Hermanus Magnetic Observatory

A facility of the National Research Foundation

Magnetic Results 2006

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 2006.

2. DESCRIPTION OF THE OBSERVATORIES

2.1 The locations of the magnetic observatories

Observatory	Geographic Coordinates		Geomagnetic Coordinates		Elevation
	Latitude	Longitude	Latitude	Longitude	m
Hermanus	34° 25’ 23” S	19° 13’ 33” E	42° 24’ S	82° 58’ E	26
Hartebeesthoek	25° 52’ 58” S	27° 42’ 25” E	34° 28’ S	96° 02’ E	1555
Tsumeb	19° 12’ 08” S	17° 35’ 03” E	29° 42’ S	87° 07’ E	1273
Keetmanshoop	26° 32’ 26” S	18° 06’ 37” E	35° 40’ S	85° 37’ E	1065

Geomagnetic coordinates given are relative to a geomagnetic North Pole position of 83.6° N, 120.0° W, computed from the IGRF model (degree 13) at the epoch 2006.5.

2.2 New Observatory at Keetmanshoop, Namibia

During 2005 a new magnetic observatory was established on the premises of the Keetmanshoop Airport as part of a collaboration project between HMO and GFZ, who donated the instruments, consisting of a 3-axis suspended FGE fluxgate magnetometer, a dIFlux as well as an Overhauser proton magnetometer. HMO provided the data acquisition system and installed the instruments. The instruments were installed in a glass-fibre box buried partly in the ground, while the box was filled with water bottles for temperature control.

Figure. *A photo showing the container with observatory instruments at Keetmanshoop in Namibia.*

This was made possible with the cordial cooperation of the Namibian Airports Company who kindly agreed to set aside some space at the Keetmanshoop airport. This location was specifically chosen about halfway between Hermanus in the south and Tsumeb in the north in order to correct for disturbance effects from external sources and to refer the repeat station data to a common epoch during field surveys. This newly-established INTERMAGNET-grade observatory will play a key role in the region, as:

1. A reference magnetic observatory for field stations within a radius of 600 km located in the large area between the northern Cape and southern Namibia a region which has not been adequately covered in the past.
2. An accurate monitor of spatial changes in secular variation across southern Africa. At present the declination secular variations at the south-eastern and north-western borders of southern Africa are currently 7.7 arc min/yr westward and 5 arc min/yr eastward, respectively. Keetmanshoop observatory, located between HER and TSU in a North-South direction, as well as in an East-West direction on approximately the same magnetic latitude of Hartebeesthoek, will help to accurately monitor the spatial change of secular variation across southern Africa.

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 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.

3.3 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.

3.4 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 measured by a proton precession magnetometer (PPM) some distance away for Hartebeesthoek, and for Tsumeb and Keetmanshoop 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:

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

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 – 59	-1.0 nT	1 – 365	78.7 nT	1 – 365	15.4 nT	1 – 365	5.0 nT
60– 120	-1.2 nT						
121 – 243	-1.0 nT						
244 –365	-1.1 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, 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. In order to improve the base-line

values an analysis of the night levels of Hermanus data versus Hartebeesthoek (or Tsumeb and Keetmanshoop) 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, due to failure of the fluxgate magnetometer and the PPM, there were no recorded data for the period 1 January - 6 April 2006. For Hartebeesthoek, there are no observed base-line values for January, February, May and June. The adopted base-line values were extrapolated using the observed base-line values of the previous months or/and the following months. The Keetmanshoop observatory started operating in July 2006. There are no observed base-line values for November and December. The adopted base-line values were extrapolated using the observed base-line values of the previous months.

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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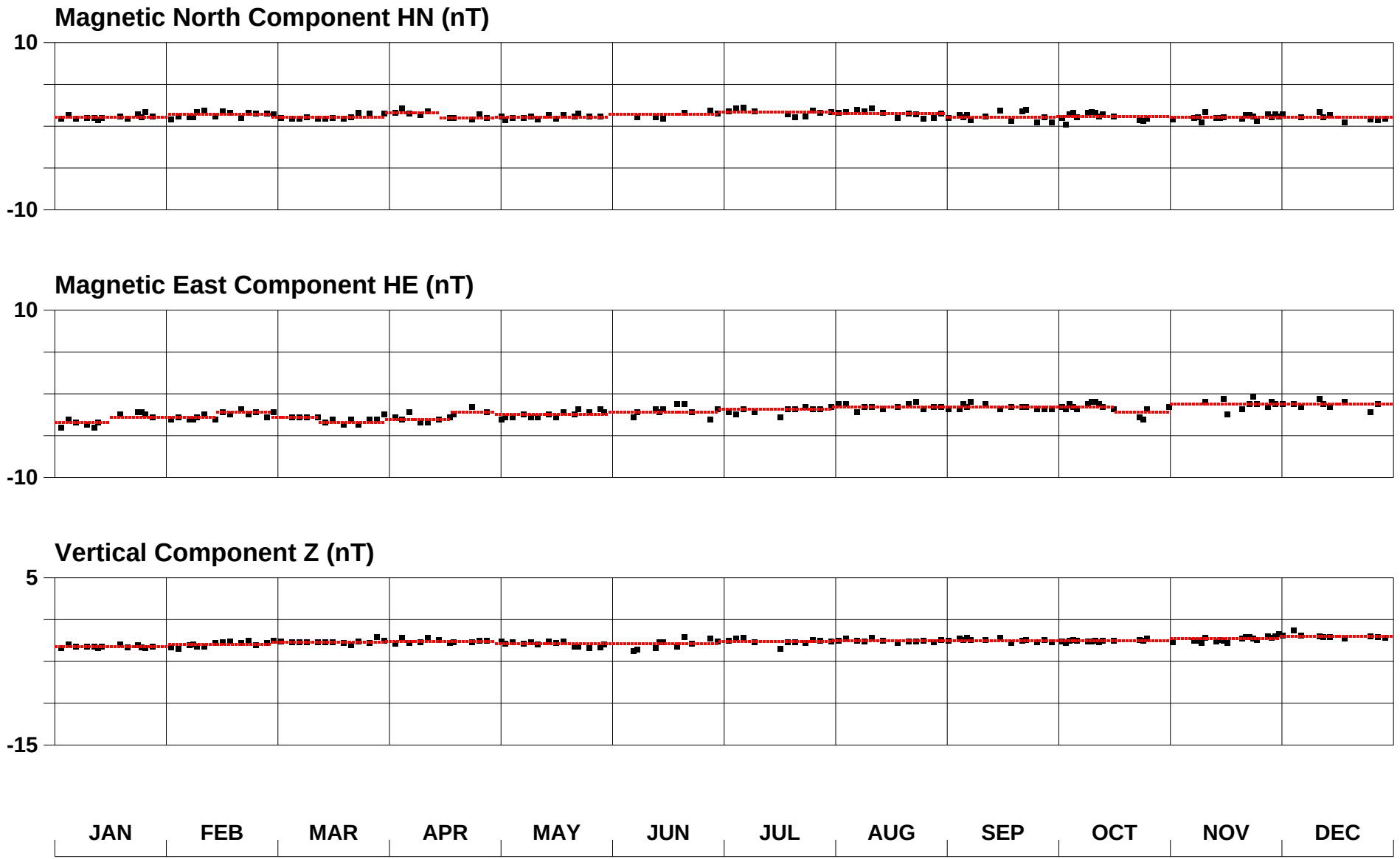
Magnetic Results 2006

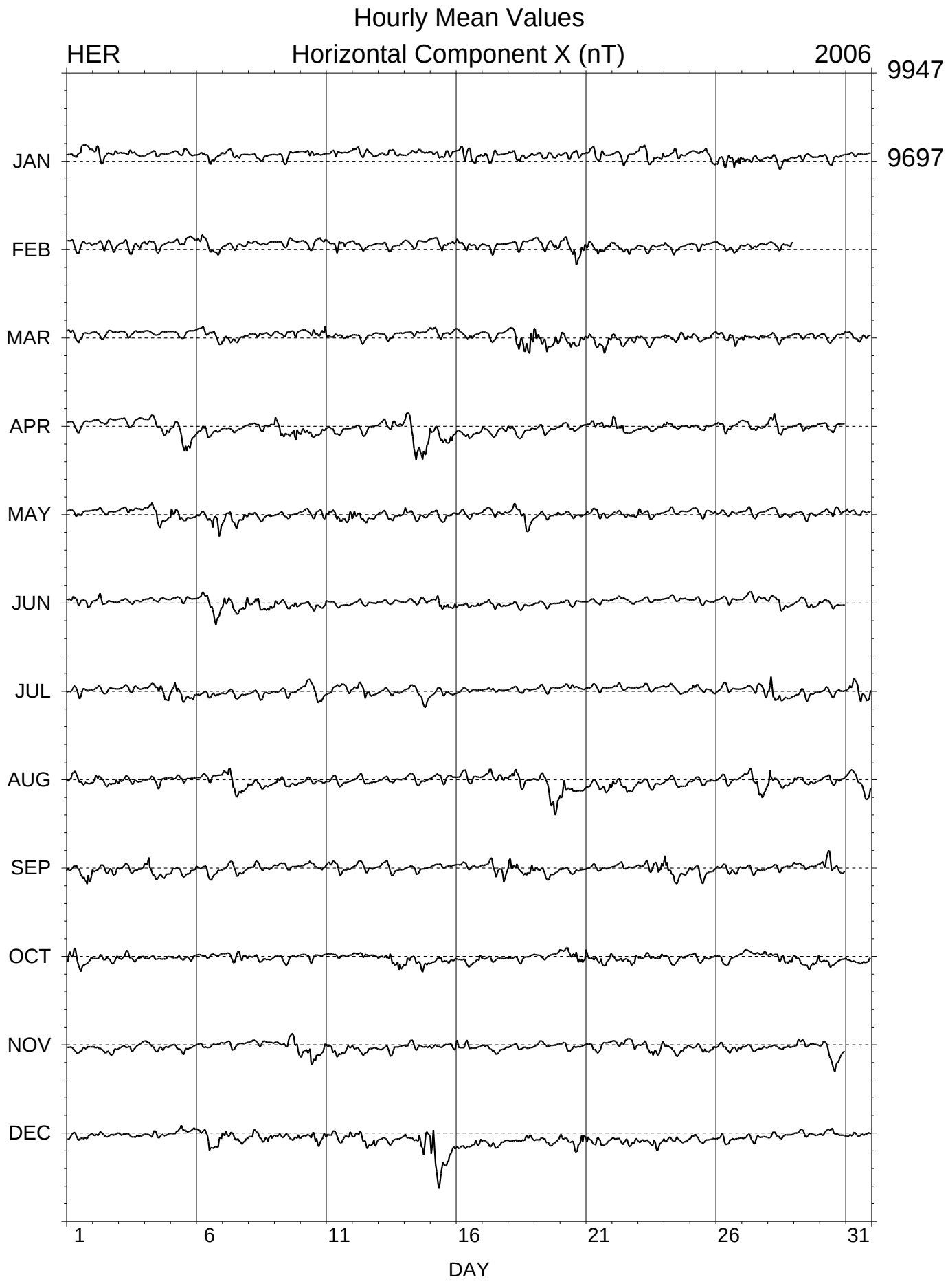
Hermanus

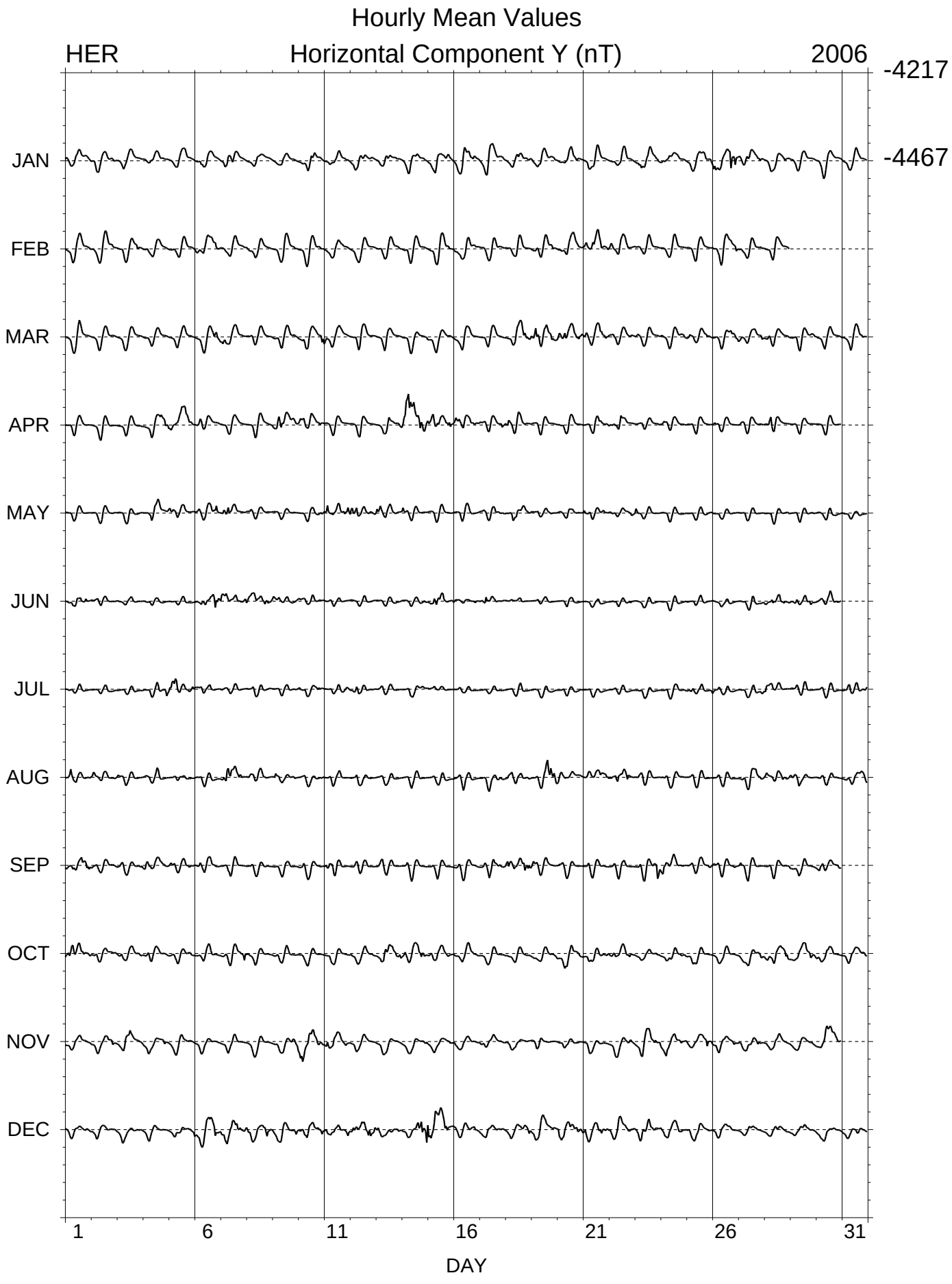
Observed and Adopted Baseline Values, HER 2006

