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03-12

Magnetic Results 2002

Brorfelde, Qeqertarsuaq, Qaanaaq and Narsarsuaq Observatories



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Cover: The picture shows the variometer house (to the left) and the absolute house (to the right) at Narsarsuaq Geomagnetic Observatory.

Across the fjord we have the settlement of Qassiarsuk where the ruins of the Viking settlement Brattahlid can be seen. Brattahlid was settled by Erik the Red more than thousand years ago.

PREFACE

As shown in the tables and on the map below the Danish Meteorological Institute (DMI) operates four permanent geomagnetic observatories in Denmark and Greenland, namely Brorfelde, Qeqertarsuaq (formerly Godhavn), Qaanaaq (formerly Thule) and Narsarsuaq, and further also two magnetometer chains in Greenland. The chain on the west coast consists of the three permanent observatories and a number of variation stations, while the east coast chain consists of five variation stations. Together with Space Physics Research Laboratory (SPRL) of University of Michigan, USA, DMI also operates a Magnetometer Array on the Greenland Ice Cap (MAGIC). The variation stations are without absolute control.

This yearbook presents the result of the geomagnetic measurements carried out at the four permanent observatories during 2002. The yearbook has been compiled by Børge Pedersen.

The yearbook is divided in seven sections. **Section I** describes the instrumentation and methods of data reduction and distribution used for all four observatories, while the **sections II-V** describes what is relevant for each individual observatory, such as observatory description, diary, tables of adopted baseline values, tables of monthly mean values, and tables and plots of annual mean values. Maps of the magnetic declination for Denmark, Faeroe Islands and Greenland are shown in **section VI**. In **section VII** the following plots are presented: plots of observed and adopted baseline values, plots of differences between observed and calculated absolute values D , H and Z , and plots of hourly and daily mean values of X , Y and Z .

Danish Meteorological Institute
Solar-Terrestrial Physics Division
February 2003

TABLE 1. Permanent Geomagnetic Observatories Operated by DMI.

Observatory	IAGA-code	Geographic Coordinates			Geomagnetic Coordinates ¹		Invariant Latitude ² °N
		°N	°W	°E	°N	°E	
Qaanaaq	THL	77.47	69.23	290.77	87.92	14.28	85.21
Qeqertarsuaq	GDH	69.25	53.53	306.47	78.77	34.36	75.79
Narsarsuaq	NAQ	61.16	45.44	314.56	70.09	38.63	66.50
Brorfelde	BFE	55.63		11.67	55.45	98.66	

TABLE 2. Greenland West Coast Geomagnetic Variation Stations Operated by DMI.

Station	Acronym	Geographic Coordinates			Geomagnetic Coordinates ¹		Invariant Latitude ² °N
		°N	°W	°E	°N	°E	
Savissivik	SVS	76.02	65.10	294.90	86.26	24.80	83.46
Kullorsuaq	KUV	74.57	57.18	302.82	84.14	40.46	81.08
Upernavik	UPN	72.78	56.15	303.85	82.38	36.52	79.36
Uummanaq	UMQ	70.68	52.13	307.87	79.97	39.30	76.87
Attu	ATU	67.93	53.57	306.43	77.51	32.52	74.56
Kangerlussuaq	STF	67.02	50.72	309.28	76.34	36.09	73.21
Maniitsoq	SKT	65.42	52.90	307.10	75.01	31.03	72.07
Nuuk	GHB	64.17	51.73	308.27	73.68	31.80	70.66
Paamiut	FHB	62.00	49.68	310.32	71.36	33.25	68.15

TABLE 3. Greenland East Coast Geomagnetic Variation Stations Operated by DMI.

Station	Acronym	Geographic Coordinates			Geomagnetic Coordinates ¹		Invariant Latitude ² °N
		°N	°W	°E	°N	°E	
Nord	NRD	81.60	16.67	343.33	81.12	129.27	81.05
Danmarkshavn	DMH	76.77	18.63	341.37	79.20	102.91	77.29
Daneborg	DNB	74.30	20.22	339.78	77.78	92.54	75.26
Illoqqortoormiut	SCO	70.48	21.97	338.03	75.06	80.84	71.82
Tasiilaq	AMK	65.60	37.63	322.37	73.31	53.48	69.49

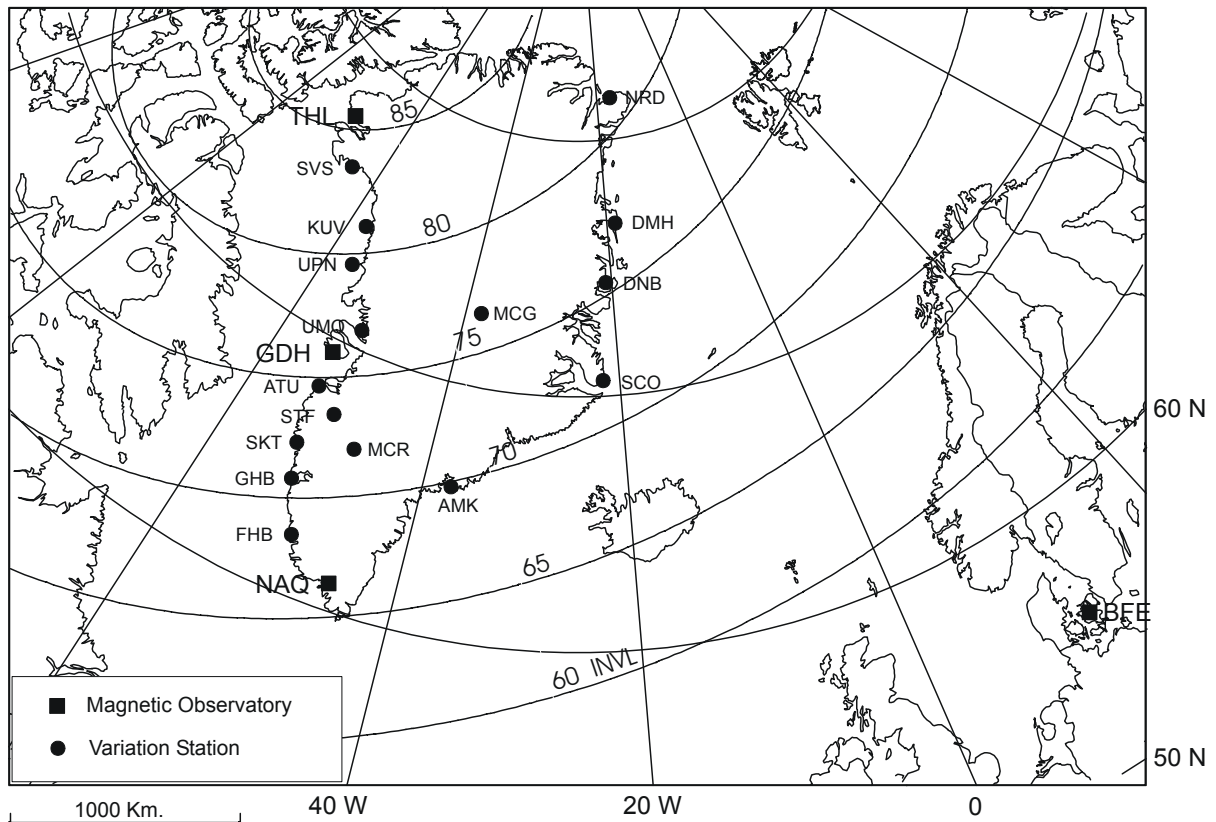
TABLE 4. MAGIC Stations on the Greenland Ice Cap Operated by DMI and SPRL.

Station	Acronym	Geographic Coordinates			Geomagnetic Coordinates ¹		Invariant Latitude ² °N
		°N	°W	°E	°N	°E	
GISP	MCG	72.60	38.35	321.65	79.68	66.29	76.36
Raven Skiway	MCR	66.48	46.29	313.71	75.31	42.28	71.91

¹The geomagnetic coordinates are based on the IGRF 2000.0 magnetic field model in which the geomagnetic north pole position is 79.5°N, 288.4°E.

²Based on the IGRF 2000.0 magnetic field model, Epoch 2000.0 and a height of 105 km.

Map of the Geomagnetic Observatories and Variation Stations



NOTE: The invariant latitudes are based on the IGRF2000 model (Epoch 2000.0) and a height of 105 Km

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SECTION I

Instrumentation and data handling.

1. CONTINUOUS RECORDING OF FIELD VARIATIONS.

Continuous recording of the magnetic field variations were performed by means of two digital variometer systems, a primary one and a supplementary one. The main parts of the two independent variometer systems are a tri-axial fluxgate magnetometer and a data logger, which is based on a single-board personal computer. The magnetometers and the data loggers are manufactured by DMI. The PC data logger (PCD) converts the analogue output from the magnetometers to digital values and writes them on ZIP disks. Temperatures measured in the environment of the sensors and data loggers as well as outdoor temperatures are normally also recorded. As the values written on the ZIP disk can only be accessed after computer processing at the DMI, both variometer systems are equipped with a printer for hard copy of the recorded data during times when absolute measurements are made. As monitor for the observatory staff, real-time magnetograms are displayed on a graphics screen. The data logger offers the possibility for remote control as well as data transfer from an observatory to the DMI via the public telephone network. The units in the primary variometer system (except for the peripherals: printer and graphics screen) are all supplied from an Uninterruptible Power Supply (UPS) which has internal batteries capable of powering the system for a couple of hours in the event of mains failure. The units in the supplementary variometer system are all mains powered without standby battery supply. The PC-clock, though, ensures correct time after power failures. In this way, although no data are recorded during power failures, the data will be properly timed, when power is restored. The fluxgate sensors and electronics of the two variometer systems are placed in the variometer house which is heated by means of thermostatically controlled non-magnetic electric heaters. The data loggers, printers and the graphics screens are all placed in the electronics house.

The instrumentation of the variometer systems are shown in table 1 and 2, while block diagrams of the systems are shown in figure 1.

The fluxgate magnetometer is model FGE, versions D and E designed at the laboratory of the Solar-Terrestrial Physics Division, and consists of a sensing head with three sensors mounted orthogonally to each other, and an electronic unit. The fluxgate sensors are mounted in groves milled in a precision machined marble cube in order to provide accurate and stable sensor alignment. The marble cube is suspended by two crossed phosphor-bronze bands, working as a Cardan's suspension in order to overcome the difficulty with tilting pillars which causes much trouble by baseline drift, cf. reference 7. The three fluxgate sensors are oriented so that they record H_N and H_E and Z , where H_N and H_E are the magnetic north and east components respectively. This orientation has been chosen because setting up the magnetometers is easy, but also in order to keep the continuity from the photographic recordings. The fluxgate magnetometers are regarded as digital variometers the output of which is referred to the main pillar of the observatory by means of absolute measurements.

Description of the magnetometers is given in the references 1 and 2.

Technical specification of the fluxgate magnetometer model FGE

Analogue output	± 10 V
Dynamic range.....	± 4000 nT
Resolution	
Version D	0.2 nT
Version E.....	0.1 nT
Compensation:	
Range.....	64000 nT
Steps	128 nT
Misalignment of sensor axis.....	< 2 mrad (7 min. of arc)
Long time drift.....	< 3 nT/year
Temperature coefficients:	
Sensor	< 0.2 nT/ $^{\circ}$ C
Electronics.....	< 0.1 nT/ $^{\circ}$ C
Resolution of temperature	0.1 $^{\circ}$ C
Bandpass	DC to 1 Hz
Band suspended sensor:	
Range of compensation.....	$\pm 0.5^{\circ}$
Factor of compensation.....	> 1000
Dimensions and weights:	
Band suspended sensor	25 \times 25 \times 55 cm ³ ; 20 kg
Electronics	13 \times 7 \times 22 cm ³ ; 1.0 kg
Power requirements	220 VAC, 2W
Operating temperature	0 to +40 $^{\circ}$ C

Figure 1.
Block diagram of the variometer systems.

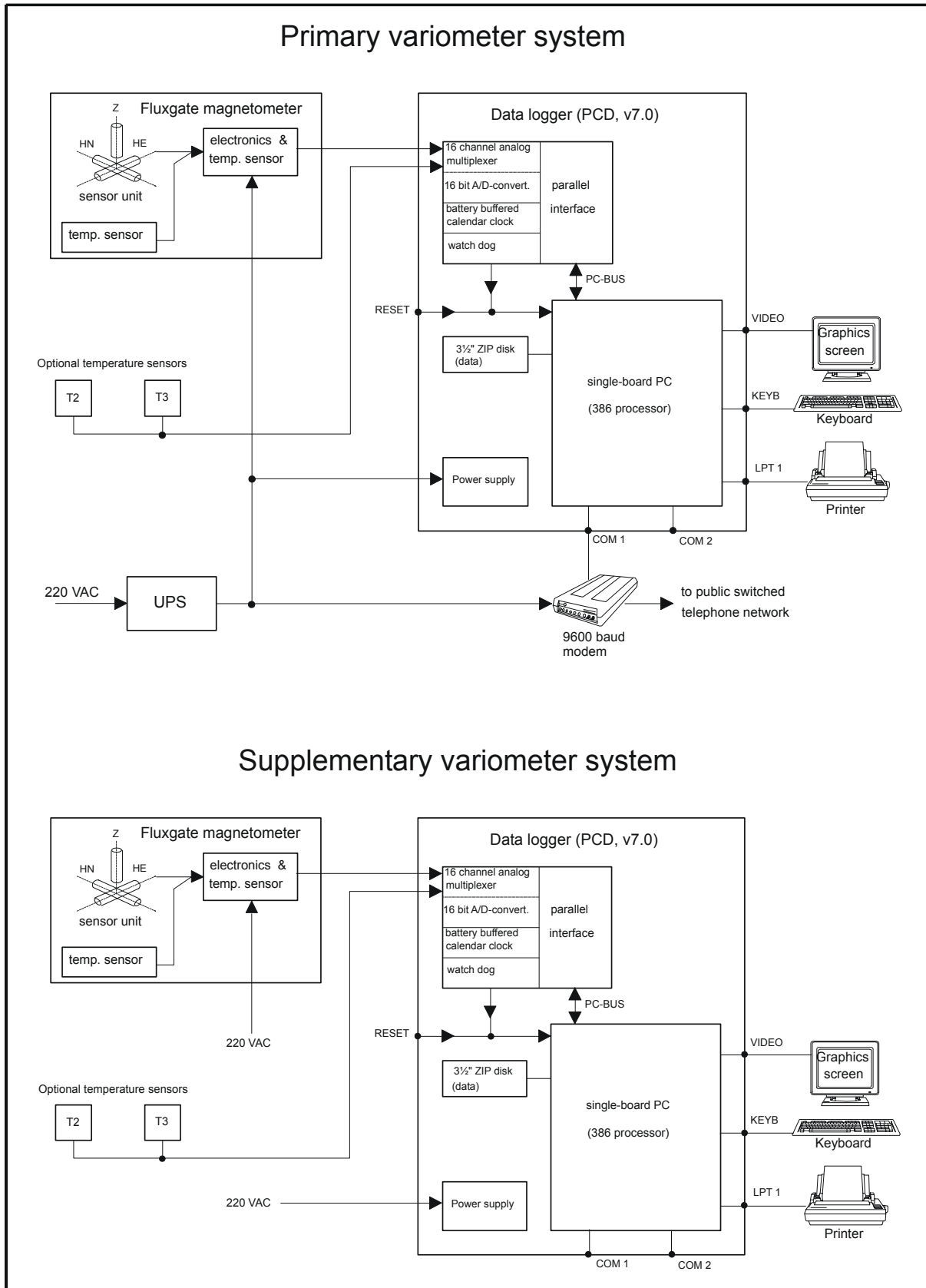


TABLE 1.							
Primary variometer systems 2002							
Station	Period	Fluxgate magnetometer		Data logger			
		Model	Sensitivity	Model	A/D-converter	Resolution	Recorded data
BFE	JAN 01 -DEC 31	FGE, v.D band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
GDH	JAN 01 -DEC 31	FGE, v.E band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
THL	JAN 01 -DEC 31	FGE, v.D band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
NAQ	JAN 01 -DEC 31	FGE, v.E band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values

TABLE 2.							
Supplementary variometer systems 2002							
Station	Period	Fluxgate magnetometer		Data logger			
		Model	Sensitivity	Model	A/D-converter	Resolution	Recorded data
BFE	JAN 01 -DEC 31	FGE, v.E band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
GDH	JAN 01 -DEC 31	FGE, v.E band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
THL	JAN 01 -DEC 31	FGE, v.D band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values
NAQ	JAN 01 -DEC 31	FGE, v.E band-suspended cube	400 nT/V	PCD,v.7.0	16 bits	1/8 nT	20 sec. mean values 1 sec. spot values

2. REDUCTION FORMULAS.

The following reduction formulas, which are independent of the sensor orientation relative to the magnetic meridian, have been used, cf. Appendix A in the yearbook for 1991 (Data Report 92-3)

$$H = \sqrt{(H_0 + S_{HN} \times \Delta H_N)^2 + (S_{HE} \times \Delta H_E)^2}$$

$$D = D_0 + \arctan \left[\frac{S_{HE} \times \Delta H_E}{H_0 + S_{HN} \times \Delta H_N} \right]$$

$$Z = Z_0 + S_Z \times \Delta Z$$

The used notation means

H_0 D_0 Z_0 baseline values.

ΔH_N ΔH_E ΔZ the digital values recorded by the data logger

S_{HN} S_{HE} S_Z scale values.

The scale values are normally calibrated so that $S_{HN} = S_{HE} = S_Z$

The scale value of the recorded data (raw data) is 1/8 nT/LSB as shown in table 1 and 2. LSB means Least Significant Bit. When the data are reformatted to our standard data format, all scale values are converted to 1/4 nT/LSB.

There are no temperature terms in the formulas, partly because the fluxgate magnetometers of DMI design have very small temperature coefficients, and partly because the temperature of the variometer house is kept stable.

3. ABSOLUTE MEASUREMENTS.

3.1. Introduction.

Absolute measurements were carried out on a regular basis by means of a DI-fluxgate magnetometer (DI-flux) for measuring the angles D and I , and a Proton Precession Magnetometer (PPM) for measuring the total field intensity F . The absolute values H and Z are 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_0 , D_0 and Z_0 necessary for calibration of the variometer systems were calculated by means of the reductions formulas shown in chapter 2, and running plots kept.

Two DI-flux measurements were on the average made once a week on the same day at all observatories. At Brorfelde a Proton Vector Magnetometer measurements were used as an independent control of the H and Z values obtained by the DI-flux combined with the PPM.

3.2. Instrumentation.

3.2.1. The DI-fluxgate magnetometer, DI-flux.

The DI-flux consists of a non-magnetic geodetic theodolite from ZEISS and a fluxgate magnetometer manufactured at DMI. The sensor of the magnetometer is fixed in a block of plexiglas, which provides adequate mechanical protection, and mounted on top of the telescope with the positive direction of the magnetic axis almost parallel to the sighting direction of the telescope. The output from the sensor is displayed on a digital voltmeter in nT with a resolution of 0.1 nT and a dynamic range of ± 200 nT. The DI-flux is used as a null-detector as described in reference 8. In order to find the zero positions in a quick and easy way, the magnetometer is equipped with a sound signal, which keeps silent when the output from the sensor is within 0 ± 70 nT.

The theodolite used is either type 010B or 020B. Type 010B was introduced in BFE in 1986 and at the Greenlandic observatories in 1988/89. Type 020B was introduced in NAQ in September 2001 to be used in routine measurements instead of type 010B because it is more convenient to handle for the two observers, cf. Section V.

Both theodolites have centesimal circle graduation, i.e. 400 grades in a circle. In modern usage, the *grade* is referred to as the *gon* (from Greek: *gonia*, angle). Subdivision by 10^3 gives the *milligon* (mgon). The relation between the centesimal and the sexagesimal units is (exact): $1 \text{ gon} = 0.9^\circ$.

TABLE 3 Circle reading		
Theodolite	Reading principle	Mean directional accuracy
010B	Optical micrometer reading	± 0.3 mgon ($\pm 1''$)
020B	Optical scale reading	± 1 mgon ($\pm 3''$)

The DI-flux is considered 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 accuracy of the measurements of the angles D and I has been treated by O. Rasmussen and B. Pedersen, cf. reference 6. The theory of the DI-flux has been carefully treated by E. Kring Lauridsen, cf. reference 3.

3.2.2. The Proton Precession Magnetometer, PPM.

At the observatories in Greenland absolute measurements of the total intensity F was made by means of the proton precession magnetometer, type 105 from EDA, which measures F with a resolution of 0.1 nT.

At Brorfelde a manually operated PPM from ELSEC, type 880B with a resolution of $\frac{1}{4}$ nT, was used for ordinary measurements of F and for vector measurements of H and Z until medio May when it was replaced by an Overhauser magnetometer type GSM-19 from GEM Systems.

The frequency of the time base in the proton precession magnetometers has been determined from time to time by means of a frequency standard, and it was found that all the PPM's except for GSM-19 needed corrections. These corrections $\Delta F_{electronics}$ are since January 01 1992 based on the most recent value of the proton gyromagnetic ratio recommended by CODATA¹

$$\gamma_p = 2.67515255(81) \times 10^8 \text{ rad/(T}\cdot\text{s)}$$

as decided at the IAGA Working Group V-1 meeting on August 19th, 1991 during the IUGG General Assembly in Vienna.

In connection with a re-examination of pillar differences and gradients in the absolute house at Brorfelde, Kring Lauridsen found that the sensor of the ELSEC proton precession magnetometer was magnetic, cf. Brorfelde yearbook 1988-89 (Technical Report 91-3). This permanent magnetism causes small corrections, ΔF_{sensor} , in H and Z . See also Wienert, reference 5 page 113. The formula for F measured by the PPM is therefore

$$F = F_{PPM} + \Delta F_{PPM} \quad \text{where} \quad \Delta F_{PPM} = \Delta F_{electronics} + \Delta F_{sensor}$$

¹CODATA is the Committee on Data for Science and Technology of the International Council for Scientific Unions.

3.2.3. The Proton Vector Magnetometer, PVM.

The PVM at Brorfelde comprises the stationary vertical coil at pillar G and a proton precession magnetometer with the sensor positioned at the center of the coil. The system is used to measure the horizontal component H of the geomagnetic field by means of Nelson's compensation method, i.e. the Z component is cancelled when H is measured. The error in H caused by the possible misalignment of the coil axis is measured directly by means of a suspended magnet variometer with liquid damping.

Description of the coil system is given in the Brorfelde yearbok for 1984, while the details of the theory and practice of the method are explained in reference 4.

3.3. Azimuth marks used for observation of the magnetic declination.

TABLE 4				
Azimuth marks valid for 2002				
observatory	mark	azimuth	distance	remarks
BFE, pillar G (main absolute pillar)	M1 ^{*)}	188°31.90'	106.5 meters	target plate
	M3	358°47.45'	86.0 meters	target plate
BFE, pillar A	M2	348°52.15'	88.5 meters	target plate
	M3	358°47.75'	80.0 meters	target plate
BFE, pillar X	M1 ^{*)}	189°01.1'	90 meters	target plate
GDH	M1 ^{*)}	55°44.0'	400 meters	vertical cliff
	M2	56°50.2'	100 meters	target plate
THL	M2	110°07.0'	135 meters	target plate
NAQ	M4	337°42.5'	250 meters	ionosonde transmitter mast
	M5	337°17.3'	about 3 km	sheep stable
	M6 ^{*)}	263°35.7'	about 6 km	mountain peak

^{*)} main azimuth marks

3.4. PPM corrections.

TABLE 5 Adopted PPM corrections valid for 2002					
observatory	PPM	$\Delta F_{\text{electronics}}$	ΔF_{sensor}	ΔF_{PPM}	remarks
BFE	Elsac 880B	0.5 nT	-0.2 nT	0.3 nT	For F~49000 nT
		0.2 nT	0.1 nT	0.3 nT	For F~17000 nT
	GEM GSM-19	0.0 nT	0.0 nT	0.0 nT	
GDH	EDA 105	-0.5 nT	0.0 nT	-0.5 nT	
THL	EDA 105	-0.5 nT	0.0 nT	-0.5 nT	
NAQ	EDA 105	-0.5 nT	0.0 nT	-0.5 nT	

3.5. Measurement and calculation.

At the observatories in Greenland D and I are measured by means of the DI-fluxgate magnetometer on the single pillar in the absolute house, while F is measured by the EDA proton precession magnetometer, the sensor of which is put up on a pillar at some distance from the absolute pillar, cf. reference 9. The site difference in F , ΔF_{pillar} between the two pillars has been measured, which enable the F measurements to be reduced to the absolute pillar:

$$F_{\text{abs. pillar}} = (F_{\text{PPM}} + \Delta F_{\text{PPM}}) + \Delta F_{\text{pillar}}$$

The values of D , I and F are thus obtained at the absolute pillar, and the calculated values of H and Z are also referred to that point, the observatory standard reference point, i.e. equal to the height of the tilting axis of the DI-theodolite above pillar surface (= 22.5 cm).

TABLE 6 ΔF_{pillar} valid for 2002	
observatory	ΔF_{pillar}
GDH	24.0 nT
THL	7.9 nT
NAQ	8.5 nT

When the theodolite 020B was introduced in Narsarsuaq in September 2001 (cf. chapter 3.2.1) it was found by comparison measurements that

$$H_{010B} = H_{020B} - 1 \text{ nT} \quad \text{and} \quad Z_{010B} = Z_{020B} + 0.2 \text{ nT}$$

These corrections are due to an error in the I measurements which again probably is due to an eccentricity error of the vertical circle which is not compensated for by the reading method (optical scale reading). We thus have a correction ΔI_{020B} to the I measurements done by 020B

$$I = I_{010B} = I_{020B} + \Delta I_{020B} \quad \text{where} \quad \Delta I_{020B} = -\sin I \frac{\Delta H}{F} + \cos I \frac{\Delta Z}{F}$$

Using mean values for I and F we found that

$$\Delta I_{020B} = -\sin 76.8^\circ \frac{-1}{54700} + \cos 76.8^\circ \frac{0.2}{54700} = 4 \text{ arc seconds}$$

At Brorfelde the routine DI-flux measurements were made on pillar A, while supplementary measurements were made on both pillar A and pillar G in order to determine the pillar differences ΔD_{pillar} and ΔI_{pillar} to be added to the measurements on pillar A in order to refer the measurements to the observatory standard reference point on pillar G. As the total intensity F is measured on pillar G no pillar difference in F , ΔF_{pillar} is needed

TABLE 7	
Pillar differences at BFE 2002	
ΔD_{pillar}	0.40'
ΔI_{pillar}	-0.05'

The measurements of F must further refer to the time of the I measurements with the DI-flux. As the proton precession magnetometer is manually operated, the measurements of F must be performed before or after the DI-flux measurements. In order to refer the measurements of F to the time of the I measurements, a time difference in F , ΔF_{time} is therefore needed

$$F_{I\text{-measurement}} = F_{PPM\text{-measurement}} + \Delta F_{time}$$

Calculation of the DI-flux and PPM measurements gives primarily the absolute values of the magnetic elements $DIFHZ$, and subsequent, by using the reduction formulas shown in chapter 2, the baseline values H_0 , D_0 and Z_0 necessary for calibration of the variometer systems. Also the DI-flux constants, i.e. sensor offset S_0 and the sensor misalignment angles ("collimation" angles) δ and ϵ , are calculated regularly as they serve as checking quantities of the measuring procedures for D and I . For easier comparison, it is convenient to convert the angular values for δ and ϵ to nT by multiplication with the normalizing factors H and Z .

4. DEFINITION OF MEAN VALUES.

One-minute values are filtered values calculated from 20-second mean values. The calculated one-minute values are centred on the minute and four 20-second samples, two before the minute and two after the minute are used to calculate one filtered one-minute value. The two samples closest to the minute are given a weight of 3 and the two other samples are given a weight of 1 in the filtered values.

Assuming uncertainties equivalent to 1 nT (or better) in D and I , and better than 1 nT in F , in the absolute measurements, the uncertainty in the adopted baseline values as well as in the final one-minute values in magnetic units, is estimated to be less than 2 nT in Greenland (quiet conditions), and less than 1 nT at Brorfelde.

Hourly mean values, centred on the UT half-hour, are calculated from the one-minute values. As decided on August 27 2001 at the IAGA Division V Business Meeting in Hanoi, Vietnam the hourly mean values are not calculated if more than 6 one-minute values within an hour are missing.

Daily mean values are calculated from the hourly mean values. The daily means are not calculated if any of the hourly mean values for the day are missing. This rule may be found in the WDC format description for hourly mean values.

Monthly mean values are calculated as the mean of available hourly mean values for the month.

Annual mean values are calculated as the mean of available hourly mean values for the year.

5. CRUSTAL ANOMALIES.

The crustal anomaly for each magnetic element is the difference between the Annual Mean (All Days) of the element and the IGRF2000 value at the location of the observatory with the secular variation model applied out to epoch 2002.5.

Observatory	Epoch 2002.5	D (° ')	I (° ')	H (nT)	X (nT)	Y (nT)	Z (nT)	F (nT)
THL	2002 Annual Mean	298°57.0'	86°01.8'	3907	1891	-3419	56299	56434
	IGRF2000 for 2002.5	297°56.0'	85°54.0'	4030	1887	-3560	56237	56381
	Crustal Anomaly	1°01.0'	0°07.8'	-123	4	141	62	53
GDH	2002 Annual Mean	319°49.5'	81°09.8'	8704	6651	-5615	55991	56664
	IGRF2000 for 2002.5	319°49.0'	81°28.2'	8276	6323	-5339	55183	55800
	Crustal Anomaly	0°00.5'	-0°18.4'	428	328	-276	808	864
NAQ	2002 Annual Mean	332°23.6'	76°44.2'	12553	11124	-5817	53254	54714
	IGRF2000 for 2002.5	331°46.2'	76°15.6'	12905	11369	-6105	52758	54313
	Crustal Anomaly	0°37.4'	0°28.6'	-352	-245	288	496	401
BFE	2002 Annual Mean	0°52.7'	69°48.2'	17145	17143	263	46607	49660
	IGRF2000 for 2002.5	1°06.6'	69°55.2'	17076	17073	331	46721	49744
	Crustal Anomaly	-0°13.9'	-0°07.0'	69	70	-68	-114	-84

6. PRESENTATION OF RESULTS.

In this yearbook the following data are organised by observatory in the sections II-V:

- Tables of adopted baseline values.
- Tables of monthly and annual mean values of all geomagnetic elements.
- Plots of the annual mean values and annual changes of X , Y and Z .

while the following plots are presented in section VII:

- Plots of observed and adopted baseline values.
- Plots of differences between observed and calculated absolute values.
- Plots of hourly and daily mean values of X , Y and Z .

The final baseline values presented in section II-V are adopted by a graphical smoothing process as described in section VII.

Monthly mean values and Annual mean values of the observed magnetic elements (HDZ) as well as the derived values ($XYFI$) for All Days, Quiet Days and Disturbed Days are tabulated in the sections II-V.

In the case of Brorfelde, annual mean values (All Days) from Rude Skov are also tabulated.

In the case of Narsarsuaq we have not calculated annual means for the period 1968-82. Instead QWD (“Quiet Winter Days”) values are calculated from field values (DHZ) determined at nighttime hours of very quiet winter days (December and January).

Declination and inclination are expressed in degrees and decimal minutes, while the units of all the other elements are nanoteslas. In the tables of annual mean values for THL and GDH the decimal minutes are rounded to the equivalent of 1 nT, i.e. to the nearest minute or half-minute respectively.

Plots of annual mean values (All Days) of the observed magnetic elements HDZ , and of first differences of the annual means, i.e. secular variation at the observatories, are also presented. For Narsarsuaq plots of Quiet Winter Days 1968-84 are also presented together with plots of All Days.

7. DATA DISTRIBUTION AND AVAILABILITY.

Preliminary one-minute digital data from all four observatories are sent by E-mail on a daily basis to the INTERMAGNET Geomagnetic Information Nodes (GINs) in Ottawa, Canada, in Edinburgh, Scotland, and in Kyoto, Japan. These data are available through Internet:

<http://www.intermagnet.org>

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 mean values are available through the World Data Center for Geomagnetism, Copenhagen:

<http://www.dmi.dk/projects/wdcc1/>

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

<http://www.intermagnet.org>

To be used in modelling work, monthly mean values are sent to IPGP in Paris. Accessible through Internet:

<http://www.ipgp.jussieu.fr:/AM-MONTHLY/index.html>

Annual means are sent to the WDC for Geomagnetism, Edinburgh, also to be used in modelling work. Accessible through Internet:

http://www.geomag.bgs.ac.uk/gifs/annual_means.shtml

PC-indices (plots and digital values) based on Thule data are published through the WDCs for Geomagnetism, Copenhagen, Denmark and Boulder, USA. Accessible through Internet:

<http://www.dmi.dk/projects/wdcc1/pcn/pcn.html>

One-minute digital data from Narsarsuaq are sent once a month to the WDC for Geomagnetism, Kyoto, Japan. The data are used in preparation of the AE-index. Accessible through Internet:

<http://swdcdb.kugi.kyoto-u.ac.jp/>

K-indices from Brorfelde are sent by E-mail twice a month to GFZ in Potsdam, Germany. The *K*-index is used in the preparation of K_p -indices published by the International Association of Geomagnetism and Aeronomy (IAGA). The lower limit for $K = 9$ at BFE is 600 nT.

http://www.gfz-potsdam.de/pb2/pb23/GeoMag/niemegk/kp_index/

Momentary values from Brorfelde at 02 UT on 10 quiet days per month selected by G. Schulz at the magnetic observatory in Wingst are used for comparisons between observatories all over Europe.

8. REFERENCES.

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SECTION II

Brorfelde Geomagnetic Observatory 2002.

OBSERVATORY DETAILS.

The Danish main geomagnetic observatory Brorfelde was established in 1978 by the Danish Meteorological Institute as a successor to the observatory at Rude Skov which suffered from disturbances from electric trains. The observatory is situated on a hilltop near the small village Brorfelde about 60 km West of Copenhagen. The protected area which has been put at the disposal of DMI by the University of Copenhagen is the triangular eastern part of the 45 ha area used by the University of Copenhagen.

The observatory consists of 4 houses: An office and guest house (52 m²), an absolute house (48 m²), an electronics house (32 m²) and a sensor house (30 m²). Further description of the new observatory and its location is given in the observatory yearbook for 1984 as well as the background for the removal.

The following coordinates etc. are valid for the observatory:

Acronym (IAGA-code).....	BFE
Elevation (top of absolute pillar)	80 m
Geographic latitude	55°37.5'N
Geographic longitude	11°40.3'E
Geomagnetic latitude	55.45°N
Geomagnetic longitude	98.66°E

The geomagnetic coordinates are based on the IGRF 2000.0 magnetic field model in which the geomagnetic north pole position is 79.5°N, 288.4°E.

STAFF.

The routine absolute measurements were made by Mr. Henrik Schwartz, while Mr. Børge Pedersen attended to the observatory at irregular intervals in order to make supplementary measurements.

DIARY.

- JAN 03 Sunshots for check of the azimuth marks.
- JAN 16 and FEB 06 The pillar differences ΔD_{pillar} and ΔI_{pillar} to be added to the measurements on pillar A in order to refer the measurements to the observatory standard reference point on pillar G were checked by means of DI-flux measurements.
- APR 07 The recordings were disturbed from a picnic party which took place just outside the variometer house.
- MAY 17 The PPM from ELSEC type 880B was replaced by an Overhauser magnetometer type GSM-19 from GEM Systems.
The frequency of the time base in the PPM was checked by means of a frequency standard, and it was found that it did not need correction, cf. chapter 3.4 in section I.
- SEP-OCT During medio September to medio October the roof covering of the four observatory buildings were renewed. This work caused many disturbances and baseline jumps as shown in the tables below.
- DEC 13 The old azimuth mark M3 to be used in connection with sunshots was replaced.

MISSING DATA.

Intervals of missing primary variometer data were, if possible, replaced by data from the supplementary recorder.

The hourly mean values are missing in the following intervals

JAN 15:	08-10 UT
APR 07:	12-14 UT
SEP 20:	05-06 UT, 07-09 UT and 10-11 UT
SEP 23:	05-07 UT and 14-15 UT
SEP 24:	05-06 UT and 12-13 UT
SEP 25:	05-06 UT and 14-15 UT
SEP 26:	05-06 UT and 08-09 UT
SEP 27:	05-06 UT and 10-11 UT
SEP 30:	05-06 UT
OCT 01:	05-14 UT
OCT 02:	05-14 UT
OCT 03:	05-14 UT
OCT 04:	07-11 UT
OCT 07:	05-15 UT
OCT 11:	05-10 UT
OCT 16:	05-12 UT

OBSERVED AND ADOPTED BASELINE VALUES.

Tables of adopted baseline values are shown below, while graphs of the observed and adopted baseline values are shown in section VII.

