



BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE

**Geomagnetic Results Wingst 1996, 1997,
1998 and 1999 including the
complete Wingst data set since 1939 on
CDrom**

Berichte des
Bundesamtes für Seeschifffahrt und Hydrographie

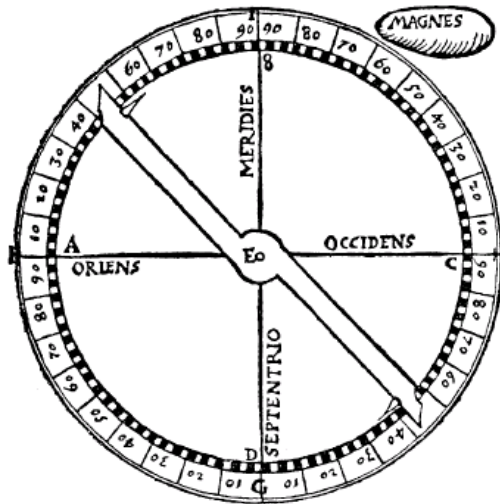
Nr. 34

Geomagnetic Results Wingst

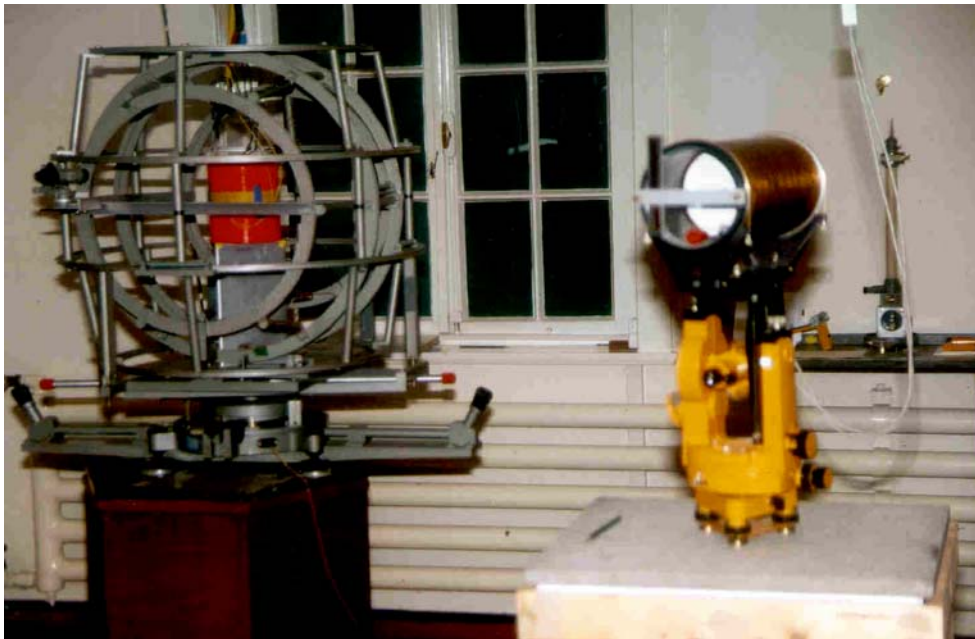
1996 1997 1998 1999

including the complete Wingst data set since 1939 on CDrom

Autor: Günter Schulz



Compass after Pierre de Maricourt, 1269 (SCHÜCK,1911)



Modern instrumentation at Wingst Geomagnetic Observatory (absolute house)

In Memoriam



Jens Traeger
(1959 – 1999)

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CDrom
CDrom

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CDrom

Preface

The present edition of the report series „Berichte des Bundesamtes für Seeschifffahrt und Hydrographie (BSH)" contains the geomagnetic data for the period from 1996 to 1999 presented by Erdmagnetisches Observatorium Wingst (Wingst Geomagnetic Observatory, WNG). Since the end of this reporting period, Wingst Observatory has been under the supervisory control of GeoForschungsZentrum Potsdam (GFZ). Thus, after more than six decades, the precise observation and complete recording of the Earth's geomagnetic field has ceased to be a task performed by a maritime institution:

- from 1938: Deutsche Seewarte (Maritime Observatory)
- from 1945: Deutsches Hydrographisches Institut (German Hydrographic Institute)
- from 1990 to 1999: Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency)

After GFZ has assumed responsibility for Wingst Observatory, the focus there is no longer on maritime issues. Nevertheless, BSH will fall back on Wingst data also in future; it will support the geomagnetic service by providing financial funding and contributing personnel.