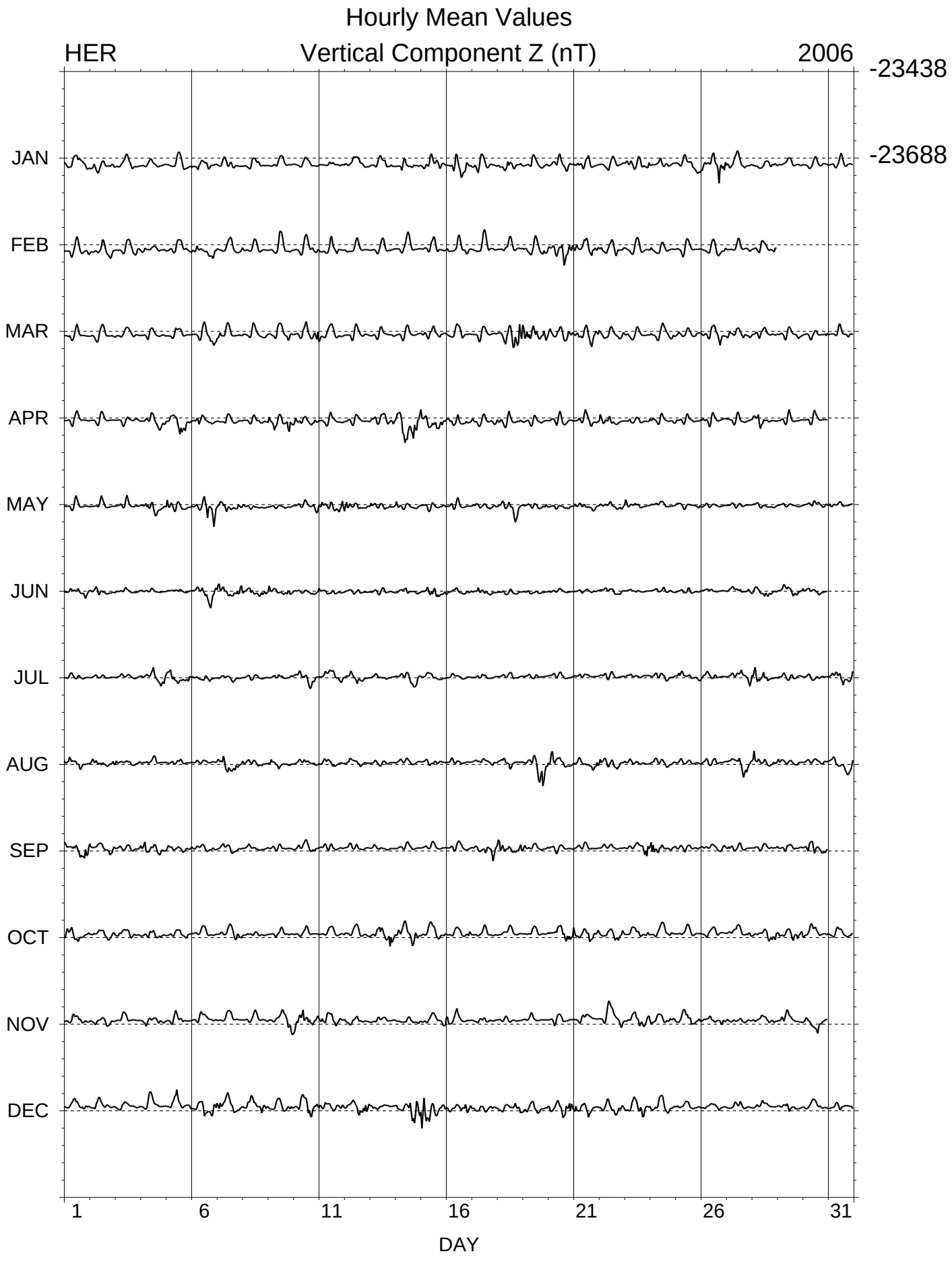
LAT: 124.425 LONG: 19.225

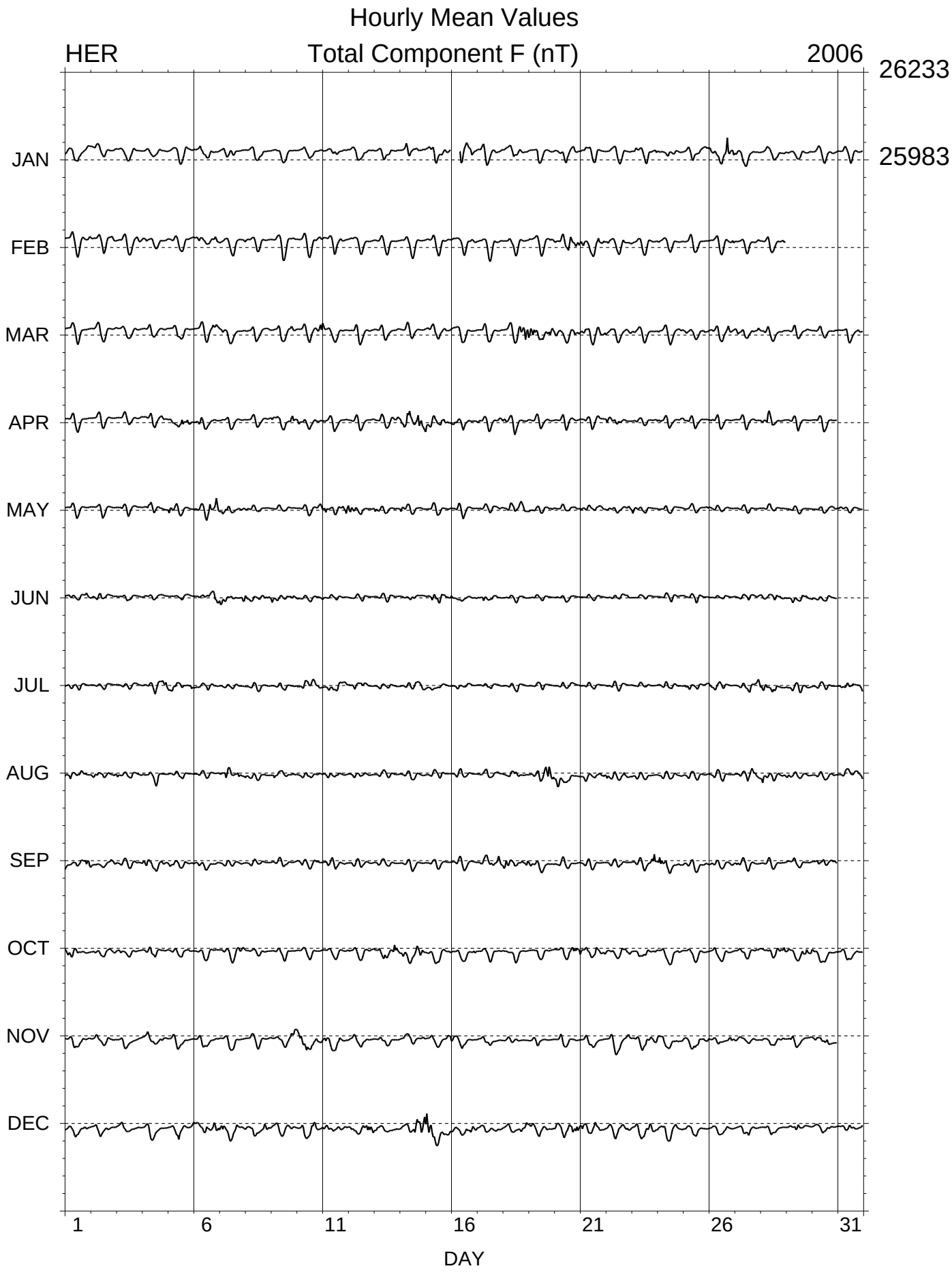
INSTITUTION: HMO INSTRUMENT: LC

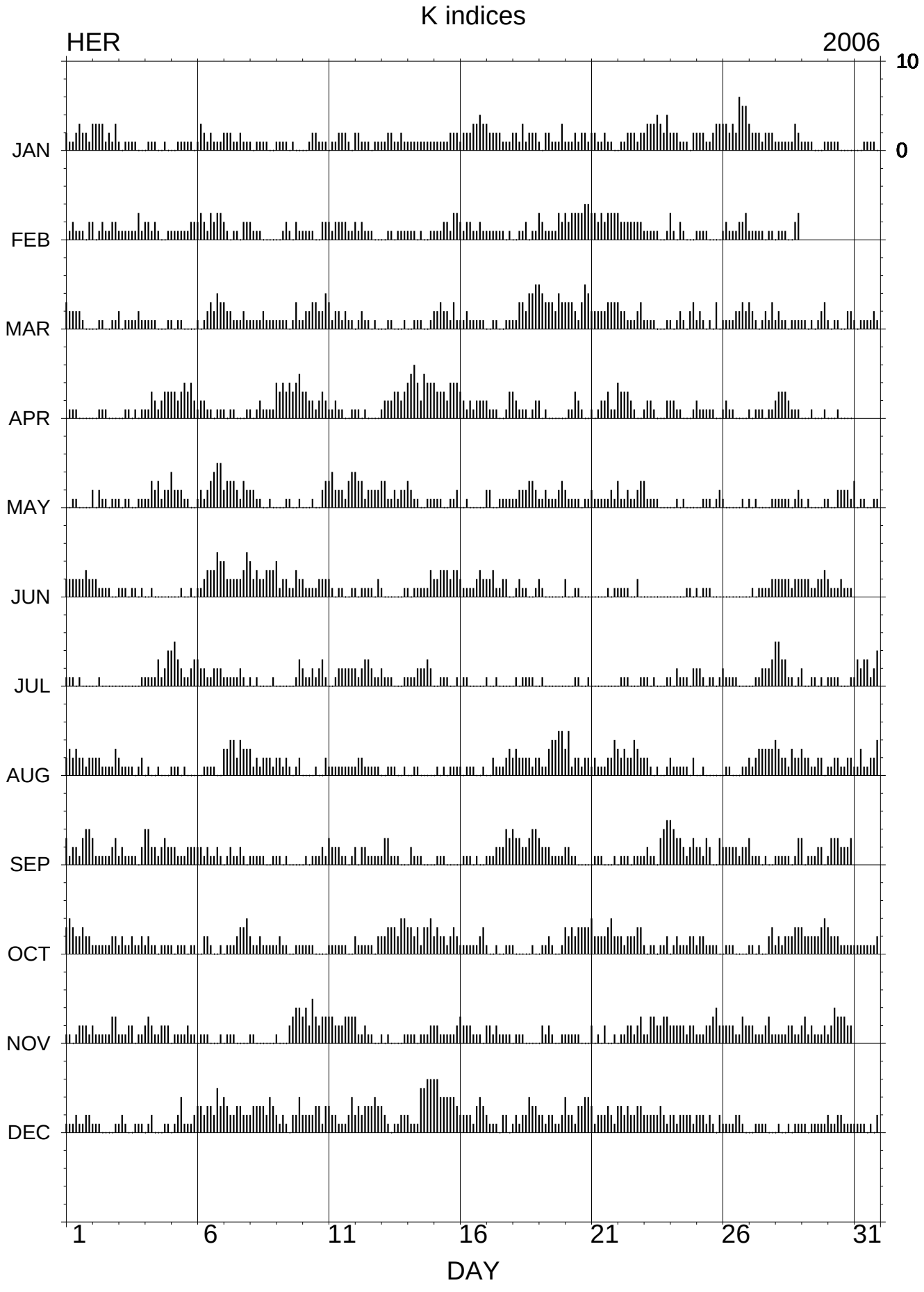



Hourly Mean Values
HER
Horizontal Component X (nT)
2006
9947
9697
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Horizontal Component Y (nT)
2006
-4217
-4467
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)
2006
-23438
-23688
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)
2006
26233
25983
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


K indices
HER
2006
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 — 2006

DATE	JAN	FEB	MAR	APR	MAY	JUN
01	2112 3221	0121 1102	3222 2100	0111 0000	0011 0000	2222 2232
02	3333 1213	2012 1122	0011 0011	0011 1000	2021 1011	2211 1100
03	1011 1100	1111 1131	2011 1121	0011 0101	1011 0011	1110 1101
04	0111 0010	2212 1001	1111 0001	1132 1233	1132 3122	0010 0000
05	0011 1110	1111 1122	1011 0000	3323 4342	4222 1100	0001 0010
06	1321 2111	2321 3233	1012 3243	1221 1011	1212 3455	1123 3354
07	2221 1211	2101 1022	3221 1121	1011 0001	2333 2132	4222 2235
08	1011 1100	2111 0000	1111 2111	1012 1111	2211 0010	4232 2333
09	1111 0100	0012 1021	1111 0131	4343 4345	0001 1001	4122 1132
10	0012 2111	1111 0022	1223 3224	3322 1232	0001 0023	2111 1222
11	0112 2210	2122 2211	3122 1211	1121 1001	3422 2134	2101 1001
12	2211 1011	2121 1100	0121 1010	1101 0000	4331 2222	1011 1102
13	1122 1121	0011 0111	0011 0001	1222 3323	3311 2122	1000 0001
14	1111 1111	1110 1001	0011 1001	4564 2544	3211 0011	1011 1113
15	1111 1222	1112 2133	2232 2131	4333 2444	1110 0112	2233 3233
16	1222 3343	2122 1121	1121 1111	3212 1222	0010 0000	2111 1232
17	3222 2111	1111 1101	0011 0011	2111 0013	2200 1111	2231 1220
18	2213 1222	0011 2011	1133 2445	3211 1012	1122 2332	0121 1001
19	1022 1113	3211 1132	5433 3243	2010 0000	1121 1123	2100 0000
20	1112 1221	3233 3344	3332 1354	0113 2100	2111 1011	2001 1000
21	2211 2110	3323 2333	2222 2333	1012 2311	2111 1121	0000 0101
22	0112 2212	3222 2222	3221 1123	4333 2100	3112 1123	1111 0020
23	2333 4324	1111 1001	1111 0001	1221 0002	3111 1000	0000 0000
24	2221 1102	3102 1000	1012 1023	2211 0001	0010 1000	0000 0110
25	2221 1233	1111 0000	1210 1030	2111 1100	0011 1012	1011 1000
26	3323 2655	1211 1223	1111 2232	1211 0000	1000 0010	0000 0000
27	3222 1222	1111 1011	3210 1213	1011 1011	1010 0001	0101 1112
28	1111 1132	0111 0023	1211 0111	2333 2111	1111 1012	2222 2122
29	1111 0001		1101 0123	0001 0001	1010 0001	2221 1223
30	1111 0000		1011 0022	0001 0000	1002 2221	2111 2111
31	0001 1110		1011 1121		3011 0011	

	JUL	AUG	SEP	OCT	NOV	DEC
01	1110 1000	2323 2212	3122 1344	3432 2322	1101 2221	1112 1122
02	0010 0000	2221 1113	3111 1123	1111 1122	2111 1133	1110 0001
03	0000 0001	2111 1012	1211 1102	1211 2112	1112 2011	1210 0111
04	1111 3124	0100 1000	4422 1232	1211 0111	2321 1222	0120 0011
05	4532 1123	1110 1000	2211 1222	1011 1011	0111 1211	0124 1112
06	3221 1222	0011 1100	2212 1121	0022 1001	0111 0001	3323 3253
07	1111 1210	3344 2433	0121 1210	0111 2334	0111 0000	4322 3322
08	1010 0001	3121 2221	1111 1001	2112 1111	1100 0000	2333 3243
09	0000 0013	2212 1012	1101 0000	1211 0011	1000 2344	2121 0224
10	2112 1231	0000 1002	0101 1121	1111 0000	3425 3233	2222 3313
11	0012 2222	1111 1111	3222 1101	1111 1100	3322 2333	3221 1124
12	2123 3211	1221 1111	2022 1111	2111 1102	3112 1100	2323 3343
13	2111 0001	0011 1001	1331 1100	2233 3244	1010 0001	3210 1122
14	1112 2232	0011 0000	0211 1000	3323 1334	1110 1112	2111 5566
15	0011 1001	0101 0111	0111 0000	2322 1232	2211 1112	6644 4443
16	0110 0000	1011 1001	0111 0100	1111 1123	3222 1110	2222 1343
17	1001 0000	0021 1123	1112 2243	1001 0011	2212 1111	2111 0220
18	0101 1110	2322 2212	4332 2344	1000 0010	0111 0000	1212 2433
19	0100 0000	2113 4455	3222 1111	0112 1001	0212 1001	2212 2112
20	0001 1001	3512 2122	2211 0000	3232 3333	1111 1000	4221 3344
21	0000 0000	1211 1224	0111 0001	4222 2342	2010 2001	3122 2321
22	0111 0001	3232 2432	0111 0111	2212 2233	0112 2123	3323 2233
23	1101 0001	2210 1001	1211 0345	1011 0112	1133 2233	2222 2321
24	1021 1102	2111 1102	5433 2123	0121 1122	2222 2122	2212 2221
25	2210 1101	0010 0000	2213 2003	1221 1110	1112 2342	2221 2102
26	2111 1000	0110 0011	2222 2122	0111 0000	2222 1132	1111 2210
27	0011 2223	2123 3333	3111 0100	1101 0023	2211 1231	0011 1100
28	5533 1101	4322 1322	1111 1013	1212 2233	1111 2211	0100 1011
29	2001 1010	3221 1220	3011 1220	3222 2234	2312 1112	1101 1111
30	1111 0001	1122 1122	1333 2223	3222 1111	1243 3322	2112 2111
31	1323 3124	1131 1224		1111 1112		1111 0102

