Hermanus Magnetic Observatory

A facility of the National Research Foundation

Magnetic Results 2007

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 2007.

2. DESCRIPTION OF THE OBSERVATORIES

Observatory	Geographic Coordinates		Geomagnetic Coordinates		Elevation
	Latitude	Longitude	Latitude	Longitude	m
Hermanus	34° 25' 28" S	19° 13' 26" E	42° 25' S	83° 02' E	26
Hartebeesthoek	25° 52' 58" S	27° 42' 25" E	34° 28' S	96° 06' E	1555
Tsumeb	19° 12' 08" S	17° 35' 03" E	29° 43' S	87° 11' E	1273
Keetmanshoop	26° 32' 26" S	18° 06' 37" E	35° 41' S	85° 41' E	1065

Geomagnetic coordinates given are relative to a geomagnetic North Pole position of 84.1° N, 123.7° W, computed from the IGRF model (degree 13) at the epoch 2007.5.

3. ABSOLUTE MEASUREMENTS

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

3.1 DI-Flux

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

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

Where H, Z and F are field values at the time of the I measurement. Baseline values H_o, D_o and Z_o were then calculated for the vector magnetometer systems described in section 4 below.

The DI-flux consists of a ZEISS non-magnetic theodolite type THEO 010B (at Hermanus), a THEO 015B (at Hartebeesthoek and Tsumeb) and a single-axis fluxgate sensor mounted on top of the telescope and electronics from Bartington. At

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

The following azimuth values were used at each observatory:

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

3.2 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:

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

The following are the adopted values for the year:

Site differences of ΔF_{pillar}							
Hermanus		Hartebeesthoek		Tsumeb		Keetmanshoop	
Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction
1 – 120	-1.1 nT	1 – 365	78.7 nT	1 – 365	15.4 nT	1 – 137	4.4 nT
121 – 334	-1.9 nT					138 – 193	4.3 nT
335 –365	-2.1 nT					194 – 290	3.7 nT
						291 – 365	3.9 nT

4. VECTOR MAGNETOMETERS

4.1 FGE Magnetometer

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

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

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

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

Technical specifications are:

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

Temperature coefficient, electronics	< 0.1 nT/°C
Band pass	DC to 1 Hz

4.2 Suspended dIdD Magnetometer

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

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

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

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

Technical specifications are:

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

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

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

5. PRESENTATION OF RESULTS

5.1 Base-line values

The observed and adopted base-line values are shown in a graphical form. The Hartebeesthoek, Tsumeb and Keetmanshoop base-line values show fluctuations

different from Hermanus that can be attributed to the fact that fewer absolute observations are done at these 3 observatories. 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, there are no observed base-line values for March and due to failure of the Overhauser magnetometer there were no recorded F data for the period 13 December - 31 December 2007. The adopted base-line values were extrapolated using the observed base-line values of February and April.

For Hartebeesthoek observatory, due to failure of the Fluxgate and Overhauser magnetometers there were no recorded data for the period 11 December - 31 December 2007.

For Keetmanshoop observatory, due to failure of the Fluxgate and Overhauser magnetometers there were no recorded data for the period 20 June - 28 February, 15 May - 25 May and 30 June - 12 July.

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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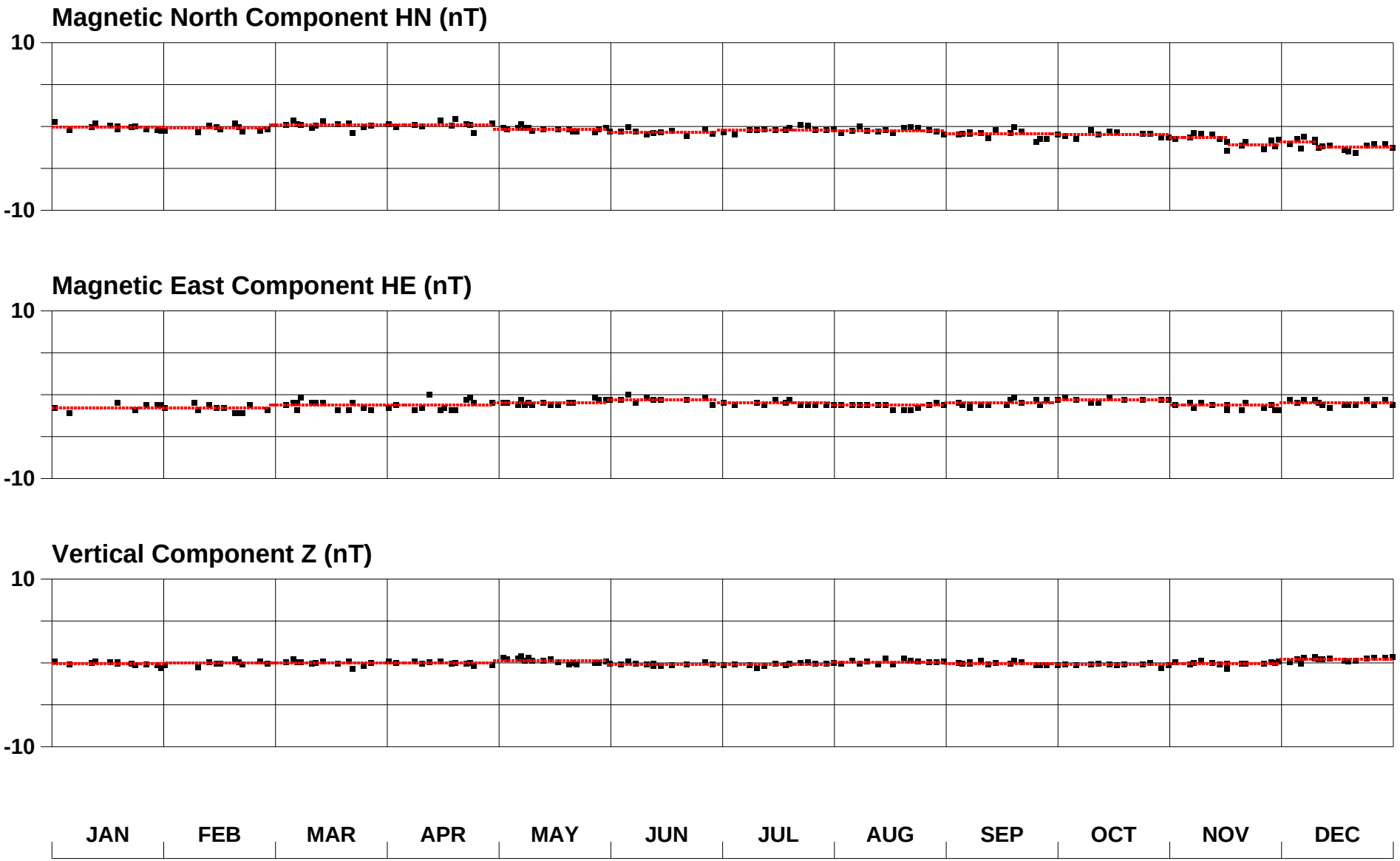
Magnetic Results 2007

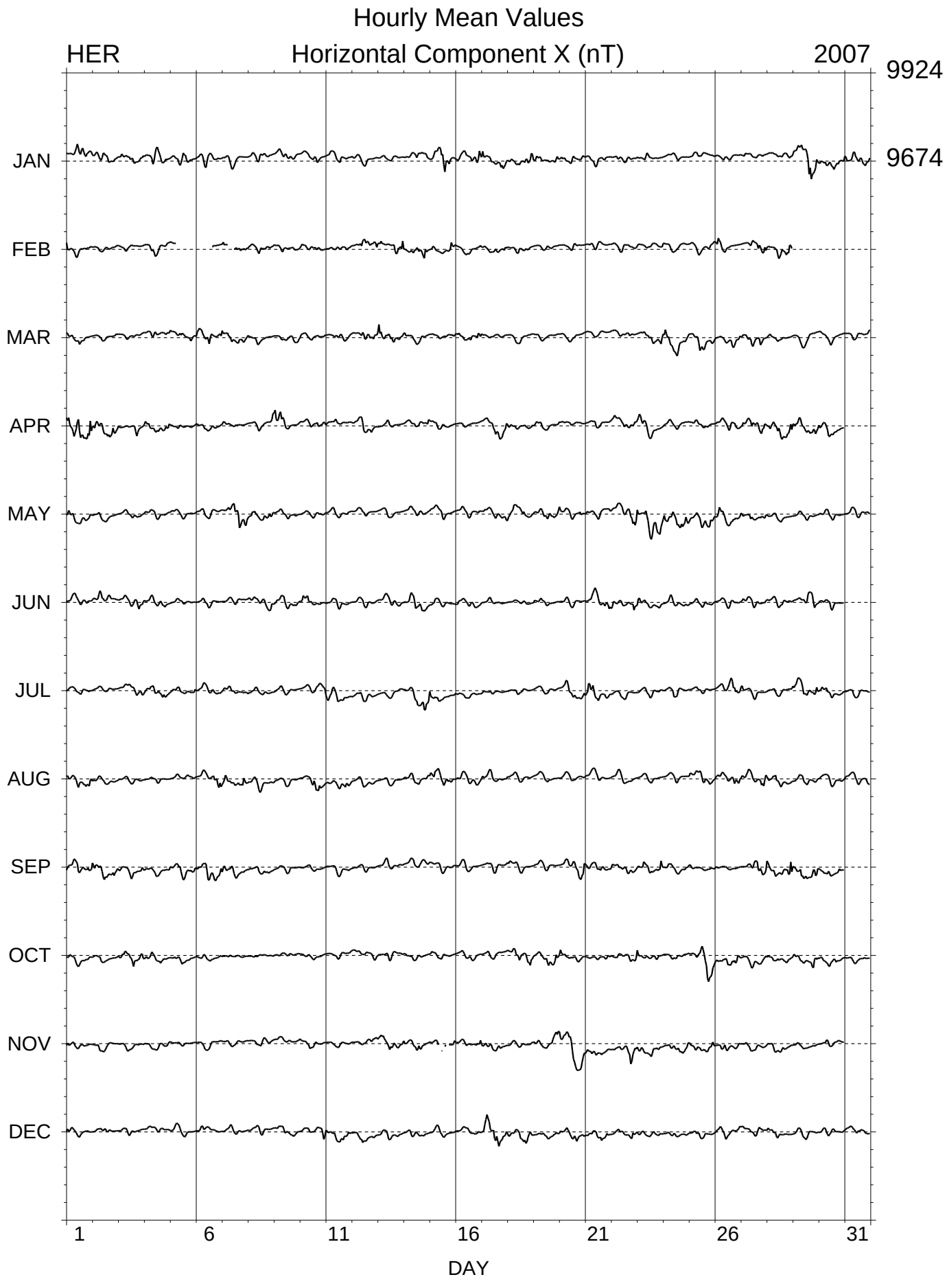
Hermanus

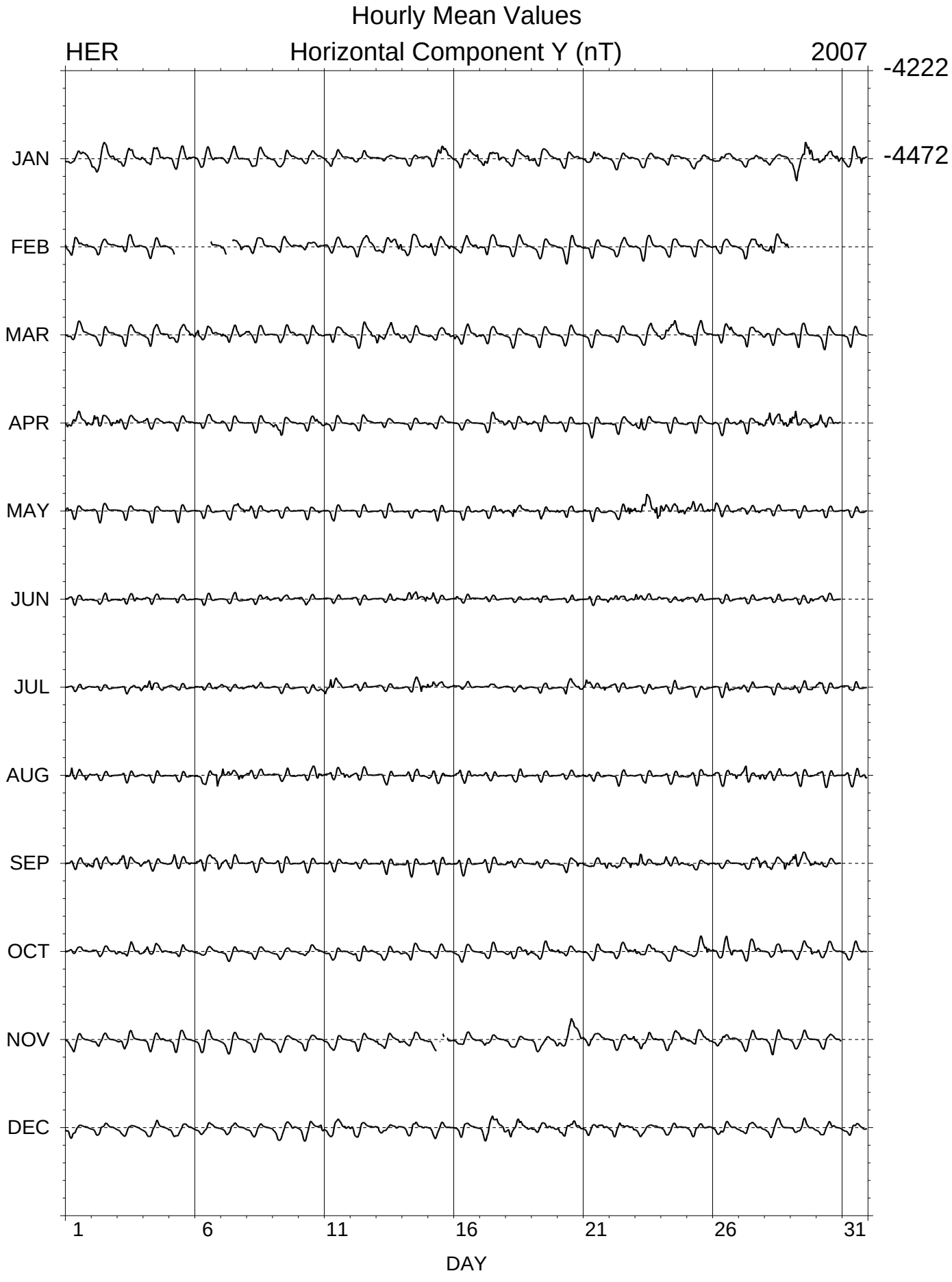
Observed and Adopted Baseline Values, HER 2007

