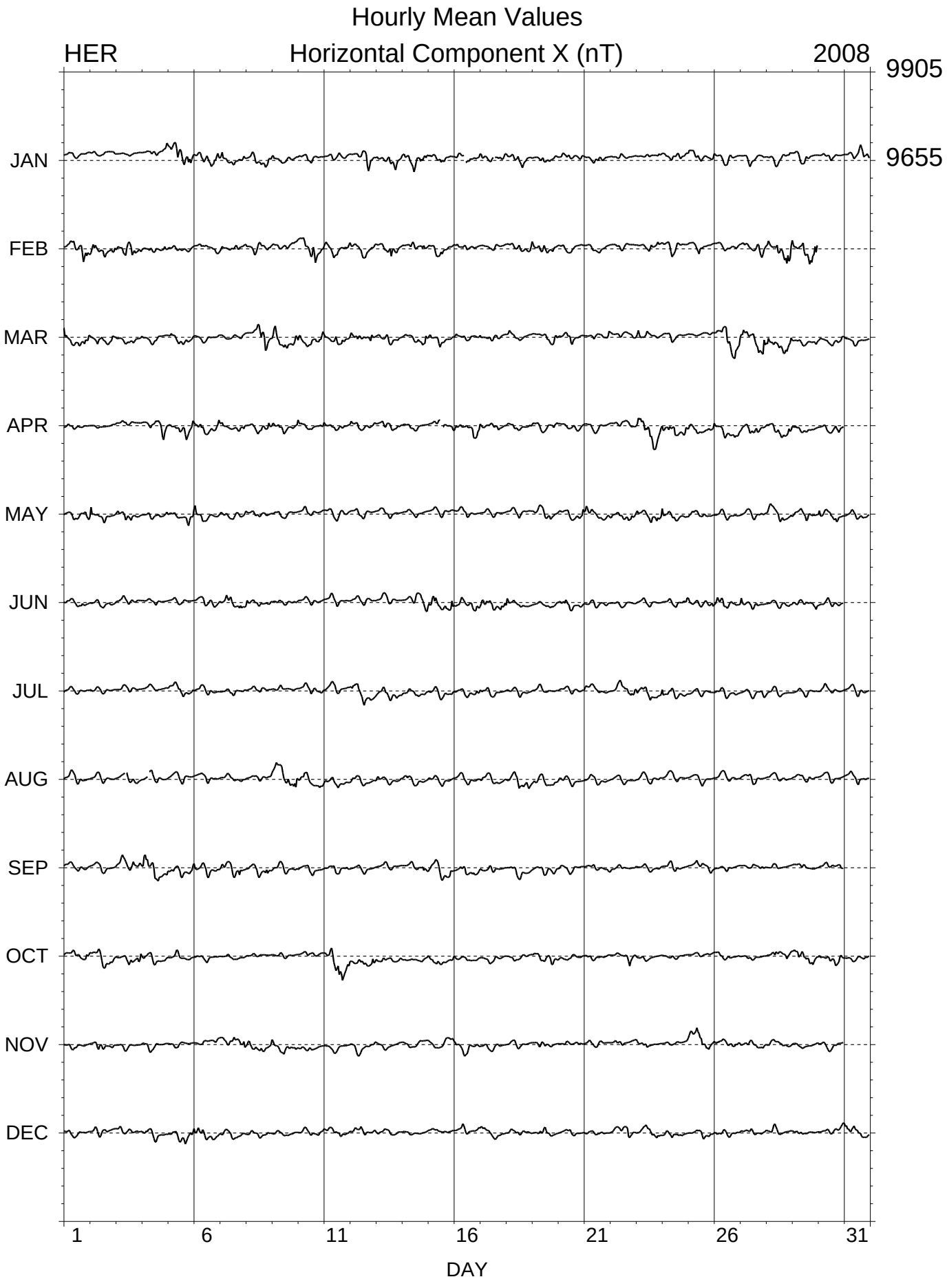


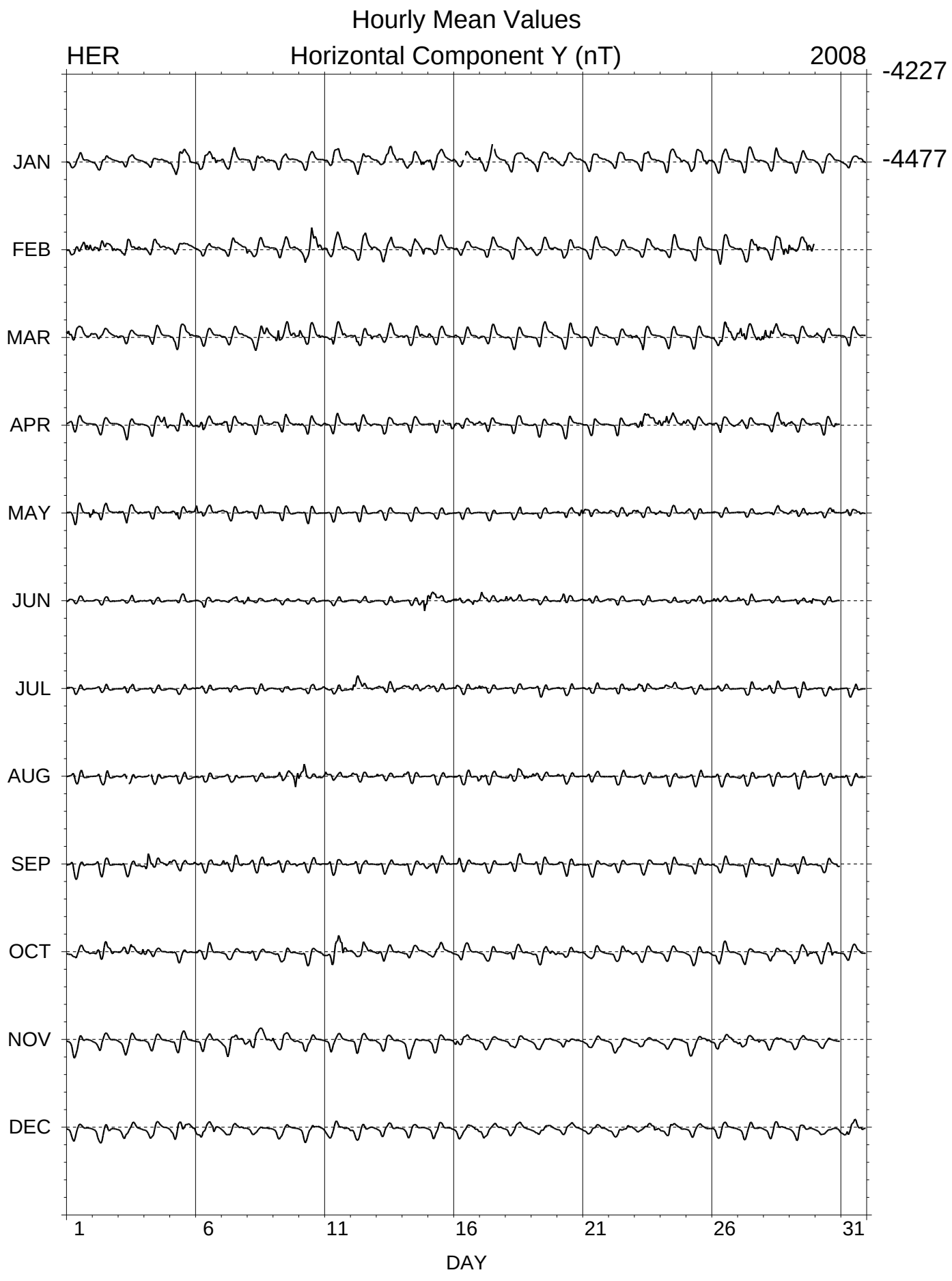
Magnetic East Component HE (nT)

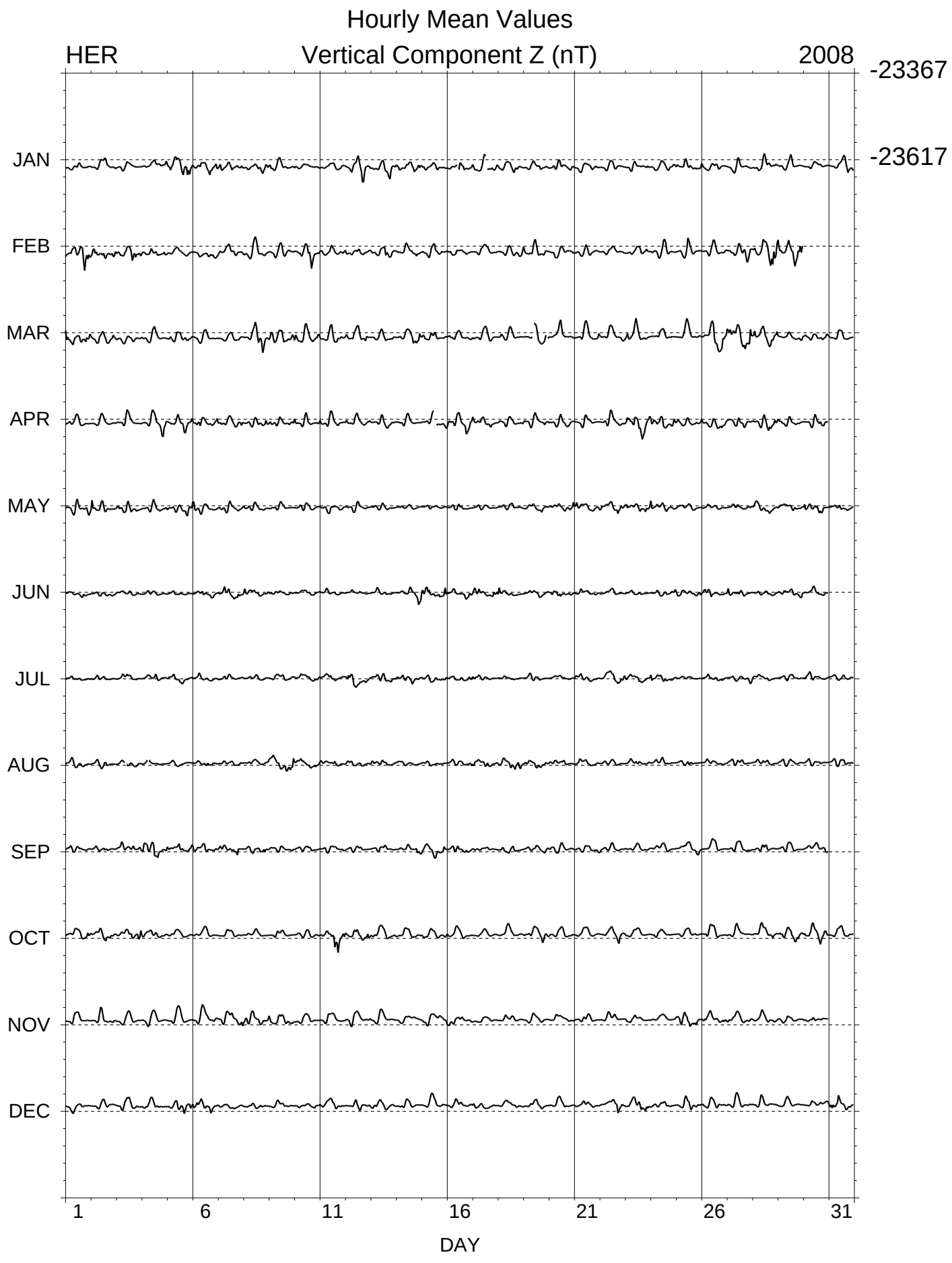


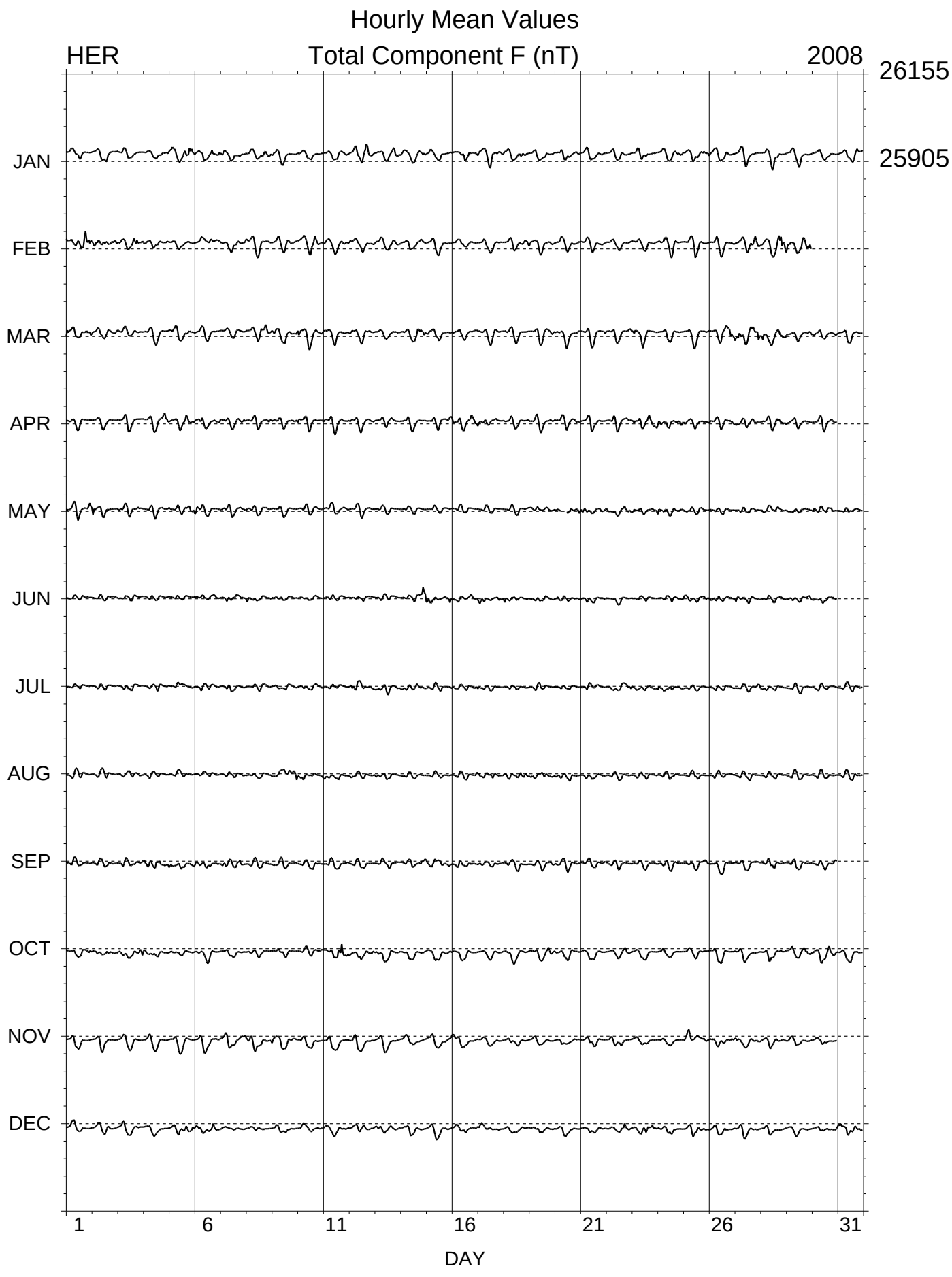
Vertical Component Z (nT)

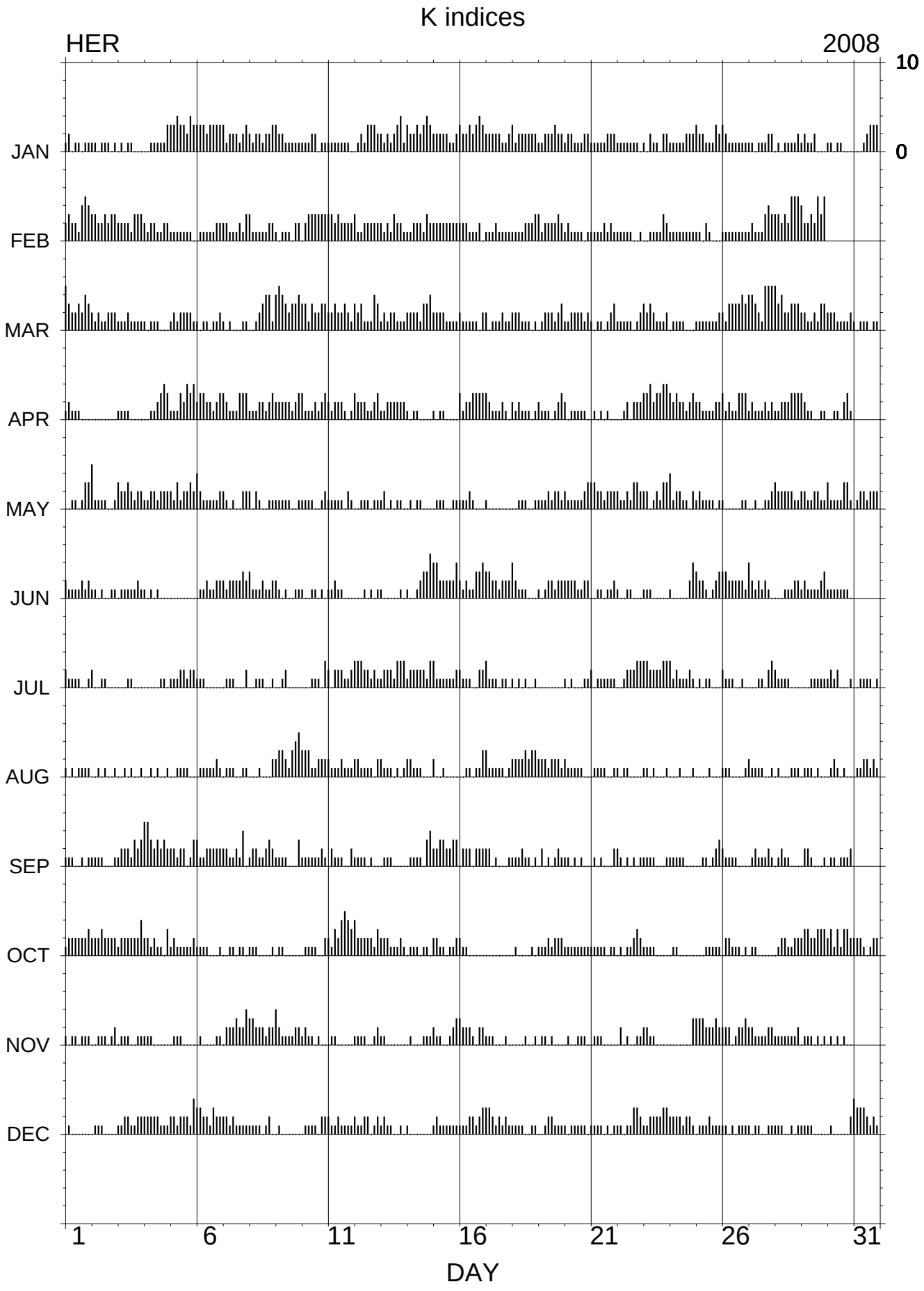



Hourly Mean Values
HER
Horizontal Component X (nT)
2008
9905
9655
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Horizontal Component Y (nT)
2008
-4227
-4477
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Vertical Component Z (nT)
2008
-23367
-23617
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Total Component F (nT)
2008
26155
25905
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


