Hermanus Magnetic Observatory

A facility of the National Research Foundation

Magnetic Results 2005

Hermanus, Hartebeesthoek and Tsumeb observatories

1. INTRODUCTION

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

This yearbook presents the results of the magnetic measurements carried out at these observatories during 2005.

2. DESCRIPTION OF THE OBSERVATORIES

The locations of the magnetic observatories are as follows:

Observatory	Geographic Coordinates		Geomagnetic Coordinates		Elevation
	Latitude	Longitude	Latitude	Longitude	m
Hermanus	34° 25' 23" S	19° 13' 33" E	42° 40' S	83° 14' E	26
Hartebeesthoek	25° 52' 58" S	27° 42' 25" E	36° 13' S	95° 38' E	1555
Tsumeb	19° 12' 08" S	17° 35' 03" E	31° 04' S	87° 17' E	1273

Geomagnetic coordinates given are relative to a geomagnetic North Pole position of 83.5° N, 119.5° W, computed from the IGRF model (degree 13) at the epoch 2005.5.

3. ABSOLUTE MEASUREMENTS

At each observatory absolute measurements are made in a single absolute hut. 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*, and a Proton Precession Magnetometer (PPM) or a dIdD for measuring the total magnetic field intensity, *F*. 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) and a THEO 015B (at Hartebeesthoek and Tsumeb) and a single-axis fluxgate sensor mounted on top of the telescope and electronics from Bartington. 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"

3.2 Proton Magnetometer

The PPM is a Geometrics type G-856AX. It is installed in the electronics unit and is powered from the DC power supply 16V outlet. The PPM is triggered from the computer digital I/O and the output is obtained serially. The signal levels are converted to RS232 by a converter card in the electronics unit and fed to the computer's serial port.

The PC computer serves as the instrument controller and data logger. The PPM readings are fed into the computer for processing through an RS232 serial port.

The instrument runs continuously and obtains a reading every 5 seconds. From these readings one-minute values for *F* can be 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.

3.2.1 F pillar corrections

At Hermanus *D* and *I* are measured on pillar no. 1 in the Absolute House and at Hartebeesthoek and Tsumeb *D* and *I* are measured in the so-called “Standard Huts”, while *F* is measured by a proton precession magnetometer (PPM) some distance away for Hartebeesthoek, and for Hermanus and Tsumeb *F* is obtained from an Overhauser sensor which forms part of the suspended dIdD vector magnetometer. Site differences were obtained at regular intervals at each observatory to enable the *F* measurements to be reduced to the standard pillar:

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

The following are the adopted values for the year:

Site differences of ΔF_{pillar}					
Hermanus		Hartebeesthoek		Tsumeb	
Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction
1 – 31	-1.1 nT	1 – 365	77.0 nT	1 – 365	18.0 nT
32 – 59	-1.6 nT				
60 – 90	-0.9 nT				
91 –181	-1.2 nT				
182 – 212	-1.3 nT				
213 – 243	-1.0 nT				
244 – 365	-1.2 nT				

4. VECTOR MAGNETOMETERS

4.1 FGE Magnetometer

A type FGE fluxgate manufactured by the Danish Meteorological Institute, Denmark is in operation at all three 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 sec. 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 and Tsumeb base-line values show fluctuations different from Hermanus that can be attributed to the fact that fewer absolute observations are done at these 2 observatories. In order to improve the base-line values an analysis of the night levels of Hermanus data versus Hartebeesthoek (or Tsumeb) were done. Whenever large deviations were detected in the data, the base-line values were adjusted and new one-minute data computed. This is particularly visible in the graphs where the adopted base-line values are not representative of the observed values.
For Tsumeb observatory there are no observed base-line values for January and February. The adopted base-line values were extrapolated using the observed base-line values of the previous months. Due to failure of the fluxgate magnetometer and the PPM, there were no recorded data for the period 9 February-12 May 2005.

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 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.

5.5 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, Copenhagen:

http://dmiweb.dmi.dk/fsweb/projects/wdcc1/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

Hermanus Magnetic Observatory
P.O. Box 32
Hermanus 7200
South Africa

Tel. : +27 (28) 3121196
Fax. : +27 (28) 3122039
Email : info@hmo.ac.za
Internet : http://www.hmo.ac.za

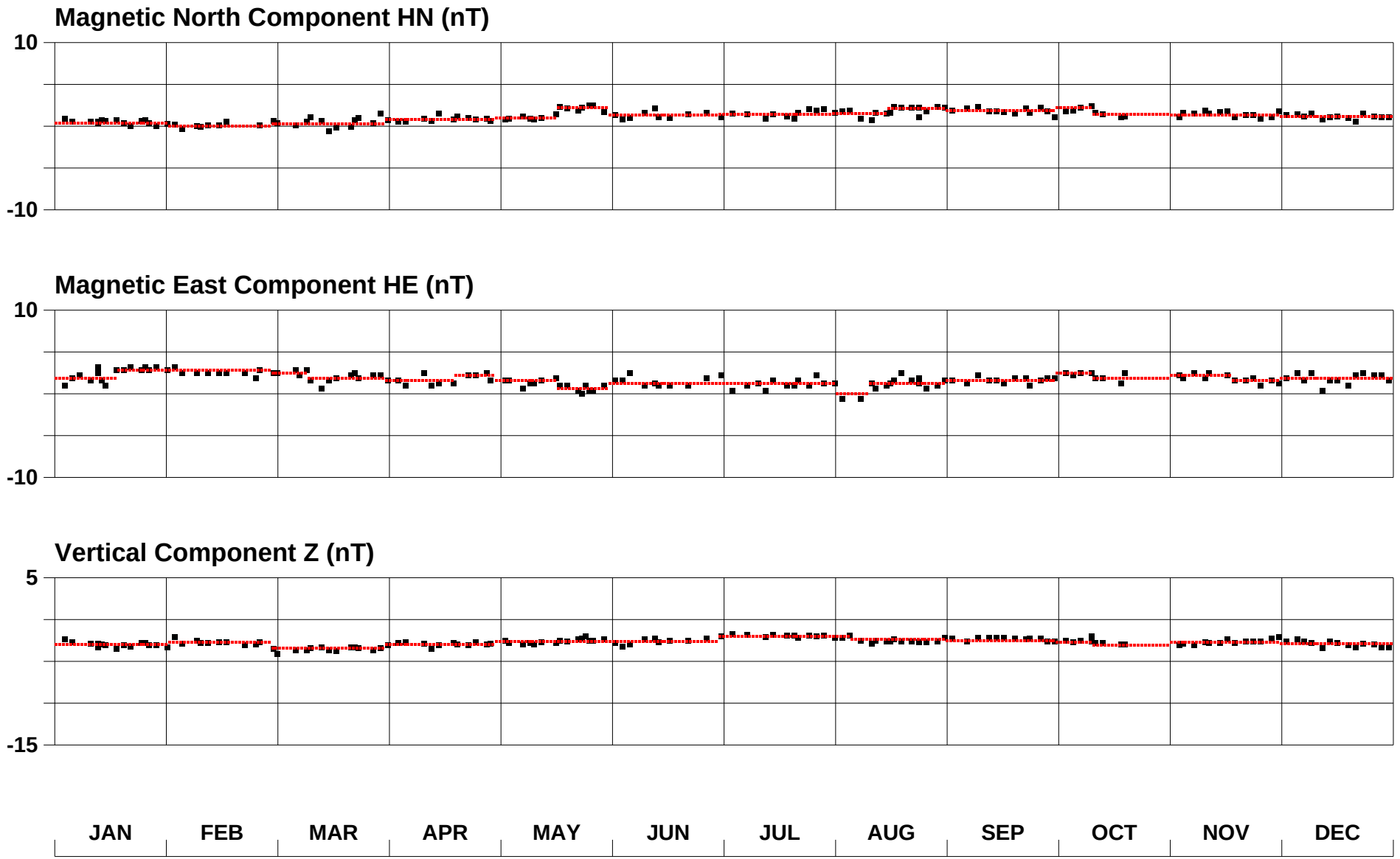
Magnetic Results 2005

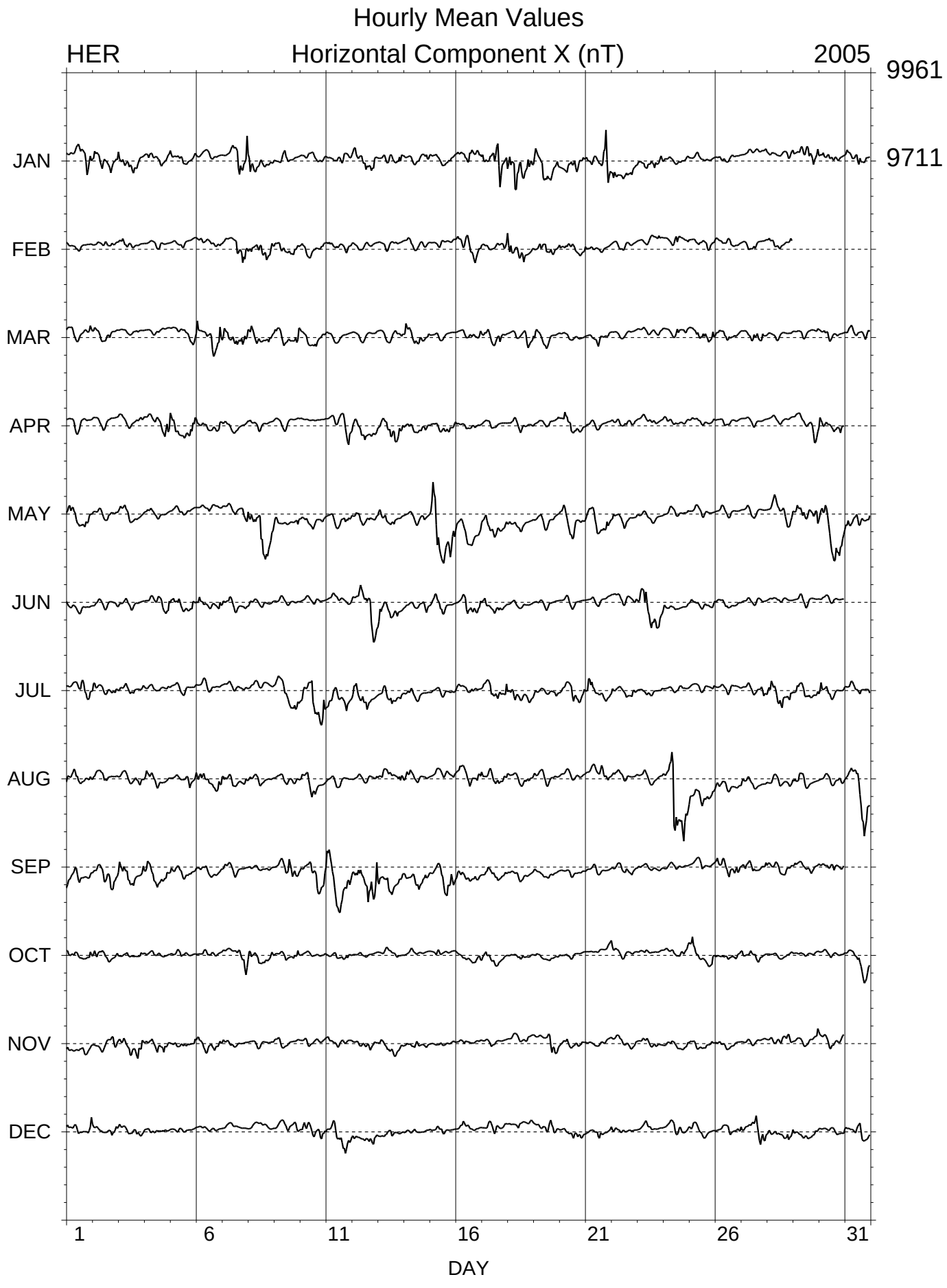
Hermanus

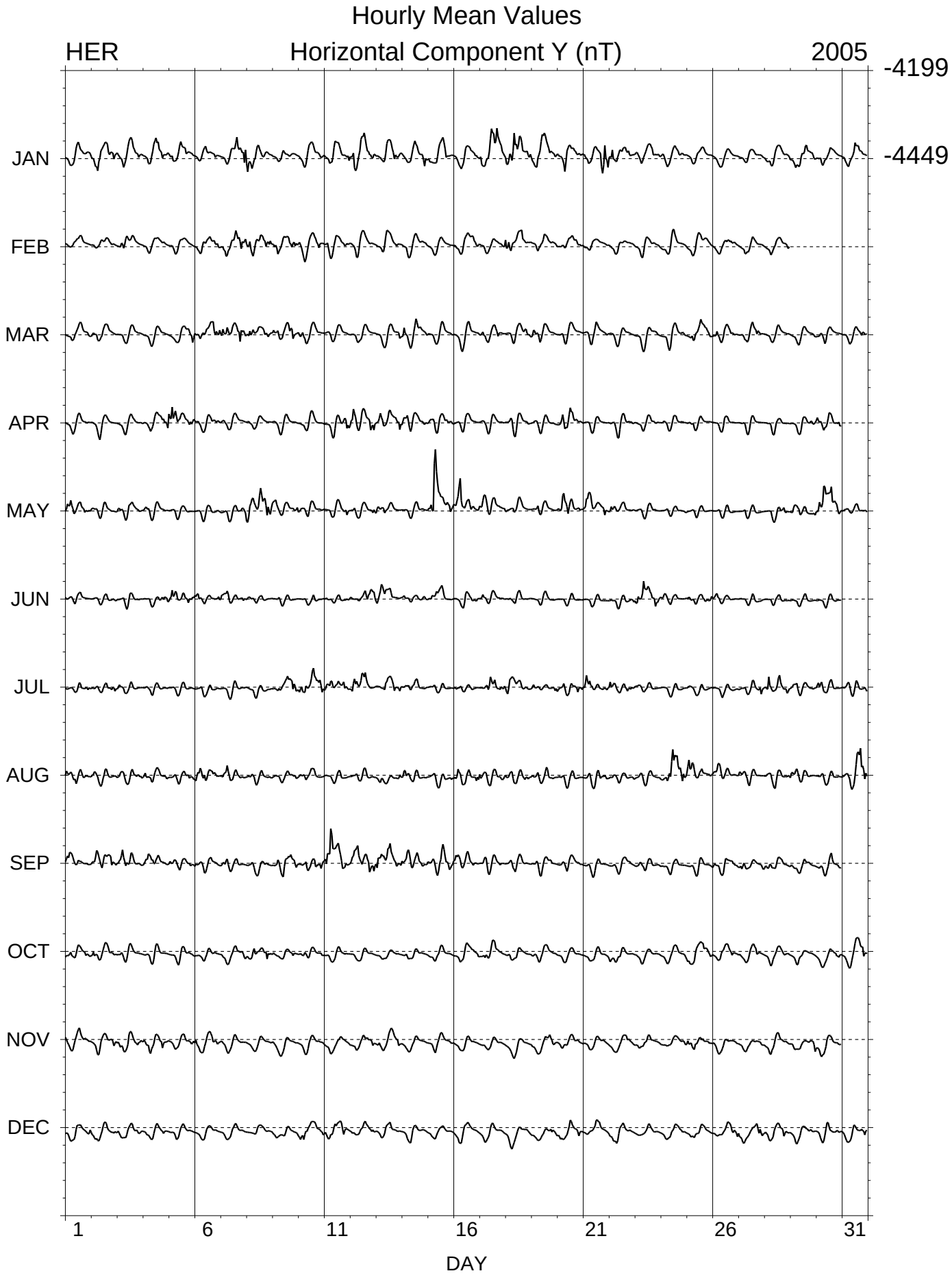
Observed and Adopted Baseline Values, HER 2005

