Hermanus Magnetic Observatory

A facility of the National Research Foundation

Magnetic Results 2001

Hermanus, Hartebeesthoek and Tsumeb observatories

1. INTRODUCTION

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

This yearbook presents the results of the magnetic measurements carried out at these observatories during 2001.

2. DESCRIPTION OF THE OBSERVATORIES

The locations of the magnetic observatories are as follows:

Observatory	Geographic Coordinates		Geomagnetic Coordinates		Elevation
	Latitude	Longitude	Latitude	Longitude	m
Hermanus	34° 25' 30" S	19° 13' 30" E	42° 31' S	82° 49' E	26
Hartebeesthoek	25° 52' 58" S	27° 42' 25" E	33° 32' S	94° 55' E	1428
Tsumeb	19° 12' 08" S	17° 35' 03" E	27° 54' S	86° 23' E	1273

Geomagnetic coordinates given are relative to a geomagnetic north pole position of 81.2° N, 110.5° W, computed from the IGRF model (degree 10) at the epoch 2001.5.

3. ABSOLUTE MEASUREMENTS

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

3.1 DI-Flux

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

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

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

The DI-flux consists of a ZEISS non-magnetic theodolite type THEO 010B (at Hermanus) and a THEO 015B (at Hartebeesthoek and Tsumeb) and a single-axis fluxgate sensor mounted on top of the telescope and electronics from Bartington. The DI-flux is considered to be an absolute instrument, which means that the angles

measured by the instrument do not deviate from the true values *D* and *I*. This is achieved by using an observation procedure which eliminates the unknown parameters such as sensor offset, collimation angles and theodolite errors.

The following azimuth values were used at each observatory.

Observatory	Mark	Azimuth value
Hermanus	HMO Beacon	342° 20' 31"
Hartebeesthoek	Red-white pole	177° 45' 09"
Tsumeb	Max Planck	015° 55' 06"

3.2 Proton Magnetometer

The proton precession magnetometer which is an integral part of the proton vector magnetometer is used for the continuous recording of total intensity data, F. See 4.2.3 below.

3.2.1 F pillar corrections

At Hermanus *D* and *I* are measured on pillar no. 1 in the Absolute House and at Hartebeesthoek and Tsumeb *D* and *I* are measured in the so-called "Standard Huts", while *F* is measured by the integral Geometrics magnetometer of the PVM system some distance away. The site differences have been measured which enable the *F* measurements to be reduced to the absolute pillar:

$$F_{\text{absolute pillar}} = F_{\text{ppm}} + \Delta F_{\text{pillar}}$$

The following are the adopted values for the year:

Site differences of ΔF_{pillar}					
Hermanus		Hartebeesthoek		Tsumeb	
Period (Day numbers)	Correction	Period (Day numbers)	Correction	Period (Day numbers)	Correction
1 – 31	18.0 nT	1 – 52	70.0 nT	1 – 365	17.6 nT
32 – 59	18.2 nT	53 – 242	69.5 nT		
60 – 90	18.3 nT	243 - 365	69.8 nT		
91 – 120	18.4 nT				
121 – 151	18.6 nT				
152 – 181	18.8 nT				
182 – 212	19.0 nT				
213 – 243	19.1 nT				
244 – 273	18.9 nT				
274 – 304	18.8 nT				
305 – 334	18.7 nT				
335 – 365	18.6 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
Bandpass	DC to 1 Hz

4.2 PVM Magnetometer

A Proton Vector Magnetometer (PVM) is also in use. It consists of a Proton Precession Magnetometer (PPM) mounted in the centre of a set of coils which are used to apply bias fields to the magnetometer.

4.2.1 Overall Instrument Description

The PVM consists of a proton precession magnetometer, a dual four-coil combination, electronics unit and a personal computer.

The electronics unit houses the PPM, current control, DC power supply and interfacing hardware. The PC computer serves as the instrument controller and data logger.
The PPM sensor is mounted inside the coil combination. The coils are positioned such that additional field vectors can be applied in the horizontal and vertical planes perpendicular to the total field vector (*F*). A stable current is passed through each coil set individually to apply the additional vectors first in a forward and then in a

reverse direction. At each of these steps the resulting vector length is determined by taking a PPM reading. This is used to calculate the *H, D* and *Z* components of the ambient magnetic field.

A stable current through the coils is obtained using a series connected current load. Current switching is controlled through a digital I/O port on the computer.

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, H, D* and *Z* can be derived. These are calculated by the computer and is available on the screen and line printer. A graphic display of the last 24 hours recorded data is also available. Unprocessed data are stored on disk every 5 minutes.

4.2.2 Sensor

The sensor consists of two four-coil combinations (*D* and *I*) mounted orthogonally with the PPM sensor in the middle. Each coil set consists of four equiradial circular coils on aluminium formers mounted coaxially. Each is a Barker 52/23 type with coil distances calculated for optimum homogeneity over the volume of the PPM sensor.

4.2.3 Proton Precession Magnetometer (PPM)

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.

4.3 dIdD Magnetometer

The dIdD has a completely integrated design for measuring the Earth’s magnetic field by a sequence of measuring the total magnetic field and then four biased values of the magnetic field with an integral Overhauser magnetometer based on GEM Systems GSM-19 Model.

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 difference between the coil axes and the direction of the earth vector to compute *H* and *Z* components.

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

The measuring range is 20,000-120,000 nT, the sensitivity 0.02 nT, resolution 0.01 nT and the absolute accuracy 0.2 nT. 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 Loràǹd 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 quality of the Hartebeesthoek and Tsumeb base-line values are not good due to environmental conditions, not properly trained observers, etc. In order to improve the base-line values an analysis of the night levels of Hermanus data versus Hartebeesthoek (or Tsumeb) were done. Whenever large deviations were detected in the data, the base-line values were adjusted and new one-minute data computed. This is particularly visible in the graphs where the adopted base-line values are not representative of the observed values.

5.1 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 12 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.

5.2 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 are 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.

5.3 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

6.4.1 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.

6.4.2 *am* Indices

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

6.4.3 Dst indices

The Hermanus Magnetic Observatory also supplies one-minute data for the generation of the Dst ring-current index, which is the most commonly used measure of geomagnetic storm intensity.

7. RAPID VARIATIONS

The supply of rapid variations as recorded at the Hermanus Magnetic Observatory is performed according to guidelines given in the "*Provisional Atlas of Rapid Variations (IAGA, 1961)* ". Occurrences of Solar Flare Effects (SFEs) and Storm Sudden Commencements (SSCs) are identified for publication in "*Solar-Geophysical Data*". Only SSC data for Hermanus are included in this publication.

8. DATA AVAILABILITY

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

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

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

http://www.intermagnet.org

9. CONTACT INFORMATION

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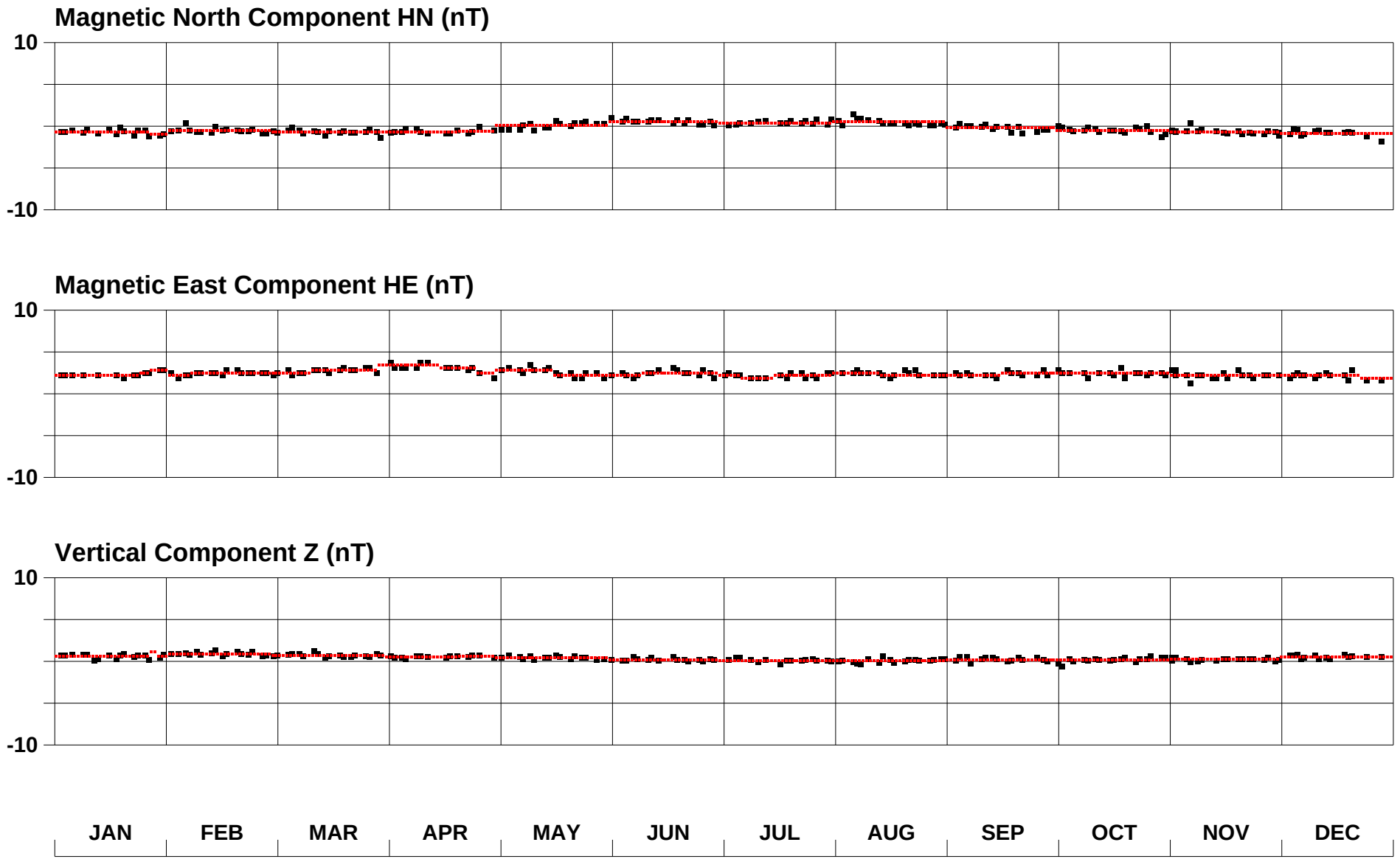
Magnetic Results 2001

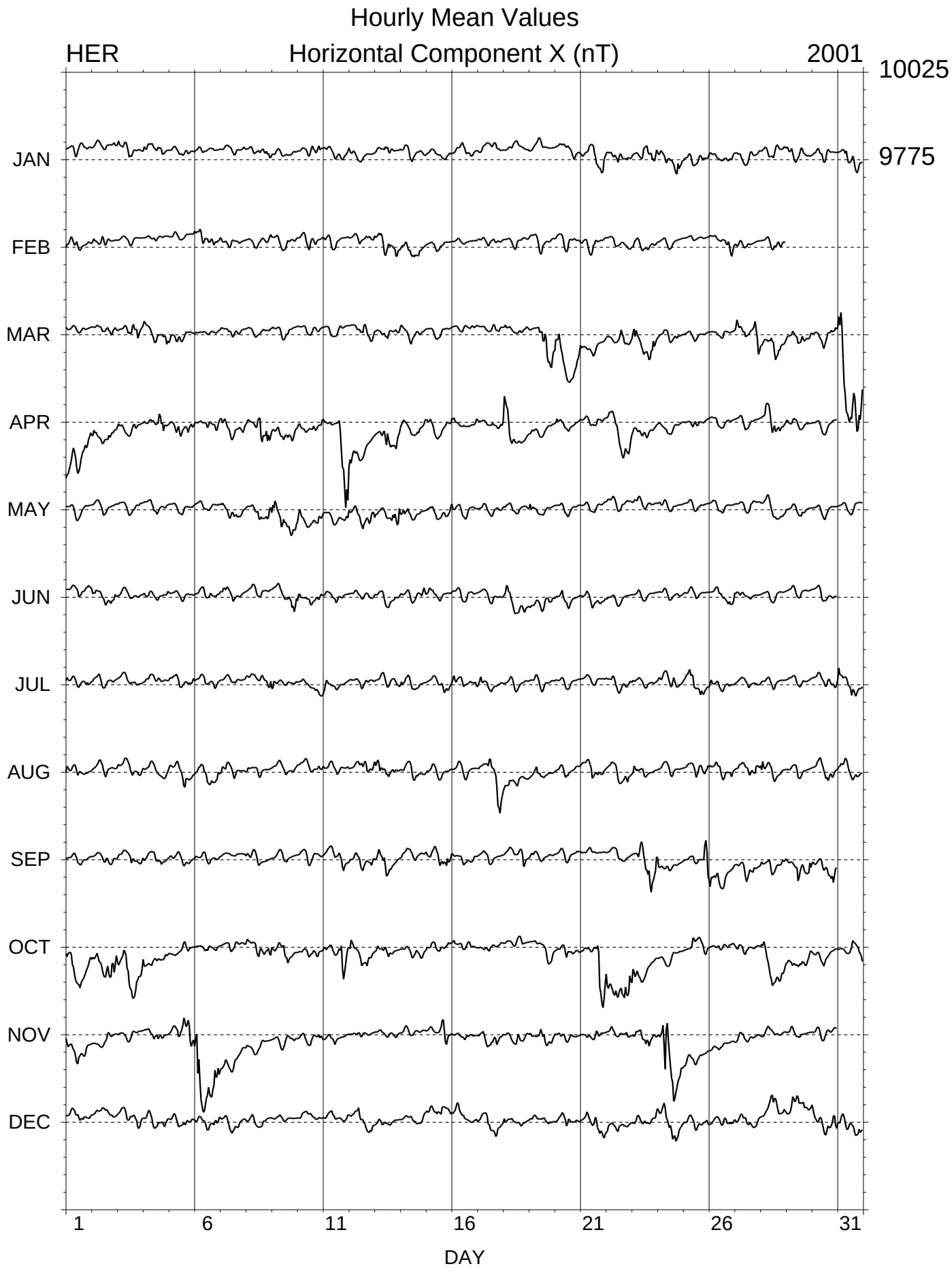
Hermanus

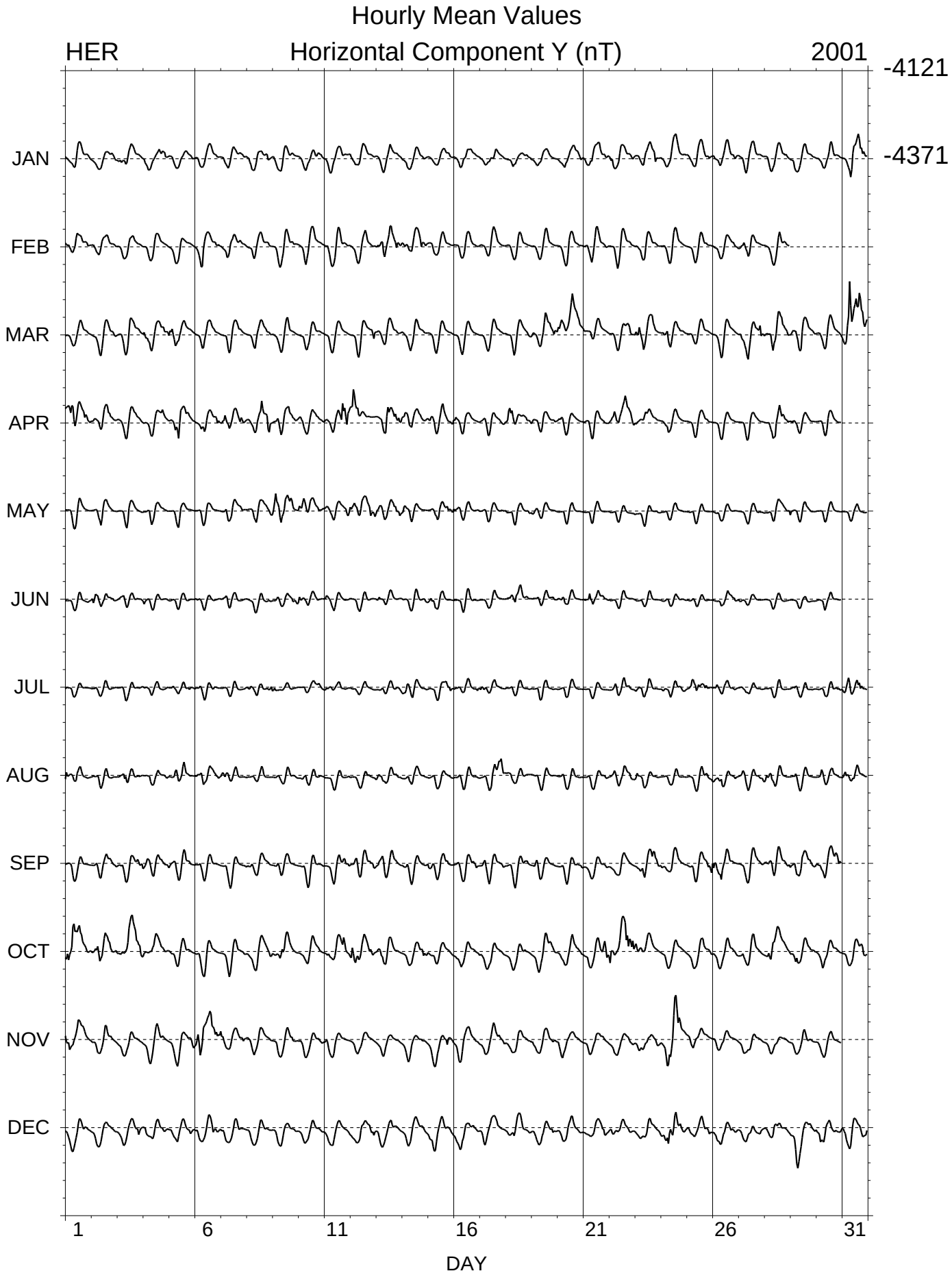
Observed and Adopted Baseline Values, HER 2001