K indices
HER
2008
10
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

K INDICES

HER — K9 = 300 nT — 2008

DATE	JAN	FEB	MAR	APR	MAY	JUN
01	1201 1011	2322 1454	5322 3243	1211 1000	0011 0133	2111 1212
02	1101 1101	3322 3233	2121 1222	0000 0000	5111 1001	1101 0011
03	0101 1000	2222 1333	1112 1111	1111 0000	3223 2122	0111 1121
04	0011 1113	2122 1122	1011 1000	0011 2343	1122 1222	1010 1000
05	3343 3243	1111 1110	1212 2221	1113 2434	2131 2232	0000 0000
06	3332 3333	0111 1122	1011 0112	2332 2123	4211 1112	0112 1122
07	3122 2123	2211 1213	1010 0011	3211 1333	2101 0022	2122 2232
08	2122 1223	3111 1122	0012 3441	1112 2123	2021 0011	3111 2112
09	3221 1111	1011 1022	4543 2334	2222 2123	1111 1001	2101 0011
10	1112 2011	0233 3333	3313 2233	3111 2123	1111 0012	1001 1010
11	1111 1110	3323 2222	2232 2321	2122 2101	1111 1021	1121 1000
12	0121 3332	3112 2222	3231 1143	3222 1123	0011 1011	0001 0101
13	2121 2341	2121 3221	1212 2111	1122 2222	1201 0110	1000 0010
14	3223 2343	1122 2132	2222 1334	1011 0000	0101 1000	1001 2335
15	2222 2112	2222 2222	2222 1111	1011 0000	0111 0011	4422 2224
16	3223 2343	2221 1120	2111 1102	3122 3333	1112 1000	2121 1334
17	2222 2112	1112 1111	2011 1211	3211 1210	1000 0000	3322 1222
18	3122 2222	1111 2223	2221 1101	2121 1101	0011 1001	4211 1000
19	1122 2322	3122 2232	0122 2123	2111 0123	1112 1221	1012 2122
20	1221 1122	1211 1101	1122 2212	2011 1110	2111 1123	2222 1122
21	1111 1222	1111 2121	1011 0123	0101 0100	3322 1222	0011 0112
22	1111 1110	1111 1001	1111 1012	0012 0222	2112 1332	1001 1000
23	1021 1022	0011 1132	3232 1112	3342 3344	2201 2133	1110 0000
24	1111 1222	1111 1111	0111 1000	3232 2123	4122 1102	1000 0024
25	3221 1132	1102 1000	1111 1112	2211 1122	1211 1101	3221 0123
26	3211 1111	1111 1111	2133 3343	3121 1333	1000 0011	3322 2221
27	1101 1122	1211 1343	4432 1555	1211 1212	0010 0112	4212 1210
28	0101 1112	3323 2555	5342 2333	1122 2333	3222 2211	0001 1122
29	1211 2000	4223 2535	2211 2133	3211 0011	2211 2211	1211 1123
30	1101 1000		2221 1112	0011 0231	3111 1331	1111 1110
31	0001 2333		1011 1011		0122 1222	

DATE	JUL	AUG	SEP	OCT	NOV	DEC
01	2111 1001	1010 1111	1110 0101	1222 2223	1011 0111	0100 0000
02	2001 1000	0010 1001	1111 0001	2223 2222	0011 1012	0111 0000
03	0001 1000	0010 1001	1222 1323	1222 2224	0111 0011	1122 1122
04	0000 0110	0010 1001	5532 3232	2212 1103	1110 0000	2222 2111
05	1112 2122	0011 1100	2212 2013	1211 1112	0111 0000	2212 2214
06	1110 0000	0111 1121	3112 2222	1111 0001	0100 0011	3322 1322
07	0111 0002	0111 0011	2211 2140	0011 0110	0222 3224	2212 1111
08	0011 1001	0001 0002	1221 1232	1110 0001	3322 2122	1111 0120
09	0012 0000	2332 1345	1111 0003	0110 0000	4211 1122	0100 0000
10	0001 1103	3331 1222	1111 1121	0111 1002	1211 0100	0111 1022
11	2022 2112	2111 2111	0211 1002	2132 4543	0110 0000	2112 1111
12	3332 2121	2211 1102	1111 0100	4222 2213	1111 0012	2112 2012
13	1222 1333	2111 0101	0111 0000	2221 1121	1100 0000	1211 0010
14	1222 2213	2211 1000	0111 1034	0111 0110	0100 0111	1000 0000
15	3111 1112	2001 0000	2233 2233	2211 0112	2110 0123	1211 1111
16	2111 0022	0011 0113	0222 0222	2110 0000	3222 1022	1112 2123
17	3111 0110	3111 1101	2201 0001	0000 0000	1110 0010	3321 2121
18	1010 1001	2222 3233	1112 1101	0100 0010	0000 1001	1111 0011
19	0000 0000	2221 2221	0201 0121	1112 1222	0110 1000	0012 2111
20	1010 0011	2111 1100	1101 0100	1111 1111	0100 1110	1011 1110
21	2011 1111	0111 1001	0101 0002	1111 1011	0111 0000	1111 0101
22	0012 2233	1011 0000	2101 0101	0101 1232	0201 0011	1101 1332
23	3322 2233	1101 0001	1111 0001	1111 0000	2211 0000	1122 2233
24	3121 1121	0001 0001	1111 1000	0110 0000	0000 0003	2222 1221
25	0101 1000	0000 1000	0011 0123	0001 1111	3332 2232	0111 2111
26	2111 0010	1110 0001	2111 1000	0221 1101	2220 1223	1101 0111
27	0001 1023	2111 1001	0121 1121	0110 0000	2211 1122	1011 0011
28	2111 1000	0100 0111	0121 1000	0122 1122	1111 1112	1110 0101
29	0001 1111	0111 0100	0221 0001	2332 2333	0111 0101	1111 0000
30	1212 0001	0121 0100	0110 1112	2313 1332	0101 0100	0100 0002
31	0011 1101	0112 2121		2221 0122		4333 2121

HERMANUS
MEAN MONTHLY VALUES 2008

Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-24 49.9	-65 44.7	10650	9666	-4473	-23637	25926	A	HDZF
FEB	-24 50.9	-65 45.3	10644	9659	-4473	-23634	25921	A	HDZF
MAR	-24 51.5	-65 45.7	10638	9653	-4472	-23629	25913	A	HDZF
APR	-24 52.3	-65 45.7	10638	9651	-4474	-23627	25911	A	HDZF
MAY	-24 52.5	-65 44.8	10643	9656	-4477	-23623	25910	A	HDZF
JUN	-24 52.6	-65 44.7	10643	9655	-4477	-23620	25907	A	HDZF
JUL	-24 52.9	-65 44.4	10643	9655	-4478	-23616	25903	A	HDZF
AUG	-24 53.2	-65 43.8	10646	9657	-4480	-23611	25901	A	HDZF
SEP	-24 53.7	-65 44.0	10644	9655	-4481	-23609	25897	A	HDZF
OCT	-24 54.2	-65 44.1	10641	9652	-4481	-23605	25892	A	HDZF
NOV	-24 54.6	-65 43.2	10646	9656	-4484	-23601	25891	A	HDZF
DEC	-24 54.5	-65 42.9	10648	9657	-4484	-23599	25890	A	HDZF
YEAR	-24 52.7	-65 44.4	10644	9656	-4478	-23617	25905	A	HDZF
JAN	-24 49.5	-65 43.6	10658	9674	-4475	-23634	25927	Q	HDZF
FEB	-24 50.4	-65 44.5	10650	9664	-4474	-23631	25920	Q	HDZF
MAR	-24 51.3	-65 45.0	10643	9658	-4474	-23628	25914	Q	HDZF
APR	-24 52.2	-65 45.0	10643	9656	-4476	-23625	25912	Q	HDZF
MAY	-24 52.5	-65 44.1	10648	9661	-4479	-23621	25911	Q	HDZF
JUN	-24 52.1	-65 44.0	10648	9660	-4478	-23619	25908	Q	HDZF
JUL	-24 52.7	-65 44.0	10647	9659	-4479	-23615	25904	Q	HDZF
AUG	-24 53.2	-65 43.3	10650	9661	-4482	-23610	25902	Q	HDZF
SEP	-24 53.6	-65 43.6	10646	9657	-4481	-23608	25898	Q	HDZF
OCT	-24 54.3	-65 43.4	10646	9656	-4483	-23603	25893	Q	HDZF
NOV	-24 55.3	-65 42.8	10650	9658	-4487	-23600	25892	Q	HDZF
DEC	-24 55.1	-65 42.9	10648	9657	-4487	-23600	25891	Q	HDZF
YEAR	-24 52.7	-65 43.8	10648	9660	-4480	-23616	25906	Q	HDZF
JAN	-24 50.6	-65 45.1	10647	9662	-4473	-23638	25925	D	HDZF
FEB	-24 51.6	-65 46.0	10640	9654	-4473	-23638	25922	D	HDZF
MAR	-24 51.5	-65 46.9	10629	9644	-4468	-23630	25911	D	HDZF
APR	-24 51.9	-65 46.7	10630	9645	-4470	-23628	25910	D	HDZF
MAY	-24 52.4	-65 45.3	10640	9653	-4475	-23625	25910	D	HDZF
JUN	-24 52.7	-65 45.0	10641	9654	-4477	-23621	25907	D	HDZF
JUL	-24 52.7	-65 45.1	10638	9651	-4475	-23617	25902	D	HDZF
AUG	-24 52.9	-65 44.4	10642	9654	-4477	-23613	25901	D	HDZF
SEP	-24 53.6	-65 44.9	10637	9649	-4478	-23611	25898	D	HDZF
OCT	-24 54.0	-65 44.8	10636	9647	-4478	-23607	25893	D	HDZF
NOV	-24 53.9	-65 43.6	10644	9655	-4481	-23603	25892	D	HDZF
DEC	-24 54.3	-65 43.5	10644	9654	-4482	-23601	25890	D	HDZF
YEAR	-24 52.7	-65 45.1	10639	9652	-4476	-23619	25905	D	HDZF

*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

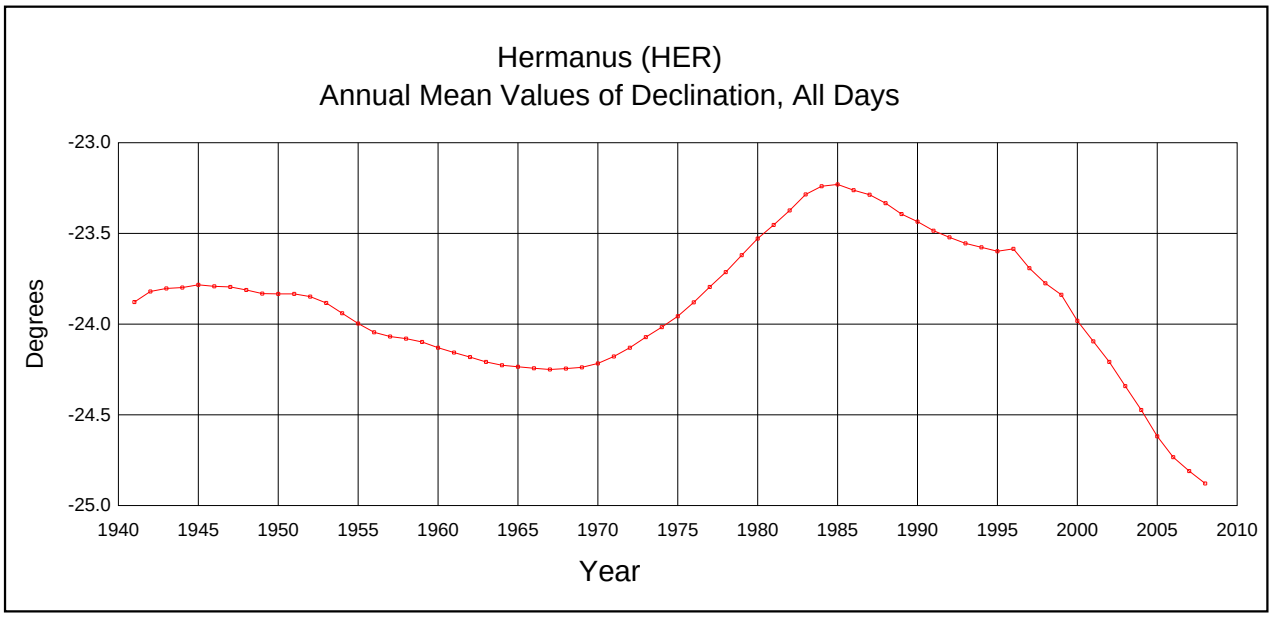
HERMANUS
MEAN ANNUAL VALUES

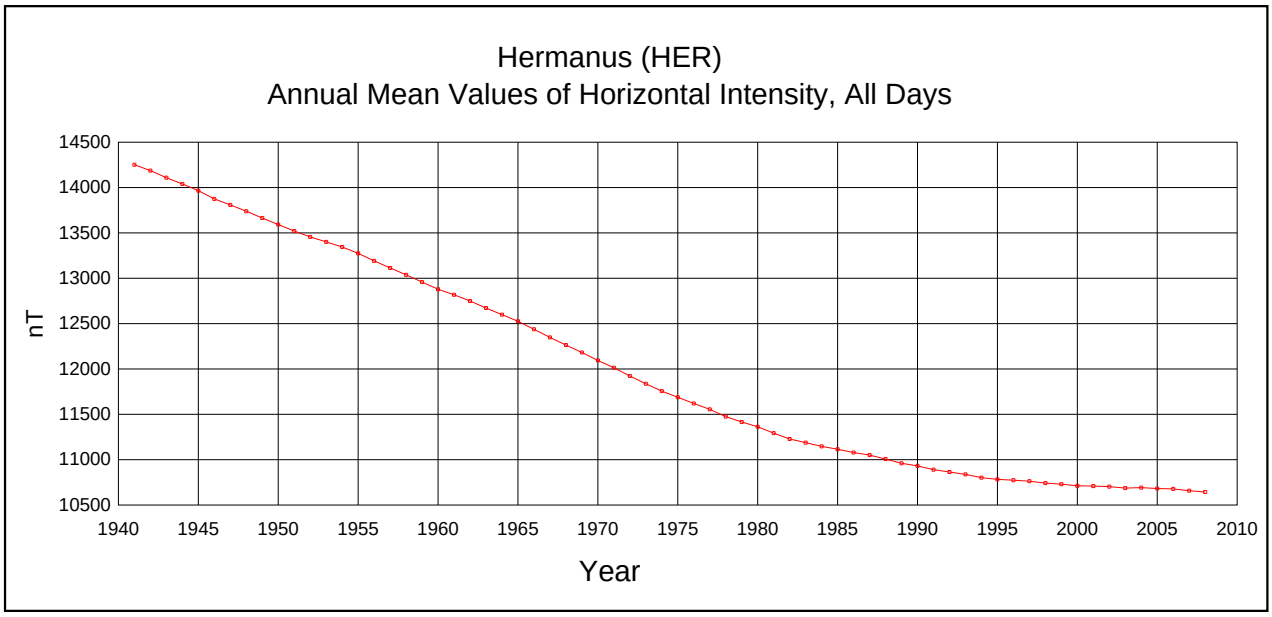
Date	°D	'	°I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1941.5	-23	51.6	-64	01.4	14252	13034	-5765	-29249	32537	A	DHZ
1942.5	-23	48.1	-64	03.0	14187	12980	-5724	-29153	32422	A	DHZ
1943.5	-23	47.1	-64	06.4	14109	12911	-5690	-29065	32309	A	DHZ
1944.5	-23	46.8	-64	09.1	14040	12848	-5661	-28981	32202	A	DHZ
1945.5	-23	45.9	-64	12.4	13966	12782	-5628	-28900	32097	A	DHZ
1946.5	-23	46.4	-64	17.5	13875	12697	-5594	-28819	31985	A	DHZ
1947.5	-23	46.6	-64	19.9	13809	12637	-5567	-28734	31880	A	DHZ
1948.5	-23	47.6	-64	22.4	13739	12571	-5543	-28642	31767	A	DHZ
1949.5	-23	48.8	-64	25.8	13664	12501	-5517	-28557	31657	A	DHZ
1950.5	-23	48.9	-64	28.5	13592	12435	-5488	-28465	31543	A	DHZ
1951.5	-23	48.9	-64	31.2	13521	12370	-5460	-28373	31430	A	DHZ
1952.5	-23	49.8	-64	33.1	13456	12309	-5436	-28278	31316	A	DHZ
1953.5	-23	51.9	-64	33.9	13401	12255	-5422	-28179	31203	A	DHZ
1954.5	-23	55.3	-64	35.3	13345	12199	-5411	-28090	31098	A	DHZ
1955.5	-23	58.7	-64	38.7	13275	12130	-5395	-28013	30999	A	DHZ
1956.5	-24	01.6	-64	44.0	13192	12049	-5372	-27950	30907	A	DHZ
1957.5	-24	03.0	-64	48.5	13114	11976	-5344	-27880	30810	A	DHZ
1958.5	-24	03.7	-64	52.6	13038	11905	-5316	-27804	30709	A	DHZ
1959.5	-24	04.8	-64	56.9	12958	11830	-5287	-27724	30603	A	DHZ
1960.5	-24	06.7	-65	01.0	12879	11755	-5261	-27640	30493	A	DHZ
1961.5	-24	08.3	-65	02.8	12818	11697	-5242	-27546	30382	A	DHZ
1962.5	-24	09.8	-65	04.8	12750	11633	-5219	-27444	30261	A	DHZ
1963.5	-24	11.4	-65	08.0	12672	11559	-5192	-27340	30134	A	DHZ
1964.5	-24	12.5	-65	10.6	12599	11491	-5166	-27238	30010	A	DHZ
1965.5	-24	13.0	-65	13.5	12526	11423	-5138	-27139	29890	A	DHZ
1966.5	-24	13.5	-65	18.2	12438	11343	-5104	-27046	29769	A	DHZ
1967.5	-24	13.9	-65	23.3	12348	11260	-5068	-26956	29650	A	DHZ
1968.5	-24	13.6	-65	27.6	12264	11184	-5032	-26860	29527	A	DHZ
1969.5	-24	13.2	-65	31.6	12182	11110	-4997	-26764	29406	A	DHZ
1970.5	-24	11.9	-65	36.3	12094	11032	-4957	-26668	29282	A	DHZ
1971.5	-24	09.6	-65	40.3	12014	10962	-4917	-26573	29163	A	DHZ
1972.5	-24	06.7	-65	45.7	11923	10883	-4871	-26482	29042	A	DHZ
1973.5	-24	03.2	-65	50.7	11837	10809	-4825	-26394	28927	A	DHZ
1974.5	-23	59.9	-65	55.0	11756	10740	-4781	-26302	28810	A	DHZ
1975.5	-23	56.3	-65	57.9	11688	10683	-4743	-26210	28698	A	DHZ
1976.5	-23	51.7	-66	00.9	11620	10627	-4700	-26116	28584	A	DHZ
1977.5	-23	46.6	-66	03.5	11555	10574	-4659	-26024	28473	A	DHZ
1978.5	-23	41.7	-66	08.1	11475	10508	-4611	-25937	28362	A	DHZ
1979.5	-23	36.1	-66	10.2	11416	10461	-4571	-25846	28255	A	DHZ
1980.5	-23	30.6	-66	11.4	11363	10420	-4533	-25753	28148	A	DHZ