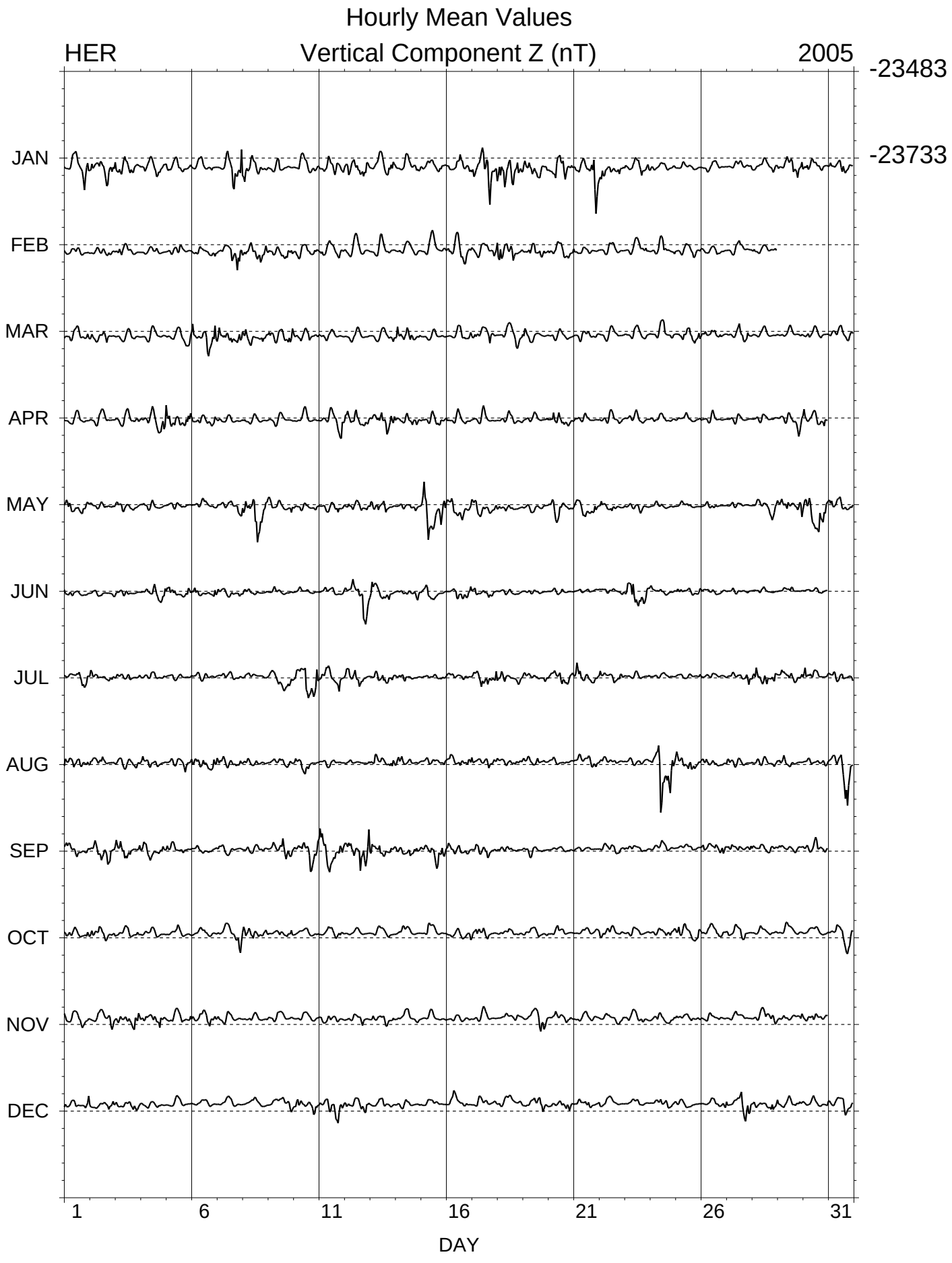
LAT: 124.425 LONG: 19.225

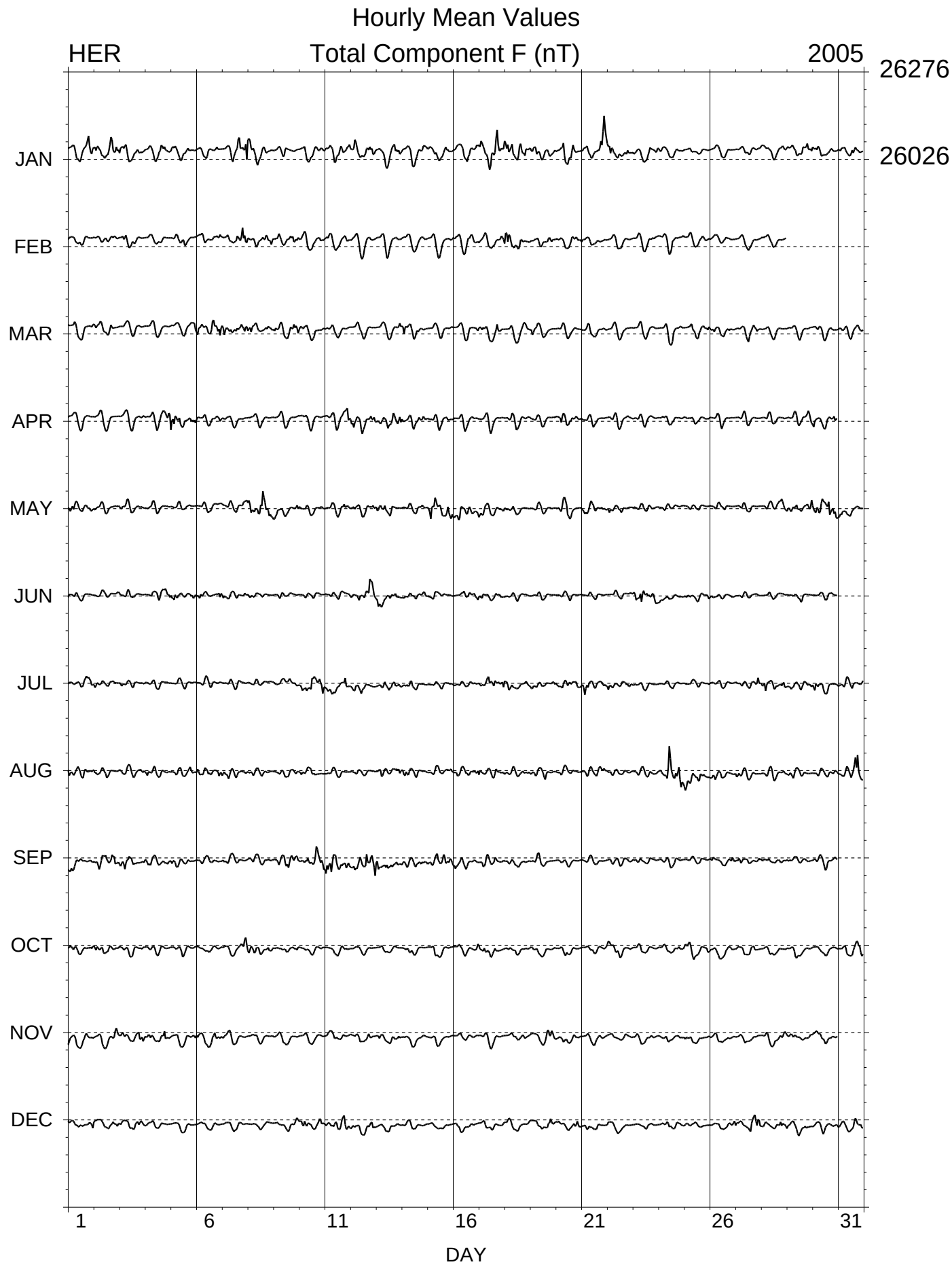
INSTITUTION: HMO INSTRUMENT: LC

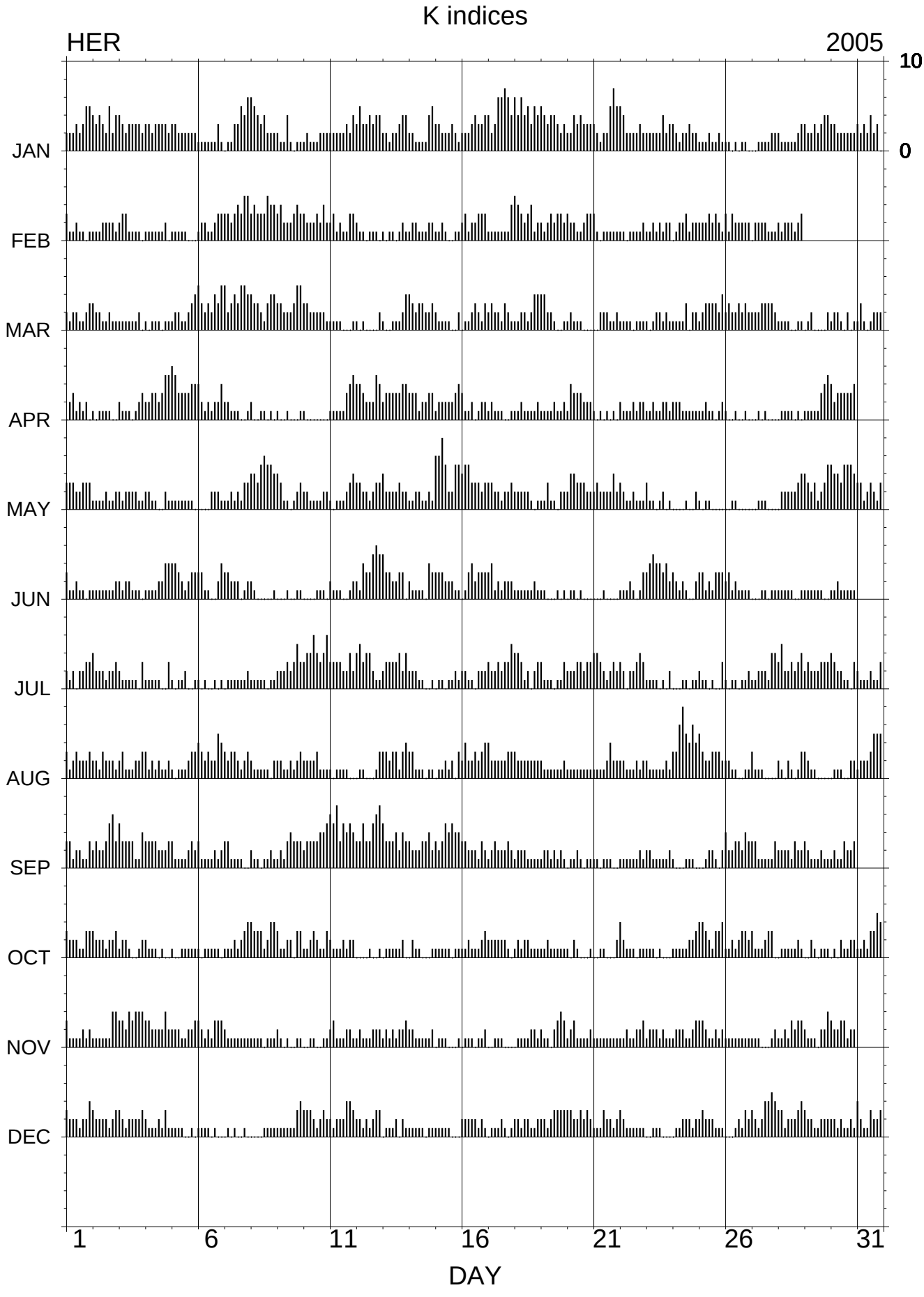



Hourly Mean Values
HER
Horizontal Component X (nT)
2005
9961
9711
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Horizontal Component Y (nT)
2005
-4199
-4449
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)
2005
-23483
-23733
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)
2005
26276
26026
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


K indices
HER
2005
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 — 2005

DATE	JAN	FEB	MAR	APR	MAY	JUN
01	2223 2355	3112 1101	2122 1123	0231 2120	3332 2333	3112 1101
02	4343 2524	1112 2221	3221 1211	1011 1100	1111 2112	1111 1112
03	4323 3332	2331 1110	1111 1120	2111 0123	2122 2211	2122 1110
04	3323 3332	1111 1120	1011 1011	2233 2355	2211 0021	1111 2244
05	3322 2222	1111 1000	1221 1234	6533 3344	1111 1110	4432 1233
06	1111 1131	1221 1233	5323 2435	4212 1224	0000 2221	3311 0024
07	0113 3546	3323 4355	5234 3554	2211 1001	1121 2133	3322 2012
08	6543 4222	3433 3544	4332 1344	2001 1010	4435 6554	2100 0001
09	2114 1011	3422 2343	3322 2355	1001 0001	4311 0123	0001 0011
10	1211 1222	3222 3242	3322 2221	1000 0000	2211 1122	0000 1110
11	2222 2324	2312 1133	1111 0001	1111 1345	1011 1234	2111 0012
12	3533 4344	2110 1110	1010 0002	4432 2254	3322 1233	2143 3565
13	2212 2344	1011 0121	1001 1124	2333 3344	4222 2322	5332 2330
14	2211 1145	1221 1122	4323 3223	3331 2233	1122 1121	2111 1043
15	3322 2321	1121 0011	2111 1002	1222 2234	6685 2255	3332 2211
16	2223 4334	2312 2333	0112 3213	3112 0122	4553 3323	0134 2333
17	4236 6764	1111 1114	2322 1321	1211 1001	3322 1223	3412 1222
18	6464 5354	5432 3412	1122 1244	1121 1112	2222 2101	1111 1121
19	5434 4323	2123 2332	4422 1001	1111 2112	1131 1022	1100 0101
20	2243 4333	3221 1233	1211 1000	1433 3222	2443 3322	0110 1000
21	3212 2575	3101 1111	0022 2112	1010 1010	2322 2242	0001 0000
22	5422 2232	1101 1112	1111 0111	2111 2122	3211 2111	1112 1013
23	2222 2423	1121 2122	1012 2121	1121 1221	3110 1201	3454 4342
24	3212 2322	0122 3122	1111 3022	2221 1111	0000 1002	3212 1002
25	1112 1121	2223 2321	1233 3324	1121 1012	1011 0000	3312 1333
26	1101 0110	3132 2222	2322 3232	1001 0010	0011 0000	2312 1111
27	0011 1122	0222 2111	2223 3332	0010 1000	0011 1000	0001 1011
28	2111 1123	2122 2123	1111 0011	0111 1010	0222 2234	1111 1001
29	3223 2344		0120 0002	1111 1345	4323 1235	1111 1100
30	3322 2222		1221 0201	4233 3334	5443 5554	1121 1111
31	3232 4230		1310 1222		3312 3213	