Adopted baseline values for the primary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	16968.0 nT	0°25.7'	46429.0 nT
JAN	07	00:00 UT		0°25.6'	
MAR	01	00:00 UT			46429.5 nT
APR	01	00:00 UT	16968.5 nT		
MAY	01	00:00 UT	16969.0 nT		
MAY	13	00:00 UT		0°25.7'	46430.0 nT
JUN	11	00:00 UT		0°25.8'	
JUL	01	00:00 UT	16969.5 nT	0°25.9'	
AUG	01	00:00 UT			46430.5 nT
SEP	20	05:40 UT	16966.5 nT	0°26.3'	46447.5 nT
SEP	20	10:40 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	23	06:05 UT	16965.5 nT	0°26.1'	46449.5 nT
SEP	23	14:05 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	24	05:10 UT	16966.5 nT	0°26.1'	46449.5 nT
SEP	24	12:50 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	25	05:07 UT	16966.5 nT	0°26.3'	46443.5 nT
SEP	25	14:08 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	26	05:10 UT	16966.5 nT	0°26.3'	46443.5 nT
SEP	26	08:27 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	27	05:11 UT	16968.5 nT	0°26.1'	46445.5 nT
SEP	27	10:30 UT	16969.5 nT	0°25.9'	46430.5 nT
SEP	30	05:34 UT	16968.5 nT	0°26.1'	46445.5 nT
SEP	30	14:00 UT	16969.5 nT	0°25.9'	46430.5 nT
OCT	04	10:00 UT	16969.0 nT	0°25.9'	46430.0 nT
OCT	21	00:00 UT		0°25.8'	
NOV	11	00:00 UT		0°25.7'	

Adopted baseline values for the supplementary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	17063.5 nT	0°25.6'	46390.0 nT
JAN	10	00:00 UT			46391.0 nT
JAN	15	00:00 UT		0°25.4'	
FEB	01	00:00 UT	17062.0 nT		
APR	01	00:00 UT	17063.5 nT		
MAY	01	00:00 UT	17064.5 nT	0°25.6'	46390.5 nT
MAY	06	00:00 UT	17065.0 nT		
MAY	15	00:00 UT		0°25.7'	
MAY	21	00:00 UT	17066.0 nT		
JUN	11	00:00 UT	17066.5 nT	0°25.8'	46390.0 nT
JUL	01	00:00 UT		0°25.9'	
SEP	01	00:00 UT			46389.5 nT
OCT	01	00:00 UT		0°26.2'	
NOV	01	00:00 UT	17066.0 nT	0°26.1'	46390.5 nT
NOV	11	00:00 UT	17065.5 nT	0°26.0'	
NOV	20	00:00 UT	17065.0 nT	0°25.8'	

Monthly Mean Values, All Days, Quiet Days and Disturbed Days.

Year	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
2002	°	'	°	'	nT	nT	nT	nT	nT		
JAN	0	48.9	69	47.9	17143	17141	244	46590	49644	A	DHZ
FEB	0	49.7	69	47.9	17143	17141	248	46589	49643	A	DHZ
MAR	0	49.9	69	47.7	17146	17144	249	46590	49645	A	DHZ
APR	0	50.9	69	48.2	17142	17140	254	46597	49650	A	DHZ
MAY	0	51.7	69	47.8	17149	17147	258	46599	49654	A	DHZ
JUN	0	51.5	69	47.0	17160	17158	257	46598	49657	A	DHZ
JUL	0	52.5	69	47.2	17158	17156	262	46600	49658	A	DHZ
AUG	0	53.7	69	48.0	17148	17146	268	46607	49662	A	DHZ
SEP	0	54.2	69	48.8	17140	17138	270	46618	49669	A	DHZ
OCT	0	56.4	69	49.7	17129	17127	281	46629	49676	A	DHZ
NOV	0	56.4	69	49.4	17136	17134	281	46632	49681	A	DHZ
DEC	0	56.3	69	48.6	17147	17145	281	46629	49682	A	DHZ
WINTER	0	52.7	69	48.5	17142	17140	263	46610	49662	A	DHZ
EQUINOX	0	53.0	69	48.6	17139	17137	264	46609	49660	A	DHZ
SUMMER	0	52.3	69	47.5	17154	17152	261	46601	49658	A	DHZ
YEAR	0	52.7	69	48.2	17145	17143	263	46607	49660	A	DHZ
JAN	0	48.7	69	47.6	17147	17145	243	46588	49643	Q	DHZ
FEB	0	49.3	69	47.7	17146	17144	246	46589	49644	Q	DHZ
MAR	0	49.7	69	47.4	17150	17148	248	46588	49644	Q	DHZ
APR	0	50.7	69	47.5	17150	17148	253	46592	49648	Q	DHZ
MAY	0	52.1	69	48.0	17146	17144	260	46600	49654	Q	DHZ
JUN	0	51.1	69	46.9	17162	17160	255	46597	49657	Q	DHZ
JUL	0	51.9	69	46.9	17161	17159	259	46598	49658	Q	DHZ
AUG	0	53.3	69	47.6	17153	17151	266	46603	49660	Q	DHZ
SEP	0	53.7	69	48.1	17149	17147	268	46615	49669	Q	DHZ
OCT	0	55.0	69	48.8	17142	17140	274	46626	49677	Q	DHZ
NOV	0	55.3	69	48.6	17147	17145	276	46629	49682	Q	DHZ
DEC	0	55.3	69	47.6	17160	17158	276	46624	49682	Q	DHZ
WINTER	0	52.1	69	47.9	17150	17148	260	46608	49663	Q	DHZ
EQUINOX	0	52.3	69	48.0	17148	17146	261	46605	49660	Q	DHZ
SUMMER	0	52.1	69	47.3	17156	17154	260	46599	49657	Q	DHZ
YEAR	0	52.1	69	47.7	17151	17149	260	46604	49660	Q	DHZ
JAN	0	49.2	69	48.5	17135	17133	245	46593	49644	D	DHZ
FEB	0	50.8	69	48.7	17132	17130	253	46591	49641	D	DHZ
MAR	0	50.5	69	48.1	17141	17139	252	46590	49643	D	DHZ
APR	0	51.8	69	50.0	17121	17119	258	46616	49661	D	DHZ
MAY	0	51.5	69	47.9	17150	17148	257	46609	49664	D	DHZ
JUN	0	51.5	69	47.3	17156	17154	257	46600	49658	D	DHZ
JUL	0	52.5	69	47.5	17153	17151	262	46601	49658	D	DHZ
AUG	0	54.8	69	48.6	17137	17135	273	46604	49655	D	DHZ
SEP	0	55.0	69	50.0	17124	17122	274	46624	49669	D	DHZ
OCT	0	58.9	69	50.9	17111	17108	293	46625	49665	D	DHZ
NOV	0	57.4	69	50.3	17123	17121	286	46636	49680	D	DHZ
DEC	0	57.2	69	49.3	17137	17135	285	46632	49681	D	DHZ
WINTER	0	53.6	69	49.2	17132	17130	267	46613	49662	D	DHZ
EQUINOX	0	54.0	69	49.7	17124	17122	269	46614	49660	D	DHZ
SUMMER	0	52.5	69	47.8	17149	17147	262	46603	49658	D	DHZ
YEAR	0	53.4	69	48.9	17135	17133	266	46610	49660	D	DHZ

*A = All days

*Q = Q-days

*D = D-days

ELE = Elements recorded

ANNUAL MEAN VALUES.

In the following two tables the observatory means of the magnetic elements in Denmark since 1891 are presented. In the first table the annual means are shown for the two old observatories Copenhagen (COP) and Rude Skov (RSV) for the period 1891-1980. The second table shows the means for Brorfelde since 1980.

Annual Mean Values, Copenhagen and Rude Skov 1891-1980, All Days.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1891.5	348 54.3	69 04.6	17198	16877	-3310	44982	48158	C	DHZ
1892.5	349 01.0	69 05.3	17206	16891	-3278	45030	48205	C	DHZ
1893.5	349 07.2	69 03.8	17234	16924	-3253	45045	48229	C	DHZ
1894.5	349 13.6	69 02.4	17250	16946	-3224	45032	48223	C	DHZ
1895.5	349 19.6	69 00.0	17277	16978	-3200	45010	48212	C	DHZ
1896.5	349 25.4	68 58.0	17299	17005	-3175	44988	48199	C	DHZ
1897.5	349 30.5	68 55.5	17327	17037	-3155	44964	48187	C	DHZ
1898.5	349 35.2	68 53.8	17344	17058	-3135	44941	48172	C	DHZ
1899.5	349 39.2	68 51.7	17367	17085	-3119	44918	48158	C	DHZ
1900.5	349 42.8	68 49.6	17390	17110	-3105	44895	48145	C	DHZ
1901.5	349 45.7	68 47.6	17411	17134	-3095	44872	48131	C	DHZ
1902.5	349 48.5	68 46.2	17423	17148	-3083	44850	48115	C	DHZ
1903.5	349 51.5	68 45.1	17431	17159	-3069	44826	48096	C	DHZ
1904.5	349 55.3	68 44.2	17434	17165	-3051	44802	48075	C	DHZ
1905.5	350 00.1	68 43.7	17432	17167	-3027	44778	48051	C	DHZ
1906.5	350 05.5	68 43.4	17427	17167	-2999	44752	48025	C	DHZ
1907.5	350 11.8	68 43.2	17420	17166	-2966	44727	48000	A	DHZ
1908.5	350 18.5	68 43.5	17403	17155	-2930	44694	47963	A	DHZ
1909.5	350 25.7	68 43.9	17386	17144	-2891	44666	47930	A	DHZ
1910.5	350 32.9	68 44.2	17375	17139	-2853	44648	47910	A	DHZ
1911.5	350 41.2	68 44.8	17359	17130	-2809	44631	47888	A	DHZ
1912.5	350 49.4	68 45.4	17342	17120	-2766	44610	47862	A	DHZ
1913.5	350 58.1	68 46.6	17319	17104	-2719	44597	47842	A	DHZ
1914.5	351 08.0	68 48.2	17293	17086	-2665	44592	47828	A	DHZ
1915.5	351 17.3	68 50.6	17257	17058	-2614	44591	47814	A	DHZ
1916.5	351 27.0	68 52.7	17229	17038	-2561	44599	47811	A	DHZ
1917.5	351 35.6	68 54.8	17198	17013	-2514	44599	47800	A	DHZ
1918.5	351 44.5	68 56.5	17167	16989	-2466	44587	47778	A	DHZ
1919.5	351 54.2	68 58.2	17144	16973	-2415	44592	47774	A	DHZ
1920.5	352 04.4	68 59.7	17124	16960	-2361	44596	47771	A	DHZ
1921.5	352 14.8	69 01.2	17105	16949	-2308	44607	47774	A	DHZ
1922.5	352 26.2	69 02.6	17087	16938	-2249	44615	47775	A	DHZ
1923.5	352 37.4	69 03.6	17073	16932	-2192	44615	47770	A	DHZ
1924.5	352 49.6	69 05.1	17053	16920	-2129	44621	47769	A	DHZ
1925.5	353 02.3	69 07.2	17025	16899	-2064	44631	47768	A	DHZ
1926.5	353 14.8	69 10.0	16992	16874	-1998	44654	47778	A	DHZ
1927.5	353 26.6	69 11.6	16974	16863	-1938	44670	47786	A	DHZ
1928.5	353 38.0	69 13.9	16948	16843	-1879	44691	47797	A	DHZ
1929.5	353 49.0	69 16.2	16924	16826	-1823	44718	47813	A	DHZ
1930.5	353 59.6	69 19.0	16893	16800	-1768	44747	47830	A	DHZ

continues...

Annual Mean Values, Copenhagen and Rude Skov, continued.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1931.5	354 09.6	69 20.5	16879	16791	-1717	44767	47843	A	DHZ
1932.5	354 20.1	69 23.1	16855	16773	-1664	44805	47870	A	DHZ
1933.5	354 30.4	69 25.0	16839	16762	-1612	44838	47896	A	DHZ
1934.5	354 40.7	69 26.9	16824	16751	-1560	44875	47925	A	DHZ
1935.5	354 51.2	69 29.6	16804	16736	-1507	44927	47967	A	DHZ
1936.5	355 01.1	69 31.9	16786	16723	-1458	44972	48003	A	DHZ
1937.5	355 10.7	69 34.4	16767	16708	-1409	45022	48043	A	DHZ
1938.5	355 19.7	69 36.7	16752	16696	-1364	45071	48084	A	DHZ
1939.5	355 28.5	69 38.2	16745	16693	-1321	45113	48120	A	DHZ
1940.5	355 37.2	69 39.8	16739	16690	-1278	45162	48164	A	DHZ
1941.5	355 45.9	69 41.5	16730	16684	-1235	45207	48203	A	DHZ
1942.5	355 53.4	69 42.5	16727	16684	-1199	45240	48233	A	DHZ
1943.5	356 01.5	69 44.4	16714	16674	-1159	45281	48267	A	DHZ
1944.5	356 09.0	69 45.6	16710	16672	-1122	45318	48301	A	DHZ
1945.5	356 16.5	69 46.9	16701	16666	-1085	45349	48327	A	DHZ
1946.5	356 25.2	69 49.3	16680	16647	-1042	45386	48354	A	DHZ
1947.5	356 32.9	69 50.3	16677	16647	-1004	45419	48384	A	DHZ
1948.5	356 40.3	69 50.7	16676	16648	-968	45435	48399	A	DHZ
1949.5	356 47.8	69 51.5	16675	16649	-932	45465	48426	A	DHZ
1950.5	356 55.2	69 51.7	16685	16661	-896	45498	48461	A	DHZ
1951.5	357 02.7	69 52.0	16692	16670	-860	45529	48492	A	DHZ
1952.5	357 09.8	69 52.0	16701	16681	-827	45554	48519	A	DHZ
1953.5	357 16.2	69 51.5	16713	16694	-796	45568	48536	A	DHZ
1954.5	357 22.4	69 51.1	16726	16708	-767	45586	48558	A	DHZ
1955.5	357 28.4	69 51.3	16733	16717	-738	45616	48588	A	DHZ
1956.5	357 34.2	69 52.4	16732	16717	-709	45657	48626	A	DHZ
1957.5	357 39.0	69 52.6	16738	16724	-686	45683	48653	A	DHZ
1958.5	357 43.1	69 52.5	16749	16736	-667	45707	48679	A	DHZ
1959.5	357 47.3	69 52.6	16759	16747	-647	45737	48711	A	DHZ
1960.5	357 51.6	69 52.6	16771	16759	-626	45772	48748	A	DHZ
1961.5	357 55.2	69 51.7	16794	16783	-610	45798	48780	A	DHZ
1962.5	357 59.2	69 50.8	16814	16804	-591	45815	48803	A	DHZ
1963.5	358 03.0	69 50.5	16825	16815	-573	45833	48824	A	DHZ
1964.5	358 05.6	69 49.8	16841	16832	-560	45847	48842	A	DHZ
1965.5	358 08.4	69 49.1	16859	16850	-547	45867	48867	A	DHZ
1966.5	358 11.3	69 49.0	16868	16860	-533	45887	48889	A	DHZ
1967.5	358 13.8	69 49.0	16878	16870	-521	45914	48918	A	DHZ
1968.5	358 15.2	69 48.4	16895	16887	-515	45937	48945	A	DHZ
1969.5	358 16.2	69 47.7	16917	16909	-511	45966	48980	A	DHZ
1970.5	358 17.5	69 47.2	16936	16928	-505	45997	49016	A	DHZ
1971.5	358 19.1	69 46.1	16963	16956	-498	46025	49051	A	DHZ
1972.5	358 21.8	69 45.5	16985	16978	-485	46059	49091	A	DHZ
1973.5	358 25.1	69 45.0	17006	17000	-469	46096	49133	A	DHZ
1974.5	358 30.1	69 44.9	17021	17015	-445	46133	49173	A	DHZ
1975.5	358 34.5	69 44.4	17041	17036	-424	46168	49213	A	DHZ
1976.5	358 40.3	69 44.2	17058	17053	-395	46204	49252	A	DHZ
1977.5	358 46.4	69 43.9	17071	17067	-365	46226	49277	A	DHZ
1978.5	358 54.0	69 44.8	17071	17068	-328	46266	49315	A	DHZ
1979.5	359 01.2	69 44.9	17077	17075	-292	46286	49336	A	DHZ
1980.5	359 08.4	69 45.2	17078	17076	-256	46300	49349	A	DHZ

*C = The values from 1891 to 1906 are calculated from the old Copenhagen observatory and transformed to RSV values, as described in the observatory yearbook "Rude Skov, Magnetic Results 1980. Copenhagen 1983".

*A = All days.

ELE = Elements recorded.

Annual Mean Values, Brorfelde, All Days, Quiet Days and Disturbed Days.

YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1980.5	0	38.2	0	15.3	-135	-131	194	265	201	J	DHZ
1980.5	358	30.2	69	29.9	17213	17207	-450	46035	49148	A	DHZ
1981.5	358	36.9	69	31.2	17204	17199	-416	46062	49170	A	DHZ
1982.5	358	44.0	69	32.4	17194	17190	-380	46087	49190	A	DHZ
1983.5	358	50.6	69	32.8	17194	17190	-347	46100	49202	A	DHZ
1984.5	358	57.0	69	33.7	17185	17182	-315	46116	49214	A	DHZ
1985.5	359	03.2	69	34.6	17178	17176	-284	46134	49228	A	DHZ
1986.5	359	09.3	69	36.1	17165	17163	-253	46158	49246	A	DHZ
1987.5	359	14.9	69	36.9	17160	17159	-225	46177	49262	A	DHZ
1988.5	359	20.7	69	38.6	17145	17144	-196	46209	49287	A	DHZ
1989.5	359	26.2	69	40.5	17129	17128	-168	46242	49313	A	DHZ
1990.5	359	30.8	69	41.2	17125	17124	-145	46263	49331	A	DHZ
1991.5	359	35.8	69	42.5	17115	17115	-120	46288	49351	A	DHZ
1992.5	359	40.7	69	42.7	17118	17118	-96	46304	49367	A	DHZ
1993.5	359	46.7	69	42.9	17121	17121	-66	46320	49383	A	DHZ
1994.5	359	53.8	69	43.6	17119	17119	-31	46346	49407	A	DHZ
1995.5	0	00.4	69	43.8	17125	17125	2	46368	49429	A	DHZ
1996.5	0	07.8	69	43.7	17133	17133	39	46389	49452	A	DHZ
1997.5	0	15.7	69	44.6	17132	17132	78	46422	49482	A	DHZ
1998.5	0	23.7	69	45.9	17126	17126	118	46462	49518	A	DHZ
1999.5	0	30.9	69	46.6	17129	17128	154	46496	49551	A	DHZ
2000.5	0	38.1	69	47.7	17127	17126	190	46536	49588	A	DHZ
2001.5	0	45.3	69	47.8	17136	17135	226	46569	49622	A	DHZ
2002.5	0	52.7	69	48.2	17145	17143	263	46607	49660	A	DHZ
1980.5	358	30.0	69	29.7	17216	17210	-451	46034	49148	Q	DHZ
1981.5	358	36.3	69	30.5	17212	17207	-419	46058	49169	Q	DHZ
1982.5	358	43.5	69	31.8	17202	17198	-383	46084	49190	Q	DHZ
1983.5	358	49.7	69	32.1	17204	17200	-352	46100	49206	Q	DHZ
1984.5	358	56.5	69	33.3	17191	17188	-318	46115	49215	Q	DHZ
1985.5	359	02.8	69	34.2	17184	17182	-286	46133	49229	Q	DHZ
1986.5	359	08.8	69	35.6	17172	17170	-256	46157	49248	Q	DHZ
1987.5	359	14.6	69	36.6	17164	17163	-227	46176	49263	Q	DHZ
1988.5	359	20.2	69	38.1	17152	17151	-199	46206	49287	Q	DHZ
1989.5	359	25.4	69	39.8	17138	17137	-172	46239	49313	Q	DHZ
1990.5	359	30.1	69	40.6	17133	17132	-149	46259	49330	Q	DHZ
1991.5	359	35.1	69	41.8	17123	17123	-124	46283	49349	Q	DHZ
1992.5	359	40.1	69	42.1	17125	17125	-99	46300	49366	Q	DHZ
1993.5	359	46.2	69	42.4	17127	17127	-69	46318	49383	Q	DHZ
1994.5	359	53.0	69	43.0	17128	17128	-35	46344	49408	Q	DHZ
1995.5	359	59.8	69	43.3	17132	17132	-1	46366	49430	Q	DHZ
1996.5	0	07.2	69	43.5	17136	17136	36	46388	49452	Q	DHZ
1997.5	0	15.4	69	44.2	17137	17137	77	46421	49483	Q	DHZ
1998.5	0	23.3	69	45.5	17132	17132	116	46460	49518	Q	DHZ
1999.5	0	30.5	69	46.2	17134	17133	152	46494	49551	Q	DHZ
2000.5	0	37.7	69	47.1	17134	17133	188	46533	49587	Q	DHZ
2001.5	0	44.9	69	47.3	17143	17142	224	46566	49621	Q	DHZ
2002.5	0	52.1	69	47.7	17151	17149	260	46604	49660	Q	DHZ

continues...

Annual Mean Values, Brorfelde, continued.

YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1980.5	358	30.8	69	30.6	17204	17198	-446	46040	49149	D	DHZ
1981.5	358	37.5	69	32.0	17193	17188	-413	46068	49172	D	DHZ
1982.5	358	45.1	69	33.6	17177	17173	-374	46091	49188	D	DHZ
1983.5	358	51.6	69	33.7	17180	17177	-342	46100	49197	D	DHZ
1984.5	358	57.9	69	34.5	17173	17170	-310	46117	49211	D	DHZ
1985.5	359	04.0	69	35.2	17169	17167	-280	46135	49226	D	DHZ
1986.5	359	10.1	69	36.7	17155	17153	-249	46158	49243	D	DHZ
1987.5	359	15.3	69	37.4	17153	17152	-223	46180	49263	D	DHZ
1988.5	359	21.3	69	39.5	17134	17133	-193	46214	49288	D	DHZ
1989.5	359	27.8	69	41.9	17110	17109	-160	46249	49312	D	DHZ
1990.5	359	31.7	69	42.2	17112	17111	-141	46267	49330	D	DHZ
1991.5	359	36.9	69	43.9	17097	17097	-115	46298	49354	D	DHZ
1992.5	359	41.3	69	43.6	17105	17105	-93	46308	49366	D	DHZ
1993.5	359	47.5	69	43.7	17109	17109	-62	46322	49381	D	DHZ
1994.5	359	54.4	69	44.4	17108	17108	-28	46347	49404	D	DHZ
1995.5	0	01.2	69	44.3	17117	17117	6	46370	49428	D	DHZ
1996.5	0	08.4	69	44.1	17127	17127	42	46389	49450	D	DHZ
1997.5	0	16.3	69	45.2	17123	17123	81	46424	49481	D	DHZ
1998.5	0	24.5	69	46.9	17113	17113	122	46465	49516	D	DHZ
1999.5	0	31.7	69	47.3	17119	17118	158	46498	49549	D	DHZ
2000.5	0	39.4	69	48.7	17112	17111	196	46540	49586	D	DHZ
2001.5	0	46.4	69	48.9	17122	17120	231	46574	49621	D	DHZ
2002.5	0	53.4	69	48.9	17135	17133	266	46610	49660	D	DHZ

*J = Site differences RSV-BFE calculated from the annual means 1980. A linear regression based on measurements during 1980-94 yields the following values of the field differences

$$D_{RSV} - D_{BFE} = 39 - 0.2 \times (t - 1980.0) \text{ minutes of arc}$$

$$H_{RSV} - H_{BFE} = -136 - 0.7 \times (t - 1980.0) \text{ nT}$$

$$Z_{RSV} - Z_{BFE} = 265 \text{ nT}$$

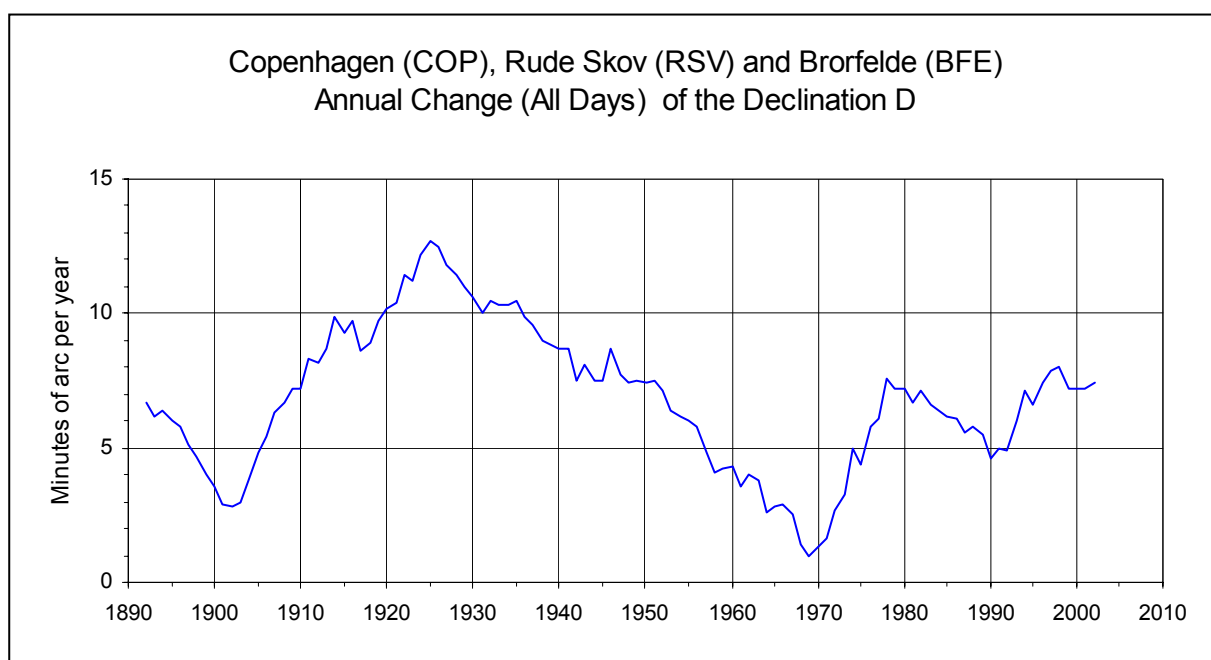
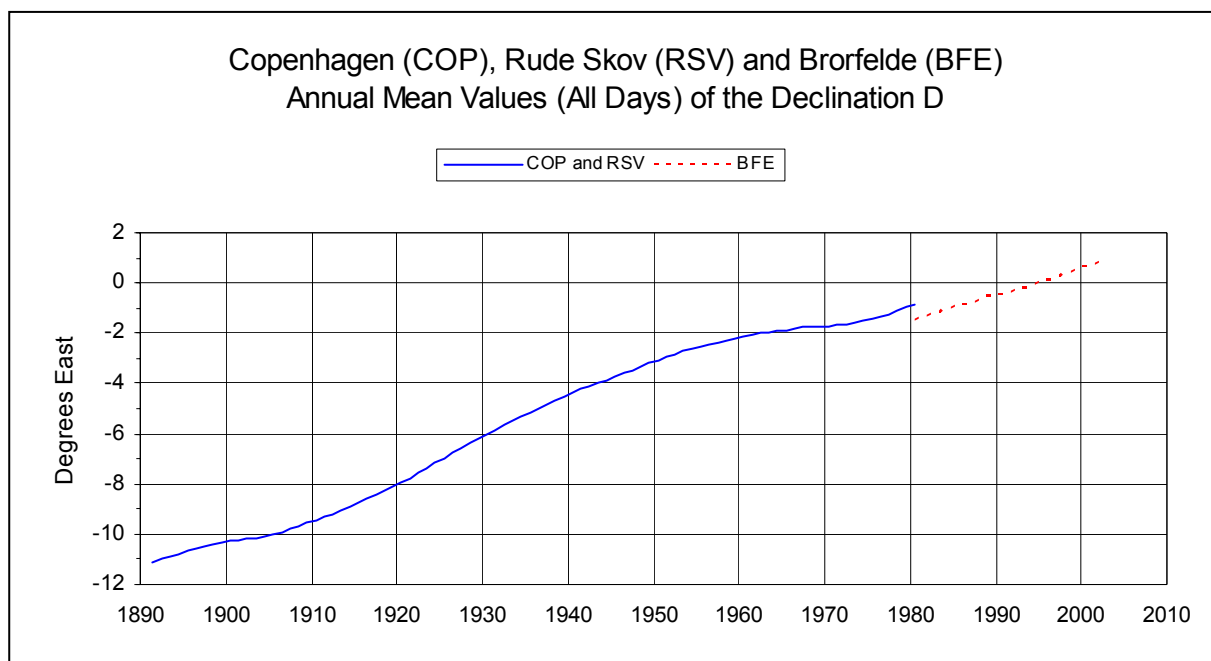
cf. Appendix A in the observatory yearbook for 1994 (Reference 8 in Section I).

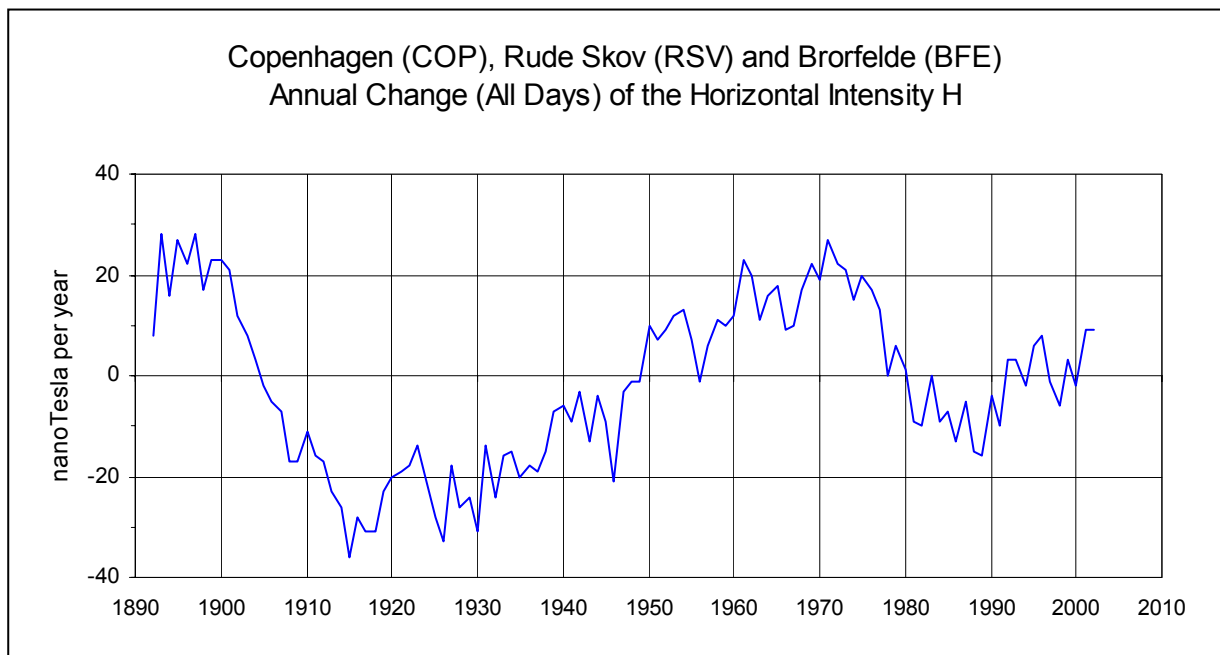
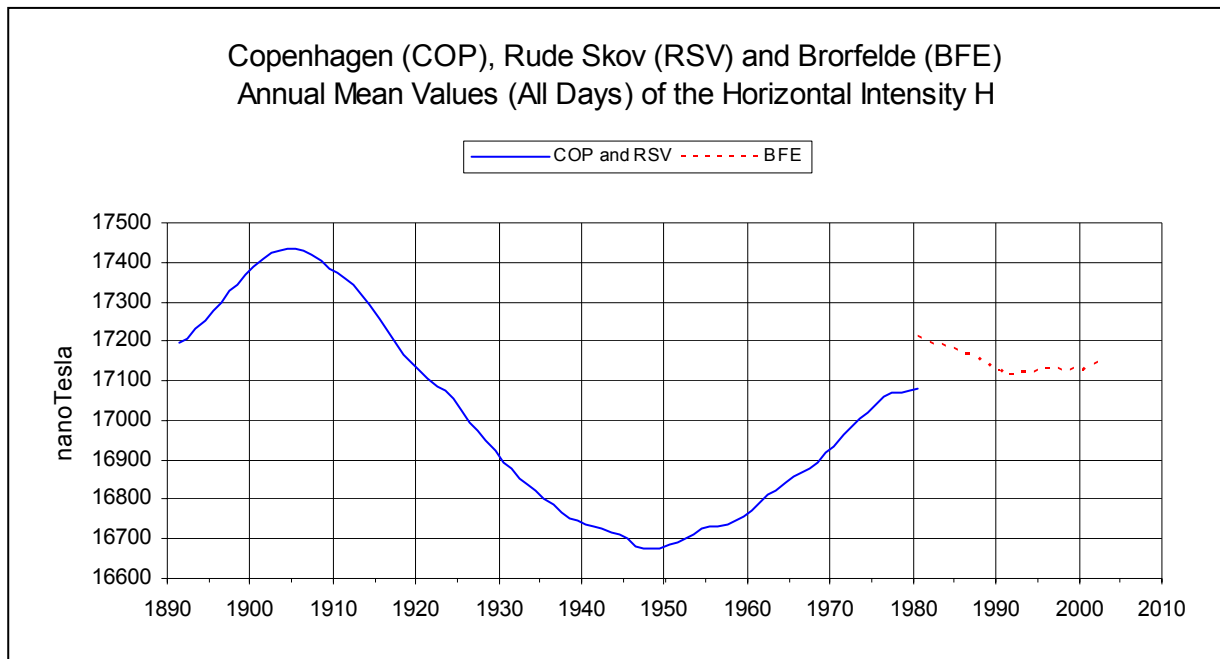
*A = All days.

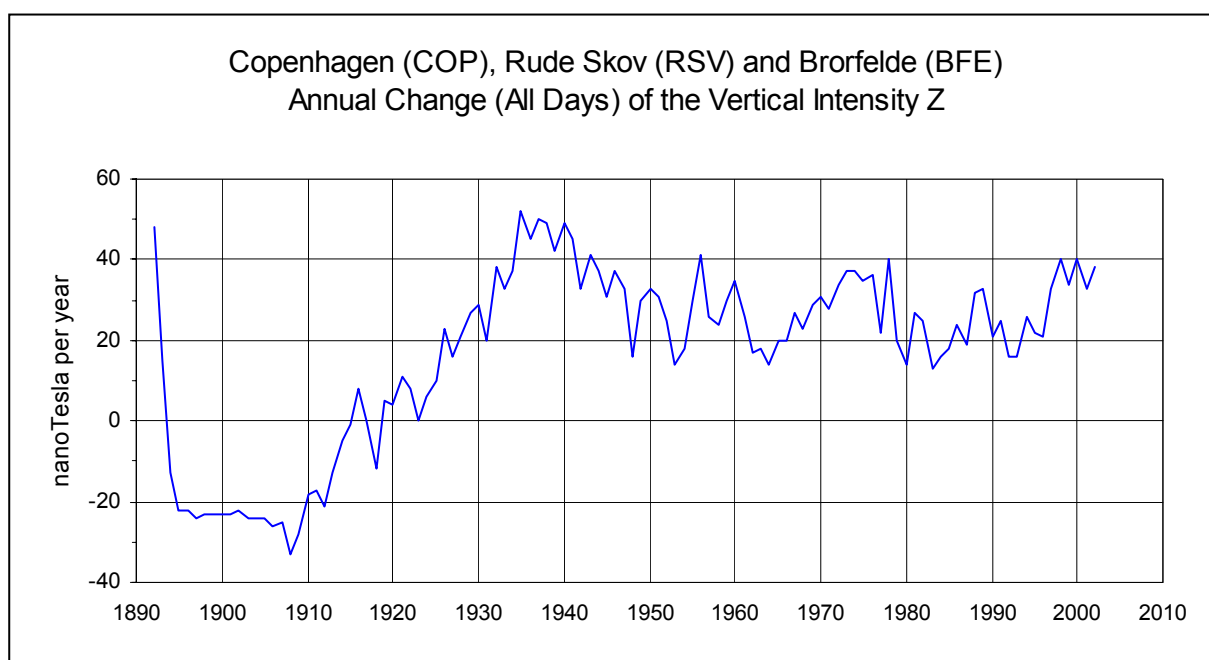
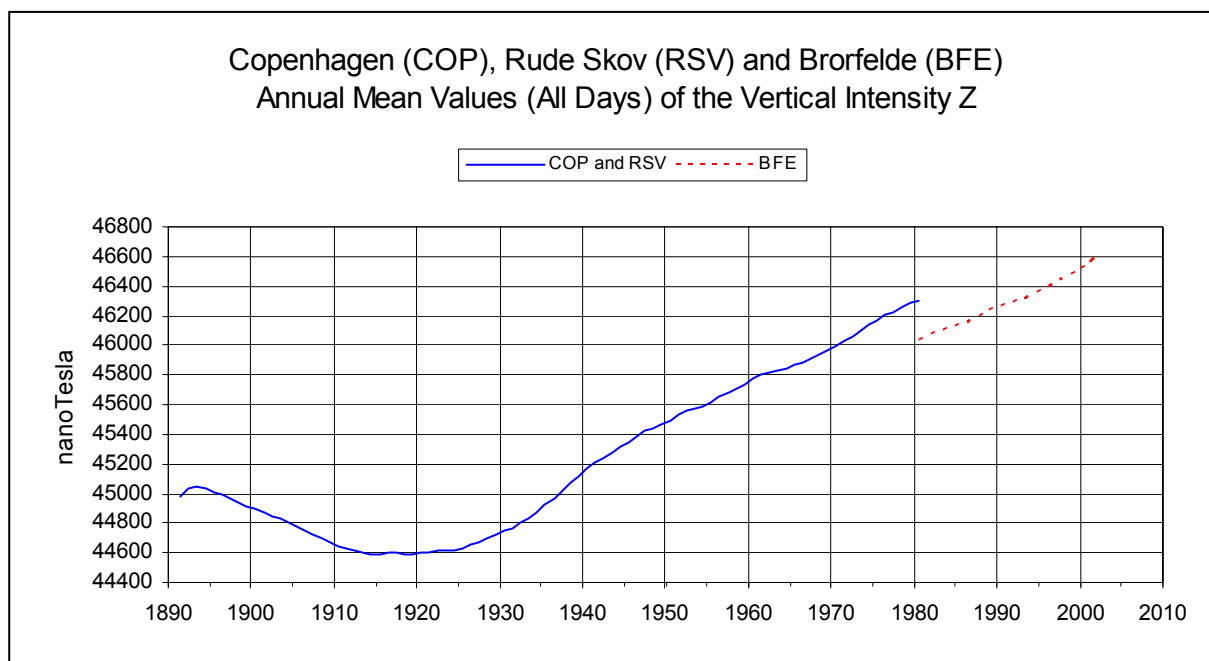
*Q = Quiet days.