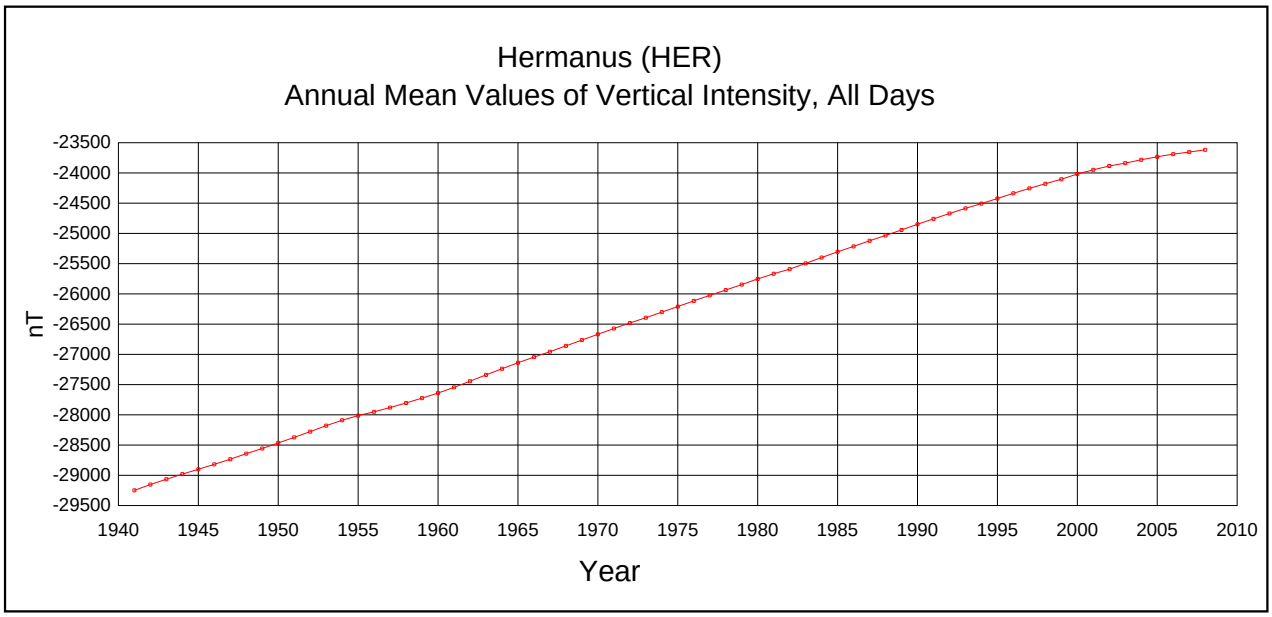
HERMANUS
MEAN ANNUAL VALUES

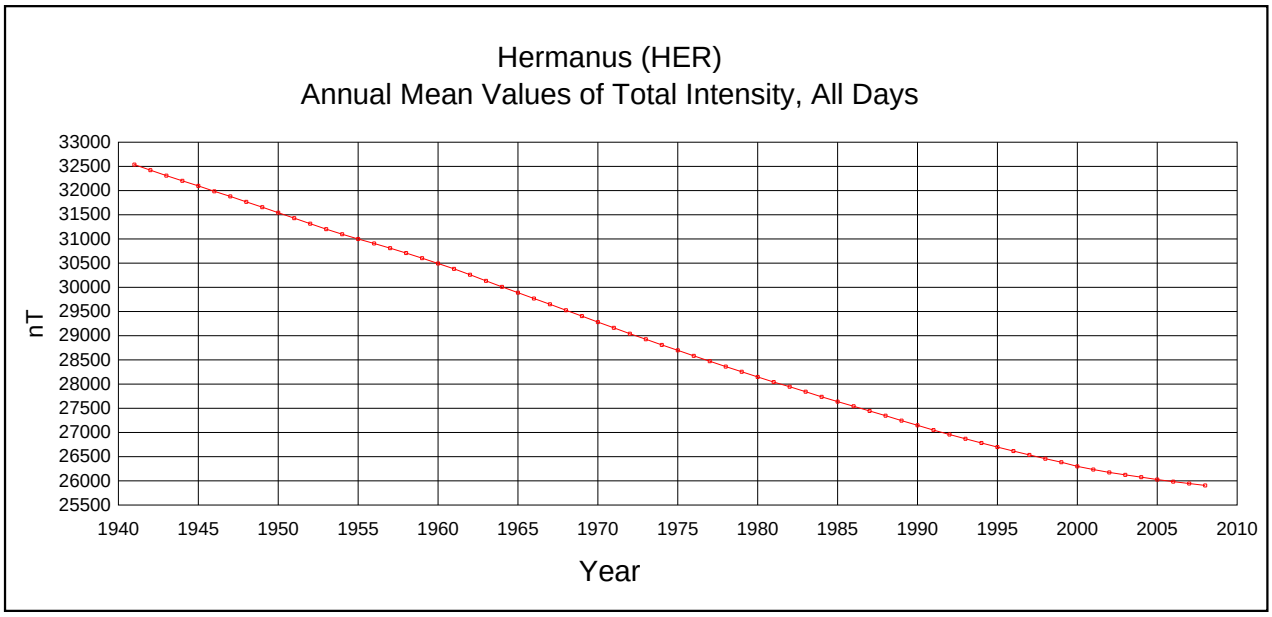
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1981.5	-23 26.1	-66 15.0	11293	10362	-4492	-25667	28042	A	DHZ
1982.5	-23 21.3	-66 18.6	11228	10309	-4452	-25591	27946	A	DHZ
1983.5	-23 16.0	-66 18.4	11188	10279	-4420	-25496	27843	A	DHZ
1984.5	-23 13.3	-66 18.3	11147	10244	-4395	-25399	27737	A	DHZ
1985.5	-23 12.7	-66 17.2	11115	10216	-4381	-25304	27638	A	DHZ
1986.5	-23 14.6	-66 16.8	11079	10180	-4373	-25215	27542	A	DHZ
1987.5	-23 16.1	-66 15.3	11051	10153	-4366	-25122	27445	A	DHZ
1988.5	-23 18.9	-66 15.9	11007	10109	-4357	-25034	27347	A	DHZ
1989.5	-23 22.5	-66 16.7	10960	10061	-4349	-24943	27245	A	DHZ
1990.5	-23 25.0	-66 15.2	10932	10032	-4345	-24849	27148	A	DHZ
1991.5	-23 28.0	-66 15.5	10890	9990	-4337	-24759	27049	A	DHZ
1992.5	-23 30.2	-66 14.0	10864	9963	-4333	-24671	26958	A	DHZ
1993.5	-23 32.2	-66 12.7	10838	9937	-4329	-24586	26870	A	DHZ
1994.5	-23 33.5	-66 12.8	10802	9902	-4318	-24507	26783	A	DHZ
1995.5	-23 34.8	-66 10.7	10783	9883	-4314	-24423	26698	A	DHZ
1996.5	-23 34.0	-66 07.2	10774	9876	-4308	-24337	26616	A	DHZ
1997.5	-23 40.4	-66 04.3	10763	9858	-4322	-24255	26536	A	DHZ
1998.5	-23 45.4	-66 02.7	10742	9833	-4328	-24179	26458	A	DHZ
1999.0	0 1.1	0 -0.5	3	4	2	-16	4	J	DHZ
1999.5	-23 50.3	-66 00.3	10730	9815	-4337	-24104	26385	A	DHZ
2000.5	-23 58.9	-65 57.8	10712	9788	-4355	-24018	26299	A	DHZ
2001.5	-24 05.7	-65 54.4	10709	9776	-4372	-23948	26234	A	DHZ
2002.5	-24 12.5	-65 51.7	10703	9762	-4389	-23885	26174	A	DHZ
2003.5	-24 20.5	-65 51.1	10687	9738	-4406	-23838	26124	A	DHZ
2004.5	-24 28.4	-65 47.5	10692	9732	-4430	-23782	26076	A	DHZ
2005.5	-24 37.1	-65 46.1	10682	9712	-4450	-23733	26027	A	DHZ
2006.5	-24 44.0	-65 44.2	10678	9698	-4468	-23689	25984	A	DHZ
2007.5	-24 48.6	-65 44.7	10658	9675	-4473	-23655	25945	A	DHZ
2008.5	-24 52.7	-65 44.4	10644	9656	-4478	-23617	25905	A	DHZ

*A: All days
*I: Incomplete
*J: Jump in data, jump value = old site value - new site value
ELE: Elements recorded


Hermanus (HER)
Annual Mean Values of Declination, All Days
Degrees
-23.0
-23.5
-24.0
-24.5
-25.0
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hermanus (HER)
Annual Mean Values of Horizontal Intensity, All Days
nT
14500
14000
13500
13000
12500
12000
11500
11000
10500
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hermanus (HER)
Annual Mean Values of Vertical Intensity, All Days
nT
-23500
-24000
-24500
-25000
-25500
-26000
-26500
-27000
-27500
-28000
-28500
-29000
-29500
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hermanus (HER)
Annual Mean Values of Total Intensity, All Days
nT
33000
32500
32000
31500
31000
30500
30000
29500
29000
28500
28000
27500
27000
26500
26000
25500
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

Magnetic Results 2008

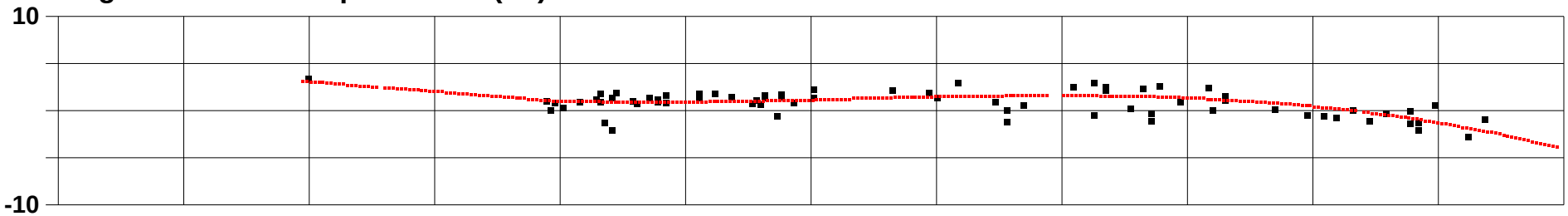
Hartebeesthoek

Observed and Adopted Baseline Values, HBK 2008

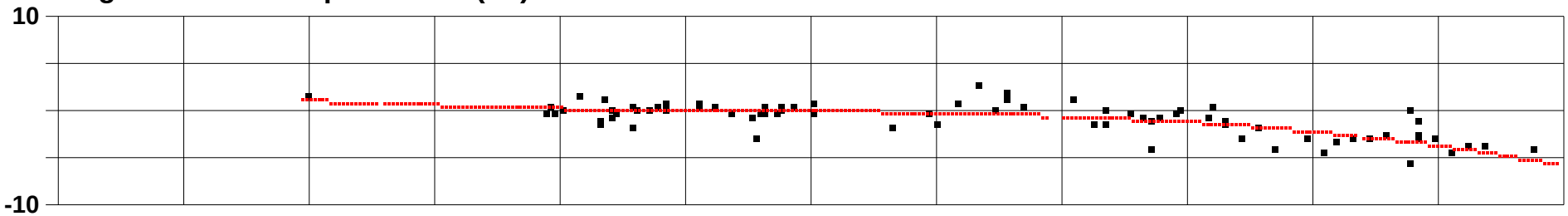
LAT: 115.883 LONG: 27.707

INSTITUTION: HMO INSTRUMENT: LC

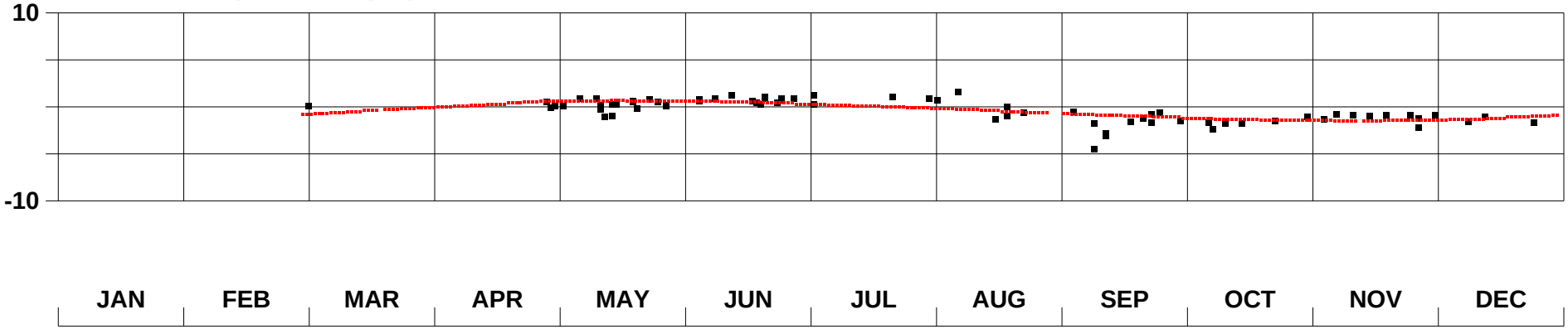
Magnetic North Component HN (nT)