A CDrom containing not only the data of the above reporting period but also a revised digital set of all data that have been published since the establishment of Wingst Observatory is included with the present report.

Dr. P. Ehlers
President and Professor

1 Introduction

This report contains the results of Erdmagnetisches Observatorium Wingst for 1996, 1997, 1998, and 1999 (year books No 42, 43, 44 and 45).

In the years under review, Bundesamt für Seeschifffahrt und Hydrographie additionally published on a monthly basis:

- a) Reports on geomagnetic indices and special geomagnetic events.
- b) Reports on preliminary daily and monthly means.

Preliminary monthly and annual mean values were prepublished in Deutsche Hydrographische Zeitschrift/ German Journal of Hydrography (SCHULZ, 1996; 1998b; 1999).

Geomagnetic data have been provided on a regular basis to the following institutions:

- a) International Ursigram and World Days Service (IUWDS), followed by the International Space Environment Service (ISES) in 1997: Geomagnetic indices and geomagnetic events (daily)
- b) International Service of Geomagnetic Indices (ISGI): Geomagnetic indices and special geomagnetic events (monthly and annually)
- c) World Data Centers for Geomagnetism: Microfiches of variation (until 1997), pulsation magnetogrammes, geomagnetic indices and one-minute values (annually)
- d) INTERMAGNET (Global near-real-time magnetic observatory network): One-minute values (reported data via METEOSAT, hourly; adjusted data via Email, on week days); Geomagnetic indices and one-minute values (CDrom, annually).

Indices and information on special events were made available through a telephone service on weekdays.

Phone: +49 4778 812152

The preliminary variations and indices can be found on the Internet on a real time basis (hourly updates) in graphical form at

<http://www.bsh.de/en/Marine%20data/Observations/Geomagnetism/obs.jsp>

or (update every 10 minutes):

http://www.gfz-potsdam.de/pb2/pb23/GeoMag/Other/BothObs_e.html

and in numerical form (update every 10 minutes, pass word required):

<ftp://wng@ftp.bsh.de/outgoing/boulder>

Definitive (compressed) data from 1939 onwards (minute values since 1981) can be found at:

<ftp://ftp.bsh.de/outgoing/wng>

The following list shows some additional selected links providing Wingst data:

Intermagnet (variations):

<http://www.intermagne.bgs.ac.uk/cgi-bin/imagform>

RWC Brussels (indices):

<http://sidc.oma.be/products/wng/index.php3>

WDC Kyoto (pulsations):

<http://swdcdb.kugi.kyoto-u.ac.jp:80/film>

WDC Copenhagen (variations):

<http://web.dmi.dk/fsweb/projects/wdcc1/obs.html>

Address for data requests, data exchange and information:

Erdmagnetisches Observatorium
Am Olymp 13
D-21789 Wingst

Phone: +49 4778 812110

Fax: +49 4778 812150

E-mail: guenter.schulz@bsh.de

Collaborators: I. Gentz, W.D. Grube, J. Traeger (†) and H. Wildt.

2 General Remarks

Wingst Geomagnetic Observatory was established in 1938 as a successor to Marineobservatorium Wilhelmshaven (WLH). Since then, the station has been operated without interruption. The observatory's development is described by VOPPEL, 1988. The development of the modern recording devices is given by SCHULZ, 1998a (see appendix 3).

The observatory is located in the Lower Elbe area on top of an terminal moraine of the Saale glacial period (elevation 50 m). Its co-ordinates are:

	Latitude	Longitude
Geographic	53° 44.6'N	09° 04.4'E
Geomagnetic	54.2°	95.3°

Geomagnetic co-ordinates refer to DGRF (Definitive Geomagnetic Reference Field) 1980.

The following abbreviations are used throughout this report:

- X North component
- Y East component
- Z Vertical component (downward positive)
- H Horizontal intensity
- D Declination (eastward positive)
- I Inclination (downward positive)
- F Total intensity
- U North-west component
- V North-east component

Times are related to UTC (Co-ordinated Universal Time).