*D = Disturbed days.

ELE = Elements recorded







SECTION III

Qeqertarsuaq (Godhavn) Geomagnetic Observatory 2002.

OBSERVATORY DETAILS.

A magnetic observatory was established in Qeqertarsuaq (Godhavn) in 1926 by the Danish Meteorological Institute. But due to artificial disturbances from the surrounding settlement it was getting more and more difficult to keep the observatory measurements at the wanted standard. During 1975 the observatory was therefore moved from the old position (69°14.4'N, 306°28.7'E) to a new site as shown in the table below. A detailed description of the observatory and its location during the first 50 years of operation is given in the observatory report for 1926. A description of the new observatory is given in the observatory yearbooks for 1976 and for 1985-90.

The following coordinates etc. are valid for the observatory:

Acronym (IAGA-code).....	GDH
Elevation (top of absolute pillar)	24 m
Geographic latitude	69°15.1'N
Geographic longitude.....	306°28.0'E
Geographic longitude.....	53°32.0'W
Geomagnetic latitude	78.77°N
Geomagnetic longitude	34.36°E
Invariant geomagnetic latitude.....	75.79°N
Magnetic local noon.....	14 UT

The geomagnetic coordinates are based on the IGRF 2000.0 magnetic field model in which the geomagnetic north pole position is 79.5°N, 288.4°E.

The invariant geomagnetic latitude is based on the IGRF 2000.0 magnetic field model valid for Epoch 2000.0 and a height of 105 km.

STAFF.

Until medio June the routine absolute measurements were made by Mr. Hans Jørgen Andersen who also supervised the buildings and the equipment. From Ultimo September these tasks were performed by Mr. Peter Graae. In the mean time Mr. Elun Stenfeldt Madsen supervised the buildings.

DIARY.

No absolute measurements were made from medio June to ultimo September due to change of staff.

During September 23-30 Mr. Børge Pedersen (DMI) visited the observatory in order to teach the new observer to make absolute measurements.

During this stay it was found that the temperature of the variometer house had raised to approximately 55 °C due to a defective thermostat. This accident happened on September 15. The defective thermostat was replaced on September 27.

The frequency of the time base in the proton precession magnetometer type 105 from EDA was checked by means of a frequency standard on September 27 and it was found that the PPM needed correction, cf. chapter 3.4. in section I.

The gap in the absolute measurements in November/December is due to Mr. Graaes vacation.

MISSING DATA.

Intervals of missing primary variometer data were, if possible, replaced by data from the supplementary recorder.

The hourly mean values are missing on September 18 (13-14 UT) and on September 27 (12-13 UT).

OBSERVED AND ADOPTED BASELINE VALUES.

Tables of adopted baseline values are shown below, while graphs of the observed and adopted baseline values are shown section VII.

Adopted baseline values for the primary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	8747.0 nT	319°17.0'	56134.0 nT
FEB	01	00:00 UT	8748.5 nT		56134.5 nT
FEB	10	00:00 UT			56135.0 nT
MAR	01	00:00 UT			56135.5 nT
MAR	20	00:00 UT	8747.5 nT		56136.0 nT
APR	01	00:00 UT	8747.0 nT		
APR	20	00:00 UT	8746.0 nT		56135.5 nT
MAY	01	00:00 UT	8745.0 nT		56135.0 nT
MAY	17	00:00 UT	8744.0 nT		56134.0 nT
JUN	01	00:00 UT	8745.0 nT		
SEP	15	12:00 UT	not adopted	not adopted	not adopted
SEP	28	06:00 UT	8726.0 nT	319°12.7'	56136.0 nT
OCT	01	00:00 UT	8724.5 nT		
OCT	11	00:00 UT	8723.5 nT	319°12.5'	

Adopted baseline values for the supplementary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	not adopted	not adopted	not adopted
SEP	15	12:00 UT	8567.0 nT	319°34.5'	55967.5 nT
SEP	28	06:00 UT	not adopted	not adopted	not adopted

Baseline values for the supplementary variometer system have only been adopted when they were used in connection with data supplementation.

Monthly Mean Values, All Days, Quiet Days and Disturbed Days.

Year	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
2002	°	'	°	'	nT	nT	nT	nT	nT		
JAN	319	32.2	81	11.2	8681	6605	-5634	55998	56667	A	DHZ
FEB	319	35.3	81	10.8	8688	6615	-5632	55994	56664	A	DHZ
MAR	319	40.1	81	10.2	8697	6630	-5629	55992	56663	A	DHZ
APR	319	46.7	81	09.6	8709	6650	-5624	56002	56675	A	DHZ
MAY	319	49.1	81	08.8	8721	6663	-5627	55990	56665	A	DHZ
JUN	319	50.7	81	08.5	8723	6667	-5625	55970	56646	A	DHZ
JUL	319	52.9	81	08.4	8723	6671	-5621	55964	56640	A	DHZ
AUG	319	56.3	81	09.0	8715	6670	-5609	55977	56651	A	DHZ
SEP	319	57.5	81	09.3	8714	6671	-5606	55994	56668	A	DHZ
OCT	319	57.5	81	10.5	8695	6657	-5594	56008	56679	A	DHZ
NOV	319	57.7	81	10.7	8691	6654	-5591	56005	56675	A	DHZ
DEC	320	00.5	81	10.6	8692	6659	-5586	55997	56668	A	DHZ
WINTER	319	46.3	81	10.9	8688	6633	-5611	55999	56669	A	DHZ
EQUINOX	319	50.5	81	09.9	8704	6652	-5613	55999	56671	A	DHZ
SUMMER	319	52.2	81	08.7	8720	6667	-5620	55975	56650	A	DHZ
YEAR	319	49.7	81	09.8	8704	6651	-5615	55991	56664	A	DHZ
JAN	319	32.8	81	10.7	8689	6612	-5638	55995	56665	Q	DHZ
FEB	319	36.8	81	10.4	8695	6623	-5634	55995	56666	Q	DHZ
MAR	319	41.7	81	09.6	8708	6641	-5633	55990	56663	Q	DHZ
APR	319	43.8	81	09.3	8713	6648	-5632	55990	56664	Q	DHZ
MAY	319	47.9	81	08.8	8722	6662	-5630	56000	56675	Q	DHZ
JUN	319	47.9	81	09.0	8715	6656	-5625	55969	56643	Q	DHZ
JUL	319	51.2	81	08.8	8717	6663	-5620	55966	56641	Q	DHZ
AUG	319	52.5	81	09.5	8705	6656	-5610	55962	56635	Q	DHZ
SEP	319	55.9	81	09.3	8712	6667	-5608	55984	56658	Q	DHZ
OCT	320	00.1	81	09.5	8711	6673	-5599	55995	56668	Q	DHZ
NOV	319	58.7	81	09.4	8711	6671	-5602	55992	56666	Q	DHZ
DEC	320	03.2	81	09.3	8711	6678	-5593	55982	56656	Q	DHZ
WINTER	319	47.8	81	10.0	8702	6646	-5617	55991	56663	Q	DHZ
EQUINOX	319	50.3	81	09.4	8711	6657	-5618	55990	56664	Q	DHZ
SUMMER	319	49.9	81	09.1	8714	6659	-5621	55974	56648	Q	DHZ
YEAR	319	49.2	81	09.5	8709	6654	-5619	55985	56658	Q	DHZ
JAN	319	29.6	81	12.3	8666	6589	-5629	56012	56678	D	DHZ
FEB	319	34.4	81	11.2	8683	6610	-5631	56010	56679	D	DHZ
MAR	319	42.7	81	10.5	8696	6633	-5623	56004	56675	D	DHZ
APR	319	48.4	81	13.0	8657	6613	-5587	56025	56690	D	DHZ
MAY	319	49.5	81	09.9	8702	6649	-5614	55985	56657	D	DHZ
JUN	319	48.0	81	10.1	8696	6642	-5613	55969	56641	D	DHZ
JUL	320	01.7	81	07.2	8747	6703	-5619	55984	56663	D	DHZ
AUG	319	47.6	81	11.0	8681	6630	-5604	55969	56638	D	DHZ
SEP	319	58.9	81	09.1	8720	6678	-5607	56011	56686	D	DHZ
OCT	319	57.1	81	11.9	8677	6642	-5583	56033	56701	D	DHZ
NOV	319	57.6	81	11.7	8678	6644	-5583	56025	56693	D	DHZ
DEC	319	57.2	81	11.9	8673	6639	-5580	56009	56676	D	DHZ
WINTER	319	44.7	81	11.8	8676	6621	-5606	56014	56682	D	DHZ
EQUINOX	319	51.9	81	11.1	8688	6642	-5600	56018	56688	D	DHZ
SUMMER	319	51.8	81	09.6	8706	6656	-5612	55977	56650	D	DHZ
YEAR	319	49.3	81	10.8	8689	6639	-5606	56003	56673	D	DHZ

*A = All days

*Q = Q-days

*D = D-days

ELE = Elements recorded

Annual Mean Values, All Days.

YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1926.5	301	15.0			8242	4276	-7046	55775		I	DHZ
1927.5	301	31.5	81	34.8	8255	4316	-7037	55764	56372	A	DHZ
1928.5	301	48.5	81	34.2	8252	4349	-7013	55686	56294	A	DHZ
1929.5	302	03.5	81	34.1	8243	4375	-6986	55604	56212	A	DHZ
1930.5	302	19.0	81	34.7	8227	4398	-6953	55564	56170	A	DHZ
1931.5	302	36.0	81	33.9	8228	4433	-6932	55484	56091	A	DHZ
1932.5	302	52.5	81	34.1	8218	4461	-6902	55442	56048	A	DHZ
1933.5	303	12.0	81	33.6	8219	4500	-6877	55389	55995	A	DHZ
1934.5	303	29.5	81	33.8	8207	4529	-6844	55334	55939	A	DHZ
1935.5	303	46.0	81	34.2	8194	4554	-6812	55284	55888	A	DHZ
1936.5	304	02.5	81	34.1	8187	4583	-6784	55235	55838	A	DHZ
1937.5	304	19.5	81	34.1	8183	4614	-6758	55205	55808	A	DHZ
1938.5	304	32.0	81	34.5	8174	4634	-6734	55193	55795	A	DHZ
1939.5	304	46.0	81	34.5	8171	4659	-6712	55171	55773	A	DHZ
1940.5	304	57.5	81	34.9	8163	4677	-6690	55162	55763	A	DHZ
1941.5	305	07.5	81	35.0	8162	4696	-6676	55158	55759	A	DHZ
1942.5	305	17.0	81	34.7	8163	4715	-6664	55131	55732	A	DHZ
1943.5	305	28.0	81	34.6	8163	4736	-6648	55127	55728	A	DHZ
1944.5	305	38.0	81	34.2	8166	4757	-6637	55103	55705	A	DHZ
1945.5	305	49.0	81	34.1	8166	4779	-6622	55085	55687	A	DHZ
1946.5	305	59.5	81	34.2	8163	4797	-6605	55085	55687	A	DHZ
1947.5	306	11.0	81	33.6	8171	4824	-6595	55067	55670	A	DHZ
1948.5	306	18.0	81	33.9	8166	4834	-6581	55072	55674	A	DHZ
1949.5	306	27.0	81	33.9	8167	4852	-6569	55072	55674	A	DHZ
1950.5	306	32.5	81	34.5	8161	4859	-6557	55103	55704	A	DHZ
1951.5	306	40.5	81	35.0	8158	4873	-6543	55135	55735	A	DHZ
1952.5	306	51.5	81	35.2	8160	4895	-6529	55166	55766	A	DHZ
1953.5	307	01.0	81	34.3	8173	4921	-6526	55160	55762	A	DHZ
1954.5	307	13.0	81	33.7	8184	4950	-6517	55165	55769	A	DHZ
1955.5	307	22.5	81	33.7	8189	4971	-6508	55195	55799	A	DHZ
1956.5	307	33.0	81	33.7	8194	4994	-6496	55236	55840	A	DHZ
1957.5	307	38.5	81	34.5	8186	4999	-6482	55271	55874	A	DHZ
1958.5	307	47.0	81	34.0	8199	5023	-6480	55306	55910	A	DHZ
1959.5	307	55.5	81	34.2	8204	5042	-6471	55356	55961	A	DHZ
1960.5	308	06.0	81	33.9	8216	5070	-6465	55408	56014	A	DHZ
1961.5	308	14.5	81	34.1	8218	5087	-6454	55441	56047	A	DHZ
1962.5	308	22.0	81	34.2	8221	5103	-6446	55475	56081	A	DHZ
1963.5	308	30.0	81	34.1	8231	5124	-6442	55523	56130	A	DHZ
1964.5	308	36.0	81	33.6	8244	5143	-6443	55556	56164	A	DHZ
1965.5	308	43.0	81	33.0	8257	5165	-6443	55581	56191	A	DHZ
1966.5	308	49.0	81	33.0	8263	5180	-6438	55626	56236	A	DHZ
1967.5	308	54.0	81	33.1	8270	5193	-6436	55679	56290	A	DHZ
1968.5	308	59.0	81	33.0	8280	5209	-6436	55741	56353	A	DHZ
1969.5	309	05.0	81	32.7	8294	5229	-6438	55799	56412	A	DHZ

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Annual Mean Values, All Days, continued.

YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1970.5	309	12.0	81	32.6	8307	5250	-6437	55871	56485	A	DHZ
1971.5	309	19.5	81	32.5	8318	5271	-6435	55939	56554	A	DHZ
1972.5	309	29.0	81	31.8	8337	5301	-6435	55986	56603	A	DHZ
1973.5	309	41.5	81	31.6	8350	5333	-6425	56045	56664	A	DHZ
1974.5	309	56.0	81	31.2	8363	5368	-6413	56090	56710	A	DHZ
1975.5	310	13.5	81	29.7	8391	5419	-6407	56116	56740	A	DHZ
1976.0	-0	03.0	0	00.7	-53	-40	36	-275	-280	J	DHZ
1976.5	310	35.0	81	27.9	8465	5507	-6429	56403	57035	A	DHZ
1977.5	310	55.5	81	26.6	8487	5560	-6413	56403	57038	A	DHZ
1978.5	311	15.5	81	25.6	8505	5609	-6394	56410	57048	A	DHZ
1979.5	311	34.5	81	24.4	8522	5655	-6375	56390	57030	A	DHZ
1980.5	311	51.0	81	23.2	8537	5696	-6359	56362	57005	A	DHZ
1981.5	312	07.0	81	22.6	8547	5732	-6340	56359	57003	I	DHZ
1982.5	312	23.0	81	22.4	8548	5762	-6314	56348	56993	A	DHZ
1983.5	312	38.5	81	22.1	8551	5793	-6290	56327	56972	A	DHZ
1984.5	312	54.0	81	22.0	8549	5819	-6263	56308	56953	A	DHZ
1985.5	313	09.5	81	21.8	8549	5848	-6236	56279	56925	A	DHZ
1986.5	313	26.5	81	21.5	8550	5879	-6208	56258	56904	A	DHZ
1987.5	313	45.5	81	21.0	8554	5916	-6178	56229	56876	A	DHZ
1988.5	314	02.5	81	21.0	8552	5945	-6148	56215	56862	A	DHZ
1989.5	314	21.5	81	20.8	8554	5981	-6116	56205	56852	A	DHZ
1990.0	0	00.0	-0	00.2	6	4	-4	15	16	J	DHZ
1990.5	314	41.0	81	20.6	8552	6014	-6080	56172	56819	A	DHZ
1991.5	315	00.0	81	20.4	8553	6048	-6048	56158	56806	A	DHZ
1992.5	315	19.5	81	19.8	8561	6088	-6019	56144	56793	A	DHZ
1993.5	315	38.5	81	19.7	8561	6121	-5985	56126	56775	A	DHZ
1994.5	316	00.5	81	19.6	8562	6160	-5947	56124	56773	A	DHZ
1995.5	316	25.5	81	18.5	8576	6213	-5912	56096	56748	A	DHZ
1996.5	316	51.0	81	17.3	8592	6268	-5876	56069	56723	A	DHZ
1997.5	317	19.5	81	16.3	8606	6327	-5834	56051	56708	A	DHZ
1998.5	317	48.0	81	15.2	8622	6387	-5792	56045	56704	A	DHZ
1999.5	318	18.0	81	13.9	8643	6453	-5750	56031	56694	A	DHZ
2000.5	318	47.5	81	12.4	8665	6519	-5709	56019	56685	A	DHZ
2001.5	319	18.5	81	11.2	8682	6583	-5661	56003	56672	A	DHZ
2002.5	319	49.5	81	09.8	8704	6651	-5615	55991	56664	A	DHZ

*A = All days

*I = Incomplete:

1. The annual means for 1926 are based on data from February to December for the magnetic elements *D*, *H*, *X* and *Y*, and June through December for *Z*. The values for *I* and *F* have been omitted from the list as the values for *H* and *Z* does not correspond to the same period.
2. The annual means for 1981 are based on data from the periods JAN 01 - JUL 08 and NOV 03 - DEC 31.

*J = Jumps:

1. The jump in the values on 1976.0 is due to movement of the observatory during 1975.
2. The jump on 1990.0 is due to the establishment of a new absolute pier during 1989.

REMARK: jump value = old site value - new site value.

ELE = Elements recorded.

Annual Mean Values, Quiet Days.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1926.5	301 16.5		8253	4285	-7054	55770		I	DHZ
1927.5	301 32.5	81 34.1	8265	4324	-7044	55762	56371	Q	DHZ
1928.5	301 48.5	81 33.8	8260	4354	-7019	55685	56294	Q	DHZ
1929.5	302 04.5	81 33.5	8252	4382	-6992	55598	56207	Q	DHZ
1930.5	302 21.5	81 33.6	8243	4412	-6963	55548	56156	Q	DHZ
1931.5	302 38.0	81 33.2	8238	4442	-6938	55478	56086	Q	DHZ
1932.5	302 54.0	81 33.4	8228	4469	-6908	55432	56039	Q	DHZ
1933.5	303 12.5	81 33.1	8226	4505	-6883	55382	55990	Q	DHZ
1934.5	303 30.0	81 33.5	8211	4532	-6847	55327	55933	Q	DHZ
1935.5	303 46.5	81 33.7	8201	4559	-6817	55277	55882	Q	DHZ
1936.5	304 03.5	81 33.4	8198	4591	-6792	55232	55837	Q	DHZ
1937.5	304 20.0	81 33.7	8190	4619	-6763	55206	55810	Q	DHZ
1938.5	304 31.5	81 34.1	8180	4636	-6739	55184	55787	Q	DHZ
1939.5	304 47.5	81 33.8	8183	4669	-6720	55167	55771	Q	DHZ
1940.5	304 58.5	81 34.1	8176	4687	-6699	55153	55756	Q	DHZ
1941.5	305 08.5	81 34.2	8173	4704	-6683	55148	55750	Q	DHZ
1942.5	305 19.5	81 33.9	8175	4727	-6670	55123	55726	Q	DHZ
1943.5	305 29.0	81 33.8	8175	4745	-6657	55116	55719	Q	DHZ
1944.5	305 39.0	81 33.7	8174	4764	-6642	55095	55698	Q	DHZ
1945.5	305 50.0	81 33.4	8175	4786	-6628	55076	55679	Q	DHZ
1946.5	305 59.5	81 33.6	8173	4803	-6613	55077	55680	Q	DHZ
1947.5	306 07.5	81 33.6	8170	4817	-6599	55064	55667	Q	DHZ
1948.5	306 18.0	81 33.6	8171	4837	-6585	55067	55670	Q	DHZ
1949.5	306 26.0	81 33.5	8173	4854	-6576	55066	55669	Q	DHZ
1950.5	306 34.5	81 33.7	8174	4871	-6564	55096	55699	Q	DHZ
1951.5	306 40.5	81 34.3	8167	4878	-6550	55122	55724	Q	DHZ
1952.5	306 52.5	81 34.1	8174	4905	-6539	55148	55750	Q	DHZ
1953.5	307 01.5	81 33.7	8180	4926	-6531	55145	55748	Q	DHZ
1954.5	307 11.5	81 33.2	8191	4951	-6525	55157	55762	Q	DHZ
1955.5	307 22.5	81 33.1	8196	4975	-6513	55186	55791	Q	DHZ
1956.5	307 33.0	81 33.1	8203	4999	-6504	55228	55834	Q	DHZ
1957.5	307 39.5	81 33.7	8199	5009	-6491	55264	55869	Q	DHZ
1958.5	307 49.0	81 33.0	8216	5038	-6490	55301	55908	Q	DHZ
1959.5	307 54.0	81 33.7	8210	5043	-6478	55347	55953	Q	DHZ
1960.5	308 05.0	81 33.5	8222	5071	-6472	55401	56008	Q	DHZ
1961.5	308 13.5	81 33.7	8224	5089	-6461	55435	56042	Q	DHZ
1962.5	308 22.5	81 33.6	8231	5110	-6453	55471	56078	Q	DHZ
1963.5	308 30.0	81 33.4	8240	5130	-6449	55513	56121	Q	DHZ
1964.5	308 37.0	81 33.0	8253	5151	-6448	55552	56162	Q	DHZ
1965.5	308 43.0	81 32.7	8262	5168	-6446	55578	56189	Q	DHZ
1966.5	308 50.0	81 32.4	8274	5188	-6445	55623	56235	Q	DHZ
1967.5	308 55.0	81 32.4	8281	5202	-6443	55676	56288	Q	DHZ
1968.5	309 00.0	81 32.3	8291	5218	-6443	55735	56348	Q	DHZ
1969.5	309 06.0	81 32.2	8303	5237	-6444	55796	56410	Q	DHZ

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Annual Mean Values, Quiet Days, continued.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1970.5	309 11.0	81 32.3	8310	5250	-6441	55863	56478	Q	DHZ
1971.5	309 20.0	81 31.9	8327	5278	-6441	55931	56547	Q	DHZ
1972.5	309 29.0	81 31.3	8345	5306	-6441	55983	56602	Q	DHZ
1973.5	309 43.0	81 30.7	8363	5344	-6433	56034	56655	Q	DHZ
1974.5	309 58.0	81 30.1	8379	5382	-6422	56077	56700	Q	DHZ
1975.5	310 15.0	81 28.9	8403	5429	-6413	56106	56732	Q	DHZ
1976.0	-0 03.0	0 00.7	-53	-40	36	-275	-280	J	DHZ
1976.5	310 36.0	81 27.2	8475	5515	-6435	56393	57026	Q	DHZ
1977.5	310 56.0	81 26.0	8495	5566	-6418	56394	57030	Q	DHZ
1978.5	311 16.0	81 25.0	8513	5615	-6399	56402	57041	Q	DHZ
1979.5	311 34.0	81 24.1	8527	5658	-6380	56388	57029	Q	DHZ
1980.5	311 51.0	81 22.9	8542	5699	-6363	56363	57007	Q	DHZ
1981.5	312 07.0	81 22.0	8558	5739	-6348	56360	57006	I	DHZ
1982.5	312 24.0	81 21.7	8558	5771	-6320	56337	56983	Q	DHZ
1983.5	312 41.0	81 21.0	8567	5808	-6298	56318	56966	Q	DHZ
1984.5	312 55.0	81 21.2	8561	5829	-6270	56299	56946	Q	DHZ
1985.5	313 10.0	81 20.9	8562	5857	-6245	56270	56918	Q	DHZ
1986.5	313 28.0	81 20.8	8560	5889	-6213	56249	56897	Q	DHZ
1987.5	313 45.0	81 20.5	8562	5921	-6185	56221	56869	Q	DHZ
1988.5	314 02.5	81 20.4	8561	5951	-6154	56209	56857	Q	DHZ
1989.5	314 23.0	81 20.1	8565	5991	-6121	56201	56850	Q	DHZ
1990.0	0 00.0	-0 00.2	6	4	-4	15	16	J	DHZ
1990.5	314 41.0	81 20.2	8558	6018	-6085	56166	56814	Q	DHZ
1991.5	314 59.0	81 20.0	8558	6050	-6053	56150	56798	Q	DHZ
1992.5	315 19.0	81 19.4	8567	6091	-6024	56139	56789	Q	DHZ
1993.5	315 40.0	81 18.9	8571	6131	-5990	56118	56769	Q	DHZ
1994.5	316 02.5	81 18.4	8579	6175	-5955	56110	56762	Q	DHZ
1995.5	316 25.5	81 17.6	8588	6222	-5920	56086	56740	Q	DHZ
1996.5	316 51.5	81 16.8	8599	6275	-5880	56065	56721	Q	DHZ
1997.5	317 19.0	81 15.8	8613	6332	-5839	56045	56703	Q	DHZ
1998.5	317 48.0	81 14.7	8631	6394	-5798	56041	56702	Q	DHZ
1999.5	318 18.5	81 13.5	8649	6458	-5753	56025	56689	Q	DHZ
2000.5	318 47.5	81 12.1	8670	6522	-5712	56013	56680	Q	DHZ
2001.5	319 19.0	81 10.7	8692	6591	-5666	56002	56672	Q	DHZ
2002.5	319 49.0	81 09.5	8709	6654	-5619	55985	56658	Q	DHZ

Q = Quiet days

*I = Incomplete:

1. The annual means for 1926 are based on data from February to December for the magnetic elements *D*, *H*, *X* and *Y*, and June through December for *Z*. The values for *I* and *F* have been omitted from the list as the values for *H* and *Z* does not correspond to the same period.
2. The annual means for 1981 are based on data from the periods JAN 01 - JUL 08 and NOV 03 - DEC 31.

*J = Jumps:

1. The jump in the values on 1976.0 is due to movement of the observatory during 1975.
2. The jump on 1990.0 is due to the establishment of a new absolute pier during 1989.

REMARK: jump value = old site value - new site value.

ELE = Elements recorded.

Annual Mean Values, Disturbed Days.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1926.5	301 10.0		8214	4251	-7028	55789		I	DHZ
1927.5	301 30.5	81 36.2	8233	4303	-7019	55775	56379	D	DHZ
1928.5	301 46.5	81 35.5	8233	4335	-6999	55695	56300	D	DHZ
1929.5	302 01.0	81 35.2	8225	4361	-6974	55615	56220	D	DHZ
1930.5	302 16.0	81 35.9	8211	4384	-6943	55589	56192	D	DHZ
1931.5	302 35.0	81 34.6	8218	4426	-6925	55494	56099	D	DHZ
1932.5	302 50.5	81 35.2	8203	4449	-6892	55459	56062	D	DHZ
1933.5	303 09.0	81 34.6	8203	4486	-6868	55397	56001	D	DHZ
1934.5	303 28.5	81 34.7	8194	4520	-6835	55346	55949	D	DHZ
1935.5	303 45.0	81 35.2	8179	4544	-6801	55296	55898	D	DHZ
1936.5	303 58.0	81 35.5	8167	4563	-6773	55246	55846	D	DHZ
1937.5	304 16.5	81 35.1	8168	4600	-6750	55209	55810	D	DHZ
1938.5	304 30.5	81 35.7	8157	4621	-6722	55206	55805	D	DHZ
1939.5	304 45.5	81 35.7	8154	4649	-6699	55184	55783	D	DHZ
1940.5	304 56.5	81 36.1	8147	4666	-6678	55179	55777	D	DHZ
1941.5	305 06.5	81 36.3	8144	4684	-6662	55180	55778	D	DHZ
1942.5	305 13.0	81 36.1	8141	4695	-6651	55147	55745	D	DHZ
1943.5	305 25.5	81 36.1	8142	4719	-6635	55149	55747	D	DHZ
1944.5	305 37.0	81 35.4	8149	4746	-6625	55120	55719	D	DHZ
1945.5	305 47.5	81 35.3	8148	4765	-6609	55103	55702	D	DHZ
1946.5	305 59.5	81 35.4	8146	4787	-6591	55097	55696	D	DHZ
1947.5	306 11.5	81 34.1	8164	4821	-6589	55078	55680	D	DHZ
1948.5	306 18.5	81 34.8	8154	4828	-6571	55090	55690	D	DHZ
1949.5	306 26.5	81 34.9	8153	4843	-6559	55087	55687	D	DHZ
1950.5	306 29.5	81 35.4	8149	4846	-6551	55120	55719	D	DHZ
1951.5	306 40.0	81 35.9	8147	4865	-6535	55156	55754	D	DHZ
1952.5	306 48.5	81 36.0	8136	4875	-6514	55192	55788	D	DHZ
1953.5	307 00.0	81 35.5	8158	4910	-6515	55188	55788	D	DHZ
1954.5	307 11.5	81 34.4	8174	4941	-6512	55181	55783	D	DHZ
1955.5	307 19.0	81 35.0	8170	4953	-6498	55213	55814	D	DHZ
1956.5	307 35.0	81 34.6	8183	4991	-6485	55257	55860	D	DHZ
1957.5	307 36.5	81 36.0	8165	4983	-6468	55291	55891	D	DHZ
1958.5	307 44.0	81 35.2	8182	5007	-6471	55320	55922	D	DHZ
1959.5	307 52.5	81 36.2	8175	5019	-6453	55379	55979	D	DHZ
1960.5	308 02.0	81 35.5	8194	5048	-6454	55429	56031	D	DHZ
1961.5	308 14.5	81 35.1	8205	5079	-6444	55459	56063	D	DHZ
1962.5	308 19.5	81 35.4	8203	5087	-6435	55485	56088	D	DHZ
1963.5	308 30.0	81 34.9	8220	5117	-6433	55547	56152	D	DHZ
1964.5	308 34.0	81 34.5	8230	5131	-6435	55563	56169	D	DHZ
1965.5	308 43.0	81 33.5	8250	5160	-6437	55593	56202	D	DHZ
1966.5	308 48.0	81 34.3	8245	5166	-6426	55641	56249	D	DHZ
1967.5	308 52.0	81 34.0	8257	5181	-6429	55694	56303	D	DHZ
1968.5	308 58.0	81 34.2	8264	5197	-6425	55762	56371	D	DHZ
1969.5	309 04.0	81 33.8	8278	5217	-6427	55814	56425	D	DHZ

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Annual Mean Values, Disturbed Days, continued.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1970.5	309 14.0	81 33.5	8294	5246	-6424	55886	56498	D	DHZ
1971.5	309 18.0	81 33.8	8300	5257	-6423	55955	56567	D	DHZ
1972.5	309 29.0	80 32.7	8324	5293	-6425	56003	56618	D	DHZ
1973.5	309 39.0	81 32.9	8331	5316	-6415	56065	56681	D	DHZ
1974.5	309 56.0	81 32.3	8348	5359	-6401	56111	56729	D	DHZ
1975.5	310 12.0	81 31.0	8372	5404	-6395	56135	56756	D	DHZ
1976.0	-0 03.0	0 00.7	-53	-40	36	-275	-280	J	DHZ
1976.5	310 33.0	81 29.4	8443	5489	-6415	56427	57055	D	DHZ
1977.5	310 54.0	81 27.8	8470	5546	-6402	56422	57054	D	DHZ
1978.5	311 17.0	81 26.5	8493	5604	-6382	56432	57068	D	DHZ
1979.5	311 34.0	81 25.3	8507	5644	-6365	56399	57037	D	DHZ
1980.5	311 51.0	81 24.2	8522	5686	-6348	56369	57010	D	DHZ
1981.5	312 06.0	81 24.1	8524	5715	-6325	56371	57012	I	DHZ
1982.5	312 23.0	81 23.7	8530	5750	-6301	56373	57015	D	DHZ
1983.5	312 37.0	81 23.7	8526	5773	-6274	56347	56988	D	DHZ
1984.5	312 52.0	81 23.7	8524	5799	-6248	56332	56973	D	DHZ
1985.5	313 08.0	81 23.3	8526	5829	-6222	56299	56941	D	DHZ
1986.5	313 24.0	81 22.9	8530	5861	-6198	56278	56921	D	DHZ
1987.5	313 45.0	81 22.1	8537	5903	-6167	56241	56885	D	DHZ
1988.5	314 02.5	81 22.2	8535	5933	-6135	56229	56873	D	DHZ
1989.5	314 19.0	81 22.2	8534	5962	-6106	56226	56870	D	DHZ
1990.0	0 00.0	-0 00.2	6	4	-4	15	16	J	DHZ
1990.5	314 42.5	81 21.8	8535	6004	-6066	56187	56832	D	DHZ
1991.5	315 01.0	81 21.8	8533	6035	-6032	56171	56815	D	DHZ
1992.5	315 22.5	81 20.7	8548	6084	-6005	56162	56809	D	DHZ
1993.5	315 36.0	81 21.4	8535	6098	-5971	56142	56787	D	DHZ
1994.5	315 58.0	81 21.4	8535	6136	-5933	56147	56792	D	DHZ
1995.5	316 24.0	81 19.7	8558	6197	-5902	56110	56759	D	DHZ
1996.5	316 49.5	81 18.2	8578	6256	-5869	56081	56733	D	DHZ
1997.5	317 17.5	81 17.5	8587	6310	-5824	56061	56715	D	DHZ
1998.5	317 49.0	81 16.2	8609	6379	-5781	56065	56722	D	DHZ
1999.5	318 18.0	81 14.9	8628	6442	-5740	56047	56707	D	DHZ
2000.5	318 47.0	81 13.3	8653	6509	-5702	56032	56696	D	DHZ
2001.5	319 16.5	81 12.3	8665	6567	-5653	56008	56674	D	DHZ
2002.5	319 49.5	81 10.8	8689	6639	-5606	56003	56673	D	DHZ

*D = Disturbed days

*I = Incomplete:

1. The annual means for 1926 are based on data from February to December for the magnetic elements *D*, *H*, *X* and *Y*, and June through December for *Z*. The values for *I* and *F* have been omitted from the list as the values for *H* and *Z* does not correspond to the same period.