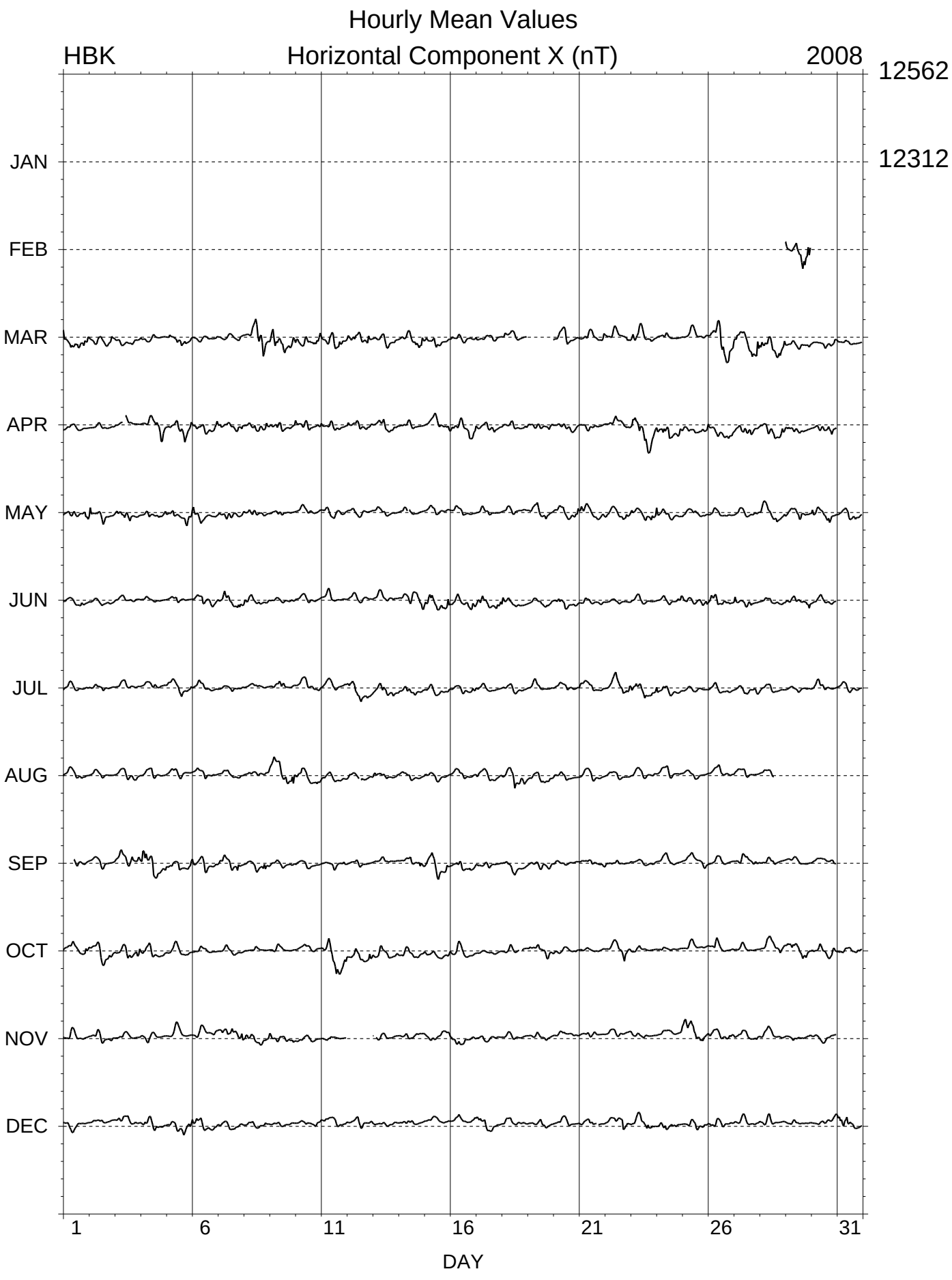


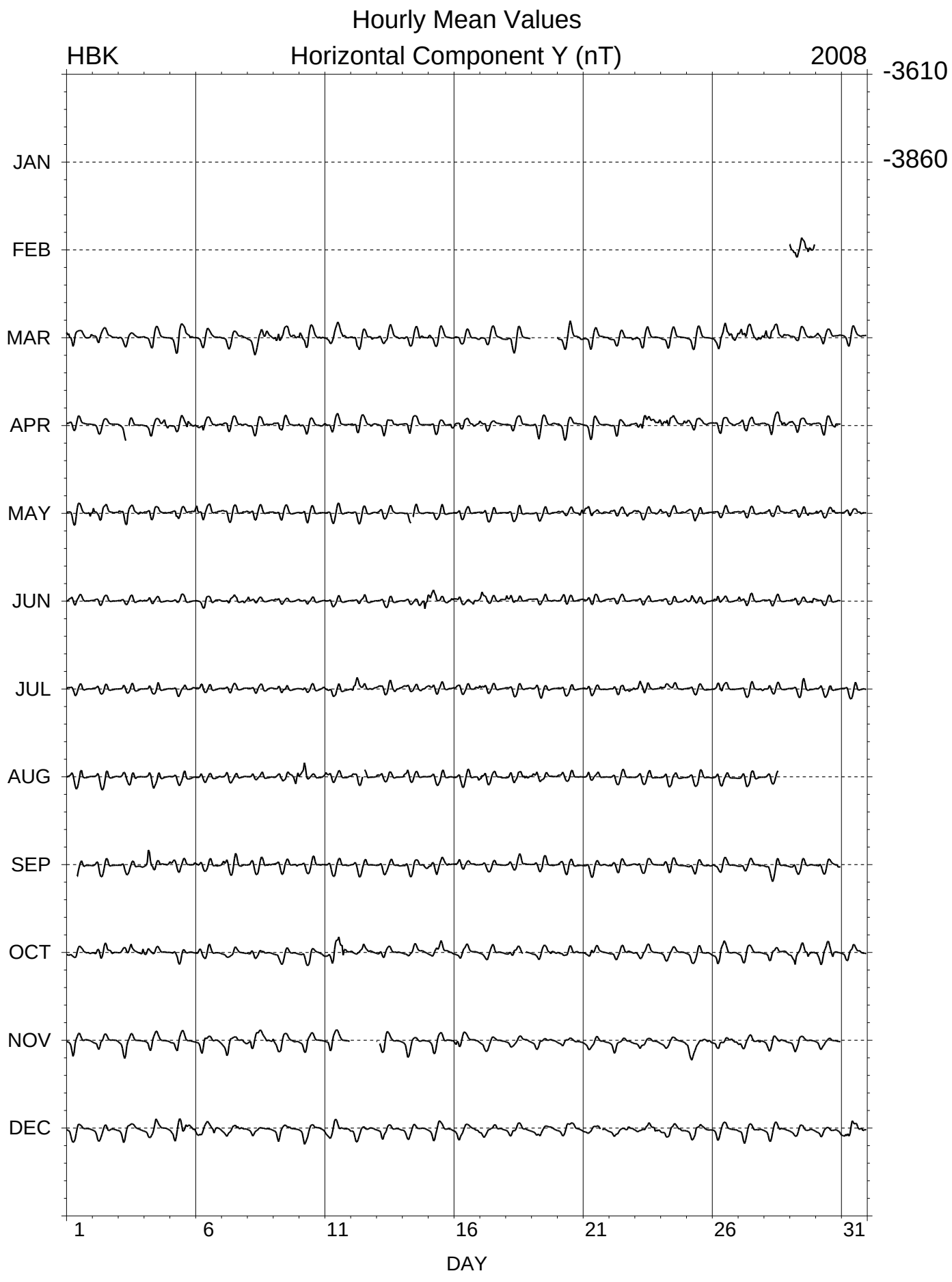
Magnetic East Component HE (nT)

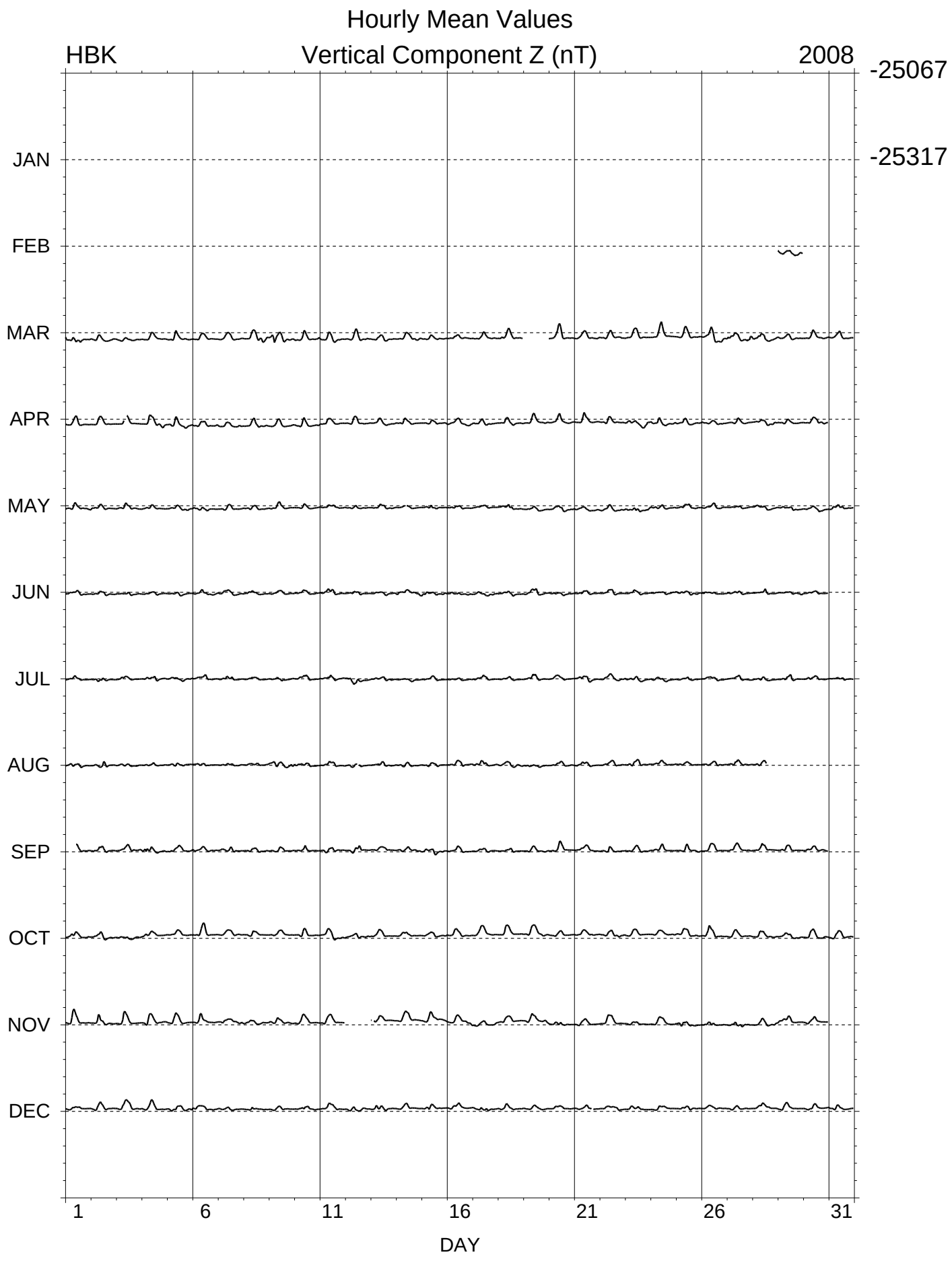


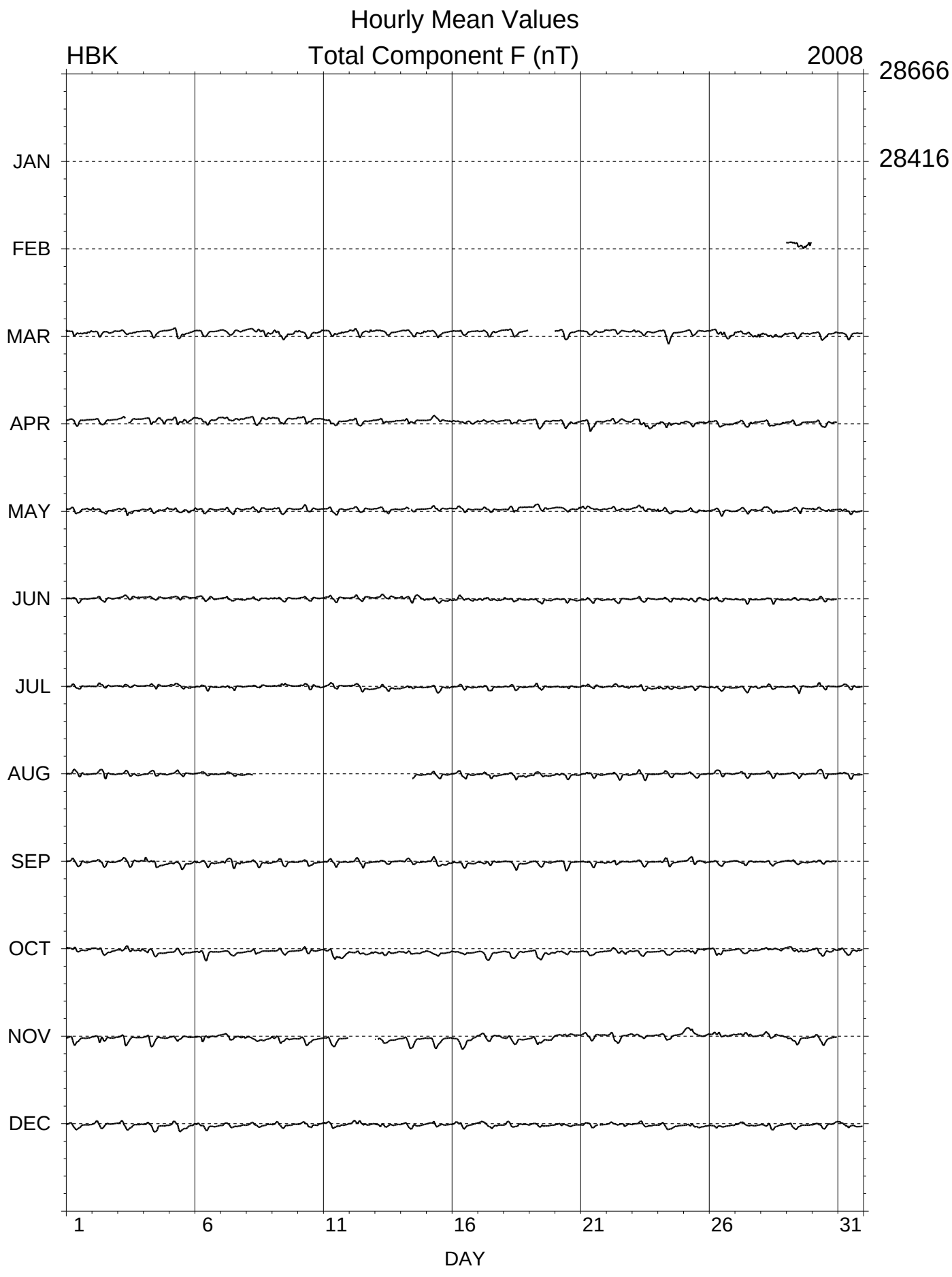
Vertical Component Z (nT)




Hourly Mean Values
HBK
Horizontal Component X (nT)
2008
12562
12312
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HBK
Horizontal Component Y (nT)
2008
-3610
-3860
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HBK
Vertical Component Z (nT)
2008
-25067
-25317
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HBK
Total Component F (nT)
2008
28666
28416
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

HARTEBEESTHOEK
MEAN MONTHLY VALUES 2008

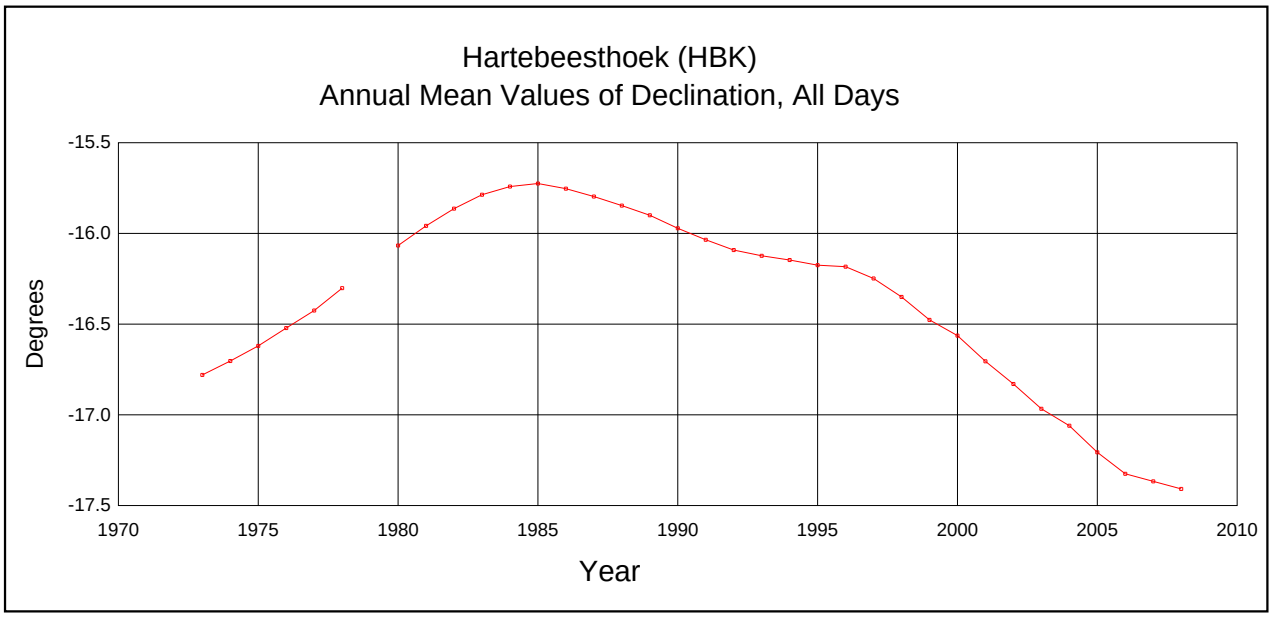
Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
MAR	-17 24.4	-63 01.2	12895	12305	-3858	-25331	28427	A	HDZF
APR	-17 24.1	-63 01.1	12895	12305	-3856	-25328	28423	A	HDZF
MAY	-17 24.1	-63 00.3	12901	12310	-3858	-25324	28421	A	HDZF
JUN	-17 24.1	-63 00.1	12901	12310	-3858	-25320	28416	A	HDZF
JUL	-17 24.4	-62 59.7	12903	12312	-3860	-25318	28414	A	HDZF
AUG	-17 24.6	-62 59.3	12905	12314	-3861	-25315	28415	A	HDZF
SEP	-17 25.0	-62 59.2	12904	12313	-3863	-25312	28412	A	HDZF
OCT	-17 24.6	-62 59.0	12904	12312	-3861	-25306	28407	A	HDZF
NOV	-17 25.0	-62 58.2	12912	12320	-3865	-25308	28411	A	HDZF
DEC	-17 25.3	-62 58.0	12914	12321	-3866	-25308	28412	A	HDZF
YEAR	-17 24.6	-62 59.6	12903	12312	-3861	-25317	28416	A	HDZF
JAN	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
MAR	-17 24.3	-63 00.2	12903	12313	-3860	-25328	28428	Q	HDZF
APR	-17 24.1	-63 00.6	12899	12309	-3858	-25326	28425	Q	HDZF
MAY	-17 24.2	-62 59.5	12907	12316	-3860	-25322	28422	Q	HDZF
JUN	-17 23.9	-62 59.4	12907	12316	-3859	-25319	28418	Q	HDZF
JUL	-17 24.2	-62 59.4	12906	12315	-3860	-25318	28416	Q	HDZF
AUG	-17 24.9	-62 58.7	12911	12319	-3864	-25314	28416	Q	HDZF
SEP	-17 25.1	-62 58.7	12909	12317	-3864	-25310	28413	Q	HDZF
OCT	-17 24.8	-62 58.1	12910	12319	-3863	-25304	28408	Q	HDZF
NOV	-17 25.5	-62 57.7	12915	12322	-3867	-25306	28410	Q	HDZF
DEC	-17 25.7	-62 58.0	12914	12321	-3868	-25308	28412	Q	HDZF
YEAR	-17 24.7	-62 59.0	12908	12317	-3862	-25316	28417	Q	HDZF
JAN	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
MAR	-17 23.9	-63 02.6	12884	12295	-3853	-25333	28423	D	HDZF
APR	-17 23.9	-63 02.1	12887	12297	-3854	-25330	28421	D	HDZF
MAY	-17 24.0	-63 00.7	12897	12307	-3857	-25325	28420	D	HDZF
JUN	-17 24.2	-63 00.3	12899	12308	-3858	-25320	28415	D	HDZF
JUL	-17 24.3	-63 00.5	12896	12306	-3858	-25319	28413	D	HDZF
AUG	-17 24.4	-62 59.8	12901	12311	-3859	-25316	28412	D	HDZF
SEP	-17 24.9	-63 00.1	12897	12306	-3860	-25314	28411	D	HDZF
OCT	-17 24.5	-62 59.9	12898	12307	-3859	-25312	28409	D	HDZF
NOV	-17 25.1	-62 58.7	12909	12317	-3864	-25311	28413	D	HDZF
DEC	-17 25.0	-62 58.5	12909	12317	-3864	-25308	28410	D	HDZF
YEAR	-17 24.4	-63 00.3	12898	12307	-3858	-25319	28415	D	HDZF