HERMANUS
MEAN MONTHLY VALUES 2006

Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-24 40.4	-65 43.4	10692	9716	-4463	-23706	26006	A	HDZF
FEB	-24 41.3	-65 43.6	10688	9711	-4464	-23700	25998	A	HDZF
MAR	-24 42.9	-65 44.1	10682	9703	-4466	-23697	25993	A	HDZF
APR	-24 43.4	-65 45.6	10670	9692	-4463	-23697	25989	A	HDZF
MAY	-24 43.5	-65 44.4	10678	9699	-4466	-23693	25988	A	HDZF
JUN	-24 43.8	-65 44.1	10679	9700	-4467	-23690	25986	A	HDZF
JUL	-24 44.3	-65 43.8	10680	9700	-4469	-23686	25983	A	HDZF
AUG	-24 44.8	-65 44.5	10673	9693	-4468	-23684	25978	A	HDZF
SEP	-24 45.0	-65 43.8	10677	9696	-4470	-23680	25976	A	HDZF
OCT	-24 45.8	-65 44.0	10674	9693	-4471	-23676	25971	A	HDZF
NOV	-24 46.3	-65 44.1	10673	9691	-4472	-23676	25970	A	HDZF
DEC	-24 46.9	-65 45.3	10664	9682	-4470	-23677	25968	A	HDZF
YEAR	-24 44.1	-65 44.2	10677	9698	-4468	-23688	25984	A	HDZF
JAN	-24 40.8	-65 43.2	10693	9716	-4465	-23705	26005	Q	HDZF
FEB	-24 41.1	-65 43.0	10692	9715	-4465	-23697	25997	Q	HDZF
MAR	-24 42.2	-65 43.3	10689	9711	-4467	-23697	25996	Q	HDZF
APR	-24 43.3	-65 43.8	10683	9704	-4468	-23694	25991	Q	HDZF
MAY	-24 43.6	-65 44.1	10680	9701	-4468	-23692	25988	Q	HDZF
JUN	-24 43.8	-65 43.3	10685	9705	-4470	-23688	25987	Q	HDZF
JUL	-24 44.5	-65 43.4	10683	9702	-4471	-23685	25983	Q	HDZF
AUG	-24 44.6	-65 43.6	10679	9699	-4470	-23682	25979	Q	HDZF
SEP	-24 44.8	-65 42.9	10684	9703	-4472	-23678	25977	Q	HDZF
OCT	-24 45.4	-65 43.1	10680	9698	-4473	-23675	25972	Q	HDZF
NOV	-24 46.0	-65 43.2	10679	9697	-4474	-23673	25971	Q	HDZF
DEC	-24 45.9	-65 43.9	10674	9692	-4471	-23674	25969	Q	HDZF
YEAR	-24 43.9	-65 43.4	10683	9704	-4469	-23687	25985	Q	HDZF
JAN	-24 41.2	-65 44.2	10687	9710	-4463	-23708	26003	D	HDZF
FEB	-24 40.3	-65 44.4	10682	9707	-4459	-23702	25998	D	HDZF
MAR	-24 43.1	-65 45.4	10672	9695	-4463	-23698	25991	D	HDZF
APR	-24 43.0	-65 48.2	10651	9676	-4454	-23703	25987	D	HDZF
MAY	-24 43.7	-65 45.8	10668	9690	-4463	-23696	25987	D	HDZF
JUN	-24 43.7	-65 45.1	10672	9693	-4464	-23692	25985	D	HDZF
JUL	-24 44.2	-65 44.8	10672	9693	-4466	-23688	25982	D	HDZF
AUG	-24 45.6	-65 46.4	10659	9679	-4464	-23688	25976	D	HDZF
SEP	-24 45.0	-65 45.0	10669	9689	-4466	-23683	25975	D	HDZF
OCT	-24 46.0	-65 45.2	10666	9685	-4468	-23679	25971	D	HDZF
NOV	-24 46.6	-65 45.6	10661	9680	-4468	-23677	25967	D	HDZF
DEC	-24 47.4	-65 47.0	10651	9670	-4466	-23682	25967	D	HDZF
YEAR	-24 44.1	-65 45.6	10668	9689	-4464	-23691	25982	D	HDZF

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

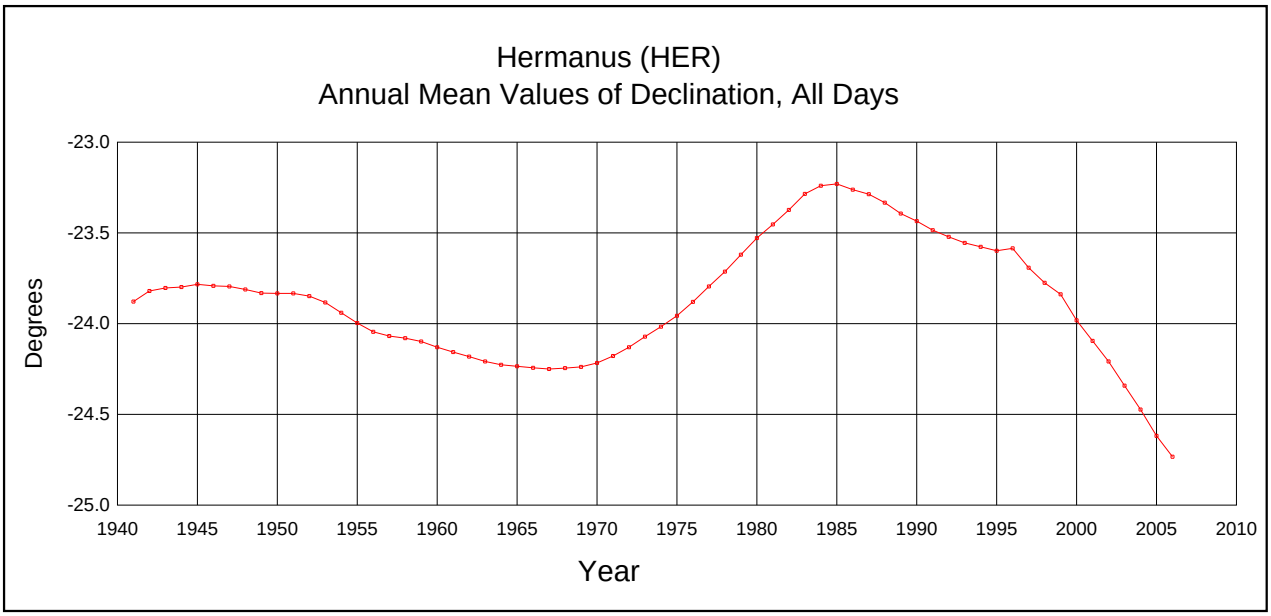
HERMANUS
MEAN ANNUAL VALUES

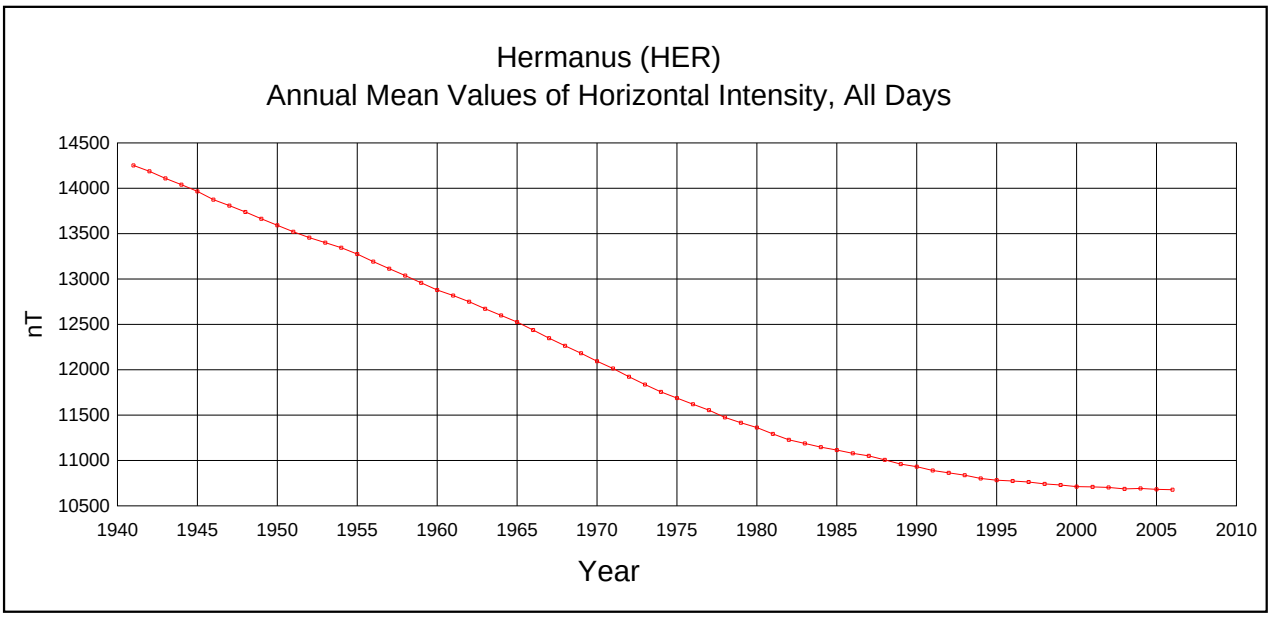
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1941.5	-23 51.6	-64 01.4	14252	13034	-5765	-29249	32537	A	DHZ
1942.5	-23 48.1	-64 03.0	14187	12980	-5724	-29153	32422	A	DHZ
1943.5	-23 47.1	-64 06.4	14109	12911	-5690	-29065	32309	A	DHZ
1944.5	-23 46.8	-64 09.1	14040	12848	-5661	-28981	32202	A	DHZ
1945.5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

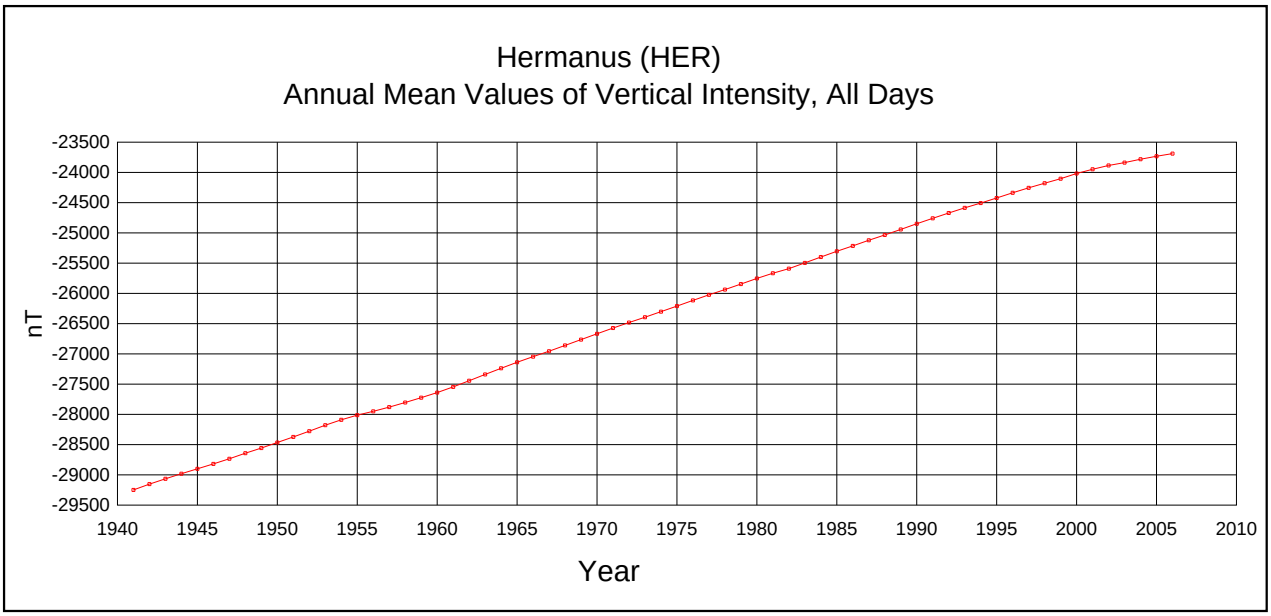
HERMANUS
MEAN ANNUAL VALUES

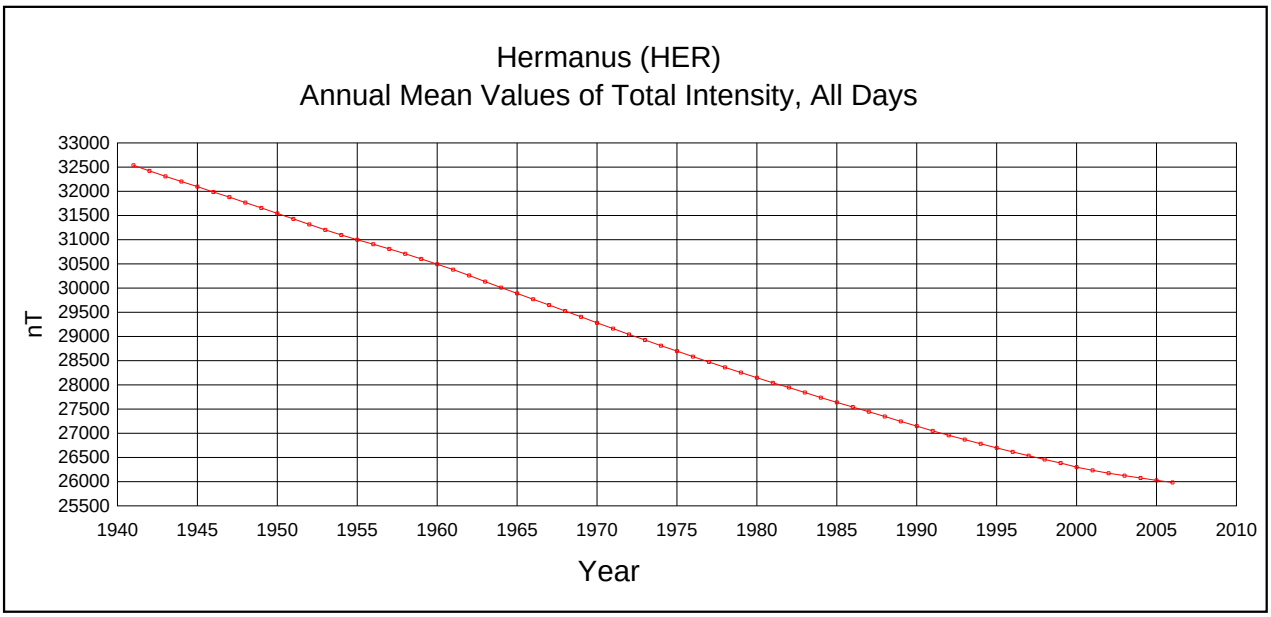
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1981.5	-23 26.1	-66 15.0	11293	10362	-4492	-25667	28042	A	DHZ
1982.5	-23 21.3	-66 18.6	11228	10309	-4452	-25591	27946	A	DHZ
1983.5	-23 16.0	-66 18.4	11188	10279	-4420	-25496	27843	A	DHZ
1984.5	-23 13.3	-66 18.3	11147	10244	-4395	-25399	27737	A	DHZ
1985.5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

*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 2006

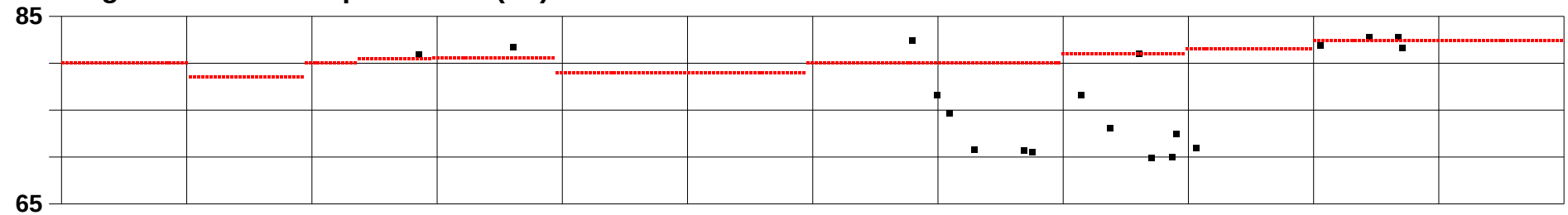
Hartebeesthoek

Observed and Adopted Baseline Values, HBK 2006

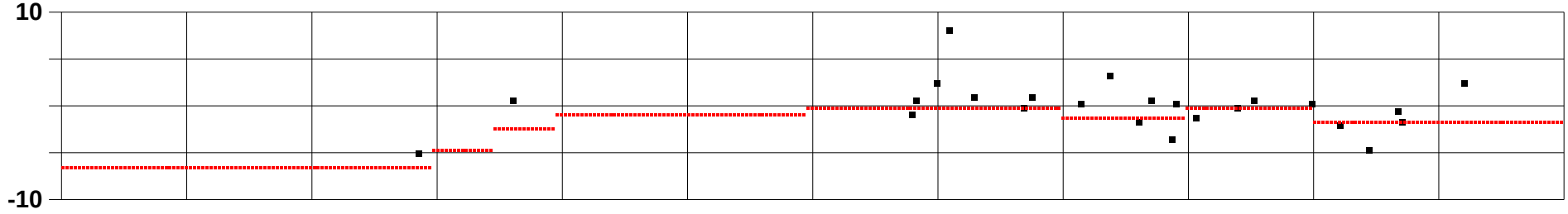
LAT: 115.883 LONG: 27.707

INSTITUTION: HMO INSTRUMENT: LC

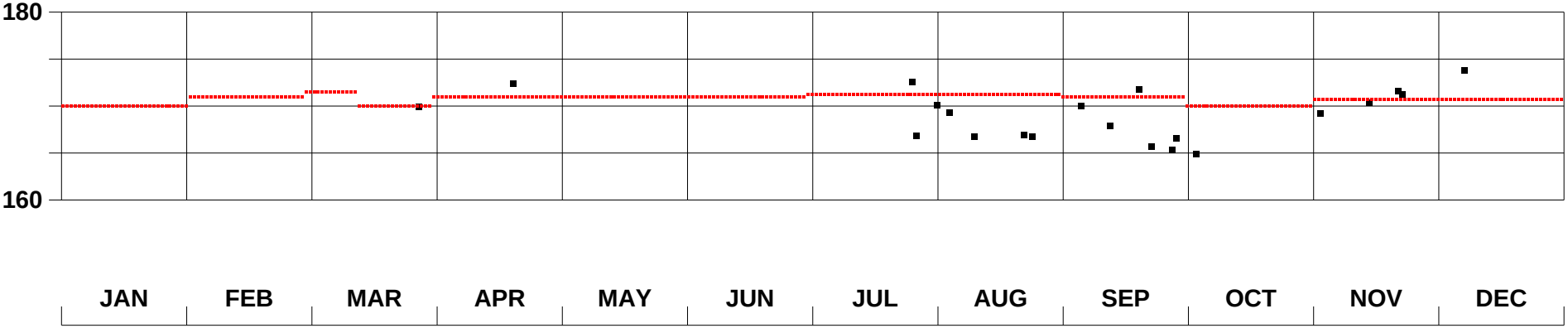
Magnetic North Component HN (nT)