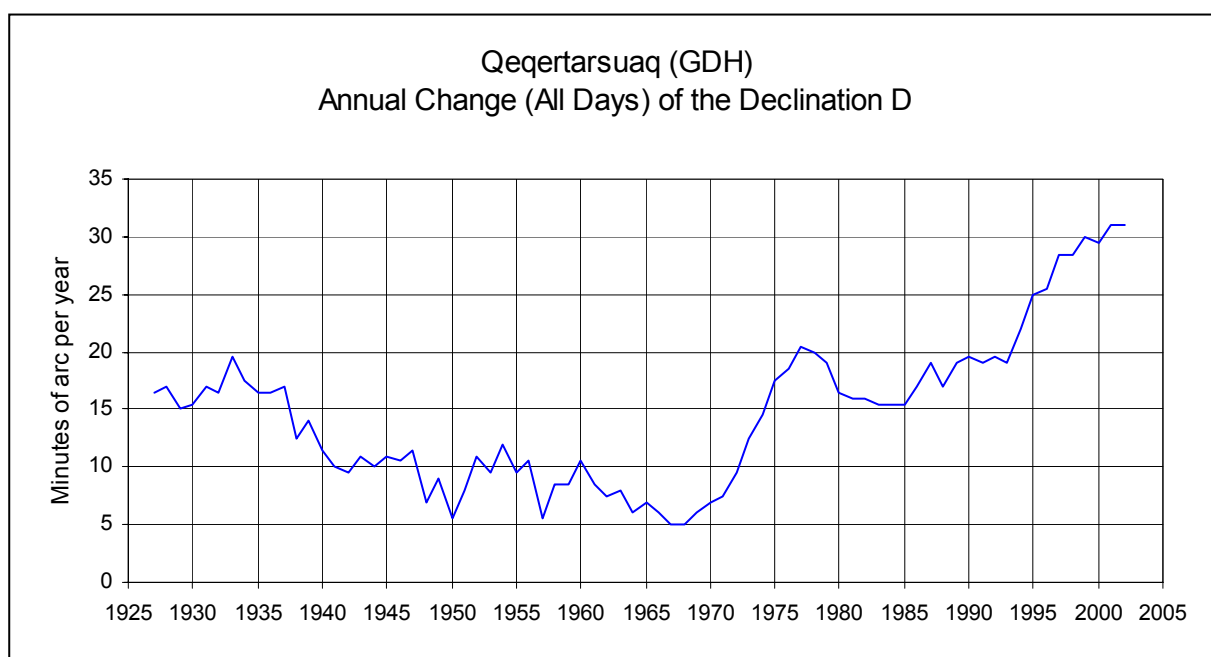
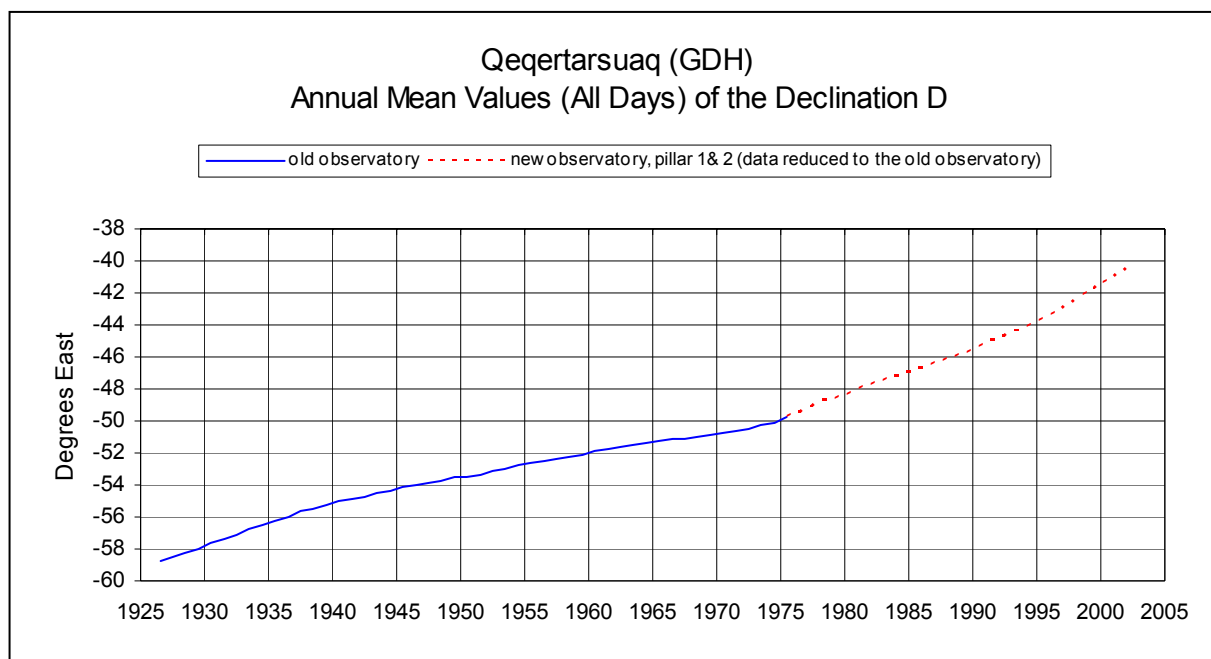
2. The annual means for 1981 are based on data from the periods JAN 01 - JUL 08 and NOV 03 - DEC 31.

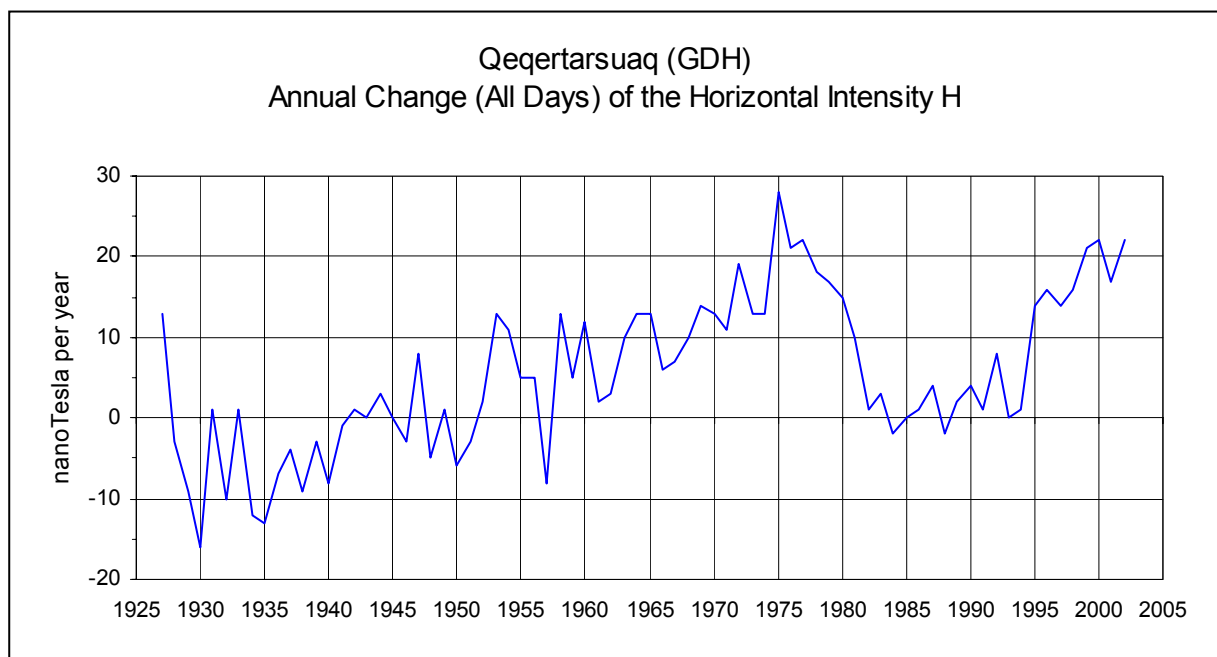
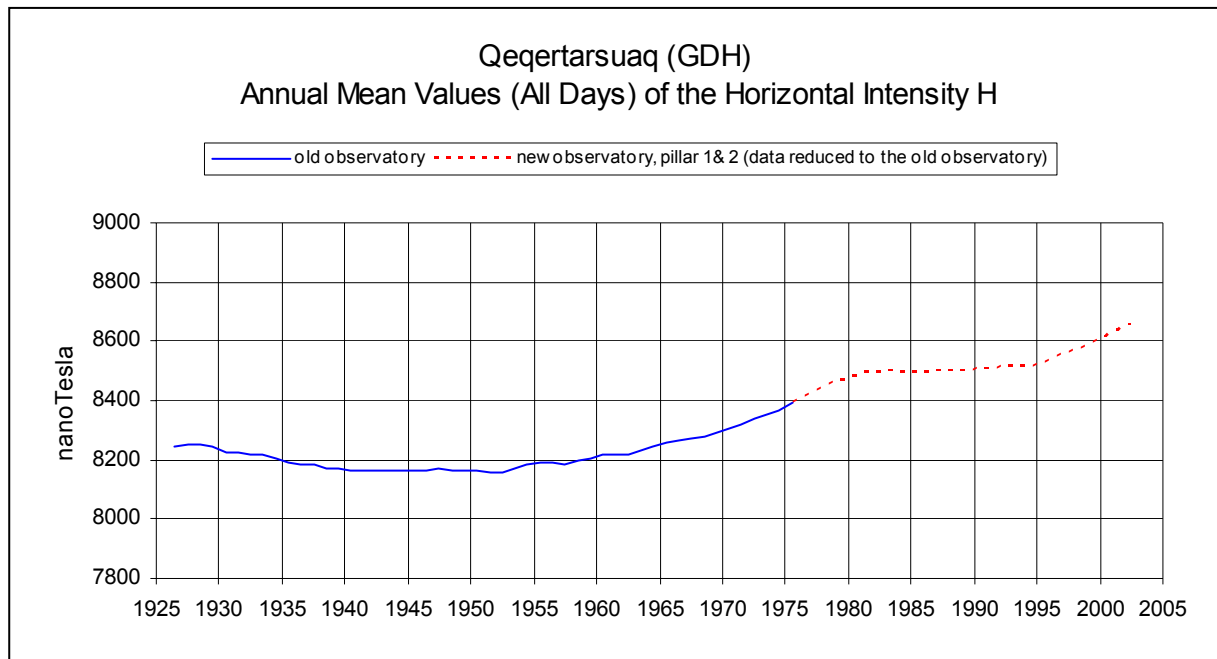
*J = Jumps:

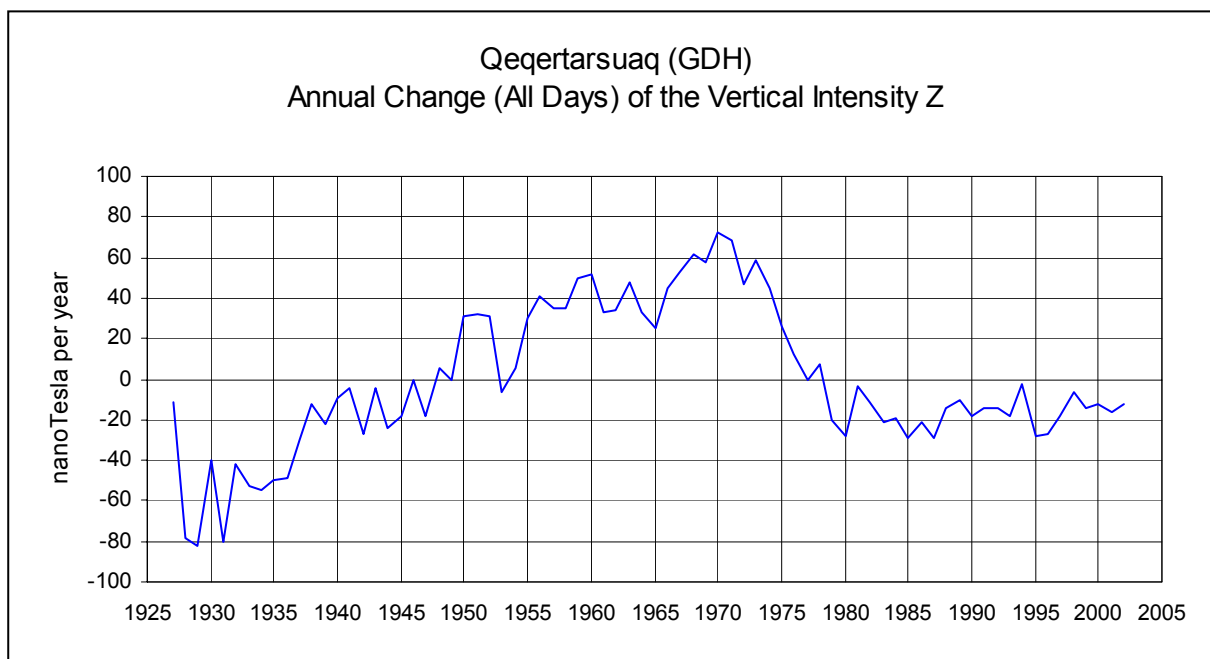
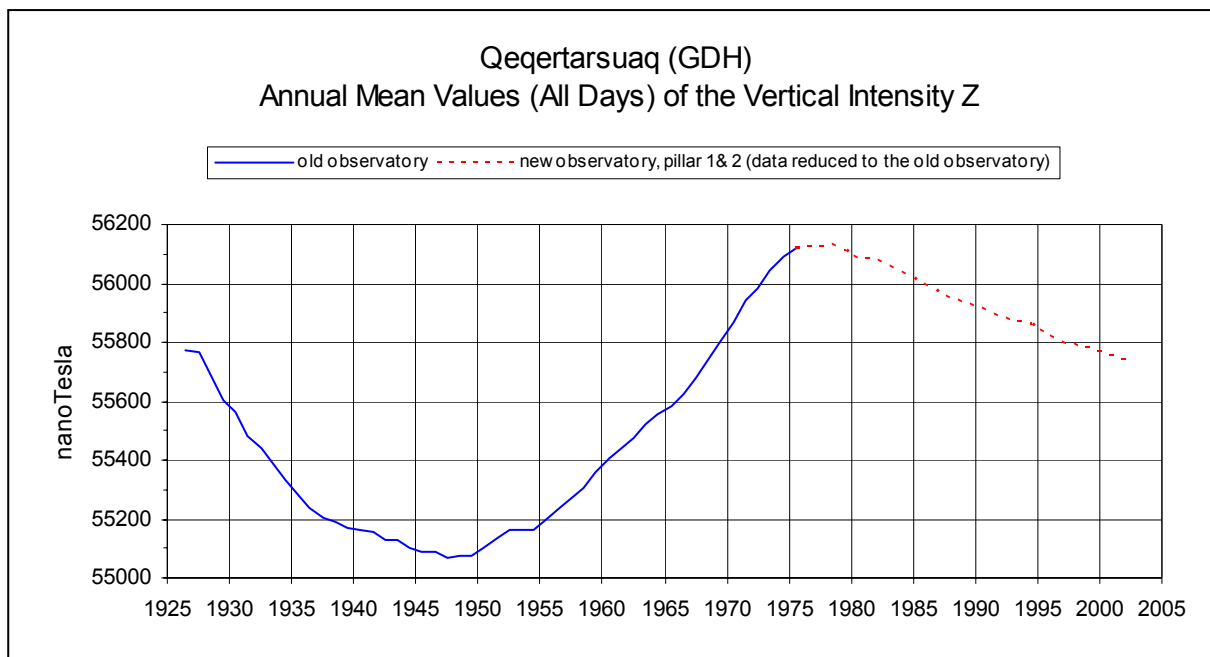
1. The jump in the values on 1976.0 is due to movement of the observatory during 1975.
2. The jump on 1990.0 is due to the establishment of a new absolute pier during 1989.

REMARK: jump value = old site value - new site value.

ELE = Elements recorded.







SECTION IV

Qaanaaq (Thule) Geomagnetic Observatory 2002.

OBSERVATORY DETAILS.

A magnetic observatory was established at Thule ($76^{\circ}32.3'N$, $290^{\circ}56.5'E$) in January 1947 by the Danish Meteorological Institute. In August 1952 however, the magnetic recordings had to be discontinued due to artificial disturbances from the nearby air base. During 1955 the observatory was re-established at Qaanaaq ($77^{\circ}29'N$, $290^{\circ}50'E$) and the geomagnetic observations were resumed in September 1955. A description of the observatory and its location is given in the observatory yearbooks for 1955-56 and for 1985-90.

The following coordinates etc. are valid for the observatory:

Acronym (IAGA-code).....	THL
Elevation (top of absolute pillar)	57 m
Geographic latitude	$77^{\circ}28.2'N$
Geographic longitude.....	$290^{\circ}46.4'E$
Geographic longitude.....	$69^{\circ}13.6'W$
Geomagnetic latitude	$87.92^{\circ}N$
Geomagnetic longitude	$14.28^{\circ}E$
Invariant geomagnetic latitude.....	$85.21^{\circ}N$
Magnetic local noon.....	14 UT

The geomagnetic coordinates are based on the IGRF 2000.0 magnetic field model in which the geomagnetic north pole position is $79.5^{\circ}N$, $288.4^{\circ}E$.

The invariant geomagnetic latitude is based on the IGRF 2000.0 magnetic field model valid for Epoch 2000.0 and a height of 105 km.

STAFF.

The only person employed at the observatory during 2002 was Mr. Svend Erik Ascanius.

DIARY.

During two periods (July 15-17 and August 27-31) construction work was done with magnetic vehicles near the observatory in order to establish a new pipeline from a water lake above the observatory to the waterworks in the settlement below the observatory. Fortunately our magnetic recordings were not disturbed.

In connection with this construction work the telephone line from the observatory was interrupted several times.

Also the power line was interrupted (July 17) but it was restored on the same day. The heating of the variometer house was however not re-established until July 22, so the variometer temperature dropped almost 4 °C in that period.

The batteries of the Uninterruptible Power Supply (UPS) for the primary variometer system was replaced on August 09 while the batteries of the UPS for the supplementary system was replaced on November 25.

MISSING DATA.

Missing primary variometer data (17:24 to 17:30 UT) on August 9 were replaced by data from the supplementary recorder. The 1-minute values are thus for the first time totally complete.

OBSERVED AND ADOPTED BASELINE VALUES.

Tables of adopted baseline values are shown below, while graphs of the observed and adopted baseline values are shown in section VII.

Adopted baseline values for the primary variometer system.

Interval beginning	H_0	D_0	Z_0
JAN 01 00:00 UT	3760.5 nT	294°09.5'	56161.0 nT
MAR 01 00:00 UT		294°10.0'	
MAY 01 00:00 UT	3761.0 nT	294°10.5'	
JUN 17 00:00 UT		294°10.0'	
JUN 26 00:00 UT			56160.5 nT
AUG 10 00:00 UT		294°10.5'	

Adopted baseline values for the supplementary variometer system.

Interval beginning	H_0	D_0	Z_0
JAN 01 00:00 UT	not adopted	not adopted	not adopted
AUG 09 00:00 UT	3781.5 nT	294°07.5'	56124.0 nT
AUG 10 00:00 UT	not adopted	not adopted	not adopted

Baseline values for the supplementary variometer system have only been adopted when they were used in connection with data supplementation.

Monthly Mean Values, All Days, Quiet Days and Disturbed Days.

Year	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
2002											
JAN	298	19.7	86	02.5	3897	1849	-3430	56317	56452	A	DHZ
FEB	298	25.6	86	02.5	3897	1855	-3427	56316	56451	A	DHZ
MAR	298	33.0	86	02.2	3900	1864	-3426	56303	56438	A	DHZ
APR	298	51.3	86	01.1	3916	1890	-3430	56264	56400	A	DHZ
MAY	299	05.6	86	00.6	3924	1908	-3429	56254	56391	A	DHZ
JUN	299	02.8	86	01.1	3915	1901	-3423	56257	56393	A	DHZ
JUL	298	59.6	86	01.8	3905	1893	-3416	56279	56414	A	DHZ
AUG	299	08.4	86	02.1	3902	1900	-3408	56298	56433	A	DHZ
SEP	299	08.9	86	01.7	3909	1904	-3414	56300	56436	A	DHZ
OCT	299	09.2	86	02.2	3902	1901	-3408	56333	56468	A	DHZ
NOV	299	12.1	86	01.9	3909	1907	-3412	56338	56473	A	DHZ
DEC	299	18.7	86	01.8	3910	1914	-3409	56332	56468	A	DHZ
WINTER	298	48.6	86	02.2	3903	1881	-3420	56326	56461	A	DHZ
EQUINOX	298	56.0	86	01.8	3907	1890	-3419	56300	56435	A	DHZ
SUMMER	299	04.5	86	01.4	3912	1901	-3419	56272	56408	A	DHZ
YEAR	298	56.8	86	01.8	3907	1891	-3419	56299	56434	A	DHZ
JAN	298	19.2	86	02.3	3900	1850	-3433	56317	56452	Q	DHZ
FEB	298	26.7	86	02.4	3899	1857	-3428	56315	56450	Q	DHZ
MAR	298	34.7	86	01.7	3907	1869	-3431	56284	56419	Q	DHZ
APR	298	39.4	86	00.7	3922	1881	-3442	56255	56392	Q	DHZ
MAY	299	20.9	85	58.2	3960	1941	-3452	56219	56358	Q	DHZ
JUN	298	57.2	86	01.1	3917	1896	-3427	56264	56400	Q	DHZ
JUL	299	00.2	86	01.5	3910	1896	-3420	56277	56413	Q	DHZ
AUG	298	53.9	86	03.1	3888	1879	-3404	56341	56475	Q	DHZ
SEP	299	02.1	86	02.1	3902	1894	-3412	56308	56443	Q	DHZ
OCT	299	11.0	86	01.9	3907	1905	-3411	56317	56452	Q	DHZ
NOV	299	11.8	86	01.4	3915	1910	-3418	56325	56461	Q	DHZ
DEC	299	21.7	86	01.5	3914	1919	-3411	56319	56455	Q	DHZ
WINTER	298	49.7	86	01.9	3907	1884	-3423	56319	56454	Q	DHZ
EQUINOX	298	51.6	86	01.6	3910	1887	-3424	56291	56427	Q	DHZ
SUMMER	299	03.0	86	01.0	3919	1903	-3426	56275	56411	Q	DHZ
YEAR	298	54.7	86	01.5	3911	1891	-3424	56295	56431	Q	DHZ
JAN	298	16.9	86	02.6	3896	1846	-3431	56321	56456	D	DHZ
FEB	298	24.3	86	02.2	3902	1856	-3432	56321	56456	D	DHZ
MAR	298	39.9	86	02.6	3894	1868	-3417	56307	56442	D	DHZ
APR	298	58.0	86	02.6	3894	1886	-3407	56303	56438	D	DHZ
MAY	299	09.7	86	01.5	3910	1905	-3414	56253	56389	D	DHZ
JUN	298	53.6	86	02.4	3897	1883	-3412	56305	56440	D	DHZ
JUL	299	22.3	86	00.3	3927	1926	-3422	56222	56359	D	DHZ
AUG	299	01.3	86	03.6	3881	1883	-3394	56350	56484	D	DHZ
SEP	299	13.1	86	01.4	3913	1910	-3415	56278	56414	D	DHZ
OCT	299	11.3	86	02.5	3898	1901	-3403	56338	56473	D	DHZ
NOV	299	10.4	86	02.3	3902	1902	-3407	56344	56479	D	DHZ
DEC	299	14.3	86	02.3	3902	1906	-3405	56339	56474	D	DHZ
WINTER	298	46.0	86	02.4	3900	1877	-3419	56331	56466	D	DHZ
EQUINOX	299	00.6	86	02.3	3899	1891	-3410	56306	56441	D	DHZ
SUMMER	299	06.4	86	01.9	3904	1899	-3411	56282	56417	D	DHZ
YEAR	298	57.8	86	02.2	3901	1889	-3413	56307	56442	D	DHZ

*A = All days

*Q = Q-days

*D = D-days

ELE = Elements recorded

Annual Mean Values, All Days.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1956.5	280 04.0	85 49.3	4082	714	-4019	55870	56019	A	DHZ
1957.5	280 14.0	85 50.4	4068	723	-4003	55927	56075	A	DHZ
1958.5	280 27.0	85 51.0	4059	736	-3992	55949	56096	A	DHZ
1959.5	280 39.0	85 51.9	4048	748	-3978	55983	56129	A	DHZ
1960.5	280 53.0	85 52.6	4038	762	-3965	56014	56159	A	DHZ
1961.5	281 05.0	85 53.6	4025	774	-3950	56049	56193	A	DHZ
1962.5	281 14.0	85 54.0	4019	783	-3942	56074	56218	A	DHZ
1963.5	281 25.0	85 54.7	4010	794	-3931	56113	56256	A	DHZ
1964.5	281 33.0	85 55.2	4005	802	-3924	56149	56292	A	DHZ
1965.5	281 40.0	85 55.8	3998	808	-3915	56180	56322	A	DHZ
1966.5	281 44.0	85 56.6	3987	811	-3904	56225	56366	A	DHZ
1967.5	281 44.0	85 57.6	3975	808	-3892	56277	56417	A	DHZ
1968.5	281 49.0	85 58.2	3967	812	-3883	56318	56458	A	DHZ
1969.5	281 51.0	85 58.8	3960	813	-3876	56349	56488	A	DHZ
1970.5	281 53.0	85 59.6	3951	814	-3866	56412	56550	A	DHZ
1971.5	281 55.0	86 00.5	3941	814	-3856	56470	56607	A	DHZ
1972.5	282 07.0	86 00.9	3937	826	-3849	56513	56650	A	DHZ
1973.5	282 22.0	86 01.5	3931	842	-3840	56564	56700	A	DHZ
1974.5	282 42.0	86 02.0	3926	863	-3830	56621	56757	A	DHZ
1975.5	283 03.0	86 02.3	3923	886	-3822	56641	56777	A	DHZ
1976.5	283 34.0	86 02.4	3923	920	-3814	56663	56799	A	DHZ
1977.5	284 06.0	86 02.4	3924	956	-3806	56674	56810	A	DHZ
1978.5	284 35.0	86 02.5	3922	988	-3796	56684	56820	A	DHZ
1979.5	285 04.0	86 02.5	3921	1019	-3786	56671	56806	A	DHZ
1980.5	285 28.0	86 02.2	3925	1047	-3783	56649	56785	A	DHZ
1981.5	285 51.0	86 02.2	3924	1072	-3775	56631	56767	A	DHZ
1982.5	286 10.0	86 02.4	3919	1091	-3764	56622	56757	A	DHZ
1983.5	286 29.0	86 02.7	3913	1110	-3752	56593	56728	A	DHZ
1984.5	286 48.0	86 03.0	3906	1129	-3739	56567	56702	A	DHZ
1985.5	287 07.0	86 03.5	3896	1147	-3723	56538	56672	A	DHZ
1986.5	287 27.0	86 04.0	3885	1165	-3706	56506	56639	A	DHZ
1987.5	287 52.0	86 04.3	3877	1189	-3690	56464	56597	A	DHZ
1988.5	288 17.0	86 04.8	3868	1214	-3673	56448	56580	A	DHZ
1989.5	288 45.0	86 05.3	3859	1240	-3654	56433	56565	A	DHZ
1990.5	289 10.0	86 05.7	3850	1264	-3637	56410	56541	A	DHZ
1991.5	289 40.0	86 06.1	3843	1294	-3619	56389	56520	A	DHZ
1992.5	290 12.0	86 06.0	3842	1327	-3606	56362	56493	A	DHZ
1993.5	290 46.0	86 06.0	3842	1362	-3592	56344	56475	A	DHZ
1994.5	291 26.0	86 06.1	3840	1403	-3574	56342	56473	A	DHZ
1995.5	292 11.0	86 06.1	3838	1449	-3554	56321	56452	A	DHZ
1996.5	293 01.0	86 05.9	3840	1501	-3534	56302	56433	A	DHZ
1997.5	293 54.0	86 05.7	3843	1557	-3514	56295	56426	A	DHZ
1998.5	294 51.0	86 05.2	3852	1619	-3495	56297	56429	A	DHZ
1999.5	295 51.0	86 04.4	3864	1685	-3477	56292	56424	A	DHZ
2000.5	296 50.0	86 03.6	3877	1750	-3460	56298	56431	A	DHZ
2001.5	297 53.0	86 02.6	3893	1821	-3441	56295	56429	A	DHZ
2002.5	298 57.0	86 01.8	3907	1891	-3419	56299	56434	A	DHZ

*A = All days

ELE = Elements recorded.

Annual Mean Values, Quiet Days.

YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1956.5	280	02.0	85	48.9	4087	712	-4024	55862	56011	Q	DHZ
1957.5	280	14.0	85	50.0	4074	724	-4009	55921	56069	Q	DHZ
1958.5	280	27.0	85	50.4	4068	738	-4001	55935	56083	Q	DHZ
1959.5	280	36.0	85	51.5	4054	746	-3985	55985	56132	Q	DHZ
1960.5	280	56.0	85	52.1	4046	767	-3973	56005	56151	Q	DHZ
1961.5	281	03.0	85	53.2	4031	773	-3956	56043	56188	Q	DHZ
1962.5	281	16.0	85	53.7	4024	786	-3946	56063	56207	Q	DHZ
1963.5	281	24.0	85	54.5	4014	793	-3935	56108	56251	Q	DHZ
1964.5	281	34.0	85	54.9	4009	804	-3928	56142	56285	Q	DHZ
1965.5	281	39.0	85	55.6	4000	808	-3918	56178	56320	Q	DHZ
1966.5	281	46.0	85	56.1	3994	814	-3910	56208	56350	Q	DHZ
1967.5	281	44.0	85	57.2	3981	810	-3898	56267	56408	Q	DHZ
1968.5	281	49.0	85	57.8	3974	814	-3890	56310	56450	Q	DHZ
1969.5	281	50.0	85	58.5	3964	813	-3880	56341	56480	Q	DHZ
1970.5	281	49.0	85	59.4	3954	810	-3870	56415	56553	Q	DHZ
1971.5	281	55.0	86	00.2	3945	815	-3860	56461	56599	Q	DHZ
1972.5	282	09.0	86	00.5	3943	830	-3855	56503	56640	Q	DHZ
1973.5	282	22.0	86	01.1	3936	843	-3845	56549	56686	Q	DHZ
1974.5	282	44.0	86	01.6	3931	866	-3834	56601	56737	Q	DHZ
1975.5	283	04.0	86	02.0	3927	888	-3825	56636	56772	Q	DHZ
1976.5	283	35.0	86	02.1	3927	922	-3817	56651	56787	Q	DHZ
1977.5	284	05.0	86	02.3	3925	955	-3807	56670	56806	Q	DHZ
1978.5	284	36.0	86	02.2	3927	990	-3800	56674	56810	Q	DHZ
1979.5	285	03.0	86	02.2	3927	1020	-3792	56670	56806	Q	DHZ
1980.5	285	27.0	86	02.0	3929	1047	-3787	56650	56786	Q	DHZ
1981.5	285	51.0	86	01.5	3934	1074	-3784	56619	56756	Q	DHZ
1982.5	286	11.0	86	02.2	3923	1093	-3768	56614	56750	Q	DHZ
1983.5	286	32.0	86	02.2	3920	1116	-3758	56581	56717	Q	DHZ
1984.5	286	50.0	86	02.6	3911	1133	-3743	56556	56691	Q	DHZ
1985.5	287	06.0	86	03.1	3901	1147	-3729	56524	56658	Q	DHZ
1986.5	287	30.0	86	03.7	3889	1169	-3709	56494	56628	Q	DHZ
1987.5	287	51.0	86	04.1	3880	1189	-3693	56460	56593	Q	DHZ
1988.5	288	17.0	86	04.4	3873	1215	-3678	56443	56576	Q	DHZ
1989.5	288	45.0	86	05.0	3863	1242	-3658	56425	56557	Q	DHZ
1990.5	289	08.0	86	05.6	3853	1263	-3640	56413	56544	Q	DHZ
1991.5	289	36.0	86	06.0	3845	1290	-3622	56394	56525	Q	DHZ
1992.5	290	10.0	86	05.7	3848	1327	-3612	56361	56492	Q	DHZ
1993.5	290	48.0	86	05.6	3847	1366	-3596	56334	56465	Q	DHZ
1994.5	291	29.0	86	05.7	3844	1408	-3577	56325	56456	Q	DHZ
1995.5	292	11.0	86	05.8	3842	1451	-3558	56312	56443	Q	DHZ
1996.5	293	03.0	86	05.6	3844	1505	-3537	56295	56426	Q	DHZ
1997.5	293	52.0	86	05.5	3846	1556	-3517	56291	56422	Q	DHZ
1998.5	294	51.0	86	04.7	3858	1622	-3501	56286	56418	Q	DHZ
1999.5	295	52.0	86	04.1	3869	1688	-3481	56287	56420	Q	DHZ
2000.5	296	46.0	86	03.5	3880	1747	-3464	56300	56434	Q	DHZ
2001.5	297	56.0	86	02.0	3903	1828	-3448	56279	56414	Q	DHZ
2002.5	298	55.0	86	01.5	3911	1891	-3424	56295	56431	Q	DHZ

*Q = Quiet days

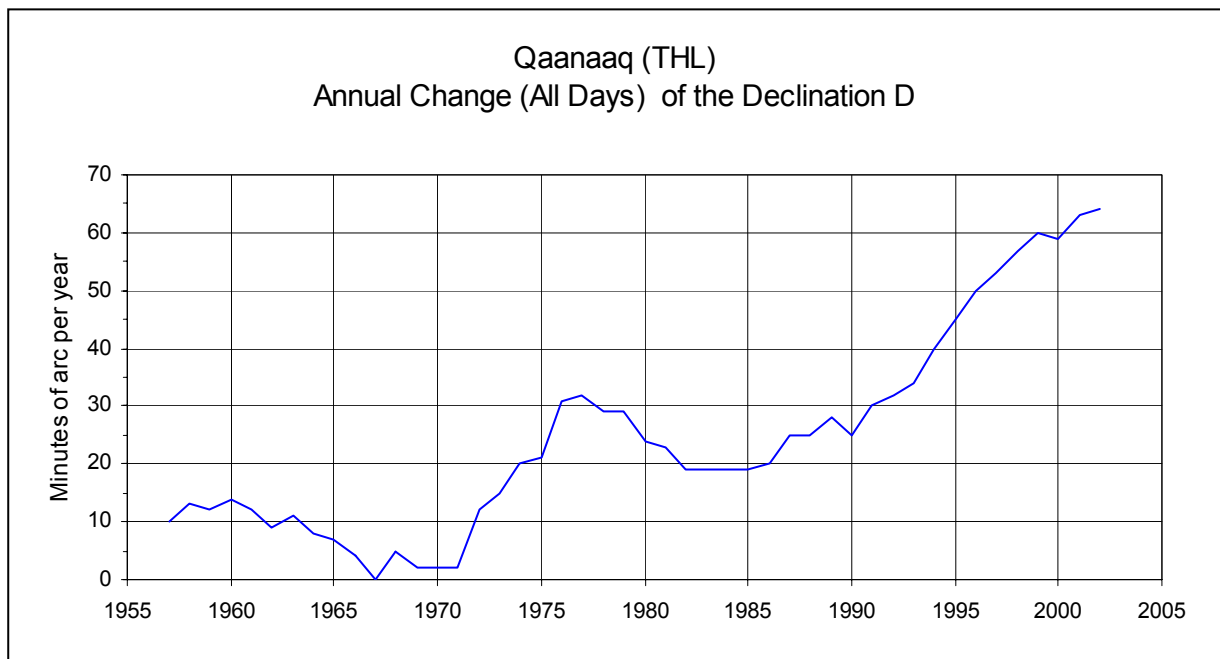
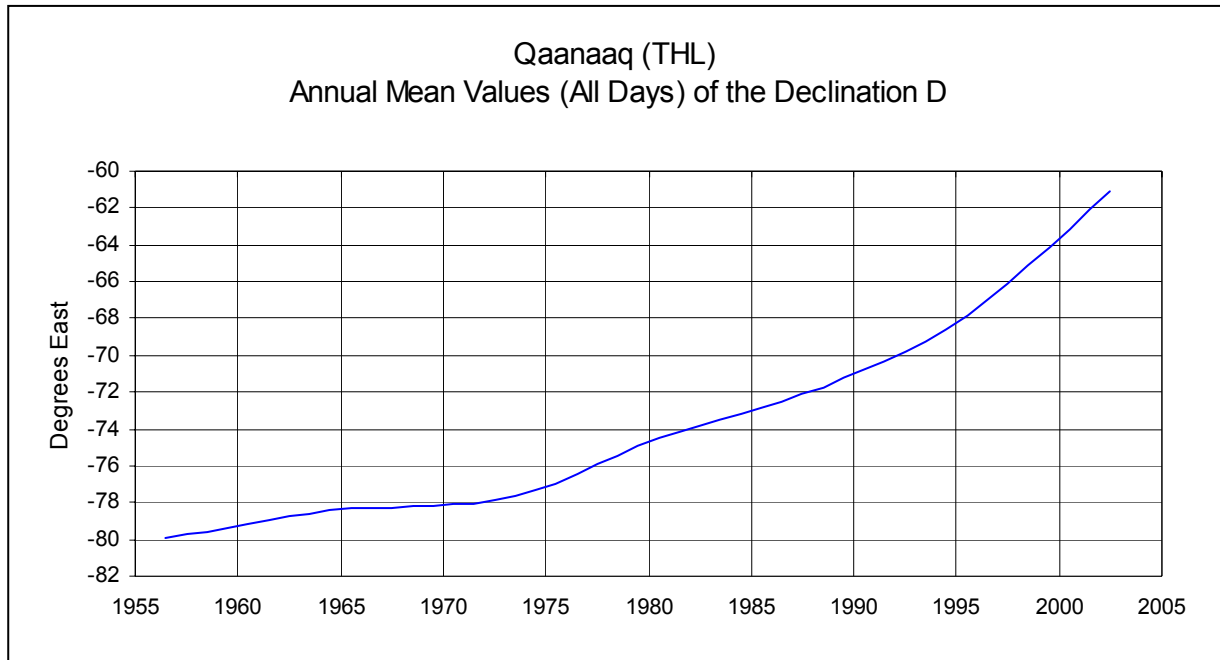
ELE = Elements recorded.