	JUL	AUG	SEP	OCT	NOV	DEC
01	2120 2233	3123 2223	3312 2113	3222 1133	3111 1212	3222 1224
02	4222 1223	2213 2221	2322 3563	3222 1223	1111 1144	3222 2123
03	2111 1103	2311 1223	5333 3114	1221 0012	3324 3444	3212 2223
04	1111 1003	3121 2112	3333 2223	2111 0100	3322 2242	2111 2131
05	1011 2001	1011 1233	3111 1232	1001 1111	2221 1223	1111 0010
06	1010 0101	4323 2254	3111 1212	1011 1110	3212 1333	1111 0100
07	0111 1112	3233 2123	3311 1100	1112 1234	2111 1111	0101 0010
08	1111 1011	2111 1102	2110 1121	4333 1244	1111 0111	0000 1111
09	2223 2353	2211 2123	1213 4333	3112 2033	2101 0011	1111 1134
10	3446 4346	2222 3111	2333 3445	1123 2113	0011 0011	3332 1232
11	3333 2242	1011 1100	6573 5454	2111 2122	2311 1221	2122 2443
12	4534 4211	0110 0013	3353 3567	0000 1001	1211 1222	2212 1233
13	2333 3424	3323 3134	5333 4243	0111 1120	1212 1223	0111 2021
14	2221 1001	3311 1011	3222 3342	0211 0001	2211 1112	1111 1011
15	0110 1121	0112 1203	3235 4544	1111 1011	0111 0001	1111 1000
16	2211 0222	2422 3234	3322 2132	1121 1123	0111 0112	2222 2121
17	3223 2335	4222 2233	1232 2232	2222 2210	0011 1000	0111 2101
18	4431 2023	3222 2222	1222 1111	1212 2111	0111 1221	2212 2112
19	3111 0113	2111 1112	1221 2121	1121 1111	2110 2343	2212 3333
20	2223 3233	1111 1111	0112 1011	1021 0001	1231 1112	3322 3232
21	4432 1232	1111 2422	1101 1100	0011 0002	1111 1111	1113 2212
22	3202 2343	2211 1212	1111 1121	4211 1011	1121 1223	3211 1111
23	1111 0102	2111 1121	2211 1112	1110 1000	1222 1211	0011 1000
24	0001 1011	3368 5464	1000 1110	1111 1223	1222 1123	0112 2212
25	2110 1003	5322 3332	0012 2102	4432 1334	3321 1212	2322 2111
26	1011 0112	2211 0011	4223 3243	1121 2332	1111 1111	0001 2132
27	1122 2144	3111 0000	3311 1113	3111 2330	1110 0012	3212 4454
28	3522 3234	2102 1013	2222 1322	0111 1121	1121 3233	3312 2234
29	2322 2333	3211 0000	3211 1211	0021 0111	2111 0224	3221 1222
30	4322 1103	0111 0022	1211 3223	0102 1122	3223 3122	2212 1121
31	2111 2113	1222 3555		1121 3354		4211 3223

HERMANUS
MEAN MONTHLY VALUES 2005

Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-24 33.0	-65 47.6	10681	9716	-4438	-23760	26050	A	HDZF
FEB	-24 33.2	-65 46.1	10690	9723	-4442	-23750	26045	A	HDZF
MAR	-24 35.0	-65 46.1	10688	9719	-4446	-23745	26039	A	HDZF
APR	-24 35.8	-65 45.8	10687	9717	-4448	-23738	26032	A	HDZF
MAY	-24 36.8	-65 48.3	10668	9698	-4443	-23741	26028	A	HDZF
JUN	-24 37.2	-65 46.7	10678	9708	-4449	-23736	26028	A	HDZF
JUL	-24 37.6	-65 46.1	10681	9709	-4451	-23731	26023	A	HDZF
AUG	-24 38.2	-65 46.1	10680	9707	-4452	-23728	26021	A	HDZF
SEP	-24 38.9	-65 47.5	10668	9696	-4449	-23728	26016	A	HDZF
OCT	-24 39.2	-65 44.7	10687	9713	-4458	-23718	26014	A	HDZF
NOV	-24 40.0	-65 44.4	10688	9712	-4460	-23714	26012	A	HDZF
DEC	-24 40.1	-65 43.8	10692	9716	-4462	-23712	26011	A	HDZF
YEAR	-24 37.1	-65 46.1	10682	9711	-4450	-23733	26027	A	HDZF
JAN	-24 32.8	-65 46.3	10691	9725	-4441	-23757	26052	Q	HDZF
FEB	-24 32.5	-65 45.0	10697	9731	-4443	-23746	26044	Q	HDZF
MAR	-24 35.2	-65 45.4	10693	9723	-4449	-23744	26040	Q	HDZF
APR	-24 35.5	-65 44.7	10695	9725	-4451	-23735	26034	Q	HDZF
MAY	-24 36.3	-65 45.3	10690	9719	-4451	-23736	26032	Q	HDZF
JUN	-24 37.2	-65 45.3	10688	9717	-4453	-23733	26029	Q	HDZF
JUL	-24 37.5	-65 44.3	10694	9722	-4456	-23728	26027	Q	HDZF
AUG	-24 38.6	-65 45.6	10684	9711	-4455	-23727	26021	Q	HDZF
SEP	-24 39.2	-65 45.7	10682	9708	-4456	-23725	26019	Q	HDZF
OCT	-24 38.9	-65 44.0	10692	9717	-4459	-23716	26014	Q	HDZF
NOV	-24 40.0	-65 43.8	10692	9716	-4462	-23714	26013	Q	HDZF
DEC	-24 38.8	-65 42.9	10698	9723	-4461	-23710	26011	Q	HDZF
YEAR	-24 36.9	-65 44.9	10691	9720	-4453	-23731	26028	Q	HDZF
JAN	-24 33.1	-65 49.6	10669	9704	-4433	-23768	26053	D	HDZF
FEB	-24 34.2	-65 47.7	10679	9712	-4440	-23755	26045	D	HDZF
MAR	-24 34.3	-65 47.2	10680	9713	-4441	-23750	26041	D	HDZF
APR	-24 35.7	-65 47.4	10674	9706	-4443	-23739	26029	D	HDZF
MAY	-24 36.8	-65 53.2	10632	9665	-4428	-23753	26024	D	HDZF
JUN	-24 37.4	-65 48.3	10668	9698	-4445	-23741	26028	D	HDZF
JUL	-24 37.8	-65 48.4	10664	9694	-4444	-23736	26021	D	HDZF
AUG	-24 39.6	-65 49.5	10655	9684	-4446	-23736	26018	D	HDZF
SEP	-24 38.3	-65 50.7	10644	9675	-4437	-23734	26011	D	HDZF
OCT	-24 39.2	-65 46.0	10677	9704	-4454	-23721	26013	D	HDZF
NOV	-24 40.3	-65 45.1	10683	9708	-4459	-23717	26012	D	HDZF
DEC	-24 41.1	-65 44.8	10686	9709	-4463	-23717	26013	D	HDZF
YEAR	-24 37.3	-65 48.2	10667	9698	-4444	-23739	26026	D	HDZF

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

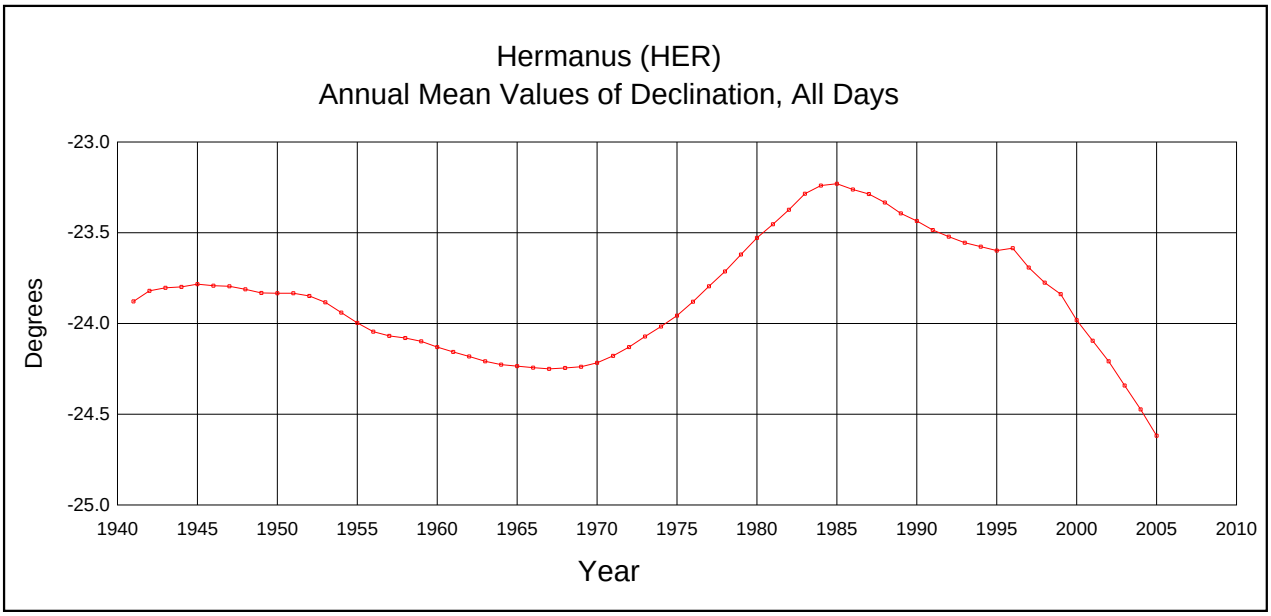
HERMANUS
MEAN ANNUAL VALUES

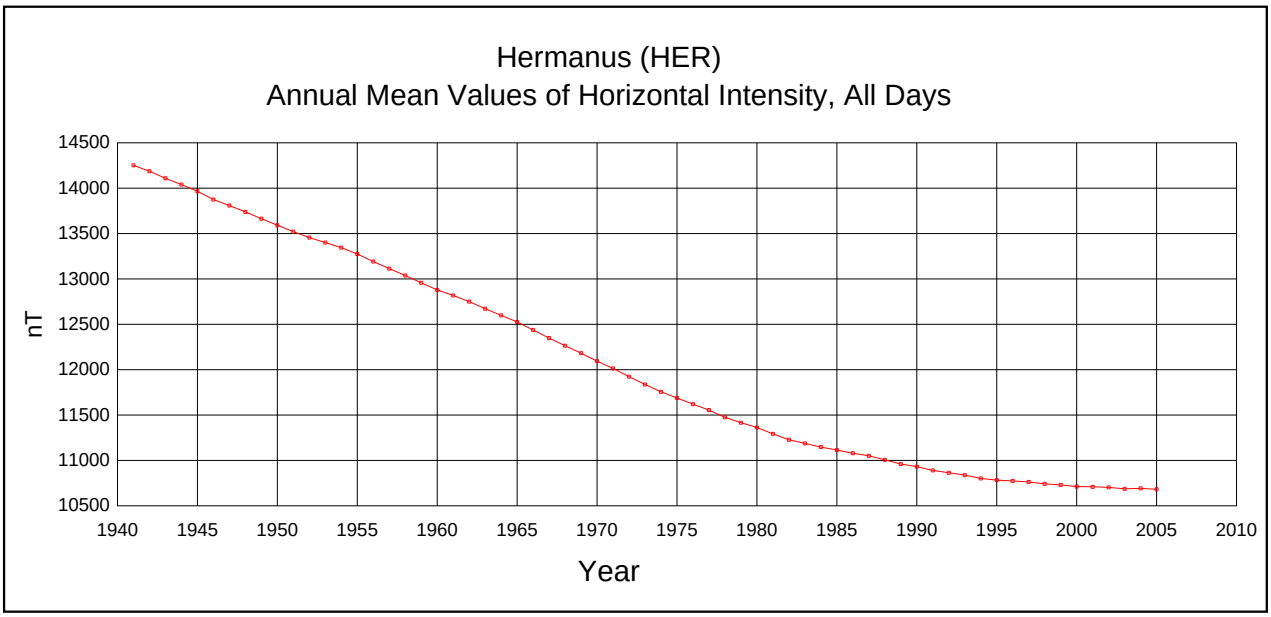
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1941.5	-23 51.6	-64 01.4	14252	13034	-5765	-29249	32537	A	DHZ
1942.5	-23 48.1	-64 03.0	14187	12980	-5724	-29153	32422	A	DHZ
1943.5	-23 47.1	-64 06.4	14109	12911	-5690	-29065	32309	A	DHZ
1944.5	-23 46.8	-64 09.1	14040	12848	-5661	-28981	32202	A	DHZ
1945.5	-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