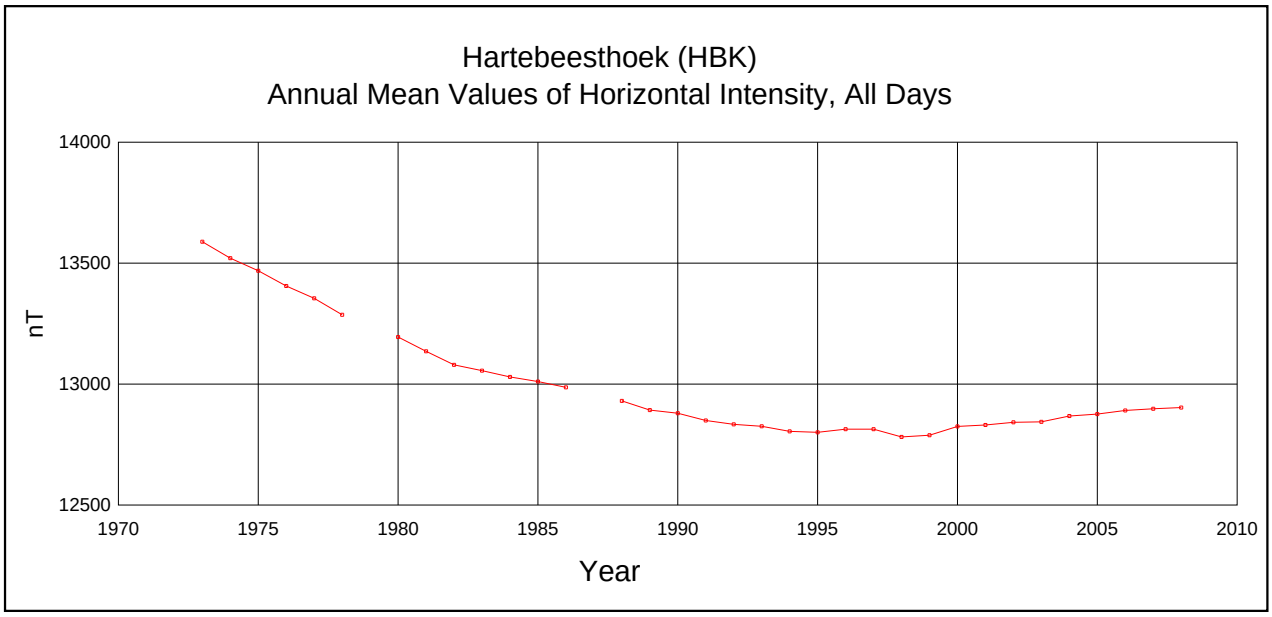
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

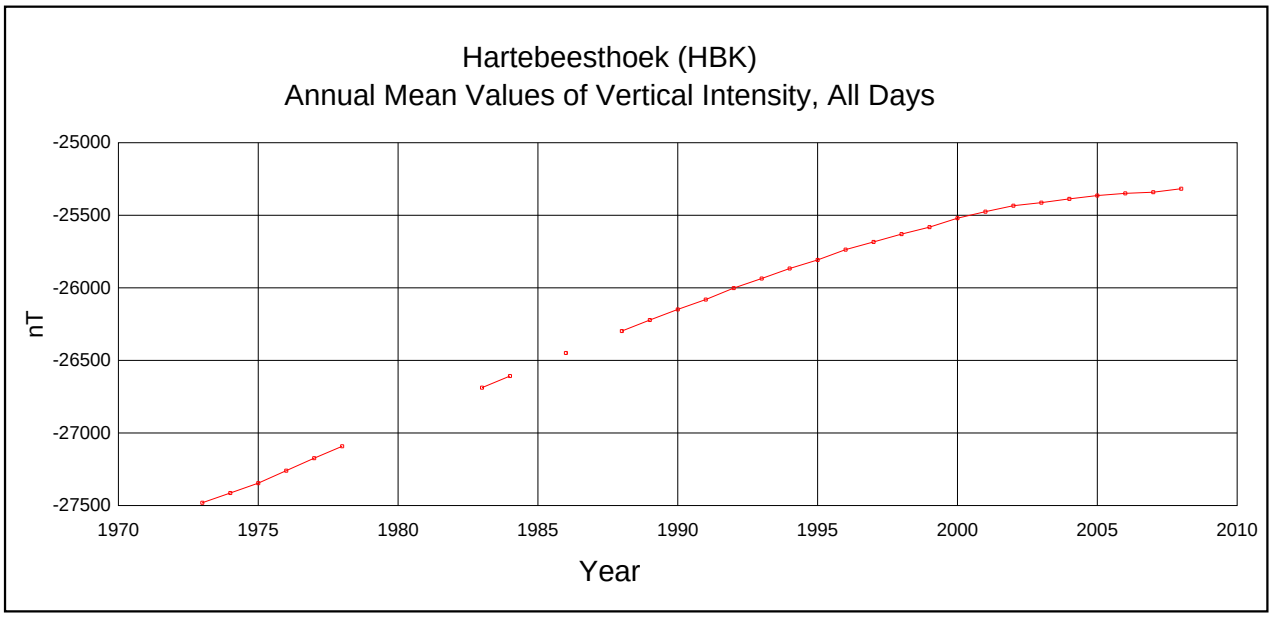
HARTEBEESTHOEK
MEAN ANNUAL VALUES

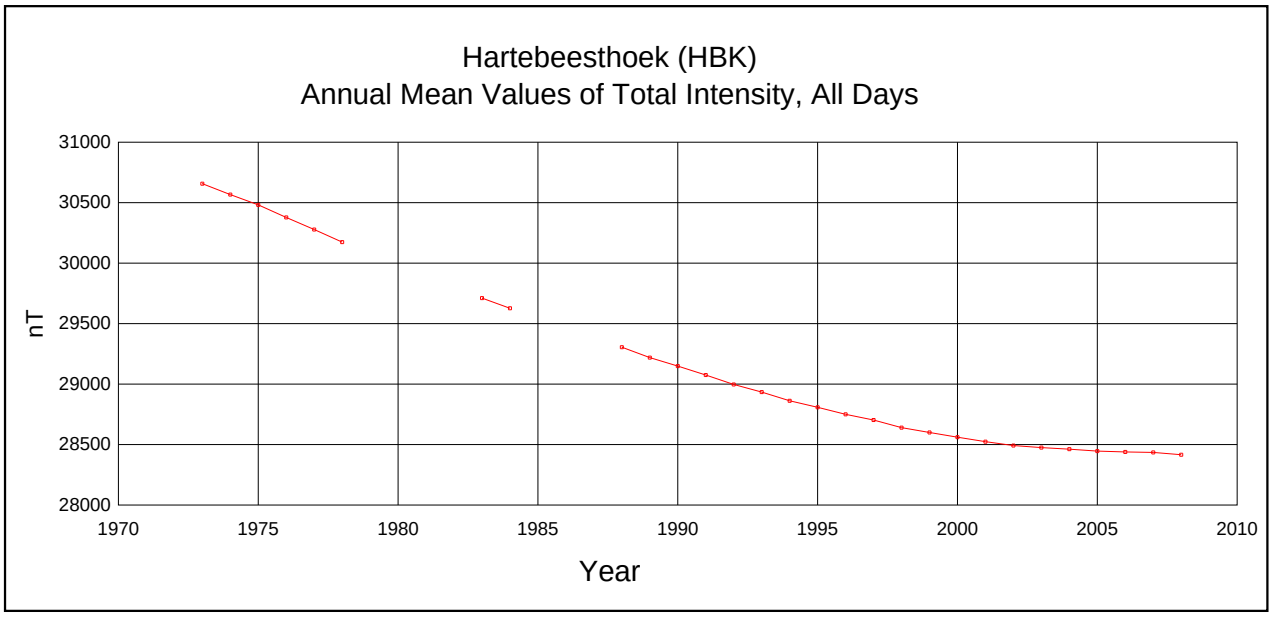
Date	°D	'	°I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1973.5	-16	46.6	-63	41.5	13588	13010	-3919	-27481	30657	I	DHZ
1974.5	-16	42.0	-63	45.0	13520	12950	-3885	-27414	30567	A	DHZ
1975.5	-16	37.0	-63	46.8	13468	12905	-3852	-27346	30482	A	DHZ
1976.5	-16	31.1	-63	49.0	13405	12852	-3811	-27260	30378	A	DHZ
1977.5	-16	25.3	-63	49.8	13354	12810	-3775	-27174	30278	A	DHZ
1978.5	-16	17.9	-63	52.6	13286	12752	-3729	-27092	30174	I	DHZ
1979.5	999	99.9	999	99.9	99999	99999	99999	99999	99999	I	DHZ
1980.5	-16	03.8	999	99.9	13194	12679	-3651	99999	99999	I	DHZ
1981.5	-15	57.3	999	99.9	13135	12629	-3610	99999	99999	I	DHZ
1982.5	-15	51.6	999	99.9	13079	12581	-3574	99999	99999	I	DHZ
1983.5	-15	47.0	-63	56.0	13055	12563	-3551	-26688	29711	I	DHZ
1984.5	-15	44.3	-63	54.5	13029	12541	-3534	-26608	29627	I	DHZ
1985.5	-15	43.3	999	99.9	13010	12524	-3525	99999	99999	I	DHZ
1986.5	-15	45.0	999	99.9	12986	99999	99999	-26449	99999	I	DHZ
1987.5	-15	47.6	999	99.9	99999	99999	99999	99999	99999	I	DHZ
1988.5	-15	50.6	-63	49.1	12930	12439	-3530	-26298	29305	I	DHZ
1989.5	-15	53.8	-63	49.1	12892	12396	-3531	-26222	29219	I	DHZ
1990.5	-15	58.1	-63	46.8	12879	12382	-3543	-26149	29149	I	DHZ
1991.5	-16	01.9	-63	46.5	12849	12349	-3548	-26081	29075	I	DHZ
1992.5	-16	05.3	-63	44.0	12833	12330	-3556	-26002	28997	I	DHZ
1993.5	-16	07.2	-63	41.3	12825	12321	-3560	-25936	28934	I	DHZ
1994.5	-16	08.6	-63	40.0	12804	12299	-3560	-25867	28862	I	DHZ
1995.5	-16	10.3	-63	37.3	12800	12294	-3565	-25808	28808	A	DHZ
1996.5	-16	10.8	-63	32.1	12813	12306	-3570	-25737	28750	A	DHZ
1997.5	-16	14.7	-63	29.3	12813	12302	-3584	-25684	28703	I	DHZ
1998.5	-16	20.8	-63	29.8	12781	12265	-3597	-25630	28640	I	DHZ
1999.5	-16	28.4	-63	26.4	12788	12263	-3626	-25582	28600	A	DHZ
2000.0	0	0.0	0	-4.8	-35	-34	11	-18	0	J	DHZ
2000.5	-16	33.8	-63	19.1	12825	12293	-3656	-25520	28561	A	DHZ
2001.5	-16	42.3	-63	16.0	12831	12290	-3688	-25475	28524	I	DHZ
2002.5	-16	49.8	-63	12.7	12842	12292	-3718	-25434	28492	I	DHZ
2003.5	-16	58.0	-63	11.4	12844	12285	-3748	-25413	28475	A	DHZ
2004.5	-17	03.6	-63	07.3	12868	12302	-3775	-25387	28462	I	DHZ
2005.5	-17	12.4	-63	05.2	12876	12300	-3809	-25364	28446	A	DHZ
2006.5	-17	19.5	-63	02.7	12891	12306	-3839	-25349	28439	A	DHZ
2007.5	-17	22.0	-63	01.4	12898	12310	-3850	-25341	28435	I	DHZ
2008.5	-17	24.5	-62	59.6	12903	12312	-3860	-25317	28416	I	DHZ

*A: All days
*I: Incomplete
*J: Jump in data, jump value = old site value - new site value
ELE: Elements recorded


Hartebeesthoek (HBK)
Annual Mean Values of Declination, All Days
Degrees
-15.5
-16.0
-16.5
-17.0
-17.5
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hartebeesthoek (HBK)
Annual Mean Values of Horizontal Intensity, All Days
nT
14000
13500
13000
12500
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hartebeesthoek (HBK)
Annual Mean Values of Vertical Intensity, All Days
-25000
-25500
-26000
-26500
-27000
-27500
nT
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Hartebeesthoek (HBK)
Annual Mean Values of Total Intensity, All Days
31000
30500
30000
29500
29000
28500
28000
nT
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