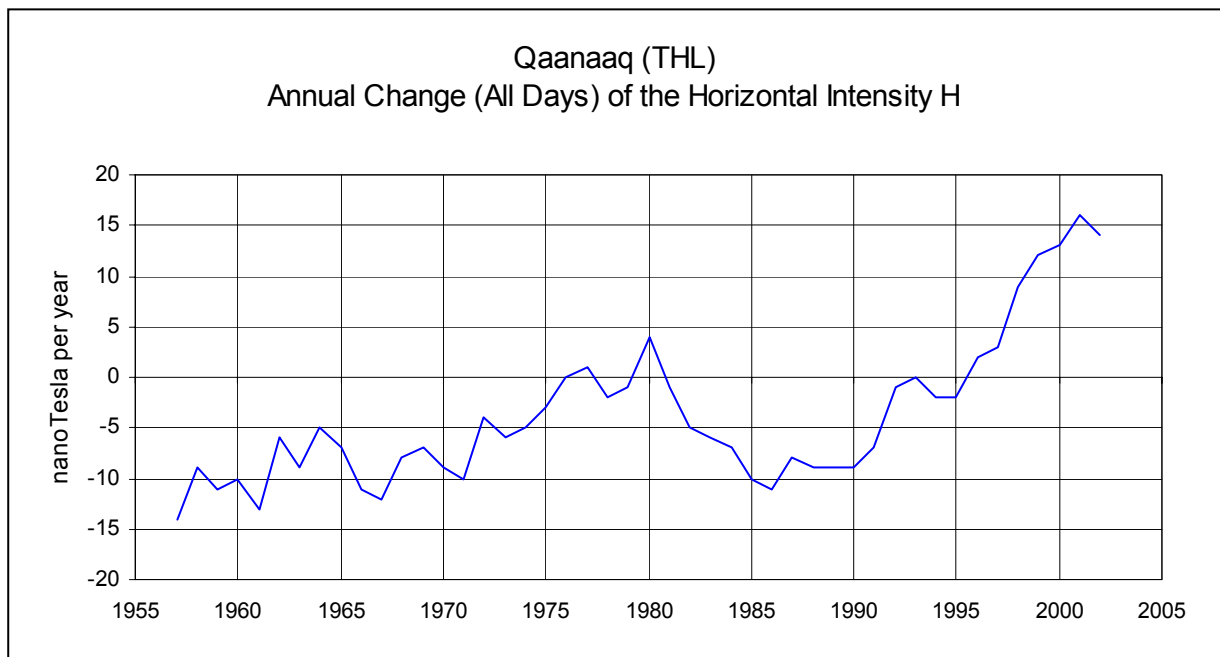
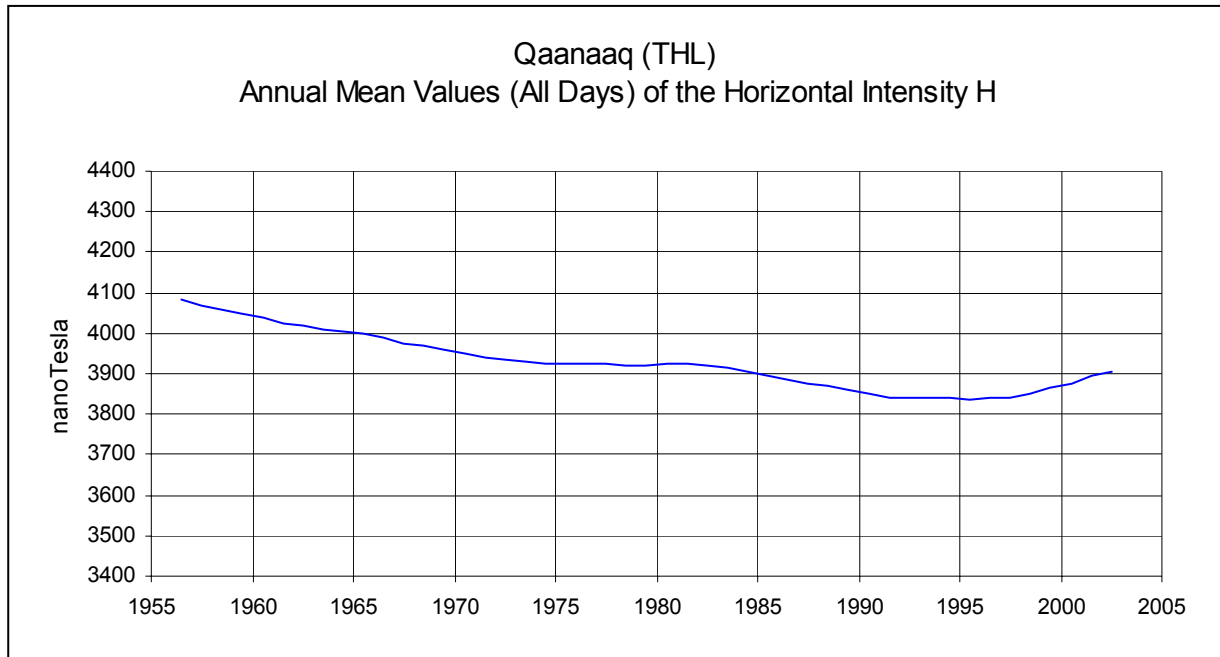
Annual Mean Values, Disturbed Days.

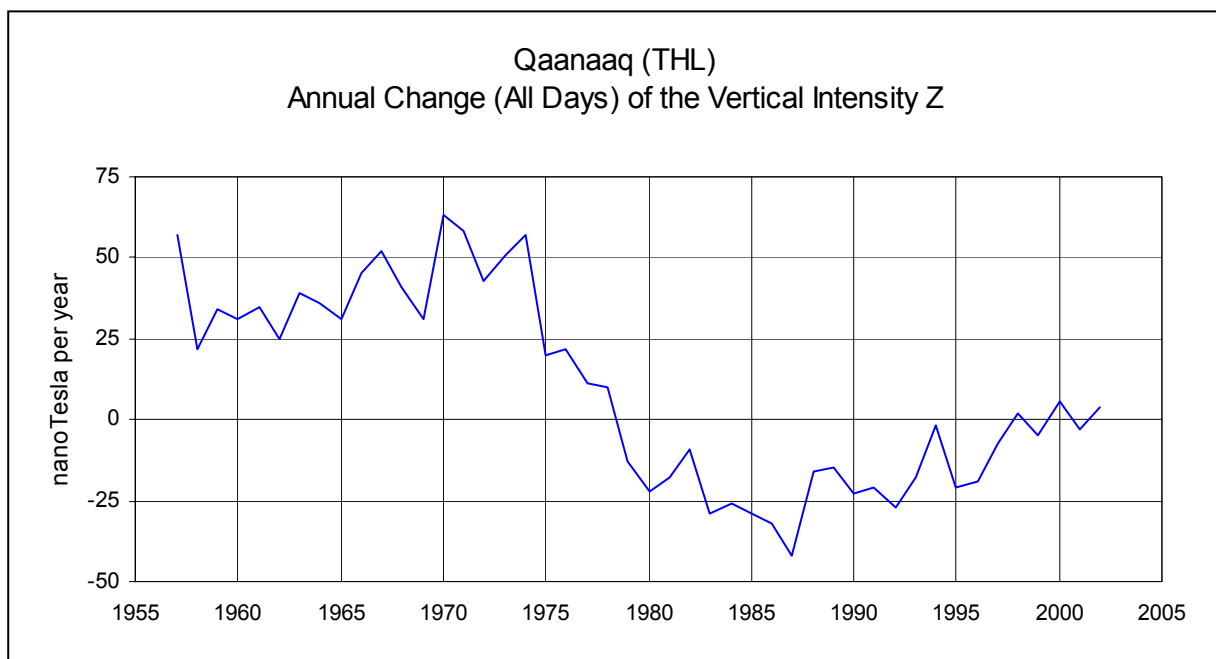
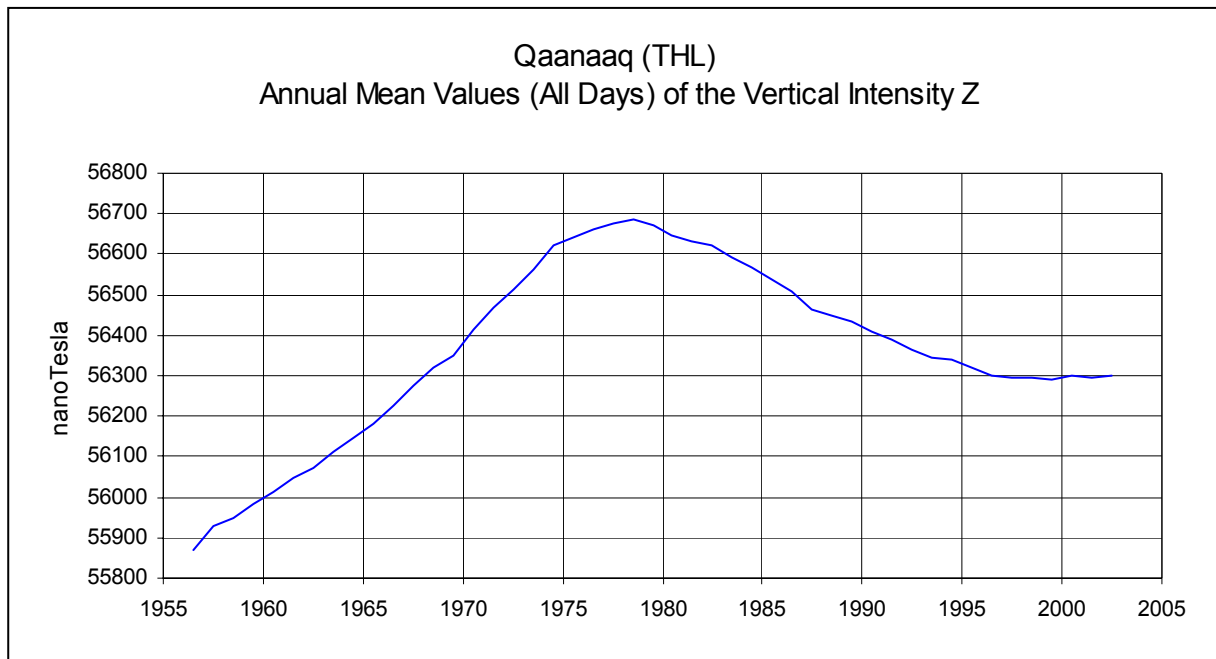
YEAR	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	°	'	°	'	nT	nT	nT	nT	nT		
1956.5	280	11.0	85	49.5	4079	721	-4015	55878	56027	D	DHZ
1957.5	280	15.0	85	50.7	4064	723	-3999	55943	56090	D	DHZ
1958.5	280	26.0	85	51.5	4052	734	-3985	55965	56111	D	DHZ
1959.5	280	37.0	85	52.6	4038	744	-3969	56010	56155	D	DHZ
1960.5	280	49.0	85	53.3	4029	756	-3957	56039	56184	D	DHZ
1961.5	281	06.0	85	54.1	4016	773	-3941	56058	56202	D	DHZ
1962.5	281	11.0	85	54.5	4012	778	-3936	56085	56228	D	DHZ
1963.5	281	25.0	85	54.9	4008	793	-3929	56120	56263	D	DHZ
1964.5	281	32.0	85	55.5	4000	800	-3919	56157	56299	D	DHZ
1965.5	281	39.0	85	56.0	3995	807	-3913	56185	56327	D	DHZ
1966.5	281	42.0	85	57.5	3974	806	-3891	56236	56376	D	DHZ
1967.5	281	42.0	85	57.9	3971	805	-3888	56283	56423	D	DHZ
1968.5	281	51.0	85	58.7	3960	813	-3876	56328	56467	D	DHZ
1969.5	281	52.0	85	59.2	3954	813	-3869	56358	56497	D	DHZ
1970.5	281	58.0	86	00.0	3945	818	-3859	56417	56555	D	DHZ
1971.5	281	55.0	86	00.9	3935	813	-3850	56483	56620	D	DHZ
1972.5	282	08.0	86	01.1	3934	827	-3846	56523	56660	D	DHZ
1973.5	282	19.0	86	01.9	3925	837	-3835	56581	56717	D	DHZ
1974.5	282	43.0	86	02.5	3919	863	-3823	56632	56767	D	DHZ
1975.5	283	02.0	86	02.8	3915	883	-3814	56656	56791	D	DHZ
1976.5	283	34.0	86	02.7	3919	919	-3810	56681	56816	D	DHZ
1977.5	284	07.0	86	02.8	3918	956	-3800	56685	56820	D	DHZ
1978.5	284	40.0	86	02.8	3918	992	-3790	56693	56828	D	DHZ
1979.5	285	03.0	86	03.0	3914	1016	-3780	56682	56817	D	DHZ
1980.5	285	28.0	86	02.8	3916	1044	-3774	56663	56798	D	DHZ
1981.5	285	55.0	86	02.9	3913	1073	-3763	56644	56779	D	DHZ
1982.5	286	13.0	86	02.9	3912	1093	-3756	56631	56766	D	DHZ
1983.5	286	27.0	86	03.4	3902	1105	-3742	56617	56751	D	DHZ
1984.5	286	47.0	86	03.6	3898	1126	-3732	56586	56720	D	DHZ
1985.5	287	07.0	86	04.0	3888	1144	-3716	56556	56689	D	DHZ
1986.5	287	23.0	86	04.5	3879	1159	-3702	56529	56662	D	DHZ
1987.5	287	52.0	86	04.7	3871	1188	-3684	56473	56606	D	DHZ
1988.5	288	18.0	86	05.5	3858	1211	-3663	56462	56594	D	DHZ
1989.5	288	43.0	86	05.6	3855	1237	-3651	56445	56576	D	DHZ
1990.5	289	14.0	86	05.8	3849	1268	-3634	56417	56548	D	DHZ
1991.5	289	44.0	86	06.6	3835	1295	-3610	56397	56527	D	DHZ
1992.5	290	18.0	86	06.5	3835	1330	-3597	56367	56497	D	DHZ
1993.5	290	43.0	86	06.7	3832	1356	-3584	56369	56499	D	DHZ
1994.5	291	26.0	86	06.6	3833	1401	-3568	56361	56491	D	DHZ
1995.5	292	09.0	86	06.6	3831	1444	-3548	56332	56462	D	DHZ
1996.5	292	59.0	86	06.1	3837	1498	-3533	56312	56443	D	DHZ
1997.5	293	52.0	86	06.1	3837	1553	-3509	56308	56439	D	DHZ
1998.5	294	55.0	86	05.5	3846	1620	-3488	56303	56434	D	DHZ
1999.5	295	54.0	86	04.8	3858	1685	-3471	56301	56433	D	DHZ
2000.5	296	48.0	86	04.0	3872	1746	-3456	56308	56441	D	DHZ
2001.5	297	50.0	86	03.3	3883	1813	-3434	56313	56447	D	DHZ
2002.5	298	58.0	86	02.2	3901	1889	-3413	56307	56442	D	DHZ

*D = Disturbed days

ELE = Elements recorded.







SECTION V

Narsarsuaq Geomagnetic Observatory 2002.

OBSERVATORY DETAILS.

A magnetic observatory was established at Narsarsuaq (61°11'N, 314°34'E) during 1967 by the Danish Meteorological Institute as a successor for the temporary IGY/IQSY-observatory at Qaqortoq (Julianehaab), 70 km SW of Narsarsuaq. A description of the observatory and its location is given in the observatory yearbooks for 1968-70, 1980-82 and for 1985-90.

The following coordinates etc. are valid for the observatory:

Acronym (IAGA-code).....	NAQ
Elevation (top of absolute pillar)	4 m
Geographic latitude.....	61°09.6'N
Geographic longitude.....	314°33.5'E
Geographic longitude.....	45°26.5'W
Geomagnetic latitude	70.09°N
Geomagnetic longitude	38.63°E
Invariant geomagnetic latitude.....	66.50°N
Magnetic local noon.....	14 UT

The geomagnetic coordinates are based on the IGRF 2000.0 magnetic field model in which the geomagnetic north pole position is 79.5°N, 288.4°E.

The invariant geomagnetic latitude is based on the IGRF 2000.0 magnetic field model valid for Epoch 2000.0 and a height of 105 km.

STAFF.

Mr. Carl Plesner and Mr. Erik Vestergaard from the Ice Patrol in Narsarsuaq alternated four weeks at a time in order to supervise the buildings and the equipment and to make absolute measurements.

DIARY.

The absolute measurements on March 02 and March 09 were cancelled due to artificial magnetism in the absolute house.

The primary recordings were defective during March 07 to April 15 due to bad connections in cables between variometer and datalogger.

During May 29 to June 03 Mr. Lars Pedersen (DMI) visited the observatory in order to check the two variometer systems. During his stay he also changed the orientation of the two sensor systems according to the magnetic meridian, checked the frequency of the time base in the proton precession magnetometer, and finally replaced the batteries of the Uninterruptible Power Supply (UPS) for the primary variometer system.

On November 11 the door to the variometer house was temporarily “locked” by means of screws. At the same time the wires that secures the absolute house and variometer house against severe high-speed outdoor winds blowing from the ice cap (socalled Föhn winds) were also adjusted.

MISSING DATA.

Intervals of missing primary variometer data were, if possible, replaced by data from the supplementary recorder.

The hourly mean values are missing in the following intervals, cf. diary

APR 06:	12-13 UT	
MAY 30:	17-18 UT	due to adjustments of the fluxgate sensors
MAY 31:	14-15 UT	due to adjustments of the fluxgate sensors
NOV 11:	15-18 UT	due to magnetic tools at the variometer house

OBSERVED AND ADOPTED BASELINE VALUES.

Tables of adopted baseline values are shown below, while graphs of the observed and adopted baseline values are shown in section VII.

Adopted baseline values for the primary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	12466.0 nT	330°52.3'	53443.0 nT
MAR	07	18:00 UT	not adopted	not adopted	not adopted
APR	15	18:00 UT	12466.0 nT	330°52.1'	53444.0 nT
MAY	31	14:20 UT	12465.5 nT	333°45.5'	53186.0 nT
JUN	20	00:00 UT		333°45.0'	53185.5 nT
JUL	11	00:00 UT			53185.0 nT
AUG	01	00:00 UT			53184.5 nT
SEP	01	00:00 UT	12466.0 nT	333°45.5'	53185.0 nT
OCT	10	00:00 UT	12466.5 nT	333°45.9'	53186.0 nT

Adopted baseline values for the supplementary variometer system.

Interval beginning			H_0	D_0	Z_0
JAN	01	00:00 UT	12420.0 nT	330°26.2'	53407.5 nT
MAY	31	13:00 UT	12541.5 nT	333°48.0'	53287.5 nT
JUN	20	00:00 UT		333°47.5'	
JUL	10	00:00 UT			53286.0 nT
AUG	01	00:00 UT	12541.0 nT	333°47.8'	
SEP	01	00:00 UT	12541.5 nT	333°48.2'	53286.5 nT
OCT	01	00:00 UT			53287.5 nT
OCT	23	00:00 UT			53288.5 nT
NOV	01	00:00 UT	12542.5 nT	333°47.9'	
DEC	01	00:00 UT			53289.0 nT

Monthly Mean Values, All Days, Quiet Days and Disturbed Days.

Year	<i>D</i>		<i>I</i>		<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
2002	°	'	°	'	nT	nT	nT	nT	nT		
JAN	332	13.0	76	44.5	12550	11103	-5850	53265	54723	A	DHZ
FEB	332	14.5	76	44.8	12543	11100	-5842	53259	54716	A	DHZ
MAR	332	16.7	76	44.5	12548	11108	-5837	53258	54716	A	DHZ
APR	332	19.3	76	45.2	12538	11103	-5824	53258	54714	A	DHZ
MAY	332	21.7	76	43.9	12557	11124	-5825	53253	54713	A	DHZ
JUN	332	24.2	76	43.3	12566	11136	-5821	53247	54710	A	DHZ
JUL	332	25.2	76	43.3	12566	11138	-5818	53247	54710	A	DHZ
AUG	332	26.7	76	43.7	12560	11135	-5810	53252	54713	A	DHZ
SEP	332	28.3	76	44.3	12551	11130	-5801	53253	54712	A	DHZ
OCT	332	29.4	76	45.3	12538	11120	-5791	53263	54719	A	DHZ
NOV	332	31.7	76	44.0	12556	11140	-5792	53252	54712	A	DHZ
DEC	332	33.5	76	43.2	12566	11152	-5791	53241	54704	A	DHZ
WINTER	332	23.1	76	44.1	12554	11124	-5819	53254	54714	A	DHZ
EQUINOX	332	23.5	76	44.8	12543	11115	-5813	53258	54715	A	DHZ
SUMMER	332	24.5	76	43.6	12562	11133	-5818	53250	54712	A	DHZ
YEAR	332	23.6	76	44.2	12553	11124	-5817	53254	54714	A	DHZ
JAN	332	12.8	76	44.5	12551	11104	-5851	53267	54726	Q	DHZ
FEB	332	14.8	76	44.9	12543	11100	-5841	53260	54717	Q	DHZ
MAR	332	17.1	76	44.5	12549	11109	-5836	53256	54714	Q	DHZ
APR	332	18.9	76	44.3	12552	11115	-5832	53257	54716	Q	DHZ
MAY	332	21.2	76	43.8	12560	11126	-5828	53256	54717	Q	DHZ
JUN	332	23.8	76	42.9	12572	11141	-5825	53242	54706	Q	DHZ
JUL	332	24.6	76	42.8	12573	11143	-5823	53241	54705	Q	DHZ
AUG	332	26.8	76	42.8	12573	11147	-5816	53245	54709	Q	DHZ
SEP	332	28.7	76	43.3	12565	11143	-5806	53246	54708	Q	DHZ
OCT	332	29.9	76	44.2	12554	11135	-5797	53258	54718	Q	DHZ
NOV	332	31.4	76	43.0	12571	11153	-5800	53251	54715	Q	DHZ
DEC	332	34.5	76	42.5	12578	11164	-5793	53241	54706	Q	DHZ
WINTER	332	23.4	76	43.8	12560	11130	-5821	53255	54716	Q	DHZ
EQUINOX	332	23.6	76	44.0	12555	11126	-5818	53254	54714	Q	DHZ
SUMMER	332	24.1	76	43.1	12569	11139	-5823	53246	54709	Q	DHZ
YEAR	332	23.7	76	43.6	12562	11132	-5821	53252	54714	Q	DHZ
JAN	332	12.3	76	45.2	12539	11092	-5847	53267	54723	D	DHZ
FEB	332	13.0	76	46.4	12518	11075	-5835	53261	54712	D	DHZ
MAR	332	18.9	76	45.7	12531	11096	-5822	53265	54719	D	DHZ
APR	332	21.0	76	46.1	12518	11088	-5809	53238	54690	D	DHZ
MAY	332	21.2	76	43.1	12564	11130	-5830	53229	54692	D	DHZ
JUN	332	23.9	76	43.5	12564	11134	-5821	53252	54714	D	DHZ
JUL	332	25.5	76	44.5	12551	11125	-5810	53265	54724	D	DHZ
AUG	332	24.5	76	44.4	12553	11125	-5814	53264	54723	D	DHZ
SEP	332	26.7	76	46.2	12520	11100	-5792	53258	54710	D	DHZ
OCT	332	27.9	76	48.1	12494	11079	-5776	53274	54720	D	DHZ
NOV	332	32.0	76	45.8	12527	11115	-5778	53259	54712	D	DHZ
DEC	332	33.3	76	44.1	12549	11137	-5784	53236	54695	D	DHZ
WINTER	332	22.7	76	45.4	12534	11105	-5811	53256	54711	D	DHZ
EQUINOX	332	23.6	76	46.5	12516	11091	-5800	53259	54710	D	DHZ
SUMMER	332	23.7	76	43.9	12558	11128	-5819	53253	54714	D	DHZ
YEAR	332	23.3	76	45.3	12536	11108	-5810	53256	54711	D	DHZ

*A = All days

*Q = Q-days

*D = D-days

ELE = Elements recorded

Annual Mean Values, Quiet Winter Days, All Days, Quiet Days and Disturbed Days.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1968.0	323 10.0	77 46.3	11617	9298	-6964	53600	54844	W	DHZ
1969.0	323 19.0	77 44.9	11652	9344	-6961	53656	54907	W	DHZ
1970.0	323 29.0	77 43.2	11692	9397	-6957	53713	54971	W	DHZ
1971.0	323 38.0	77 41.4	11733	9448	-6957	53767	55032	W	DHZ
1972.0	323 48.0	77 39.5	11775	9502	-6954	53815	55088	W	DHZ
1973.0	323 59.0	77 37.5	11816	9557	-6948	53856	55137	W	DHZ
1974.0	324 12.0	77 35.4	11859	9618	-6937	53890	55179	W	DHZ
1975.0	324 27.0	77 33.2	11900	9682	-6919	53912	55210	W	DHZ
1976.0	324 43.0	77 30.6	11942	9748	-6898	53914	55221	W	DHZ
1977.0	325 01.0	77 28.4	11978	9814	-6867	53907	55222	W	DHZ
1978.0	325 17.0	77 26.1	12012	9874	-6841	53895	55217	W	DHZ
1979.0	325 33.0	77 23.7	12048	9935	-6815	53877	55208	W	DHZ
1980.0	325 48.0	77 21.4	12078	9989	-6789	53845	55183	W	DHZ
1981.0	326 04.0	77 19.2	12108	10046	-6759	53818	55163	W	DHZ
1982.0	326 20.0	77 17.1	12138	10102	-6729	53793	55145	W	DHZ
1983.0	326 35.0	77 16.0	12153	10144	-6693	53780	55136	W	DHZ
1984.0	326 50.0	77 14.0	12178	10194	-6662	53746	55108	W	DHZ
1983.5	326 41.6	77 15.8	12152	10156	-6673	53764	55120	A	DHZ
1984.5	326 55.7	77 14.3	12171	10199	-6642	53736	55097	A	DHZ
1985.5	327 11.1	77 12.9	12187	10242	-6604	53706	55071	A	DHZ
1986.5	327 26.8	77 11.7	12201	10284	-6565	53679	55048	A	DHZ
1987.5	327 44.5	77 09.9	12223	10336	-6524	53647	55022	A	DHZ
1988.5	328 00.5	77 09.0	12235	10377	-6482	53633	55011	A	DHZ
1989.0	0 02.6	0 00.7	-4	2	10	30	28	J	DHZ
1989.5	328 13.8	77 07.2	12254	10418	-6452	53592	54975	A	DHZ
1990.5	328 29.9	77 05.9	12271	10463	-6412	53571	54959	A	DHZ
1991.5	328 45.6	77 04.9	12284	10503	-6371	53555	54946	A	DHZ
1992.5	329 01.3	77 03.4	12302	10547	-6332	53525	54920	A	DHZ
1993.5	329 17.9	77 01.6	12323	10596	-6292	53495	54896	A	DHZ
1994.0	0 00.0	0 00.0	-1	-1	0	-2	-3	J	DHZ
1994.5	329 34.3	77 00.7	12335	10636	-6247	53476	54880	A	DHZ
1995.5	329 53.6	76 58.3	12366	10698	-6203	53444	54856	A	DHZ
1996.5	330 13.6	76 56.0	12395	10759	-6155	53409	54828	A	DHZ
1997.5	330 33.9	76 54.0	12423	10819	-6105	53381	54807	A	DHZ
1998.5	330 55.6	76 52.2	12446	10878	-6048	53361	54793	A	DHZ
1999.5	331 17.3	76 50.2	12473	10939	-5992	53332	54771	A	DHZ
2000.5	331 39.0	76 48.4	12497	10998	-5934	53311	54756	A	DHZ
2001.5	332 01.3	76 46.1	12527	11063	-5877	53278	54731	A	DHZ
2002.5	332 23.6	76 44.2	12553	11124	-5817	53254	54714	A	DHZ
1983.5	326 42.3	77 15.1	12164	10167	-6677	53765	55124	Q	DHZ
1984.5	326 56.3	77 13.3	12186	10213	-6648	53734	55098	Q	DHZ
1985.5	327 11.6	77 12.0	12202	10256	-6611	53704	55073	Q	DHZ
1986.5	327 27.4	77 10.8	12215	10297	-6571	53676	55048	Q	DHZ
1987.5	327 44.9	77 09.4	12232	10345	-6527	53648	55025	Q	DHZ
1988.5	328 00.8	77 08.2	12246	10387	-6487	53631	55011	Q	DHZ
1989.0	0 02.6	0 00.7	-4	2	10	30	28	J	DHZ
1989.5	328 14.4	77 06.6	12263	10427	-6455	53591	54976	Q	DHZ

Annual Mean Values, continued.

YEAR	<i>D</i>	<i>I</i>	<i>H</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>	*	ELE
	° ' "	° ' "	nT	nT	nT	nT	nT		
1990.5	328 30.0	77 05.3	12279	10470	-6416	53567	54956	Q	DHZ
1991.5	328 46.1	77 04.0	12297	10515	-6376	53551	54945	Q	DHZ
1992.5	329 01.6	77 02.7	12312	10556	-6336	53521	54919	Q	DHZ
1993.5	329 18.2	77 00.9	12335	10607	-6297	53491	54895	Q	DHZ
1994.0	0 00.0	0 00.0	-1	-1	0	-2	-3	J	DHZ
1994.5	329 35.4	76 59.2	12357	10657	-6255	53470	54879	Q	DHZ
1995.5	329 54.2	76 57.5	12380	10711	-6208	53443	54858	Q	DHZ
1996.5	330 13.6	76 55.5	12403	10766	-6159	53407	54828	Q	DHZ
1997.5	330 34.2	76 53.4	12431	10827	-6108	53380	54808	Q	DHZ
1998.5	330 55.5	76 51.6	12456	10886	-6053	53359	54793	Q	DHZ
1999.5	331 17.9	76 49.6	12483	10949	-5995	53330	54771	Q	DHZ
2000.5	331 39.3	76 47.8	12507	11007	-5938	53308	54755	Q	DHZ
2001.5	332 01.5	76 45.6	12535	11070	-5880	53278	54733	Q	DHZ
2002.5	332 23.7	76 43.6	12562	11132	-5821	53252	54714	Q	DHZ
1983.5	326 40.4	77 17.7	12121	10128	-6659	53763	55112	D	DHZ
1984.5	326 54.6	77 16.5	12136	10168	-6626	53744	55097	D	DHZ
1985.5	327 10.1	77 14.7	12158	10216	-6592	53707	55066	D	DHZ
1986.5	327 25.6	77 13.7	12169	10255	-6552	53683	55045	D	DHZ
1987.5	327 43.9	77 11.0	12205	10320	-6516	53645	55016	D	DHZ
1988.5	327 59.5	77 10.9	12204	10349	-6469	53636	55007	D	DHZ
1989.0	0 02.6	0 00.7	-4	2	10	30	28	J	DHZ
1989.5	328 12.2	77 08.9	12228	10393	-6443	53598	54975	D	DHZ
1990.5	328 30.0	77 07.3	12249	10444	-6400	53577	54959	D	DHZ
1991.5	328 45.1	77 06.5	12258	10480	-6359	53560	54945	D	DHZ
1992.5	329 00.8	77 05.6	12268	10517	-6316	53539	54927	D	DHZ
1993.5	329 16.8	77 03.5	12295	10570	-6281	53502	54897	D	DHZ
1994.0	0 00.0	0 00.0	-1	-1	0	-2	-3	J	DHZ
1994.5	329 33.2	77 02.9	12300	10604	-6233	53481	54877	D	DHZ
1995.5	329 52.6	76 59.7	12344	10677	-6195	53445	54852	D	DHZ
1996.5	330 12.9	76 57.1	12378	10743	-6149	53411	54827	D	DHZ
1997.5	330 33.7	76 54.8	12409	10807	-6099	53382	54805	D	DHZ
1998.5	330 54.7	76 54.2	12416	10850	-6036	53371	54796	D	DHZ
1999.5	331 17.0	76 51.9	12446	10915	-5980	53336	54769	D	DHZ
2000.5	331 37.8	76 50.1	12472	10974	-5926	53317	54756	D	DHZ
2001.5	332 00.3	76 47.0	12512	11048	-5873	53276	54726	D	DHZ
2002.5	332 23.3	76 45.3	12536	11108	-5810	53256	54711	D	DHZ

*W = Quiet winter days (QWD, cf. Section I, chapter 5)

*A = All days

*Q = Quiet days

*D = Disturbed days

*J = Jumps:

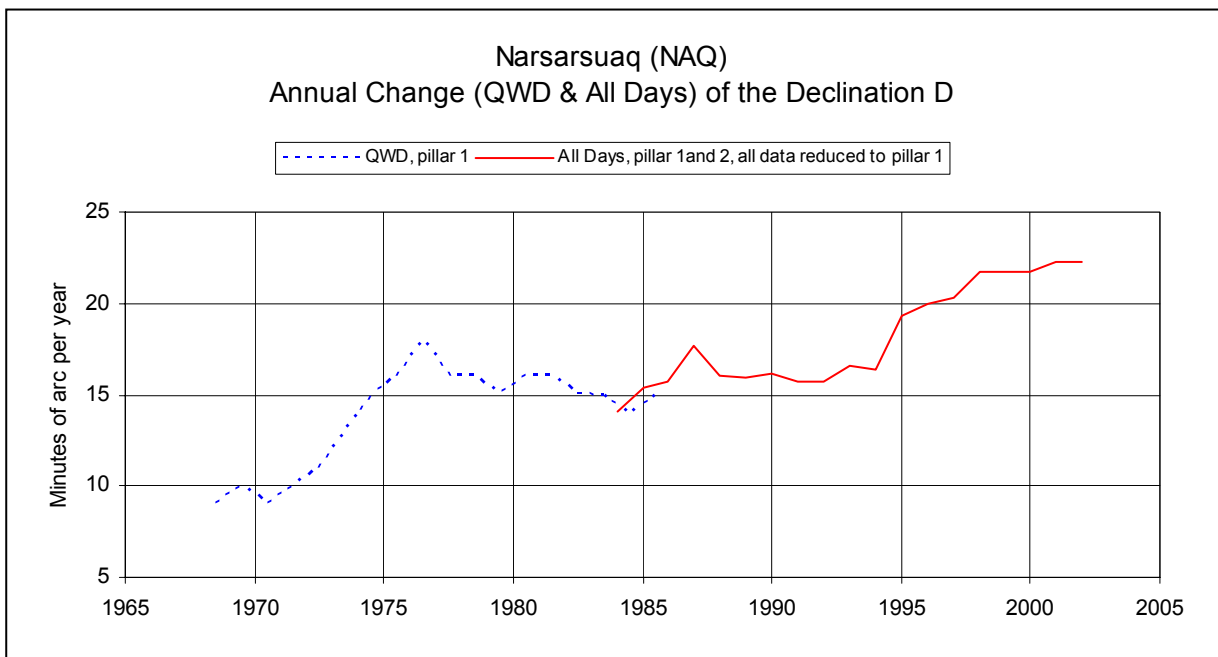
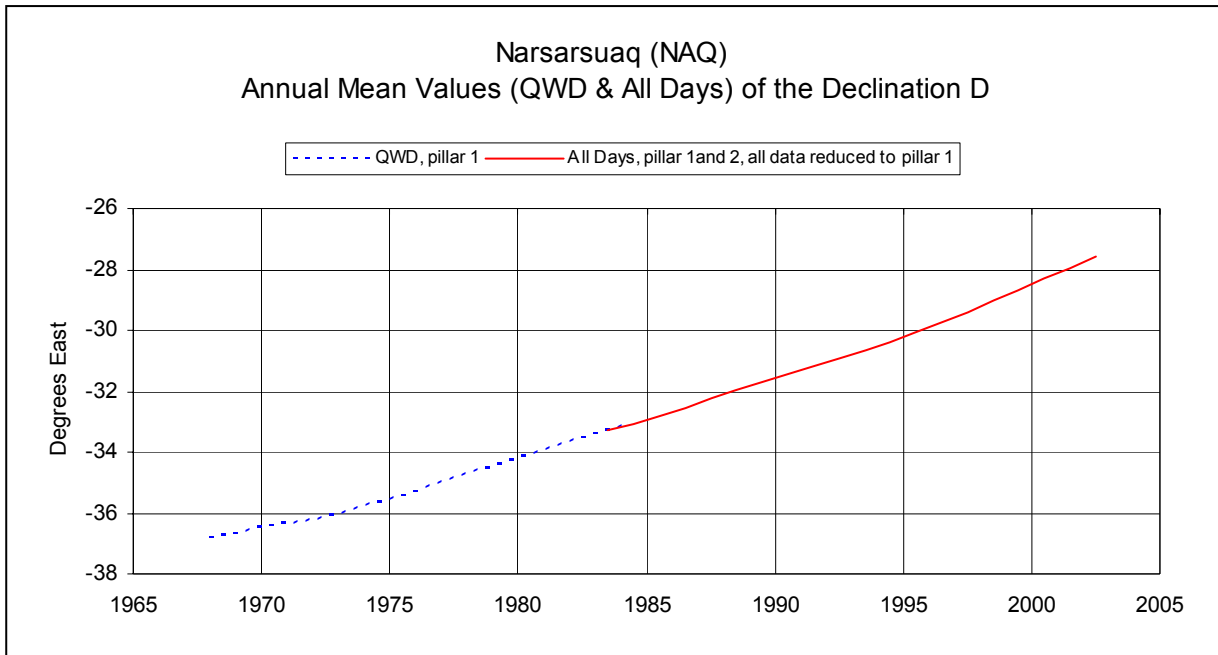
1. The jump in the values from 1988 to 1989 is due to establishment of a new absolute pillar during 1988.