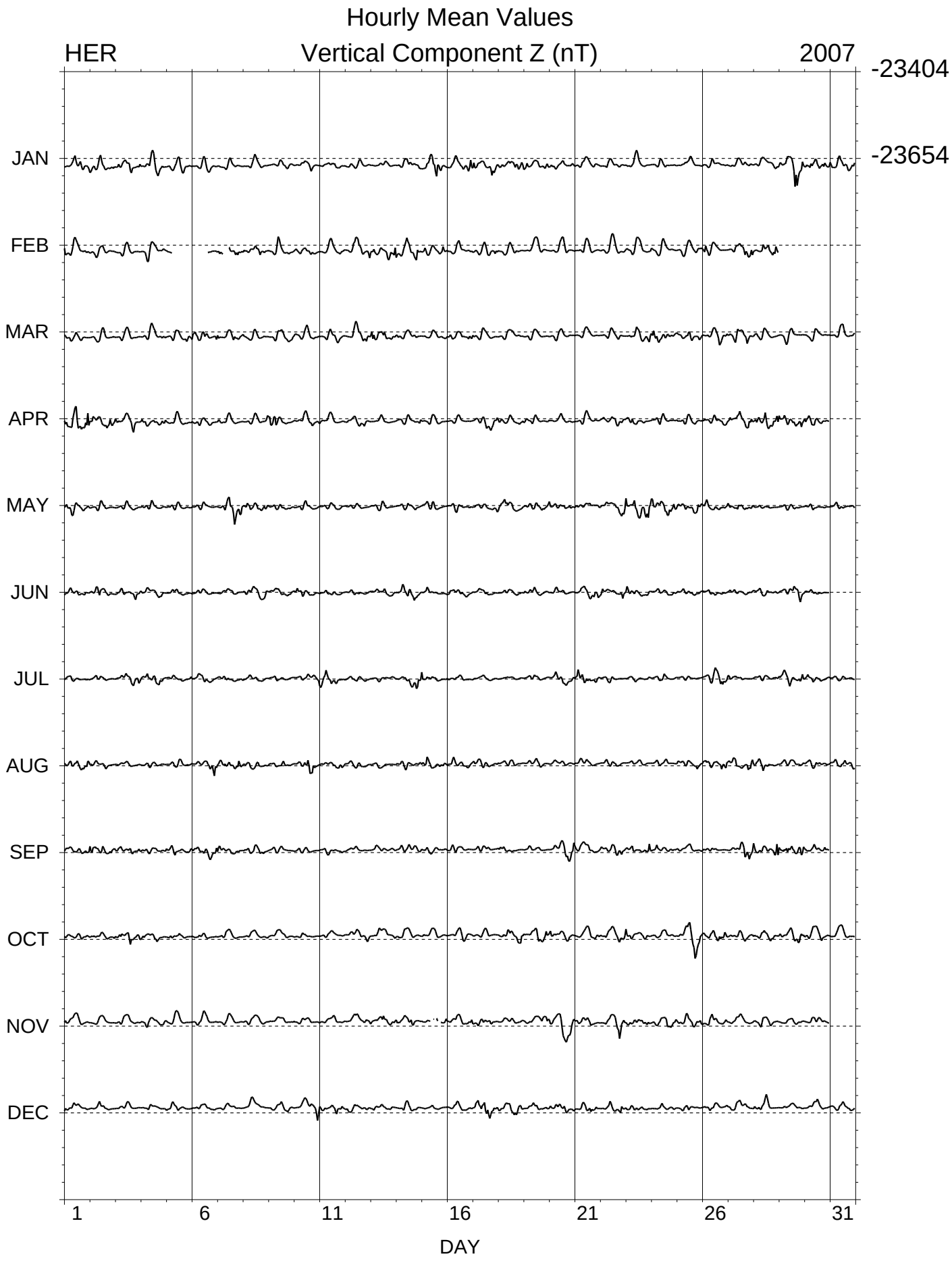
LAT: 124.425 LONG: 19.225

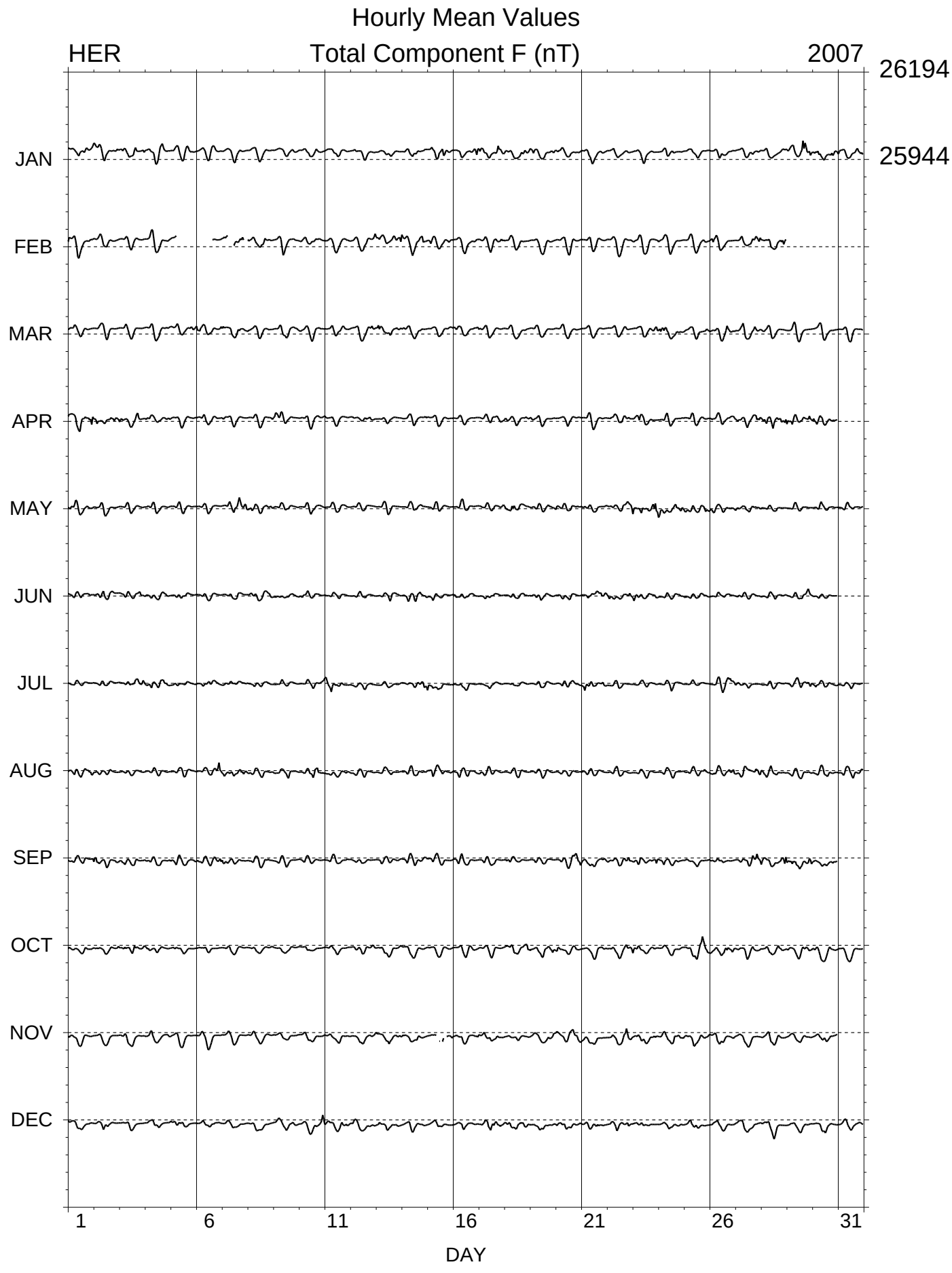
INSTITUTION: HMO INSTRUMENT: LC

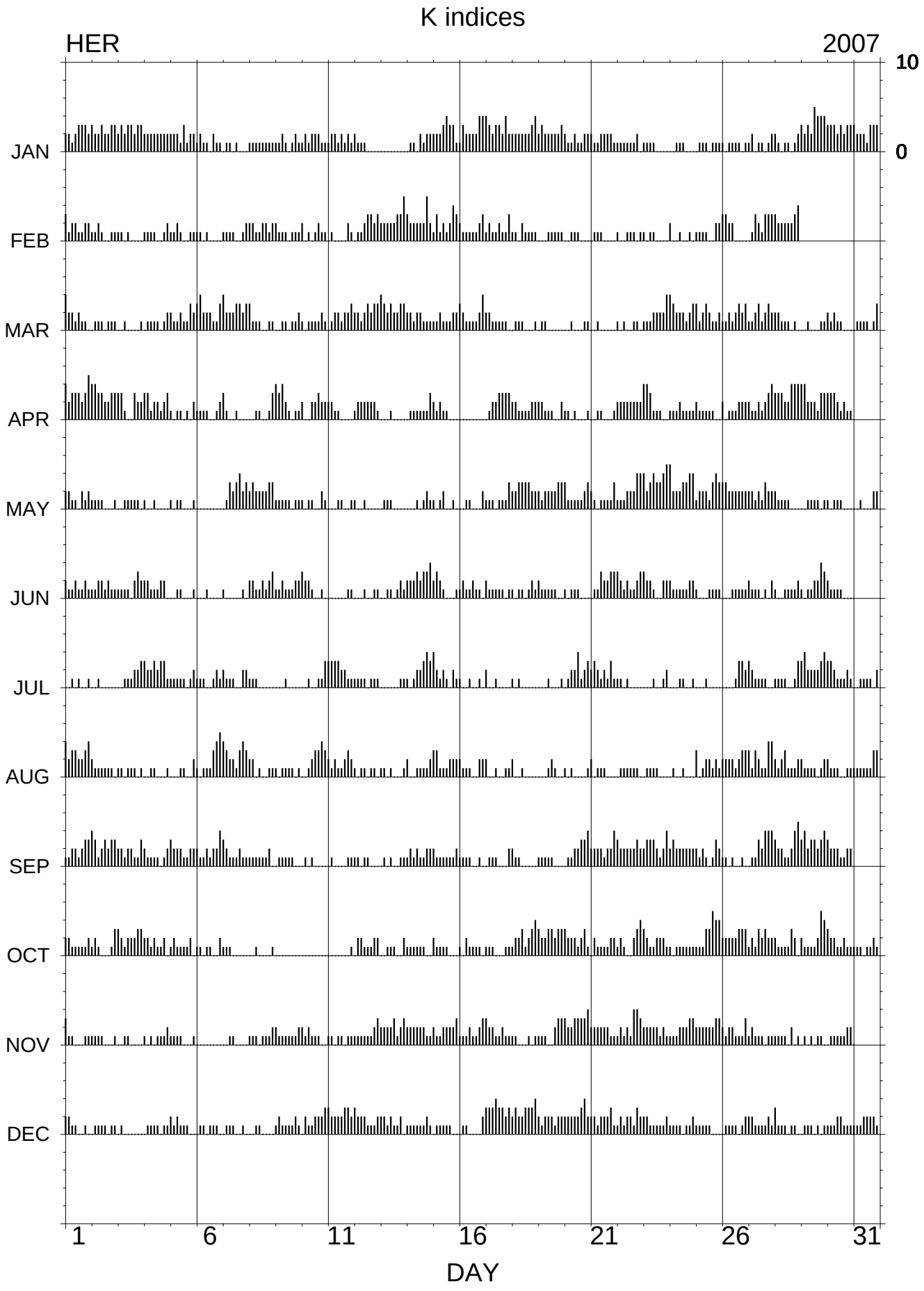



Hourly Mean Values
HER
Horizontal Component X (nT)
2007
9924
9674
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Horizontal Component Y (nT)
2007
-4222
-4472
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)
2007
-23404
-23654
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)
2007
26194
25944
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


K indices
HER
2007
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 — 2007

DATE	JAN	FEB	MAR	APR	MAY	JUN
01	2212 3332	3122 1122	4221 2110	4233 3235	2211 0212	2112 1121
02	3223 2233	1121 0011	0111 0111	4433 2233	1111 0001	1122 1211
03	2323 3233	1101 0000	0010 0001	3310 0322	0011 1110	1111 0232
04	2222 2222	1111 0012	0111 1012	3312 2123	1001 0000	2211 1220
05	2221 3122	1121 0011	2112 1132	1011 0102	1011 0001	0011 0001
06	1211 0211	1101 0000	3422 2113	1111 0012	0000 0000	0001 0000
07	0110 1000	1111 0012	4222 3323	3100 1000	0132 3423	1000 0010
08	1111 1111	2211 2212	3111 0011	0011 0013	2322 2233	2211 2123
09	1121 0121	2111 0111	0011 0112	4342 1011	1111 1011	1121 1122
10	1212 2211	2010 1211	1011 1121	2002 2322	1011 0021	3221 0010
11	1221 2121	0100 0021	0122 1223	2211 0000	0001 1001	0000 0011
12	2111 0000	0112 3323	2212 3233	1222 2221	1001 0000	0001 0011
13	0000 0000	2222 2335	4323 2233	0001 0000	0111 0000	0011 0121
14	0110 2122	3222 2252	2212 2111	0111 1113	0001 0121	2223 2334
15	2223 4331	1312 1243	1121 1122	2121 1000	1012 0010	2321 0001
16	1322 2244	2111 1123	3211 1124	0000 0000	0011 0002	1211 2110
17	4323 3242	1211 2113	2211 1110	0122 3333	1110 1113	2111 1101
18	2222 2234	1102 1111	0111 0001	2211 1122	2233 3322	1011 0121
19	2322 2223	0001 1111	0110 0000	2211 1002	2122 2233	2111 1100
20	2112 1122	0011 1000	0010 0011	1101 0001	3111 1123	1011 1000
21	2112 2221	0111 0000	0010 0000	0011 0001	2101 1113	0113 2233
22	1111 1120	1001 1101	1010 0110	2222 2222	1112 2244	3212 1123
23	1111 0000	1011 0000	1112 2224	4431 1100	4234 3345	3221 0022
24	0011 1000	2001 0010	4322 2123	1112 1111	5222 3344	2111 1122
25	0111 0111	1111 0022	3123 2112	2111 1100	1222 1343	1000 1111
26	1011 1101	3322 0000	1121 2323	2011 1222	3322 2222	0001 1111
27	1201 1012	0132 1333	1123 1232	2112 1234	2212 1322	2111 0102
28	2101 1012	3222 2234	2211 1010	3332 2444	2111 1000	1001 1112
29	3232 5444		0010 0011	4422 2133	0011 1101	1011 2243
30	3332 3233		2121 1000	3332 1211	1011 1000	2111 1000
31	3222 1333		0111 1013		0010 0022	

	JUL	AUG	SEP	OCT	NOV	DEC
01	0010 1001	4233 2234	1122 1233	2211 1112	3110 0011	2211 0010
02	0010 0000	2111 1110	4312 3233	1210 0013	1111 0001	0111 1011
03	0011 1223	1101 1101	2212 2113	3212 2233	0011 0000	0100 0000
04	3223 2331	0011 0001	2111 1012	2212 1120	1010 1112	0111 1011
05	1111 1012	0001 1002	3222 1122	1211 1120	1111 0001	2121 1100
06	1110 0121	1011 1345	2112 1224	1101 1002	0000 0000	0110 1110
07	2111 0022	4322 1343	3211 1211	1110 0000	0011 0000	0111 0010
08	1110 0000	2201 0011	1111 1120	0010 0001	1110 1112	0011 0000
09	0001 0000	1011 1101	0111 1100	0000 0000	2111 1112	1211 1121
10	0010 0113	0012 3343	0101 0000	0000 0000	2121 1100	0211 2223
11	3333 2211	2121 1232	0100 0011	0000 0001	1101 1011	3222 2332
12	1111 0111	1011 0110	1101 1000	0221 1122	1111 1123	3222 1112
13	0000 0011	1101 0001	0101 0011	0011 1002	2222 3123	2212 1120
14	1012 2343	2001 1112	1212 1122	1111 1100	2222 2211	1111 1121
15	4212 1021	3311 1222	2111 1112	2111 1000	2112 2223	0111 1100
16	1001 0010	2111 0022	1111 0010	1021 1110	1112 1123	0110 0002
17	2001 0000	2001 0011	0111 0002	1110 0011	3221 1211	3334 3323
18	1010 0000	2001 0000	2110 0000	1223 1234	1100 0101	2322 3334
19	0001 0001	0001 2100	1111 1000	3223 3233	1110 0233	2122 2122
20	0122 4123	1010 0001	0112 2334	3222 1231	3223 3334	2222 2342
21	2321 2131	2011 1000	2222 1224	0211 1122	2222 2211	2212 2231
22	1101 0000	0111 1110	3222 2232	1210 0234	1212 1443	1212 2132
23	0001 0012	0111 1000	2333 2124	3211 2221	2222 2121	2211 1112
24	0001 1001	0100 1000	2322 2222	1011 1111	1112 2233	1111 0112
25	0001 0000	3012 2121	2121 0132	1113 3544	2222 2233	1111 1000
26	0000 1332	2222 1233	1101 0010	2222 2333	2122 1113	0111 1012
27	3211 1100	3132 1144	0113 2444	1213 2322	1211 1011	2211 1121
28	1111 0013	2123 1112	3221 1245	2111 1320	1111 0201	3111 0110
29	3422 2234	2111 1012	3423 3234	2111 1254	0101 0110	0111 0101
30	3321 1121	2111 0011	3222 1122	3221 1211	0111 1122	1112 2111
31	0011 1102	1111 1133		1110 1121		1112 2221

HERMANUS
MEAN MONTHLY VALUES 2007

Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-24 46.8	-65 44.7	10666	9684	-4471	-23674	25966	A	HDZF
FEB	-24 47.2	-65 45.0	10662	9680	-4470	-23668	25959	A	HDZF
MAR	-24 48.0	-65 45.1	10660	9677	-4471	-23665	25955	A	HDZF
APR	-24 48.4	-65 45.0	10659	9675	-4472	-23661	25951	A	HDZF
MAY	-24 48.6	-65 45.1	10657	9673	-4472	-23659	25948	A	HDZF
JUN	-24 48.3	-65 44.7	10659	9676	-4472	-23655	25946	A	HDZF
JUL	-24 49.1	-65 45.0	10655	9671	-4472	-23653	25943	A	HDZF
AUG	-24 49.0	-65 44.5	10658	9673	-4473	-23650	25940	A	HDZF
SEP	-24 49.1	-65 44.7	10655	9671	-4472	-23647	25936	A	HDZF
OCT	-24 49.5	-65 44.6	10654	9669	-4473	-23643	25932	A	HDZF
NOV	-24 50.0	-65 44.4	10655	9670	-4475	-23641	25931	A	HDZF
DEC	-24 49.6	-65 43.9	10658	9673	-4475	-23639	25931	A	HDZF
YEAR	-24 48.6	-65 44.7	10658	9674	-4472	-23654	25945	A	HDZF
JAN	-24 46.7	-65 44.4	10668	9686	-4471	-23672	25965	Q	HDZF
FEB	-24 47.8	-65 44.2	10667	9684	-4474	-23665	25958	Q	HDZF
MAR	-24 48.2	-65 44.7	10663	9679	-4473	-23665	25956	Q	HDZF
APR	-24 48.3	-65 44.2	10665	9681	-4474	-23659	25952	Q	HDZF
MAY	-24 48.4	-65 44.6	10661	9677	-4473	-23658	25949	Q	HDZF
JUN	-24 48.3	-65 44.6	10659	9676	-4472	-23656	25946	Q	HDZF
JUL	-24 49.2	-65 44.3	10660	9676	-4475	-23652	25944	Q	HDZF
AUG	-24 49.2	-65 44.1	10661	9676	-4475	-23649	25941	Q	HDZF
SEP	-24 49.3	-65 44.4	10657	9673	-4474	-23647	25938	Q	HDZF
OCT	-24 49.1	-65 43.8	10660	9676	-4475	-23642	25935	Q	HDZF
NOV	-24 50.1	-65 43.9	10658	9672	-4476	-23639	25931	Q	HDZF
DEC	-24 49.4	-65 43.2	10663	9678	-4476	-23638	25931	Q	HDZF
YEAR	-24 48.7	-65 44.2	10662	9678	-4474	-23654	25945	Q	HDZF
JAN	-24 47.6	-65 45.5	10662	9679	-4471	-23677	25967	D	HDZF
FEB	-24 47.4	-65 45.8	10657	9675	-4468	-23672	25960	D	HDZF
MAR	-24 47.8	-65 45.7	10656	9673	-4469	-23666	25955	D	HDZF
APR	-24 48.5	-65 46.1	10650	9667	-4468	-23663	25949	D	HDZF
MAY	-24 48.5	-65 46.5	10646	9664	-4467	-23661	25946	D	HDZF
JUN	-24 48.2	-65 44.7	10659	9676	-4472	-23656	25946	D	HDZF
JUL	-24 49.1	-65 45.7	10650	9667	-4470	-23656	25943	D	HDZF
AUG	-24 49.1	-65 45.0	10655	9671	-4472	-23652	25941	D	HDZF
SEP	-24 49.0	-65 45.4	10649	9666	-4470	-23648	25935	D	HDZF
OCT	-24 49.5	-65 45.6	10647	9663	-4470	-23645	25932	D	HDZF
NOV	-24 49.9	-65 46.2	10642	9658	-4469	-23645	25929	D	HDZF
DEC	-24 49.7	-65 44.8	10651	9667	-4473	-23642	25930	D	HDZF
YEAR	-24 48.7	-65 45.6	10652	9669	-4470	-23657	25944	D	HDZF