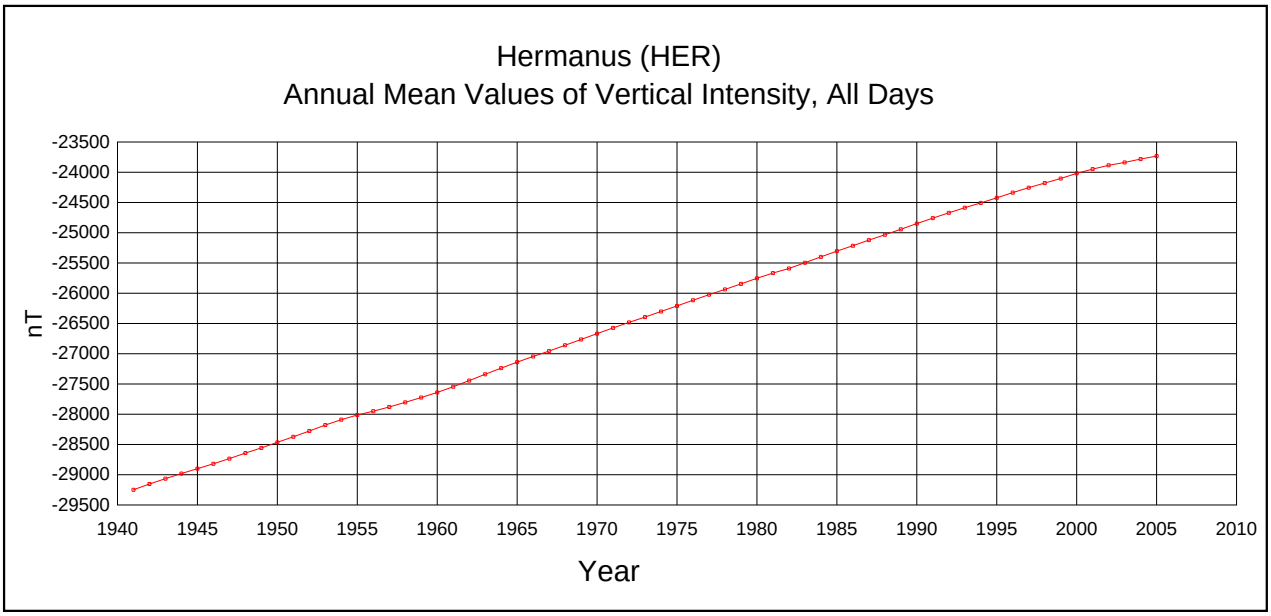
HERMANUS
MEAN ANNUAL VALUES

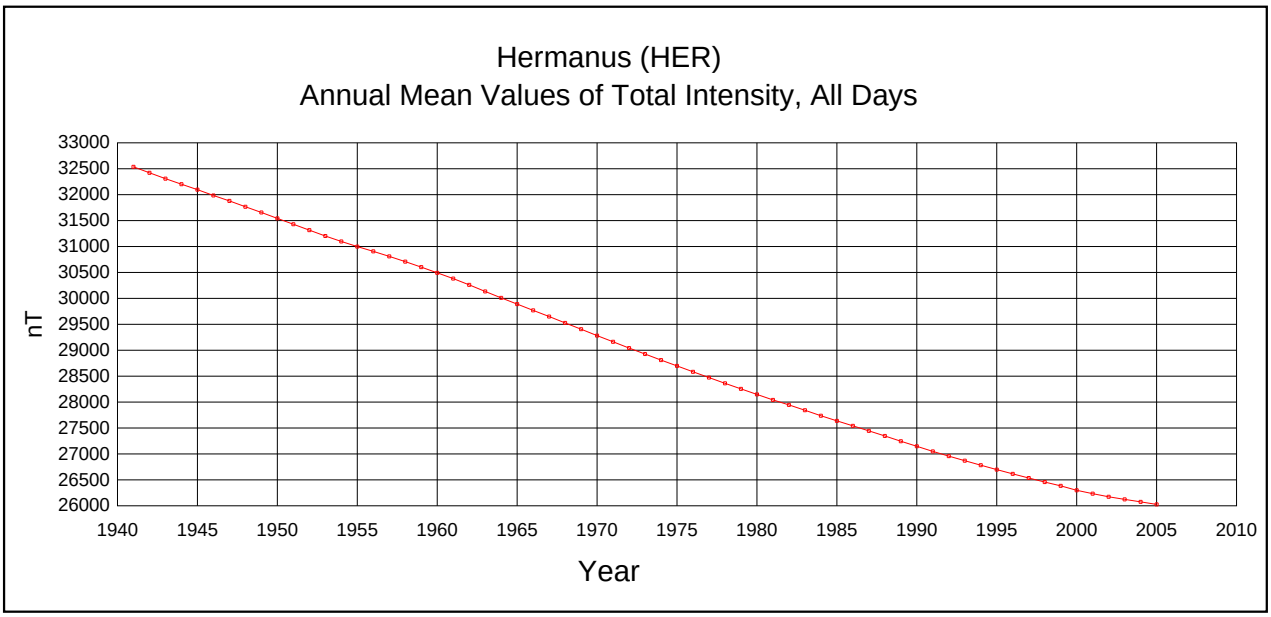
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1981.5	-23 26.1	-66 15.0	11293	10362	-4492	-25667	28042	A	DHZ
1982.5	-23 21.3	-66 18.6	11228	10309	-4452	-25591	27946	A	DHZ
1983.5	-23 16.0	-66 18.4	11188	10279	-4420	-25496	27843	A	DHZ
1984.5	-23 13.3	-66 18.3	11147	10244	-4395	-25399	27737	A	DHZ
1985.5	-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

*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
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

Magnetic Results 2005

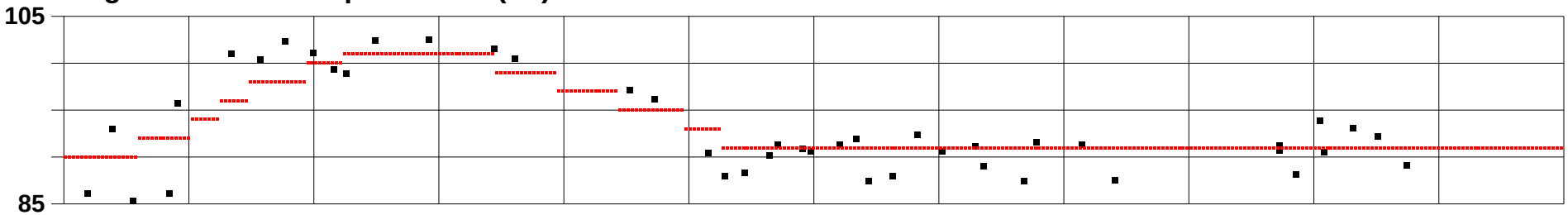
Hartebeesthoek

Observed and Adopted Baseline Values, HBK 2005

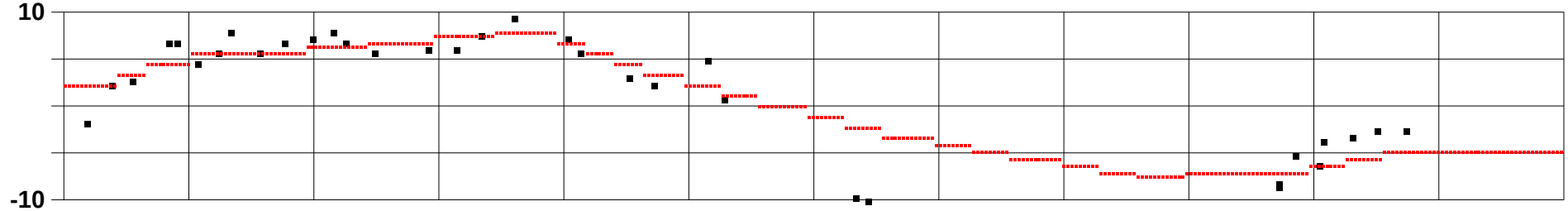
LAT: 115.883 LONG: 27.707

INSTITUTION: HMO INSTRUMENT: LC

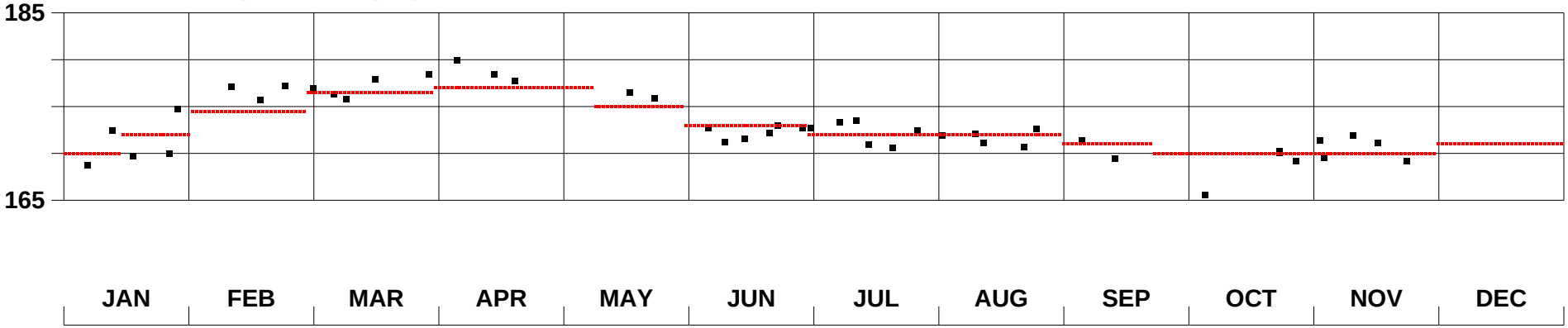
Magnetic North Component HN (nT)

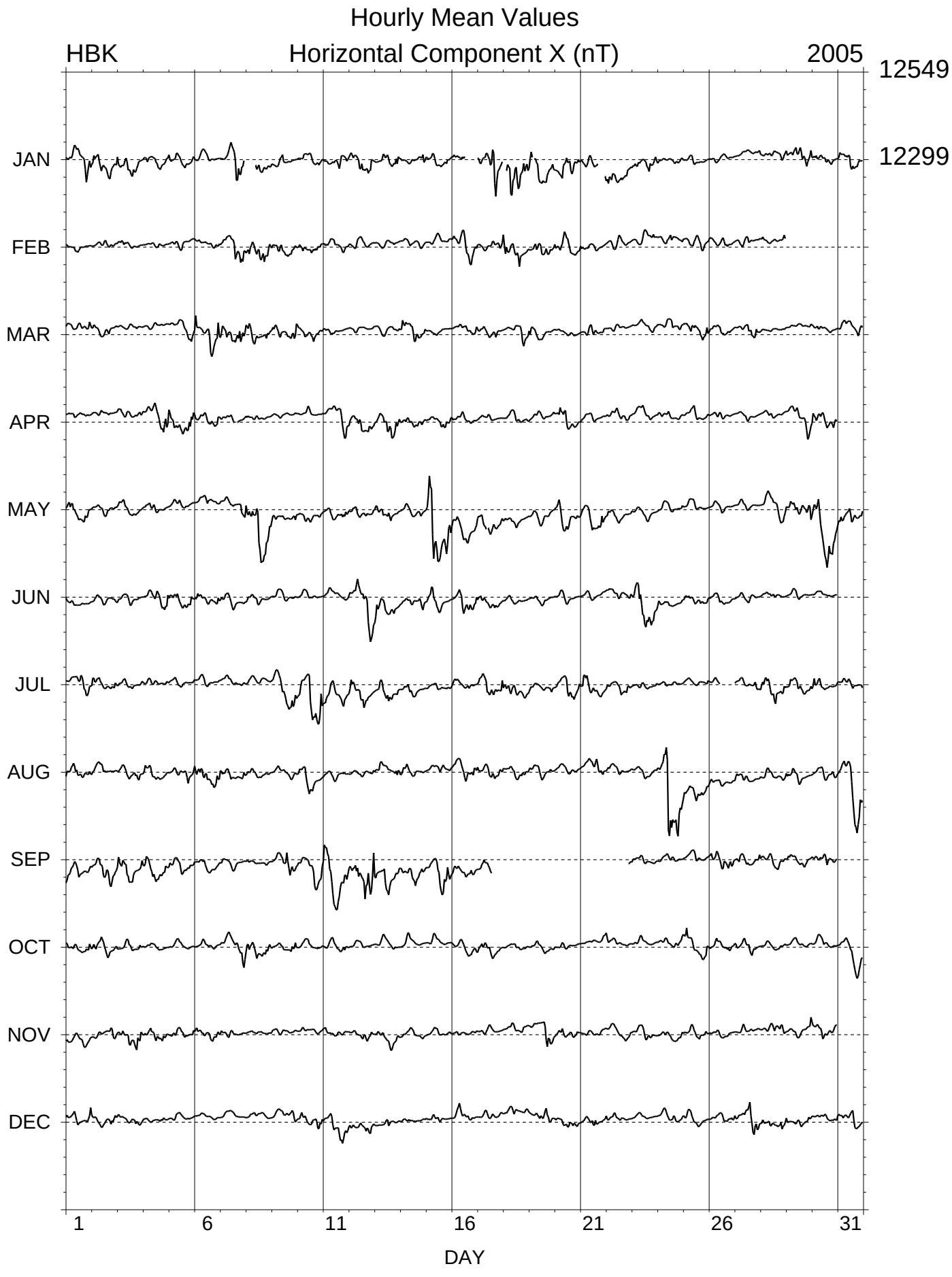


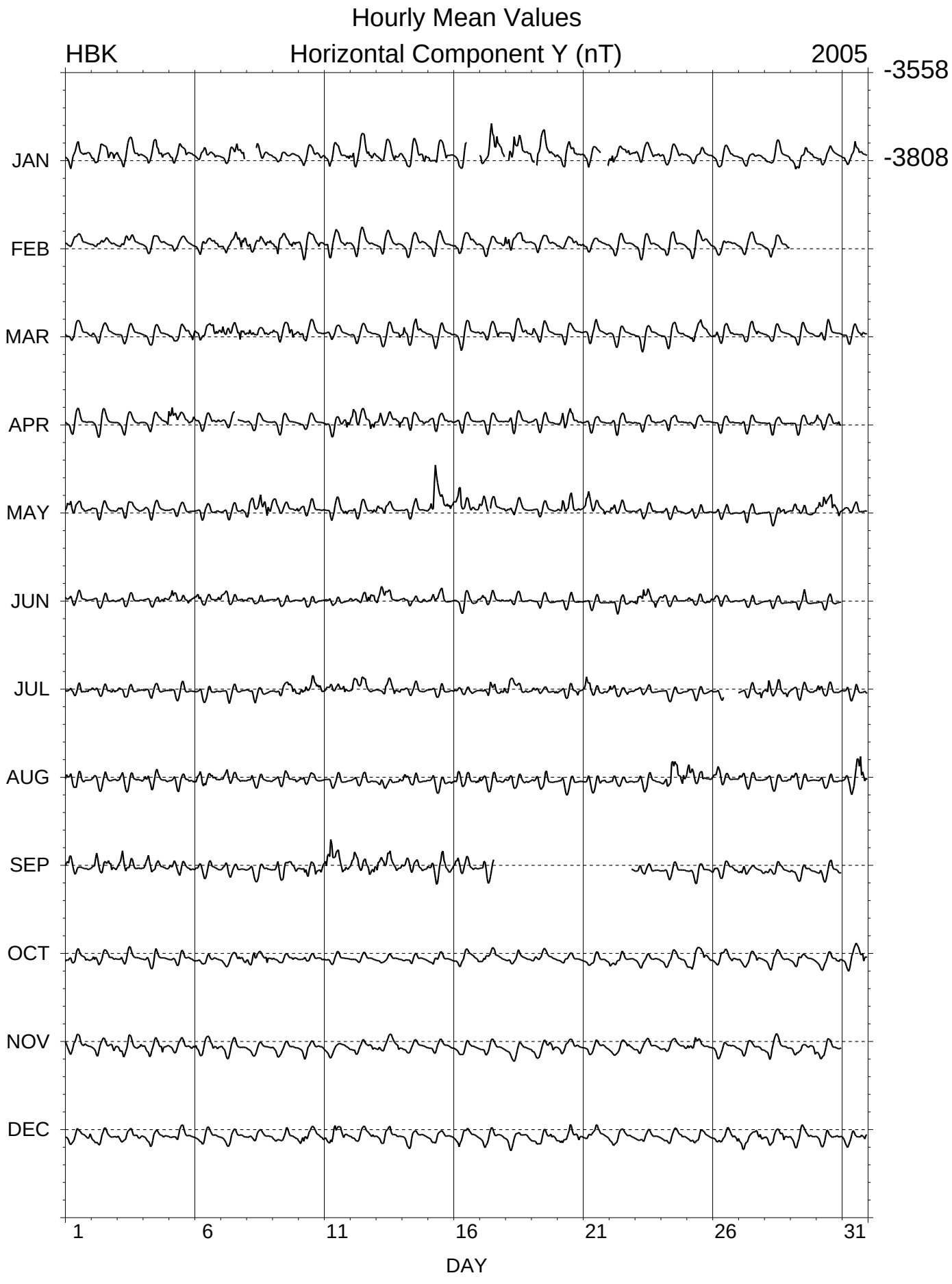
Magnetic East Component HE (nT)