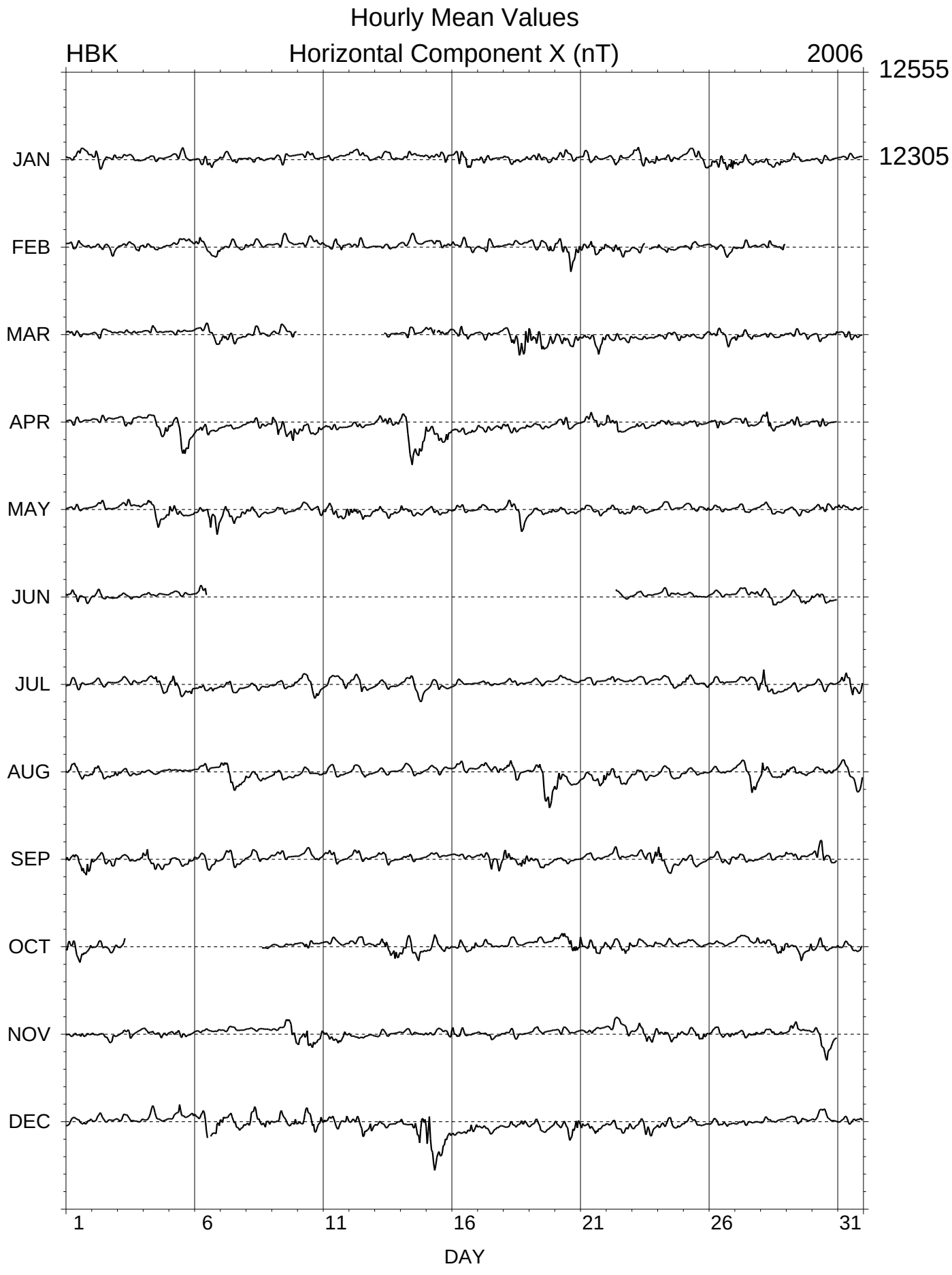


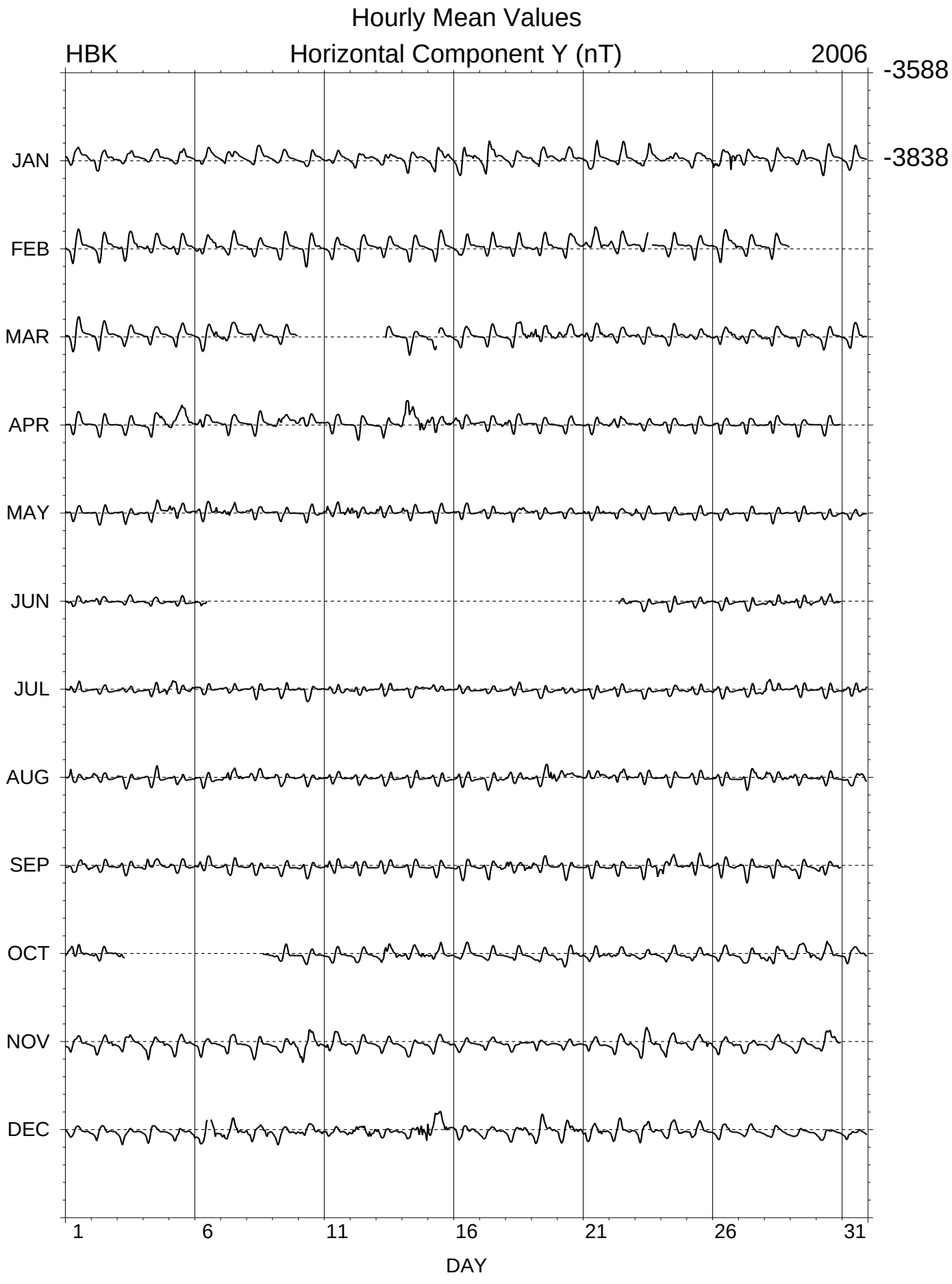
Magnetic East Component HE (nT)

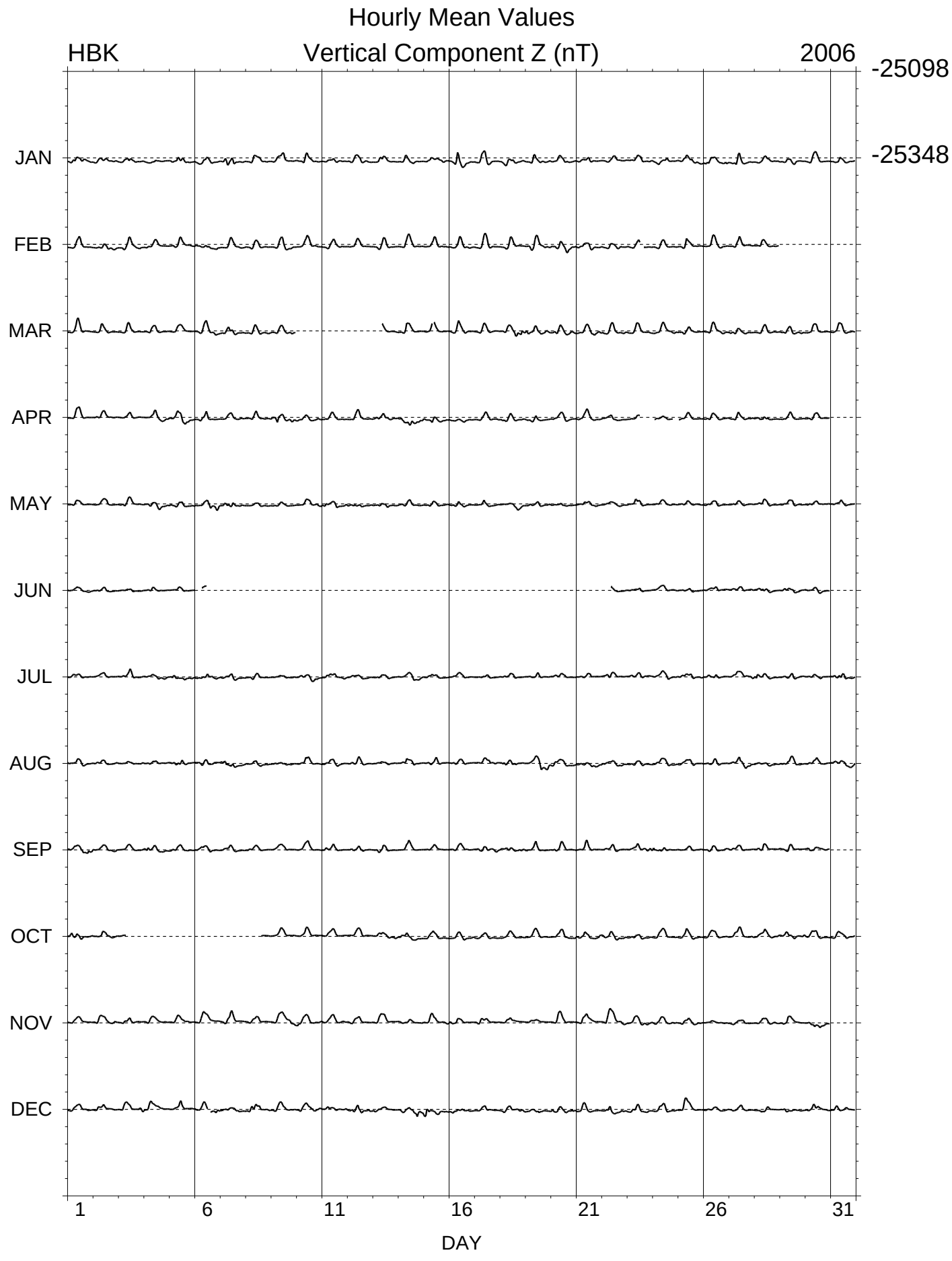


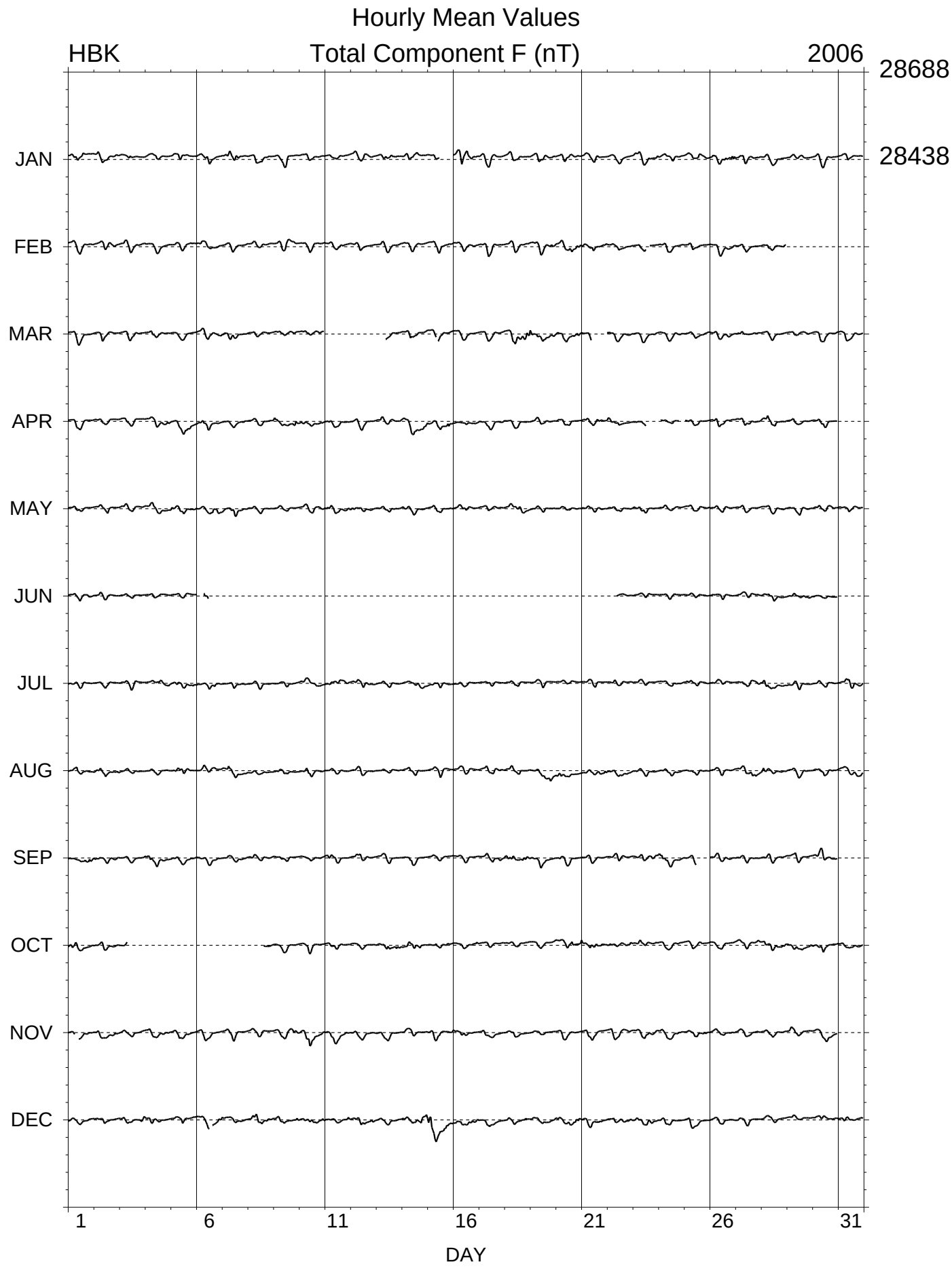
Vertical Component Z (nT)




Hourly Mean Values
HBK
Horizontal Component X (nT)
2006
12555
12305
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)
2006
-3588
-3838
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)
2006
-25098
-25348
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)
2006
28688
28438
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