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

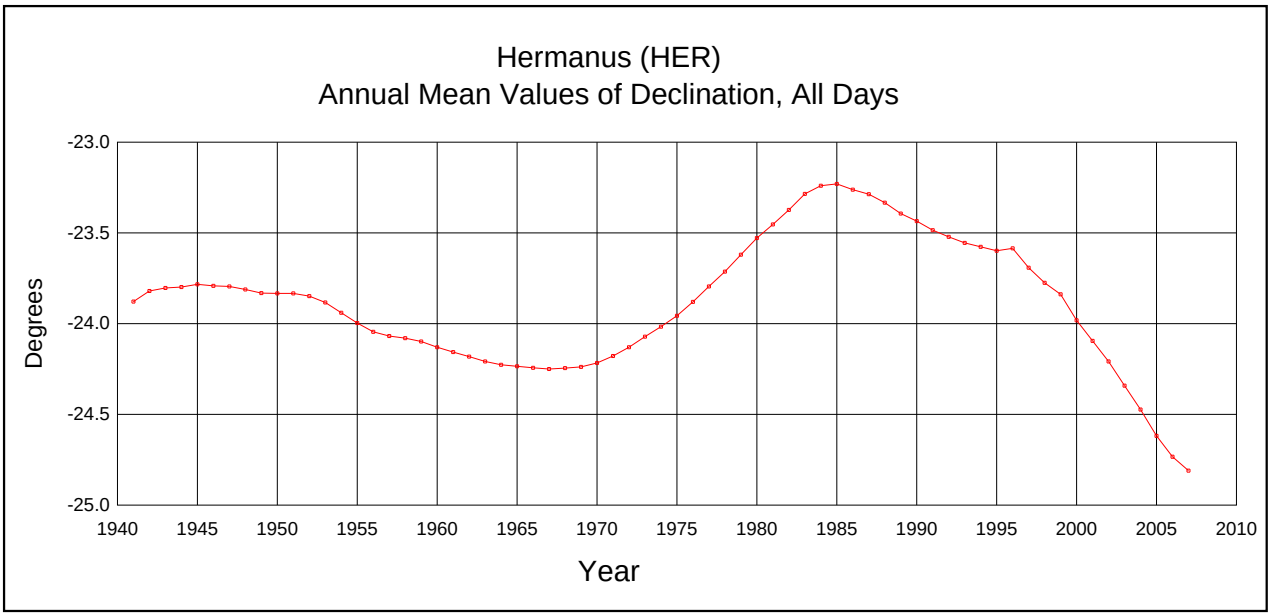
HERMANUS
MEAN ANNUAL VALUES

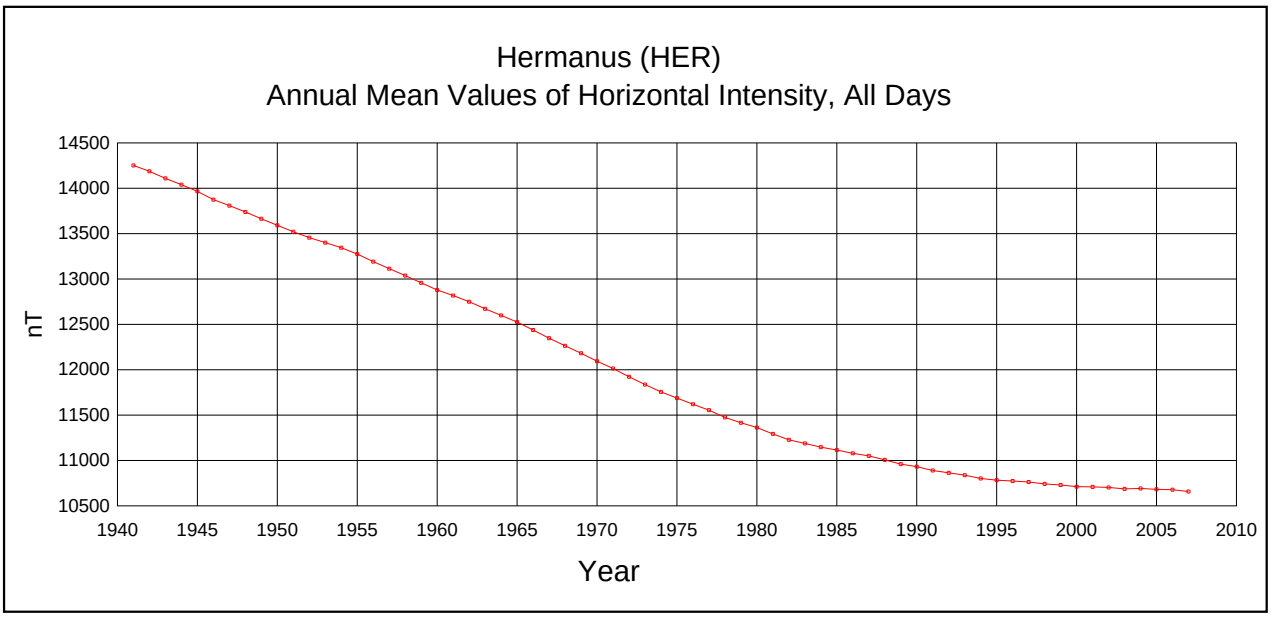
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1941.5	-23 51.6	-64 01.4	14252	13034	-5765	-29249	32537	A	DHZ
1942.5	-23 48.1	-64 03.0	14187	12980	-5724	-29153	32422	A	DHZ
1943.5	-23 47.1	-64 06.4	14109	12911	-5690	-29065	32309	A	DHZ
1944.5	-23 46.8	-64 09.1	14040	12848	-5661	-28981	32202	A	DHZ
1945.5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

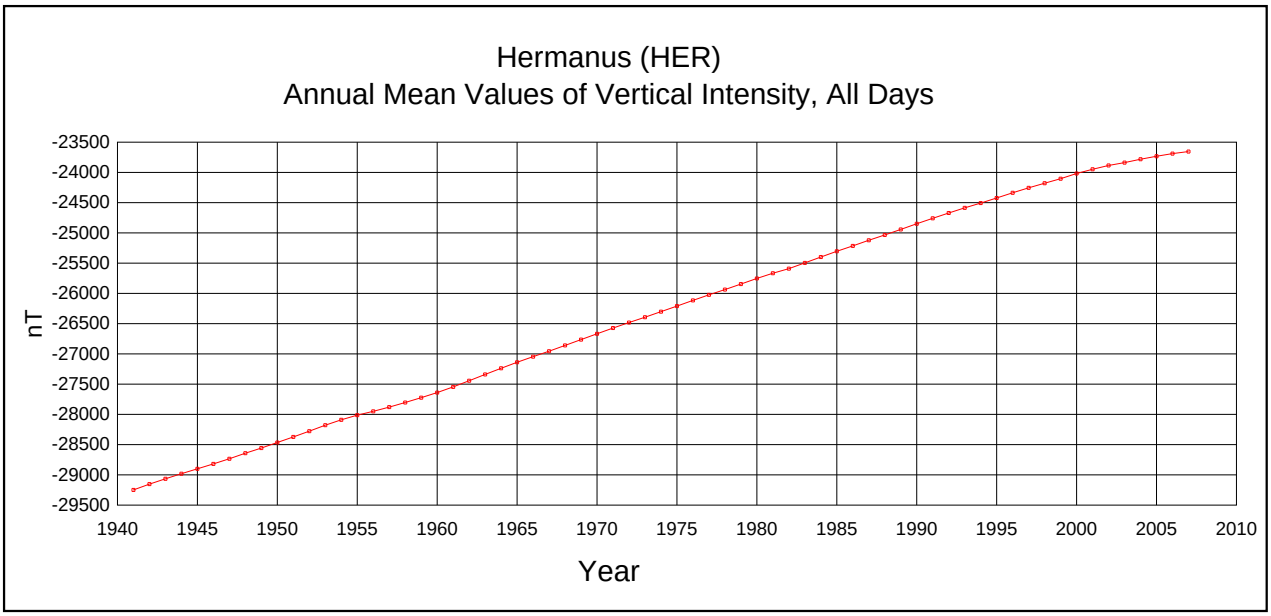
HERMANUS
MEAN ANNUAL VALUES

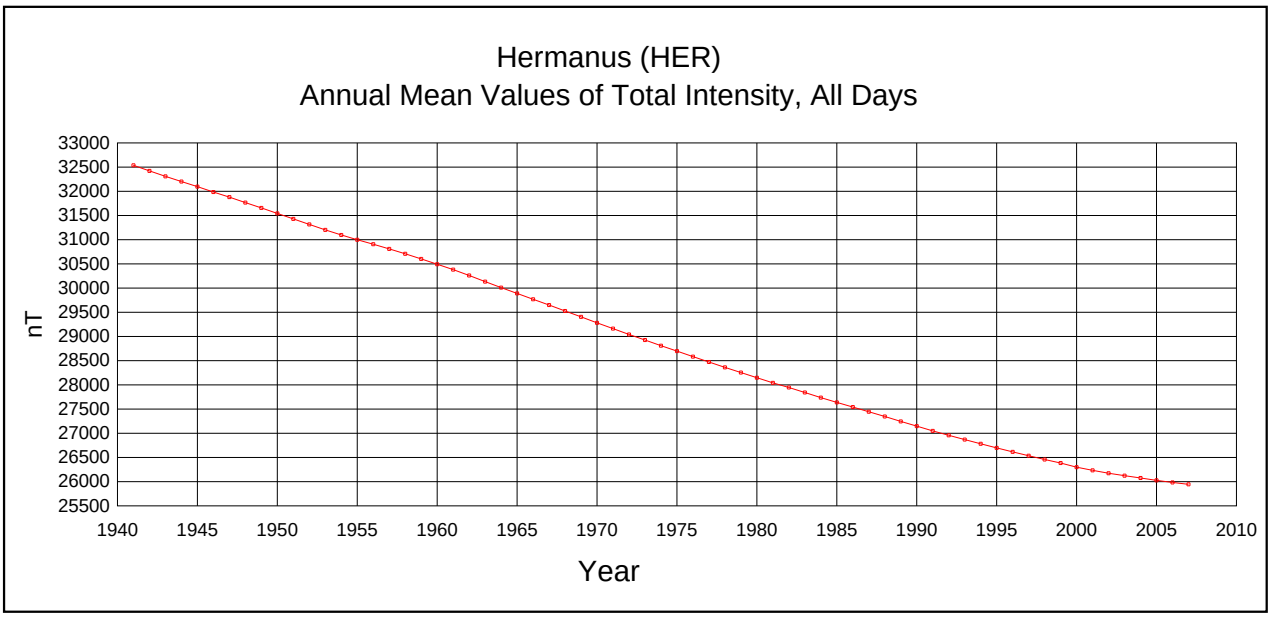
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1981.5	-23 26.1	-66 15.0	11293	10362	-4492	-25667	28042	A	DHZ
1982.5	-23 21.3	-66 18.6	11228	10309	-4452	-25591	27946	A	DHZ
1983.5	-23 16.0	-66 18.4	11188	10279	-4420	-25496	27843	A	DHZ
1984.5	-23 13.3	-66 18.3	11147	10244	-4395	-25399	27737	A	DHZ
1985.5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