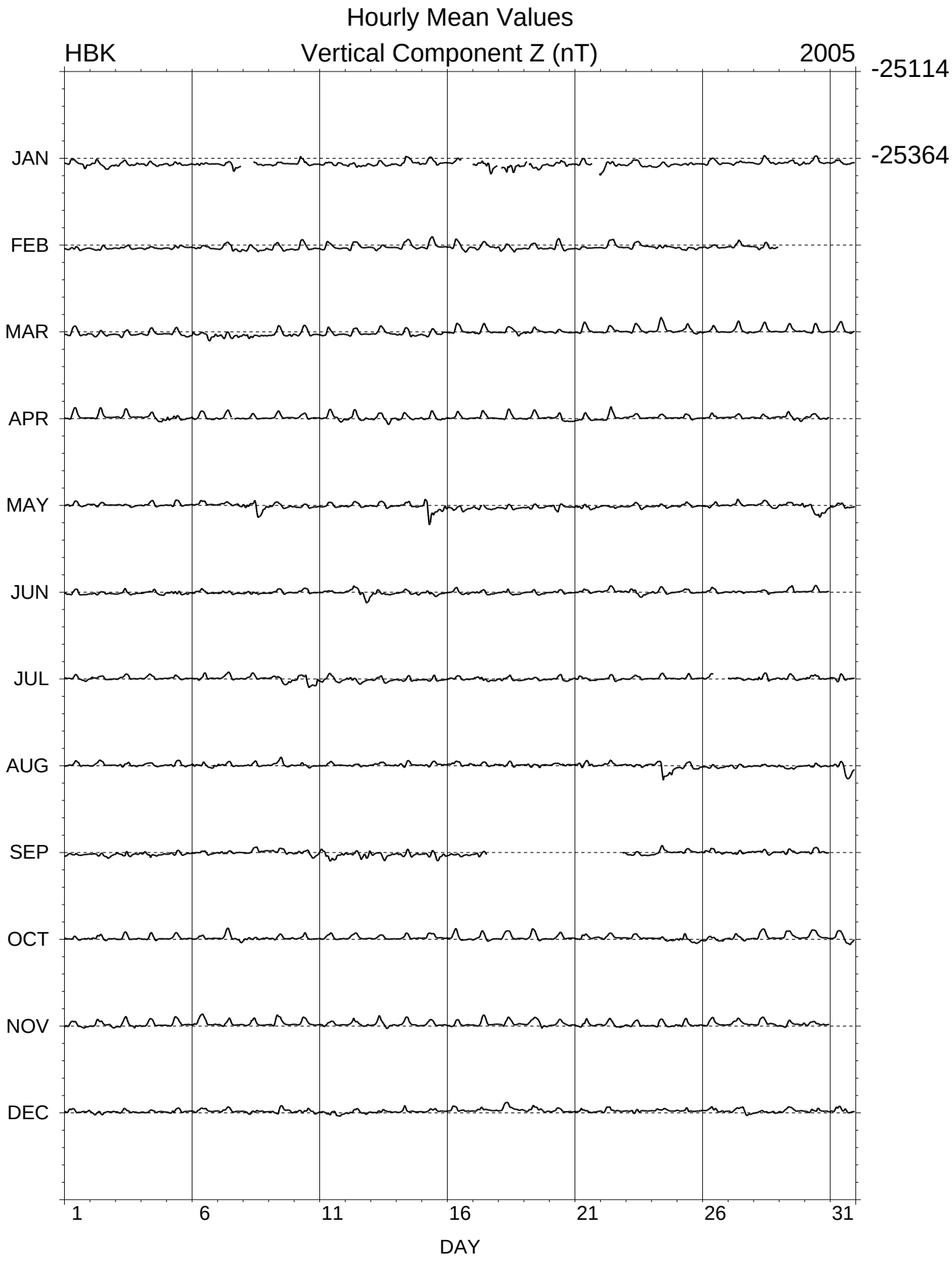


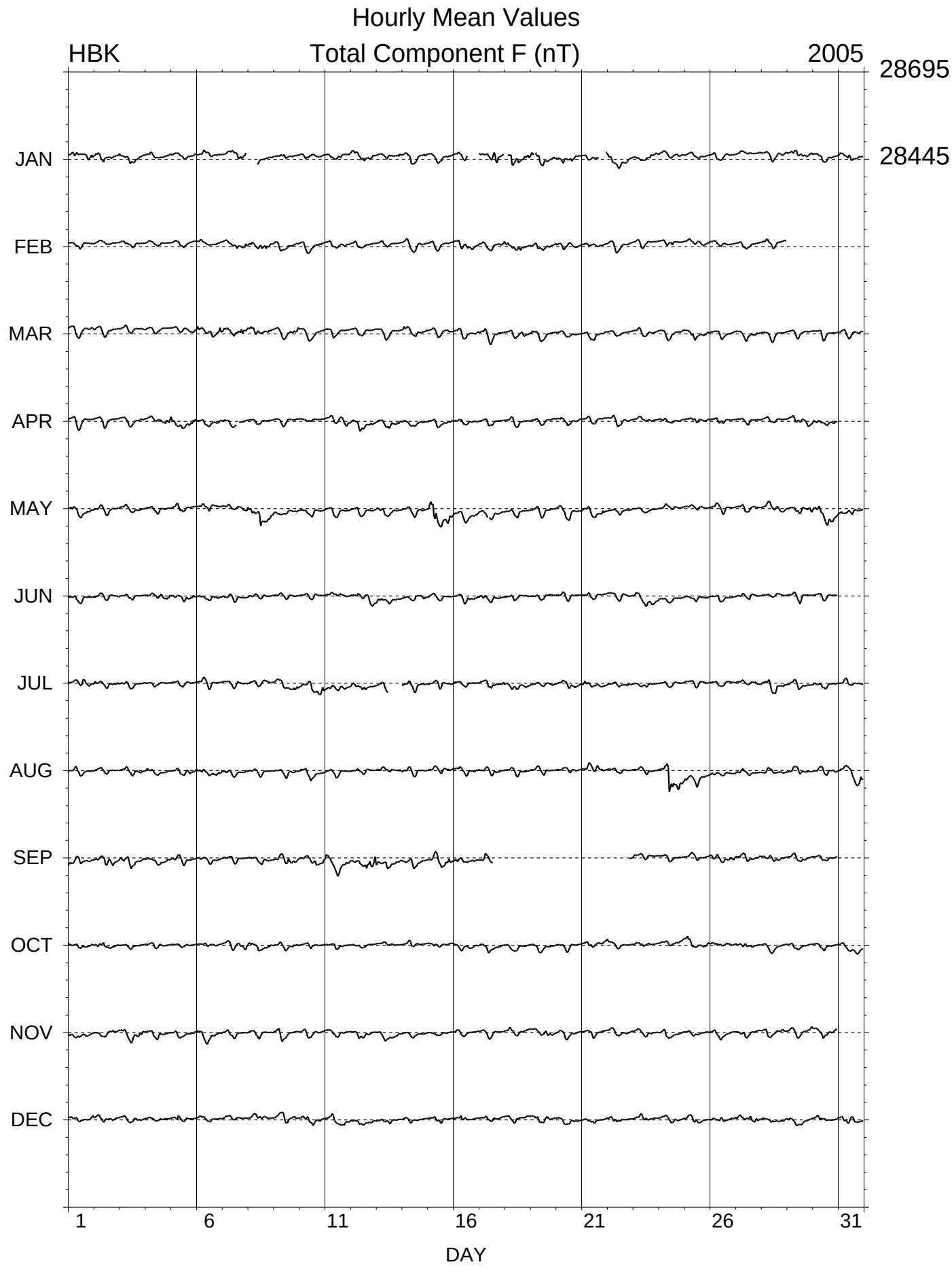
Vertical Component Z (nT)




Hourly Mean Values
HBK
Horizontal Component X (nT)
2005
12549
12299
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)
2005
-3558
-3808
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)
2005
-25114
-25364
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)
2005
28695
28445
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

HARTEBEESTHOEK
MEAN MONTHLY VALUES 2005

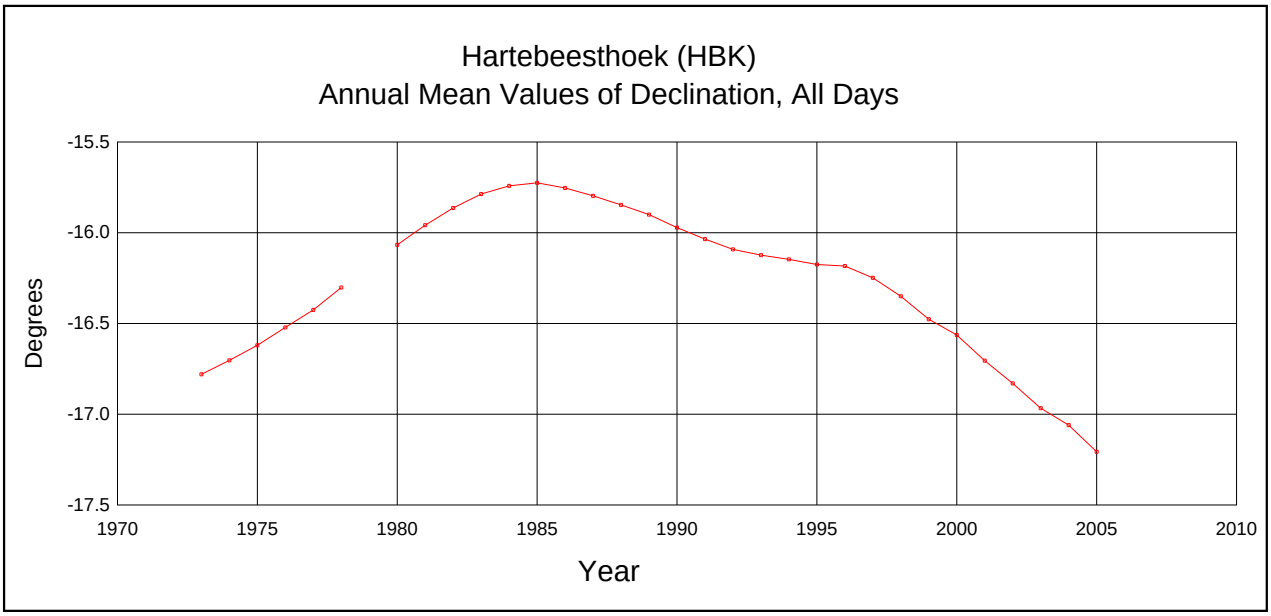
Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-17 08.1	-63 07.1	12866	12295	-3790	-25380	28454	A	HDZF
FEB	-17 07.9	-63 05.2	12878	12307	-3793	-25370	28452	A	HDZF
MAR	-17 08.4	-63 04.1	12886	12314	-3798	-25365	28450	A	HDZF
APR	-17 08.9	-63 03.8	12886	12313	-3799	-25360	28446	A	HDZF
MAY	-17 10.3	-63 07.0	12860	12287	-3797	-25366	28439	A	HDZF
JUN	-17 12.2	-63 05.9	12869	12293	-3806	-25364	28442	A	HDZF
JUL	-17 13.7	-63 05.6	12872	12294	-3812	-25363	28442	A	HDZF
AUG	-17 14.9	-63 05.6	12871	12292	-3816	-25363	28442	A	HDZF
SEP	-17 15.6	-63 07.1	12859	12280	-3816	-25367	28440	A	HDZF
OCT	-17 15.8	-63 04.0	12884	12304	-3824	-25359	28445	A	HDZF
NOV	-17 16.1	-63 03.8	12885	12304	-3825	-25357	28443	A	HDZF
DEC	-17 16.6	-63 03.2	12891	12309	-3829	-25359	28447	A	HDZF
YEAR	-17 12.4	-63 05.1	12876	12300	-3809	-25364	28445	A	HDZF
JAN	-17 08.6	-63 05.9	12876	12304	-3796	-25379	28458	Q	HDZF
FEB	-17 07.6	-63 04.3	12886	12315	-3795	-25369	28454	Q	HDZF
MAR	-17 08.9	-63 03.4	12892	12318	-3801	-25364	28451	Q	HDZF
APR	-17 09.4	-63 03.1	12894	12320	-3803	-25361	28449	Q	HDZF
MAY	-17 10.7	-63 04.1	12885	12311	-3806	-25363	28448	Q	HDZF
JUN	-17 12.6	-63 04.7	12880	12303	-3811	-25363	28446	Q	HDZF
JUL	-17 14.0	-63 03.9	12886	12308	-3818	-25361	28446	Q	HDZF
AUG	-17 15.4	-63 05.0	12876	12297	-3820	-25363	28444	Q	HDZF
SEP	-17 16.2	-63 04.4	12882	12301	-3824	-25361	28445	Q	HDZF
OCT	-17 15.6	-63 03.2	12891	12311	-3825	-25358	28446	Q	HDZF
NOV	-17 16.3	-63 03.2	12890	12309	-3827	-25356	28444	Q	HDZF
DEC	-17 16.0	-63 02.5	12898	12316	-3828	-25359	28450	Q	HDZF
YEAR	-17 12.5	-63 04.0	12886	12310	-3812	-25363	28449	Q	HDZF
JAN	-17 07.0	-63 09.2	12849	12280	-3782	-25385	28451	D	HDZF
FEB	-17 08.2	-63 06.9	12864	12293	-3790	-25373	28448	D	HDZF
MAR	-17 08.2	-63 05.6	12876	12304	-3794	-25371	28451	D	HDZF
APR	-17 08.3	-63 05.4	12873	12301	-3793	-25362	28441	D	HDZF
MAY	-17 10.1	-63 11.7	12820	12249	-3784	-25373	28427	D	HDZF
JUN	-17 12.3	-63 07.4	12856	12281	-3803	-25366	28438	D	HDZF
JUL	-17 13.5	-63 07.7	12853	12277	-3806	-25366	28436	D	HDZF
AUG	-17 15.7	-63 08.8	12844	12265	-3811	-25368	28434	D	HDZF
SEP	-17 14.9	-63 10.2	12833	12256	-3805	-25371	28432	D	HDZF
OCT	-17 15.6	-63 05.3	12873	12293	-3820	-25362	28442	D	HDZF
NOV	-17 16.2	-63 04.4	12879	12299	-3823	-25357	28440	D	HDZF
DEC	-17 17.4	-63 04.3	12882	12300	-3829	-25361	28445	D	HDZF
YEAR	-17 12.5	-63 07.2	12859	12283	-3804	-25367	28440	D	HDZF