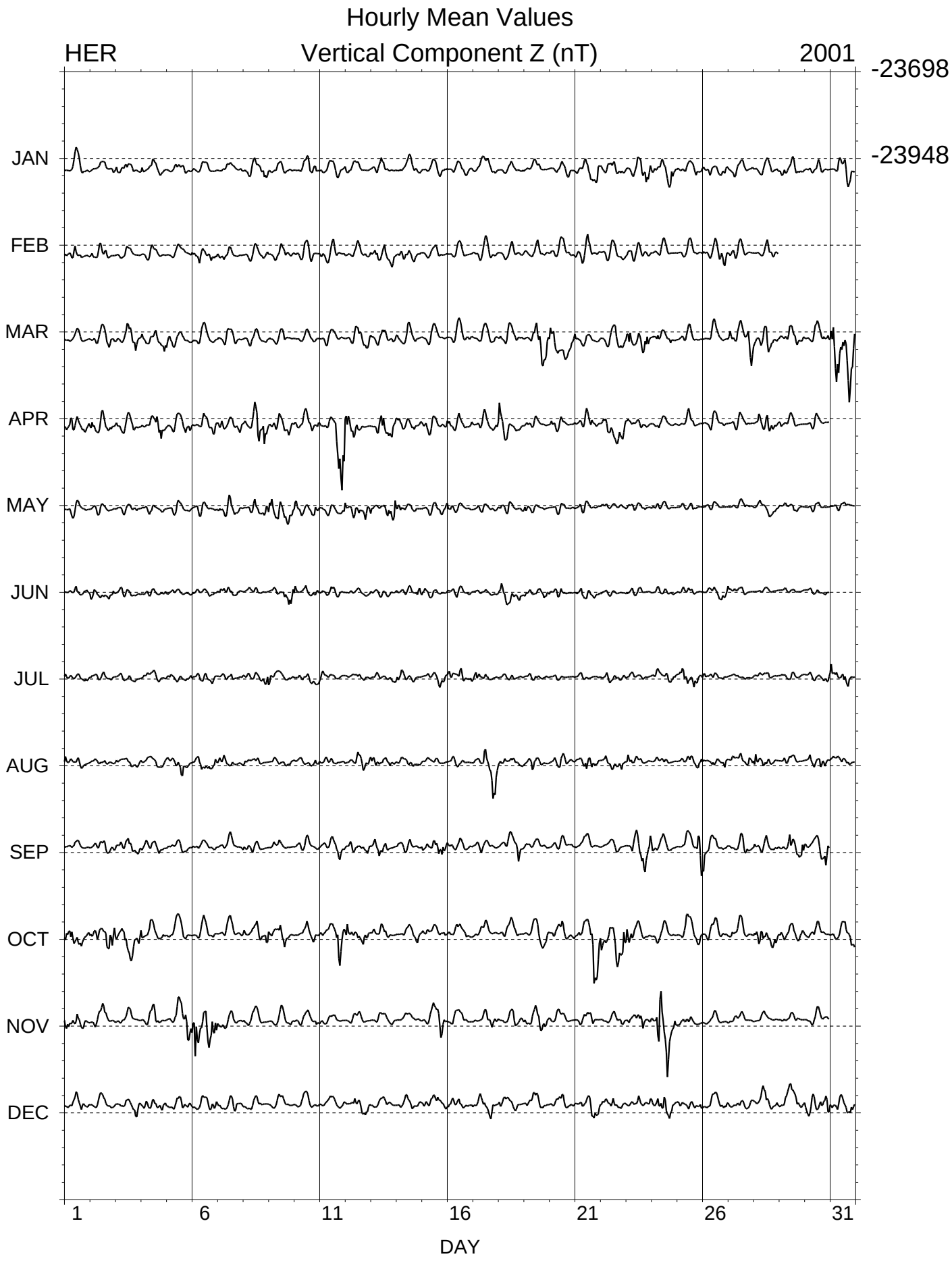
LAT: 124.425 LONG: 19.225

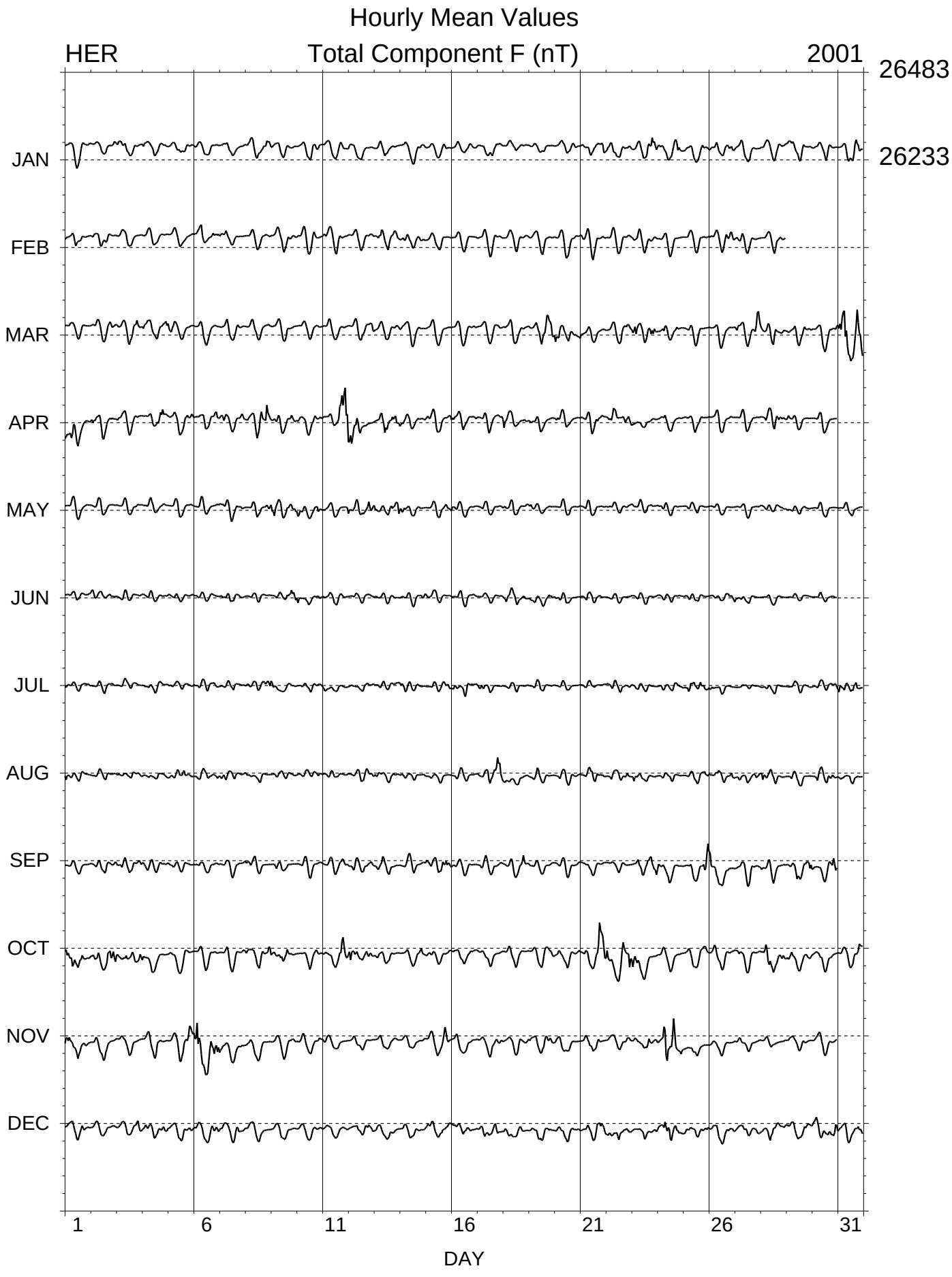
INSTITUTION: HMO INSTRUMENT: LC

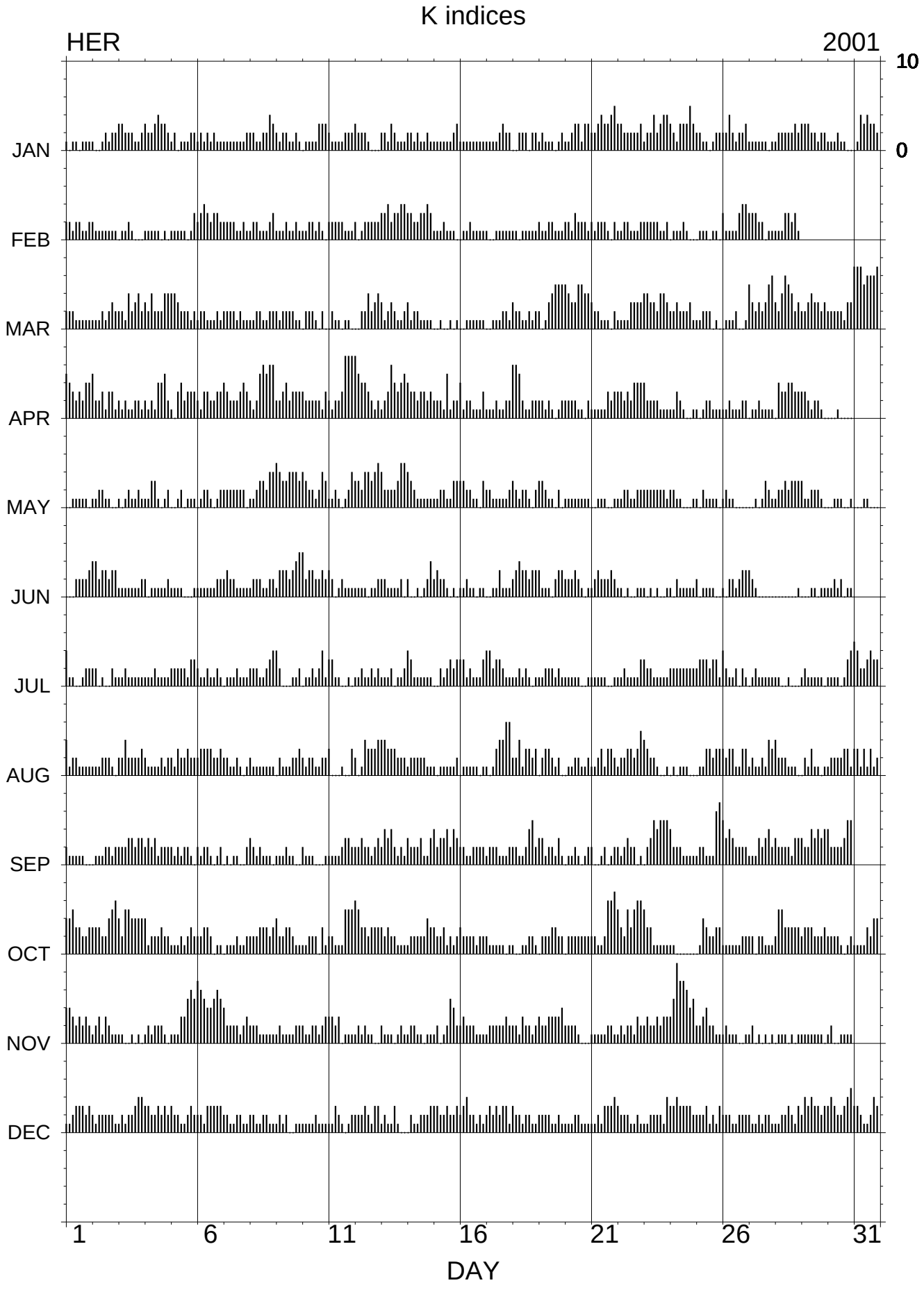



Hourly Mean Values
HER
Horizontal Component X (nT)
2001
10025
9775
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


Hourly Mean Values
HER
Horizontal Component Y (nT)
2001
-4121
-4371
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)
2001
-23698
-23948
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)
2001
26483
26233
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY


K indices
HER
2001
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 — 2001

DATE	JAN	FEB	MAR	APR	MAY	JUN
01	1011 0111	2212 2112	2221 1111	5432 3244	0011 1110	0002 2223
02	1001 2122	2111 1111	1112 1232	5223 1331	1122 1100	4423 3233
03	3322 2112	0112 1000	2214 2342	2121 1221	1012 1121	1111 1112
04	3223 4332	1111 1010	3242 2244	2121 4452	1133 1012	2011 1112
05	1201 1122	1111 1013	4432 2212	1034 2333	0012 0111	1111 0001
06	1212 1211	2343 2332	1221 1121	2133 2233	0122 1012	1111 1122
07	1111 1112	2222 1121	2222 1211	4322 2343	2222 2220	2322 1111
08	2211 2243	1221 1123	1122 1122	2125 6566	1123 3244	1222 1122
09	2122 1121	1112 1121	2122 2211	2234 2333	5433 4443	1333 2345
10	0111 1333	1122 1210	0222 1020	3222 2213	4322 1243	5233 2232
11	2111 1222	2222 2111	0211 0110	2122 3777	1121 0124	3201 2111
12	3222 1000	2012 2222	0022 4234	7544 3212	3324 4345	1111 0112
13	2213 2111	3342 3344	3123 2112	1236 4345	4222 2355	2211 1120
14	2212 1121	3322 3343	3122 1111	4332 3323	4321 1111	2001 0124
15	1111 1123	1112 1110	0010 0101	2221 5122	1122 1133	2322 1010
16	1111 1111	0112 1111	0011 1111	4122 1113	3322 1103	1121 1011
17	1111 2322	1001 1111	0011 1221	1112 1122	2211 1112	0011 3111
18	0022 2022	1101 1111	3221 1212	6652 1122	3212 2102	2343 3233
19	1211 1012	2112 2111	2013 4555	2212 1012	3321 1020	3111 0233
20	1123 3133	2213 2221	5433 5544	2222 1102	1111 1111	2223 2101
21	2234 3345	2122 2102	3221 1102	1111 1323	0011 1001	1232 2232
22	3322 2223	1122 1112	1111 3333	3323 2444	1122 1122	1101 0011
23	1224 2344	2222 2112	4433 2443	4222 2111	2222 2221	1010 1001
24	3213 3353	0111 2100	2232 2231	1132 1001	2211 0001	1021 1111
25	2211 0122	0111 0110	1122 2010	1012 2111	1021 1110	2011 1100
26	2242 1223	3111 1344	0111 2001	1121 1122	1211 0000	1022 1233
27	1111 1101	3332 2011	5323 2356	0112 1111	0010 1321	3210 0000
28	1222 2232	1113 3231	3246 5423	0433 4433	1223 2333	0000 0001
29	3332 2122		2234 3323	3321 2210	3112 2210	0001 1011
30	1112 1100		2222 2133	0001 0000	0011 1001	1121 2011
31	0143 4332		7775 6667		0001 1000	