*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

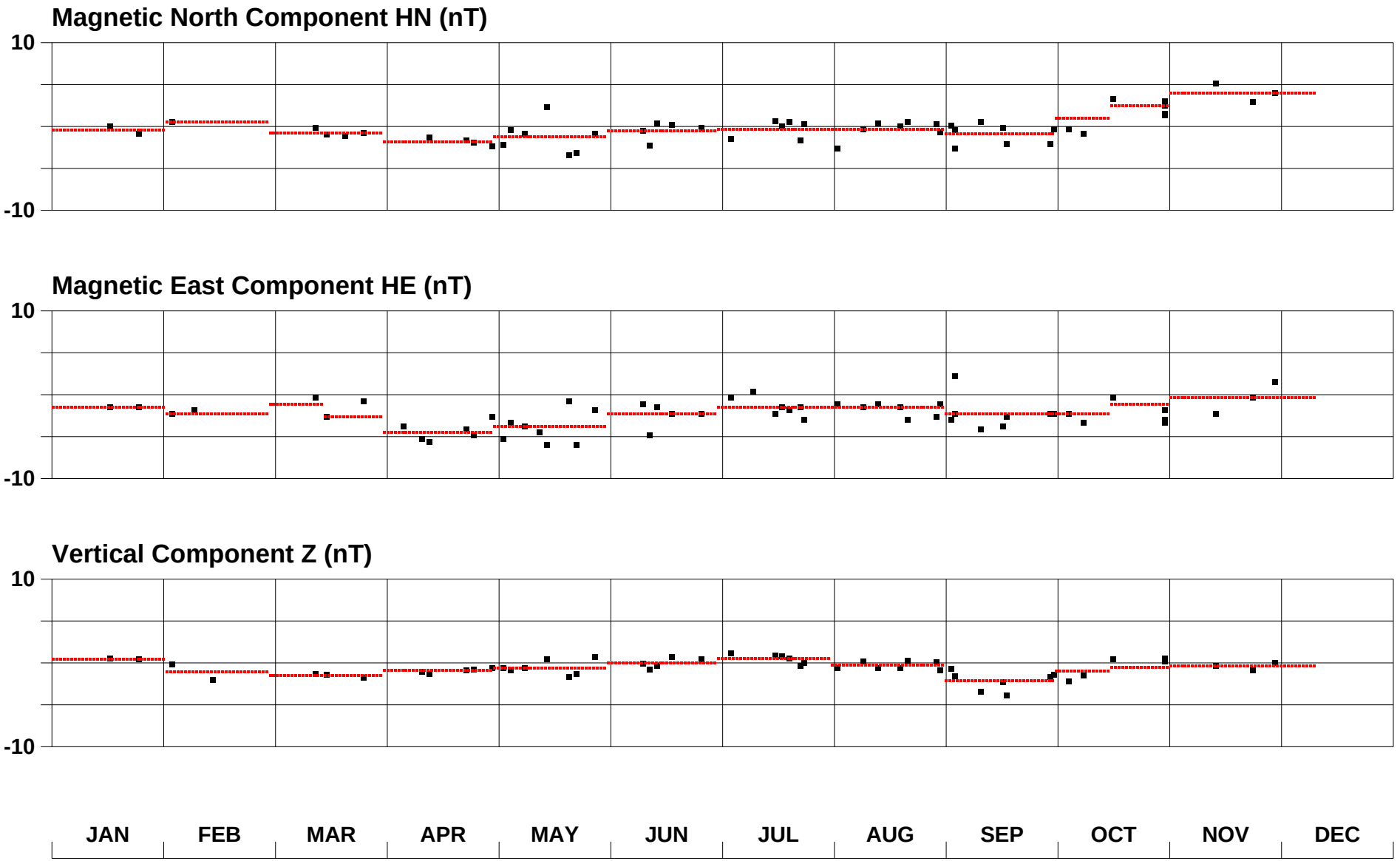
Magnetic Results 2007

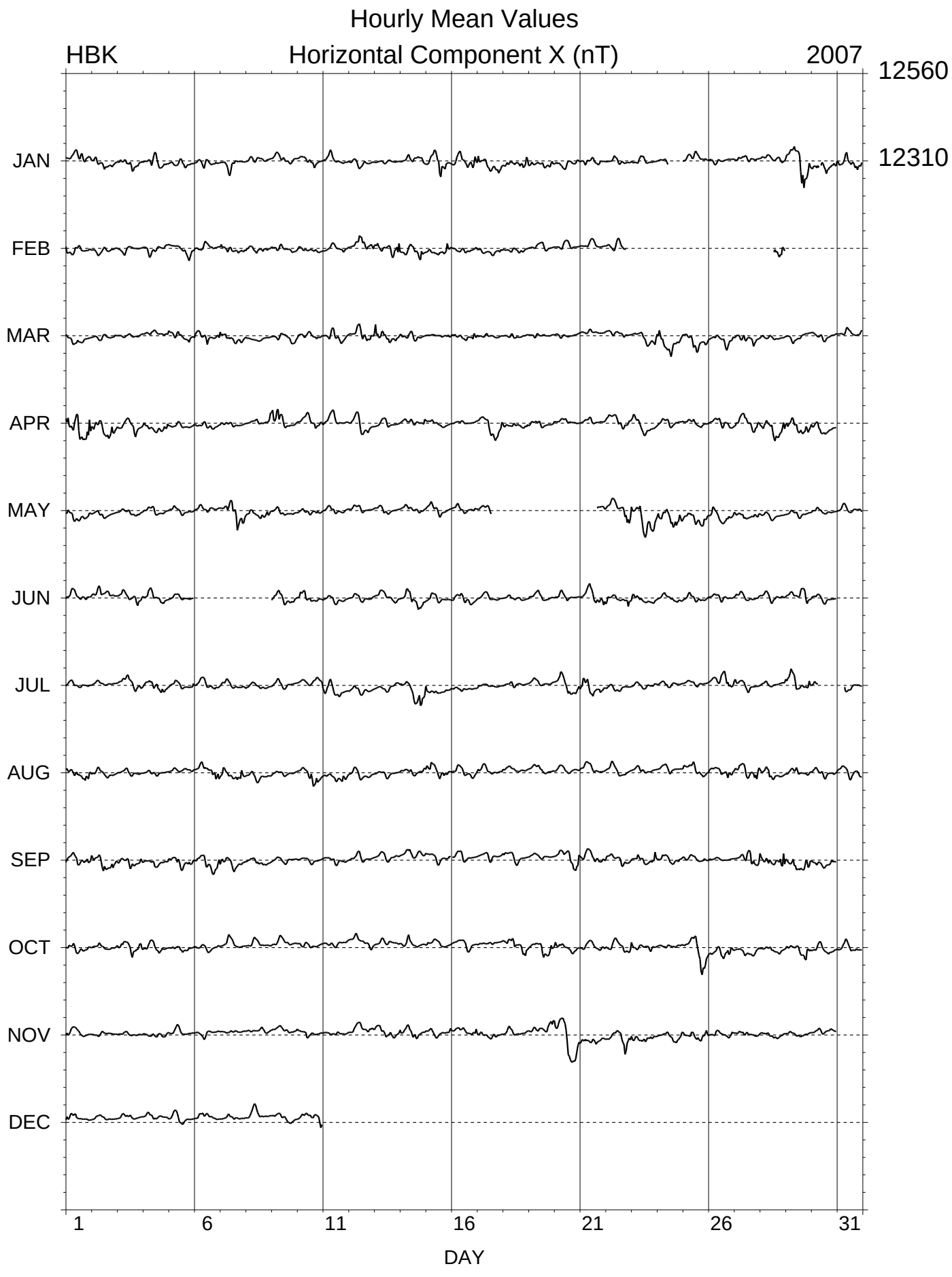
Hartebeesthoek

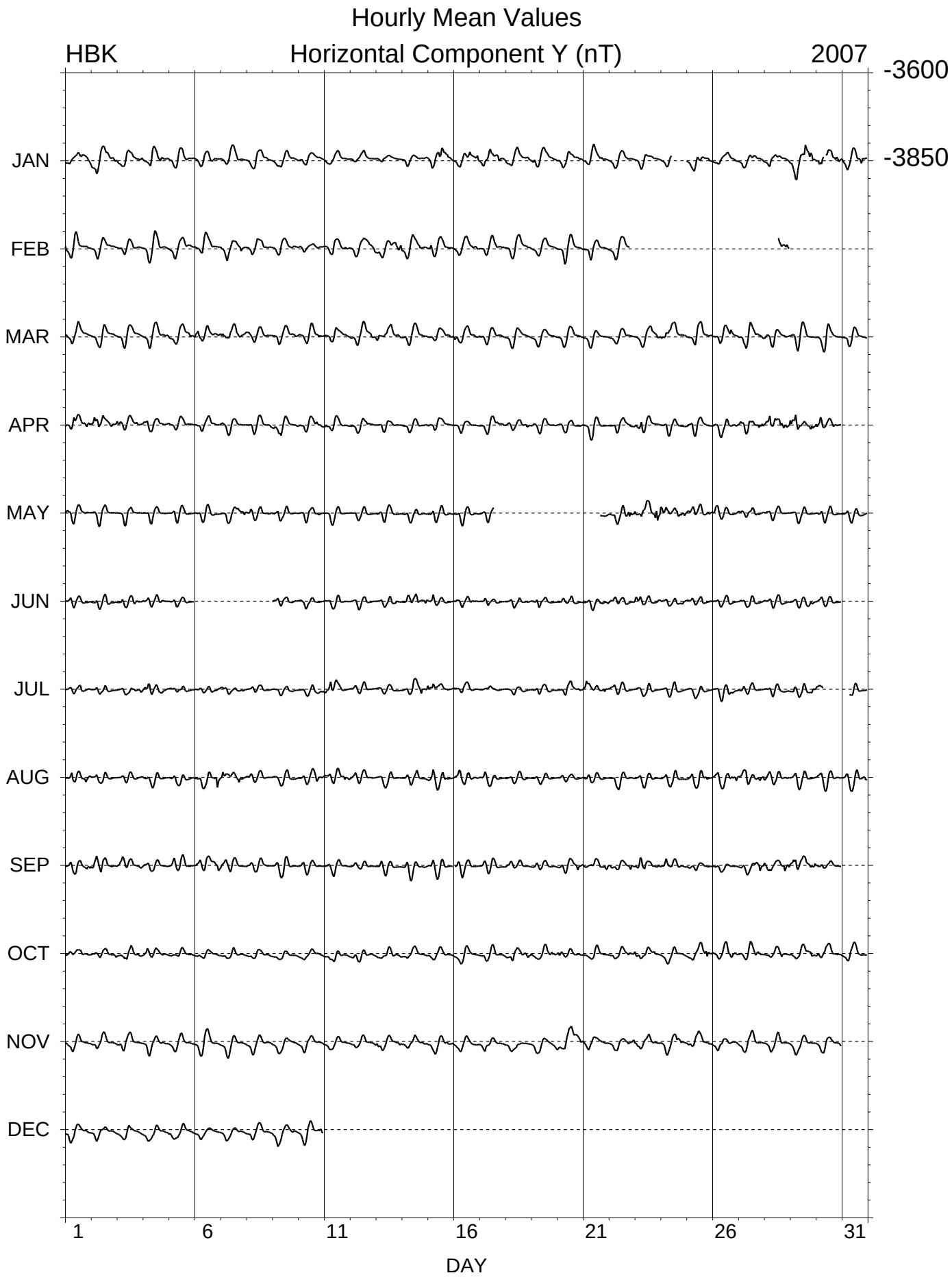
Observed and Adopted Baseline Values, HBK 2007

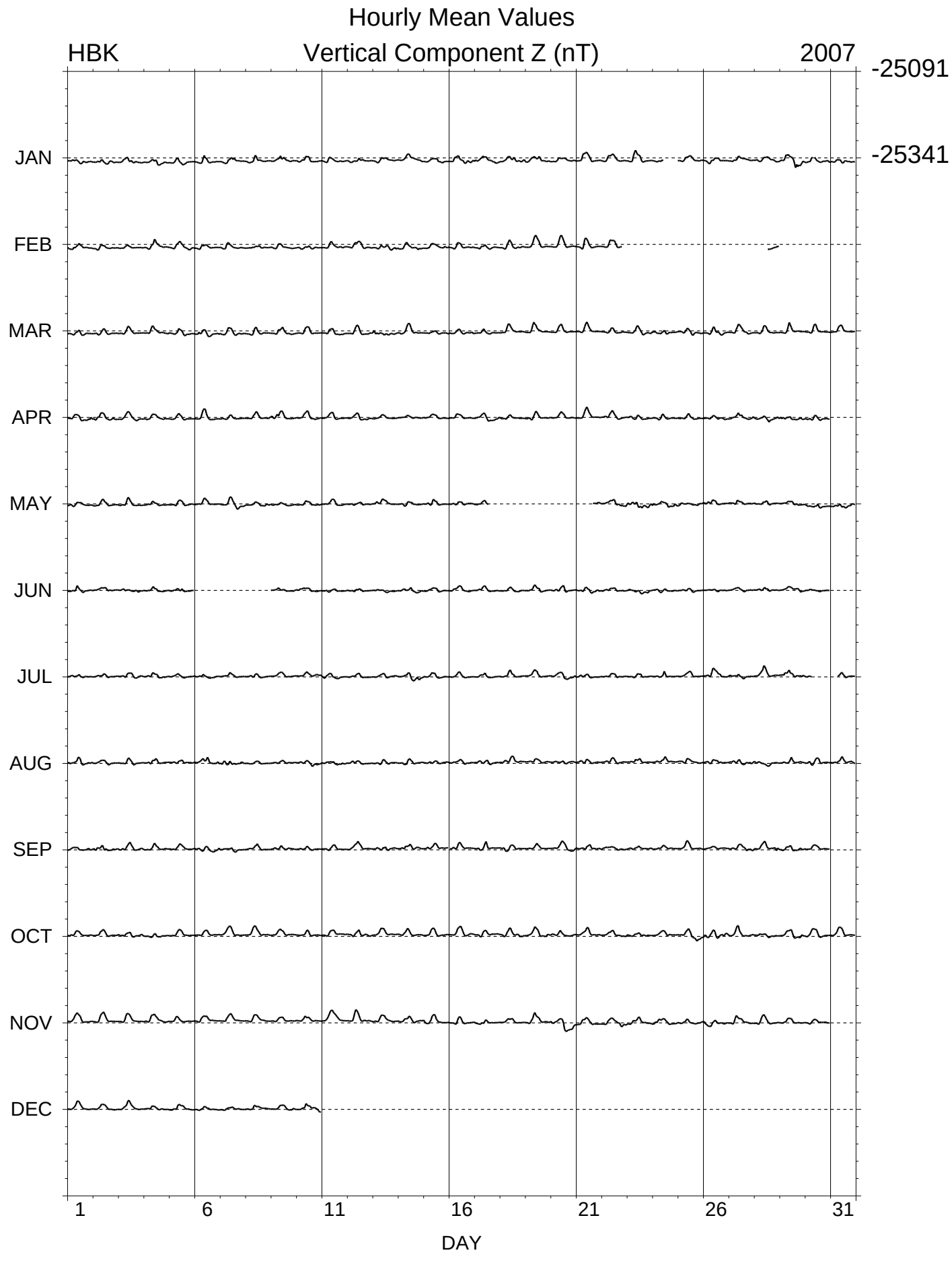
LAT: 115.883 LONG: 27.707

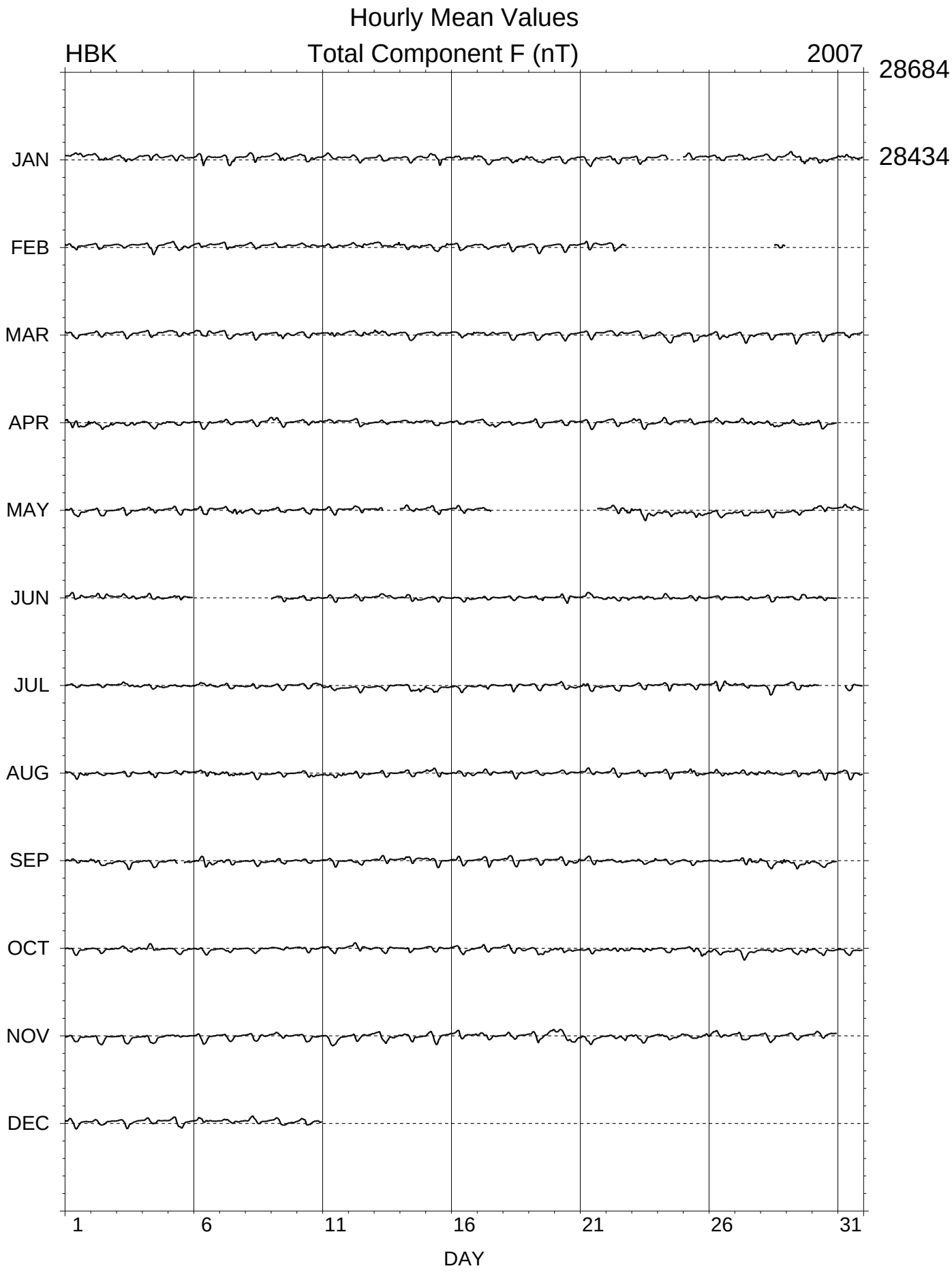
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
HBK
Horizontal Component X (nT)
2007
12560
12310
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)
2007
-3600
-3850
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)
2007
-25091
-25341
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)
2007
28684
28434
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