HARTEBEESTHOEK
MEAN MONTHLY VALUES 2006

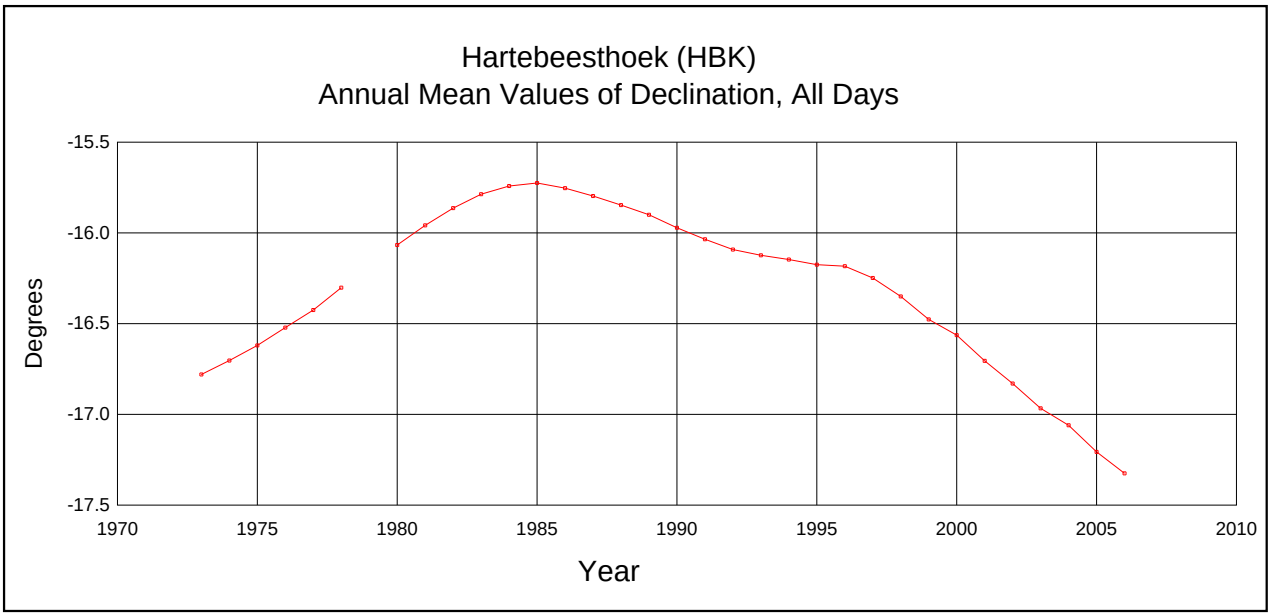
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-17 17.1	-63 03.0	12892	12310	-3831	-25357	28445	A	HDZF
FEB	-17 17.1	-63 02.8	12891	12309	-3830	-25352	28441	A	HDZF
MAR	-17 18.4	-63 03.0	12888	12304	-3834	-25349	28437	A	HDZF
APR	-17 19.2	-63 04.1	12879	12295	-3834	-25351	28435	A	HDZF
MAY	-17 19.4	-63 03.1	12888	12303	-3838	-25350	28438	A	HDZF
JUN	-17 20.0	-63 02.1	12895	12310	-3842	-25348	28440	A	HDZF
JUL	-17 20.0	-63 02.4	12893	12308	-3841	-25348	28438	A	HDZF
AUG	-17 20.2	-63 03.0	12888	12302	-3840	-25348	28436	A	HDZF
SEP	-17 20.5	-63 02.2	12894	12308	-3843	-25346	28437	A	HDZF
OCT	-17 20.0	-63 02.1	12896	12310	-3842	-25347	28439	A	HDZF
NOV	-17 21.2	-63 01.9	12896	12309	-3846	-25344	28436	A	HDZF
DEC	-17 21.4	-63 03.1	12887	12300	-3844	-25349	28436	A	HDZF
YEAR	-17 19.5	-63 02.8	12890	12305	-3839	-25349	28438	A	HDZF
JAN	-17 17.2	-63 02.7	12894	12312	-3831	-25356	28445	Q	HDZF
FEB	-17 17.2	-63 02.2	12897	12315	-3832	-25351	28443	Q	HDZF
MAR	-17 17.3	-63 02.1	12896	12313	-3832	-25347	28438	Q	HDZF
APR	-17 19.2	-63 02.5	12892	12307	-3838	-25346	28437	Q	HDZF
MAY	-17 19.4	-63 02.8	12890	12305	-3838	-25350	28439	Q	HDZF
JUN	-17 20.2	-63 01.7	12899	12313	-3844	-25347	28441	Q	HDZF
JUL	-17 20.1	-63 02.1	12896	12310	-3842	-25347	28439	Q	HDZF
AUG	-17 20.0	-63 02.2	12895	12309	-3842	-25347	28438	Q	HDZF
SEP	-17 20.6	-63 01.2	12902	12316	-3846	-25345	28440	Q	HDZF
OCT	-17 20.1	-63 01.1	12903	12317	-3845	-25344	28440	Q	HDZF
NOV	-17 21.0	-63 01.0	12903	12316	-3848	-25341	28437	Q	HDZF
DEC	-17 21.1	-63 01.9	12898	12311	-3847	-25347	28440	Q	HDZF
YEAR	-17 19.5	-63 02.0	12897	12312	-3840	-25347	28440	Q	HDZF
JAN	-17 17.9	-63 03.7	12887	12304	-3832	-25359	28444	D	HDZF
FEB	-17 16.5	-63 03.8	12884	12303	-3826	-25355	28441	D	HDZF
MAR	-17 18.6	-63 04.8	12873	12290	-3830	-25350	28435	D	HDZF
APR	-17 18.5	-63 06.7	12857	12275	-3825	-25355	28429	D	HDZF
MAY	-17 19.3	-63 04.4	12877	12293	-3834	-25353	28436	D	HDZF
JUN	-17 20.5	-63 03.0	12888	12302	-3842	-25348	28437	D	HDZF
JUL	-17 19.8	-63 03.4	12885	12300	-3838	-25349	28436	D	HDZF
AUG	-17 20.3	-63 04.7	12873	12288	-3836	-25350	28431	D	HDZF
SEP	-17 20.6	-63 03.3	12885	12299	-3841	-25348	28435	D	HDZF
OCT	-17 19.9	-63 03.4	12884	12299	-3838	-25349	28435	D	HDZF
NOV	-17 21.3	-63 03.5	12883	12296	-3843	-25346	28432	D	HDZF
DEC	-17 21.6	-63 04.8	12873	12286	-3841	-25352	28433	D	HDZF
YEAR	-17 19.5	-63 04.2	12878	12294	-3835	-25351	28435	D	HDZF

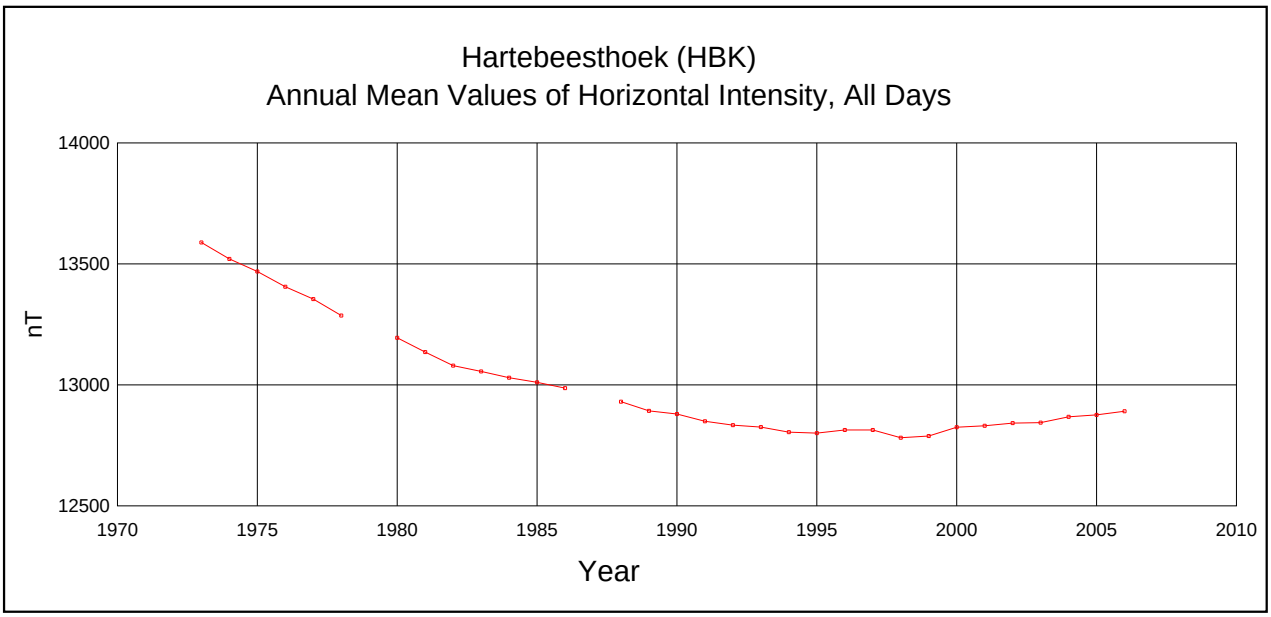
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

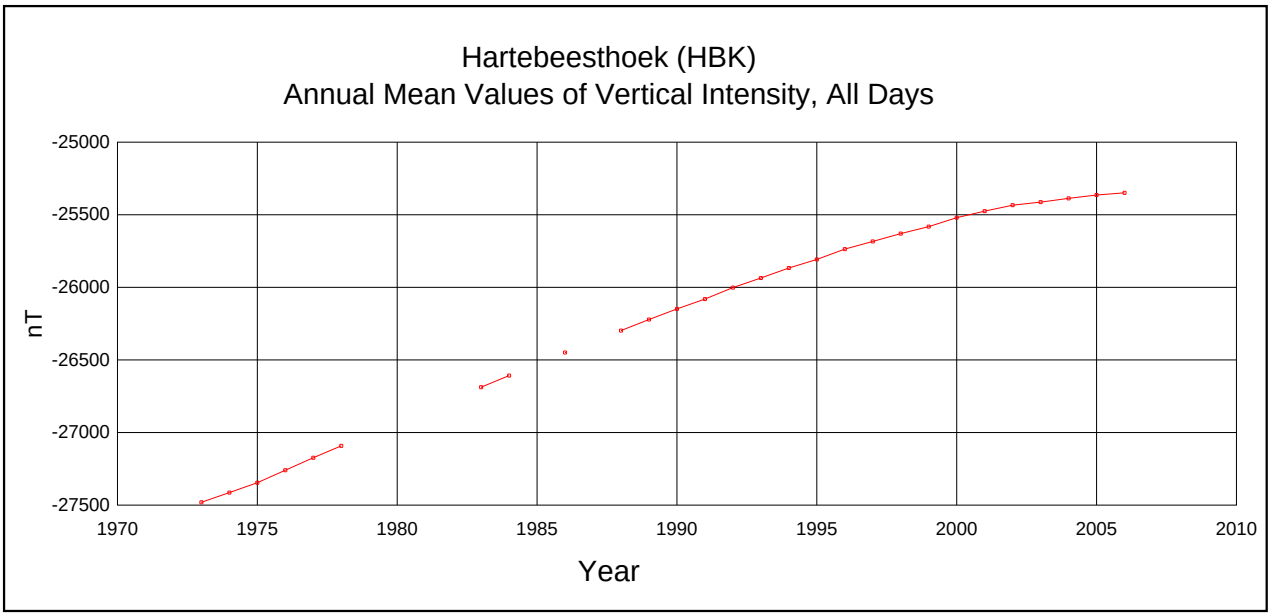
HARTEBEESTHOEK
MEAN ANNUAL VALUES

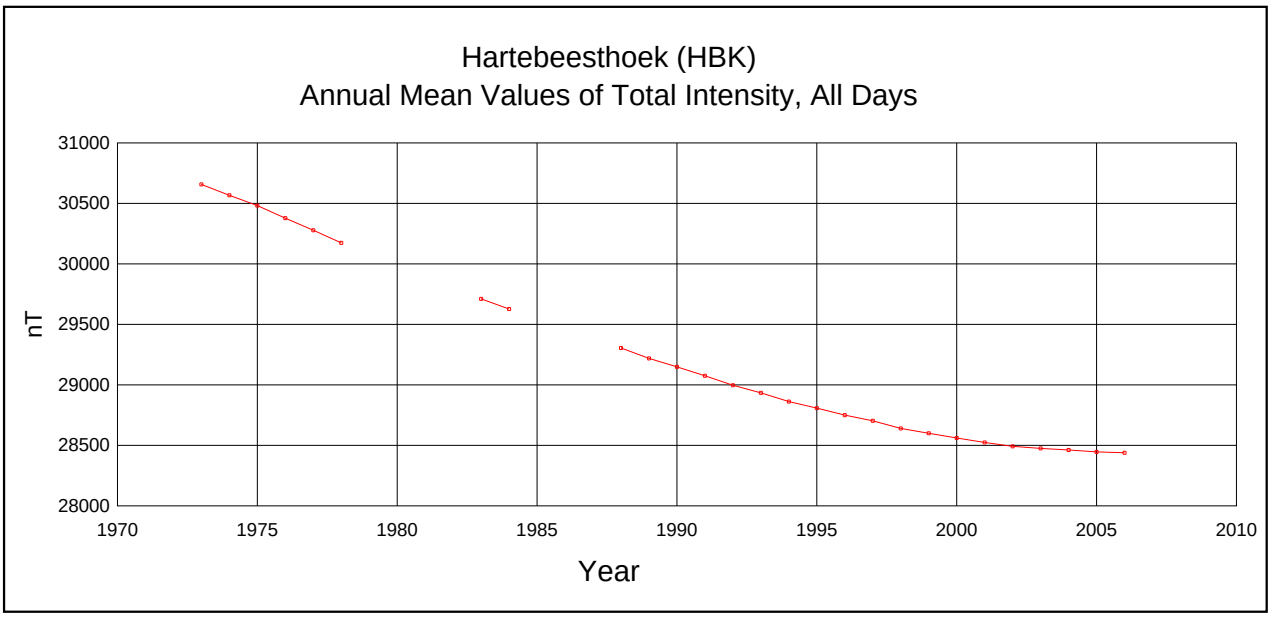
Date	°D	'	°I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1973.5	-16	46.6	-63	41.5	13588	13010	-3919	-27481	30657	I	DHZ
1974.5	-16	42.0	-63	45.0	13520	12950	-3885	-27414	30567	A	DHZ
1975.5	-16	37.0	-63	46.8	13468	12905	-3852	-27346	30482	A	DHZ
1976.5	-16	31.1	-63	49.0	13405	12852	-3811	-27260	30378	A	DHZ
1977.5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