	JUL	AUG	SEP	OCT	NOV	DEC
01	4110 0122	4122 1111	2111 1100	4453 3223	4432 3232	1123 3323
02	2201 0021	1112 2210	0111 2212	3332 2456	1231 3211	2122 2221
03	1121 1111	2242 2223	2223 3233	4255 4444	1100 1010	1212 2344
04	1112 1111	2111 1212	2323 1222	4122 2322	1212 2210	3322 3232
05	2222 2133	2132 2322	2121 2210	1112 1232	1113 3565	3221 1232
06	2112 1121	2333 3223	2122 1012	2233 2011	7654 4565	2213 3333
07	0111 2111	2211 2101	0101 1002	0111 2112	4222 2123	2211 2211
08	2221 1234	2111 1111	3212 1110	2223 3323	2221 1111	2211 2211
09	4200 0112	0211 1223	1112 1100	4223 3211	1211 1122	1212 0011
10	0112 1241	2122 1122	2111 0001	1122 2031	2112 2123	1111 2111
11	3311 0010	3000 1003	1111 2332	2211 1555	3323 0111	1132 1012
12	1121 1212	2014 3334	2232 2123	6533 2333	1212 1100	2223 2133
13	1112 0112	4433 3222	2434 2121	3232 2111	2111 0121	1211 3100
14	4311 1111	1222 2211	3222 3113	1222 2243	1221 1011	0211 2223
15	0021 2323	1011 1112	4233 4243	3223 1212	1201 2542	3322 3223
16	3312 1113	0111 1101	2211 2222	3222 2122	2322 2111	2342 2121
17	4423 3211	1013 4466	1222 1112	2111 1101	1222 2232	2323 2331
18	1121 2101	2241 3323	2211 2452	1001 1221	2213 2212	3221 2211
19	1122 2121	0233 2120	3312 2131	0222 3322	3223 3334	2222 1121
20	1111 1001	0112 2112	0112 1012	0222 2222	2222 1000	1112 2111
21	1111 1001	1123 1332	2001 2012	2211 2667	1111 1221	1121 3334
22	1121 1113	1223 3235	2123 2201	5325 3566	1212 2132	3222 1121
23	3221 1111	4322 1001	0235 4555	5331 1111	2322 3233	1122 2214
24	2222 2222	0101 1100	4222 1111	1100 0000	3597 7645	3343 3332
25	2333 2331	0113 3233	1221 1167	0143 2233	2234 2211	2223 1213
26	4211 2021	3233 1133	5343 2222	1111 1122	1211 1001	2221 1222
27	0121 1111	1211 2143	1113 2342	2202 2111	1201 0101	2112 1221
28	1100 1000	4222 1110	3222 2133	2553 3333	0111 0101	1122 3213
29	1211 1110	0213 1101	3224 3434	2333 2223	1111 1110	2434 3323
30	1111 0134	1222 2331	4222 2355	2222 1012	1200 1111	3432 2345
31	5422 3433	3313 1312		1111 3244		3321 1243

Principal Magnetic Storms – Hermanus 2001

Commencement					SC amplitudes			Maximum 3 hr. K-index		Ranges			U.T. End	
Mth.	Day	Hr.	Min.	Type	D(′)	H(nT)	Z(nT)	Day (3 hr. periods)	K	D(′)	H(nT)	Z(nT)	Day	Hr.
Jan.	20	05	--	..	..	..	..	21(8)	5	28	100	92	22	24
	23	10	49	ssc	+3	+34	+29	24(7)	5	30	90	103	25	06
	31	08	06	ssc	-5*	+34	+15	31(3,5)	4	36	114	105	01	13
Feb					NO DISTURBANCES RECORDED									
Mar.	03	11	26	ssc*	+6	-18	+20	03(4,7),04(3,7,8)05(1,2)	4	30	79	108	05	13
	19	11	--	..	..	..	..	19(6,7,8),20(1,5,6)	5	39	212	156	21	04
	22	13	46	ssc	+4*	+21	+20	23(1,2,6,7)	4	30	124	100	24	19
	27	01	--	..	..	..	..	27(8)	6	34	124	153	27	24
	28	07	--	..	..	..	..	28(4)	6	38	154	117	28	24
	29	05	--	..	..	..	..	29(4)	4	32	68	74	29	24
	31	00	56	ssc	+11	+116	+112	31(1,2 ,3, 8)	7	62	444	326	02	04
Apr.	04	14	56	ssc	+ 4	+37	+28	04(7)	5	14	68	29	04	24
	08	11	02	ssc	+3*	+38	+33	08(5,7,8)	6	46	131	170	10	18
	11	15	20	ssc	..	+19	+12	11(6,7,8),12(1)	7	78	289	322	12	15
	13	07	35	ssc	-6	+12	-4	13(4)	6	30	114	102	14	18
	18	00	48	ssc	+5	+46	+44	18(1,2)	6	41	154	133	18	12
	21	16	02	ssc	+1*	+15	+12	22(6,7,8),23(1)	4	28	154	96	23	15
	28	05	01	ssc	+9*	+30	+28	28(2,5,6)	4	28	122	70	29	06
May	08	07	--	..	..	..	..	09(1)	5	35	100	87	10	08
	12	09	--	..	..	..	..	12(8), 13(7,8)	5	26	96	85	14	08
Jun.	09	18	--	..	..	..	..	09(8),10(1)	5	23	63	93	10	04
	18	03	00	ssc	+3	+13	+16	18(3)	4	15	98	74	18	15
Jul.	30	19	--	..	..	..	..	31(1)	5	23	100	91	31	19
Aug.	03	07	18	ssc	+1	+20	+4	03(3)	4	9	22	20	03	09
	12	11	36	ssc	+1	+26	+34	12(4,8),13(1,2)	4	17	71	71	13	15
	17	11	04	ssc	+1	+23	+26	17(7,8)	6	27	208	186	18	08
	22	09	--	..	..	..	..	22(8)	5	17	84	60	23	08
	27	19	56	ssc	+2	+25	+20	27(7),28(1)	4	13	26	44	28	03
Sep.	14	02	06	ssc*	+3	+23	+18	14(1)	3	20	65	45	14	14
	18	15	--	..	..	..	..	18(7)	5	11	68	70	18	19
	23	06	--	..	..	..	..	23(4,6,7,8)	5	20	185	145	24	03
	25	20	26	ssc	+5	+53	+36	25(8)	7	32	170	196	26	11
	29	09	42	ssc*	..	+20	+20	20(4,6,8),30(1)	4	20	82	84	30	02
	30	17	--	..	..	..	..	30(7,8)	5	31	142	83	01	14
Oct.	02	18	--	..	..	..	..	02(8)	6	36	193	119	04	02
	11	17	00	ssc	+2	+28	+20	12(1)	6	33	163	186	12	12
	21	16	50	ssc	+4	+52	+30	21(8)	7	49	252	229	23	09
	28	03	18	ssc*	+4	+15	+17	28(2,3)	5	27	168	63	28	24
	31	13	50	ssc	+4	+20	+20	31(7,8)	4	27	104	91	01	13
Nov.	05	11	--	..	..	..	..	05(7)	6	27	102	166	06	01
	06	01	52	ssc	+15	+89	+80	06 (1)	7	47	321	193	07	02
	15	15	10	ssc	+3	+20	+18	15(6)	5	19	78	97	15	22
	19	18	18	ssc*	-2	+23	+12	19(8)	4	07	35	33	19	24
	24	05	--	..	..	..	..	24(3)	9	118	323	355	24	24
Dec.	23	23	16	ssc	+2	+25	+20	23(8)	4	22	141	77	24	21
	29	05	40	ssc*	-7	+40	+20	29(2,4)	4	39	97	72	29	18
	30	20	10	ssc*	+2	+39	+21	30(8)	5	21	69	76	31	09

ssc = sudden commencement; ssc* = small initial impulse followed by main pulse;
.. = gradual commencement.

Degree of activity: Moderate (when $K \leq 5$); Moderately severe (when K = 6 or 7);
Severe (when K = 8 or 9)

HERMANUS
MEAN MONTHLY VALUES 2001

Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-24 01.2	-65 54.0	10726	9797	-4366	-23978	26267	A	HDZF
FEB	-24 02.2	-65 54.1	10722	9792	-4367	-23971	26259	A	HDZF
MAR	-24 04.2	-65 56.4	10701	9771	-4364	-23967	26248	A	HDZF
APR	-24 05.4	-65 58.1	10686	9755	-4362	-23966	26240	A	HDZF
MAY	-24 05.3	-65 54.8	10709	9776	-4371	-23956	26240	A	HDZF
JUN	-24 05.5	-65 53.9	10714	9781	-4373	-23949	26236	A	HDZF
JUL	-24 05.7	-65 53.2	10717	9783	-4375	-23942	26232	A	HDZF
AUG	-24 06.2	-65 53.1	10715	9781	-4376	-23937	26226	A	HDZF
SEP	-24 07.0	-65 53.2	10711	9776	-4376	-23930	26218	A	HDZF
OCT	-24 08.2	-65 56.1	10688	9753	-4370	-23932	26210	A	HDZF
NOV	-24 09.5	-65 55.1	10696	9759	-4377	-23930	26212	A	HDZF
DEC	-24 07.7	-65 51.6	10721	9784	-4383	-23922	26214	A	HDZF
YEAR	-24 05.7	-65 54.5	10709	9776	-4372	-23948	26233	A	HDZF
JAN	-24 00.3	-65 52.6	10736	9808	-4368	-23975	26269	Q	HDZF
FEB	-24 01.7	-65 53.3	10728	9798	-4368	-23969	26261	Q	HDZF
MAR	-24 03.7	-65 53.6	10721	9789	-4371	-23959	26248	Q	HDZF
APR	-24 05.6	-65 56.2	10699	9767	-4368	-23959	26240	Q	HDZF
MAY	-24 05.4	-65 54.1	10715	9781	-4373	-23954	26241	Q	HDZF
JUN	-24 05.8	-65 53.5	10716	9783	-4375	-23946	26235	Q	HDZF
JUL	-24 05.7	-65 52.6	10721	9787	-4377	-23941	26232	Q	HDZF
AUG	-24 06.7	-65 52.5	10719	9784	-4379	-23934	26225	Q	HDZF
SEP	-24 06.8	-65 51.4	10724	9788	-4381	-23926	26219	Q	HDZF
OCT	-24 08.2	-65 52.9	10712	9775	-4380	-23925	26213	Q	HDZF
NOV	-24 08.6	-65 52.3	10716	9779	-4383	-23925	26215	Q	HDZF
DEC	-24 07.9	-65 51.2	10723	9786	-4384	-23919	26213	Q	HDZF
YEAR	-24 05.5	-65 53.0	10719	9785	-4376	-23944	26234	Q	HDZF
JAN	-24 01.6	-65 55.9	10712	9784	-4362	-23982	26266	D	HDZF
FEB	-24 02.3	-65 55.4	10713	9784	-4364	-23974	26259	D	HDZF
MAR	-24 06.2	-66 04.5	10642	9714	-4346	-23986	26241	D	HDZF
APR	-24 06.9	-66 01.8	10660	9730	-4355	-23977	26240	D	HDZF
MAY	-24 05.3	-65 57.7	10688	9757	-4362	-23961	26237	D	HDZF
JUN	-24 05.6	-65 55.3	10704	9772	-4370	-23954	26237	D	HDZF
JUL	-24 05.1	-65 53.5	10715	9782	-4372	-23942	26230	D	HDZF
AUG	-24 05.9	-65 54.5	10706	9773	-4372	-23944	26228	D	HDZF
SEP	-24 08.4	-65 55.9	10691	9756	-4372	-23934	26214	D	HDZF
OCT	-24 10.2	-66 03.0	10638	9706	-4356	-23949	26206	D	HDZF
NOV	-24 12.1	-66 02.0	10644	9708	-4364	-23944	26204	D	HDZF
DEC	-24 08.7	-65 53.5	10708	9771	-4380	-23928	26214	D	HDZF
YEAR	-24 06.5	-65 57.7	10685	9753	-4365	-23956	26231	D	HDZF