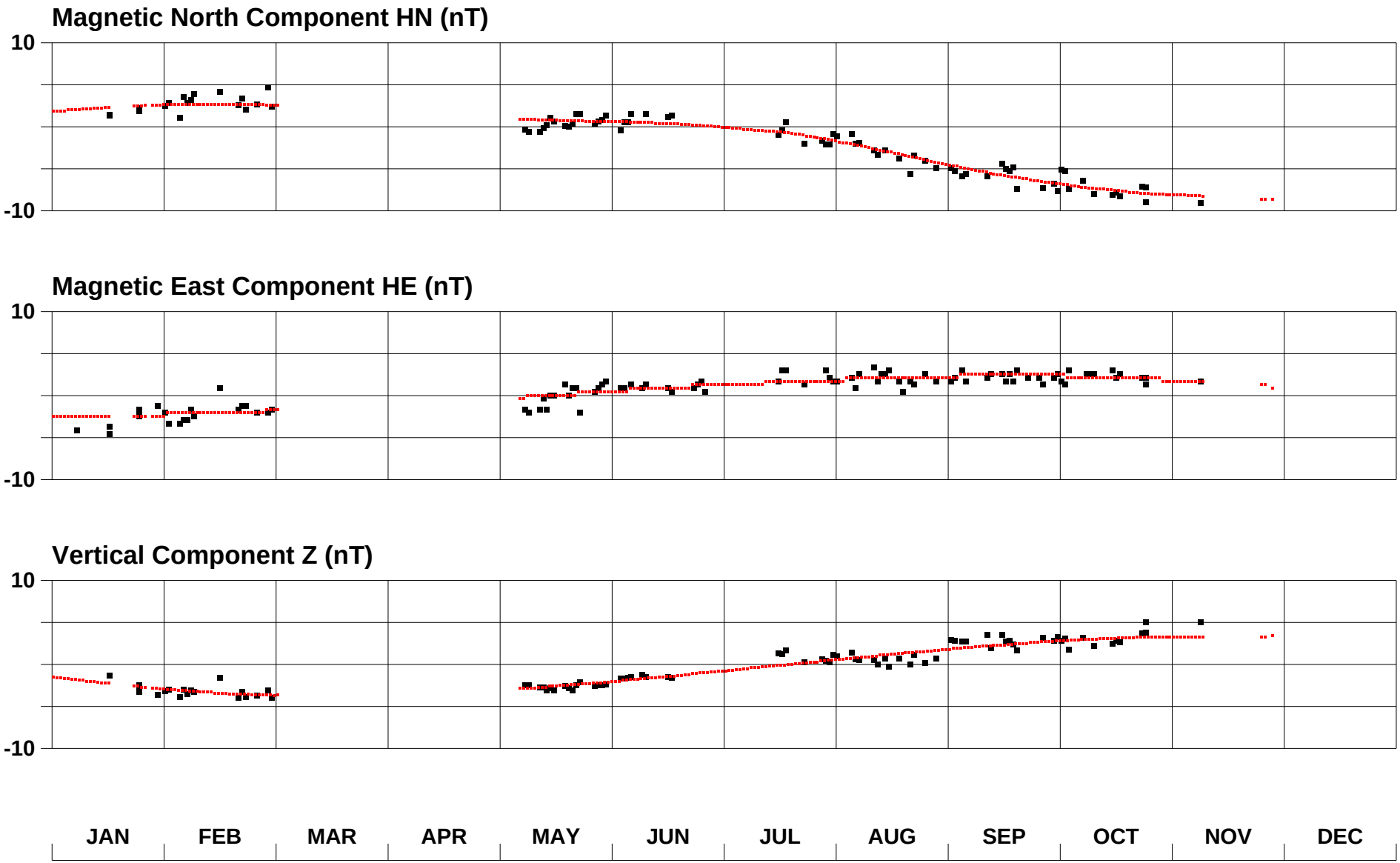
Magnetic Results 2008

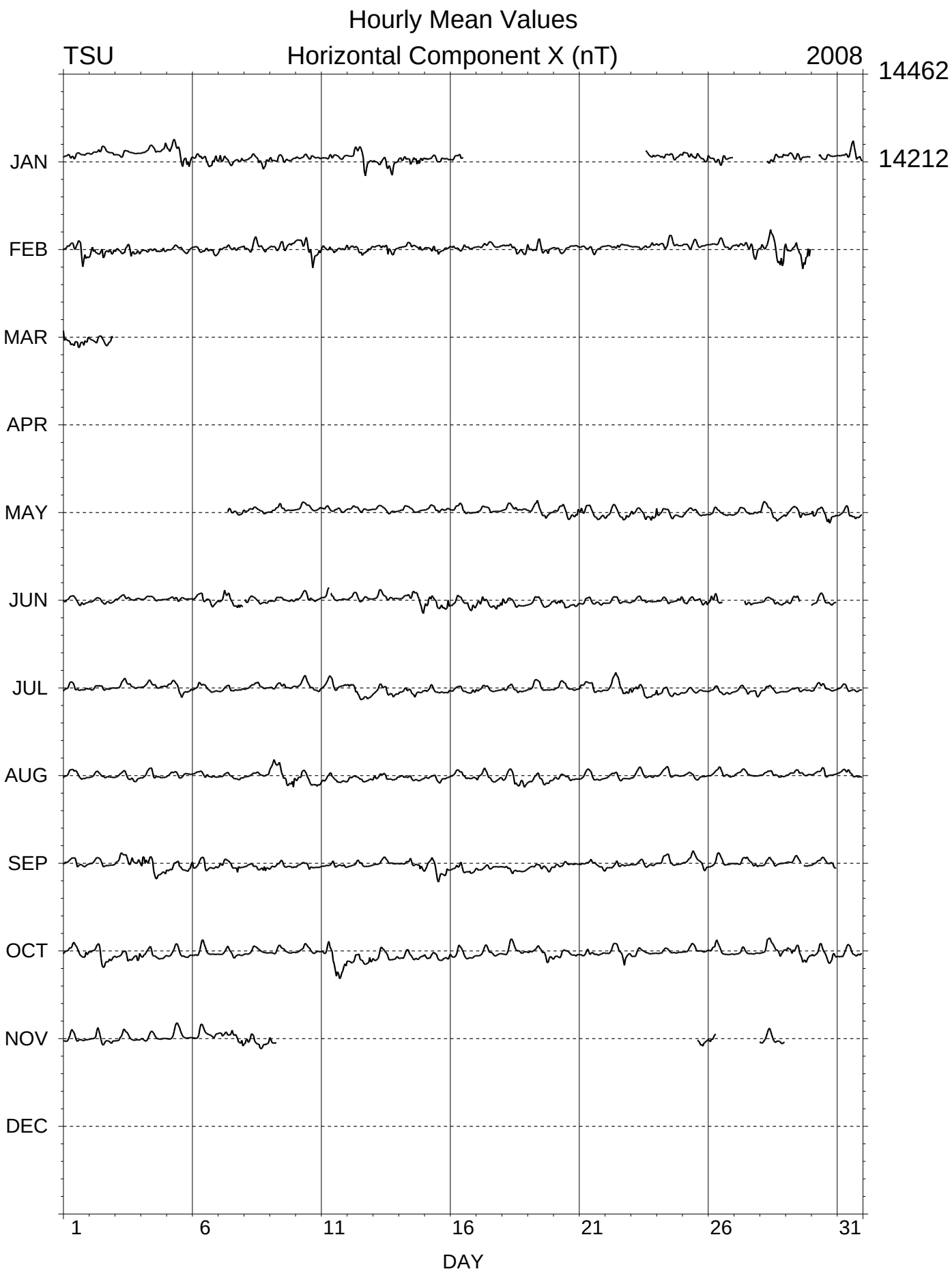
Tsumeb

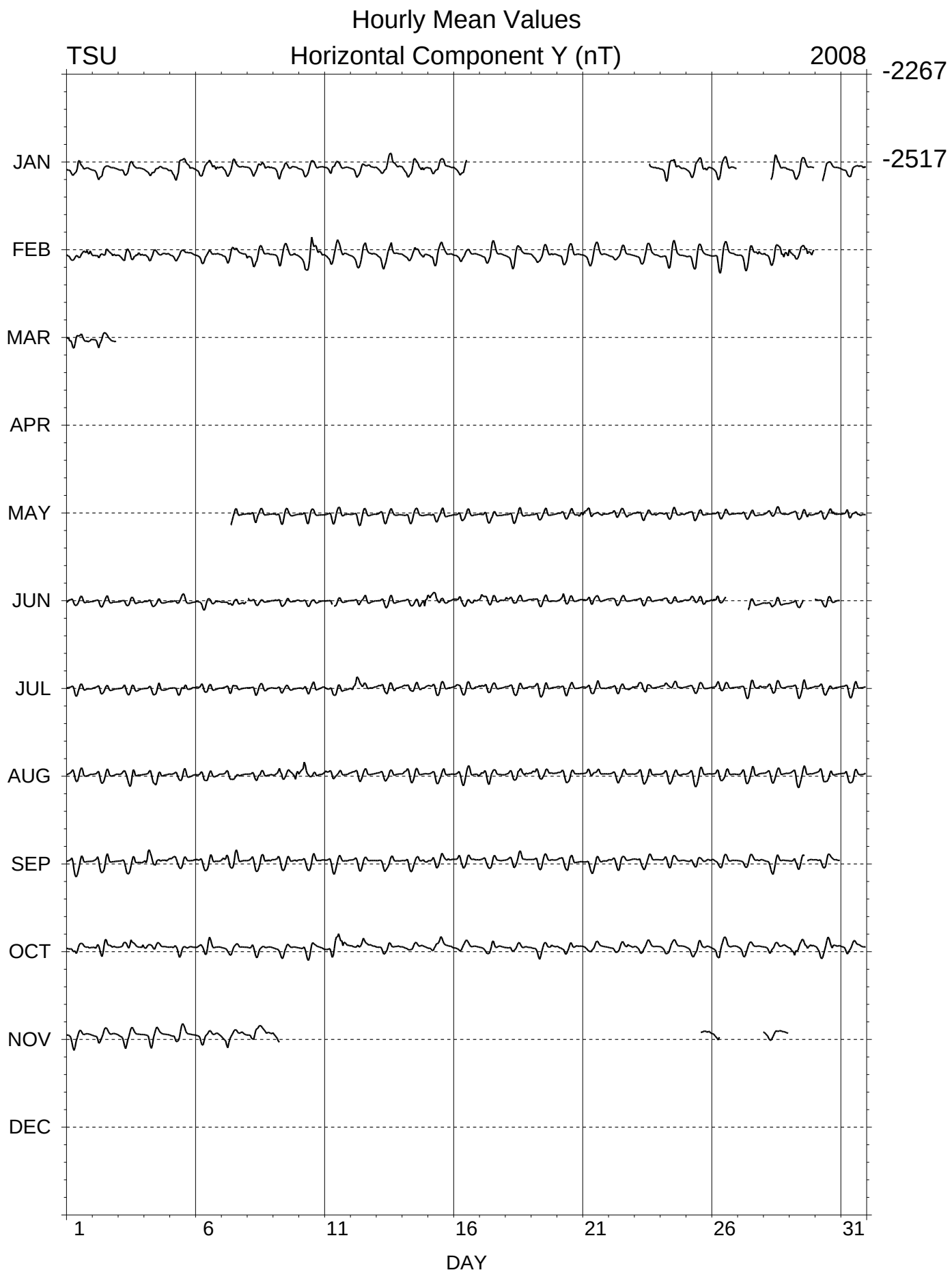
Observed and Adopted Baseline Values, TSU 2008

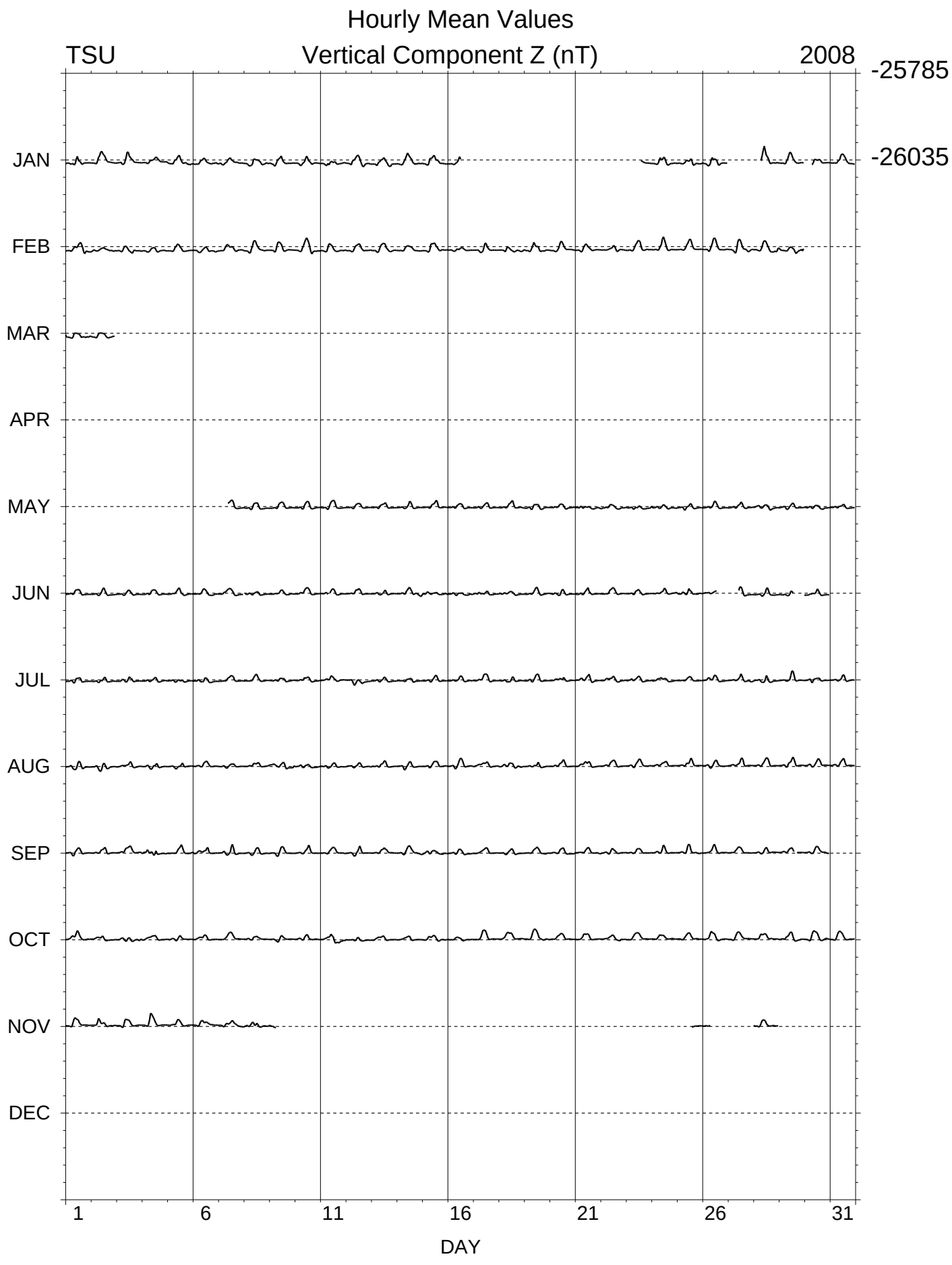
LAT: 109.202 LONG: 17.584

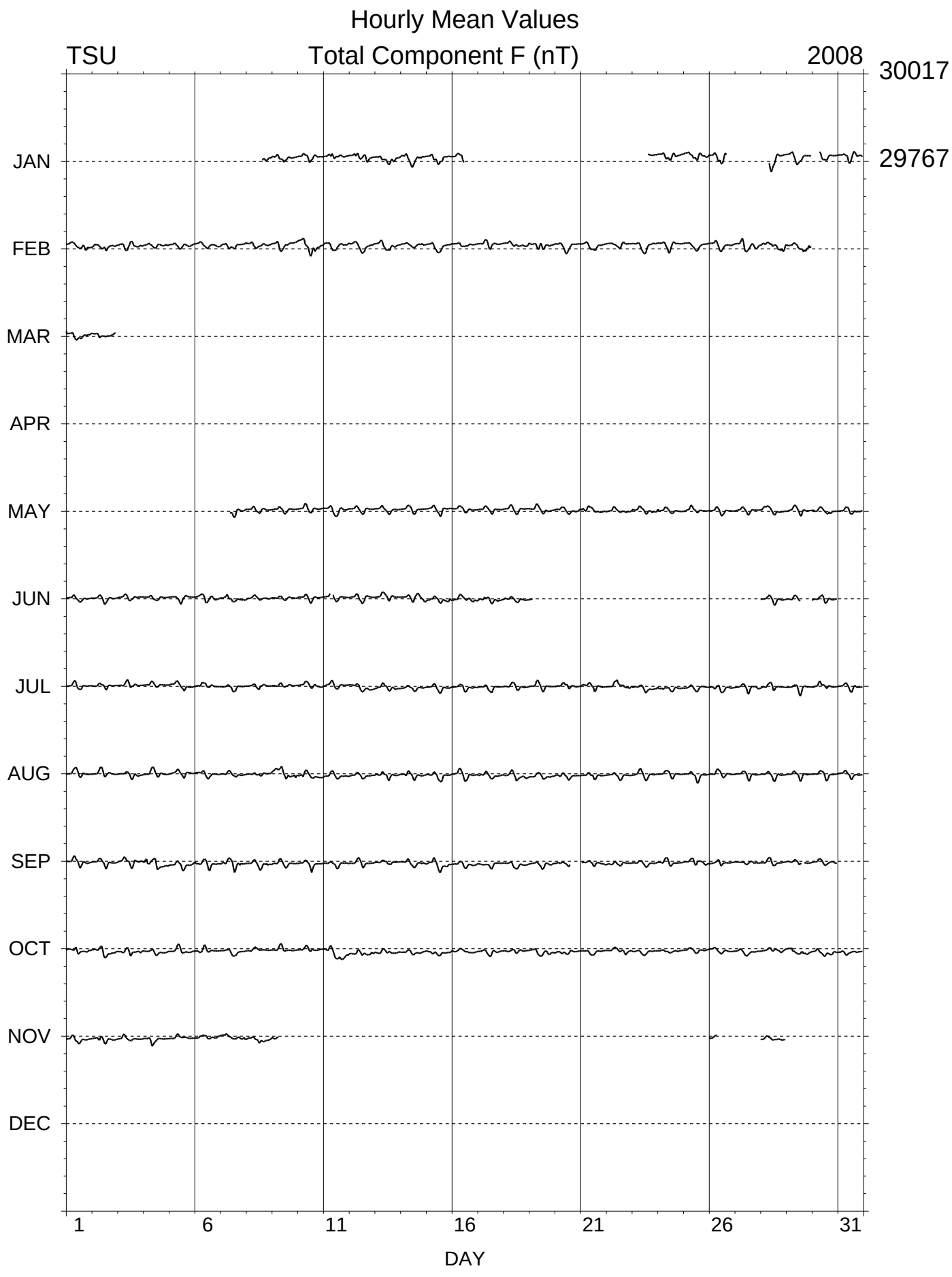
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
TSU
Horizontal Component X (nT)
2008
14462
14212
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
TSU
Horizontal Component Y (nT)
2008
-2267
-2517
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
TSU
Vertical Component Z (nT)
2008
-25785
-26035
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
TSU
Total Component F (nT)
2008
30017
29767
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

TSUMEB
MEAN MONTHLY VALUES 2008

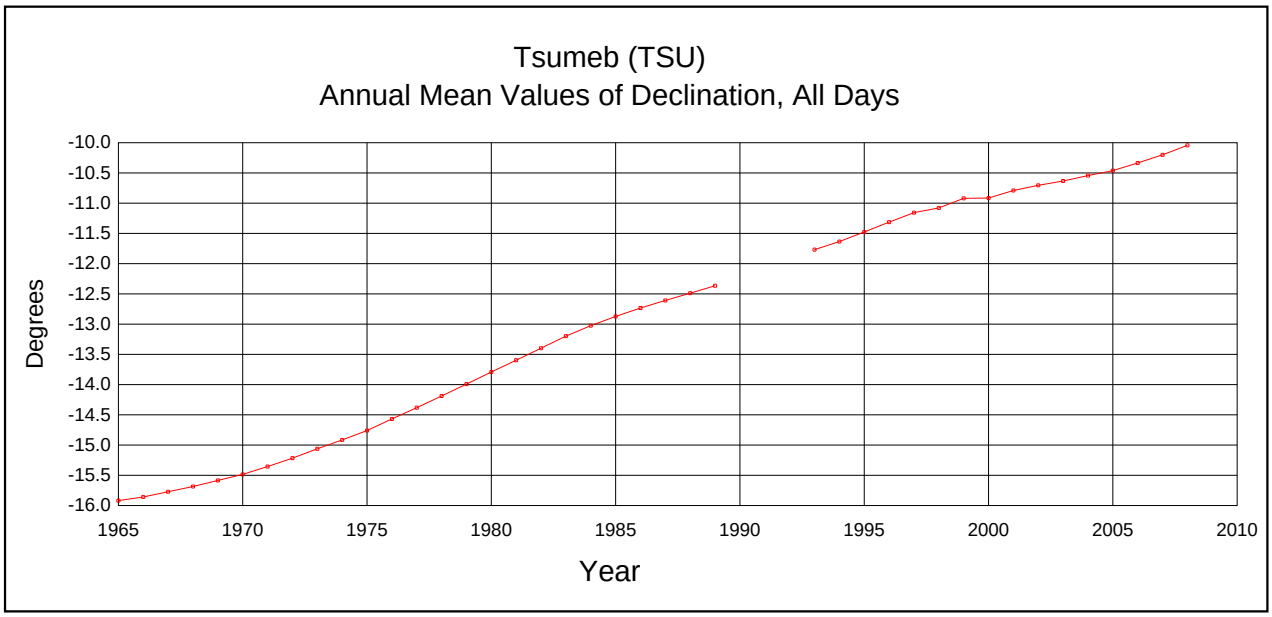
Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-10 06.2	-60 58.4	14450	14226	-2535	-26041	29780	A	HDZF
FEB	-10 05.8	-60 59.5	14440	14217	-2532	-26042	29777	A	HDZF
MAR	-10 04.5	-61 01.3	14424	14201	-2523	-26043	29770	A	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
MAY	-10 03.5	-60 59.4	14438	14216	-2521	-26036	29771	A	HDZF
JUN	-10 02.9	-60 59.9	14433	14211	-2518	-26035	29769	A	HDZF
JUL	-10 02.4	-61 00.1	14431	14210	-2516	-26036	29766	A	HDZF
AUG	-10 01.6	-60 59.9	14431	14211	-2513	-26032	29765	A	HDZF
SEP	-10 01.0	-61 00.2	14428	14208	-2510	-26032	29761	A	HDZF
OCT	-9 59.9	-61 00.5	14424	14205	-2504	-26031	29759	A	HDZF
NOV	-9 59.5	-60 59.4	14434	14215	-2504	-26029	29760	A	HDZF
DEC	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
YEAR	-10 02.6	-60 59.8	14433	14212	-2517	-26035	29767	A	HDZF
JAN	-10 06.6	-60 56.6	14466	14242	-2539	-26037	*****	Q	HDZF
FEB	-10 05.6	-60 58.5	14449	14225	-2532	-26040	29779	Q	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
MAY	-10 03.8	-60 58.8	14444	14222	-2524	-26035	29773	Q	HDZF
JUN	-10 02.8	-60 59.2	14439	14218	-2519	-26034	29772	Q	HDZF
JUL	-10 02.7	-60 59.7	14435	14213	-2518	-26036	29768	Q	HDZF
AUG	-10 01.7	-60 59.3	14436	14215	-2514	-26031	29766	Q	HDZF
SEP	-10 01.0	-60 59.7	14433	14213	-2511	-26032	29764	Q	HDZF
OCT	-10 00.1	-60 59.7	14431	14212	-2506	-26029	29762	Q	HDZF
NOV	-10 00.1	-60 59.3	14435	14216	-2507	-26029	29761	Q	HDZF
DEC	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
YEAR	-10 02.8	-60 59.1	14440	14219	-2519	-26034	29769	Q	HDZF
JAN	-10 06.2	-60 59.0	14446	14222	-2534	-26042	29776	D	HDZF
FEB	-10 06.0	-60 60.0	14436	14212	-2532	-26042	29775	D	HDZF
MAR	-10 04.8	-61 01.5	14421	14199	-2524	-26043	29770	D	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
MAY	-10 02.9	-61 00.1	14432	14211	-2518	-26038	29770	D	HDZF
JUN	-10 03.1	-61 00.2	14430	14208	-2519	-26036	29767	D	HDZF
JUL	-10 02.1	-61 00.8	14425	14204	-2513	-26037	29764	D	HDZF
AUG	-10 01.2	-61 00.5	14426	14206	-2510	-26033	29763	D	HDZF
SEP	-10 00.7	-61 01.2	14419	14199	-2507	-26034	29759	D	HDZF
OCT	-9 59.7	-61 01.4	14416	14198	-2502	-26032	29757	D	HDZF
NOV	-9 58.3	-61 01.1	14419	14202	-2497	-26033	29758	D	HDZF
DEC	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
YEAR	-10 02.6	-61 00.5	14428	14207	-2516	-26037	29765	D	HDZF