2.1 Recording systems

The results of this edition were derived from the following recording systems:

a) Digital system for variations:

Suspended fluxgate magnetometer (FM) of type FGE(DMI) (*U*, *V*, *Z*): One-minute and hourly means; indices of activity from 1997 on

Proton precession magnetometer (PPM) of type V75(VARIAN) (*F*): One minute spot values for quality check only

b) Photographic system for variations of type SCHULZE/LA COUR (*D*, *H* and *Z*; 20 mm h⁻¹): Indices of activity up to 1996; geomagnetic events (ssc, sfe, bay) and substitute hourly means

c) Photographic system for pulsations of type KIM762(KARMANN) (amplitude and phase characteristics see yearbook No 30 (1984): Geomagnetic events (pc, pi)

2.2 Levels, standards and constants

The results of this edition refer to the International Magnetic Standard (IMS). The results of the yearbooks up to and including 1980 referred to the Observatory Standard (OBS), which was represented by the classic type base line instruments bound to their original locations and surroundings.

H , Z , and F are referred to the proton vector magnetometer (PVM) of type ASKANIA/V4931(VARIAN) on pier NW (section 3.2), D to the fluxgate theodolite (DI-flux) of type 010B(ZEISS)/MAG01H(BARTINGTON) on pier NE (section 3.1) of the absolute house. Both instruments are assumed to represent IMS.

The following equations apply to D (see yearbook No 37, 1991), H and Z (see yearbook No 38, 1992):

$$\begin{aligned} D_{\text{OBS}} &= D_{\text{IMS}} \\ H_{\text{OBS}} &= H_{\text{IMS}} + 6.7 \text{ nT} \\ Z_{\text{OBS}} &= Z_{\text{IMS}} + 11.1 \text{ nT}. \end{aligned}$$

The differences for the derived elements depend on the components, i.e. from 1996 to 1999:

$$\begin{aligned} F_{\text{OBS}} &= F_{\text{IMS}} + 12.8 \text{ nT} \\ I_{\text{OBS}} &= I_{\text{IMS}} - 0.15' \\ X_{\text{OBS}} &= X_{\text{IMS}} + 6.7 \text{ nT} \\ Y_{\text{OBS}} &= Y_{\text{IMS}} \end{aligned}$$

The following physical standards are available at Wingst. They guarantee the quality of data:

SCHWILLE (frequency, DCF77, 10^{-8})
 PATEK PHILIPPE and HOPF (UTC, DCF77)
 CROPICO VS10 (Voltage, $5 \cdot 10^{-6}$)
 GUILDLINE 100 Ohm (resistance, $5 \cdot 10^{-6}$)
 Helmholtz coil of high precision (magnetic field strength, 10^{-4})

For the determination of the magnetic induction, the IAGA-recommended gyromagnetic constant (RASMUSSEN, 1991) was used:

$$2\pi\tau^{-1} = 23.487203 \text{ nT s}$$

The azimuth marks were last checked by the German Geodetic Survey in 1995. Their values, related to the NE pier (R: 3504926.873, H: 5956702.028), are:

Azimuth mark	Azimuth
N	11° 38.36'
NE	13° 23.19'
W	308° 42.94'

2.3 Special measurements

In the years under review, comparative measurements were carried out at Wingst and at the observatories Niemegek (NGK) and Fürstenfeldbruck (FUR). The station differences are as follows:

at	WNG minus	D	I	F
1996 FUR	FUR	+0.01'	-0.04'	
NGK	NGK	-0.21	+0.03	-0.7nT
WNG	NGK	+0.11	-0.19	+0.7
1997 NGK	NGK	+0.34	-0.01	+1.4
1998 FUR	FUR	+0.24	-0.16	-2.3
WNG	NGK	+0.11	-0.09	-0.2
1999 NGK	NGK	-0.13	-0.05	+1.0
NGK	NGK	+0.13	0.0	+1.0

3 Absolute measurements

The absolute measurements were reduced both according to the variations of the digital system (section 4) and - up to 1997 - according to those of the photographic system.

3.1 Declination and Inclination

Absolute measurements of D were made with the DI -flux on an approximately monthly basis. Also the determination of I was included in the measurement routine. Each measurement is based on a set of four positions. I was corrected by the pier difference of $-0.2'$ in the sense of NW minus NE. The differences $E=I-\arctg(Z/H)$ are shown in Tables 1.x (x means 1, 2, 3 or 4, respectively).

Additionally, relative measurements of D were carried out with the PVM according to the addition field method on a weekly basis. The mean differences d in the sense of PVM minus DI -flux of all pairs of measurements carried out on the same day were used as instrument constants. Their values are as follows:

	d	Number
1996	-23.85'	13
1997	-23.86	11
1998	-23.95	10
1999	-23.82	12

3.2 Horizontal intensity, vertical component and total intensity

Absolute measurements of H and Z were carried out with the PVM according to the compensation field method after each relative determination of D .