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

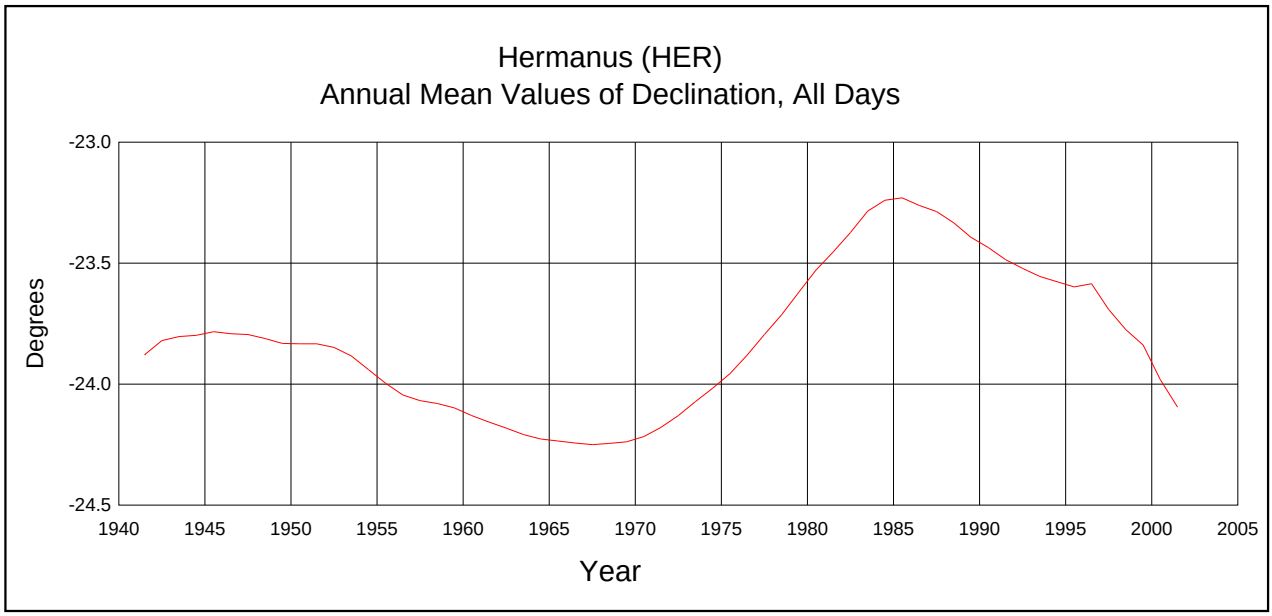
HERMANUS
MEAN ANNUAL VALUES

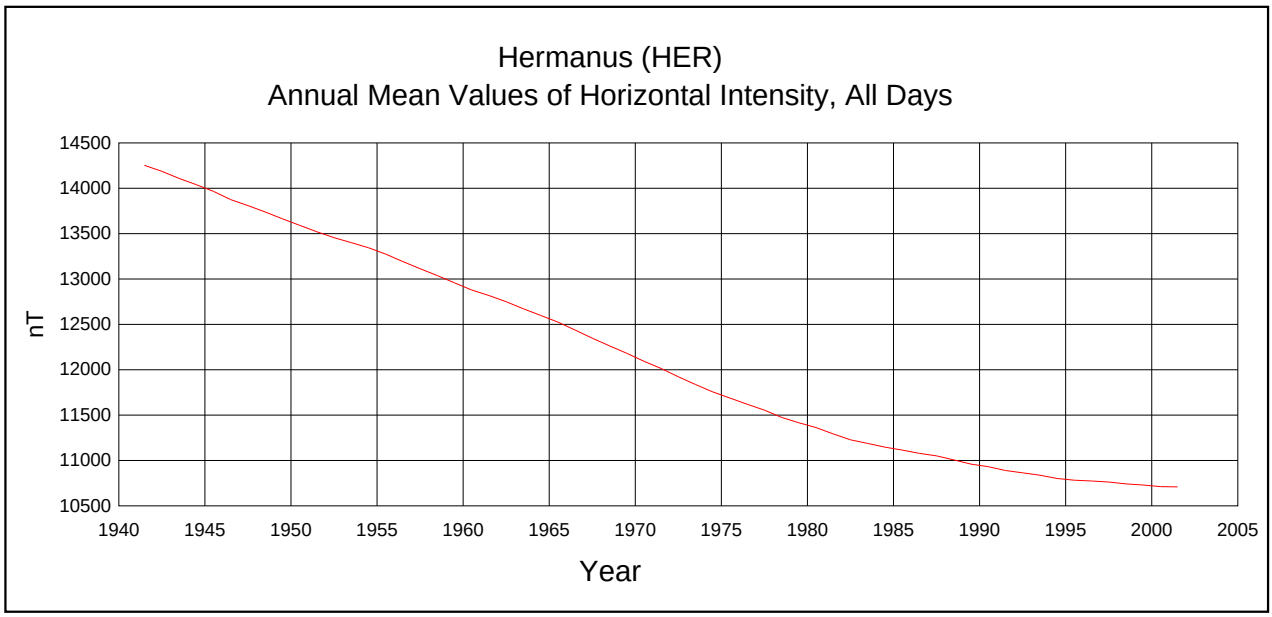
Date	D ° ,	I ° ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1941.5	-23 51.6	-64 01.4	14252	13034	-5765	-29249	32537	A	DHZ
1942.5	-23 48.1	-64 03.0	14187	12980	-5724	-29153	32422	A	DHZ
1943.5	-23 47.1	-64 06.4	14109	12911	-5690	-29065	32309	A	DHZ
1944.5	-23 46.8	-64 09.1	14040	12848	-5661	-28981	32202	A	DHZ
1945.5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

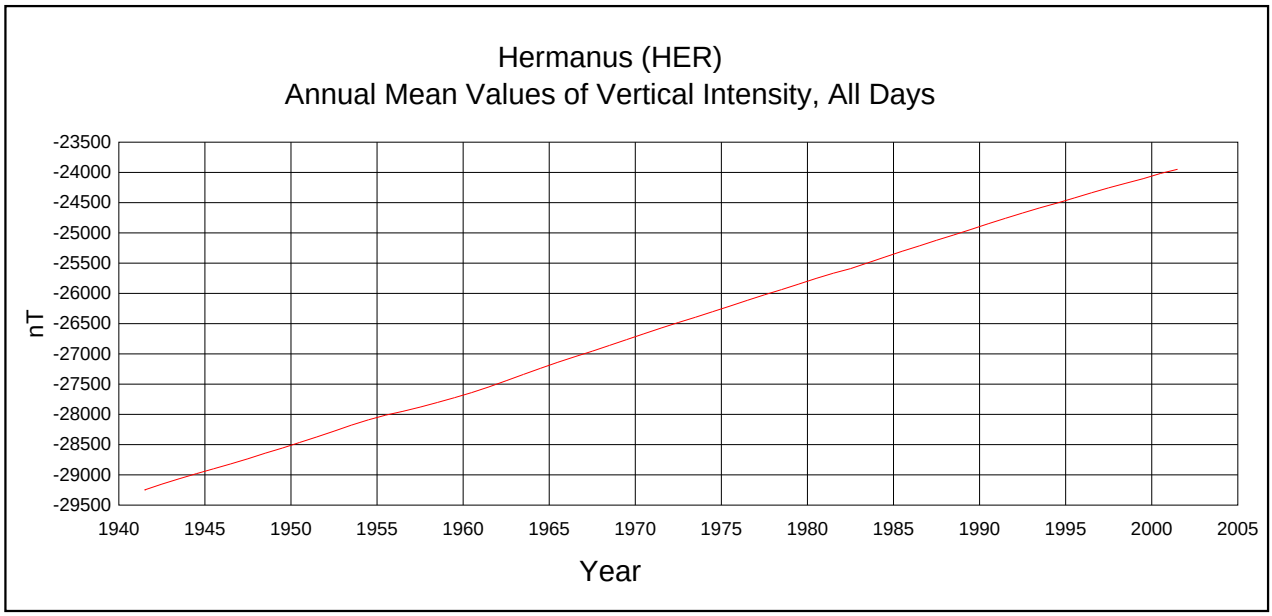
HERMANUS
MEAN ANNUAL VALUES

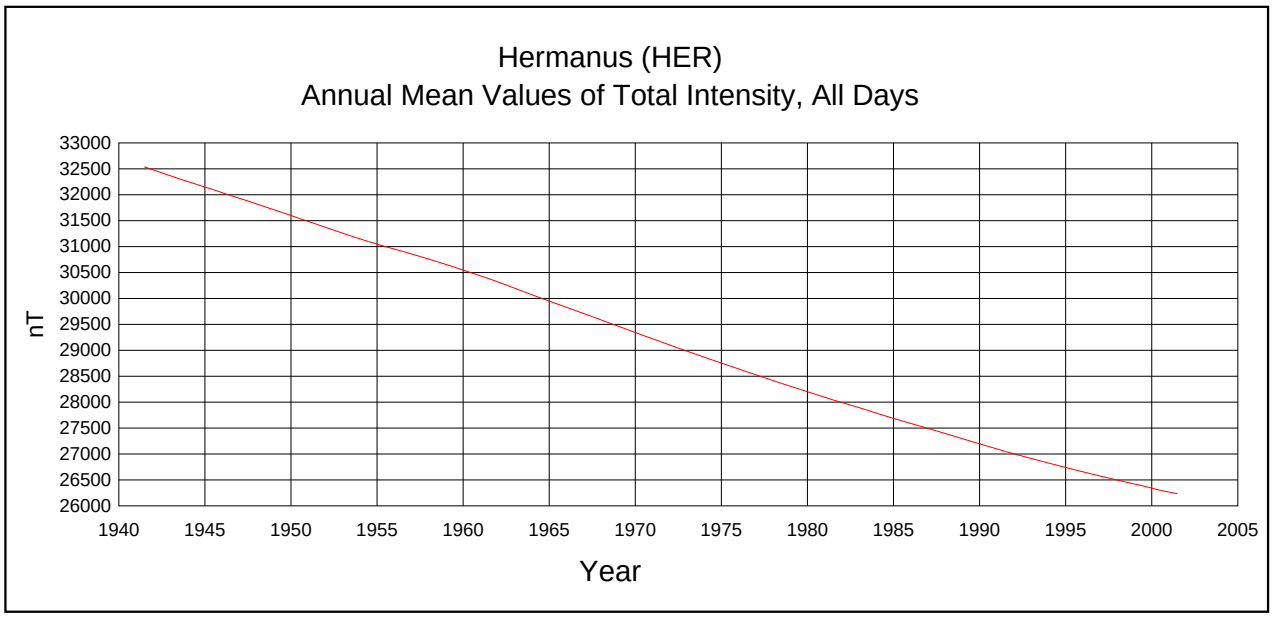
Date	° D ,	° I ,	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1981.5	-23 26.1	-66 15.0	11293	10362	-4492	-25667	28042	A	DHZ
1982.5	-23 21.3	-66 18.6	11228	10309	-4452	-25591	27946	A	DHZ
1983.5	-23 16.0	-66 18.4	11188	10279	-4420	-25496	27843	A	DHZ
1984.5	-23 13.3	-66 18.3	11147	10244	-4395	-25399	27737	A	DHZ
1985.5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

*A: All days
*Q: Quiet days
*D: Disturbed days
*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
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
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
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
Year