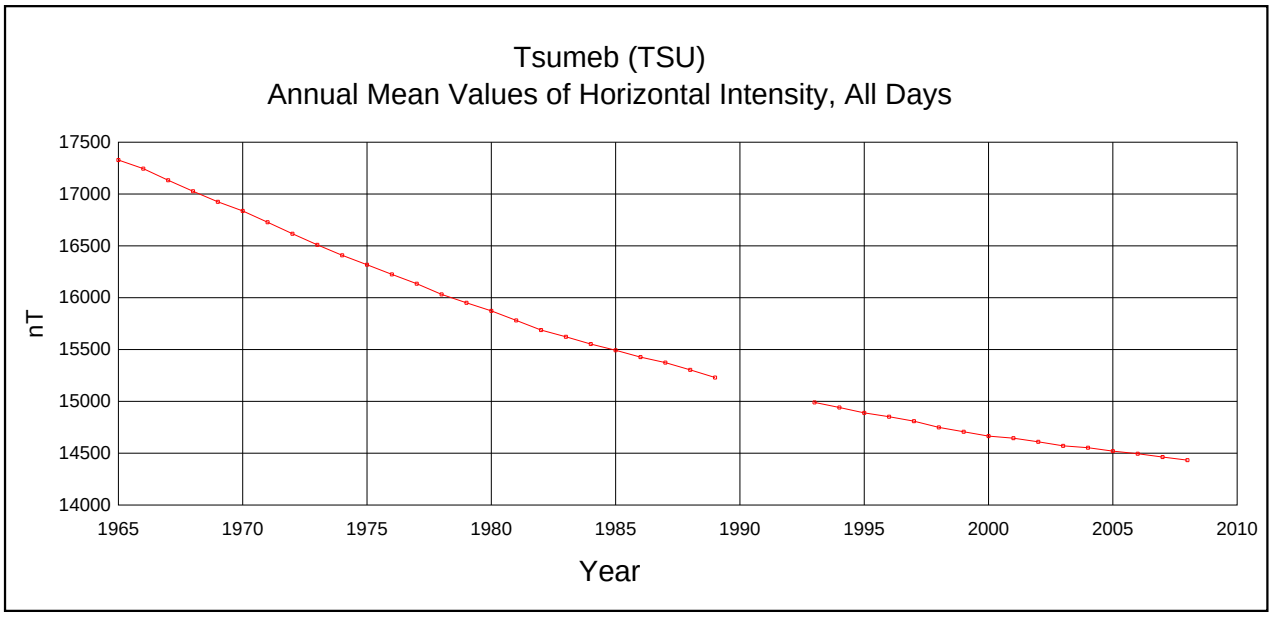
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

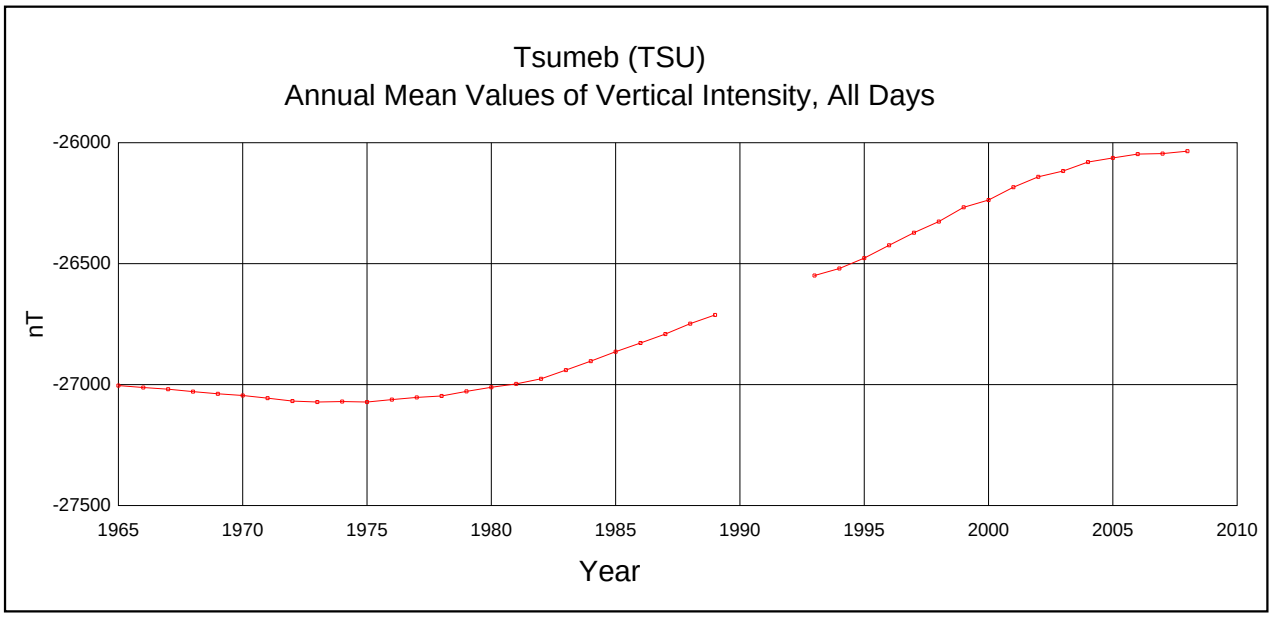
TSUMEB
MEAN ANNUAL VALUES

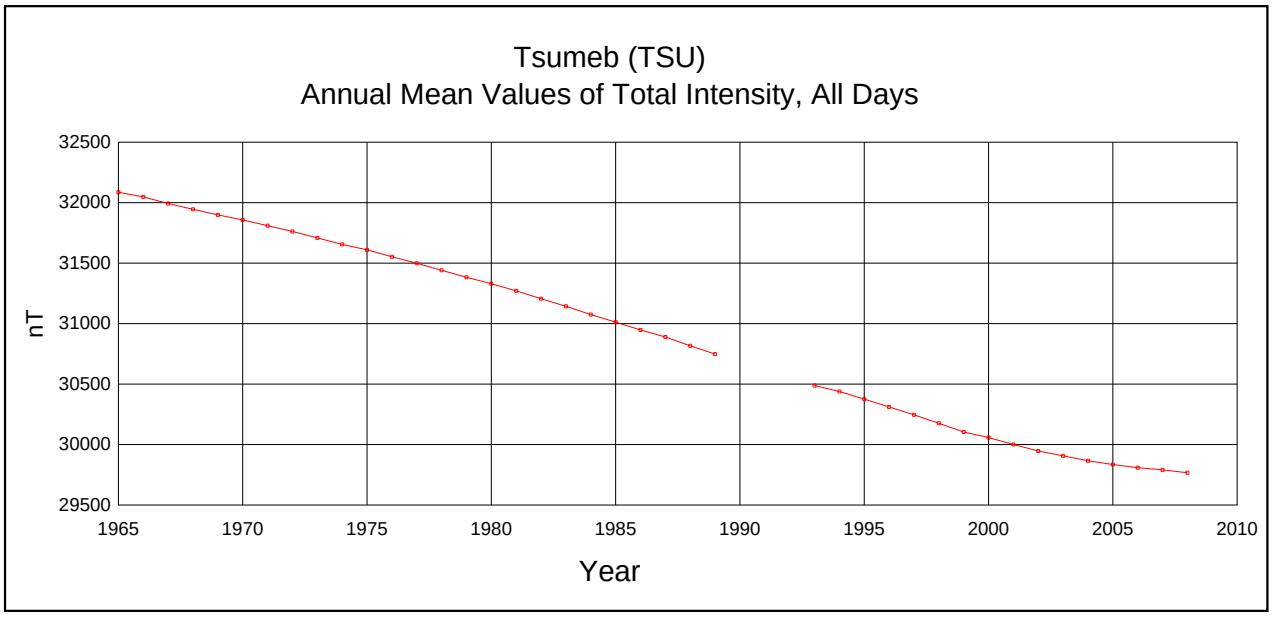
Date	D	I	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1965.5	-15 57.4	-57 18.8	17328	16660	-4764	-27004	32086	I	DHZ
1966.5	-15 53.8	-57 26.7	17245	16585	-4724	-27012	32048	I	DHZ
1967.5	-15 48.6	-57 37.3	17133	16484	-4668	-27019	31993	A	DHZ
1968.5	-15 43.4	-57 47.5	17027	16389	-4614	-27029	31945	I	DHZ
1969.5	-15 37.4	-57 57.3	16925	16300	-4558	-27038	31899	I	DHZ
1970.5	-15 31.4	-58 05.7	16837	16222	-4509	-27045	31857	I	DHZ
1971.5	-15 23.6	-58 16.4	16728	16127	-4440	-27056	31810	A	DHZ
1972.5	-15 15.3	-58 27.3	16617	16031	-4372	-27068	31762	A	DHZ
1973.5	-15 06.0	-58 37.4	16510	15940	-4301	-27072	31709	A	DHZ
1974.5	-14 57.2	-58 46.7	16409	15853	-4234	-27070	31655	I	DHZ
1975.5	-14 47.9	-58 55.2	16318	15777	-4168	-27072	31610	A	DHZ
1976.5	-14 36.4	-59 03.3	16225	15700	-4091	-27062	31553	A	DHZ
1977.5	-14 25.2	-59 11.2	16135	15627	-4018	-27053	31499	A	DHZ
1978.5	-14 13.6	-59 20.6	16032	15540	-3940	-27047	31441	A	DHZ
1979.5	-14 01.8	-59 27.2	15951	15475	-3867	-27028	31383	A	DHZ
1980.5	-13 49.8	-59 33.6	15873	15413	-3795	-27011	31330	A	DHZ
1981.5	-13 38.1	-59 41.5	15781	15336	-3720	-26997	31271	A	DHZ
1982.5	-13 26.2	-59 49.2	15688	15259	-3645	-26976	31206	A	DHZ
1983.5	-13 14.2	-59 53.4	15623	15208	-3577	-26940	31143	A	DHZ
1984.5	-13 03.8	-59 58.0	15553	15151	-3516	-26903	31075	A	DHZ
1985.5	-12 54.7	-60 01.6	15493	15102	-3462	-26864	31012	A	DHZ
1986.5	-12 46.3	-60 06.0	15427	15045	-3410	-26828	30948	A	DHZ
1987.5	-12 38.8	-60 09.0	15374	15001	-3366	-26791	30889	A	DHZ
1988.5	-12 31.6	-60 13.4	15304	14940	-3319	-26748	30817	A	DHZ
1989.5	-12 24.2	-60 18.6	15230	14874	-3271	-26712	30748	A	DHZ
1990.5	*** **.*	*** **.*	*****	*****	*****	*****	*****		
1991.5	*** **.*	*** **.*	*****	*****	*****	*****	*****		
1992.5	999 99.9	999 99.9	99999	99999	99999	99999	99999	I	DHZ
1993.5	-11 48.4	-60 33.0	14990	14673	-3067	-26549	30488	I	DHZ
1994.5	-11 40.4	-60 36.2	14941	14632	-3023	-26520	30439	I	DHZ
1995.5	-11 30.9	-60 39.0	14889	14589	-2972	-26477	30376	I	DHZ
1996.5	-11 21.1	-60 39.7	14852	14561	-2923	-26424	30311	A	DHZ
1997.5	-11 11.7	-60 41.1	14809	14527	-2875	-26372	30246	I	DHZ
1998.5	-11 07.0	-60 44.4	14749	14472	-2844	-26326	30176	I	DHZ
1999.5	-10 57.5	-60 45.3	14707	14439	-2796	-26267	30104	I	DHZ
2000.0	0 -2.3	0 -0.2	1	-1	-10	1	-1	J	DHZ
2000.5	-10 54.9	-60 47.8	14665	14400	-2777	-26237	30058	I	DHZ
2001.5	-10 47.4	-60 46.9	14645	14386	-2742	-26184	30001	I	DHZ
2002.5	-10 42.3	-60 48.0	14610	14356	-2714	-26141	29947	I	DHZ
2003.5	-10 38.0	-60 50.5	14571	14321	-2688	-26117	29907	I	DHZ
2004.5	-10 32.6	-60 50.2	14553	14308	-2663	-26080	29866	I	DHZ
2005.5	-10 27.7	-60 52.6	14520	14280	-2637	-26063	29835	I	DHZ
2006.5	-10 20.1	-60 54.3	14495	14260	-2601	-26047	29809	I	DHZ
2007.5	-10 12.0	-60 57.4	14463	14234	-2561	-26045	29791	I	DHZ
2008.5	-10 02.6	-60 59.8	14433	14212	-2517	-26035	29767	I	DHZ

*A: All days
*I: Incomplete
*J: Jump in data, jump value = old site value - new site value
ELE: Elements recorded


Tsumeb (TSU)
Annual Mean Values of Declination, All Days
Degrees
-10.0
-10.5
-11.0
-11.5
-12.0
-12.5
-13.0
-13.5
-14.0
-14.5
-15.0
-15.5
-16.0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Tsumeb (TSU)
Annual Mean Values of Horizontal Intensity, All Days
nT
17500
17000
16500
16000
15500
15000
14500
14000
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Tsumeb (TSU)
Annual Mean Values of Vertical Intensity, All Days
-26000
-26500
-27000
-27500
nT
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year


Tsumeb (TSU)
Annual Mean Values of Total Intensity, All Days
32500
32000
31500
31000
30500
30000
29500
nT
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