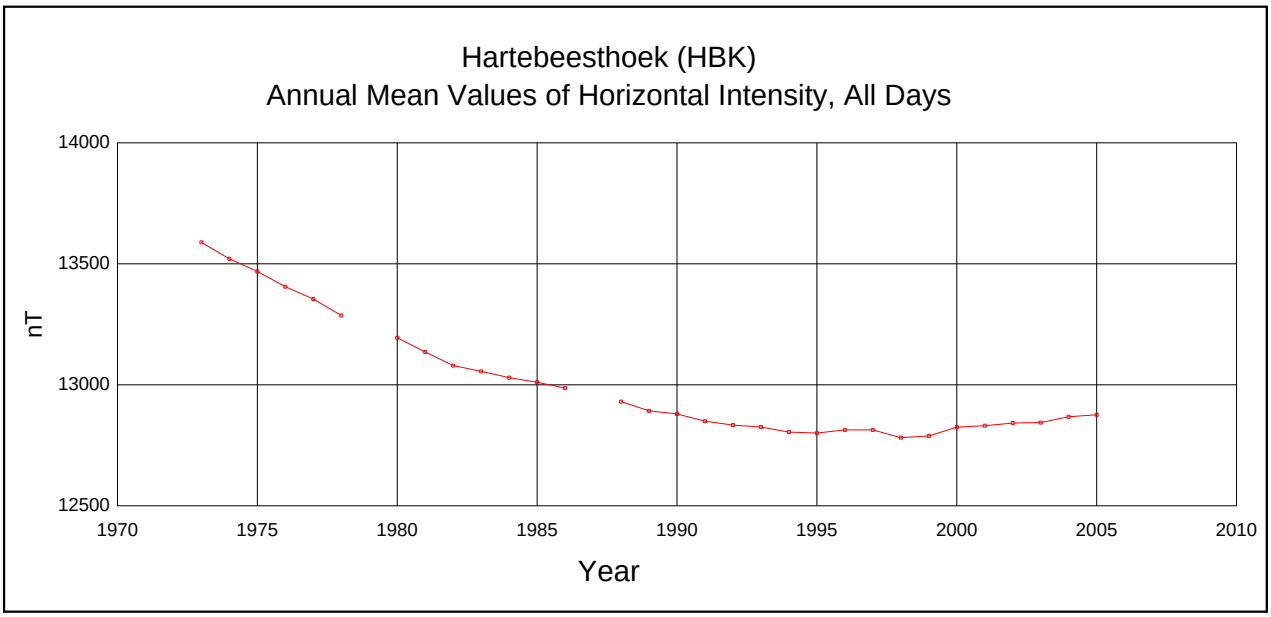
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

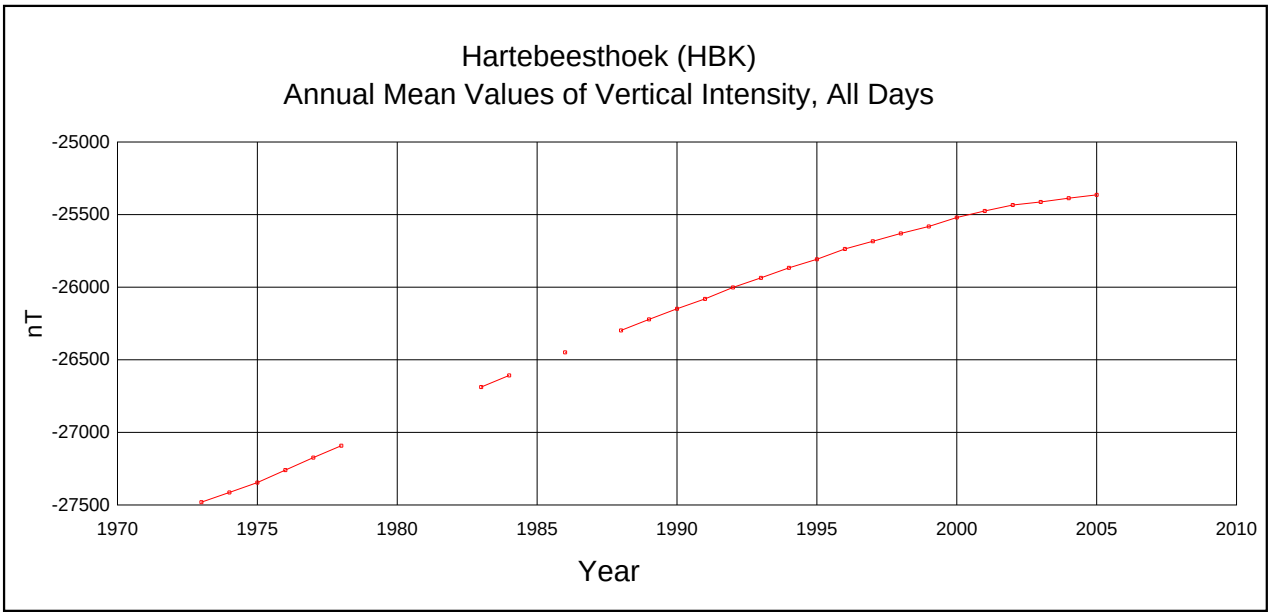
HARTEBEESTHOEK
MEAN ANNUAL VALUES

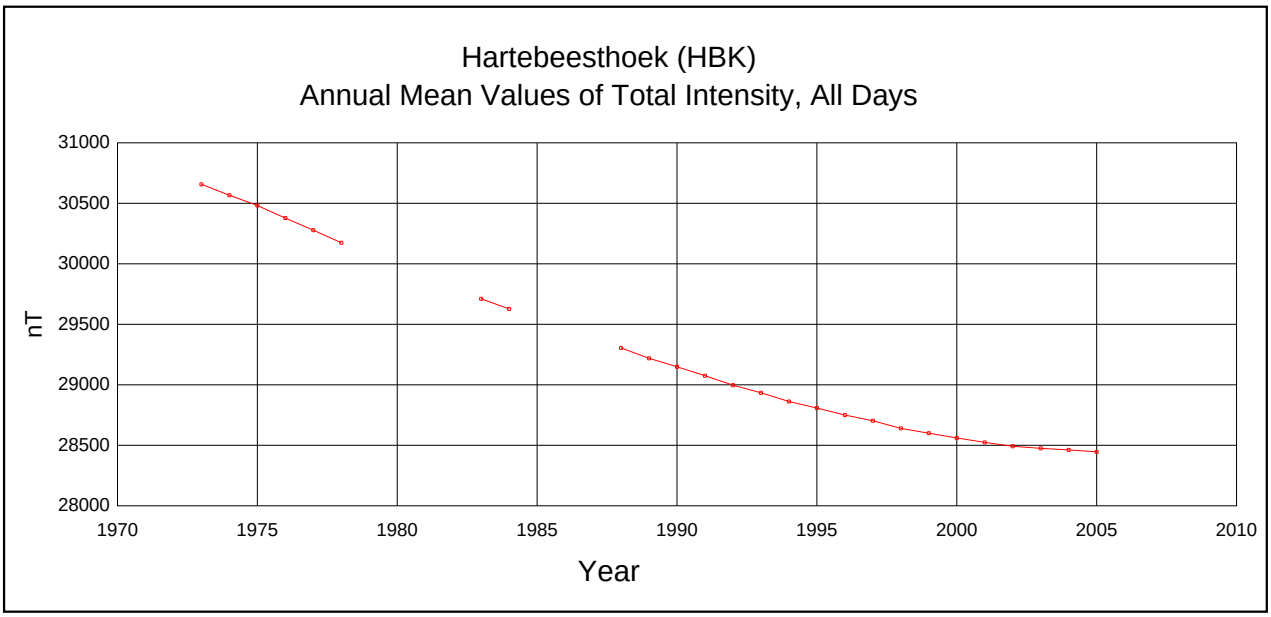
Date	° D	'	° I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1973.5	-16	46.6	-63	41.5	13588	13010	-3919	-27481	30657	I	DHZ
1974.5	-16	42.0	-63	45.0	13520	12950	-3885	-27414	30567	A	DHZ
1975.5	-16	37.0	-63	46.8	13468	12905	-3852	-27346	30482	A	DHZ
1976.5	-16	31.1	-63	49.0	13405	12852	-3811	-27260	30378	A	DHZ
1977.5	-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