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

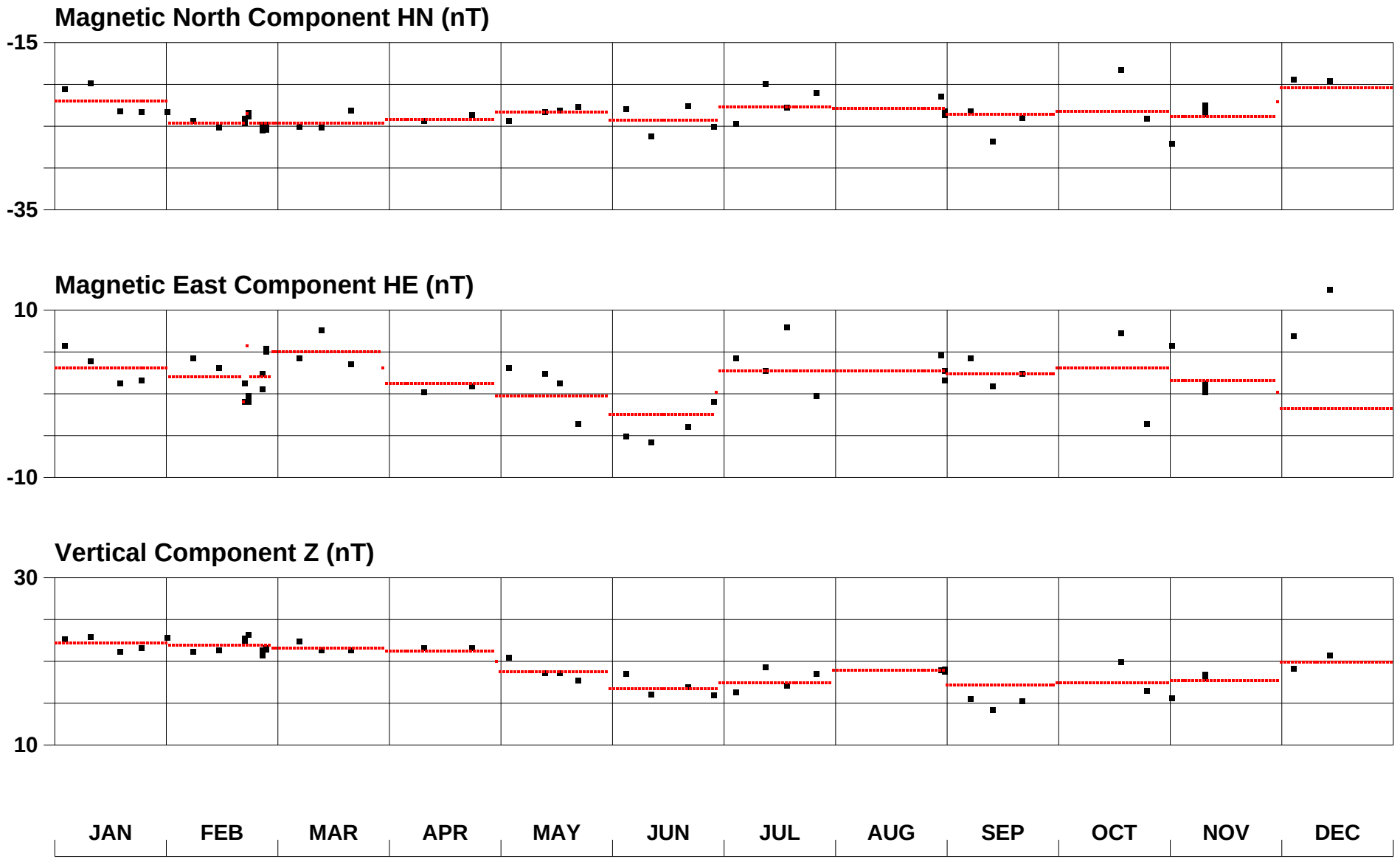
Magnetic Results 2001

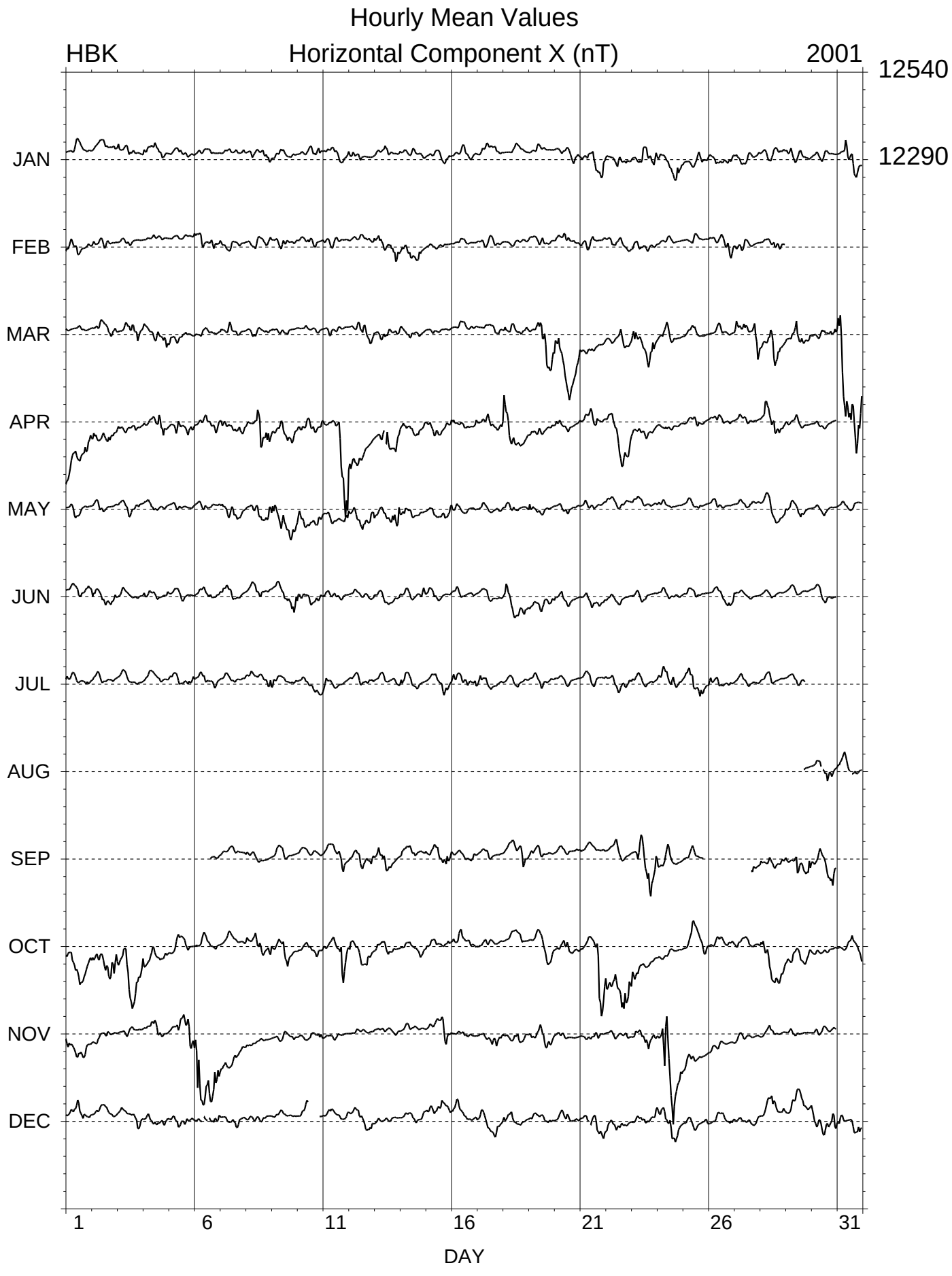
Hartebeesthoek

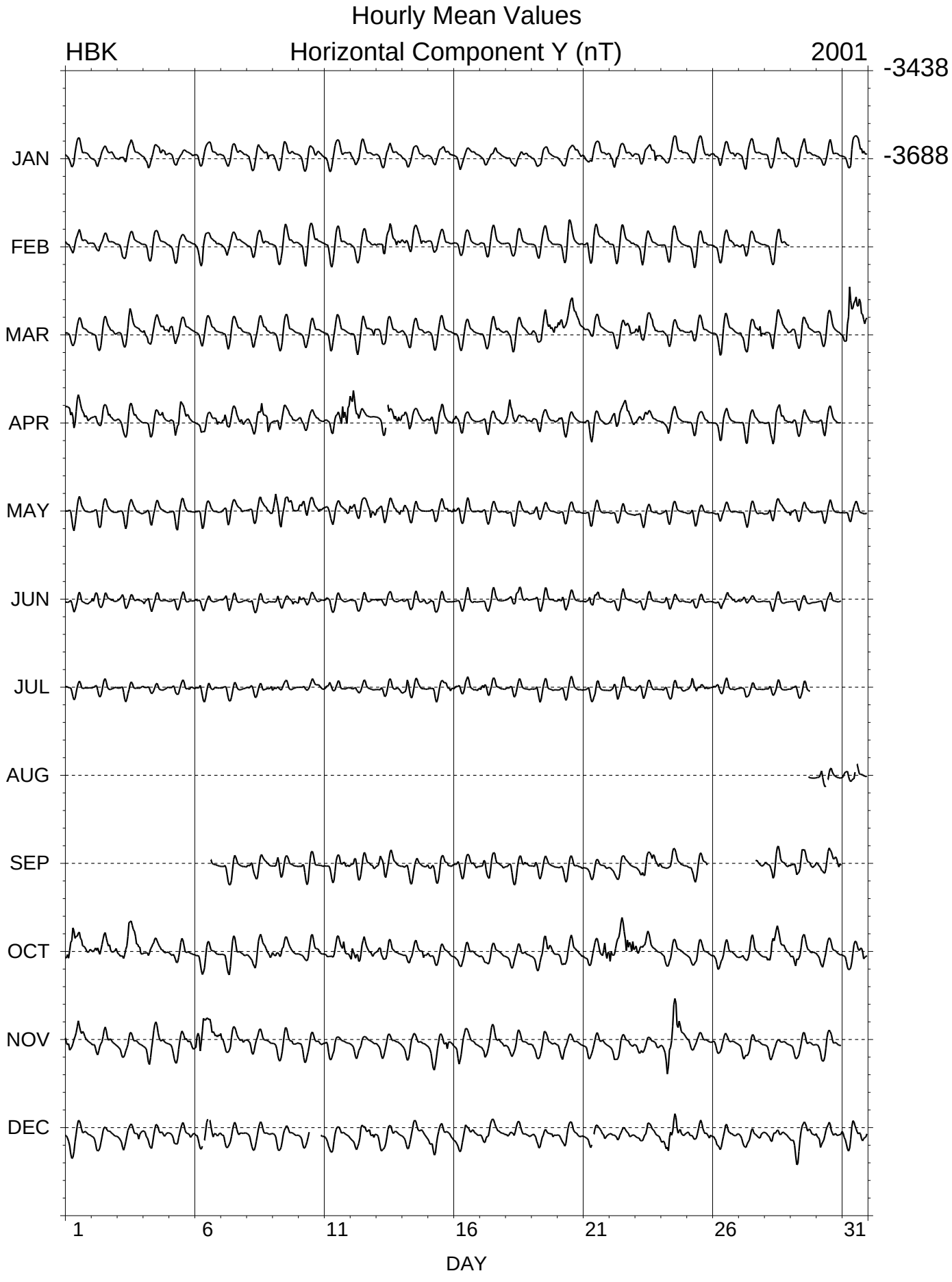
Observed and Adopted Baseline Values, HBK 2001

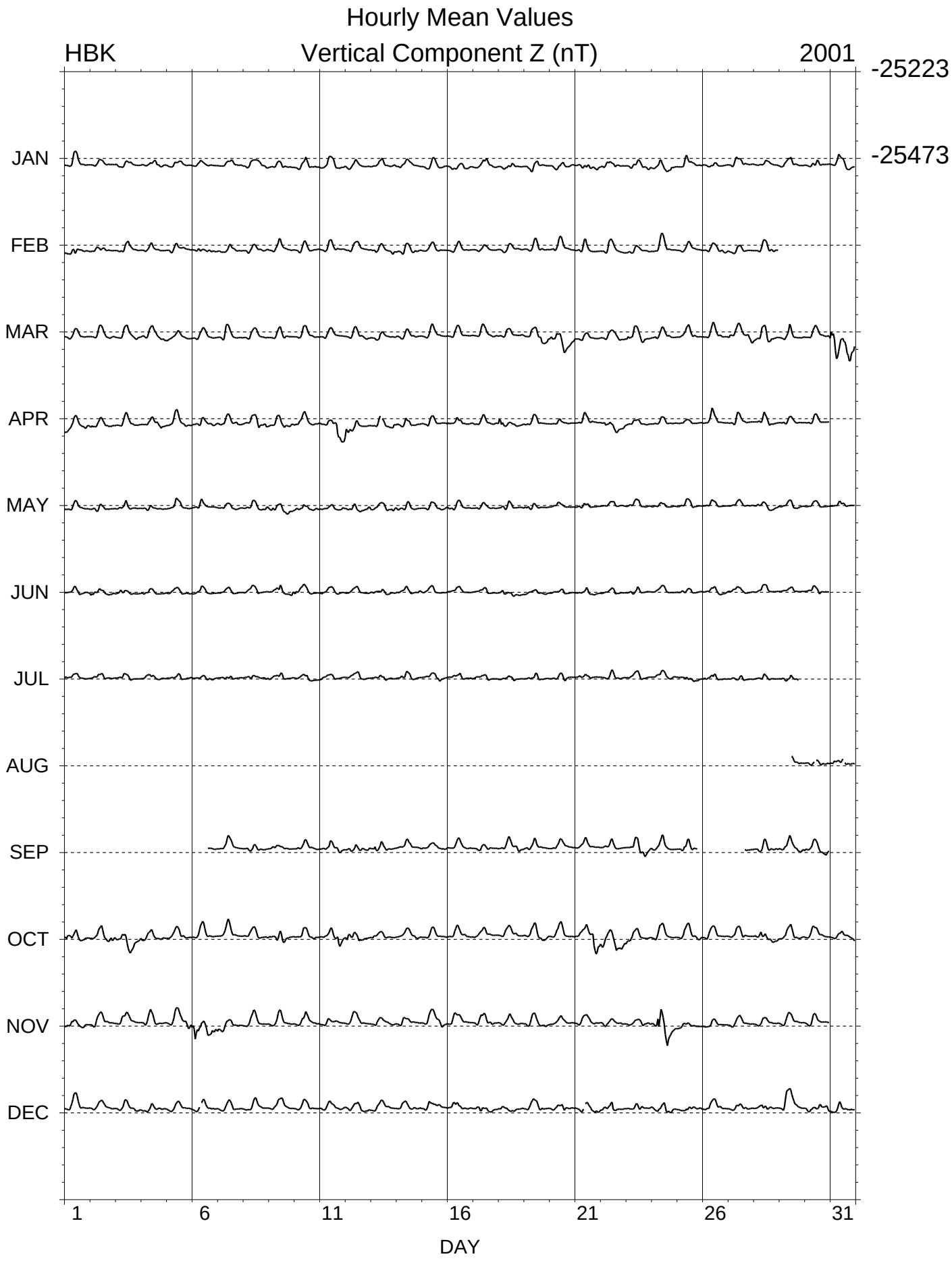
LAT: 115.882 LONG: 27.707

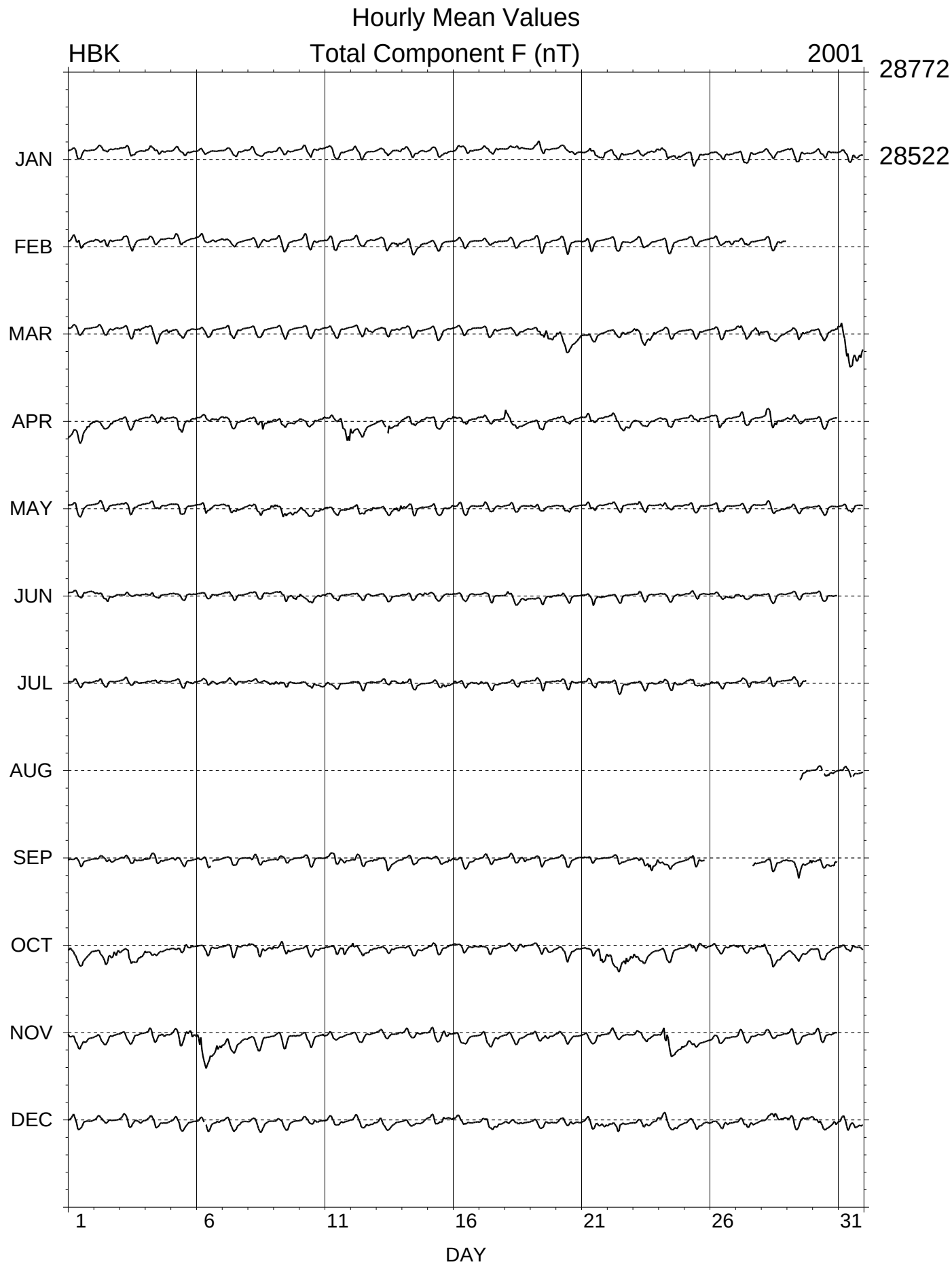
INSTITUTION: HMO INSTRUMENT: LC




Hourly Mean Values
HBK
Horizontal Component X (nT)
2001
12540
12290
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)
2001
-3438
-3688
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)
2001
-25223
-25473
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)
2001
28772
28522
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

HARTEBEESTHOEK
MEAN MONTHLY VALUES 2001

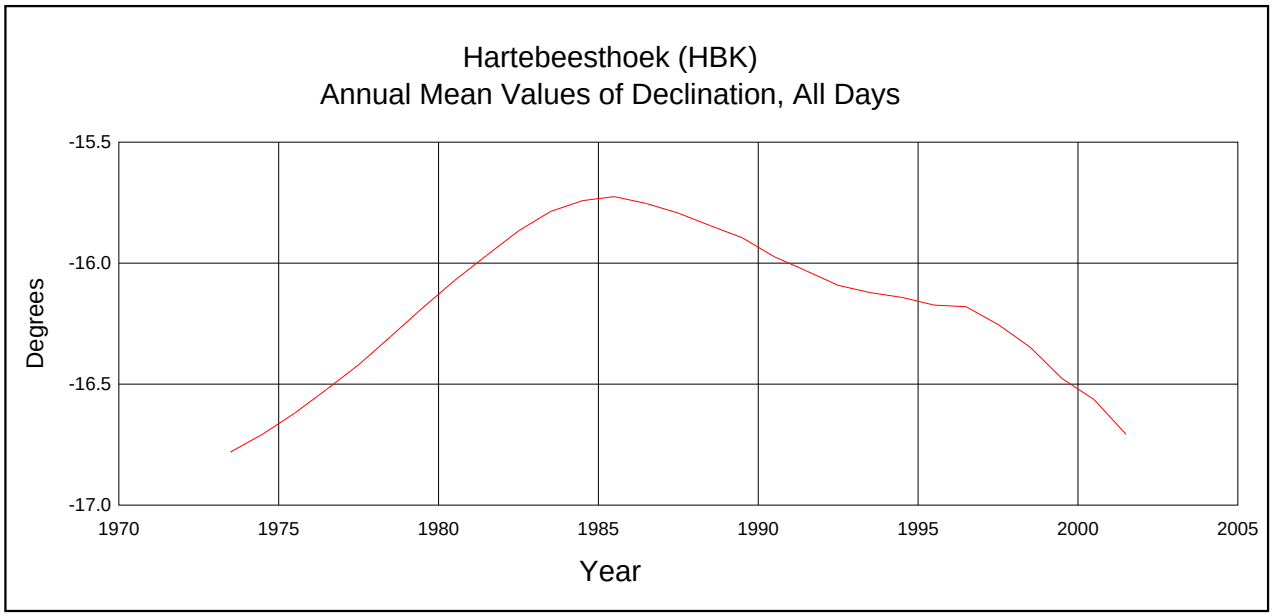
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-16 38.0	-63 15.7	12843	12305	-3676	-25492	28545	A	HDZF
FEB	-16 38.7	-63 15.5	12841	12303	-3678	-25484	28537	A	HDZF
MAR	-16 39.3	-63 17.6	12821	12283	-3675	-25484	28528	A	HDZF
APR	-16 41.3	-63 19.2	12807	12268	-3678	-25486	28523	A	HDZF
MAY	-16 42.4	-63 16.0	12832	12290	-3689	-25477	28526	A	HDZF
JUN	-16 43.3	-63 15.3	12836	12294	-3693	-25472	28524	A	HDZF
JUL	-16 42.3	-63 14.4	12843	12301	-3692	-25469	28524	A	HDZF
AUG	-16 41.8	-63 14.2	12843	12301	-3690	-25465	28520	A	HDZF
SEP	-16 43.1	-63 13.9	12842	12300	-3694	-25458	28516	A	HDZF
OCT	-16 43.5	-63 16.9	12817	12275	-3688	-25463	28507	A	HDZF
NOV	-16 46.3	-63 16.5	12820	12275	-3699	-25463	28508	A	HDZF
DEC	-16 47.1	-63 13.3	12848	12301	-3710	-25458	28516	A	HDZF
YEAR	-16 42.3	-63 15.9	12832	12290	-3688	-25474	28523	A	HDZF
JAN	-16 37.2	-63 14.3	12855	12317	-3677	-25490	28548	Q	HDZF
FEB	-16 38.7	-63 14.8	12847	12309	-3680	-25484	28539	Q	HDZF
MAR	-16 39.2	-63 14.8	12844	12305	-3681	-25479	28533	Q	HDZF
APR	-16 41.4	-63 17.3	12823	12283	-3683	-25482	28526	Q	HDZF
MAY	-16 42.4	-63 15.2	12839	12297	-3691	-25475	28527	Q	HDZF
JUN	-16 43.6	-63 14.9	12839	12296	-3695	-25470	28524	Q	HDZF
JUL	-16 42.5	-63 13.9	12848	12306	-3694	-25469	28526	Q	HDZF
AUG	*** ****	*** ****	*****	*****	*****	******	*****	Q	HDZF
SEP	-16 43.0	-63 12.3	12856	12313	-3698	-25456	28519	Q	HDZF
OCT	-16 43.8	-63 13.7	12844	12300	-3697	-25457	28514	Q	HDZF
NOV	-16 46.1	-63 14.0	12842	12296	-3705	-25461	28516	Q	HDZF
DEC	-16 47.4	-63 12.6	12854	12306	-3713	-25456	28516	Q	HDZF
YEAR	-16 42.2	-63 14.4	12844	12302	-3692	-25471	28526	Q	HDZF
JAN	-16 38.1	-63 17.5	12827	12290	-3672	-25494	28539	D	HDZF
FEB	-16 39.0	-63 16.8	12830	12292	-3676	-25488	28535	D	HDZF
MAR	-16 39.6	-63 25.3	12755	12220	-3657	-25495	28508	D	HDZF
APR	-16 42.1	-63 22.9	12776	12237	-3672	-25492	28515	D	HDZF
MAY	-16 42.1	-63 18.9	12807	12267	-3681	-25481	28519	D	HDZF
JUN	-16 43.1	-63 16.6	12825	12283	-3689	-25474	28520	D	HDZF
JUL	-16 41.8	-63 14.6	12841	12300	-3689	-25470	28523	D	HDZF
AUG	*** ****	*** ****	*****	*****	*****	******	*****	D	HDZF
SEP	-16 43.4	-63 15.8	12825	12283	-3690	-25459	28509	D	HDZF
OCT	-16 43.9	-63 23.3	12762	12221	-3674	-25472	28491	D	HDZF
NOV	-16 46.9	-63 23.3	12763	12219	-3685	-25473	28492	D	HDZF
DEC	-16 47.7	-63 15.3	12831	12284	-3708	-25462	28512	D	HDZF
YEAR	-16 42.5	-63 19.3	12803	12262	-3681	-25479	28515	D	HDZF