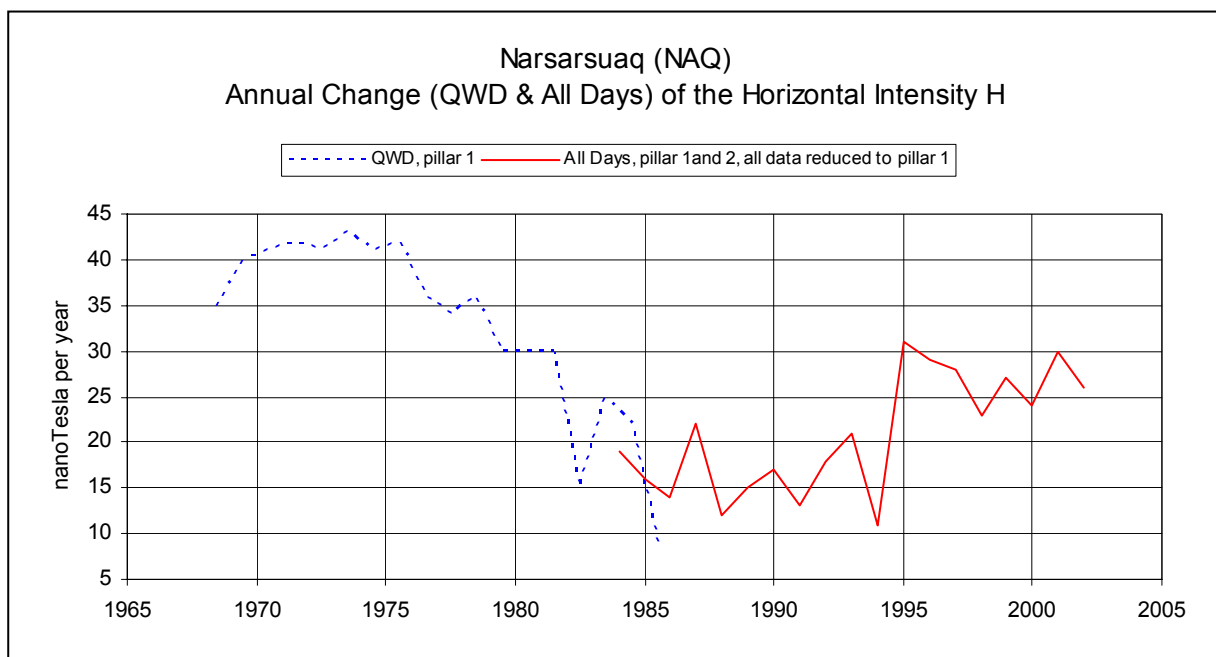
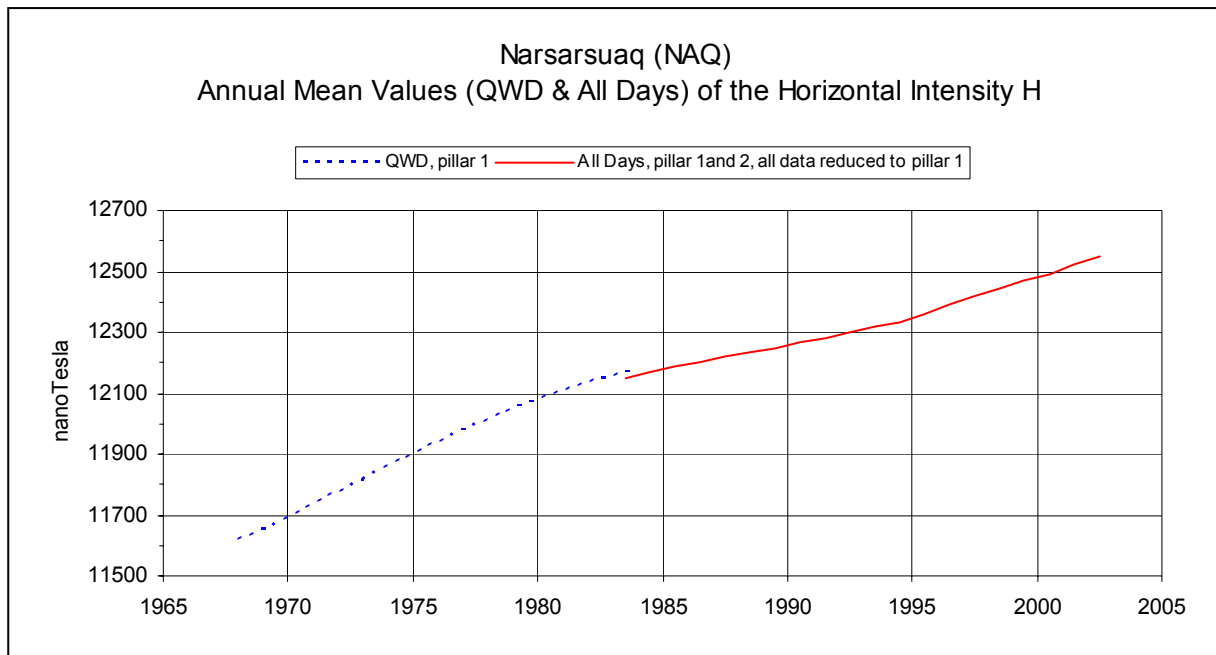
2. The jump in the values from 1993 to 1994 is due to a change in the difference ΔF between the PPM-pillar and the absolute pillar.

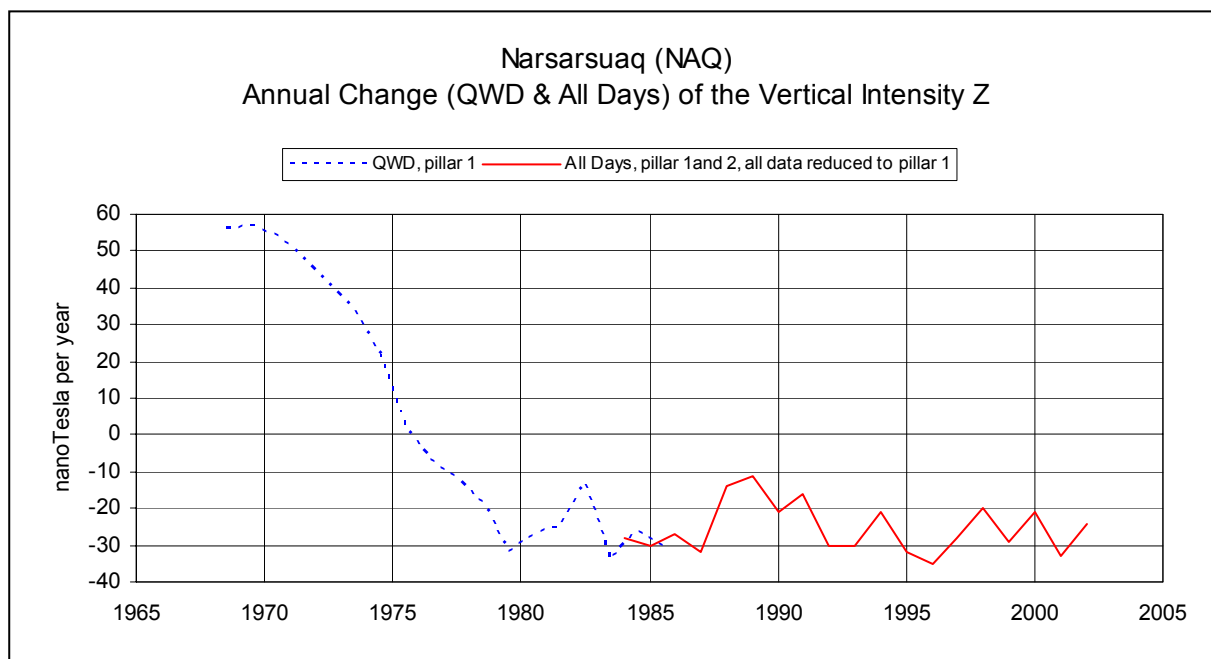
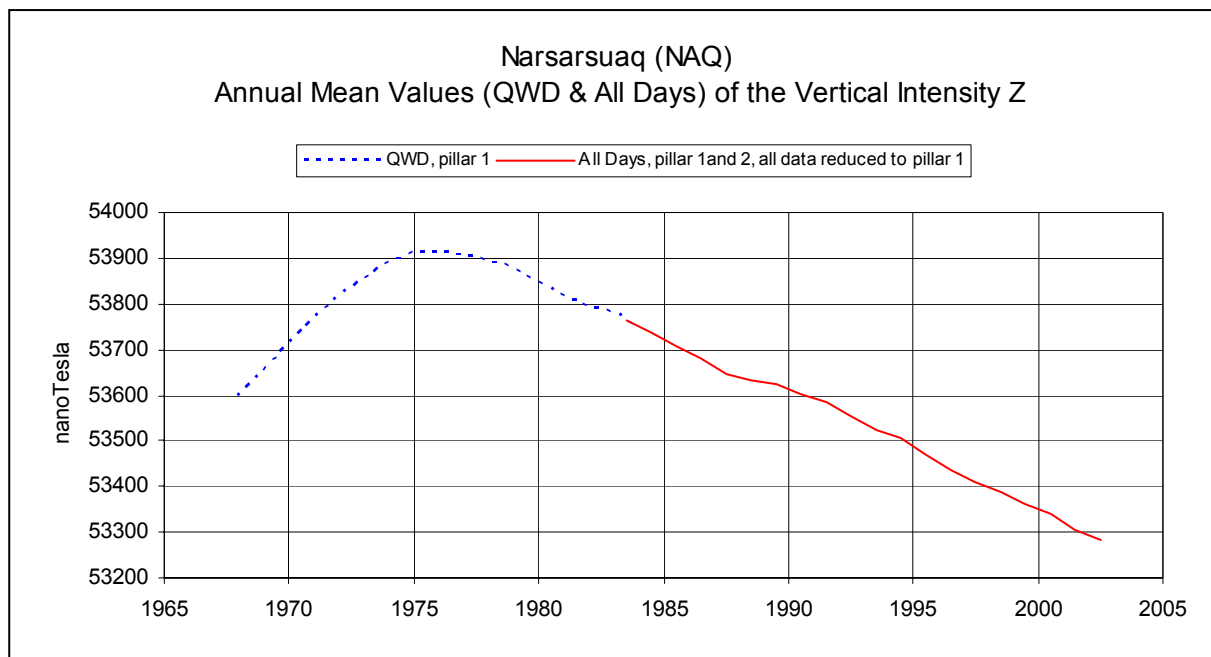
The change happened between spring 1989 and autumn 1993. Why and when is unknown.

REMARK: jump value = old site value - new site value.

ELE = Elements recorded.







SECTION VI

Maps of the Magnetic Declination.

Isogonic maps for Denmark, Faeroe Islands and Greenland showing lines of equal magnetic declination based on the IGRF 2000 magnetic field model and valid for Epoch 2002.5 are shown on page 62, 63 and 64.

The measured secular variation of the magnetic declination, i.e. the annual change in D , valid for the Danish and Greenlandic observatories since 1950¹, is shown on the graph on page 66. The data are first differences of the calculated annual means.

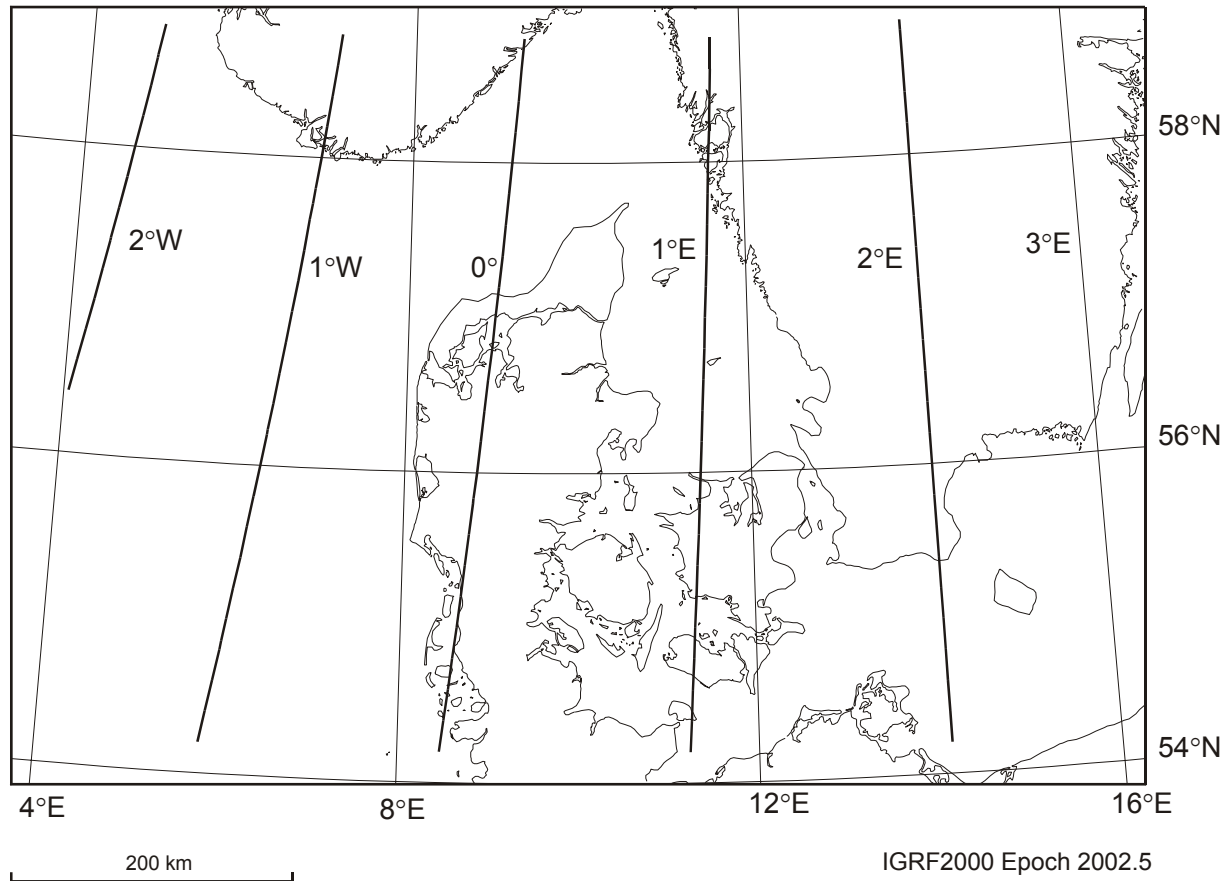
The predicted secular variation can also be calculated from the IGRF 2000 magnetic field model, and we find that it is 7 minutes of arc per year eastwards for Denmark, and 12 minutes of arc per year eastwards for Faeroe Islands.

The secular variation for Greenland is shown on the iso-variational map, or isoporonic map, on page 65. The map is also based on the IGRF 2000 magnetic field model, and shows the lines of equal change in D (in minutes of arc per year) for the period 2000-2005.

¹The annual change in D for BFE and GDH since the start of the two observatories are shown on graphs in section II and III respectively.

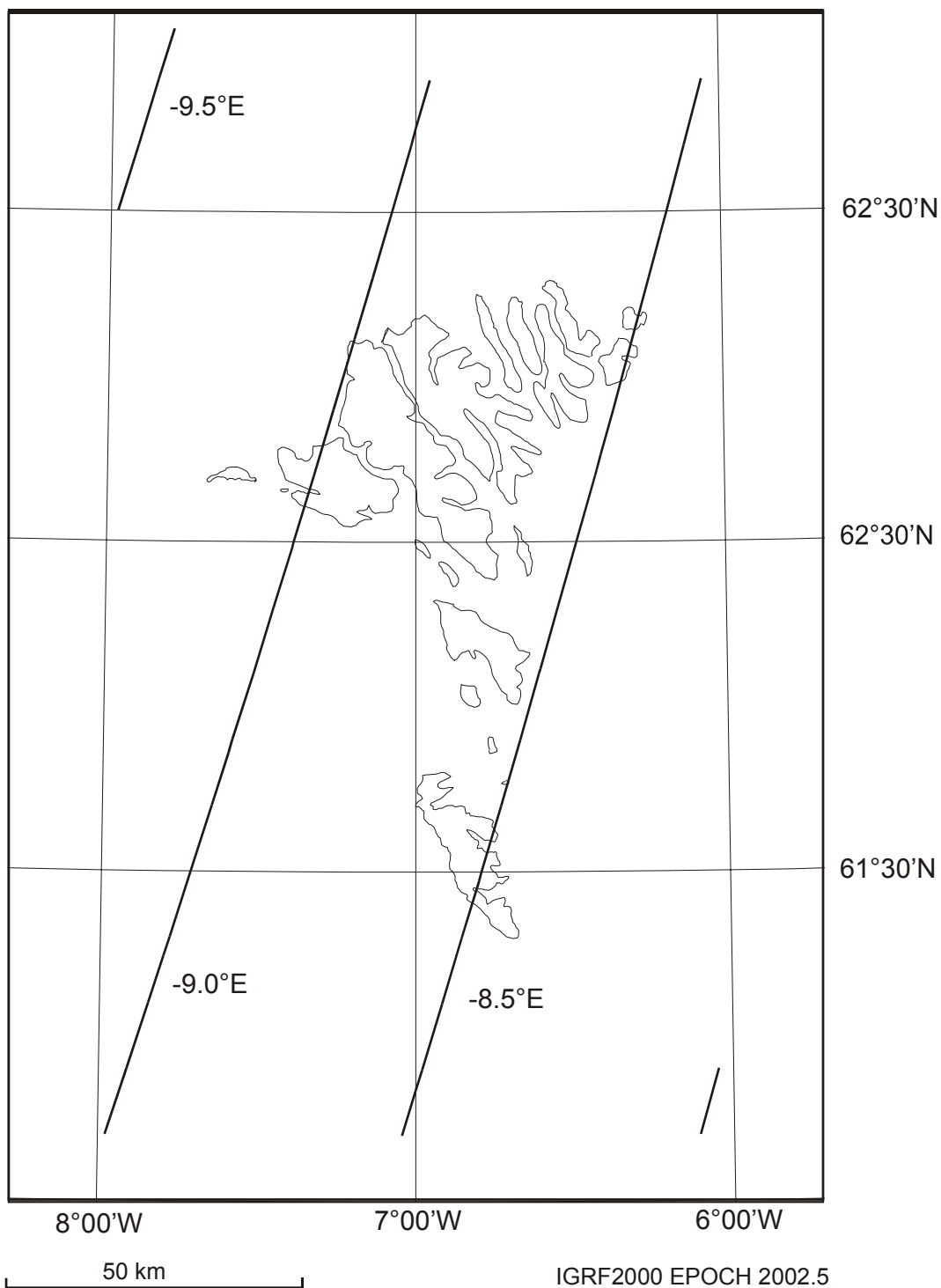
Denmark

Magnetic Declination 2002



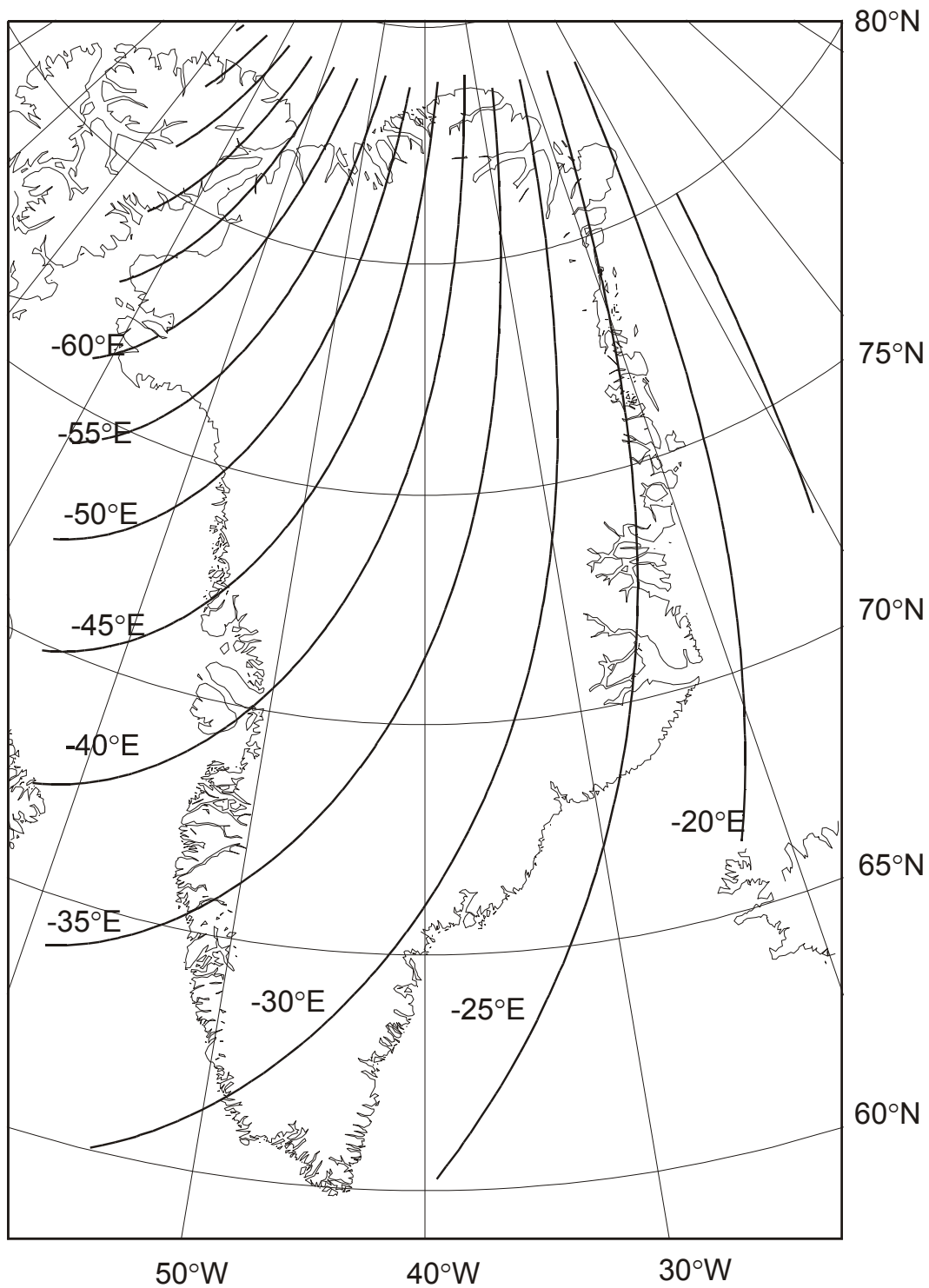
Faeroe Islands

Magnetic Declination 2002



Greenland

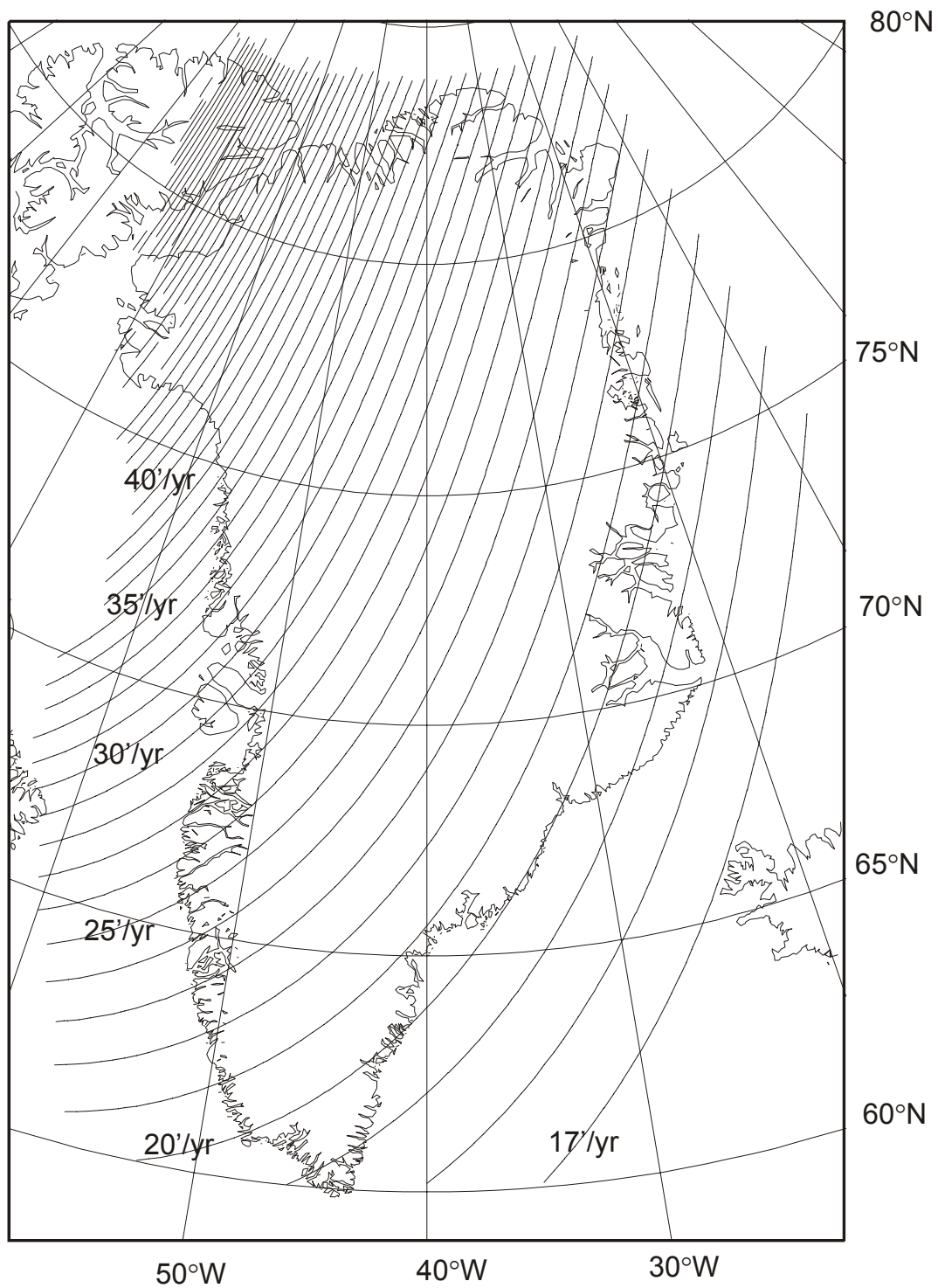
Magnetic Declination 2002



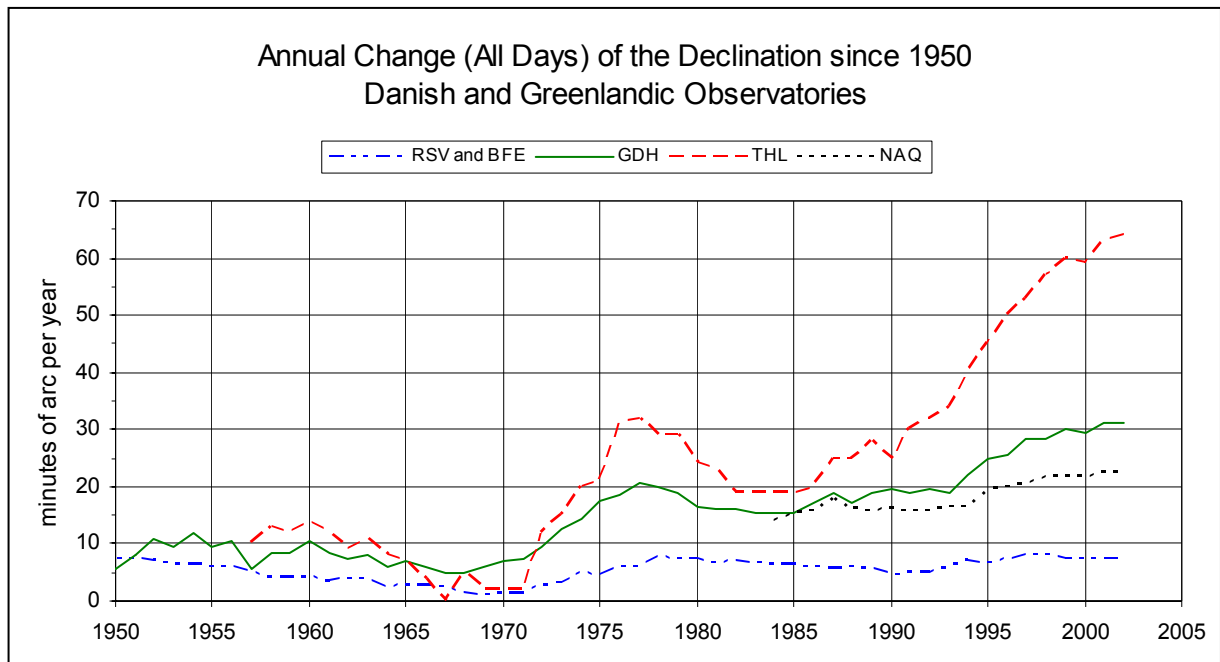
IGRF2000 Epoch 2002.5

Greenland

Annual Change in Magnetic Declination 2000-2005



IGRF2000



SECTION VII

Annual plots.

In this section the following plots are presented:

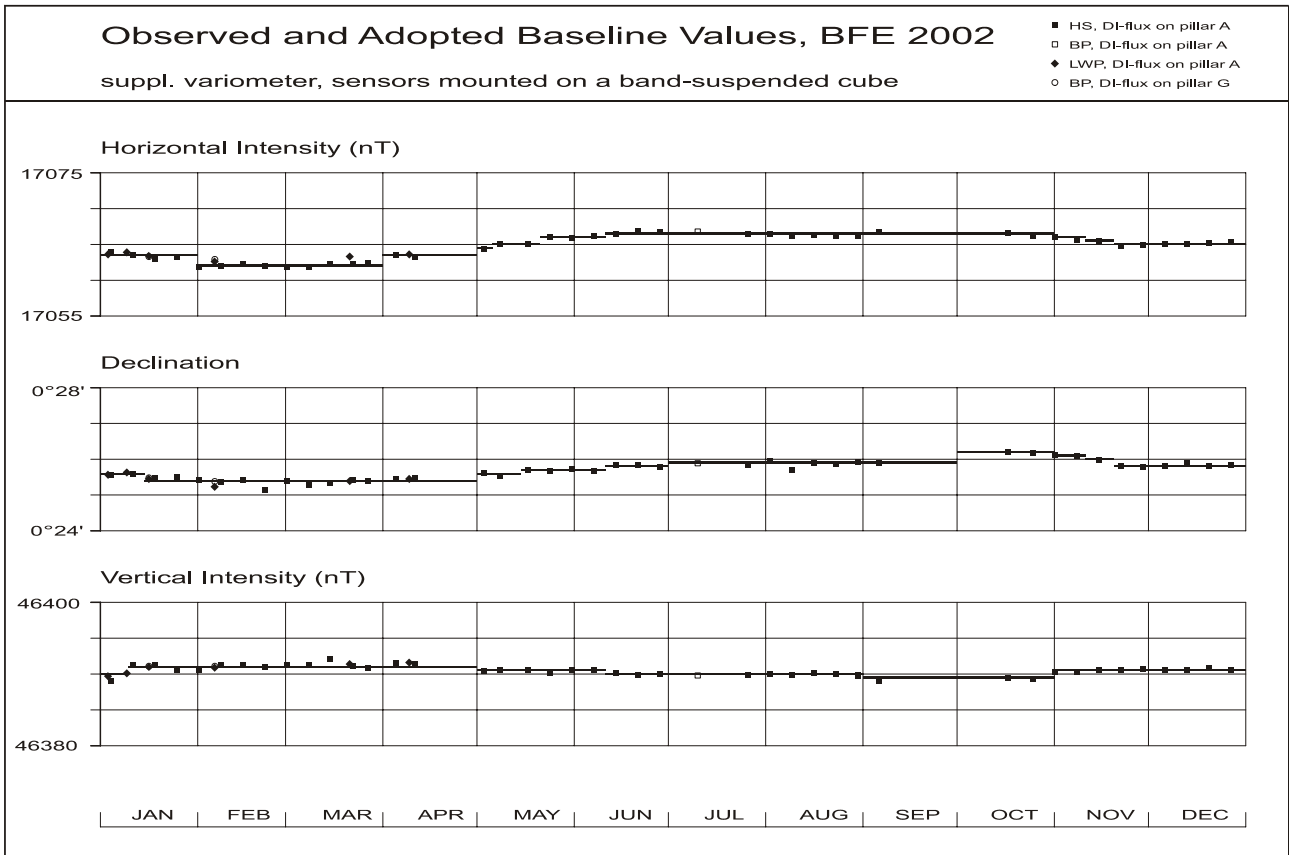
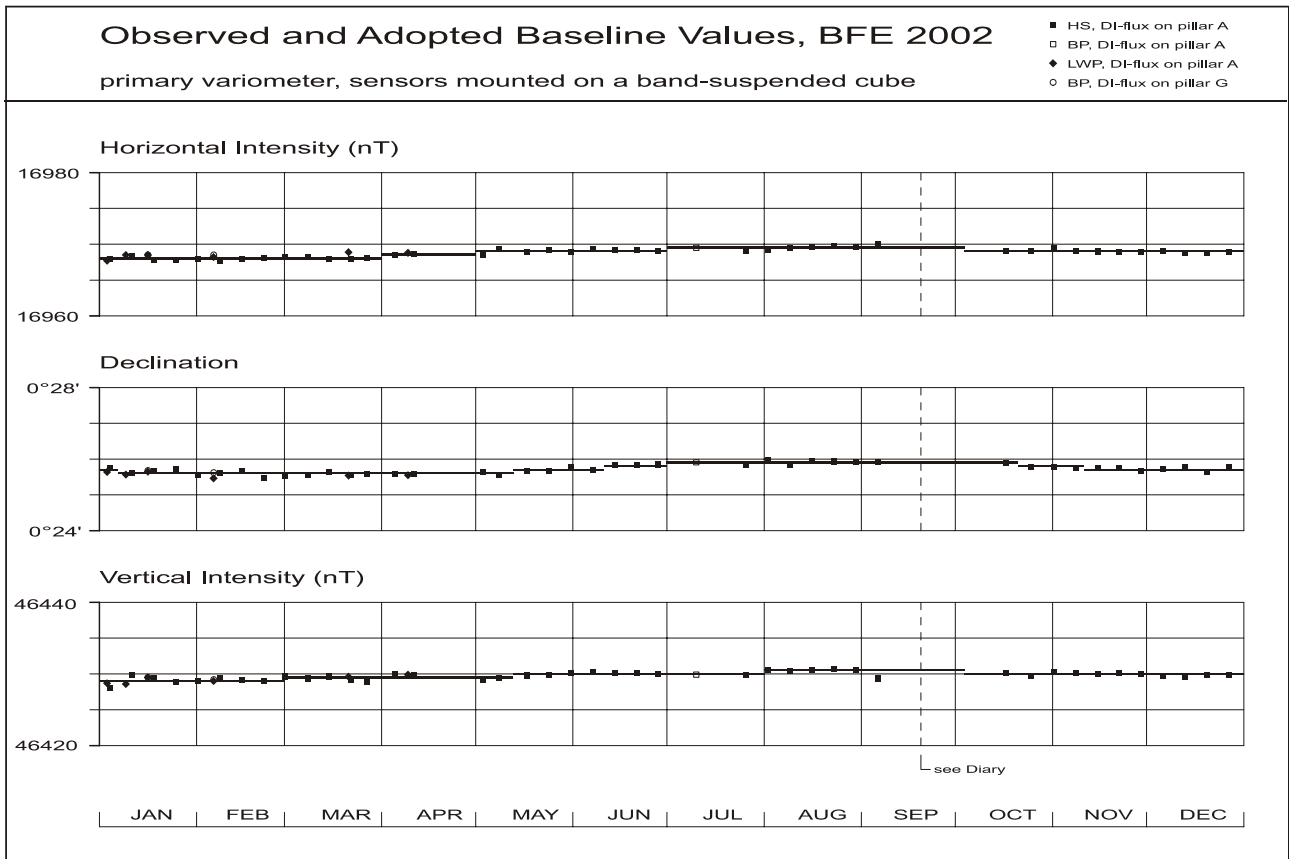
1. Plots of observed and adopted baseline values.
2. Plots of differences between observed and calculated absolute values D , H and Z .
3. Plots of hourly and daily mean values of X , Y and Z .