HARTEBEESTHOEK
MEAN MONTHLY VALUES 2007

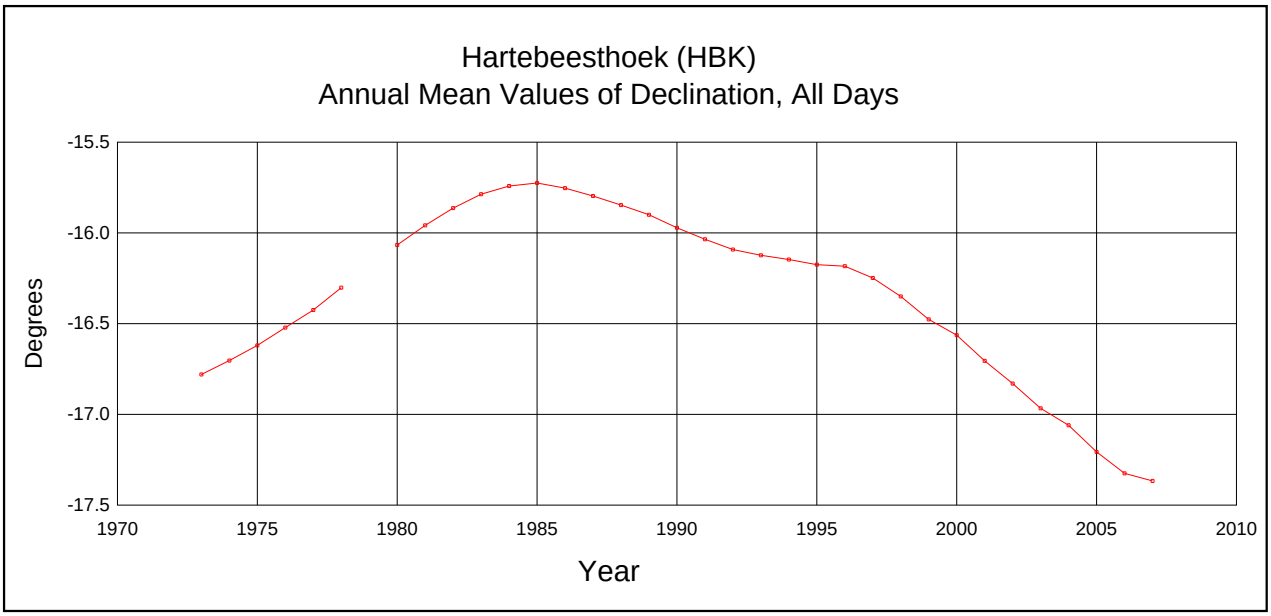
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-17 20.8	-63 02.3	12895	12308	-3845	-25349	28441	A	HDZF
FEB	-17 20.9	-63 02.2	12895	12309	-3845	-25349	28440	A	HDZF
MAR	-17 21.1	-63 02.1	12894	12308	-3846	-25345	28437	A	HDZF
APR	-17 22.1	-63 01.9	12895	12307	-3849	-25342	28435	A	HDZF
MAY	-17 22.8	-63 02.1	12893	12305	-3851	-25342	28434	A	HDZF
JUN	-17 22.4	-63 01.3	12900	12312	-3852	-25341	28436	A	HDZF
JUL	-17 22.4	-63 01.4	12898	12310	-3851	-25339	28433	A	HDZF
AUG	-17 22.5	-63 01.0	12901	12313	-3853	-25339	28434	A	HDZF
SEP	-17 22.1	-63 01.1	12900	12312	-3851	-25337	28433	A	HDZF
OCT	-17 22.3	-63 00.8	12902	12314	-3852	-25336	28431	A	HDZF
NOV	-17 23.1	-63 00.6	12904	12314	-3855	-25336	28433	A	HDZF
DEC	-17 23.1	-62 59.5	12916	12326	-3859	-25338	28440	A	HDZF
YEAR	-17 22.1	-63 01.4	12899	12311	-3850	-25341	28435	A	HDZF
JAN	-17 20.8	-63 02.0	12897	12311	-3845	-25348	28441	Q	HDZF
FEB	-17 21.0	-63 01.2	12903	12316	-3848	-25345	28440	Q	HDZF
MAR	-17 21.4	-63 01.5	12899	12312	-3848	-25342	28437	Q	HDZF
APR	-17 22.3	-63 01.1	12902	12313	-3852	-25340	28436	Q	HDZF
MAY	-17 22.4	-63 01.4	12899	12311	-3852	-25341	28436	Q	HDZF
JUN	-17 22.7	-63 01.6	12898	12309	-3852	-25343	28436	Q	HDZF
JUL	-17 22.5	-63 00.7	12904	12315	-3853	-25338	28434	Q	HDZF
AUG	-17 22.9	-63 00.6	12905	12315	-3855	-25338	28435	Q	HDZF
SEP	-17 22.5	-63 00.8	12902	12314	-3853	-25338	28434	Q	HDZF
OCT	-17 22.5	-62 59.7	12911	12322	-3856	-25334	28434	Q	HDZF
NOV	-17 22.9	-63 00.3	12905	12315	-3855	-25331	28428	Q	HDZF
DEC	-17 23.0	-62 59.2	12918	12328	-3859	-25338	28441	Q	HDZF
YEAR	-17 22.3	-63 00.8	12904	12315	-3853	-25339	28436	Q	HDZF
JAN	-17 21.4	-63 03.1	12888	12301	-3845	-25351	28439	D	HDZF
FEB	-17 21.6	-63 02.6	12892	12305	-3846	-25350	28439	D	HDZF
MAR	-17 20.4	-63 02.8	12889	12303	-3841	-25347	28437	D	HDZF
APR	-17 22.0	-63 03.0	12886	12299	-3846	-25344	28432	D	HDZF
MAY	-17 22.9	-63 03.7	12879	12291	-3847	-25344	28428	D	HDZF
JUN	-17 22.4	-63 01.2	12901	12312	-3852	-25341	28436	D	HDZF
JUL	-17 22.4	-63 02.0	12893	12305	-3850	-25340	28431	D	HDZF
AUG	-17 22.4	-63 01.5	12898	12309	-3851	-25340	28433	D	HDZF
SEP	-17 22.1	-63 01.7	12895	12307	-3849	-25337	28430	D	HDZF
OCT	-17 22.6	-63 01.9	12892	12304	-3850	-25337	28427	D	HDZF
NOV	-17 22.9	-63 02.4	12890	12302	-3851	-25341	28431	D	HDZF
DEC	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
YEAR	-17 22.1	-63 02.3	12891	12304	-3848	-25343	28433	D	HDZF

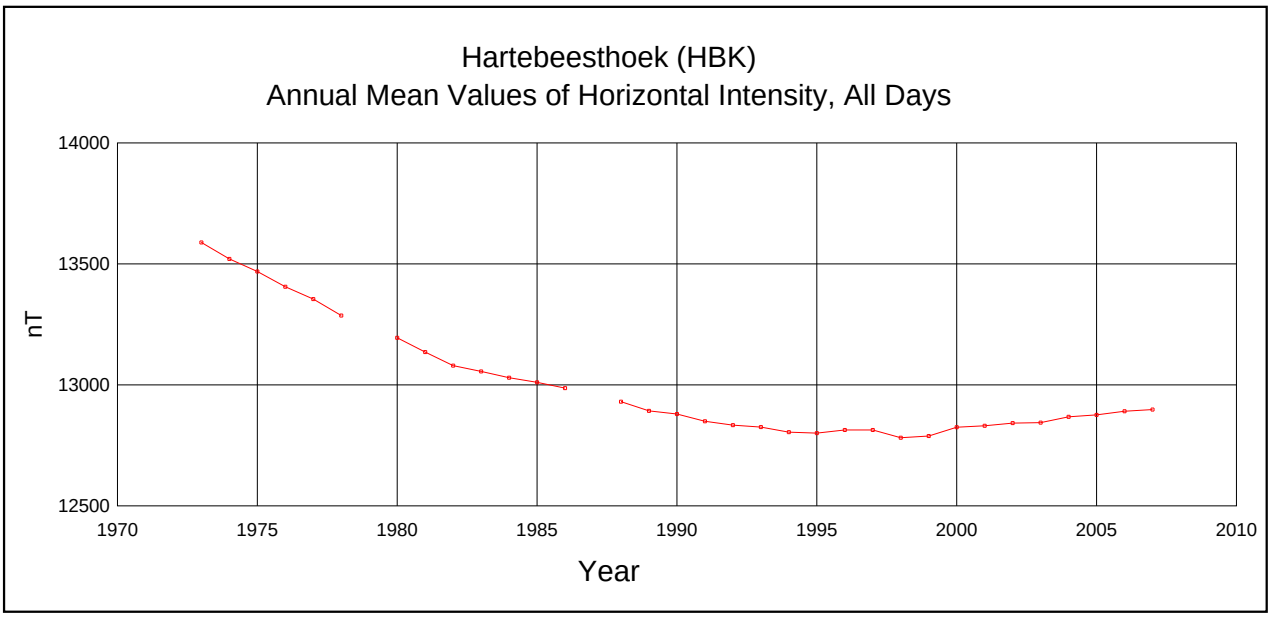
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

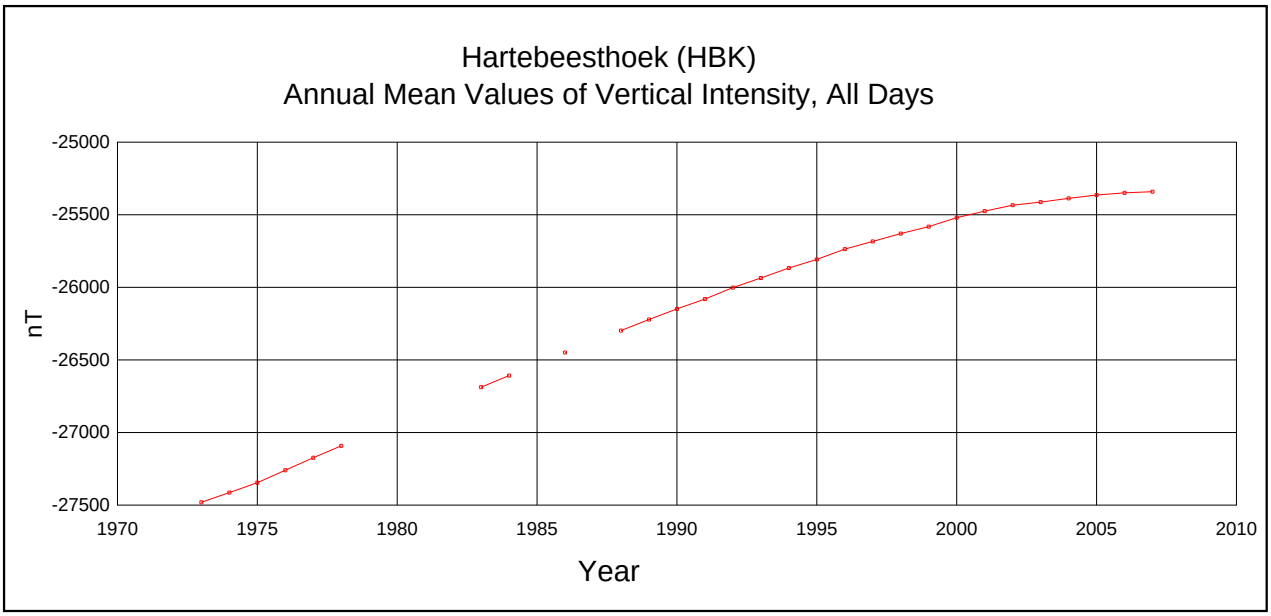
HARTEBEESTHOEK
MEAN ANNUAL VALUES

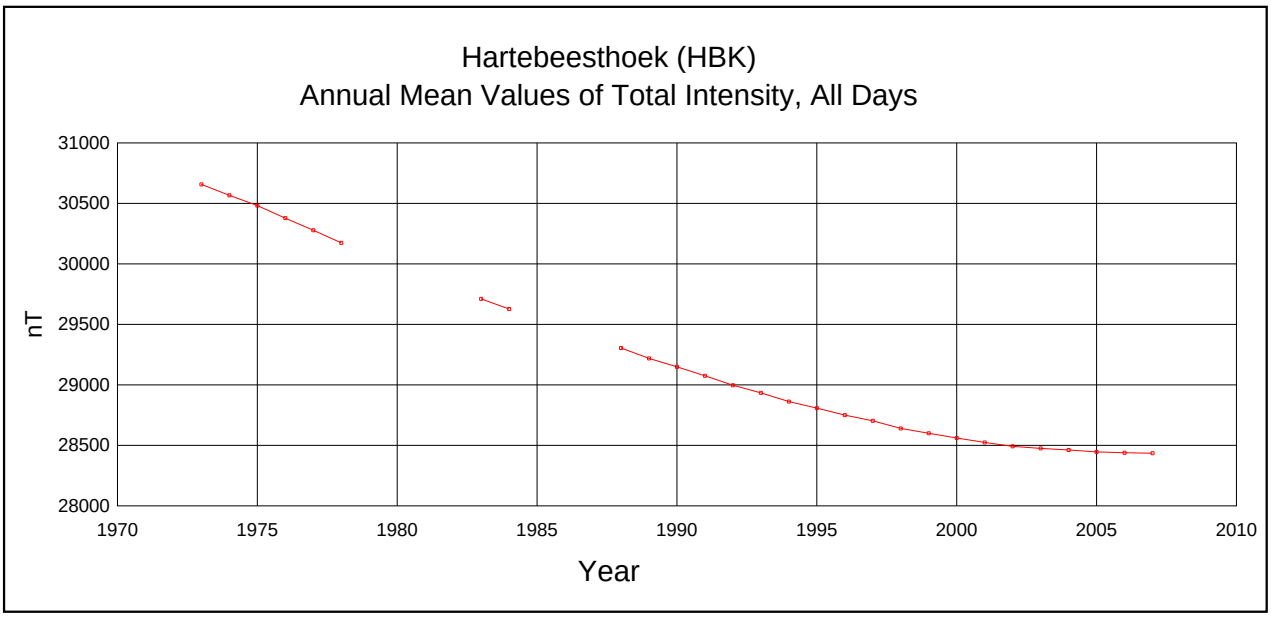
Date	°D ,	°I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1973.5	-16 46.6	-63 41.5	13588	13010	-3919	-27481	30657	I	DHZ
1974.5	-16 42.0	-63 45.0	13520	12950	-3885	-27414	30567	A	DHZ
1975.5	-16 37.0	-63 46.8	13468	12905	-3852	-27346	30482	A	DHZ
1976.5	-16 31.1	-63 49.0	13405	12852	-3811	-27260	30378	A	DHZ
1977.5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