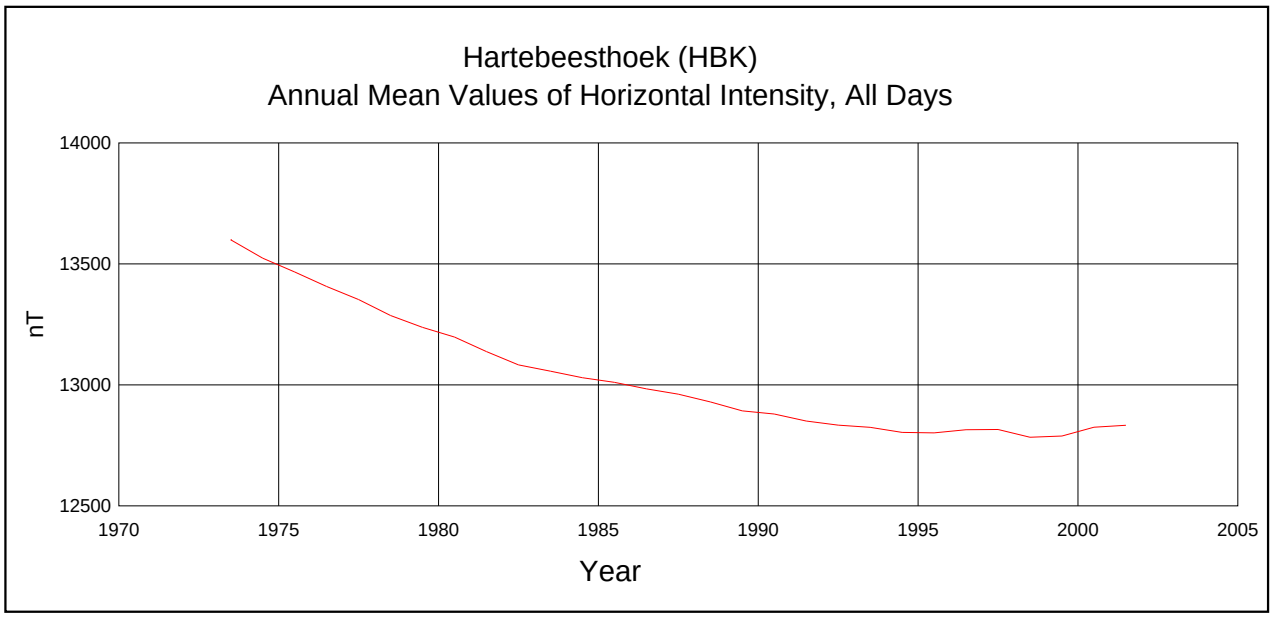
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

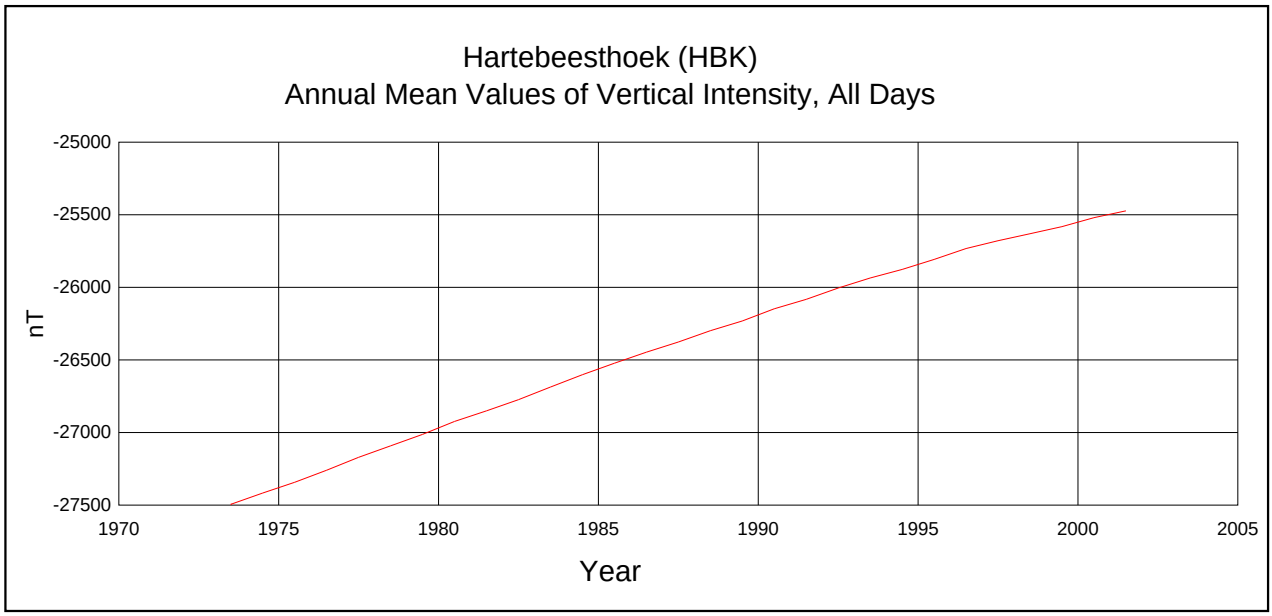
HARTEBEESTHOEK
MEAN ANNUAL VALUES

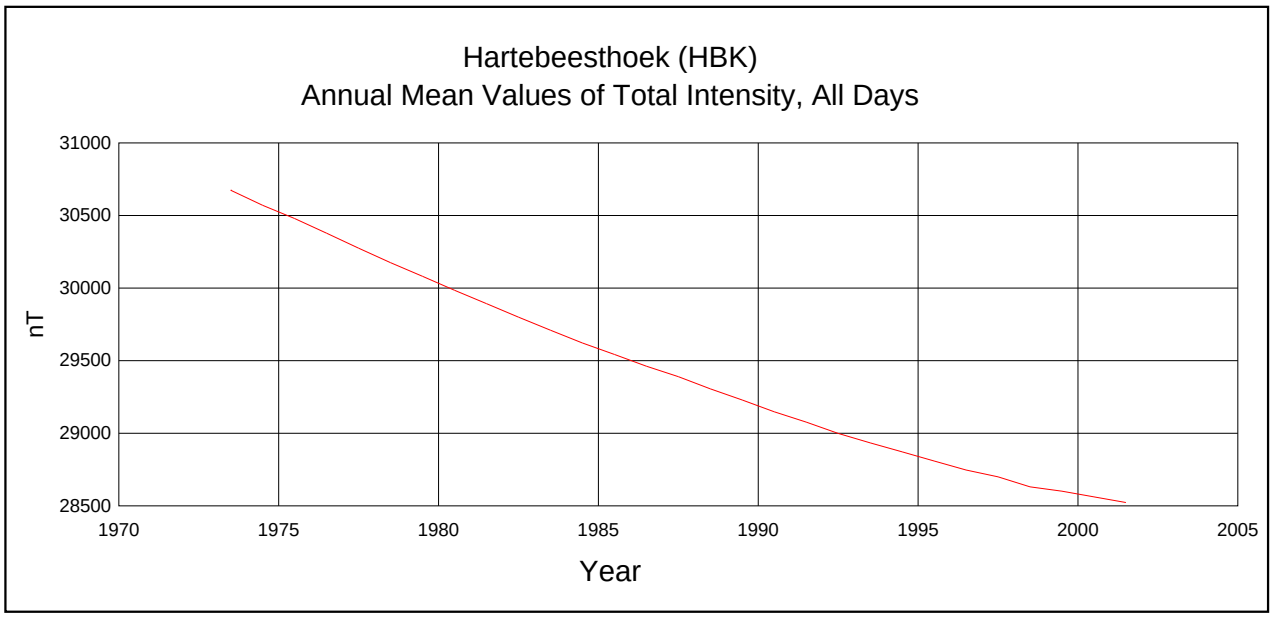
Date	° D	'	° I	'	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1973.5	-16	46.6	-63	41.0	13599	13020	-3925	-27495	30674	A	DHZ
1974.5	-16	42.2	-63	44.8	13523	12952	-3887	-27417	30570	A	DHZ
1975.5	-16	37.0	-63	46.8	13466	12903	-3851	-27343	30479	A	DHZ
1976.5	-16	31.1	-63	48.8	13406	12852	-3812	-27260	30378	A	DHZ
1977.5	-16	25.0	-63	49.8	13352	12808	-3774	-27171	30275	A	DHZ
1978.5	-16	18.0	-63	52.6	13286	12752	-3729	-27092	30175	A	DHZ
1979.5	-16	10.9	-63	53.7	13237	12713	-3689	-27013	30081	A	DHZ
1980.5	-16	04.1	-63	53.2	13197	12682	-3653	-26924	29985	A	DHZ
1981.5	-15	57.9	-63	55.7	13137	12631	-3614	-26851	29893	A	DHZ
1982.5	-15	51.8	-63	57.5	13082	12585	-3577	-26774	29800	A	DHZ
1983.5	-15	47.0	-63	55.8	13056	12564	-3552	-26687	29710	A	DHZ
1984.5	-15	44.3	-63	54.3	13029	12541	-3535	-26602	29622	A	DHZ
1985.5	-15	43.3	-63	52.2	13010	12524	-3526	-26523	29543	A	DHZ
1986.5	-15	45.0	-63	51.2	12983	12496	-3525	-26447	29462	A	DHZ
1987.5	-15	47.4	-63	49.8	12961	12473	-3528	-26377	29390	A	DHZ
1988.5	-15	50.5	-63	49.2	12929	12438	-3530	-26299	29306	A	DHZ
1989.5	-15	53.5	-63	49.6	12892	12400	-3531	-26232	29229	A	DHZ
1990.5	-15	58.2	-63	46.7	12879	12382	-3544	-26148	29148	A	DHZ
1991.5	-16	01.7	-63	46.4	12850	12351	-3549	-26083	29077	A	DHZ
1992.5	-16	05.3	-63	44.1	12833	12331	-3557	-26005	28999	A	DHZ
1993.5	-16	07.1	-63	41.4	12824	12320	-3561	-25936	28934	A	DHZ
1994.5	-16	08.3	-63	40.5	12803	12299	-3559	-25877	28872	A	DHZ
1995.5	-16	10.2	-63	37.1	12801	12295	-3565	-25808	28809	A	DHZ
1996.5	-16	10.6	-63	31.7	12814	12308	-3570	-25733	28747	A	DHZ
1997.5	-16	15.0	-63	28.7	12815	12304	-3586	-25679	28700	A	DHZ
1998.5	-16	20.6	-63	29.6	12783	12267	-3598	-25631	28631	A	DHZ
1999.5	-16	28.4	-63	26.4	12788	12263	-3627	-25582	28601	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	-3657	-25520	28562	A	DHZ
2001.5	-16	42.4	-63	15.7	12833	12292	-3689	-25473	28523	A	DHZ

*A: All days
*Q: Quiet days
*D: Disturbed days
*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
1970
1975
1980
1985
1990
1995
2000
2005
Year