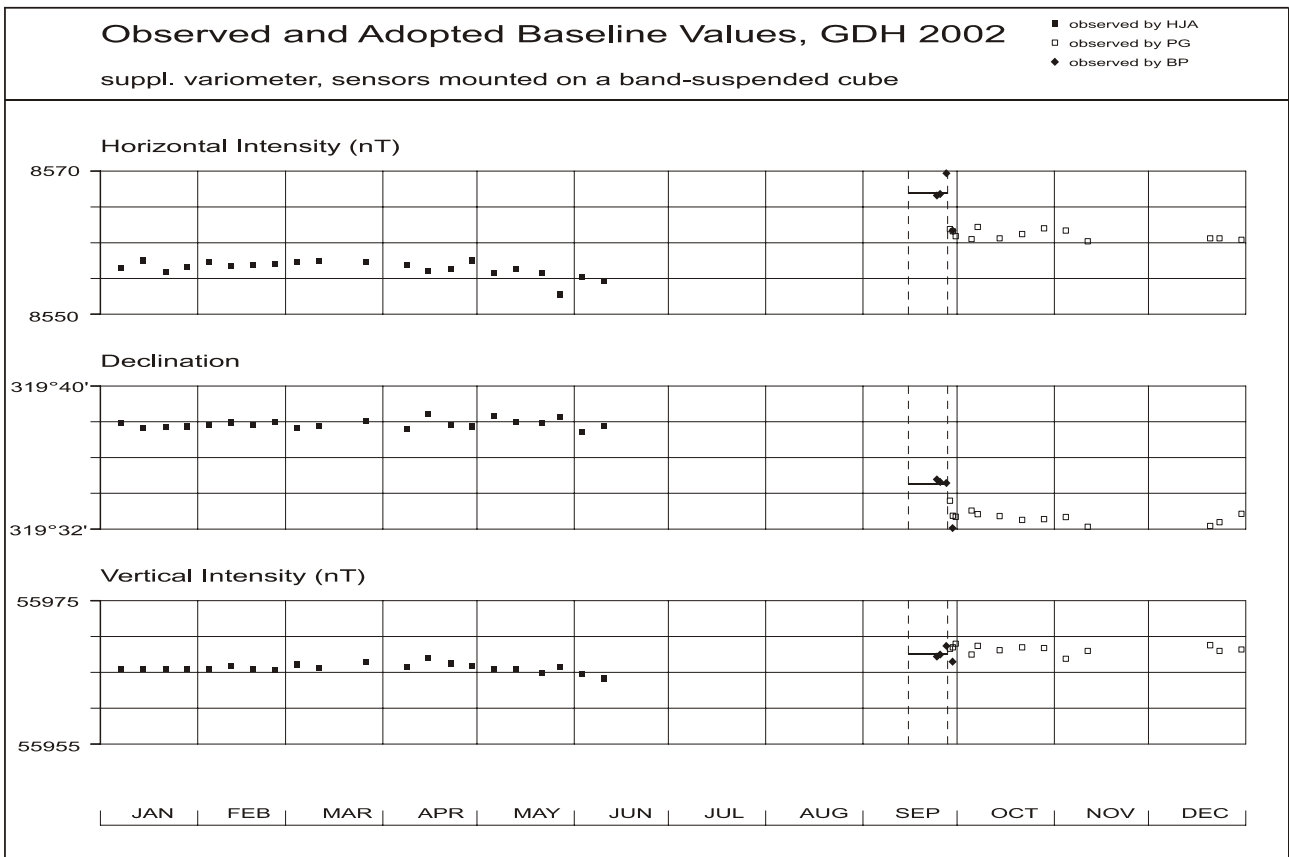
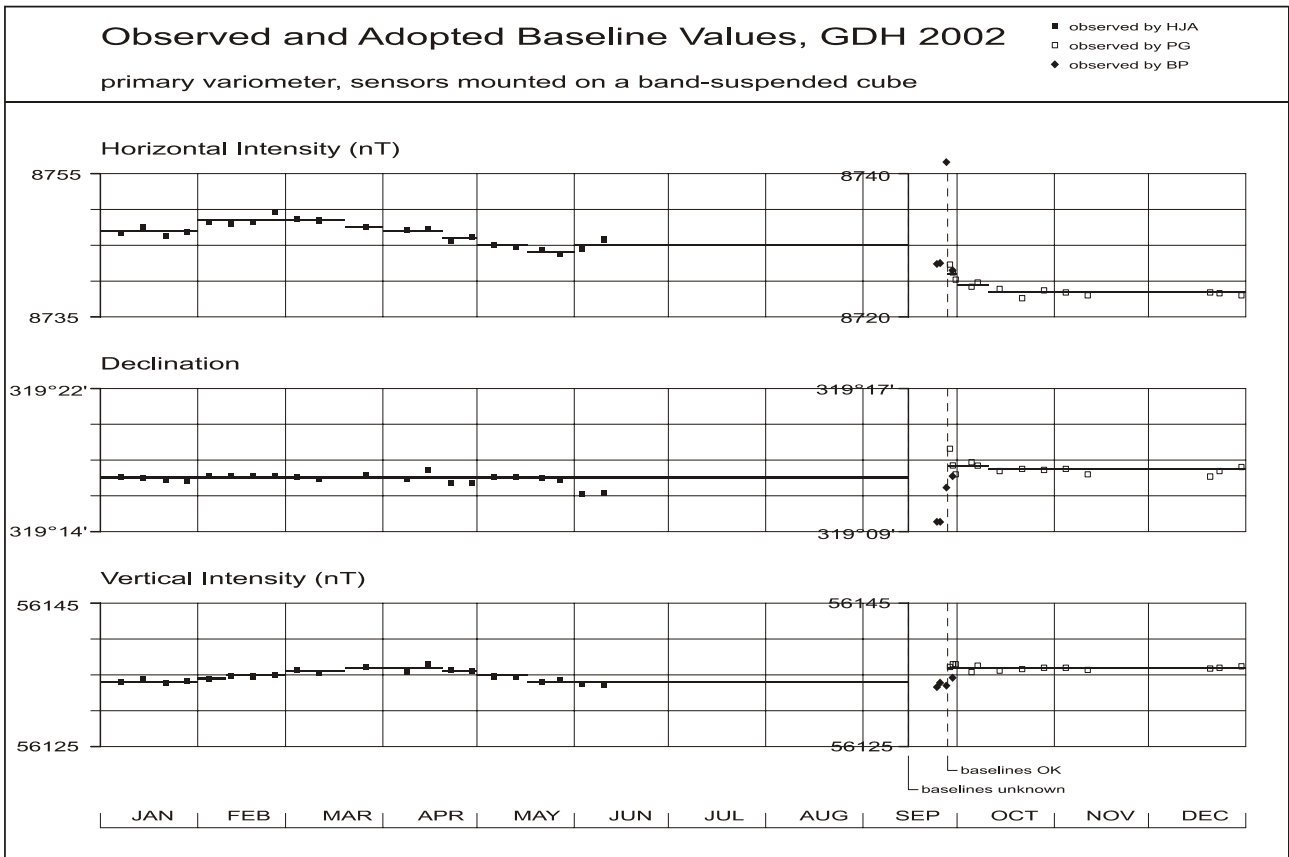
1. In the plots the observed baseline values are shown as dots, one dot representing the mean of all baseline measurements on one day. The solid lines which shift in steps are the final baseline values which are adopted by a graphical smoothing process, cf. Wienert (reference 5, page 176). Normally one value is adopted for at least the whole of one UT day except for known instrumental discontinuities. When adopting the final baseline values the absolute measurements immediately before the beginning and after the end of the year were used to ensure that unrealistic discontinuities are not introduced at the year boundaries. These measurements are not shown in the plots.

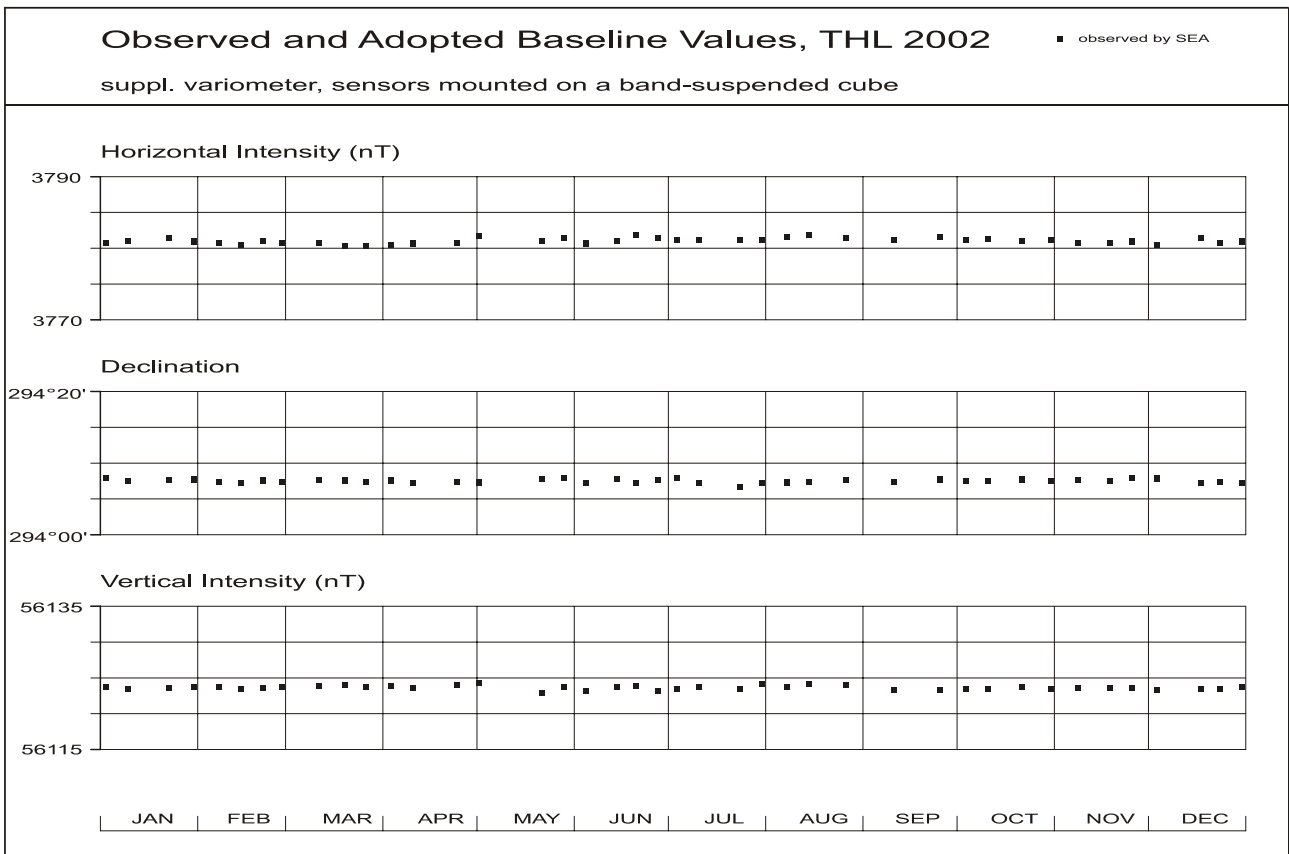
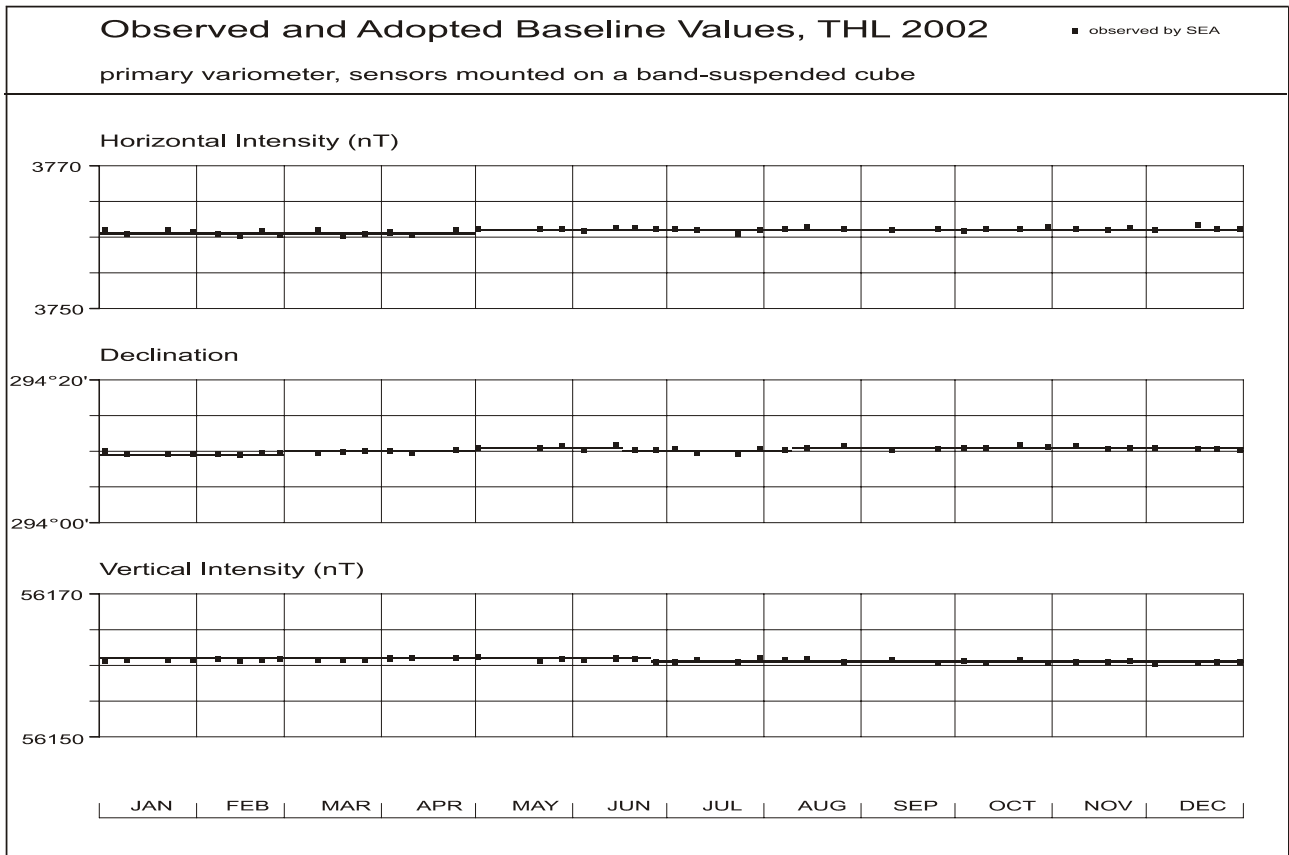
Tables of adopted baseline values are presented in section II-V.

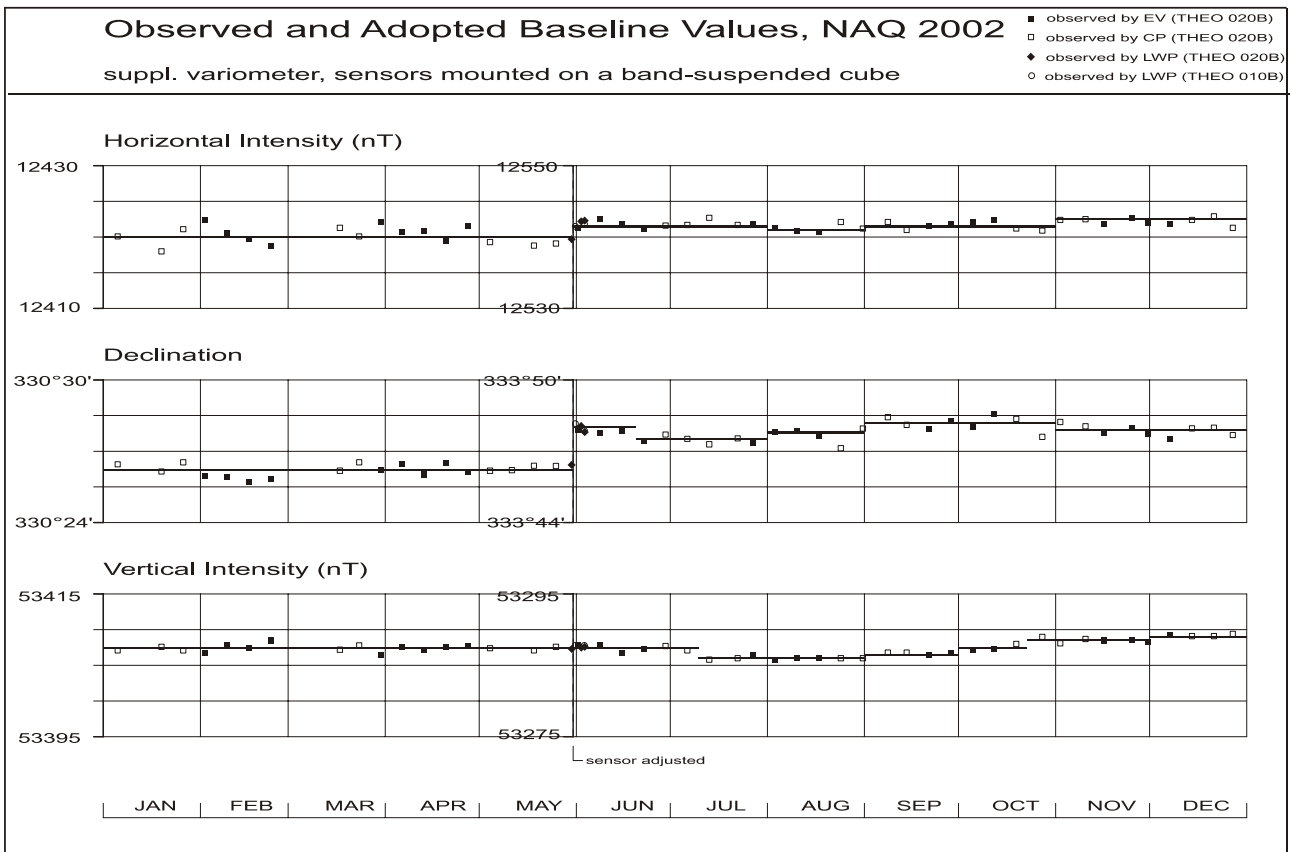
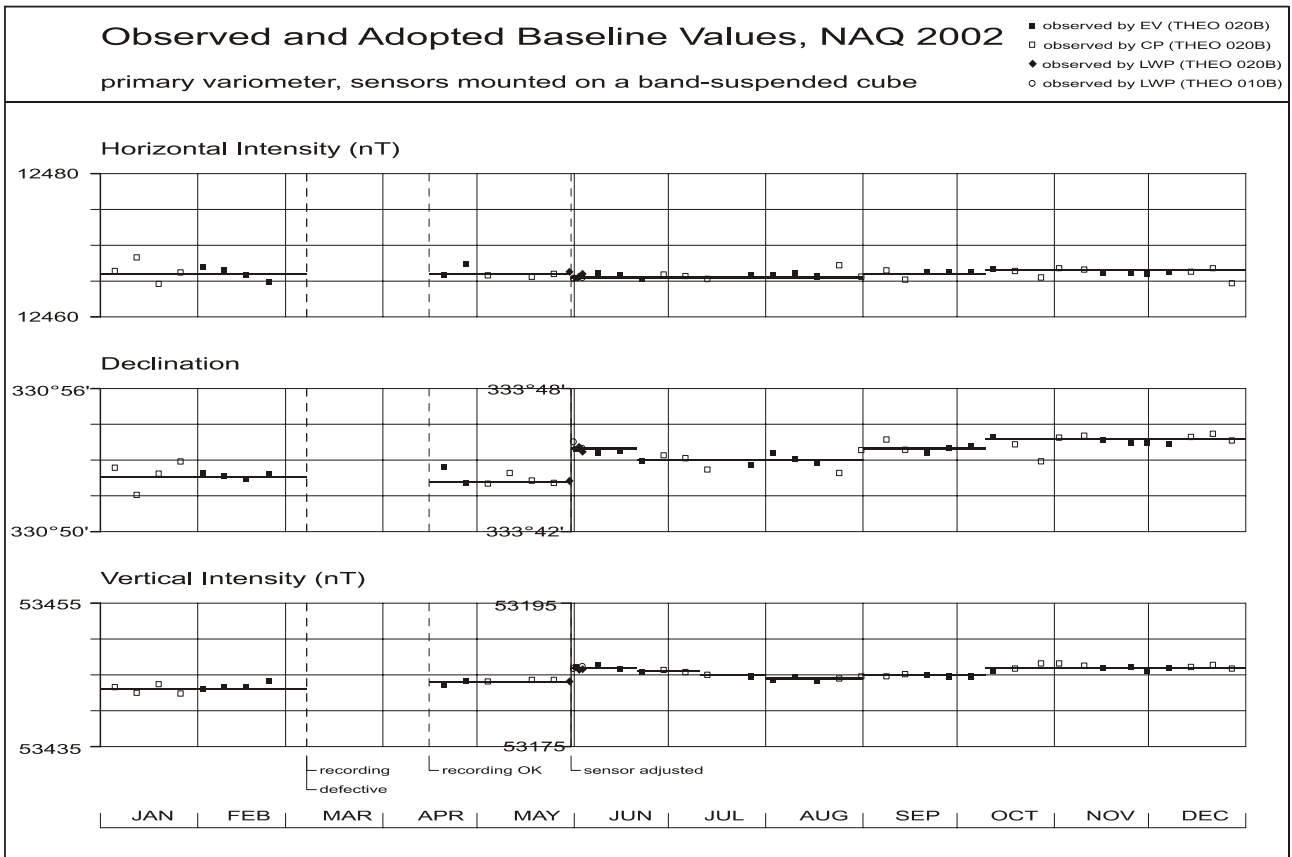
2. The plots of the differences between the observed and the calculated absolute values, converted to nT, shows the differences between the weekly absolute measurements of DHZ and the corresponding final 1-minute values calculated from variometer output and adopted baseline values.

3. The plots of hourly and daily mean values show a number of features of geomagnetic field variations, such as diurnal variation, seasonal changes in its magnitude, and periods of geomagnetic disturbance.



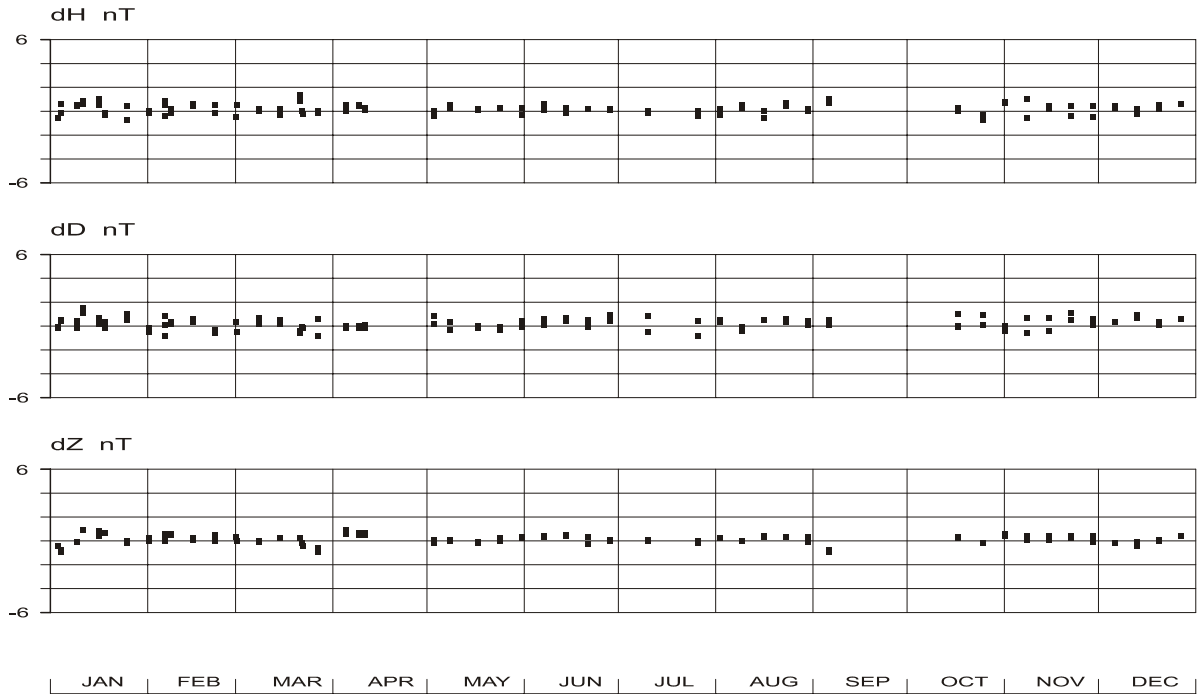






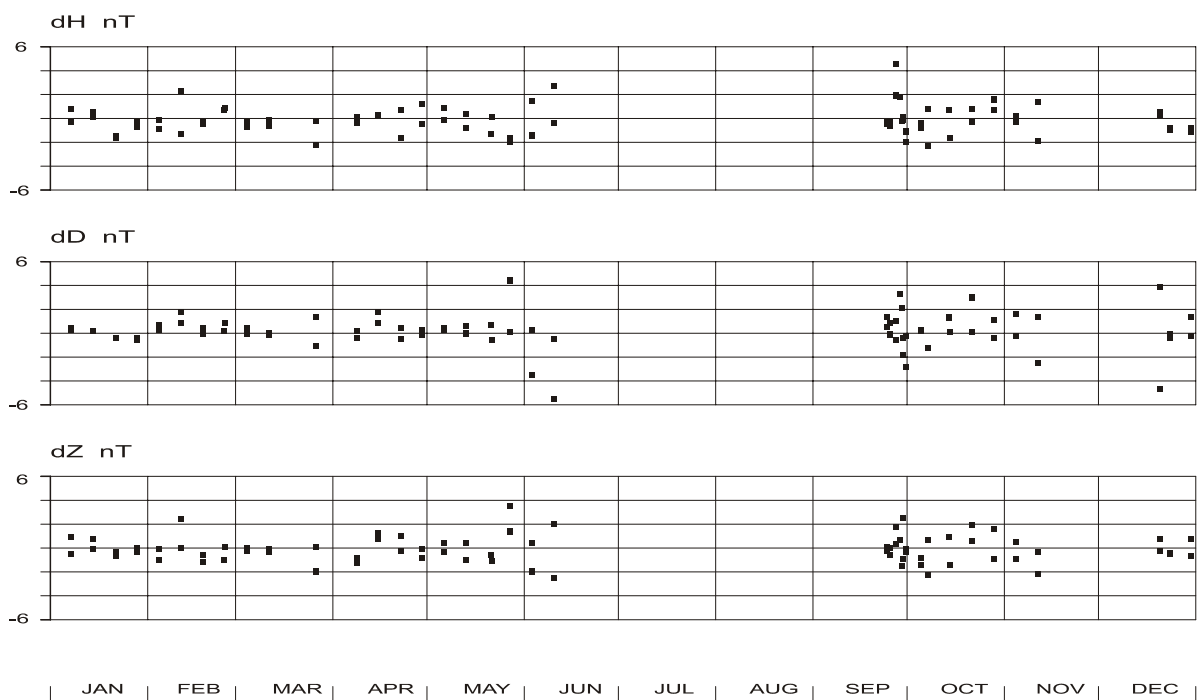
Differences between observed and calculated absolute values

BFE 2002



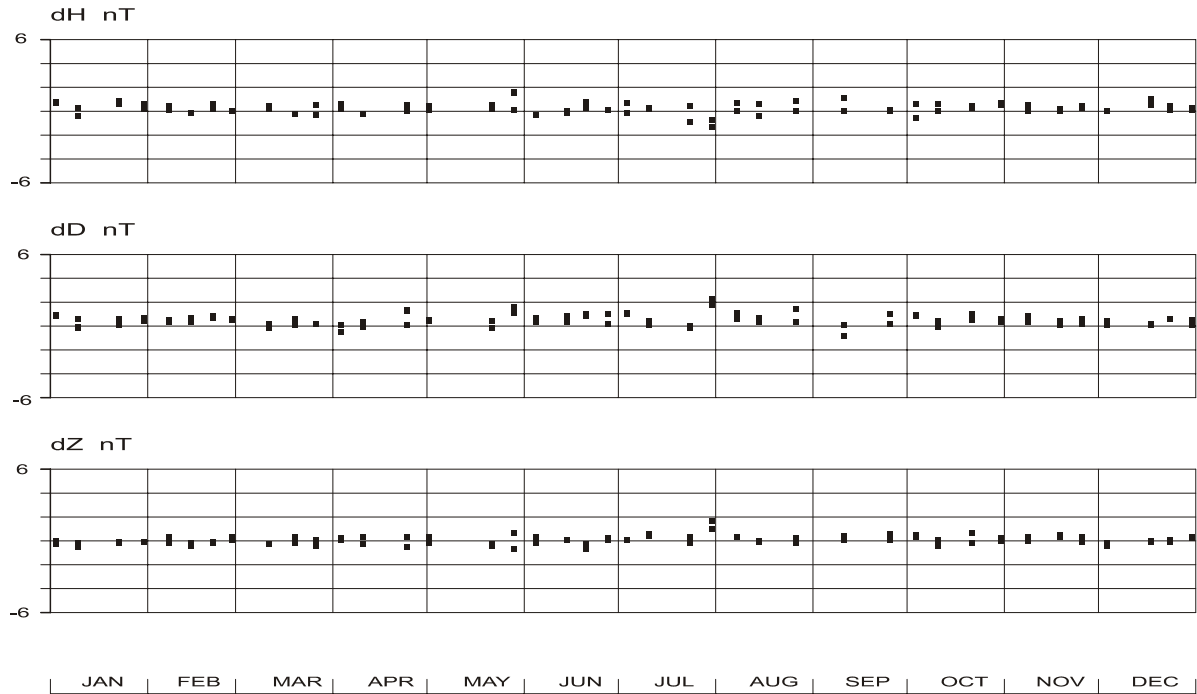
Differences between observed and calculated absolute values

GDH 2002



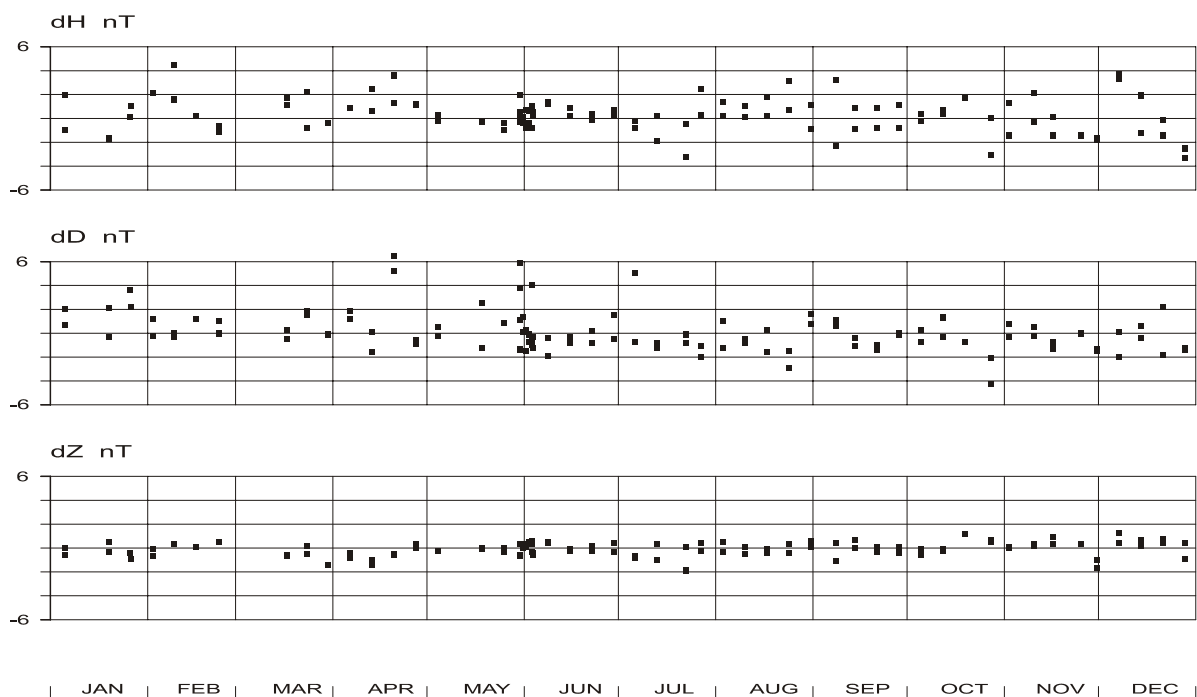
Differences between observed and calculated absolute values

THL 2002



Differences between observed and calculated absolute values

NAQ 2002

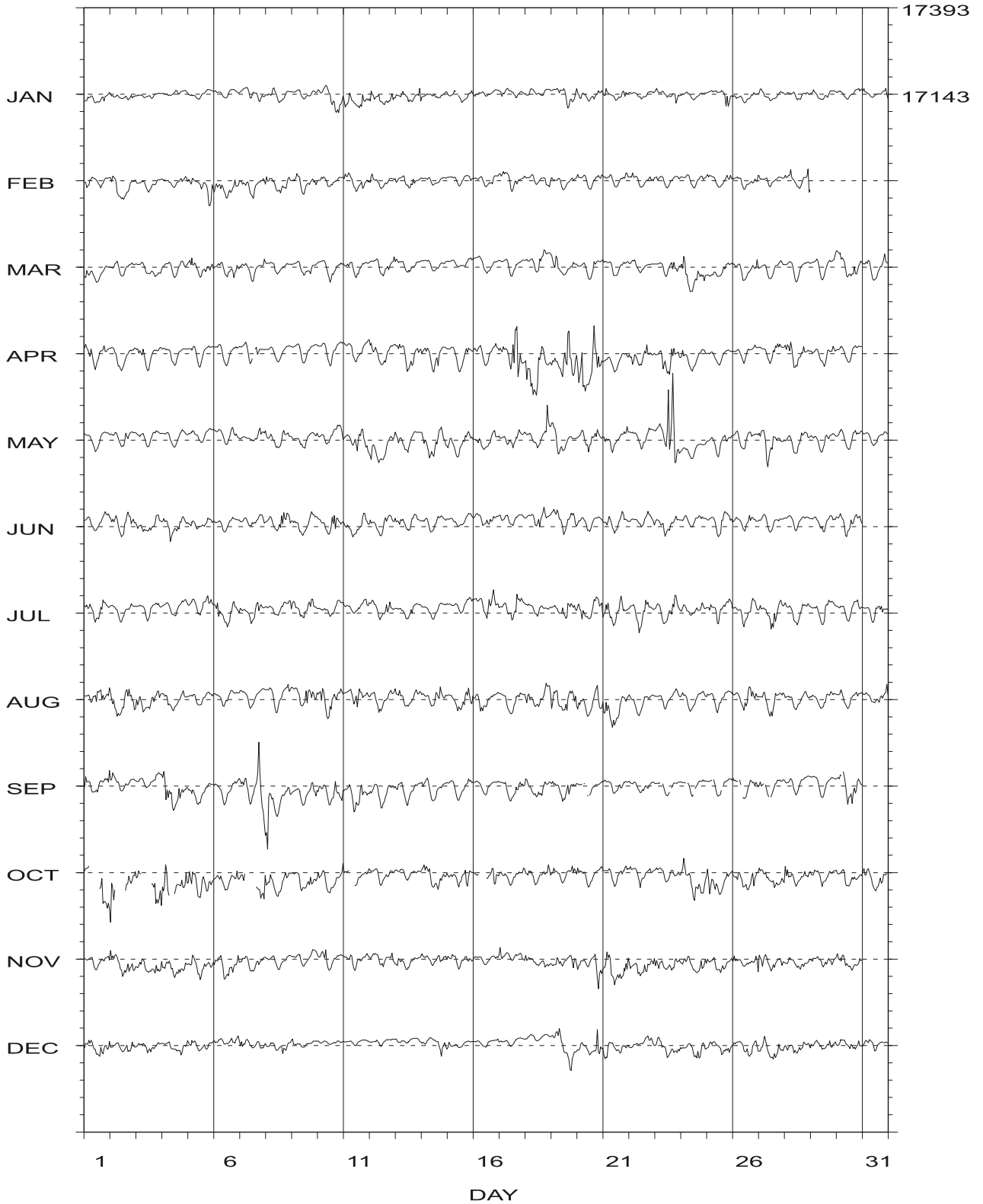


Hourly Mean Values

Horizontal Component X (nT)