*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

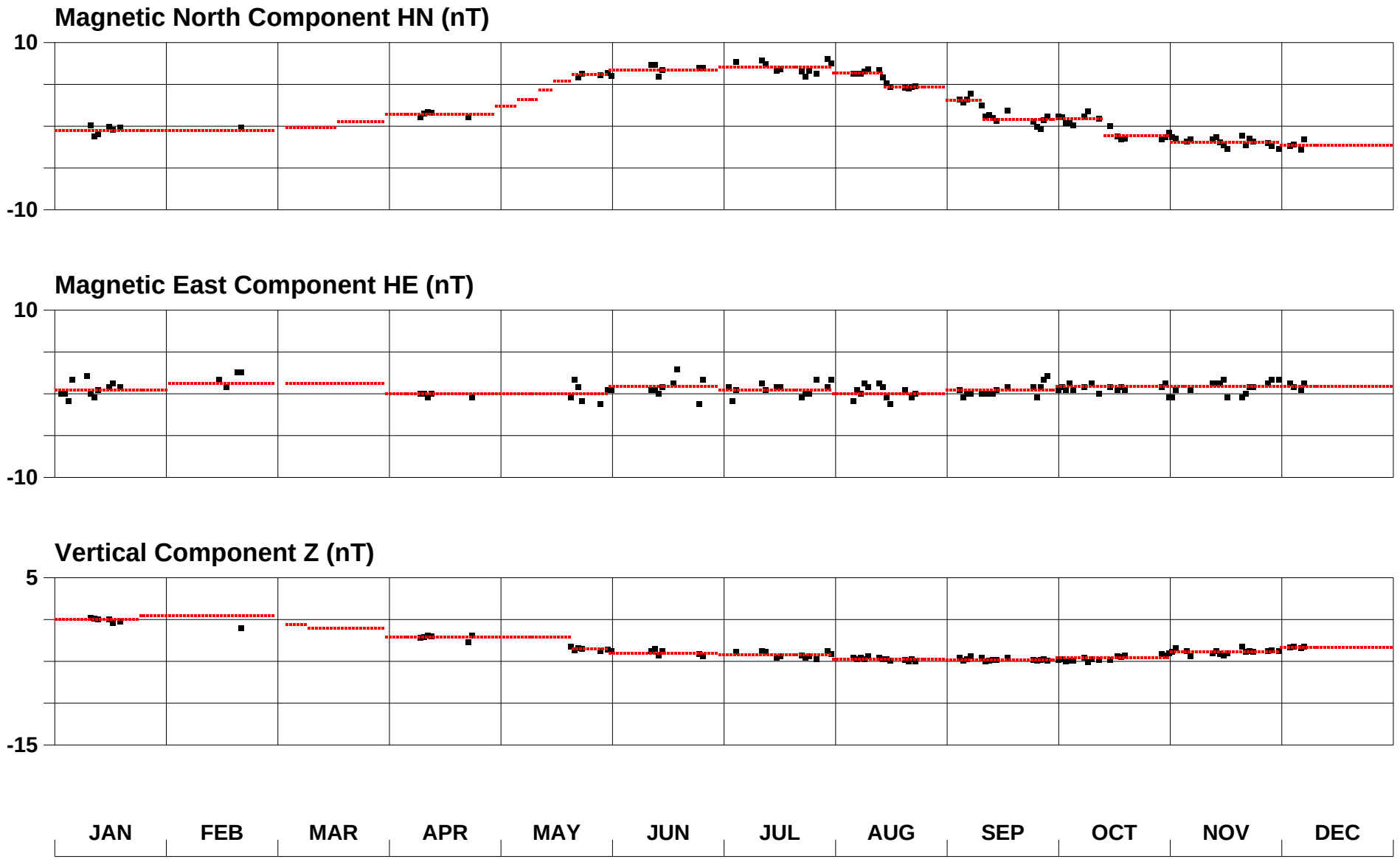
Magnetic Results 2007

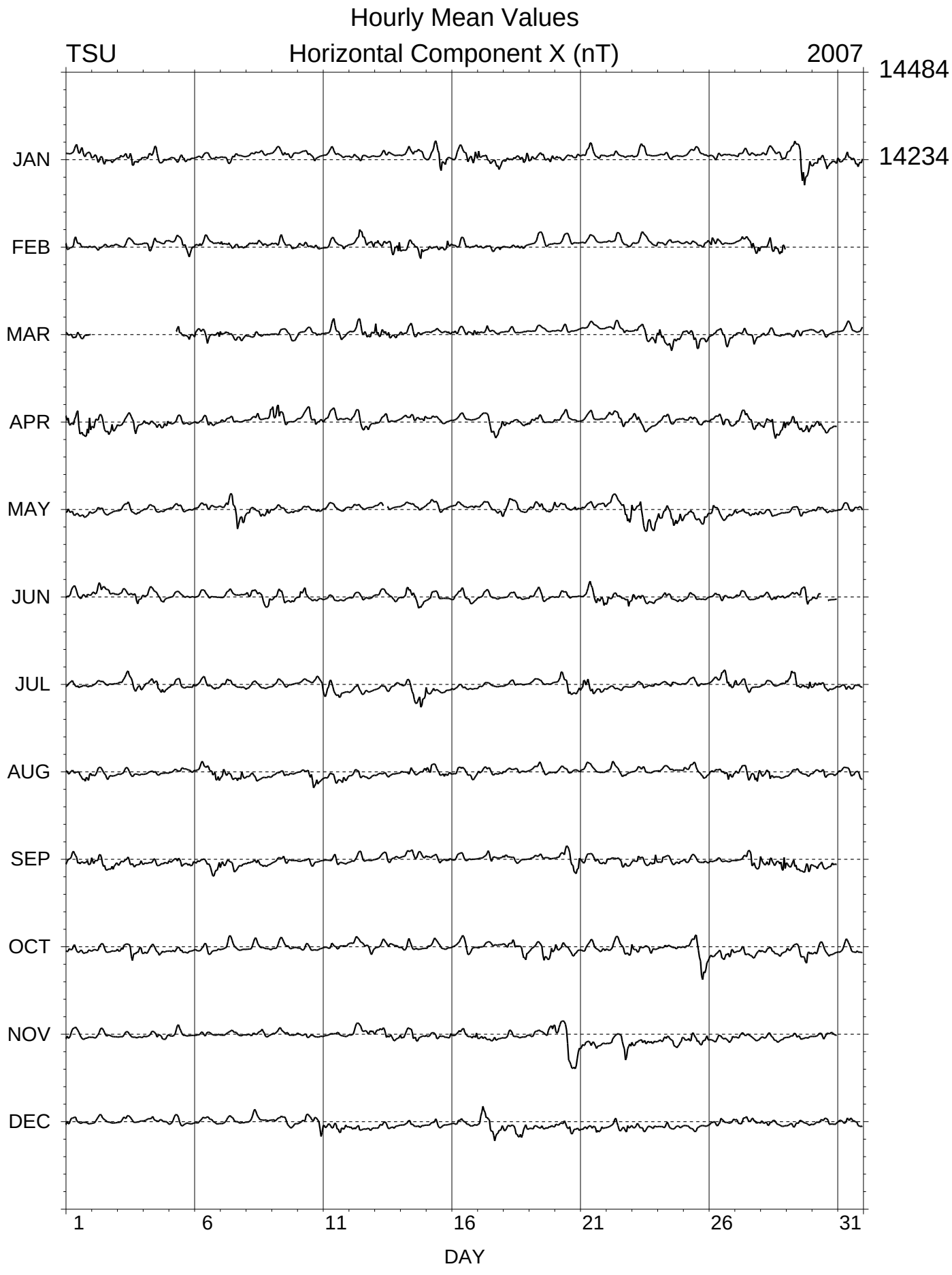
Tsumeb

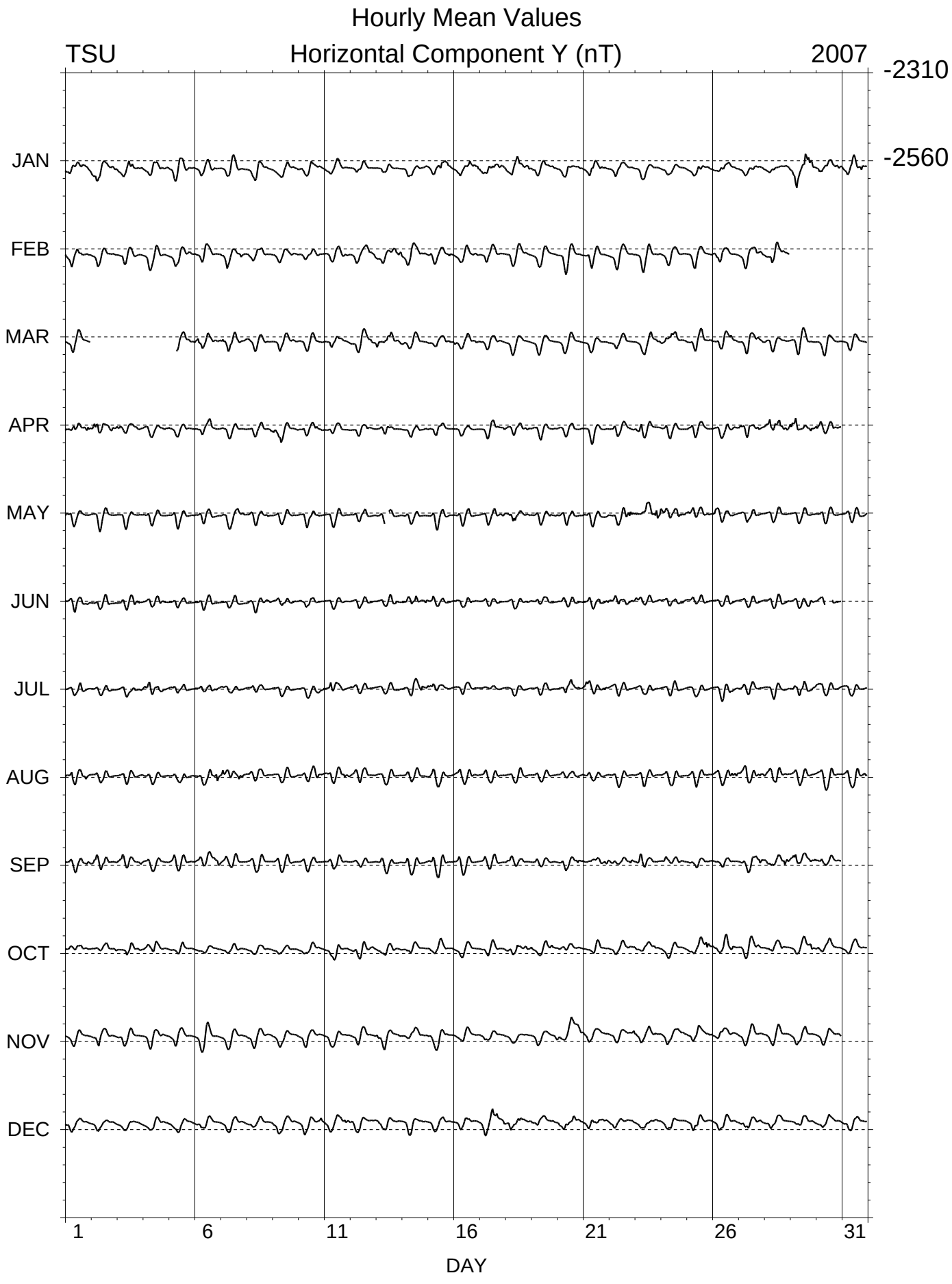
Observed and Adopted Baseline Values, TSU 2007

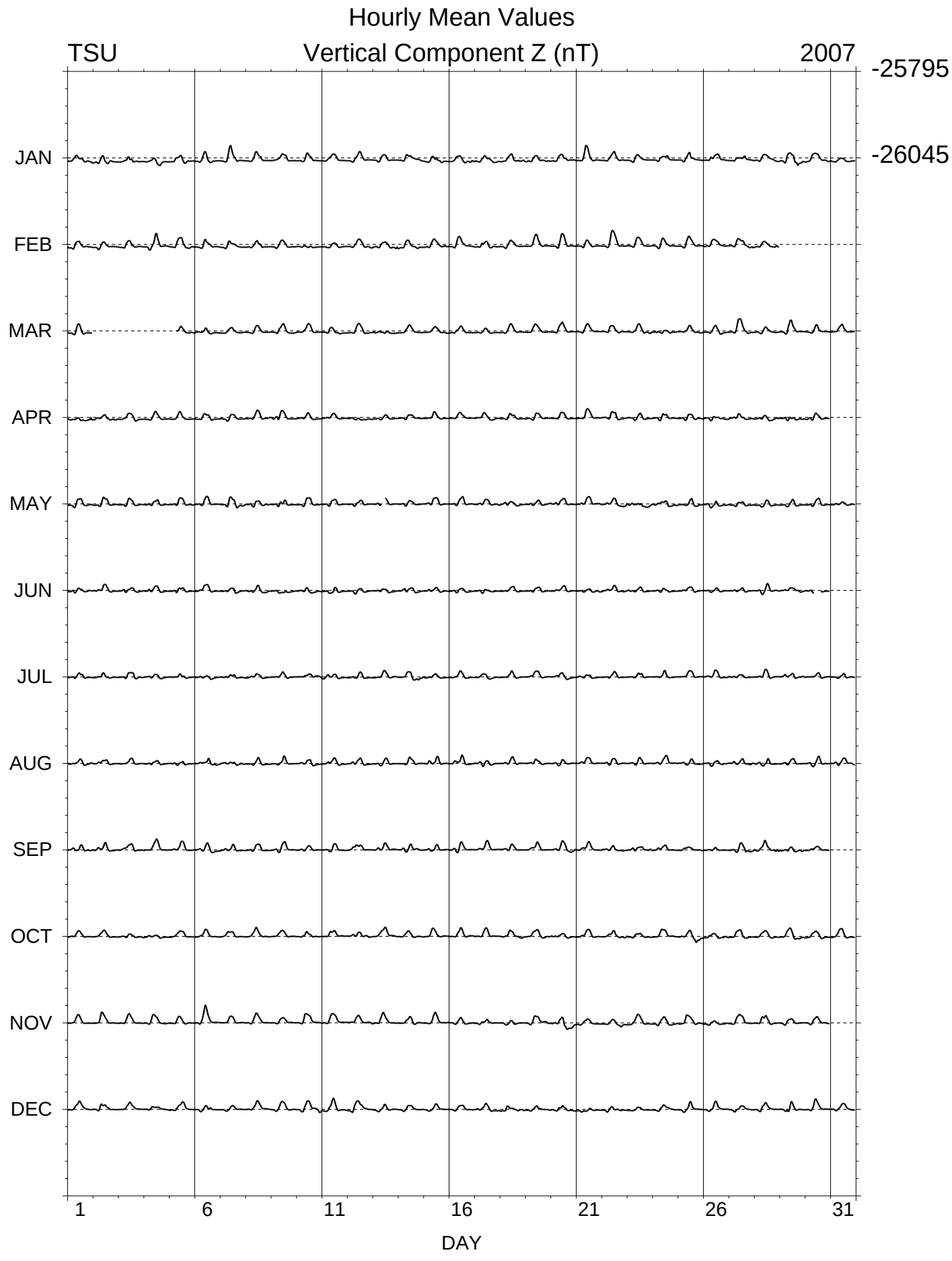
LAT: 109.202 LONG: 17.584

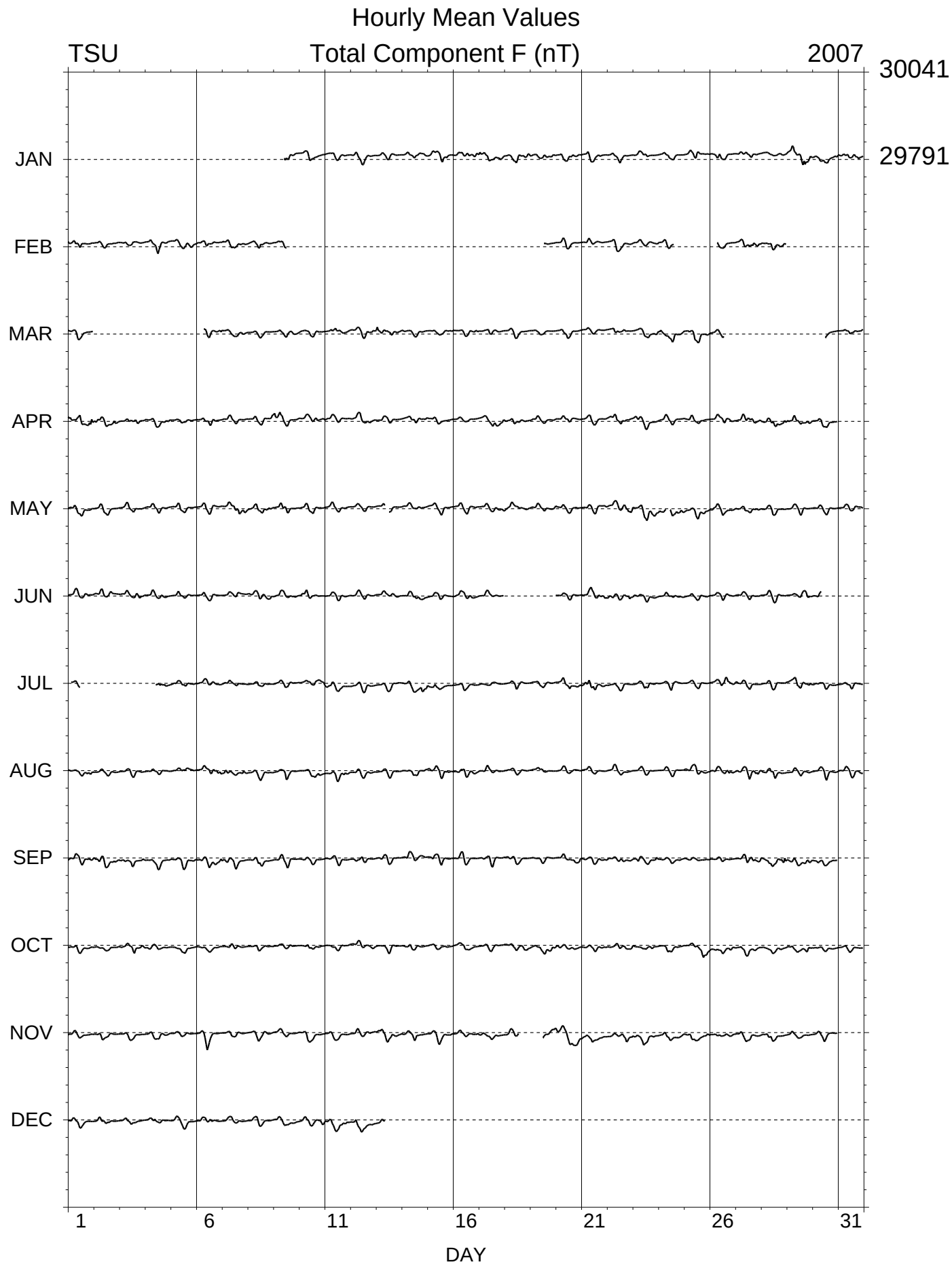
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
TSU
Horizontal Component X (nT)
2007
14484
14234
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)
2007
-2310
-2560
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)
2007
-25795
-26045
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)
2007
30041
29791
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