*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

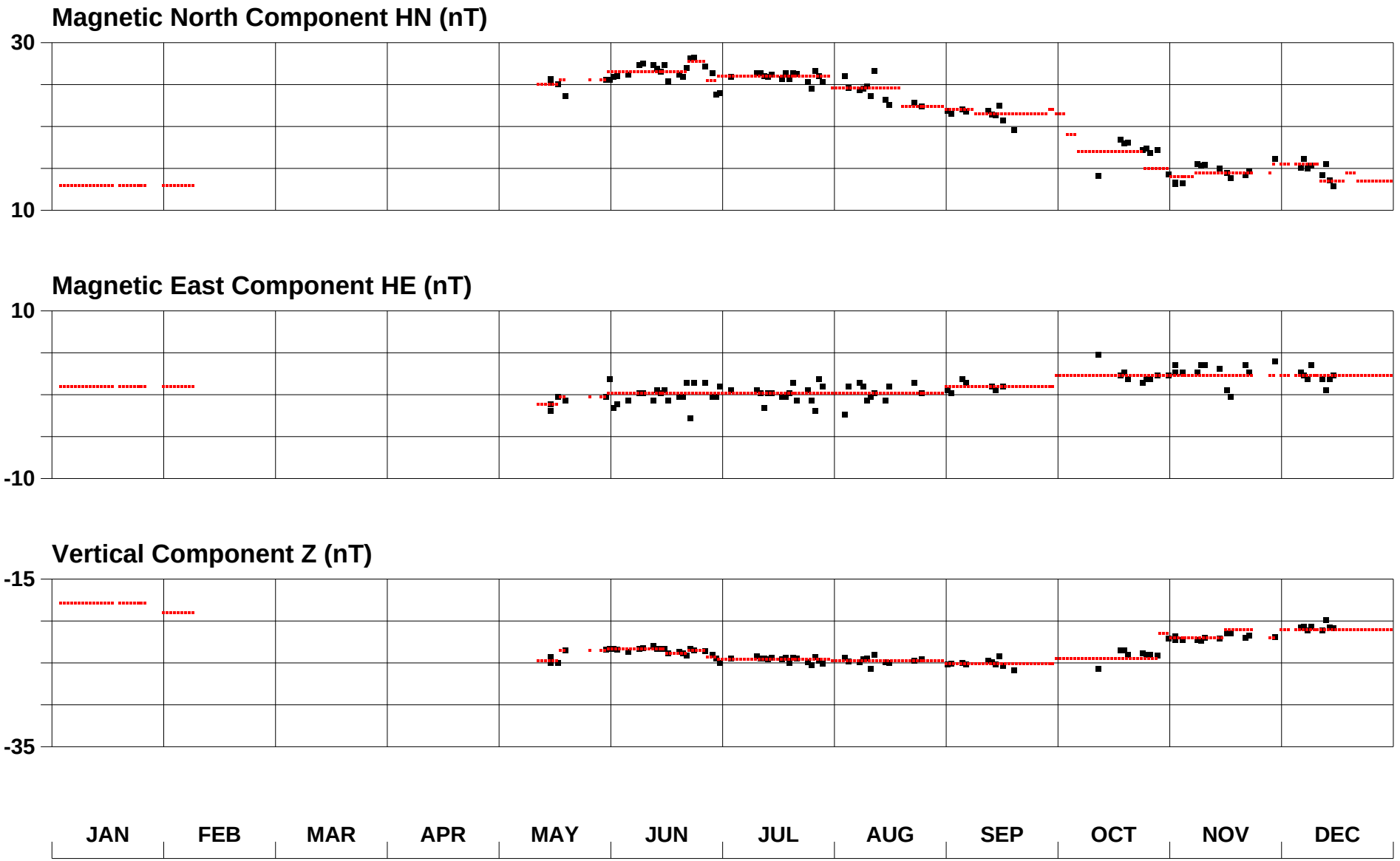
Magnetic Results 2005

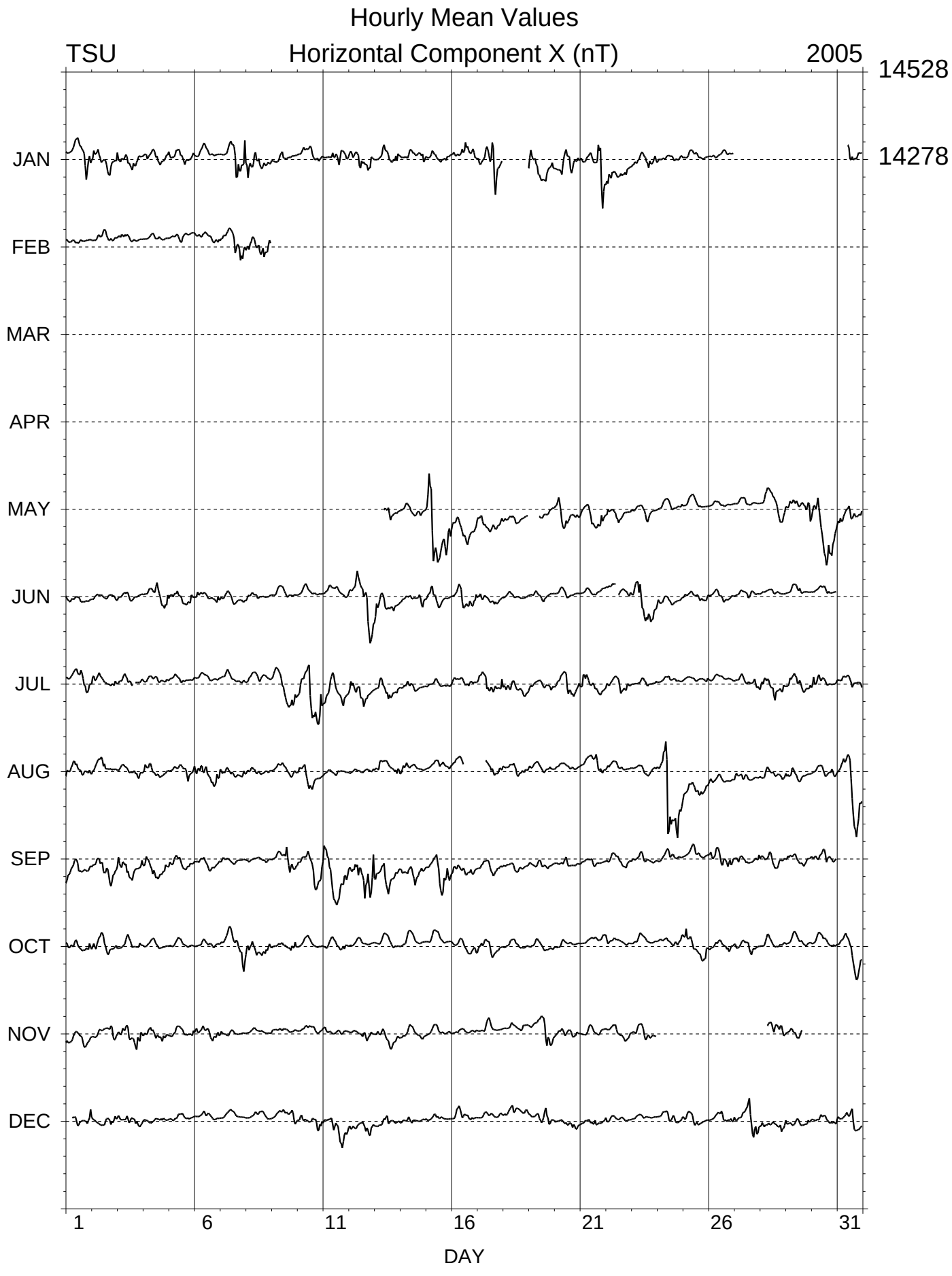
Tsumeb

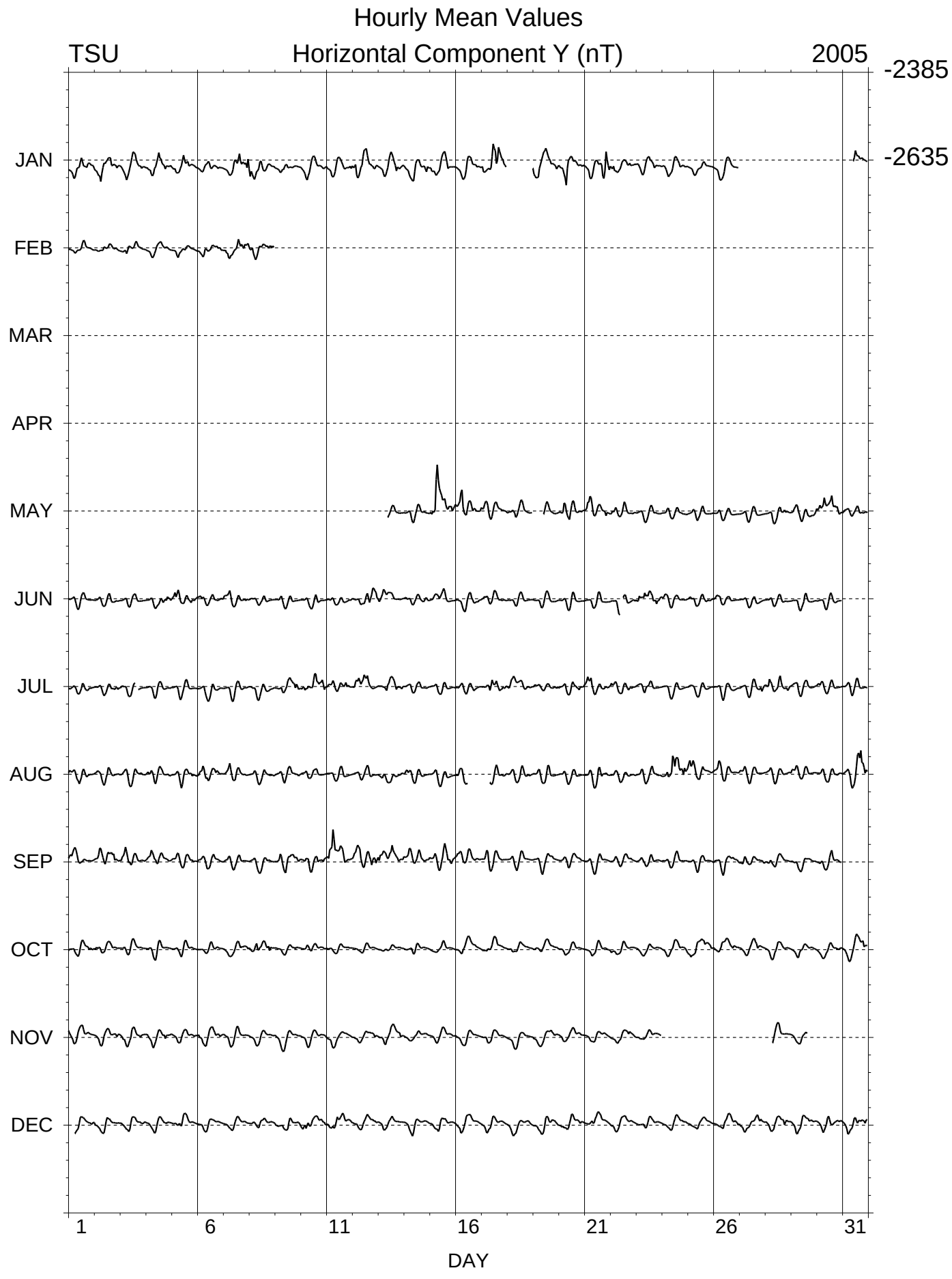
Observed and Adopted Baseline Values, TSU 2005

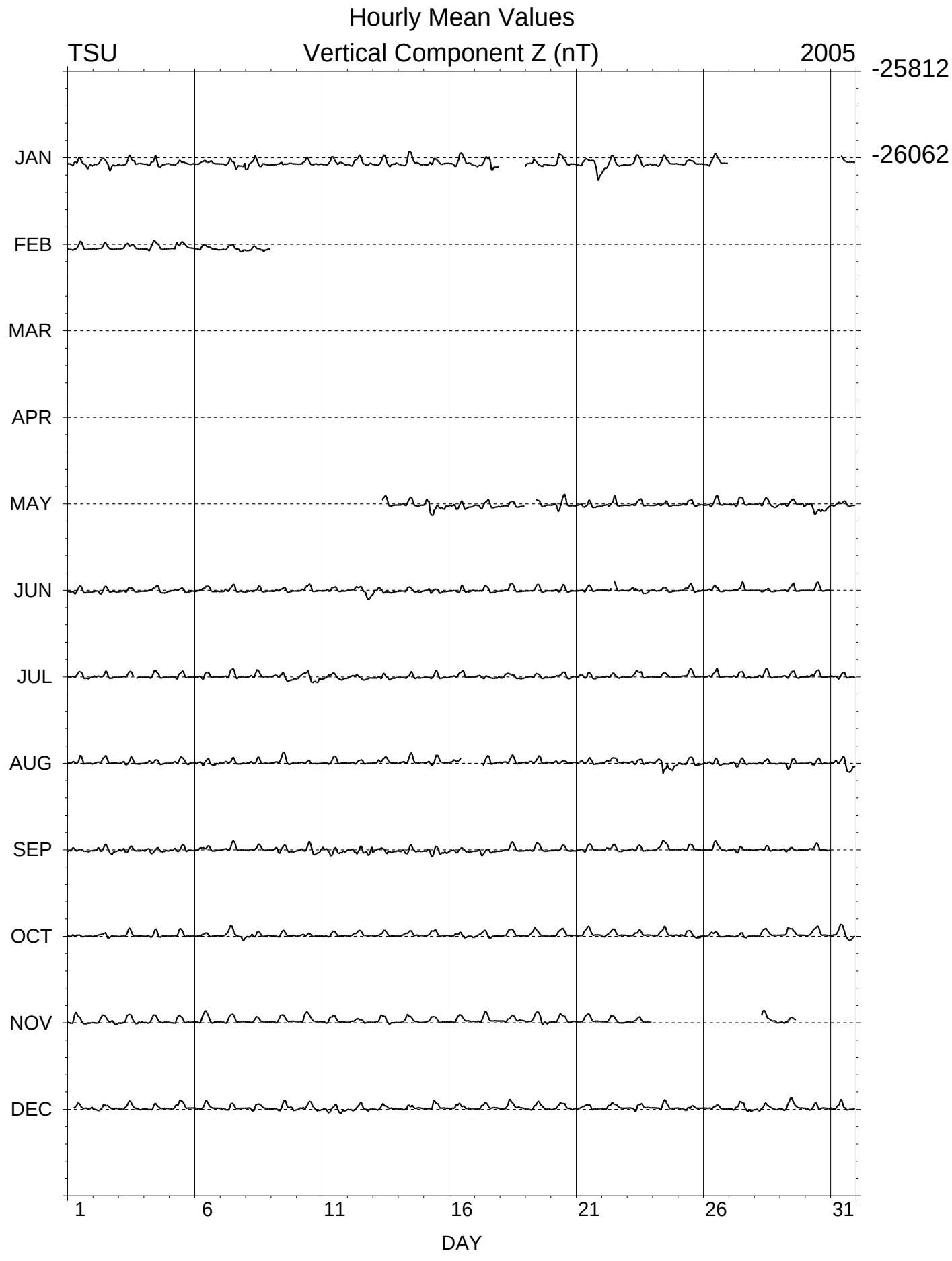
LAT: 109.202 LONG: 17.584

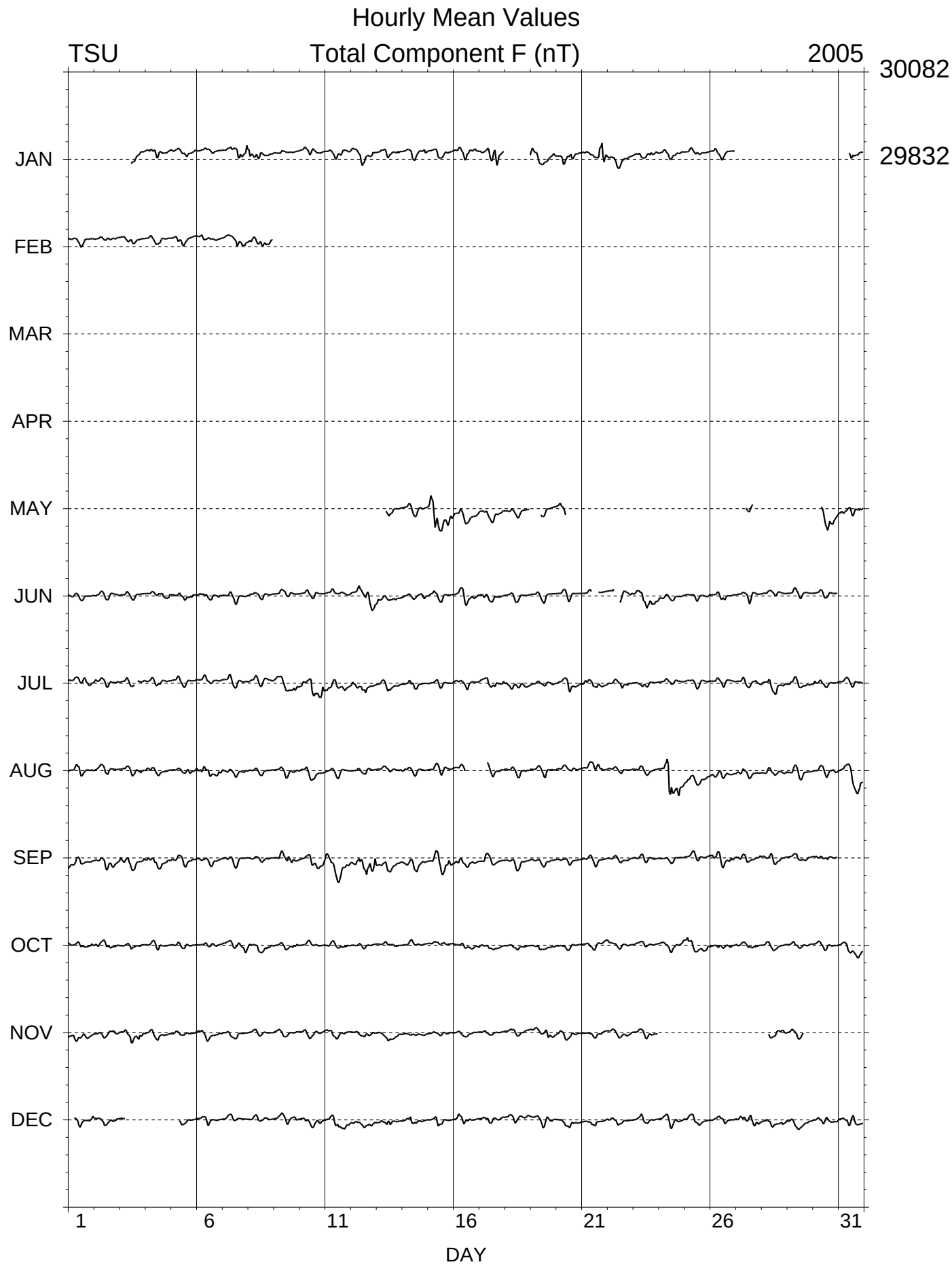
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
TSU
Horizontal Component X (nT)
2005
14528
14278
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)
2005
-2385
-2635
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)
2005
-25812
-26062
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)
2005
30082
29832
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