BFE

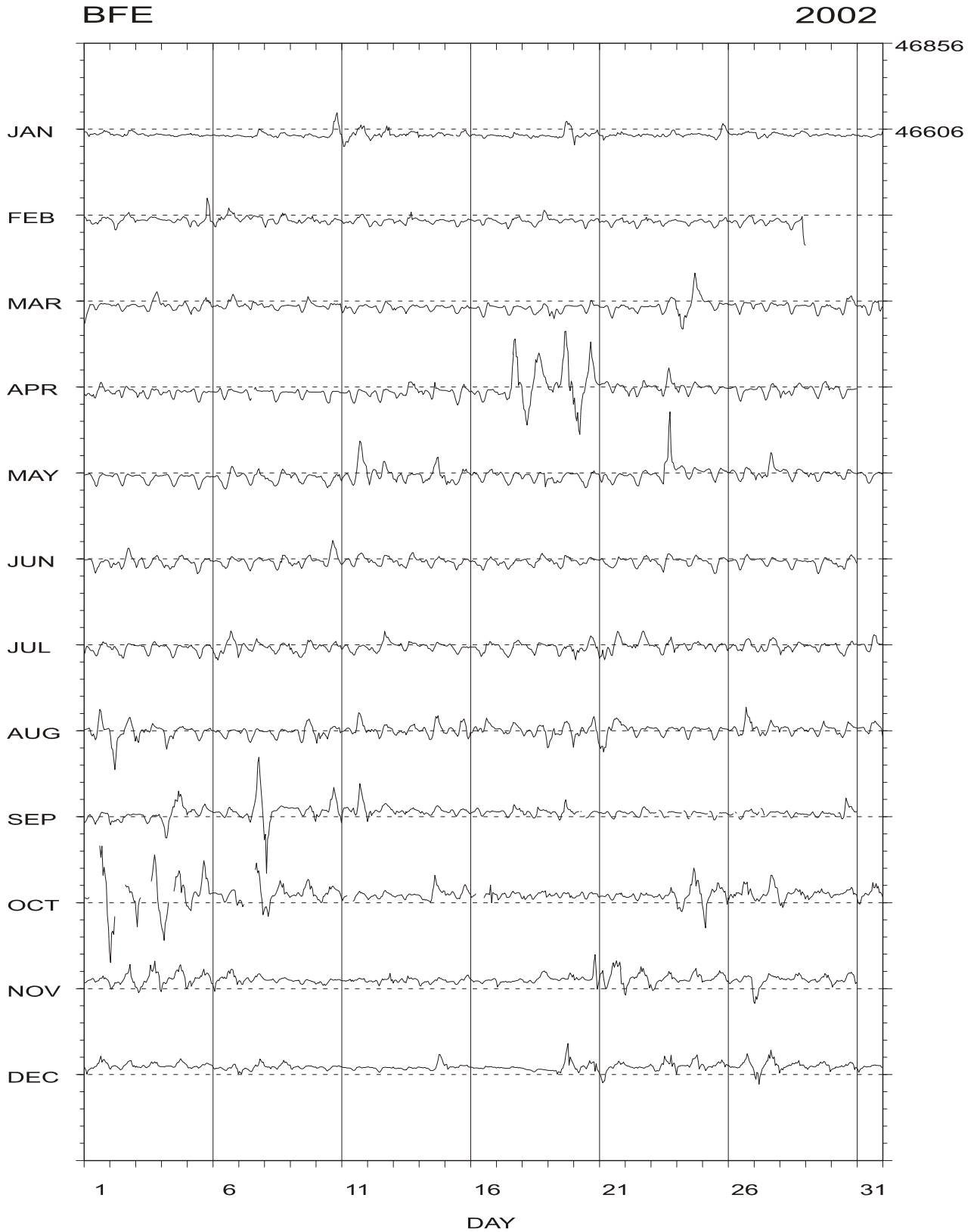
2002



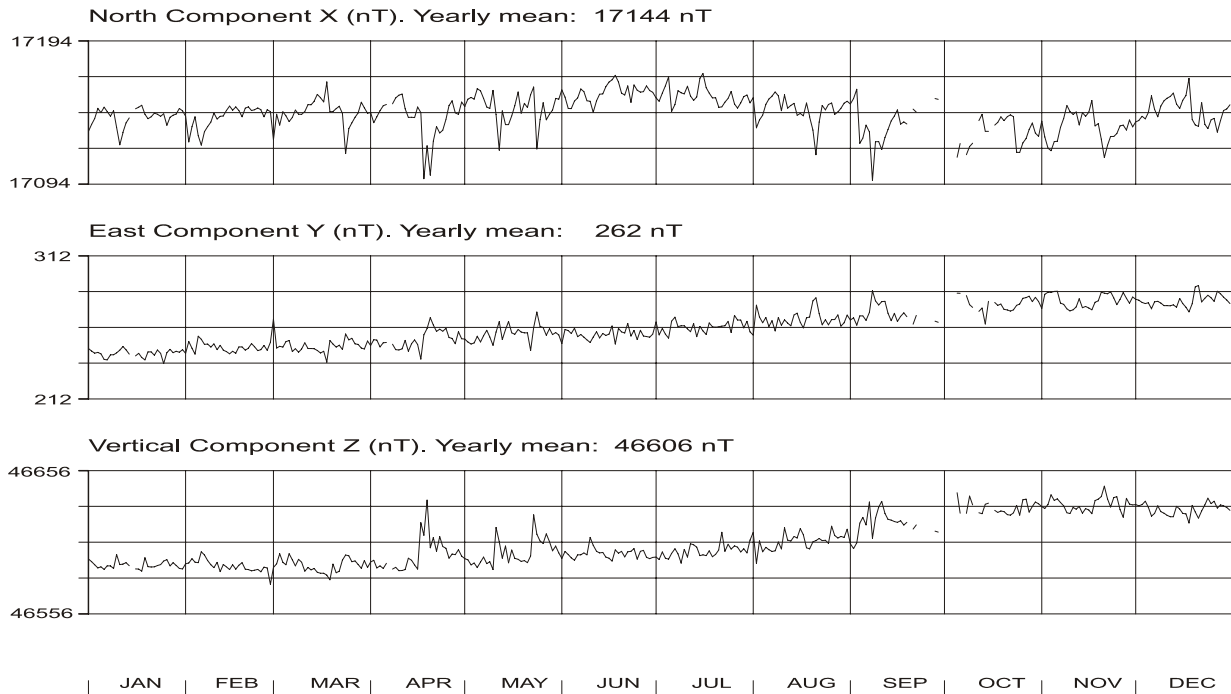
Hourly Mean Values Horizontal Component Y (nT)

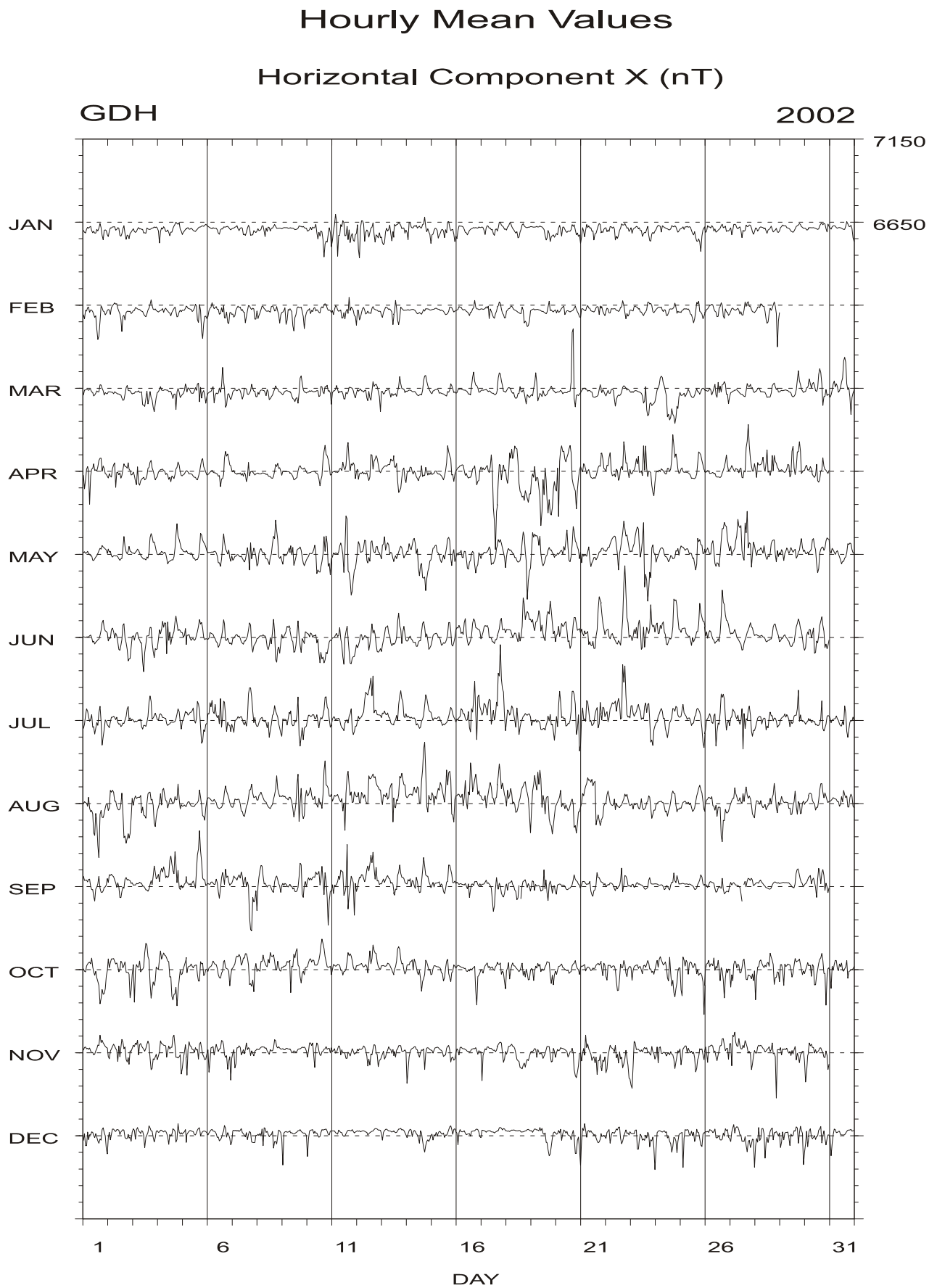


Hourly Mean Values Vertical Component Z (nT)



Daily Mean Values BFE 2002



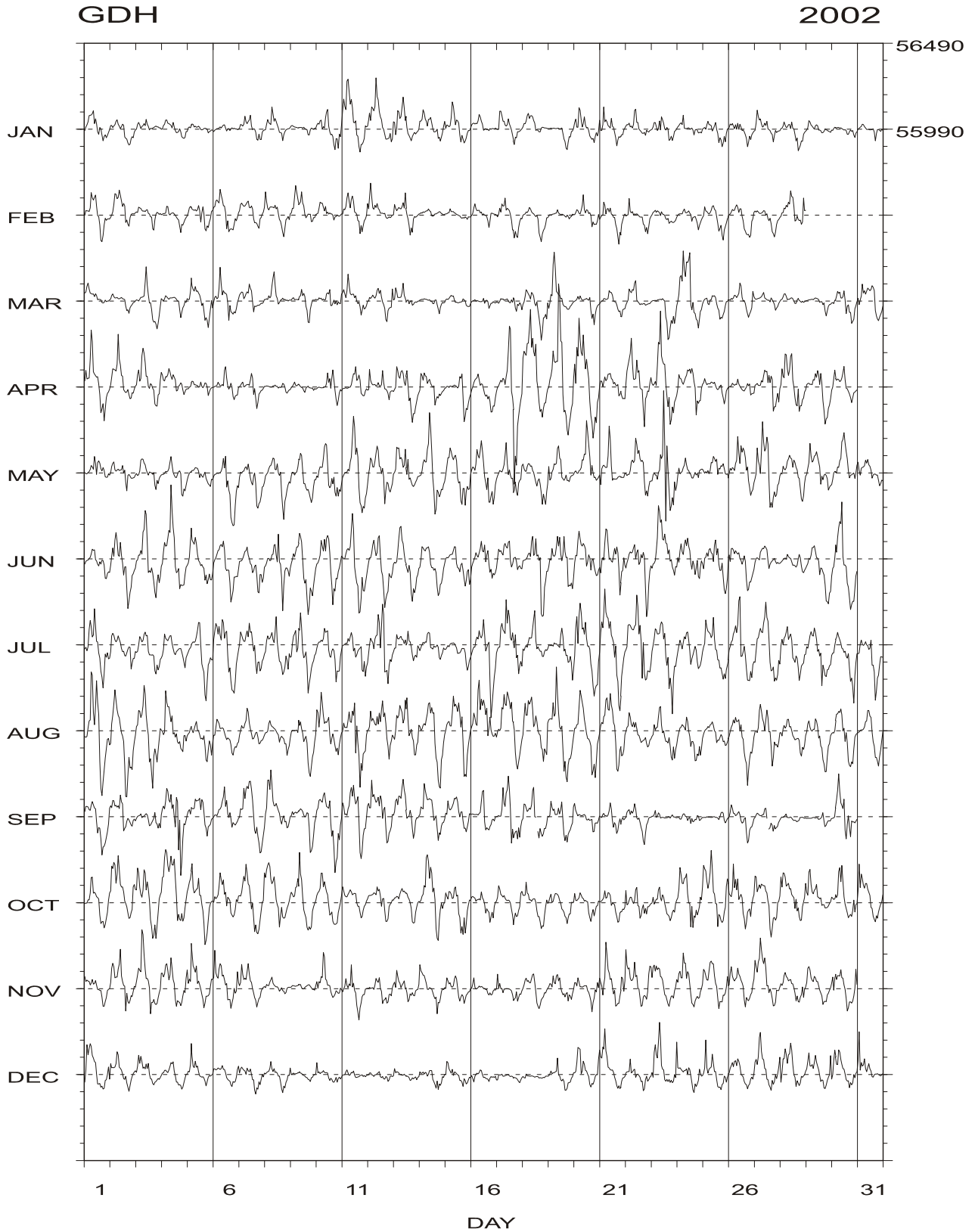


Hourly Mean Values

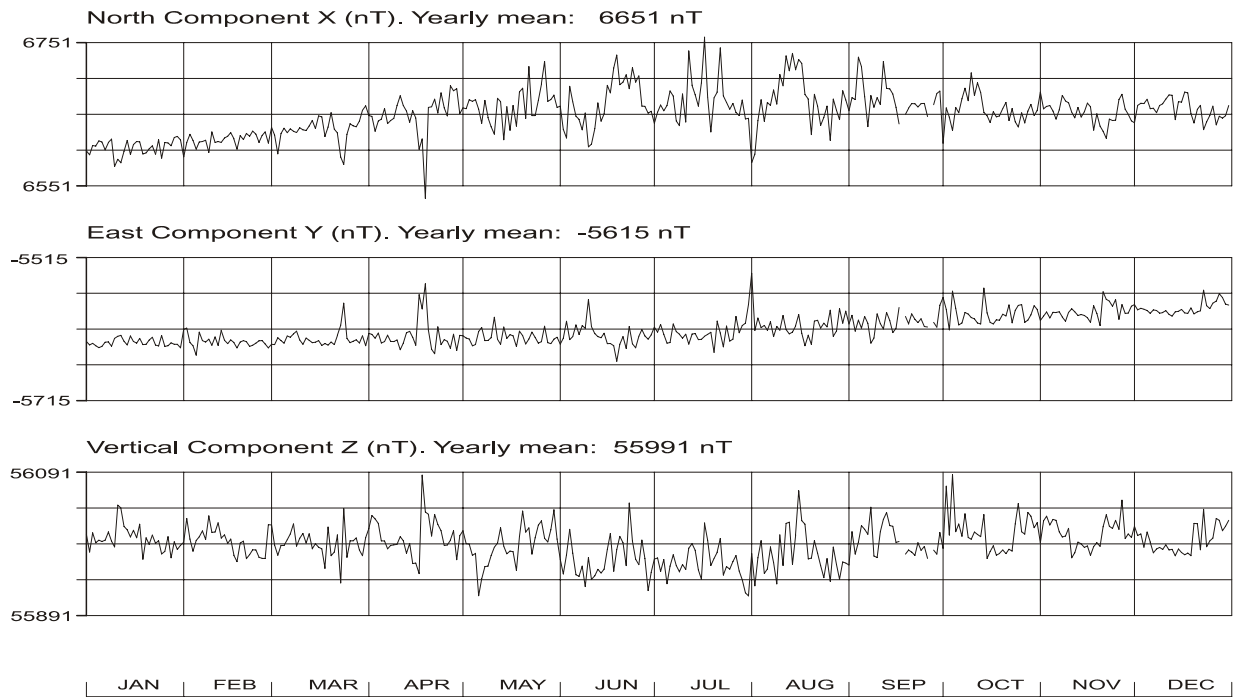
Horizontal Component Y (nT)



Hourly Mean Values Vertical Component Z (nT)

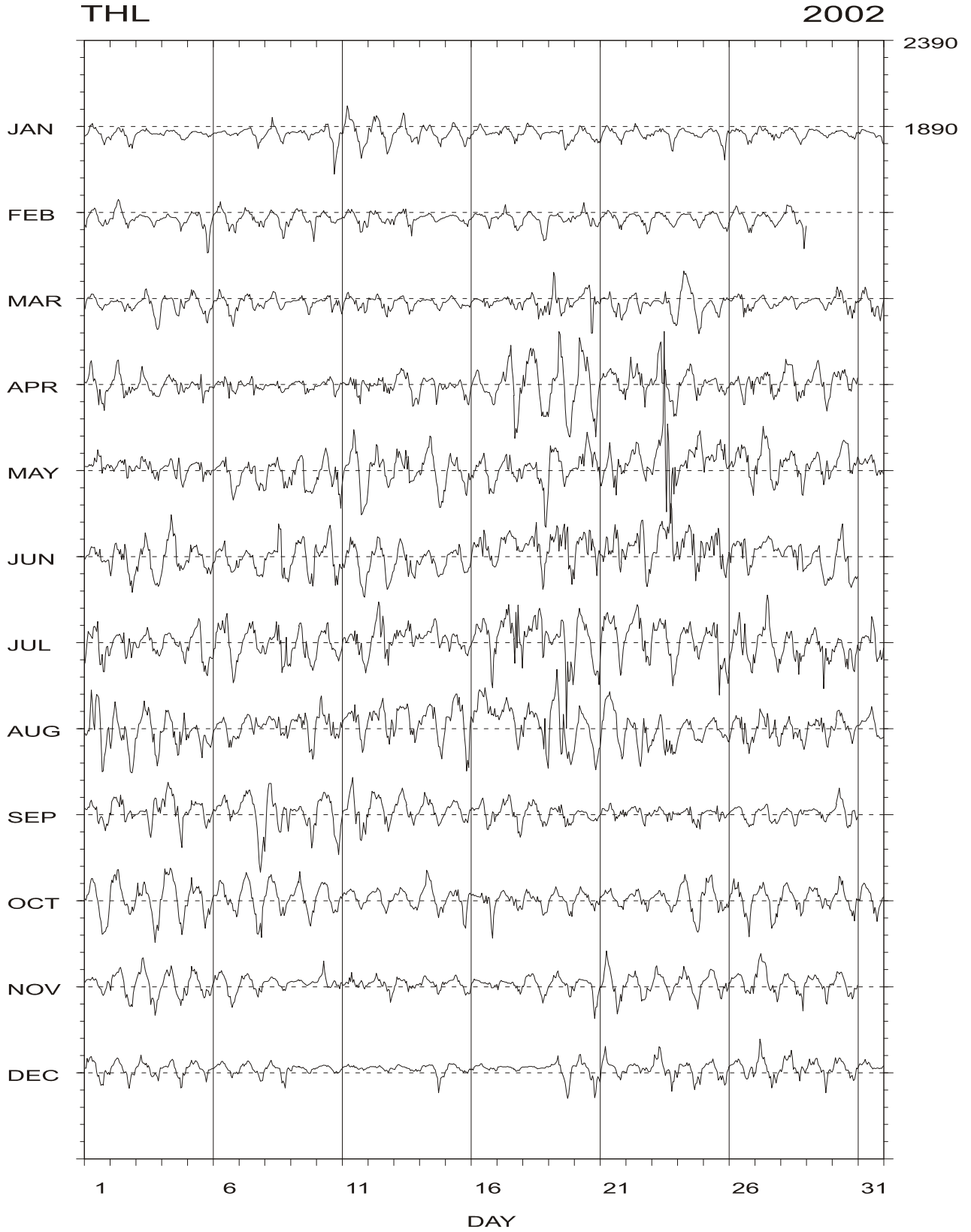


Daily Mean Values GDH 2002



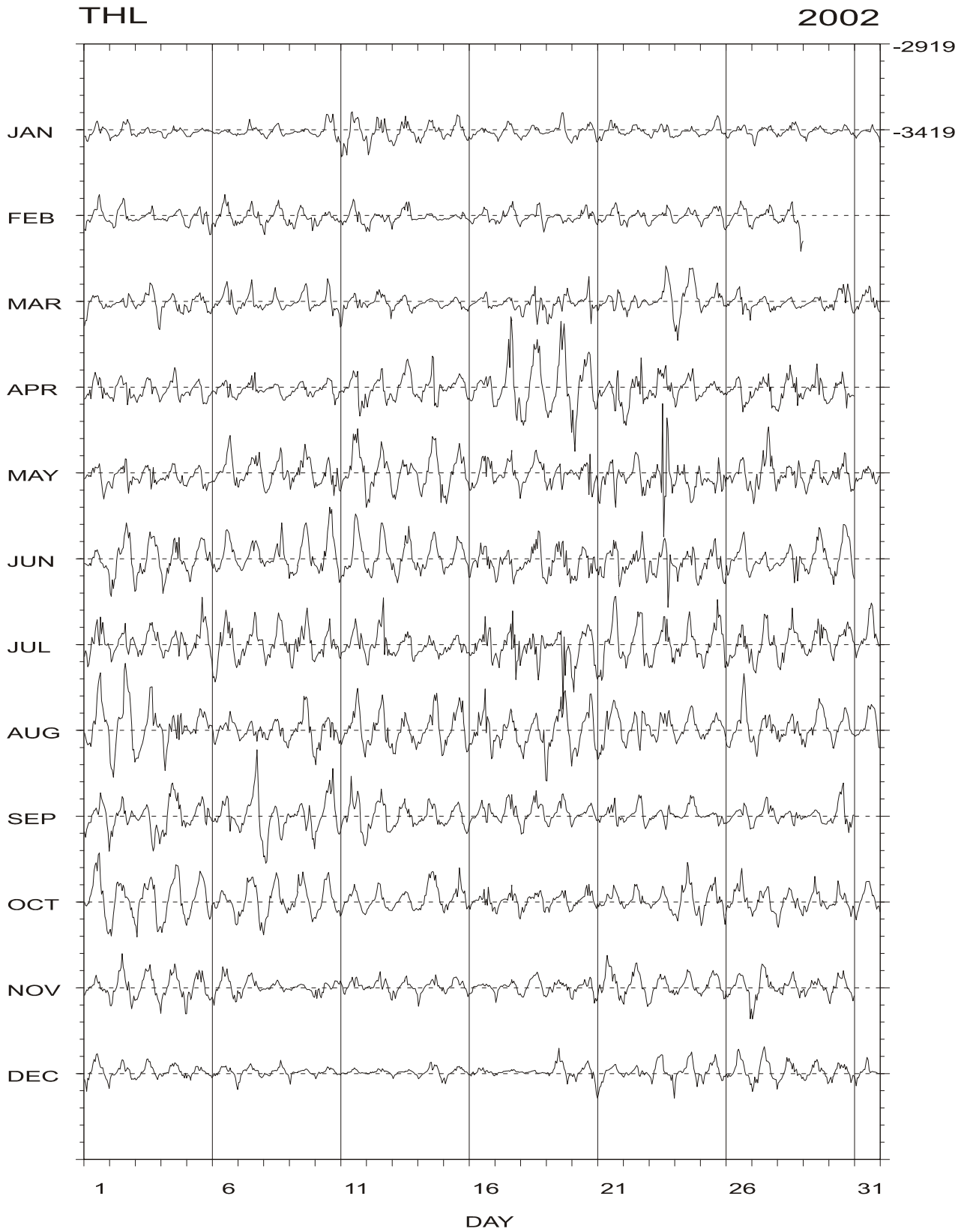
Hourly Mean Values

Horizontal Component X (nT)



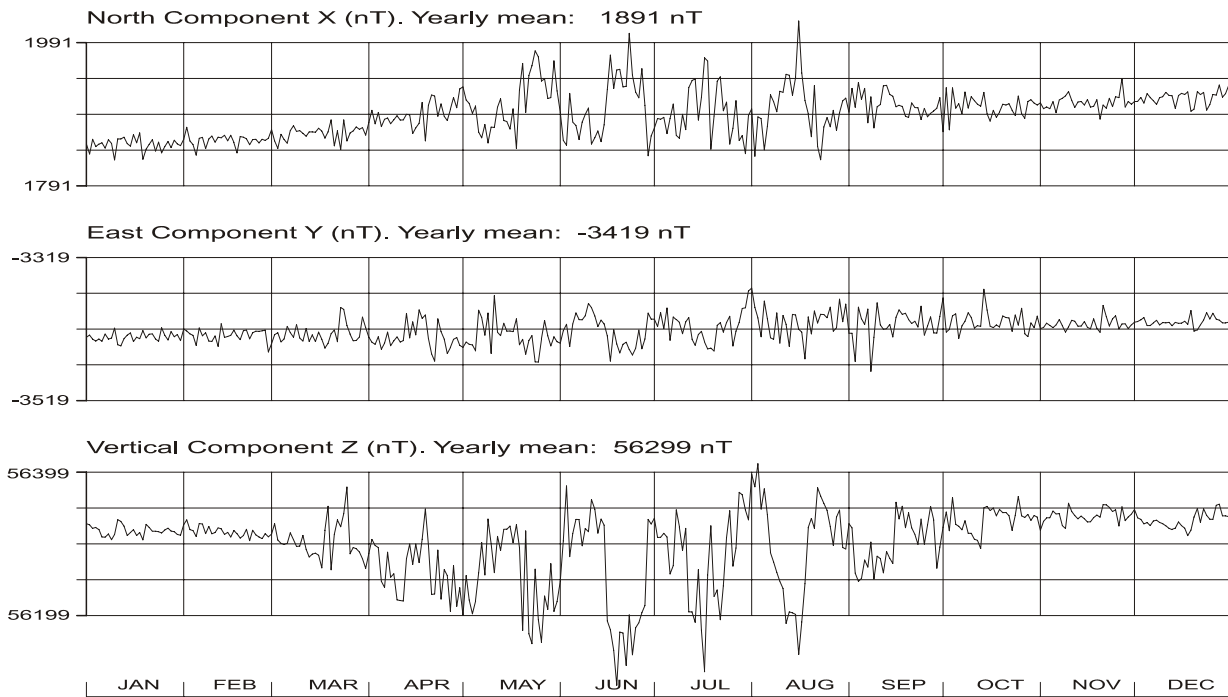
Hourly Mean Values

Horizontal Component Y (nT)



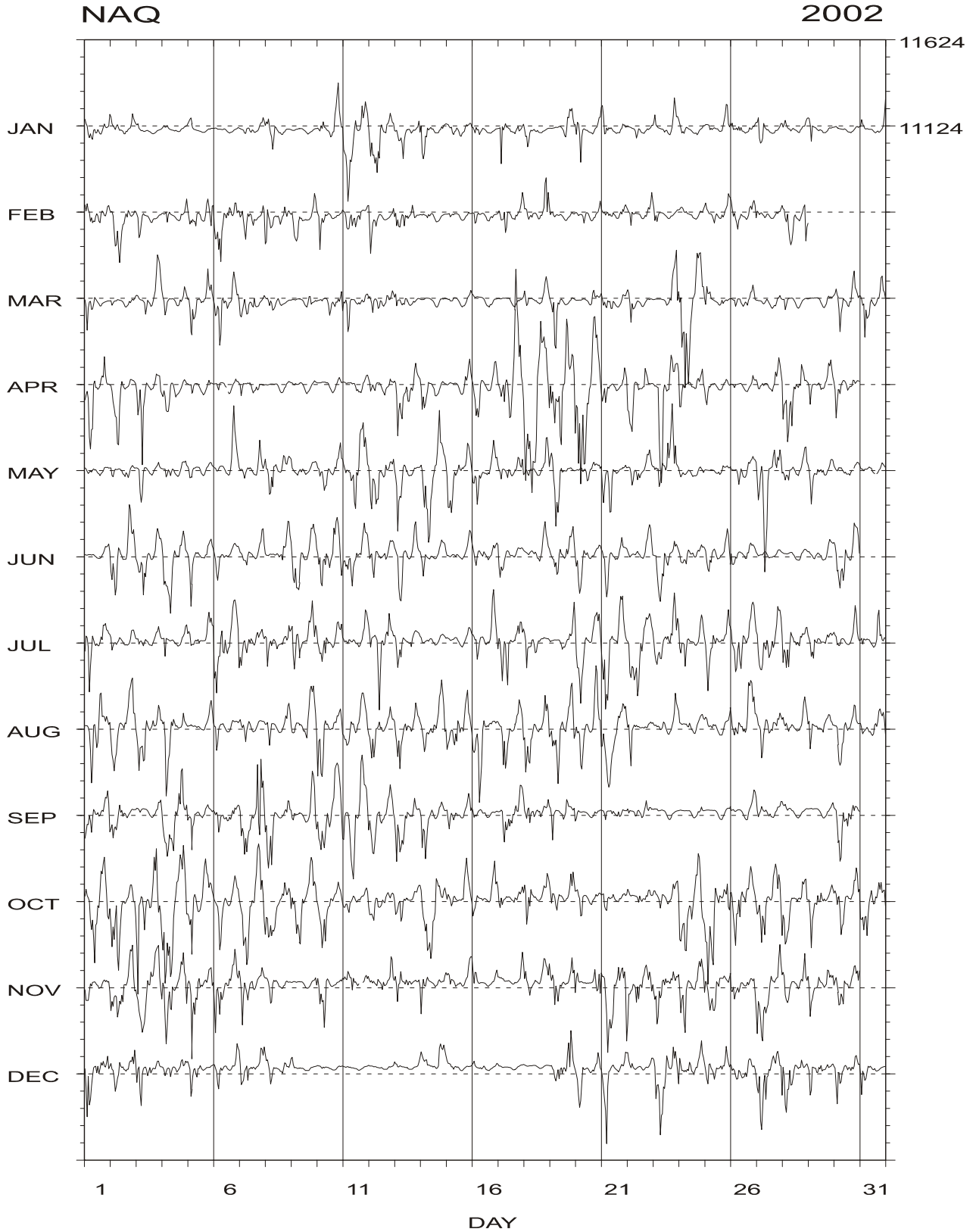


Daily Mean Values THL 2002



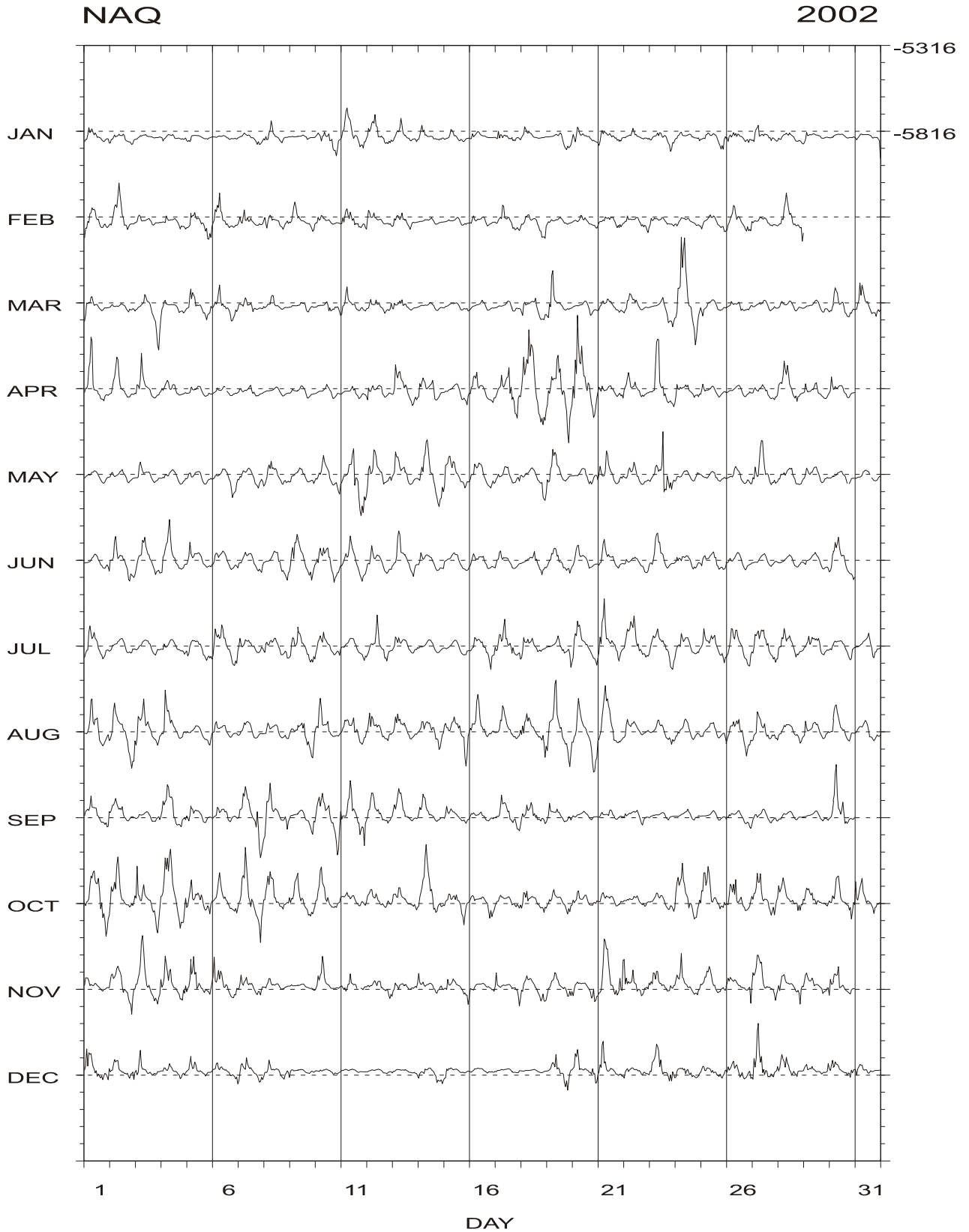
Hourly Mean Values

Horizontal Component X (nT)

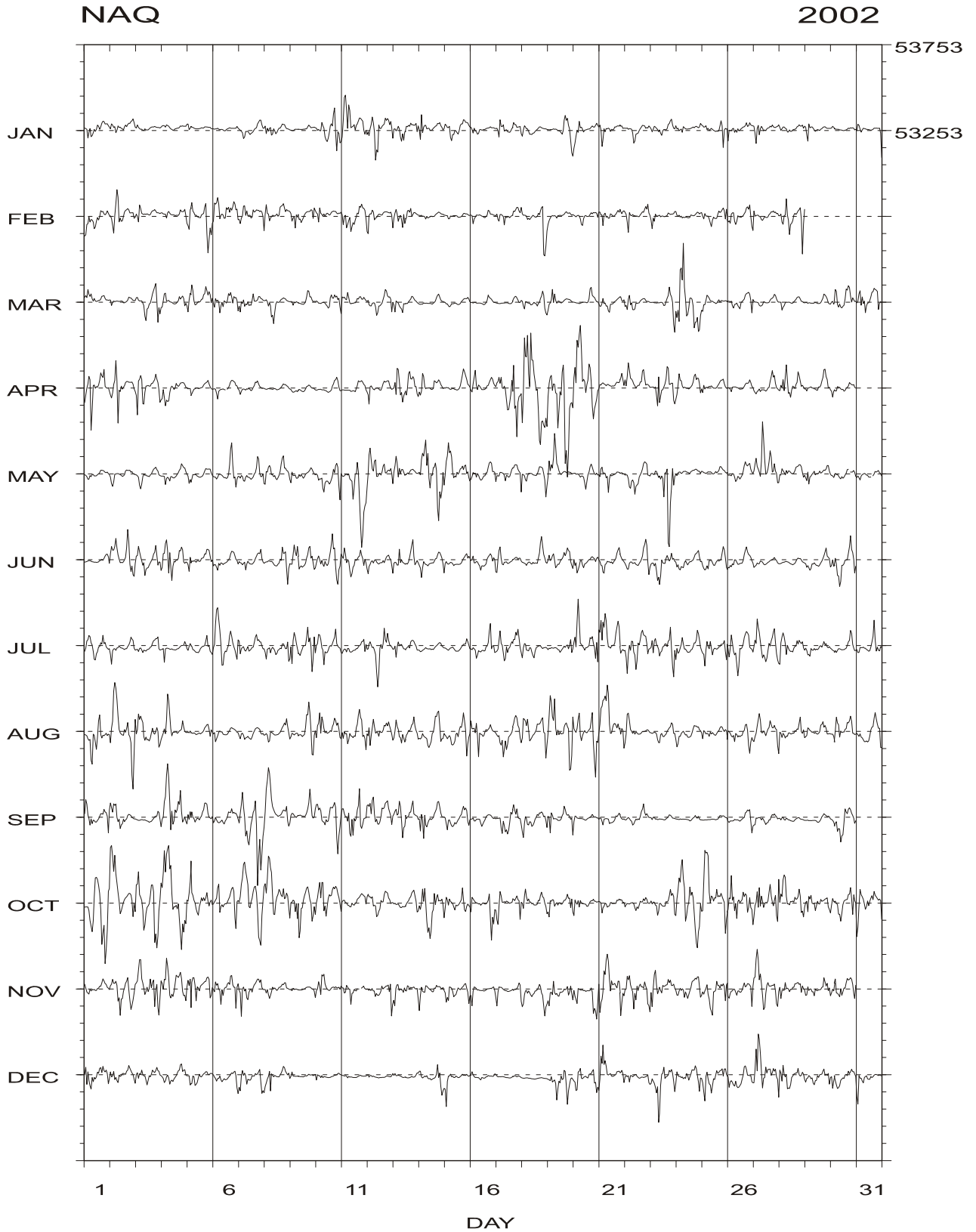


Hourly Mean Values

Horizontal Component Y (nT)



Hourly Mean Values Vertical Component Z (nT)



Daily Mean Values NAQ 2002