TSUMEB
MEAN MONTHLY VALUES 2007

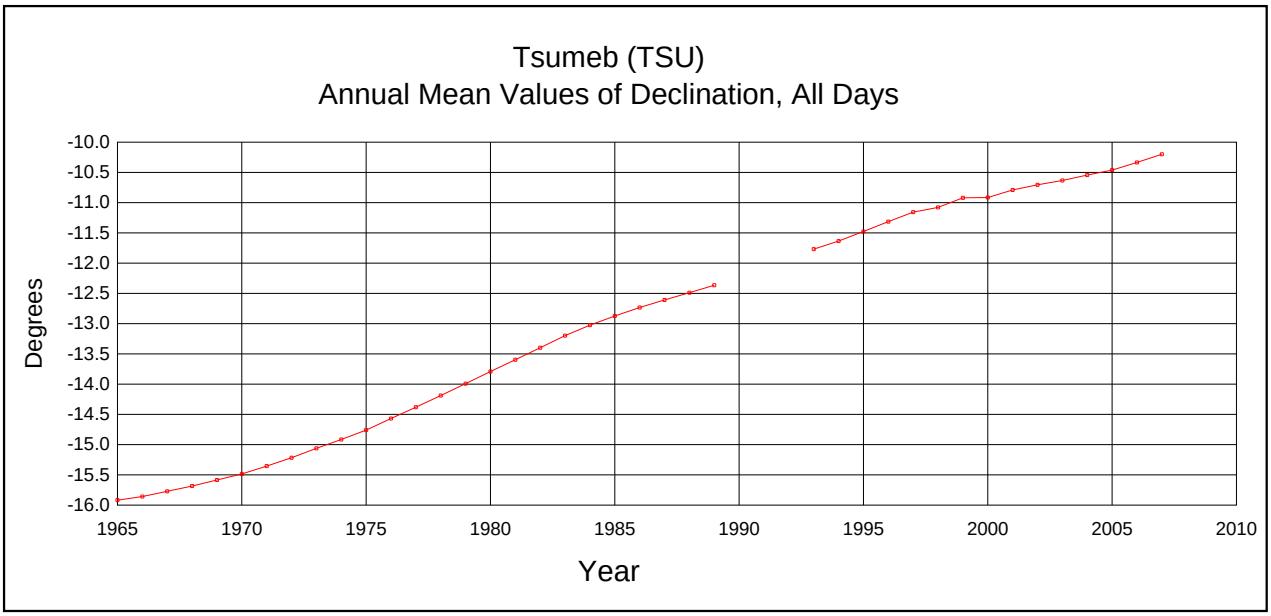
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-10 16.5	-60 56.3	14477	14245	-2582	-26050	29802	A	HDZF
FEB	-10 15.5	-60 56.4	14474	14243	-2578	-26047	29801	A	HDZF
MAR	-10 14.7	-60 56.7	14470	14239	-2574	-26046	29797	A	HDZF
APR	-10 14.3	-60 57.0	14467	14237	-2571	-26047	29795	A	HDZF
MAY	-10 13.4	-60 57.4	14463	14234	-2567	-26045	29792	A	HDZF
JUN	-10 12.2	-60 57.2	14465	14236	-2562	-26046	29793	A	HDZF
JUL	-10 11.7	-60 57.7	14459	14231	-2559	-26044	29789	A	HDZF
AUG	-10 10.9	-60 57.7	14459	14232	-2556	-26044	29789	A	HDZF
SEP	-10 09.7	-60 57.9	14456	14230	-2551	-26043	29786	A	HDZF
OCT	-10 08.7	-60 58.1	14455	14229	-2546	-26043	29785	A	HDZF
NOV	-10 08.3	-60 58.2	14453	14228	-2544	-26042	29784	A	HDZF
DEC	-10 07.7	-60 58.3	14453	14228	-2541	-26043	29786	A	HDZF
YEAR	-10 11.9	-60 57.4	14463	14234	-2561	-26045	29791	A	HDZF
JAN	-10 16.5	-60 55.9	14479	14247	-2583	-26048	29804	Q	HDZF
FEB	-10 15.7	-60 55.5	14482	14250	-2580	-26045	29801	Q	HDZF
MAR	-10 15.0	-60 55.8	14478	14247	-2577	-26044	29798	Q	HDZF
APR	-10 14.5	-60 56.1	14475	14245	-2574	-26045	29797	Q	HDZF
MAY	-10 13.7	-60 56.9	14468	14238	-2569	-26044	29794	Q	HDZF
JUN	-10 12.6	-60 57.2	14466	14237	-2564	-26046	29793	Q	HDZF
JUL	-10 11.8	-60 56.9	14466	14238	-2561	-26043	29791	Q	HDZF
AUG	-10 11.3	-60 57.3	14463	14235	-2558	-26044	29791	Q	HDZF
SEP	-10 10.1	-60 57.5	14460	14233	-2553	-26042	29787	Q	HDZF
OCT	-10 09.3	-60 57.3	14462	14235	-2550	-26042	29788	Q	HDZF
NOV	-10 08.9	-60 57.5	14459	14233	-2548	-26039	29784	Q	HDZF
DEC	-10 07.8	-60 57.5	14460	14235	-2543	-26042	29789	Q	HDZF
YEAR	-10 12.2	-60 56.8	14468	14239	-2563	-26044	29793	Q	HDZF
JAN	-10 17.0	-60 57.4	14466	14234	-2582	-26052	29798	D	HDZF
FEB	-10 15.6	-60 57.3	14467	14235	-2577	-26049	29798	D	HDZF
MAR	-10 14.4	-60 57.5	14463	14233	-2571	-26048	29795	D	HDZF
APR	-10 13.7	-60 58.3	14456	14226	-2567	-26049	29792	D	HDZF
MAY	-10 12.8	-60 58.6	14452	14223	-2562	-26047	29787	D	HDZF
JUN	-10 12.2	-60 57.2	14465	14236	-2562	-26046	29793	D	HDZF
JUL	-10 11.4	-60 58.4	14453	14226	-2557	-26045	29786	D	HDZF
AUG	-10 10.8	-60 58.1	14455	14228	-2555	-26045	29788	D	HDZF
SEP	-10 09.4	-60 58.6	14450	14224	-2548	-26044	29784	D	HDZF
OCT	-10 08.7	-60 59.2	14445	14219	-2544	-26045	29781	D	HDZF
NOV	-10 07.6	-61 00.0	14437	14212	-2538	-26045	29778	D	HDZF
DEC	-10 07.7	-60 59.4	14443	14218	-2540	-26045	29779	D	HDZF
YEAR	-10 11.8	-60 58.3	14454	14226	-2559	-26047	29788	D	HDZF

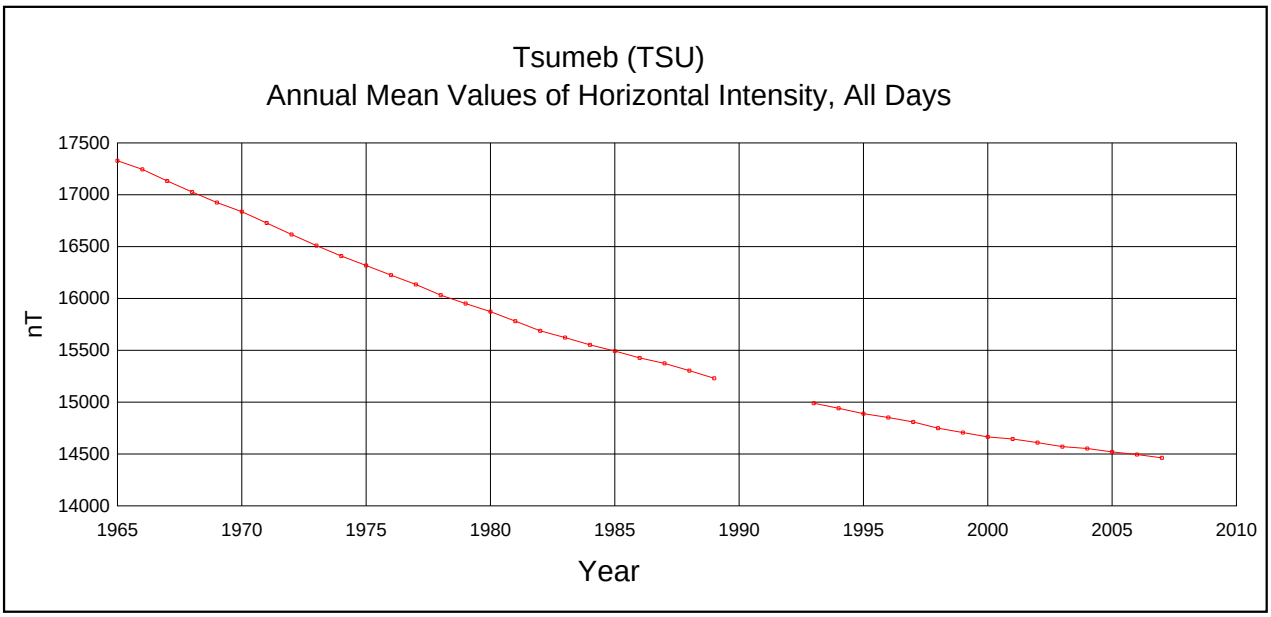
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

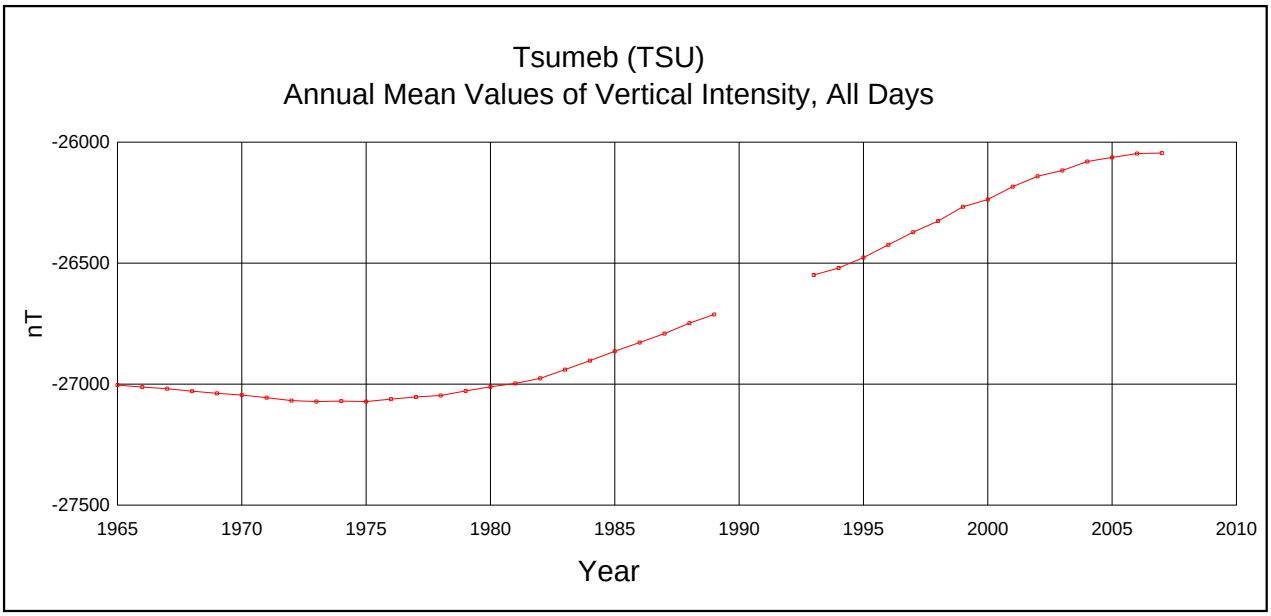
TSUMEB
MEAN ANNUAL VALUES

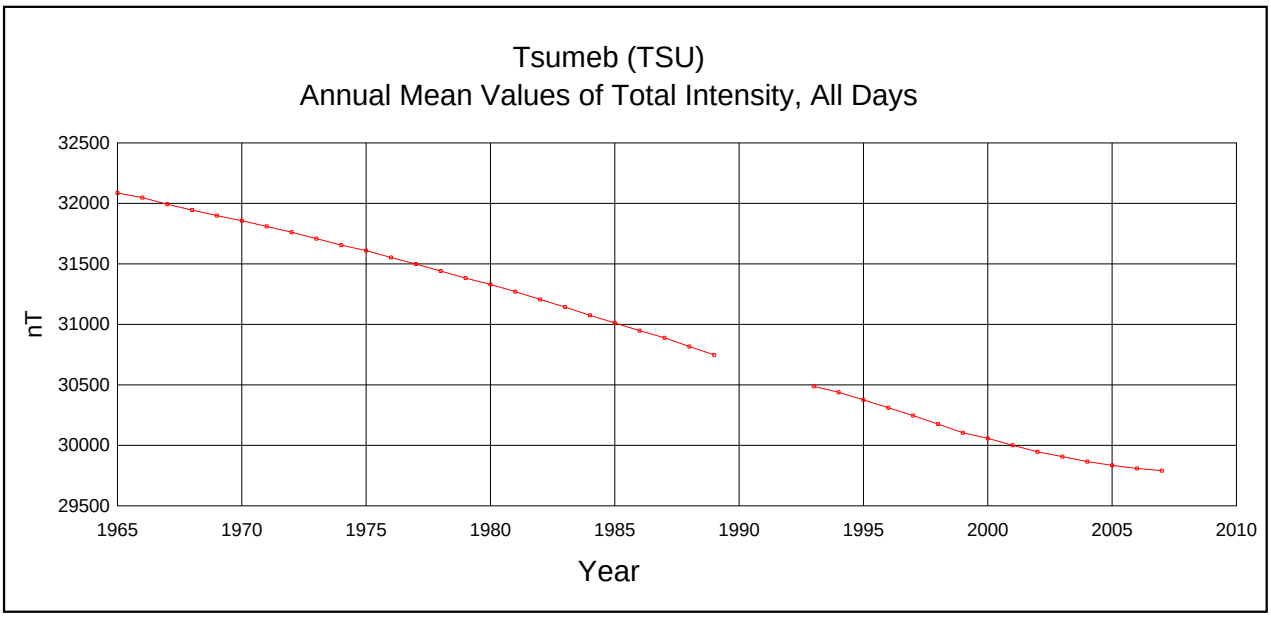
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1965.5	-15 57.4	-57 18.8	17328	16660	-4764	-27004	32086	I	DHZ
1966.5	-15 53.8	-57 26.7	17245	16585	-4724	-27012	32048	I	DHZ
1967.5	-15 48.6	-57 37.3	17133	16484	-4668	-27019	31993	A	DHZ
1968.5	-15 43.4	-57 47.5	17027	16389	-4614	-27029	31945	I	DHZ
1969.5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