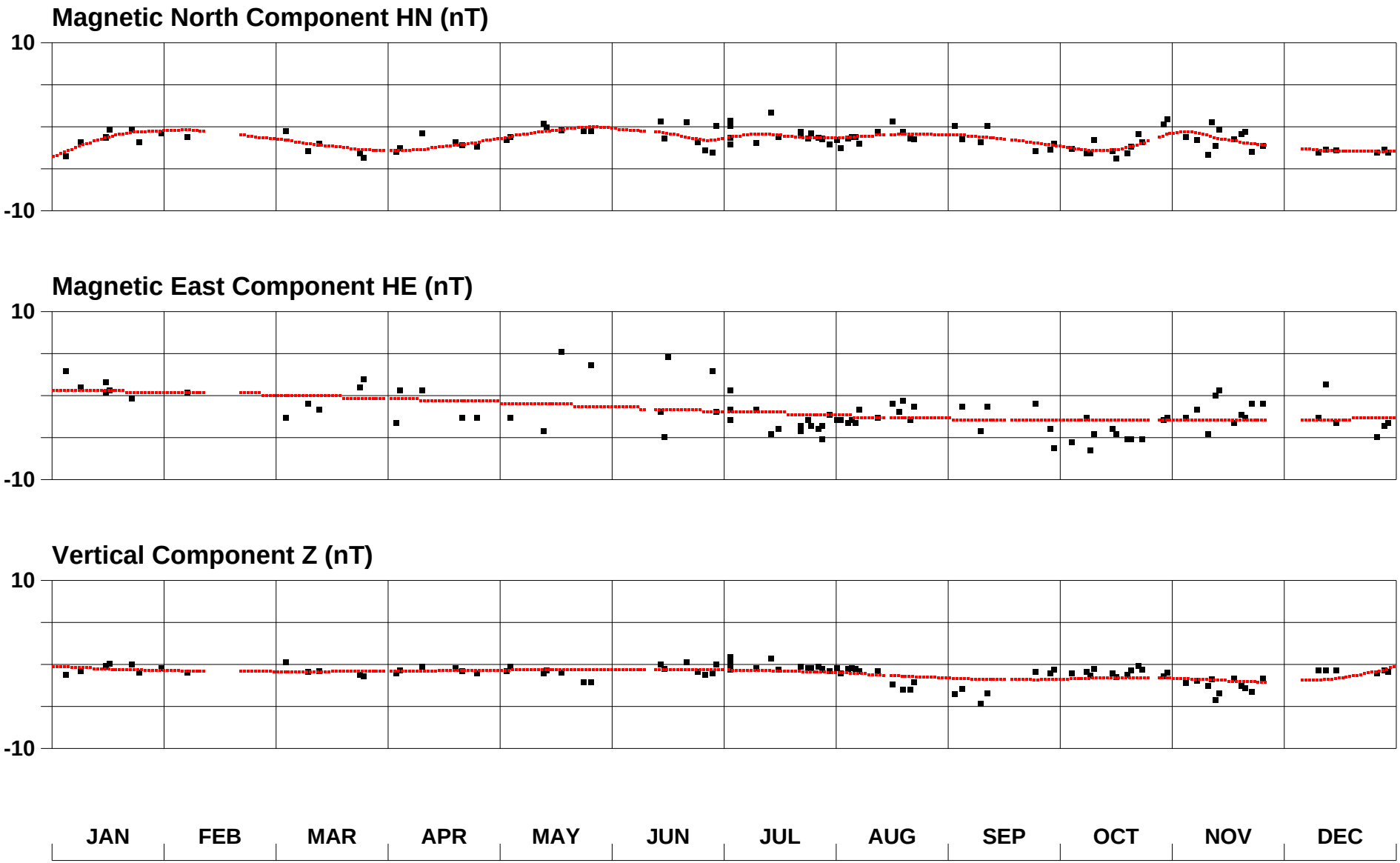
Magnetic Results 2008

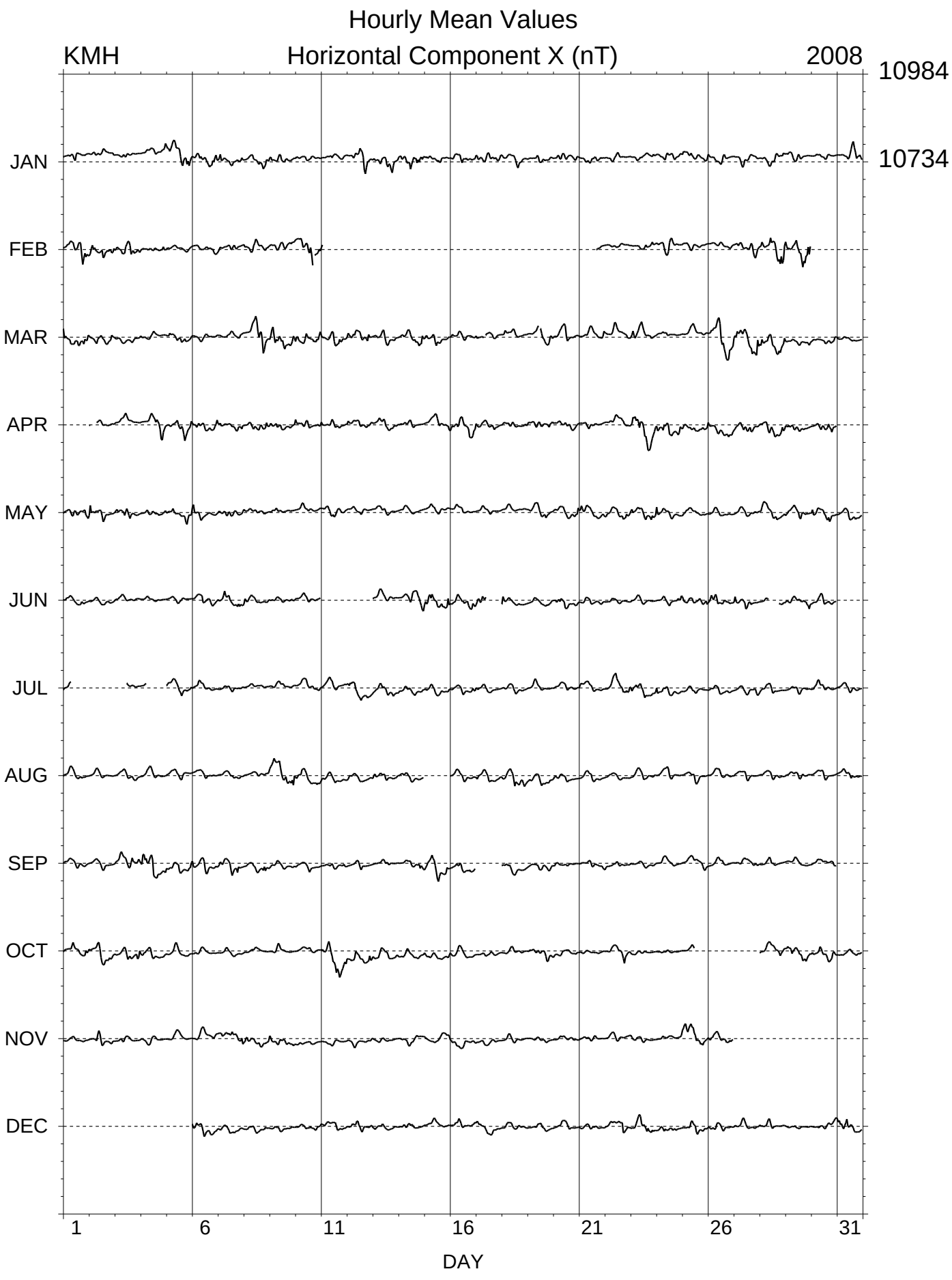
Keetmanshoop

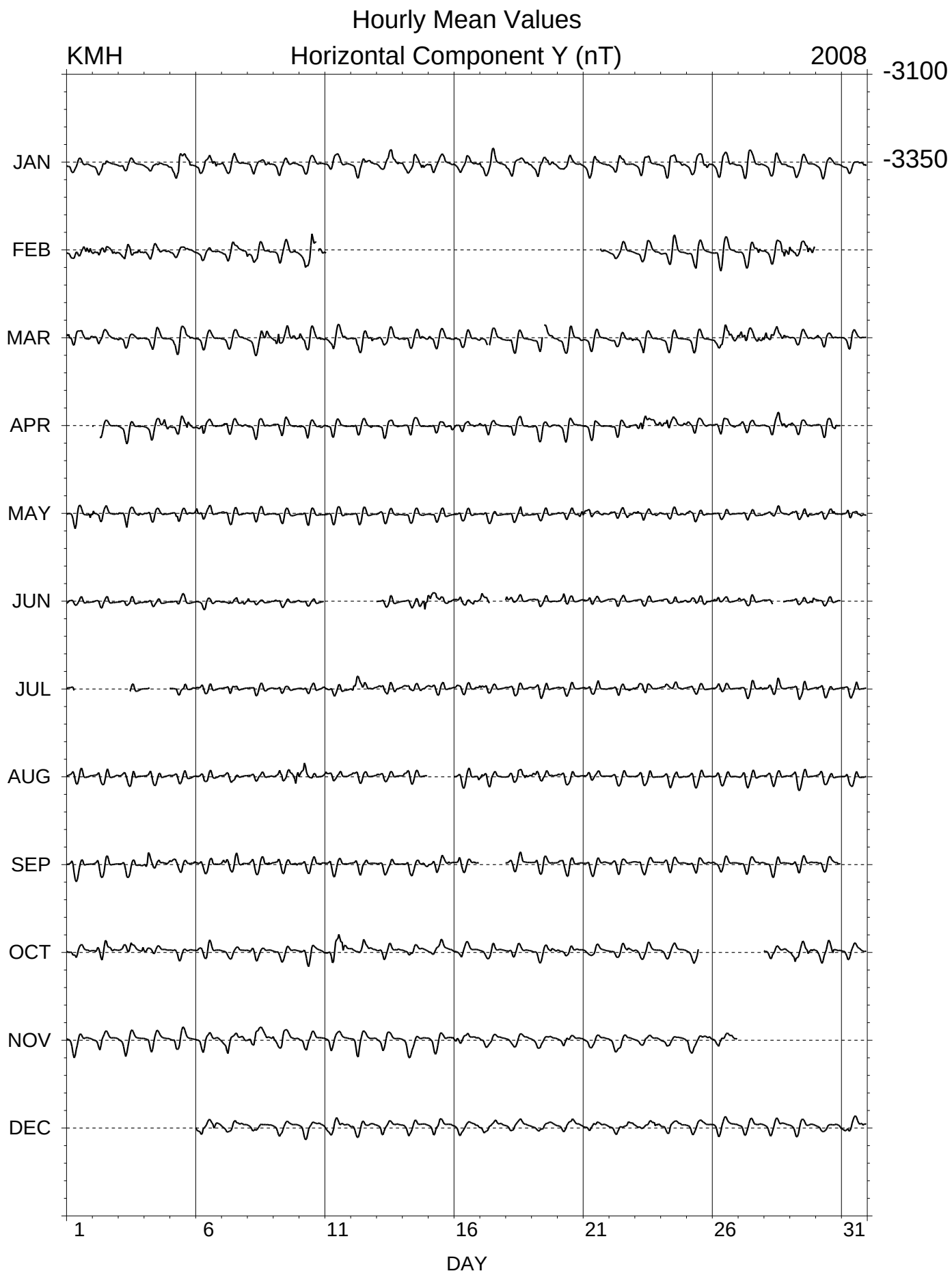
Observed and Adopted Baseline Values, KMH 2008

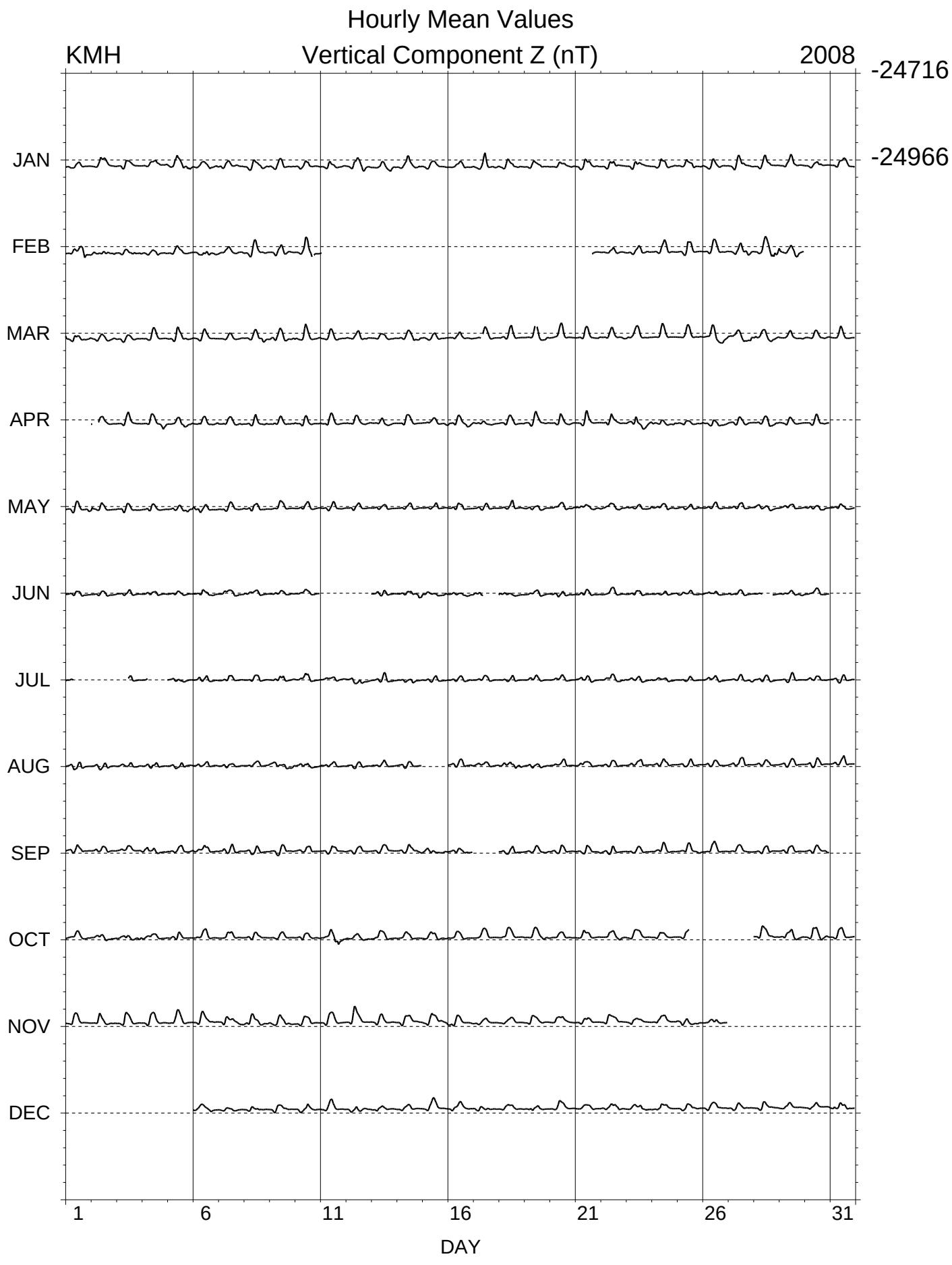
LAT: 116.541 LONG: 18.110

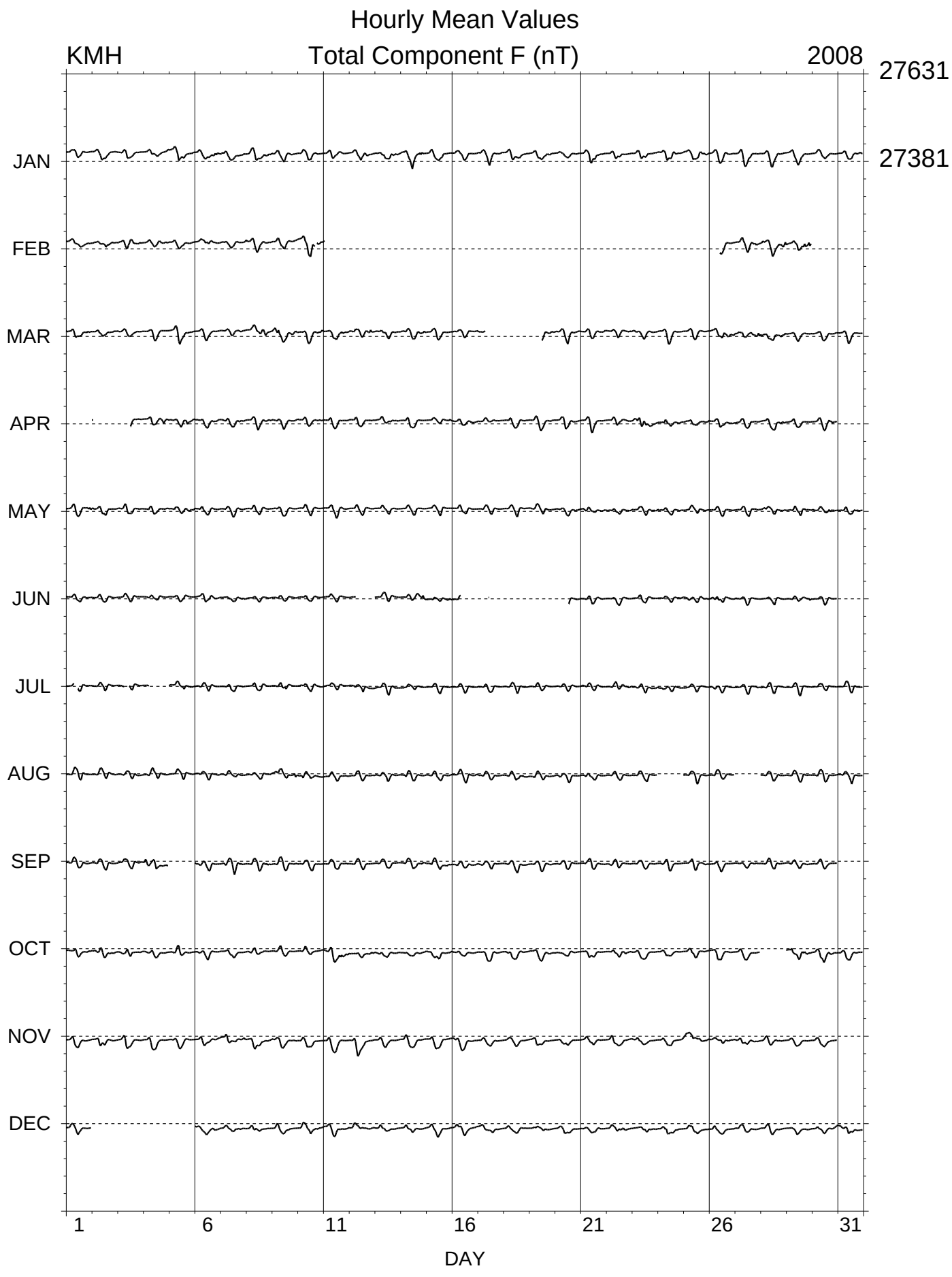
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
KMH
Horizontal Component X (nT)
2008
10984
10734
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
KMH
Horizontal Component Y (nT)
2008
-3100
-3350
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
KMH
Vertical Component Z (nT)
2008
-24716
-24966
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
KMH
Total Component F (nT)
2008
27631
27381
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

KEETMANSHOOP
MEAN MONTHLY VALUES 2008

Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-17 20.9	-65 44.3	11260	10747	-3358	-24982	27402	A	HDZF
FEB	-17 21.3	-65 45.0	11253	10740	-3357	-24981	27398	A	HDZF
MAR	-17 20.7	-65 45.6	11246	10734	-3353	-24977	27391	A	HDZF
APR	-17 20.7	-65 45.8	11243	10732	-3352	-24974	27388	A	HDZF
MAY	-17 20.7	-65 45.1	11248	10736	-3353	-24970	27387	A	HDZF
JUN	-17 20.3	-65 45.4	11244	10733	-3351	-24968	27384	A	HDZF
JUL	-17 19.7	-65 45.3	11243	10733	-3349	-24966	27380	A	HDZF
AUG	-17 19.9	-65 45.0	11245	10734	-3350	-24962	27378	A	HDZF
SEP	-17 20.1	-65 45.3	11241	10730	-3349	-24959	27374	A	HDZF
OCT	-17 19.1	-65 45.5	11238	10728	-3345	-24957	27369	A	HDZF
NOV	-17 19.8	-65 44.6	11243	10732	-3349	-24951	27368	A	HDZF
DEC	-17 18.5	-65 44.8	11242	10733	-3345	-24952	27367	A	HDZF
YEAR	-17 20.1	-65 45.2	11245	10735	-3351	-24966	27381	A	HDZF
JAN	-17 20.8	-65 43.2	11268	10756	-3360	-24980	27404	Q	HDZF
FEB	-17 20.6	-65 44.2	11259	10747	-3356	-24978	27401	Q	HDZF
MAR	-17 20.6	-65 44.7	11253	10741	-3355	-24975	27393	Q	HDZF
APR	-17 20.9	-65 44.8	11251	10740	-3355	-24972	27388	Q	HDZF
MAY	-17 20.9	-65 44.3	11254	10742	-3356	-24969	27388	Q	HDZF
JUN	-17 20.0	-65 44.7	11250	10739	-3351	-24967	27385	Q	HDZF
JUL	-17 19.7	-65 44.7	11249	10738	-3350	-24965	27382	Q	HDZF
AUG	-17 20.2	-65 44.5	11249	10738	-3352	-24961	27379	Q	HDZF
SEP	-17 19.8	-65 44.8	11245	10734	-3349	-24958	27374	Q	HDZF
OCT	-17 19.1	-65 44.8	11244	10734	-3347	-24956	27370	Q	HDZF
NOV	-17 20.7	-65 44.3	11246	10734	-3353	-24950	27368	Q	HDZF
DEC	-17 18.9	-65 44.9	11241	10732	-3346	-24952	27367	Q	HDZF
YEAR	-17 20.3	-65 44.4	11251	10740	-3353	-24966	27382	Q	HDZF
JAN	-17 21.2	-65 44.8	11256	10744	-3357	-24982	27401	D	HDZF
FEB	-17 21.8	-65 45.6	11248	10735	-3357	-24981	27396	D	HDZF
MAR	-17 20.2	-65 47.0	11235	10724	-3348	-24978	27388	D	HDZF
APR	-17 20.2	-65 46.8	11236	10725	-3348	-24976	27387	D	HDZF
MAY	-17 20.4	-65 45.6	11244	10733	-3351	-24971	27386	D	HDZF
JUN	-17 20.2	-65 45.5	11243	10732	-3350	-24968	27383	D	HDZF
JUL	-17 19.4	-65 46.0	11238	10729	-3347	-24967	27379	D	HDZF
AUG	-17 19.6	-65 45.7	11239	10729	-3347	-24963	27377	D	HDZF
SEP	-17 20.1	-65 46.3	11233	10723	-3347	-24961	27373	D	HDZF
OCT	-17 19.0	-65 46.3	11232	10723	-3343	-24958	27369	D	HDZF
NOV	-17 19.0	-65 45.1	11240	10731	-3346	-24954	27369	D	HDZF
DEC	-17 18.3	-65 45.1	11240	10731	-3343	-24952	27366	D	HDZF
YEAR	-17 20.0	-65 45.8	11240	10730	-3349	-24968	27381	D	HDZF

*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

KEETMANSHOOP
MEAN ANNUAL VALUES

Date	° D	'	° I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
2007.5	-17	23.3	-65	43.4	11273	10758	-3369	-24993	27417	I	DHZ
2008.5	-17	20.1	-65	45.2	11245	10735	-3351	-24966	27381	A	DHZ

*A: All days
*I: Incomplete
ELE: Elements recorded