*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

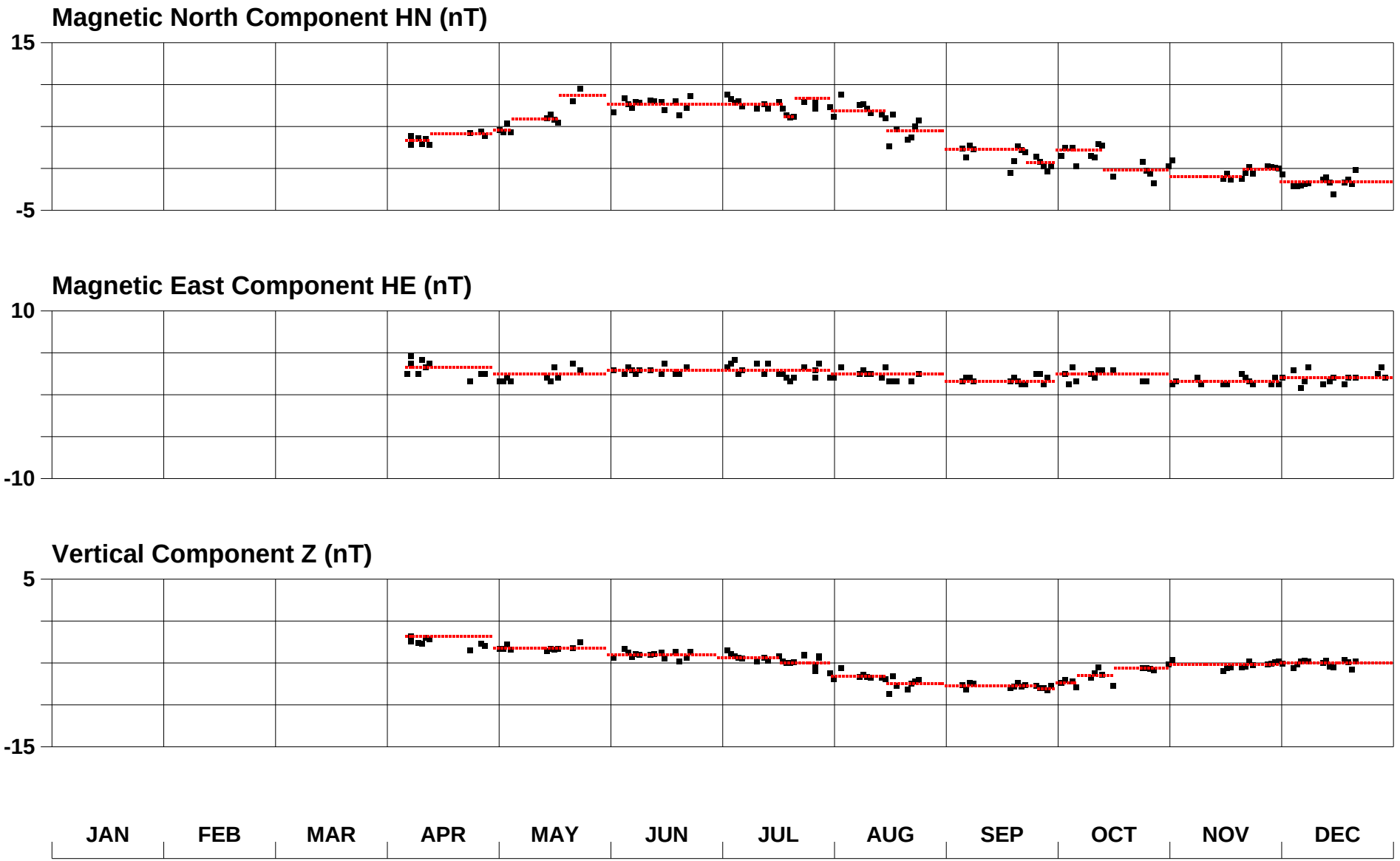
Magnetic Results 2006

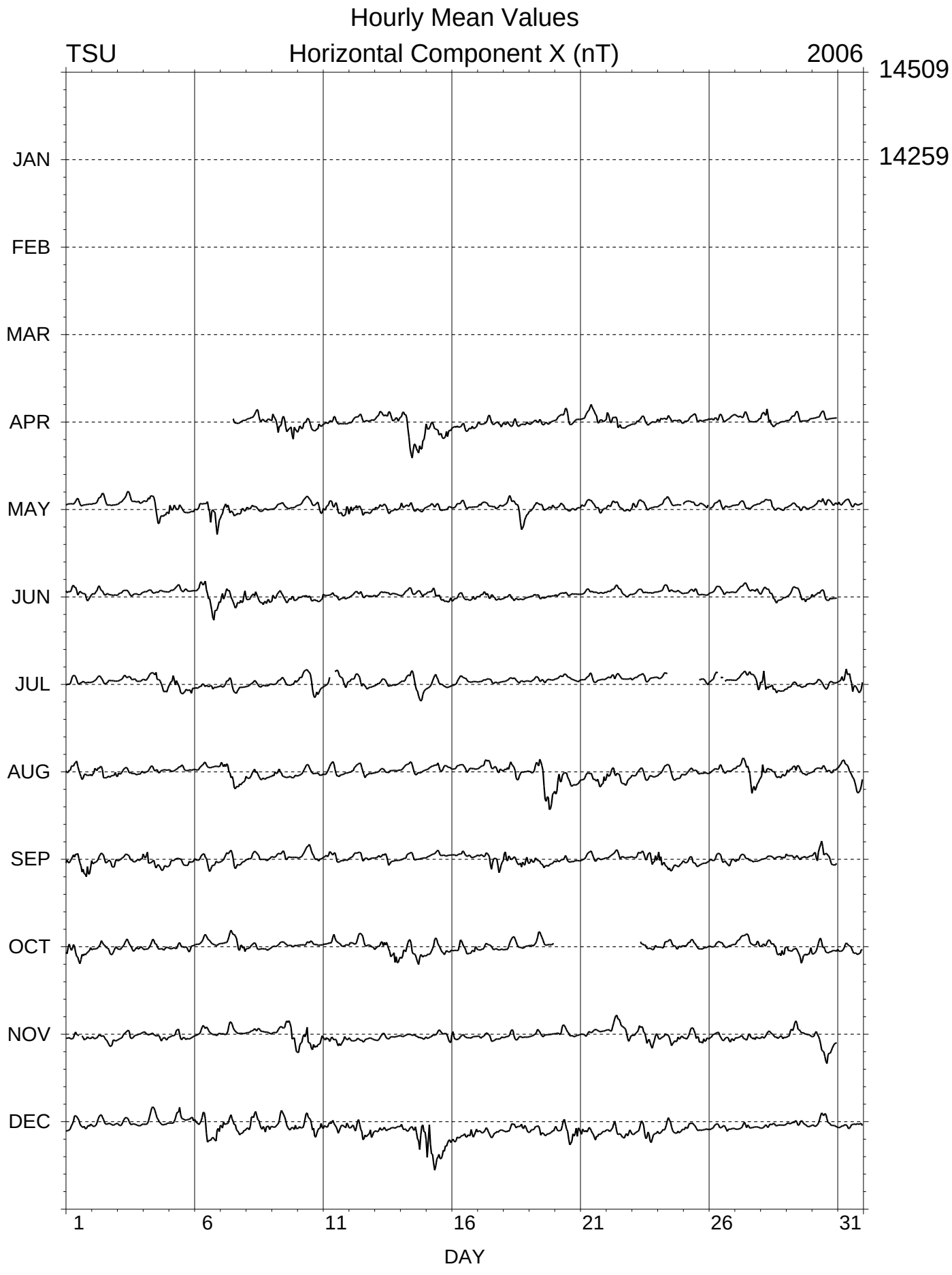
Tsumeb

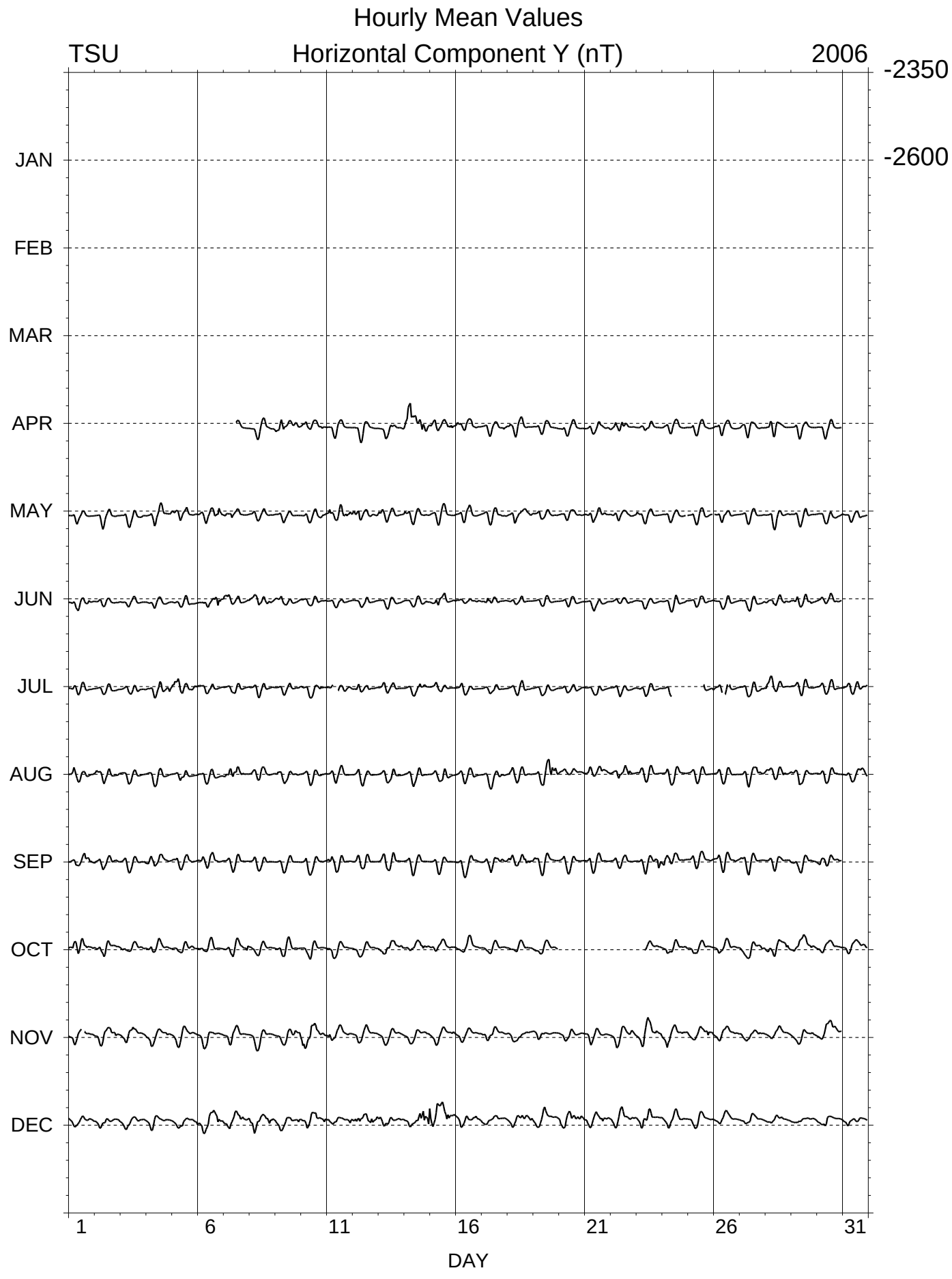
Observed and Adopted Baseline Values, TSU 2006

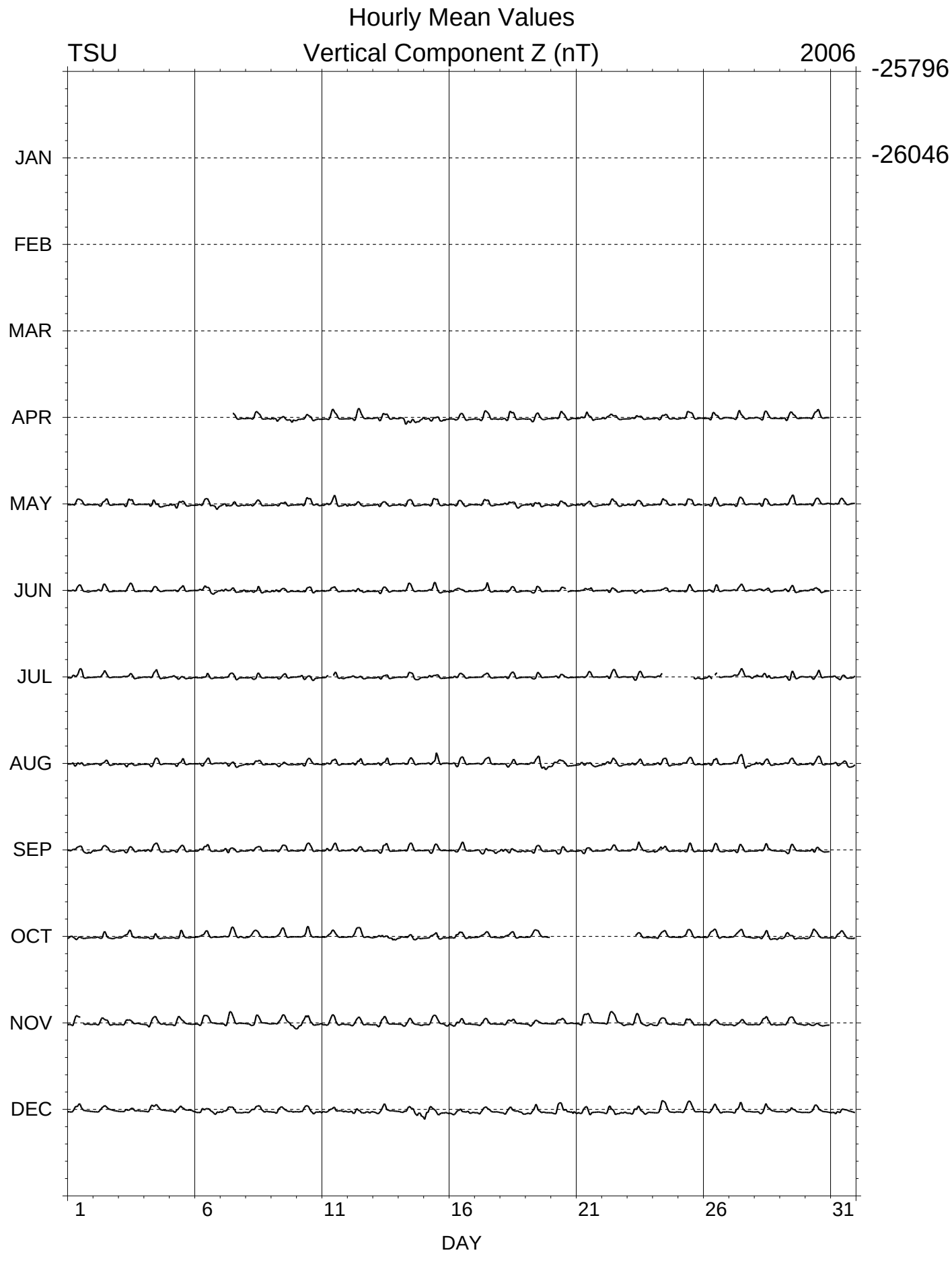
LAT: 109.202 LONG: 17.584

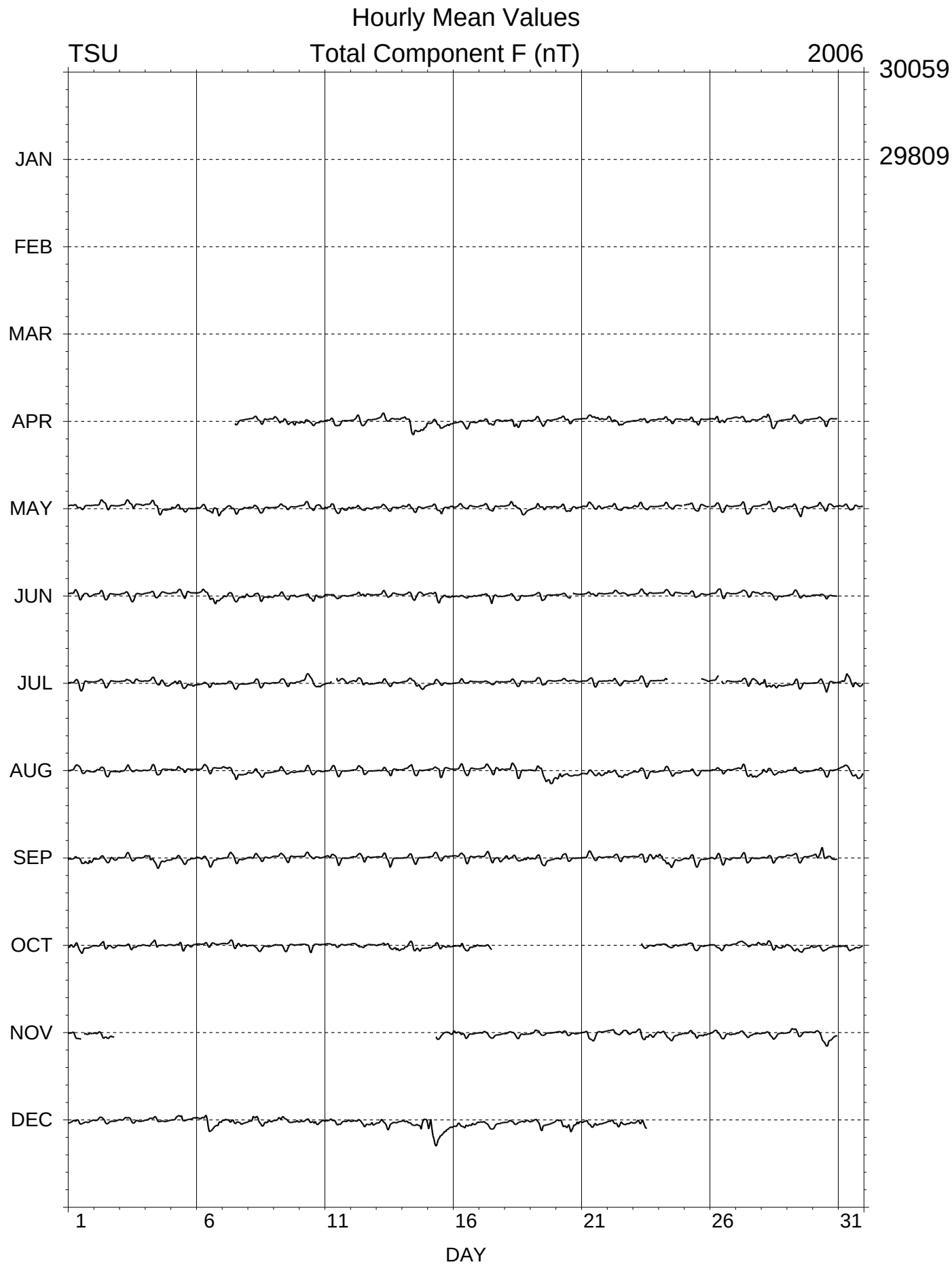
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
TSU
Horizontal Component X (nT)
2006
14509
14259
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)
2006
-2350
-2600
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)
2006
-25796
-26046
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)
2006
30059
29809
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