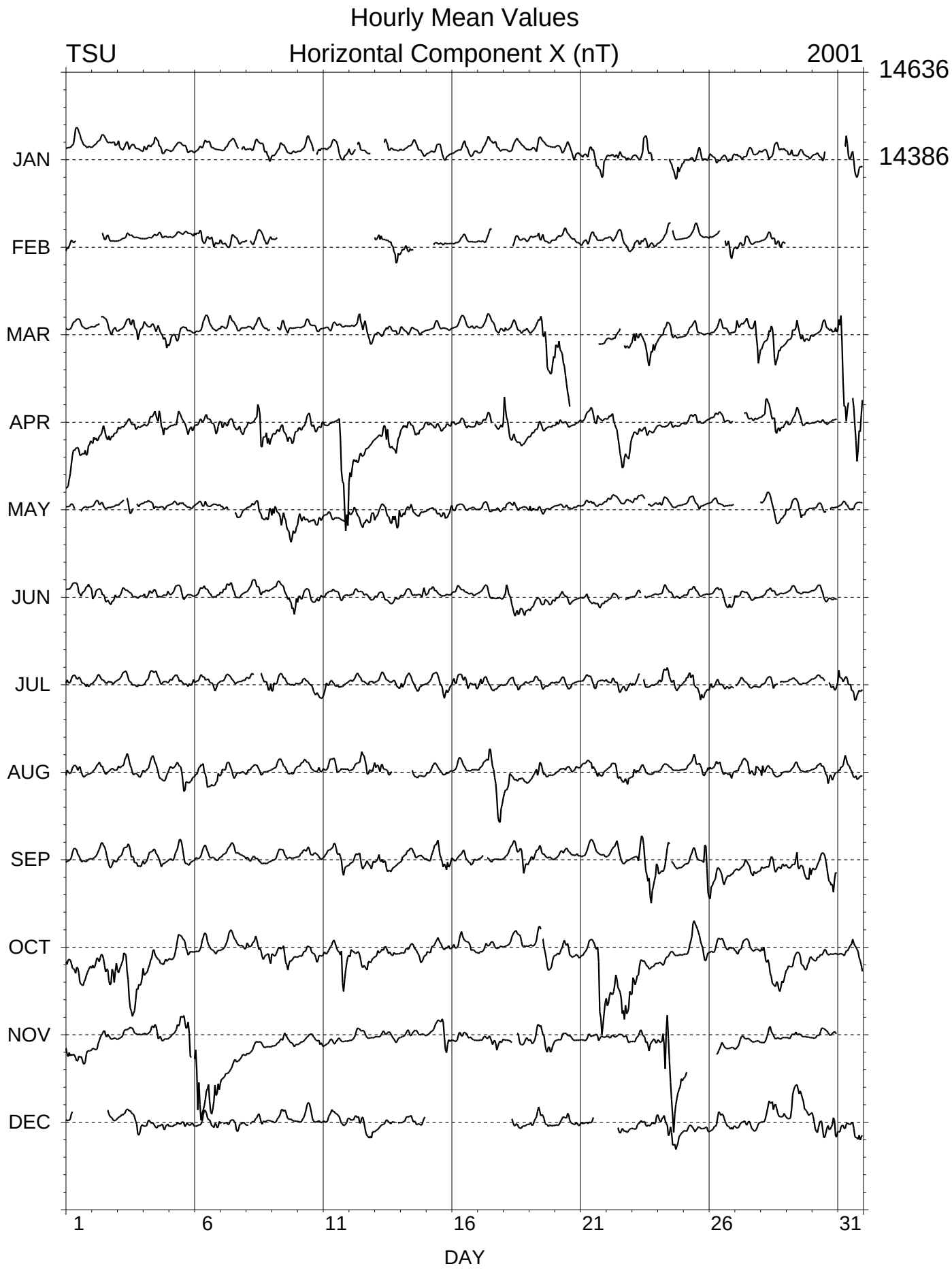

Hartebeesthoek (HBK)
Annual Mean Values of Horizontal Intensity, All Days
nT
14000
13500
13000
12500
1970
1975
1980
1985
1990
1995
2000
2005
Year

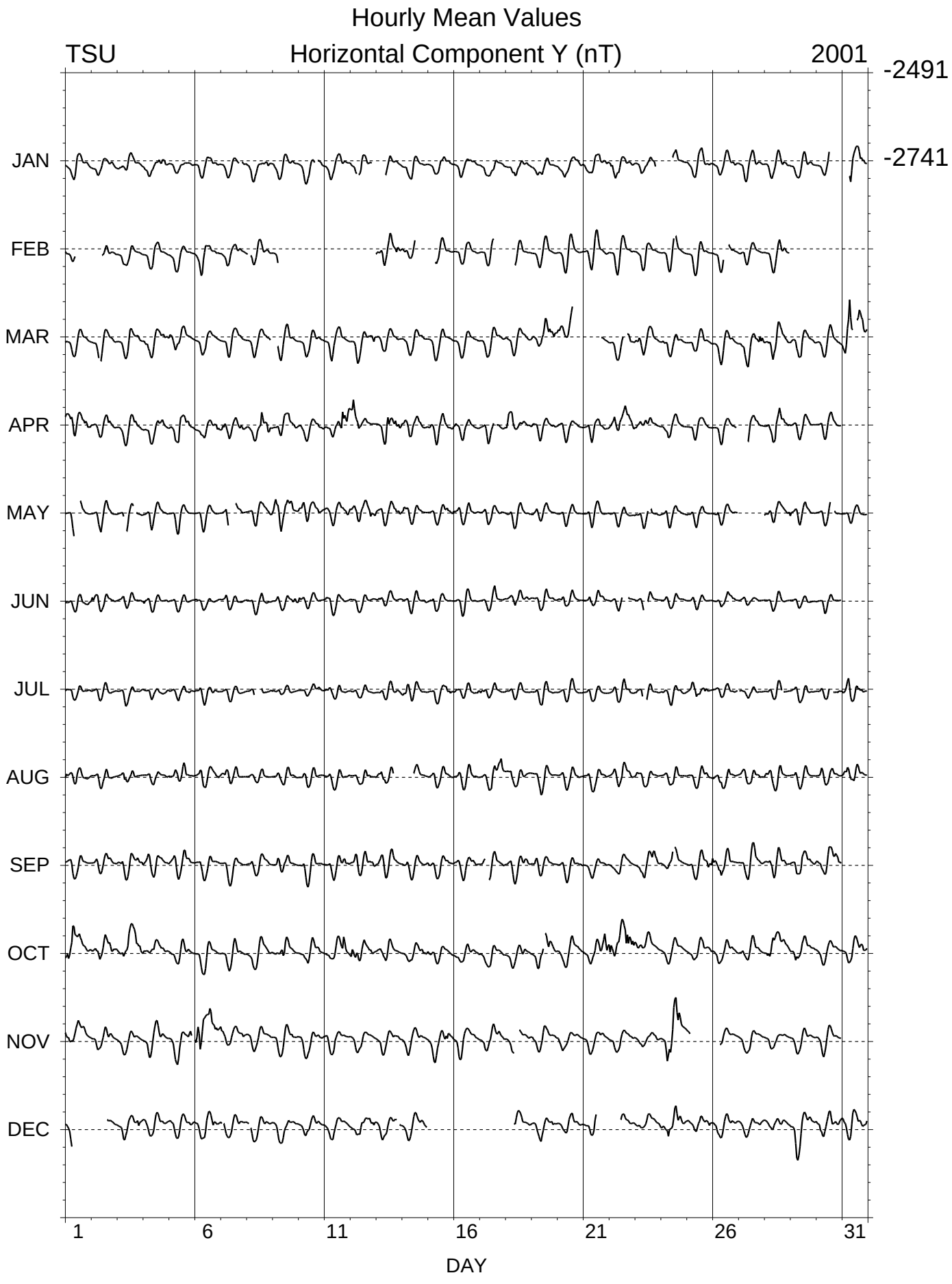

Hartebeesthoek (HBK)
Annual Mean Values of Vertical Intensity, All Days
-25000
-25500
-26000
-26500
-27000
-27500
nT
1970
1975
1980
1985
1990
1995
2000
2005
Year

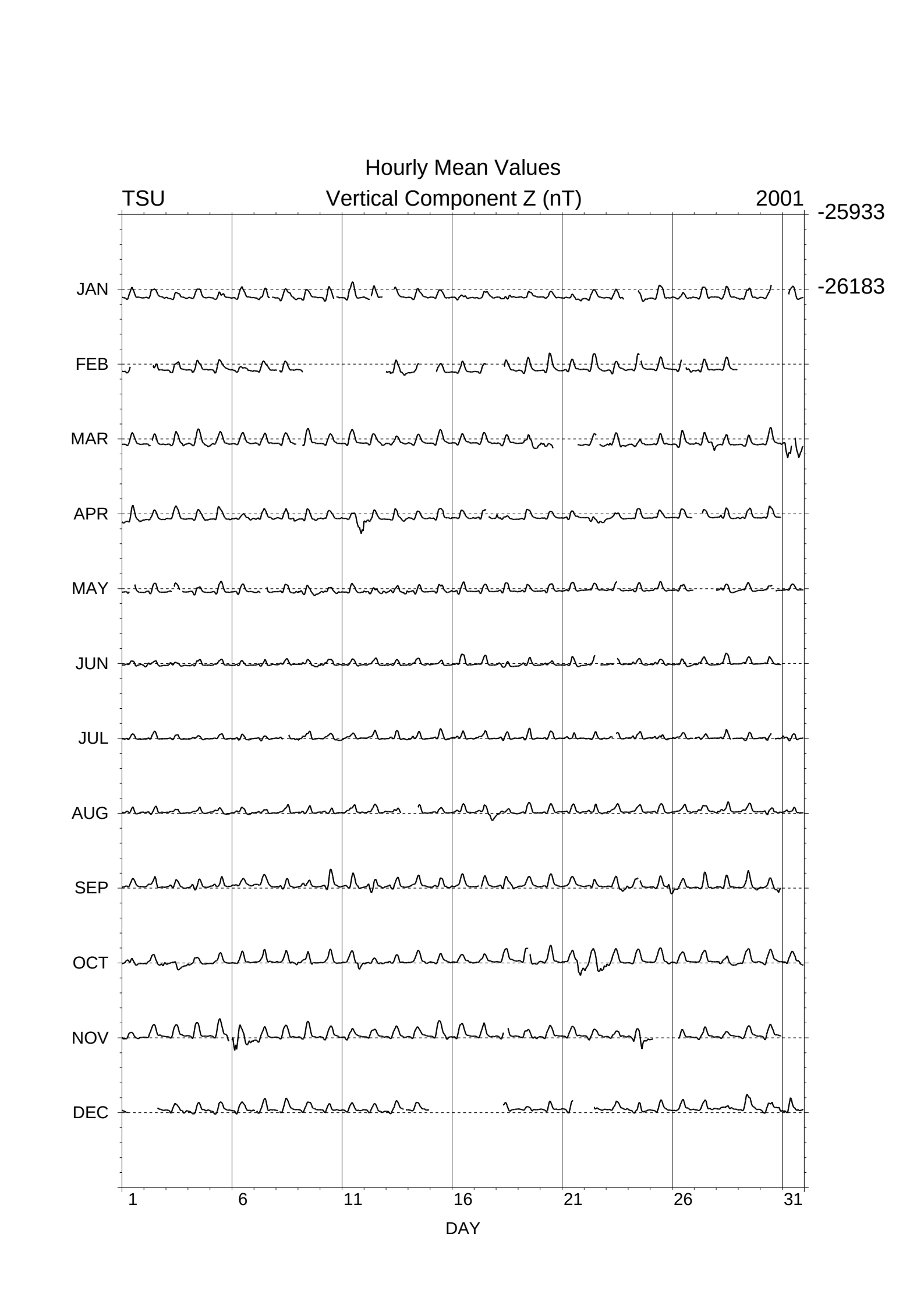

Hartebeesthoek (HBK)
Annual Mean Values of Total Intensity, All Days
31000
30500
30000
29500
29000
28500
nT
1970
1975
1980
1985
1990
1995
2000
2005
Year

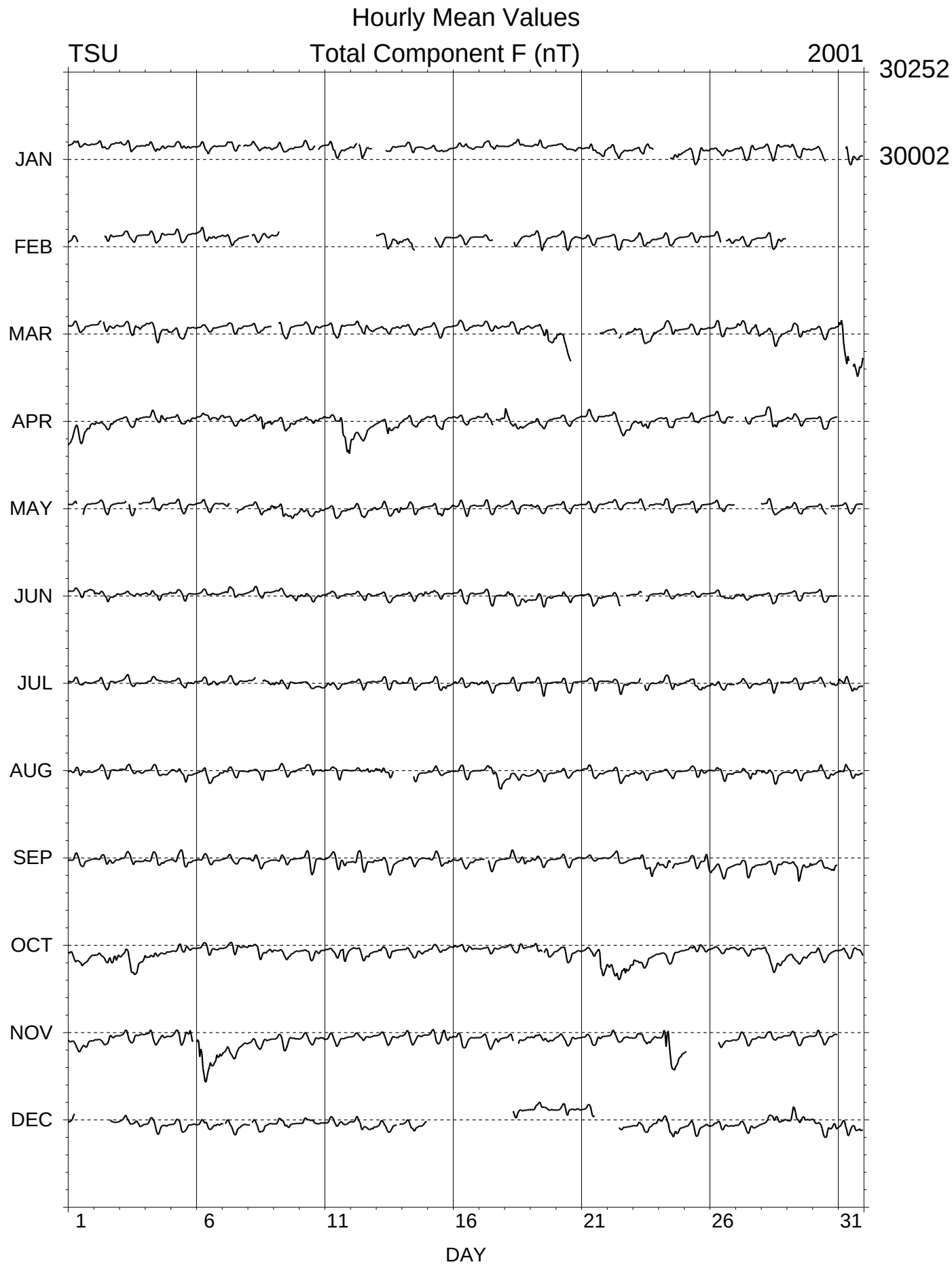
Magnetic Results 2001

Tsumeb


Hourly Mean Values
TSU
Horizontal Component X (nT)
2001
14636
14386
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)
2001
-2491
-2741
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)
2001
-25933
-26183
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)
2001
30252
30002
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1
6
11
16
21
26
31
DAY