TSUMEB
MEAN MONTHLY VALUES 2005

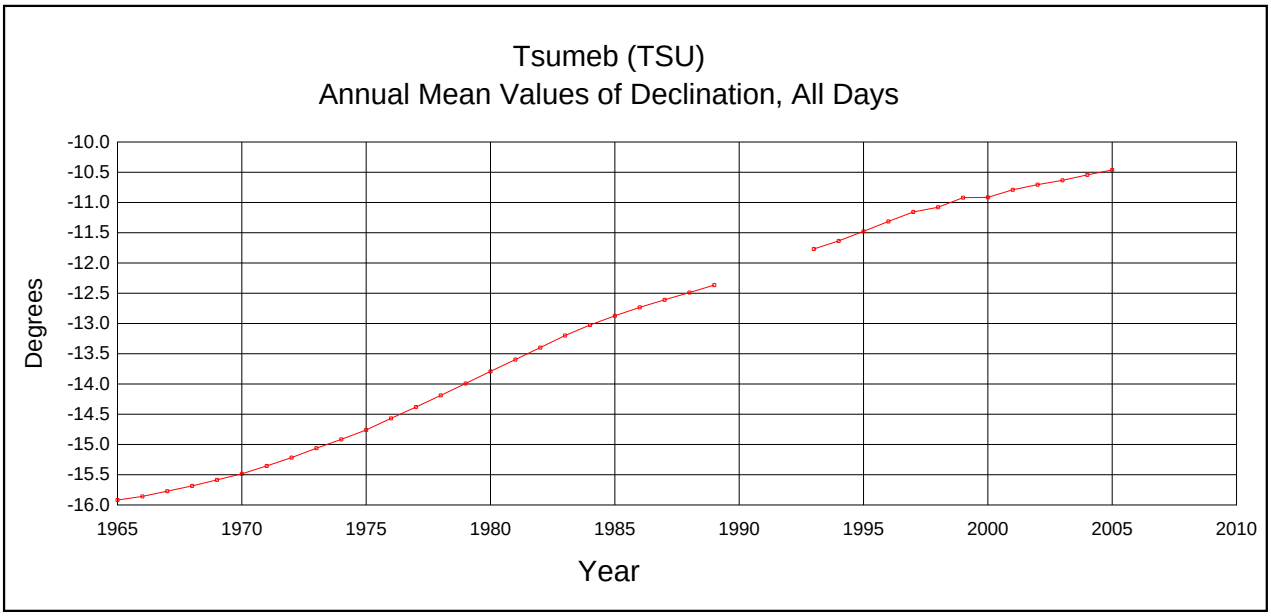
Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-10 31.8	-60 53.0	14525	14280	-2654	-26078	29850	A	HDZF
FEB	-10 27.5	-60 51.0	14541	14300	-2639	-26072	29853	A	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
MAY	-10 28.1	-60 54.3	14505	14263	-2635	-26065	29820	A	HDZF
JUN	-10 28.3	-60 52.4	14522	14280	-2639	-26062	29834	A	HDZF
JUL	-10 28.0	-60 52.4	14522	14280	-2638	-26060	29833	A	HDZF
AUG	-10 27.5	-60 52.9	14516	14275	-2635	-26060	29830	A	HDZF
SEP	-10 26.7	-60 54.4	14502	14262	-2629	-26062	29825	A	HDZF
OCT	-10 26.3	-60 51.8	14525	14285	-2631	-26057	29832	A	HDZF
NOV	-10 26.6	-60 51.9	14523	14283	-2633	-26055	29829	A	HDZF
DEC	-10 26.0	-60 51.9	14524	14284	-2630	-26057	29831	A	HDZF
YEAR	-10 27.6	-60 52.6	14519	14278	-2636	-26062	29833	A	HDZF
JAN	-10 32.1	-60 51.8	14536	14291	-2658	-26077	29854	Q	HDZF
FEB	-10 27.5	-60 50.1	14548	14307	-2641	-26069	29854	Q	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
MAY	-10 28.6	-60 51.0	14536	14294	-2643	-26062	*****	Q	HDZF
JUN	-10 28.6	-60 51.3	14533	14290	-2642	-26061	29839	Q	HDZF
JUL	-10 28.7	-60 50.8	14537	14294	-2644	-26059	29839	Q	HDZF
AUG	-10 27.6	-60 52.4	14521	14279	-2636	-26060	29832	Q	HDZF
SEP	-10 27.1	-60 52.6	14519	14278	-2634	-26059	29830	Q	HDZF
OCT	-10 26.3	-60 50.9	14534	14293	-2633	-26056	29835	Q	HDZF
NOV	-10 26.7	-60 51.1	14530	14289	-2634	-26054	29832	Q	HDZF
DEC	-10 25.7	-60 51.0	14532	14292	-2630	-26056	29834	Q	HDZF
YEAR	-10 27.8	-60 51.4	14531	14290	-2639	-26061	29837	Q	HDZF
JAN	-10 31.4	-60 54.6	14511	14267	-2650	-26081	29845	D	HDZF
FEB	-10 28.0	-60 52.5	14528	14286	-2639	-26075	29849	D	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
APR	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
MAY	-10 26.2	-60 60.0	14453	14214	-2618	-26072	29809	D	HDZF
JUN	-10 28.2	-60 53.8	14509	14267	-2636	-26064	29830	D	HDZF
JUL	-10 27.4	-60 54.6	14500	14259	-2632	-26063	29825	D	HDZF
AUG	-10 27.4	-60 55.9	14488	14247	-2629	-26062	29819	D	HDZF
SEP	-10 25.5	-60 57.4	14474	14235	-2619	-26065	29814	D	HDZF
OCT	-10 26.1	-60 53.1	14513	14273	-2628	-26058	29827	D	HDZF
NOV	-10 26.7	-60 52.7	14515	14275	-2631	-26056	29826	D	HDZF
DEC	-10 26.3	-60 53.4	14510	14270	-2629	-26059	29826	D	HDZF
YEAR	-10 27.3	-60 54.8	14500	14259	-2631	-26065	29826	D	HDZF

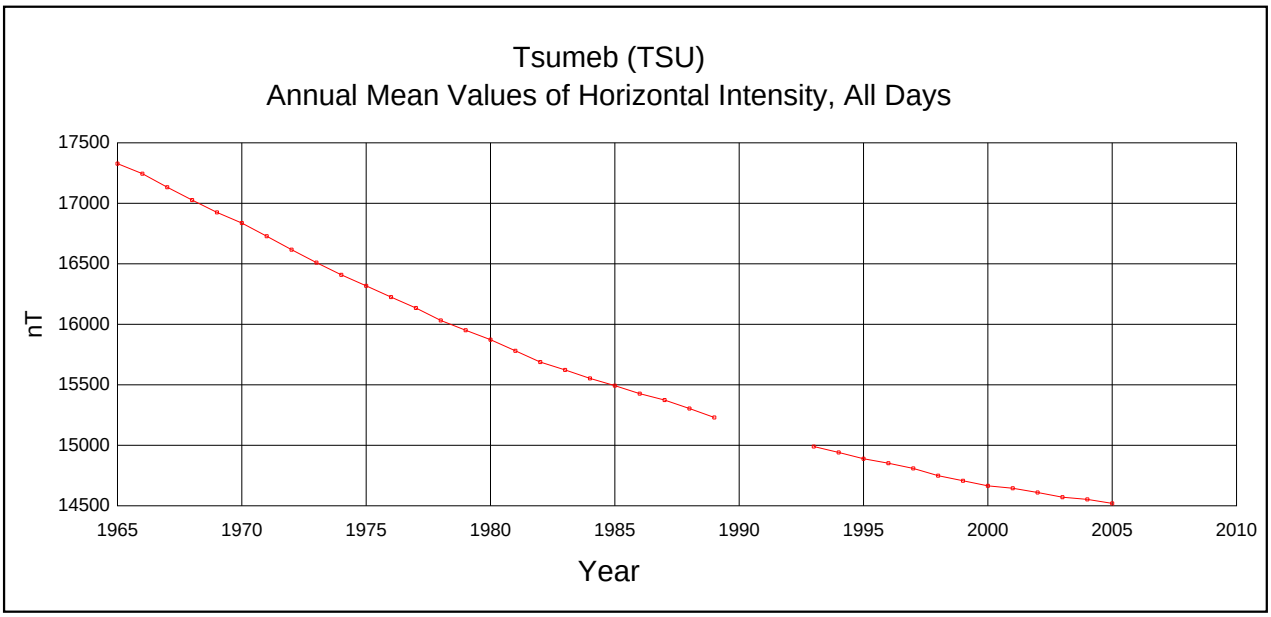
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

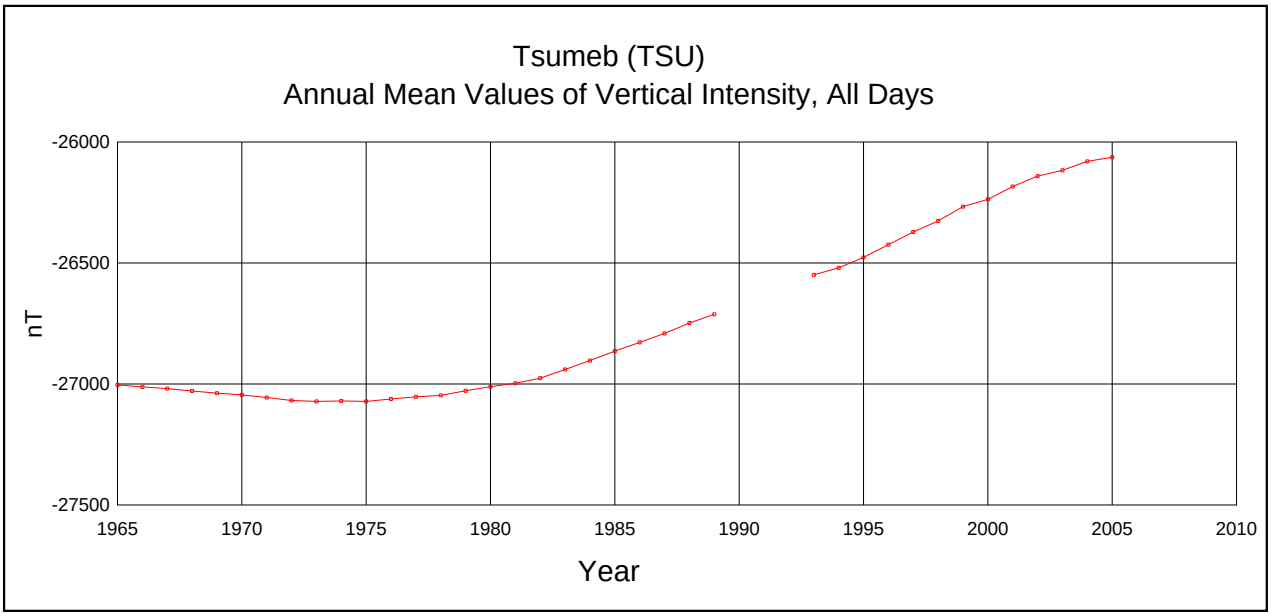
TSUMEB
MEAN ANNUAL VALUES

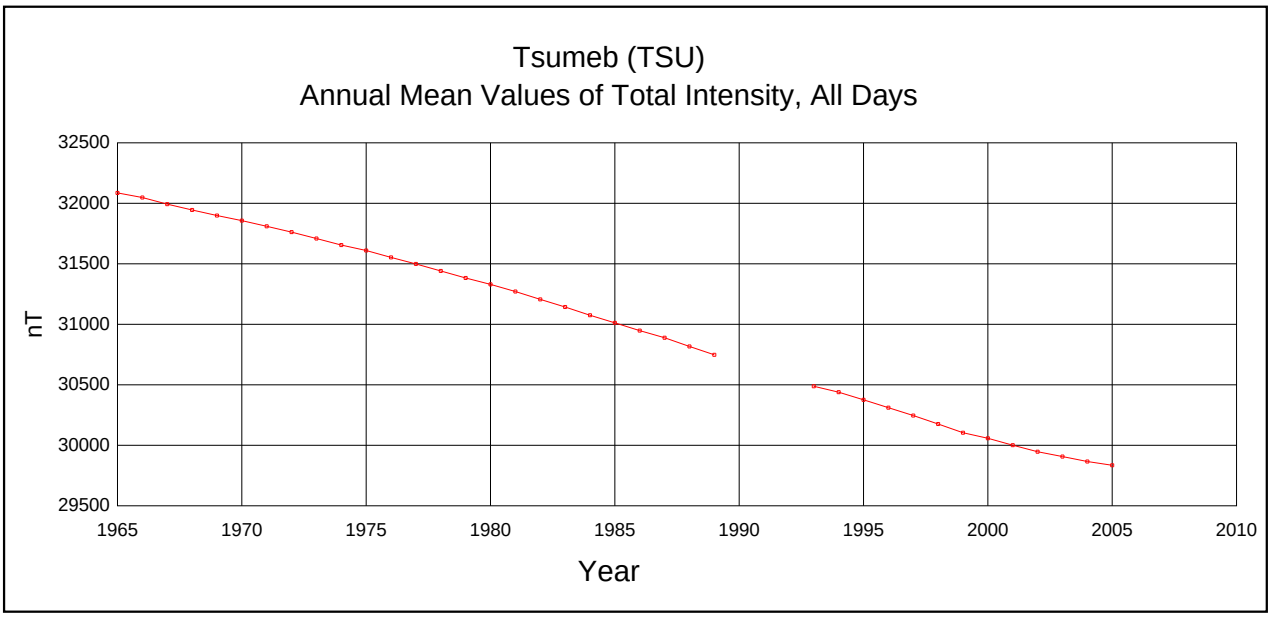
Date	°D	'	°I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1965.5	-15	57.4	-57	18.8	17328	16660	-4764	-27004	32086	I	DHZ
1966.5	-15	53.8	-57	26.7	17245	16585	-4724	-27012	32048	I	DHZ
1967.5	-15	48.6	-57	37.3	17133	16484	-4668	-27019	31993	A	DHZ
1968.5	-15	43.4	-57	47.5	17027	16389	-4614	-27029	31945	I	DHZ
1969.5	-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

*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
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