TSUMEB
MEAN MONTHLY VALUES 2006

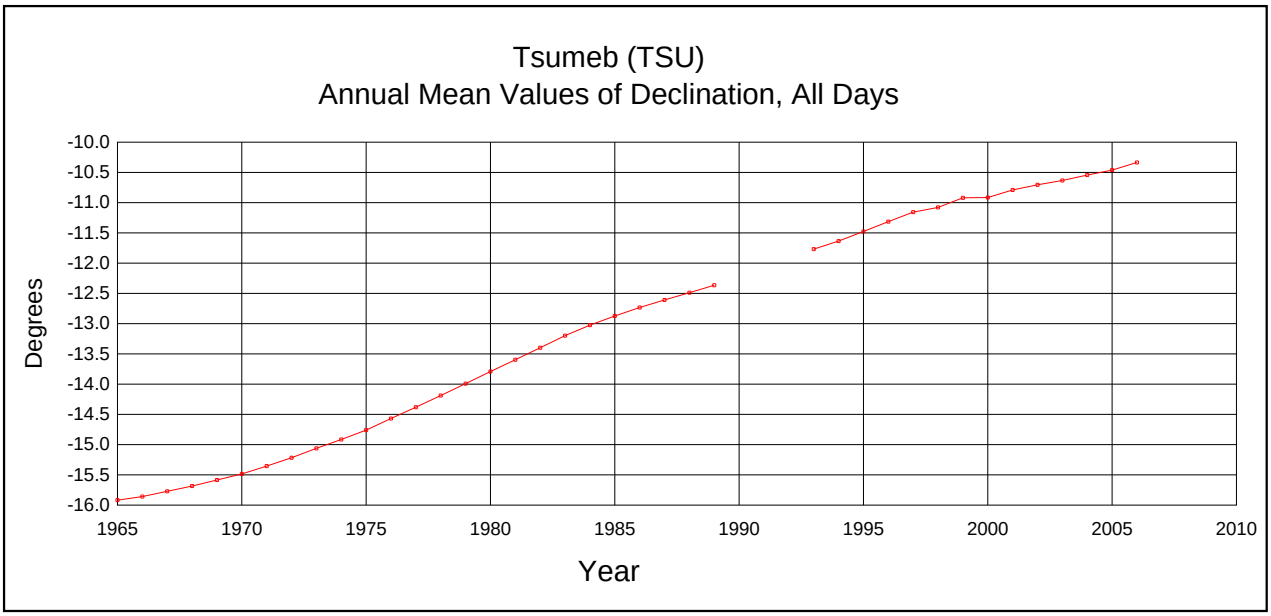
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
APR	-10 22.4	-60 54.1	14497	14261	-2610	-26048	29811	A	HDZF
MAY	-10 22.3	-60 53.2	14506	14269	-2612	-26047	29814	A	HDZF
JUN	-10 21.6	-60 53.4	14504	14267	-2608	-26047	29812	A	HDZF
JUL	-10 21.0	-60 53.4	14503	14267	-2605	-26046	29812	A	HDZF
AUG	-10 20.2	-60 54.4	14493	14258	-2601	-26047	29808	A	HDZF
SEP	-10 19.7	-60 54.2	14496	14261	-2599	-26047	29809	A	HDZF
OCT	-10 18.5	-60 54.3	14494	14260	-2594	-26046	29807	A	HDZF
NOV	-10 18.4	-60 54.9	14489	14255	-2592	-26046	29805	A	HDZF
DEC	-10 17.3	-60 56.6	14474	14242	-2585	-26051	29801	A	HDZF
YEAR	-10 20.1	-60 54.3	14495	14260	-2600	-26047	29809	A	HDZF
JAN	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
APR	-10 23.0	-60 52.8	14508	14270	-2615	-26044	29813	Q	HDZF
MAY	-10 22.5	-60 52.9	14508	14271	-2613	-26046	29814	Q	HDZF
JUN	-10 22.0	-60 52.7	14510	14273	-2611	-26047	29816	Q	HDZF
JUL	-10 21.3	-60 53.1	14506	14270	-2608	-26046	29813	Q	HDZF
AUG	-10 20.4	-60 53.7	14500	14265	-2603	-26046	29810	Q	HDZF
SEP	-10 20.0	-60 53.2	14505	14270	-2602	-26046	29812	Q	HDZF
OCT	-10 18.5	-60 53.2	14504	14270	-2596	-26044	29809	Q	HDZF
NOV	-10 18.6	-60 53.8	14498	14264	-2595	-26044	29806	Q	HDZF
DEC	-10 17.3	-60 55.2	14487	14254	-2587	-26049	29808	Q	HDZF
YEAR	-10 20.2	-60 53.4	14503	14267	-2602	-26046	29812	Q	HDZF
JAN	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
MAR	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
APR	-10 21.7	-60 56.4	14476	14240	-2604	-26052	29804	D	HDZF
MAY	-10 22.1	-60 54.4	14495	14258	-2609	-26048	29809	D	HDZF
JUN	-10 21.3	-60 54.2	14495	14259	-2606	-26047	29809	D	HDZF
JUL	-10 20.5	-60 54.3	14495	14259	-2602	-26047	29809	D	HDZF
AUG	-10 19.9	-60 56.1	14478	14243	-2596	-26047	29801	D	HDZF
SEP	-10 19.5	-60 55.2	14486	14251	-2596	-26048	29805	D	HDZF
OCT	-10 18.3	-60 56.1	14478	14245	-2590	-26050	29803	D	HDZF
NOV	-10 18.1	-60 56.4	14474	14241	-2588	-26048	29801	D	HDZF
DEC	-10 17.2	-60 58.3	14459	14226	-2582	-26053	29796	D	HDZF
YEAR	-10 19.8	-60 55.7	14482	14247	-2597	-26049	29804	D	HDZF

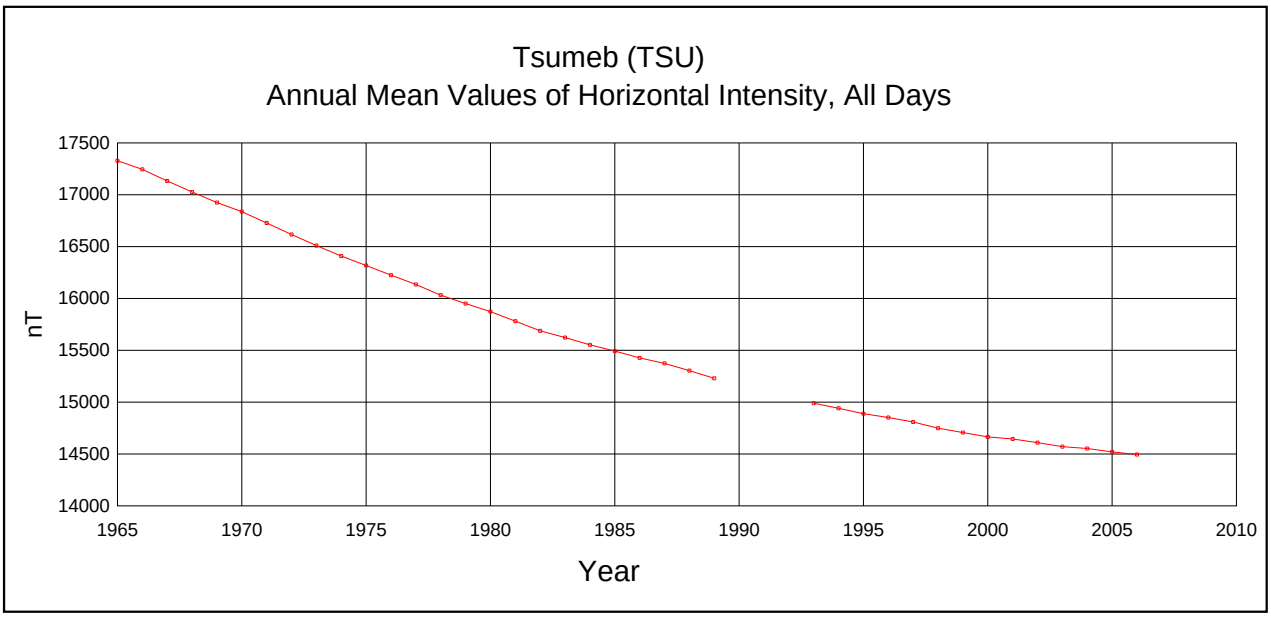
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

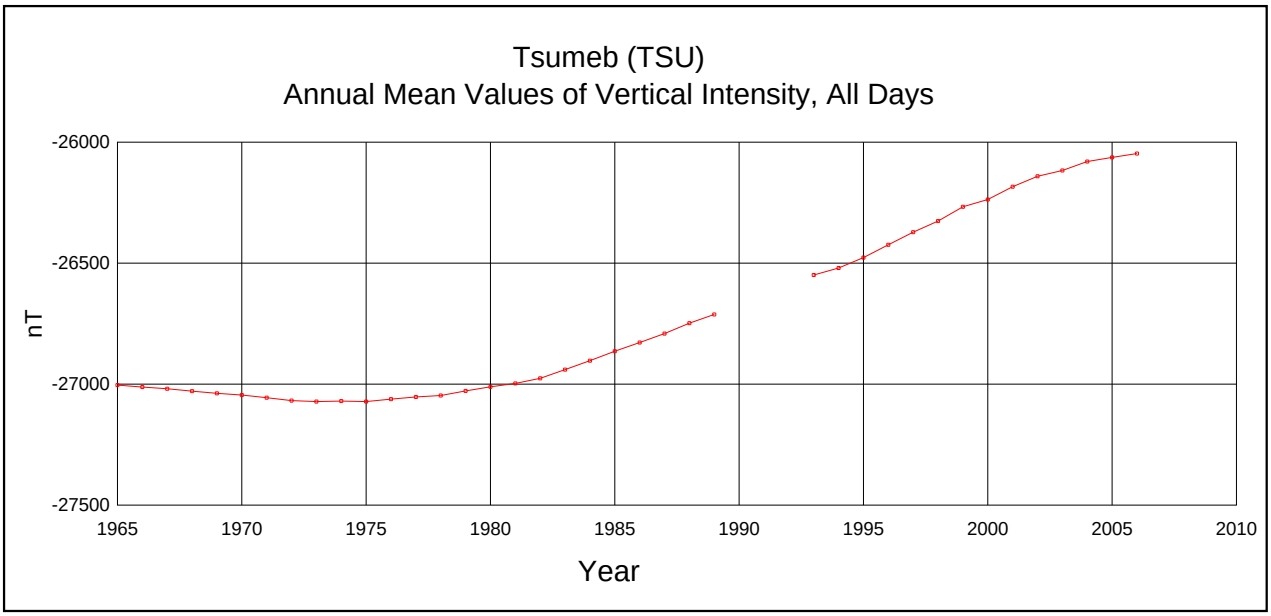
TSUMEB
MEAN ANNUAL VALUES

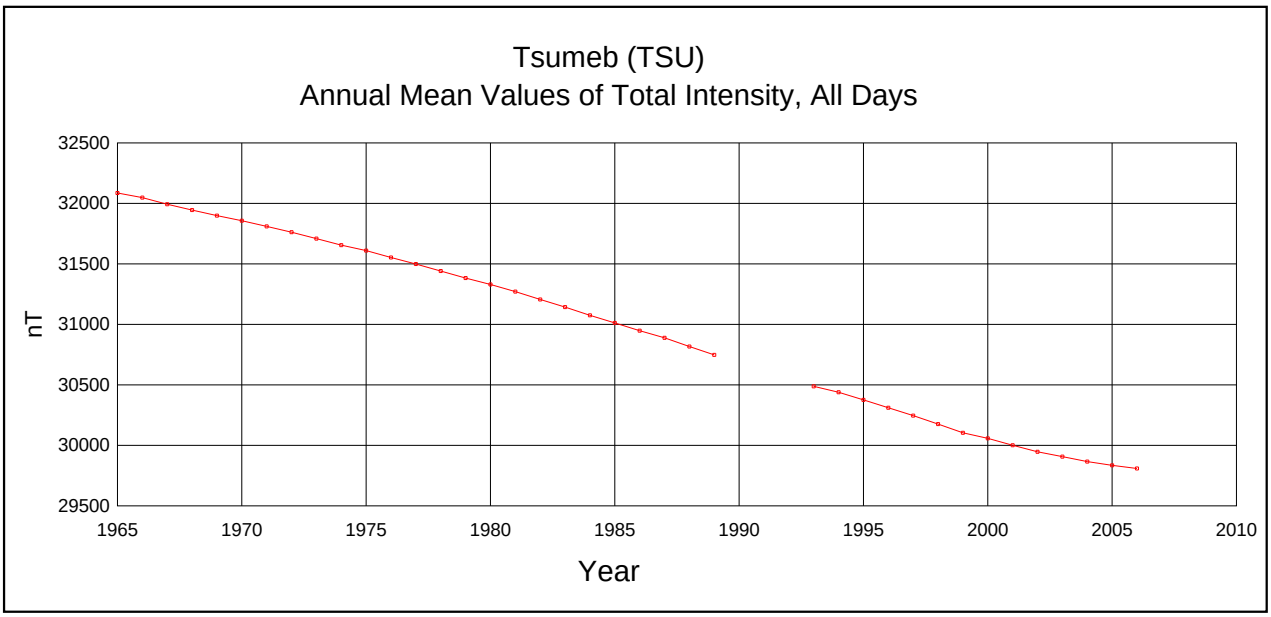
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1965.5	-15 57.4	-57 18.8	17328	16660	-4764	-27004	32086	I	DHZ
1966.5	-15 53.8	-57 26.7	17245	16585	-4724	-27012	32048	I	DHZ
1967.5	-15 48.6	-57 37.3	17133	16484	-4668	-27019	31993	A	DHZ
1968.5	-15 43.4	-57 47.5	17027	16389	-4614	-27029	31945	I	DHZ
1969.5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