TSUMEB
MEAN MONTHLY VALUES 2001

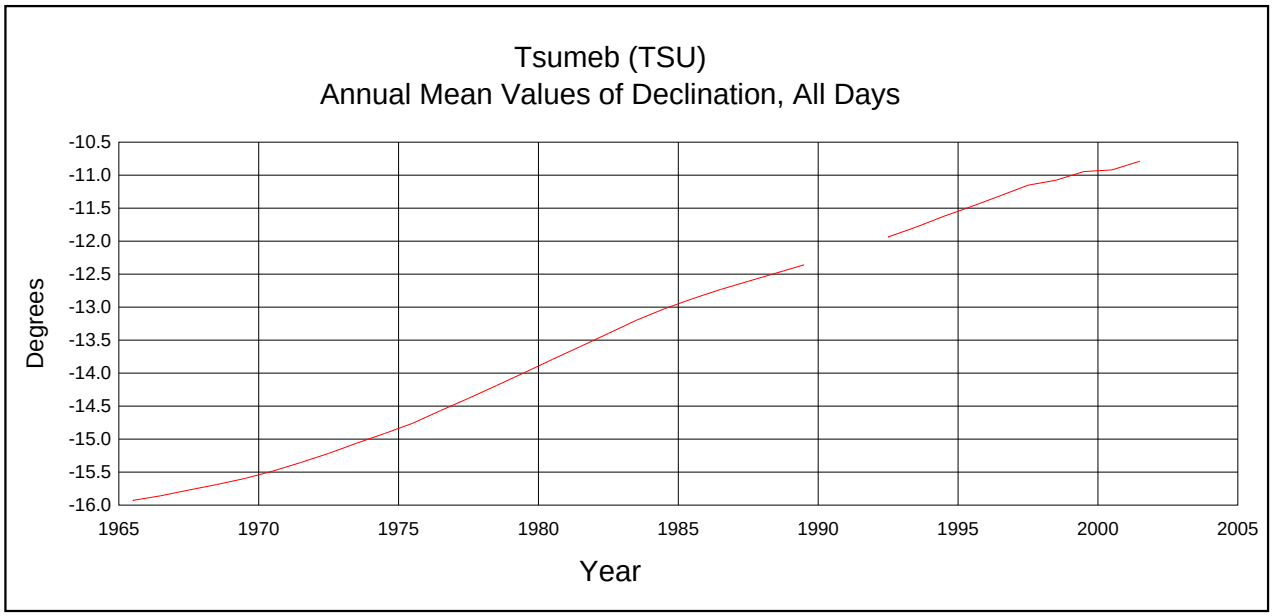
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
JAN	-10 49.0	-60 45.0	14676	14415	-2754	-26206	30036	A	HDZF
FEB	-10 49.0	-60 45.0	14671	14410	-2753	-26197	30027	A	HDZF
MAR	-10 49.4	-60 45.9	14659	14399	-2753	-26193	30017	A	HDZF
APR	-10 48.7	-60 49.3	14627	14367	-2744	-26194	30002	A	HDZF
MAY	-10 47.0	-60 46.7	14649	14391	-2741	-26188	30007	A	HDZF
JUN	-10 46.6	-60 46.1	14652	14394	-2740	-26184	30005	A	HDZF
JUL	-10 48.5	-60 45.9	14653	14393	-2748	-26181	30002	A	HDZF
AUG	-10 46.3	-60 46.0	14650	14392	-2738	-26177	29997	A	HDZF
SEP	-10 46.2	-60 46.2	14646	14388	-2737	-26173	29992	A	HDZF
OCT	-10 46.3	-60 49.1	14618	14360	-2732	-26175	29979	A	HDZF
NOV	-10 46.1	-60 48.6	14622	14364	-2732	-26173	29981	A	HDZF
DEC	-10 44.1	-60 46.2	14644	14387	-2728	-26169	29993	A	HDZF
YEAR	-10 47.2	-60 46.8	14646	14387	-2741	-26184	30002	A	HDZF
JAN	-10 48.6	-60 43.3	14692	14432	-2756	-26205	30042	Q	HDZF
FEB	-10 49.8	-60 44.0	14680	14419	-2758	-26196	30032	Q	HDZF
MAR	-10 49.4	-60 44.6	14671	14410	-2755	-26190	30021	Q	HDZF
APR	-10 48.0	-60 47.6	14641	14382	-2744	-26190	30005	Q	HDZF
MAY	-10 47.2	-60 45.6	14659	14399	-2743	-26185	30009	Q	HDZF
JUN	-10 46.6	-60 45.6	14656	14398	-2741	-26181	30005	Q	HDZF
JUL	-10 48.5	-60 45.5	14657	14397	-2749	-26181	30004	Q	HDZF
AUG	-10 46.4	-60 45.3	14656	14397	-2739	-26175	29998	Q	HDZF
SEP	-10 46.6	-60 44.4	14662	14403	-2742	-26170	29998	Q	HDZF
OCT	-10 47.1	-60 46.1	14646	14388	-2741	-26171	29990	Q	HDZF
NOV	-10 46.1	-60 46.5	14642	14384	-2736	-26172	29990	Q	HDZF
DEC	-10 44.5	-60 45.6	14650	14393	-2730	-26170	30000	Q	HDZF
YEAR	-10 47.3	-60 45.4	14658	14399	-2744	-26181	30006	Q	HDZF
JAN	-10 49.5	-60 47.2	14656	14395	-2752	-26210	30029	D	HDZF
FEB	-10 49.0	-60 46.2	14661	14401	-2751	-26201	30025	D	HDZF
MAR	-10 49.0	-60 49.8	14623	14363	-2744	-26197	30002	D	HDZF
APR	-10 49.1	-60 53.0	14592	14333	-2739	-26198	29990	D	HDZF
MAY	-10 46.4	-60 49.3	14625	14367	-2734	-26192	29998	D	HDZF
JUN	-10 46.5	-60 47.4	14641	14383	-2737	-26186	30001	D	HDZF
JUL	-10 48.2	-60 46.4	14647	14388	-2746	-26180	29999	D	HDZF
AUG	-10 45.8	-60 47.6	14635	14378	-2733	-26179	29992	D	HDZF
SEP	-10 46.5	-60 48.8	14621	14364	-2733	-26175	29982	D	HDZF
OCT	-10 45.6	-60 55.6	14558	14302	-2718	-26183	29957	D	HDZF
NOV	-10 45.1	-60 55.8	14555	14299	-2715	-26181	29956	D	HDZF
DEC	-10 44.0	-60 48.4	14623	14367	-2723	-26171	29981	D	HDZF
YEAR	-10 46.9	-60 50.0	14616	14358	-2734	-26187	29990	D	HDZF

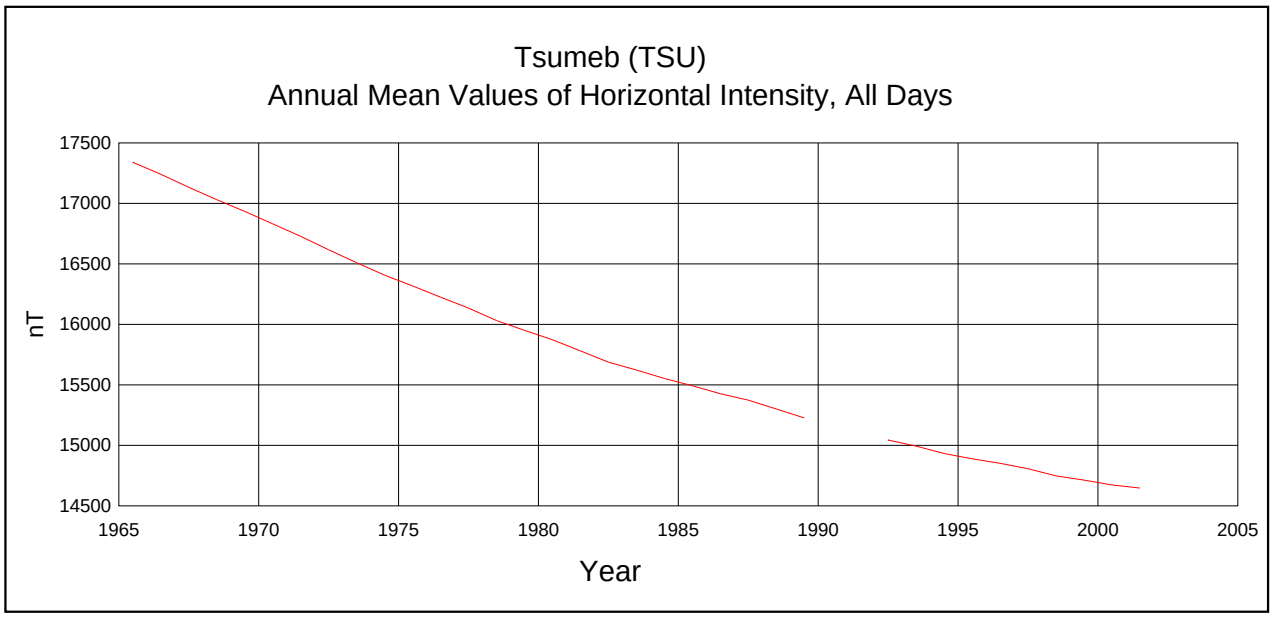
*A: All days
*Q: Quiet days
*D: Disturbed days
ELE: Elements recorded

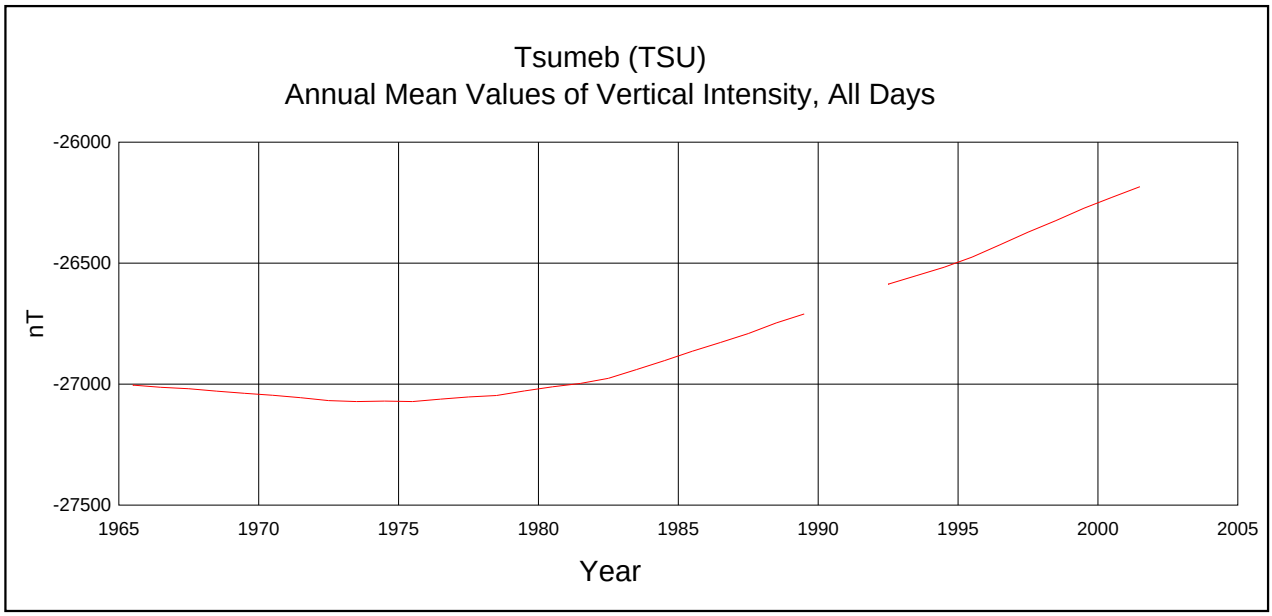
TSUMEB
MEAN ANNUAL VALUES

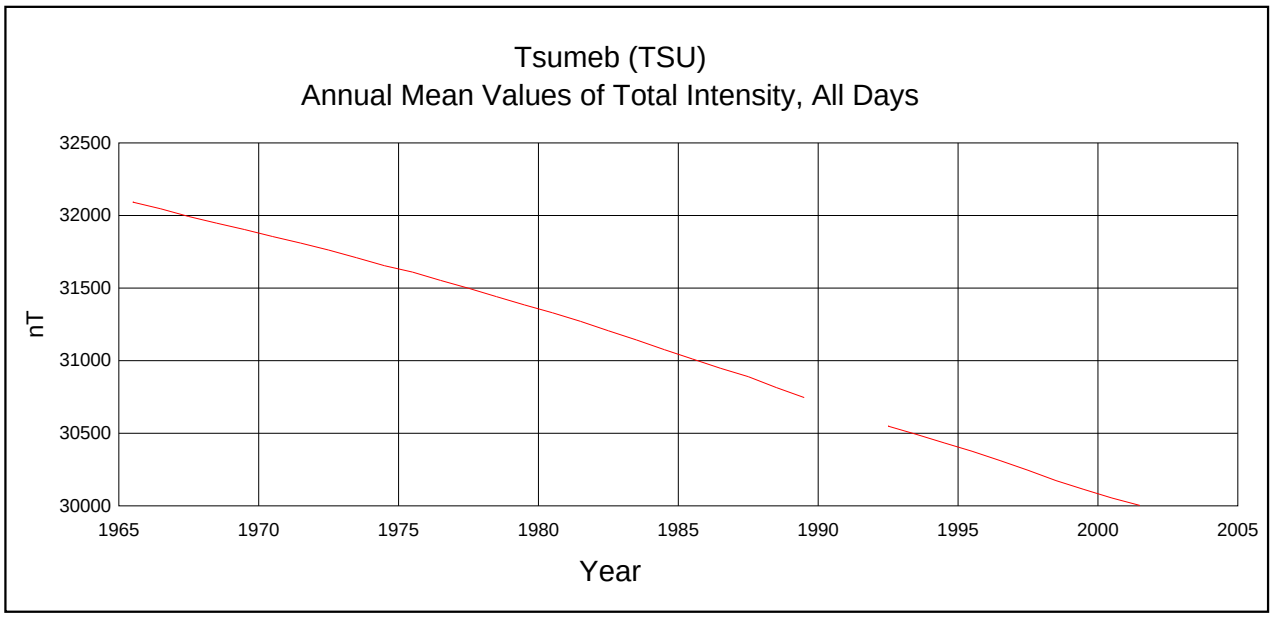
Date	° D '	° I '	H nT	X nT	Y nT	Z nT	F nT	*	ELE
1965.5	-15 58.0	-57 17.7	17340	16671	-4770	-27004	32092	A	DHZ
1966.5	-15 53.8	-57 27.1	17241	16582	-4772	-27013	32046	A	DHZ
1967.5	-15 48.6	-57 37.3	17133	16484	-4668	-27019	31993	A	DHZ
1968.5	-15 43.6	-57 47.1	17031	16393	-4616	-27029	31947	A	DHZ
1969.5	-15 38.1	-57 56.4	16934	16309	-4564	-27038	31903	A	DHZ
1970.5	-15 31.4	-58 06.4	16831	16217	-4504	-27046	31855	A	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 46.8	16407	15851	-4234	-27070	31654	A	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 27.1	15951	15475	-3867	-27028	31384	A	DHZ
1980.5	-13 49.8	-59 33.5	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 49.1	15688	15259	-3646	-26976	31206	A	DHZ
1983.5	-13 14.2	-59 53.4	15623	15209	-3578	-26940	31143	A	DHZ
1984.5	-13 03.8	-59 58.0	15553	15151	-3516	-26903	31076	A	DHZ
1985.5	-12 54.7	-60 01.6	15493	15102	-3463	-26864	31012	A	DHZ
1986.5	-12 46.3	-60 06.0	15427	15046	-3411	-26828	30948	A	DHZ
1987.5	-12 38.8	-60 09.0	15374	15002	-3366	-26791	30890	A	DHZ
1988.5	-12 31.3	-60 13.6	15301	14938	-3318	-26747	30815	A	DHZ
1989.5	-12 23.8	-60 18.8	15227	14873	-3269	-26710	30746	A	DHZ
1990.5	*** **.*	*** **.*	*****	*****	*****	*****	*****		
1991.5	*** **.*	*** **.*	*****	*****	*****	*****	*****		
1992.5	-11 58.5	-60 29.8	15044	14717	-3122	-26587	30549	A	DHZ
1993.5	-11 49.5	-60 32.9	14994	14676	-3073	-26552	30493	A	DHZ
1994.5	-11 39.6	-60 36.8	14933	14626	-3019	-26517	30434	A	DHZ
1995.5	-11 30.6	-60 38.8	14889	14591	-2971	-26475	30376	A	DHZ
1996.5	-11 21.1	-60 39.7	14852	14562	-2924	-26424	30312	A	DHZ
1997.5	-11 11.4	-60 41.2	14807	14526	-2874	-26372	30245	A	DHZ
1998.5	-11 06.9	-60 44.4	14748	14472	-2844	-26324	30174	A	DHZ
1999.5	-10 59.0	-60 45.0	14713	14444	-2804	-26273	30113	A	DHZ
2000.0	0 -2.3	0 -0.2	1	-1	-10	1	-1	J	DHZ
2000.5	-10 55.2	-60 46.5	14673	14408	-2780	-26228	30054	A	DHZ
2001.5	-10 47.3	-60 46.7	14647	14388	-2742	-26184	30003	A	DHZ

*A: All days
*Q: Quiet days
*D: Disturbed days
*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
-10.5
-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
Year


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


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