*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

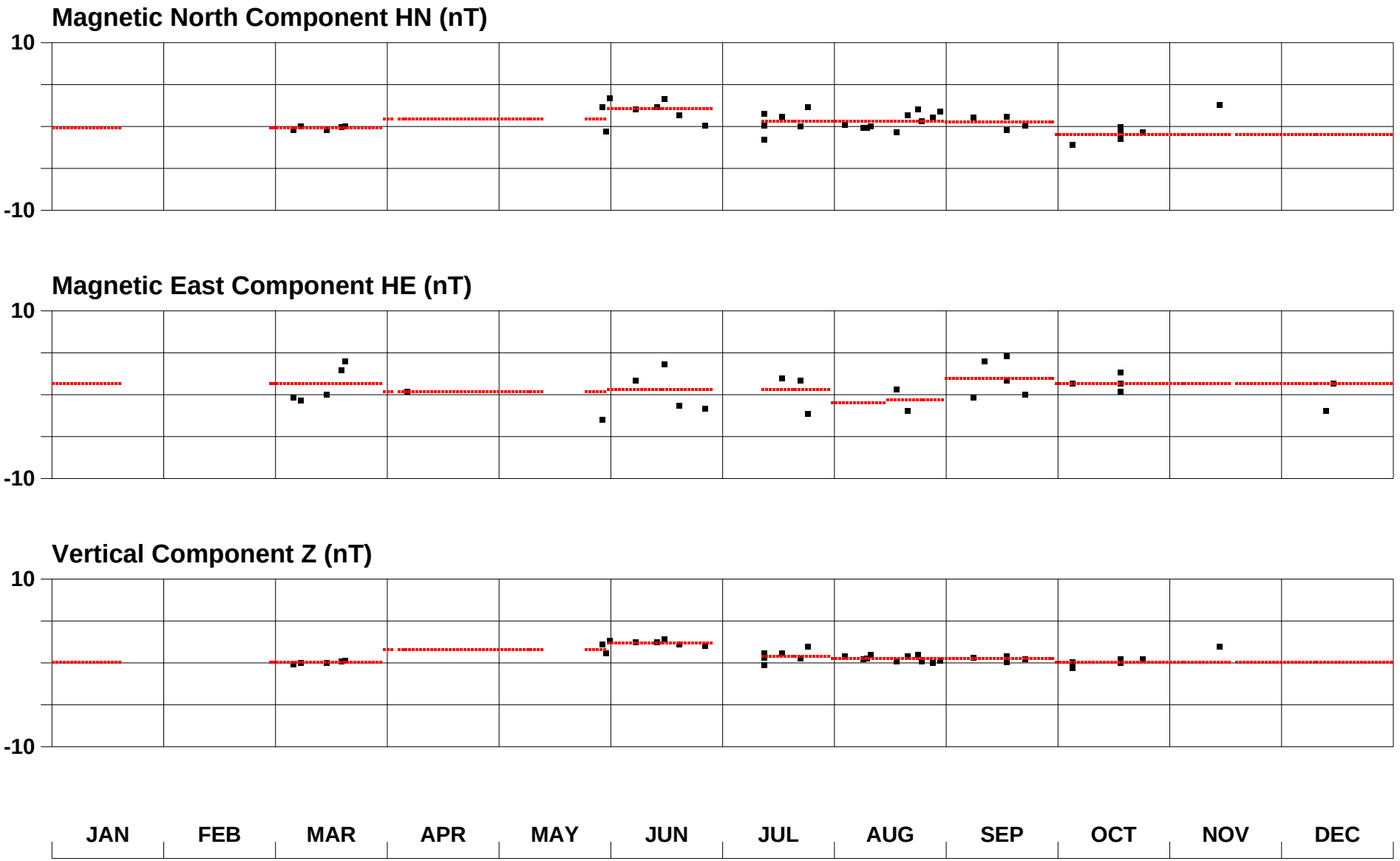
Magnetic Results 2007

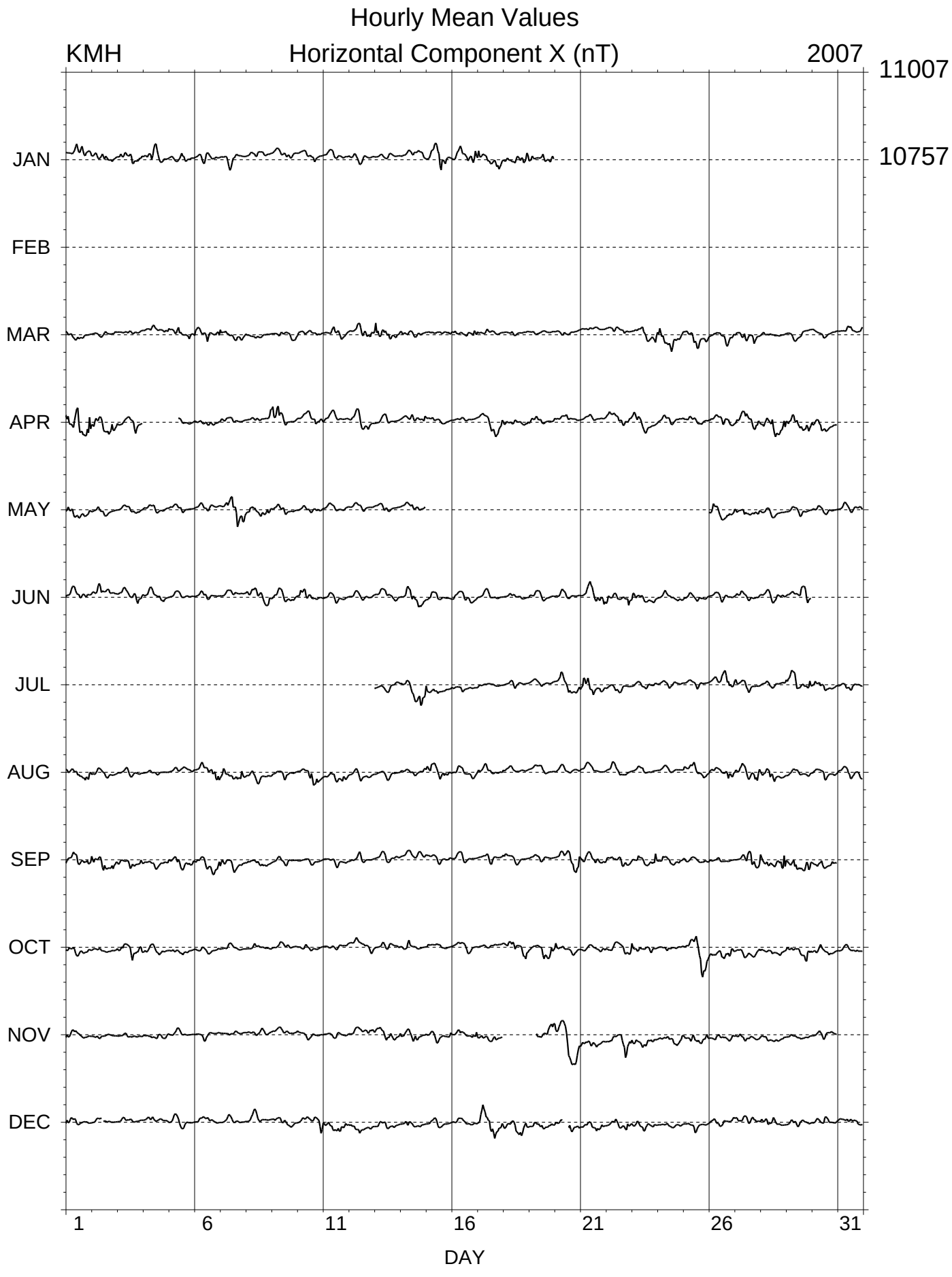
Keetmanshoop

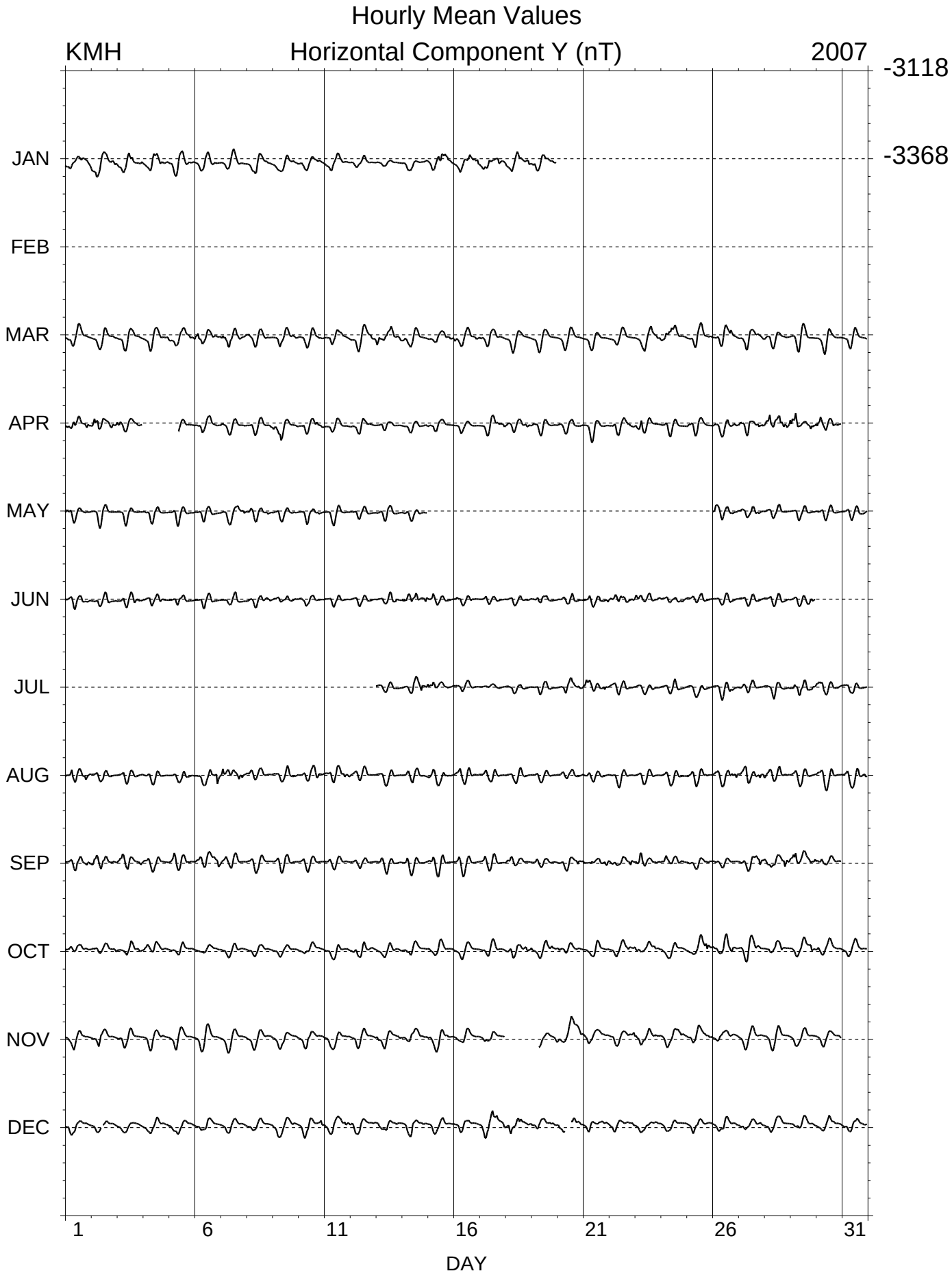
Observed and Adopted Baseline Values, KMH 2007

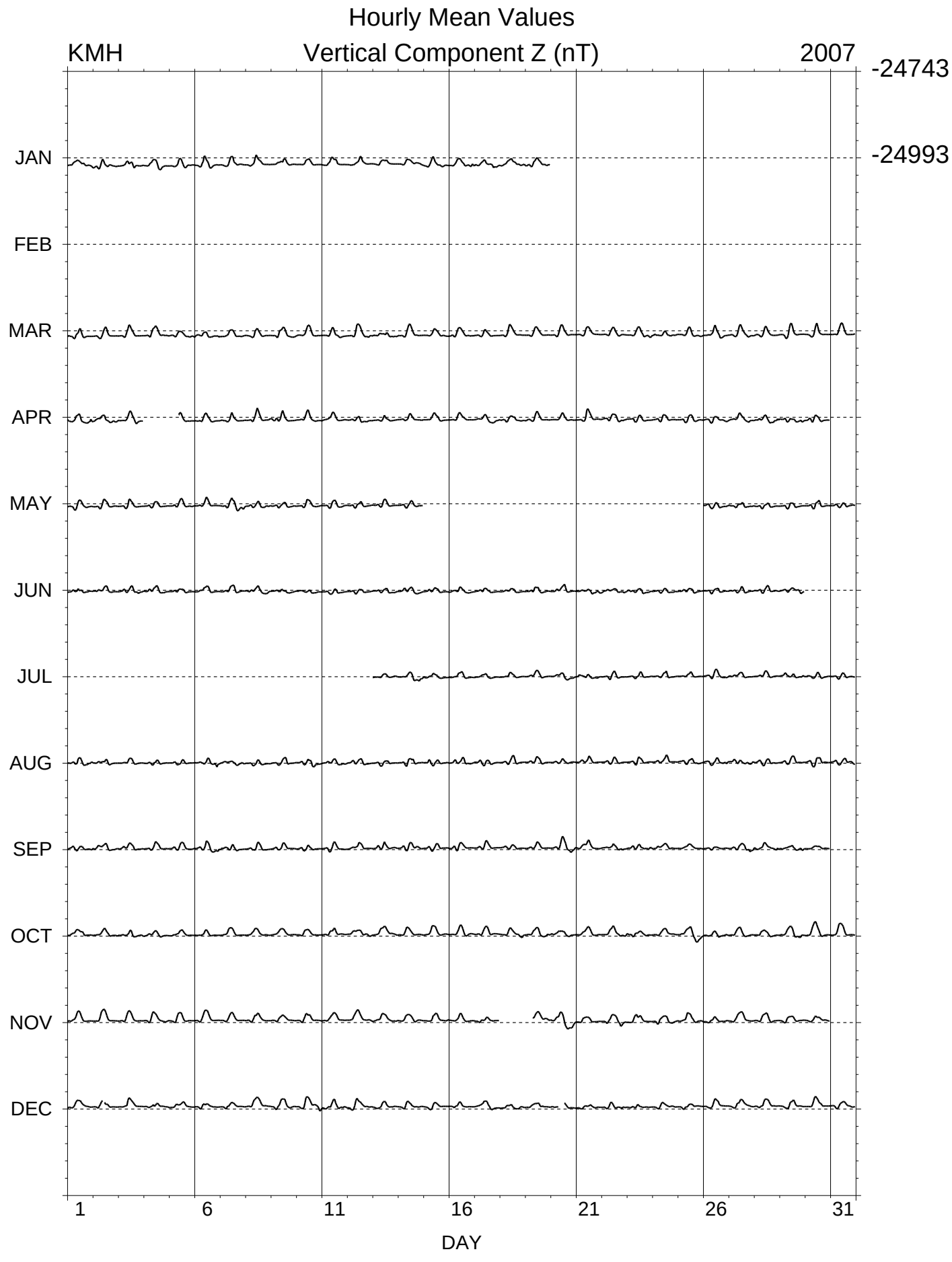
LAT: 116.541 LONG: 18.110

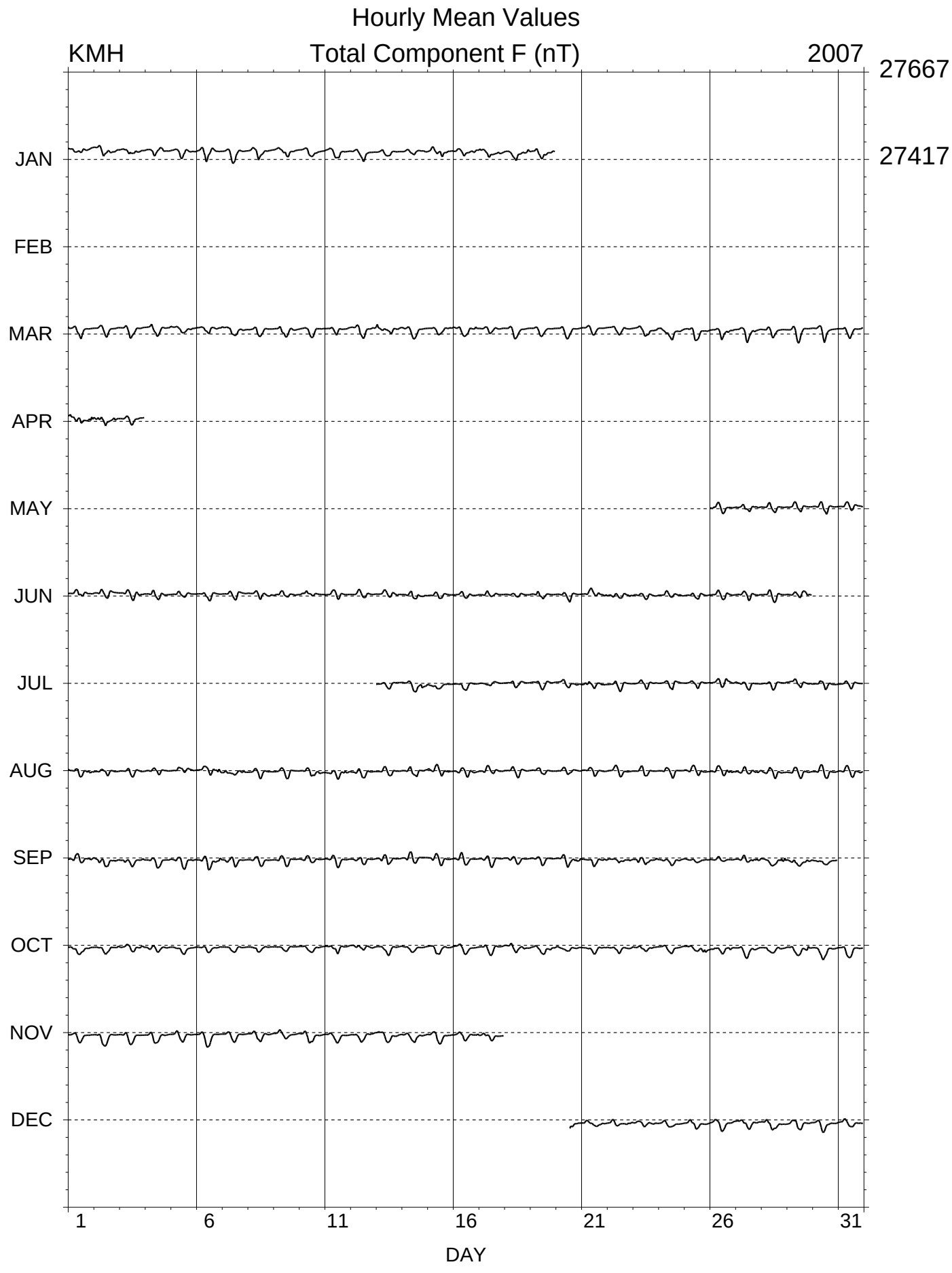
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
KMH
Horizontal Component X (nT)
2007
11007
10757
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)
2007
-3118
-3368
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)
2007
-24743
-24993
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)
2007
27667
27417
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

KEETMANSHOOP
MEAN MONTHLY VALUES 2007

Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-17 25.7	-65 42.8	11285	10767	-3380	-25010	27439	A	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	A	HDZF
MAR	-17 25.1	-65 43.3	11278	10761	-3376	-25002	27428	A	HDZF
APR	-17 24.8	-65 43.1	11278	10761	-3375	-24999	27423	A	HDZF
MAY	-17 24.7	-65 43.5	11274	10758	-3374	-24998	27422	A	HDZF
JUN	-17 23.4	-65 43.0	11277	10762	-3371	-24995	27421	A	HDZF
JUL	-17 23.5	-65 43.6	11271	10756	-3369	-24992	27416	A	HDZF
AUG	-17 23.4	-65 43.3	11273	10757	-3369	-24991	27415	A	HDZF
SEP	-17 22.3	-65 43.6	11269	10755	-3364	-24988	27411	A	HDZF
OCT	-17 21.7	-65 43.8	11266	10753	-3362	-24986	27408	A	HDZF
NOV	-17 21.7	-65 43.7	11266	10753	-3362	-24984	27407	A	HDZF
DEC	-17 21.3	-65 43.4	11269	10756	-3361	-24984	27406	A	HDZF
YEAR	-17 23.3	-65 43.4	11273	10758	-3369	-24993	27417	A	HDZF
JAN	-17 25.6	-65 43.1	11283	10765	-3379	-25009	27436	Q	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
MAR	-17 25.4	-65 42.7	11283	10765	-3378	-25001	27429	Q	HDZF
APR	-17 24.9	-65 42.3	11284	10767	-3377	-24997	*****	Q	HDZF
MAY	-17 24.5	-65 42.9	11279	10762	-3374	-24997	*****	Q	HDZF
JUN	-17 23.7	-65 42.9	11278	10762	-3372	-24996	27422	Q	HDZF
JUL	-17 23.6	-65 42.7	11277	10762	-3371	-24991	27417	Q	HDZF
AUG	-17 23.8	-65 42.9	11276	10761	-3372	-24991	27416	Q	HDZF
SEP	-17 22.5	-65 43.3	11271	10757	-3366	-24988	27412	Q	HDZF
OCT	-17 21.8	-65 43.0	11273	10759	-3364	-24985	27410	Q	HDZF
NOV	-17 22.1	-65 43.0	11271	10757	-3365	-24981	27406	Q	HDZF
DEC	-17 21.1	-65 42.7	11275	10762	-3362	-24983	27406	Q	HDZF
YEAR	-17 23.4	-65 42.8	11277	10761	-3370	-24992	27417	Q	HDZF
JAN	-17 26.8	-65 43.6	11281	10762	-3382	-25014	27440	D	HDZF
FEB	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
MAR	-17 24.8	-65 43.9	11273	10756	-3374	-25004	27428	D	HDZF
APR	-17 24.5	-65 44.3	11268	10752	-3371	-25000	27423	D	HDZF
MAY	-17 24.9	-65 43.5	11275	10758	-3374	-24999	*****	D	HDZF
JUN	-17 23.4	-65 43.0	11277	10761	-3371	-24995	27421	D	HDZF
JUL	-17 23.3	-65 43.9	11268	10753	-3367	-24993	27415	D	HDZF
AUG	-17 23.4	-65 43.8	11269	10754	-3368	-24992	27415	D	HDZF
SEP	-17 22.0	-65 44.3	11263	10749	-3362	-24988	27409	D	HDZF
OCT	-17 21.9	-65 44.8	11258	10745	-3360	-24988	27407	D	HDZF
NOV	-17 21.3	-65 45.5	11251	10739	-3356	-24987	*****	D	HDZF
DEC	-17 21.4	-65 44.5	11260	10747	-3359	-24986	27407	D	HDZF
YEAR	-17 23.2	-65 44.2	11266	10752	-3367	-24994	27418	D	HDZF

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