*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

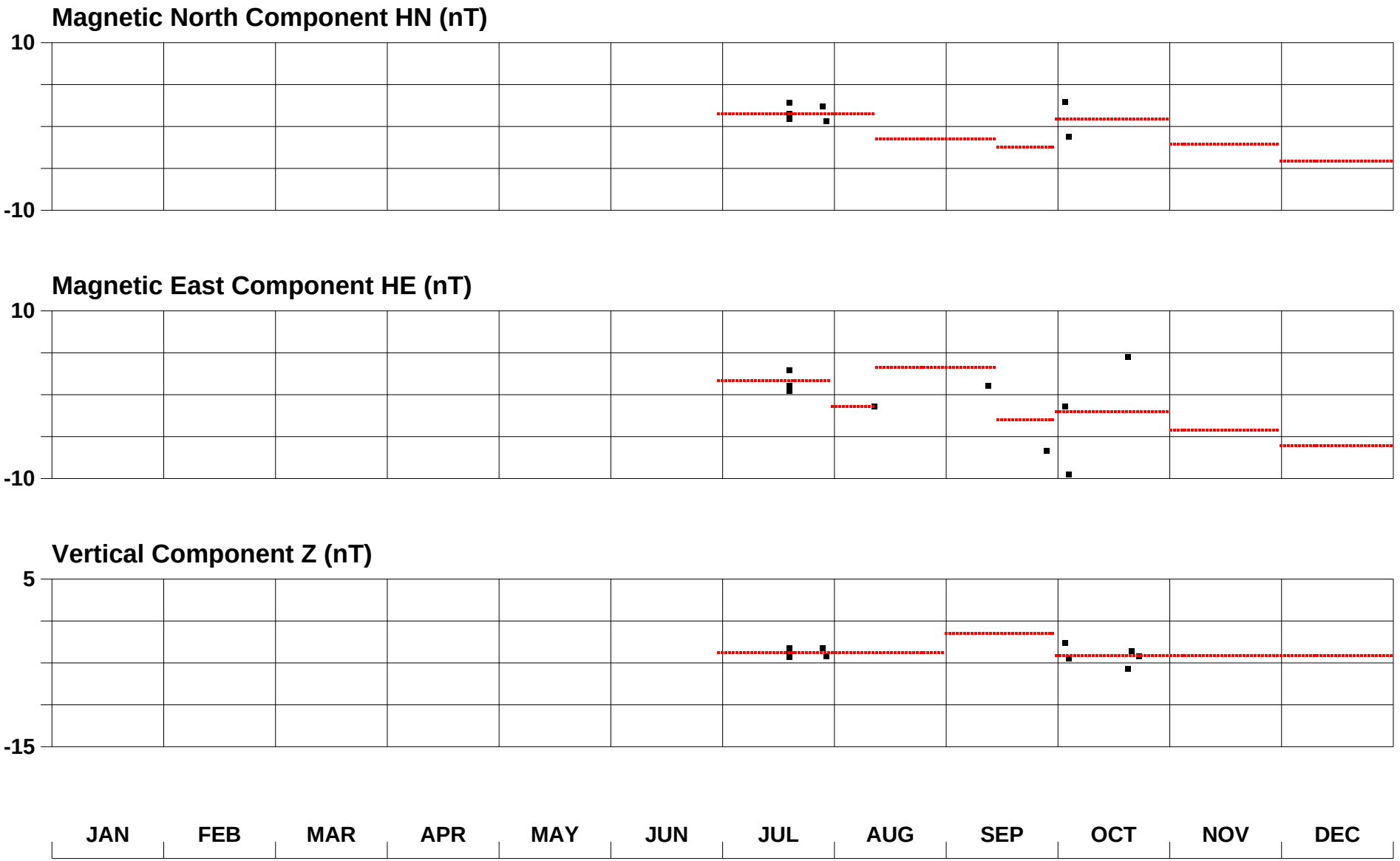
Magnetic Results 2006

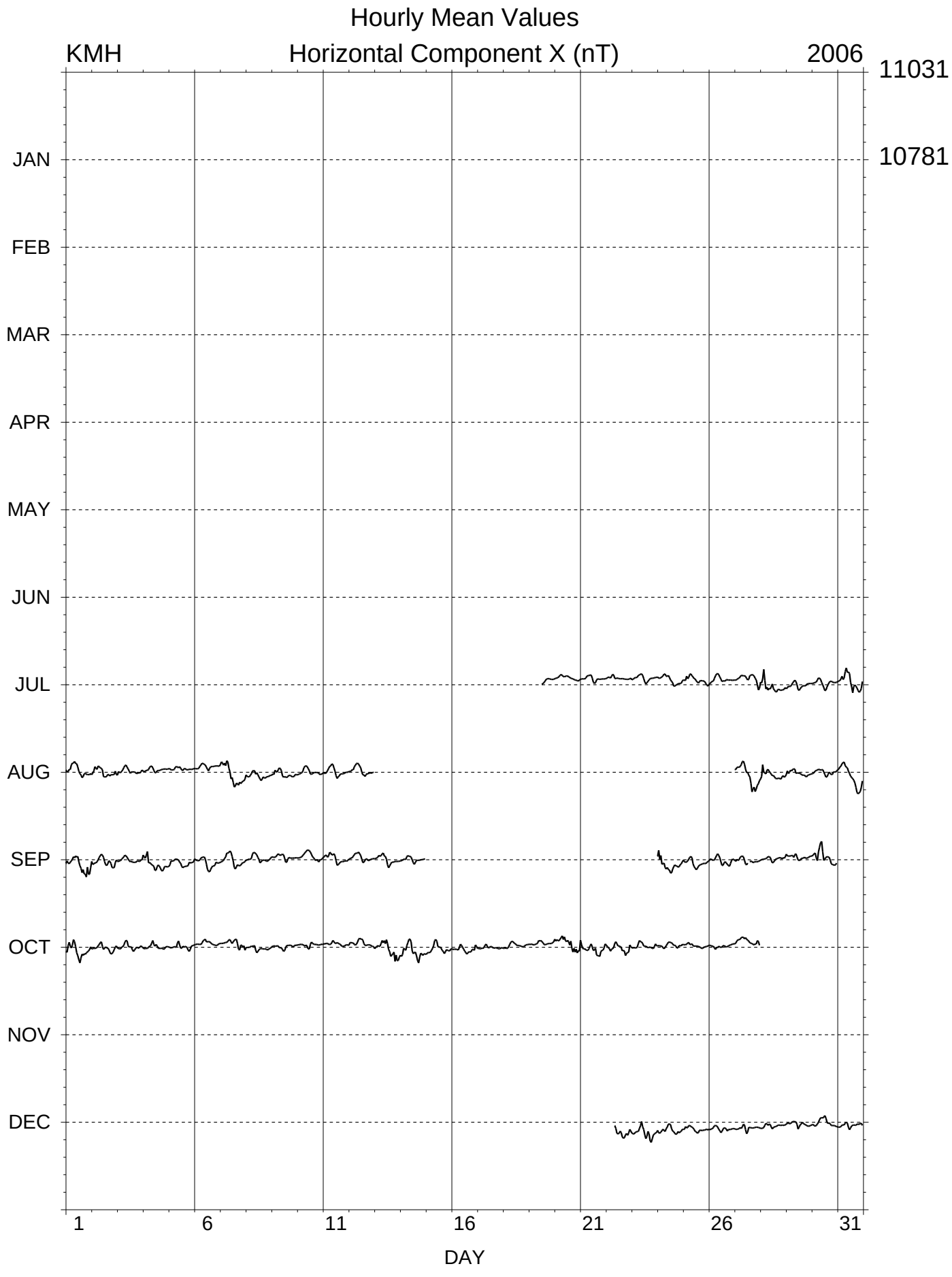
Keetmanshoop

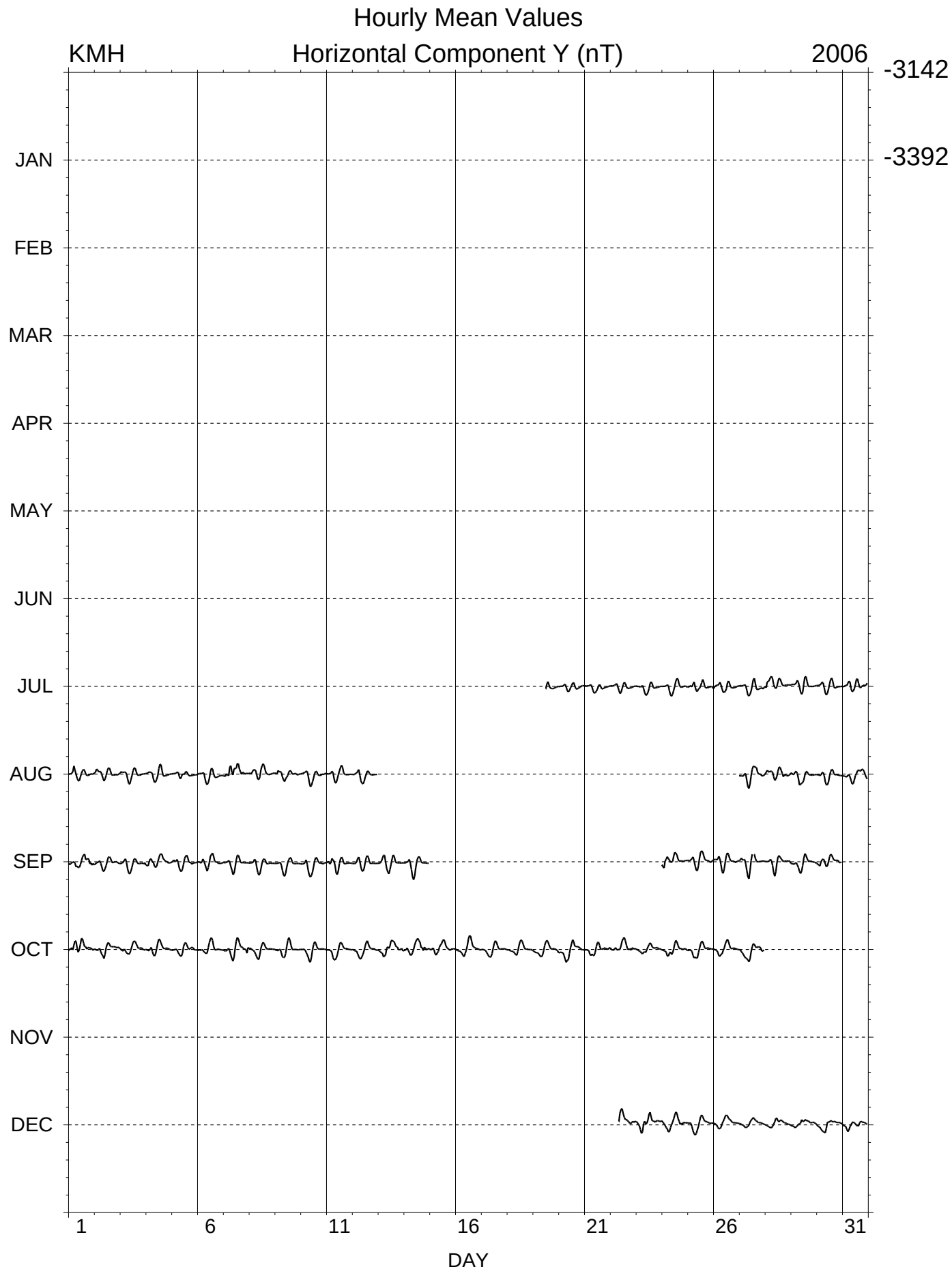
Observed and Adopted Baseline Values, KMH 2006

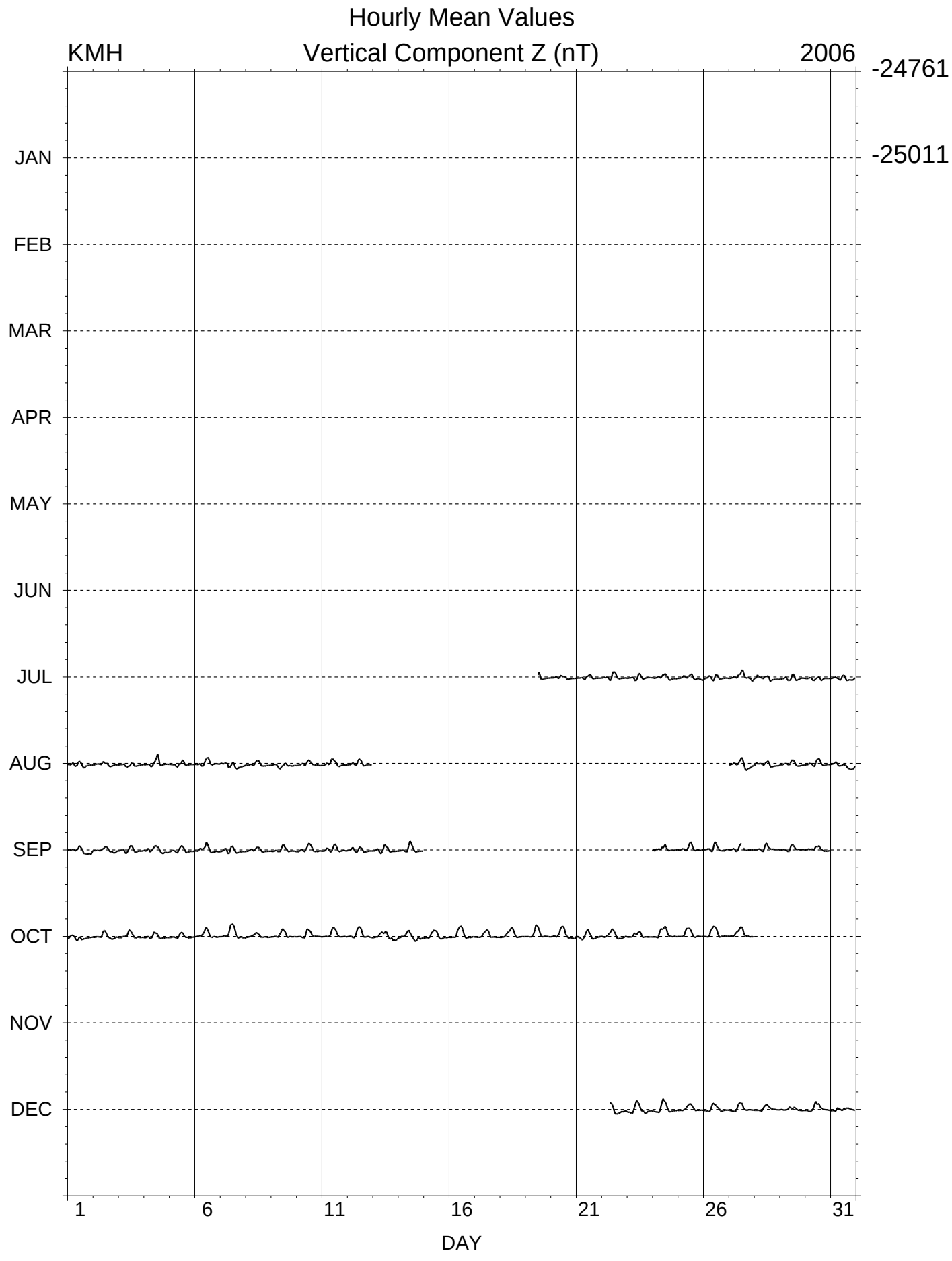
LAT: 116.541 LONG: 18.110

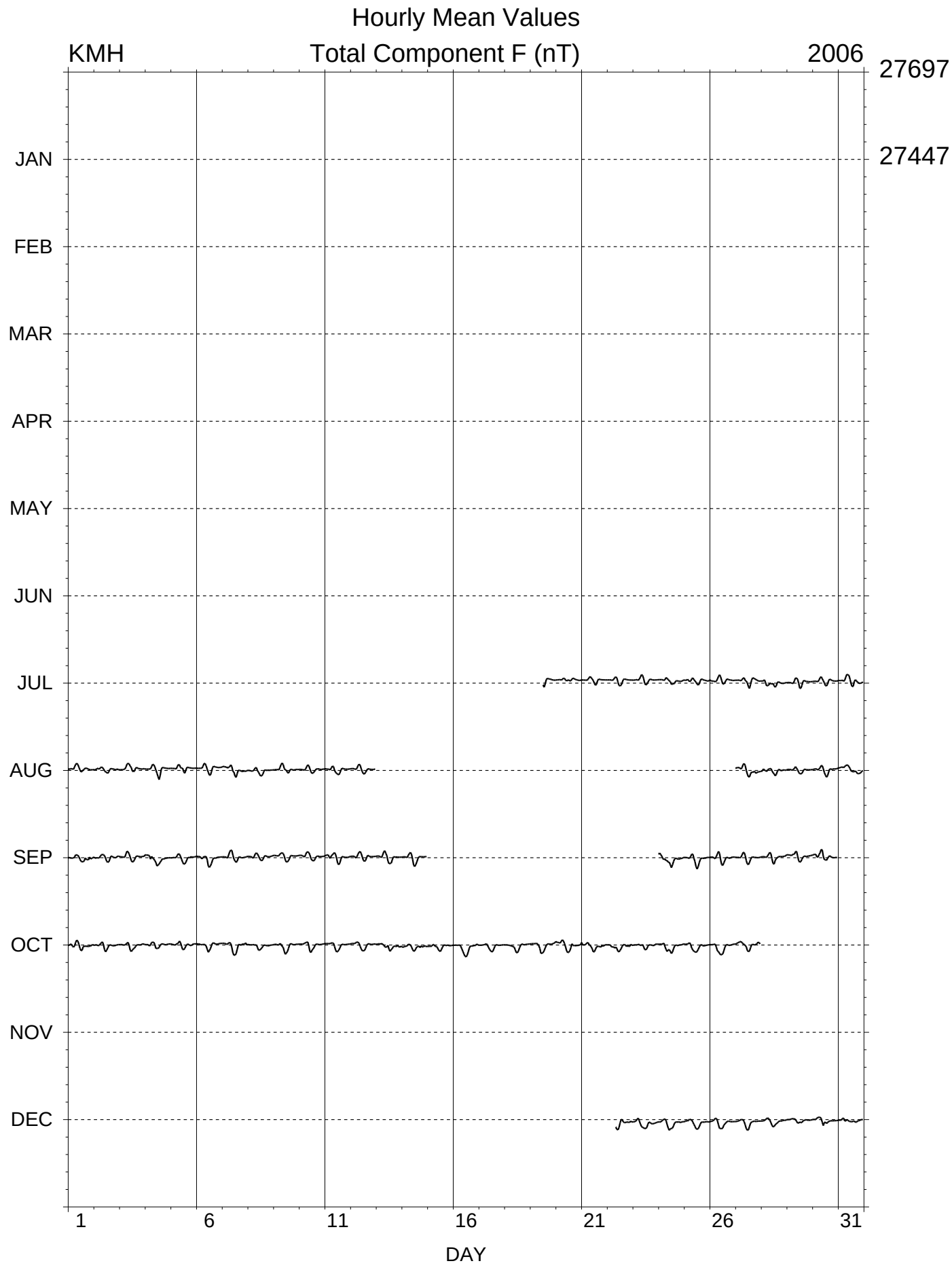
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
KMH
Horizontal Component X (nT)
2006
11031
10781
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)
2006
-3142
-3392
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)
2006
-24761
-25011
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)
2006
27697
27447
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

KEETMANSHOOP
MEAN MONTHLY VALUES 2006

Date	° D	'	° I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
FEB	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
MAR	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
APR	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
MAY	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
JUN	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
JUL	-17	26.8	-65	39.8	11314	10793	-3392	-25014	27453	A	HDZF
AUG	-17	28.2	-65	41.1	11303	10781	-3393	-25015	27450	A	HDZF
SEP	-17	28.8	-65	41.0	11302	10780	-3395	-25011	27448	A	HDZF
OCT	-17	27.4	-65	40.6	11304	10784	-3391	-25009	27444	A	HDZF
NOV	***	****	***	****	*****	*****	*****	******	*****	A	HDZF
DEC	-17	28.1	-65	42.7	11287	10767	-3388	-25010	27440	A	HDZF
YEAR	-17	27.9	-65	40.9	11303	10782	-3392	-25011	27447	A	HDZF
JAN	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
FEB	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
MAR	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
APR	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
MAY	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
JUN	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
JUL	-17	27.3	-65	39.1	11320	10799	-3396	-25014	27456	Q	HDZF
AUG	-17	27.2	-65	40.2	11309	10789	-3392	-25012	27450	Q	HDZF
SEP	-17	29.5	-65	39.9	11312	10789	-3400	-25012	27451	Q	HDZF
OCT	-17	27.2	-65	39.8	11311	10790	-3392	-25006	27445	Q	HDZF
NOV	***	****	***	****	*****	*****	*****	******	*****	Q	HDZF
DEC	-17	27.9	-65	42.1	11292	10771	-3389	-25011	27443	Q	HDZF
YEAR	-17	27.6	-65	40.4	11306	10785	-3392	-25009	27446	Q	HDZF
JAN	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
FEB	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
MAR	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
APR	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
MAY	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
JUN	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
JUL	-17	26.1	-65	41.2	11302	10783	-3386	-25015	27450	D	HDZF
AUG	-17	28.1	-65	42.1	11294	10773	-3390	-25017	27448	D	HDZF
SEP	-17	28.8	-65	42.6	11288	10767	-3391	-25012	27444	D	HDZF
OCT	-17	27.7	-65	42.1	11293	10773	-3389	-25013	27444	D	HDZF
NOV	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
DEC	***	****	***	****	*****	*****	*****	******	*****	D	HDZF
YEAR	-17	27.8	-65	42.1	11294	10773	-3389	-25014	27445	D	HDZF

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