The magnetic induction vector is over-determined due to the measurement of three elements within the meridian plane. The difference $C=F-(H^2+Z^2)^{1/2}$ represents the measurements' inherent accuracy. The annual mean values of the error C amounted to:

	C in nT	Number
1996	0.2 ±0.2	52
1997	0.2 ±0.2	52
1998	0.3 ±0.4	51
1999	0.2 ±0.3	52

C is also shown in Tables 1.x

As a rule, the PPM of type V75 was used. This instrument shows a long-term drift of some 0.1 nT depending on the components (SCHULZ AND CARSTENS, 1979). Therefore, comparative measurements using the PPM of type V4931, which represents IMS (section 2.2), were carried out on a monthly basis. All base line values as well as the recorded minute spot values of F (section 4) are referred to this instrument.

4 Digital recording system

Minute mean values of the orthogonal components U , V , and Z as well as spot values of F were acquired by the primary digital system (V75 and FGE (No 125), section 2.1). The PPM is not only part of the recording system but also serves as an indicator of the PVM (section 3).

Owing to over-determination, outliers, jumps and short-term base line instabilities between the base line measurements of all three components could be detected (section 4.1) and, under certain conditions, automatically eliminated. The following equation applies to Wingst:

$$dF = 0.26 dU + 0.26 dV + 0.93 dZ.$$

Additionally, a fourth fluxgate was operated, which had been aligned in such a way that its W orientation satisfies the following equation:

$$dW = 0.578(dU + dV + dZ).$$

In this way, jumps and outliers of the secondary system could be monitored independently.

A second suspended FM of type FGE (No 126), an FM of type EDA FM100B and a PPM of type PPM105(EDA) were operated as stand-by devices in case of failure of the primary system.

4.1 Base line values

Tables 1.x show the base line values of the FGE125 referred to IMS. Figs. 1.x show the results in graphical form. Absolute measurements of D and I (DI-flux) are marked by circles, those of relative measurements as well as H and Z (PVM) by dots. I (derived from H and Z) is also displayed (dots).

To obtain base line values, the dependence of the measured elements D , H , I , and F on the recorded components U , V , and Z within the range of variations was developed up to terms of

second order. Minute mean values of the magnetometer and the base line instruments were processed, which had been synchronized within ± 5 s.

For 1995 to 1999, the base line values of the primary components refer to the following equivalent voltages E of the fluxgate compensation fields:

Component	E in mV (nominal)
U	12861
V	12613
Z	45463

4.2 Scale values, temperature coefficients and cross talk

Scale values and cross talk were traced back to the respective parameters of the old FM100C(EDA) system by employing stochastic methods, making use of strong variations during a substorm on April 7, 1995 (SCHULZ, 1998a; see also appendix 3). The following values apply to the primary components (FGE125):

	Scale Values in 10 nT/mV $1.000+$	Cross Talk against FM100C in 10^{-3}	
U	$+10^{-3}(1.4 \pm 0.6)$	$V: +0.2 \pm 1.0$	$Z: +0.9 \pm 0.6$
V	$-10^{-3}(1.5 \pm 0.8)$	$U: -0.7 \pm 0.6$	$Z: -0.5 \pm 0.4$
Z	$+10^{-3}(0.8 \pm 0.4)$	$U: -0.6 \pm 0.4$	$V: -0.5 \pm 0.6$

Considering the respective values of the FM100C (see yearbook No 41, 1995), the absolute misalignments and errors of the scale values of the FGE125 fluxgates probably do not exceed the order of magnitude of 10^{-3} .

Temperature coefficients were neglected because the FGE double system had been installed in the old variometer room with almost perfect temperature control (contact thermometers, $\pm 0.03^\circ\text{C}$).

5 Data processing

The base line values (Tables 1.x) were smoothed by Bathspline approximation in steps of $0.01'$ for D or 0.1 nT for H and Z , respectively (SCHOTT, 1992).

Hourly mean values were formed using 60 minute mean values of U , V , and Z (taken at minutes 00 to 59 UTC and centred at second 30) as well as 60 F spot values (taken at second 05).

The international quiet (Q) and disturbed (D) days were taken from the Göttingen (1996) and Potsdam (since 1997) Listings of ISGI, respectively.

The data were processed by a computer double system of type HP9000 330/360. Each workstation is connected to a data acquisition unit of type HP3852 and to BSH by X25 computer link. All necessary calculations including those for the yearbook were carried out by the workstation of type HP9000 360.

6 Indices

The indices presented in this edition (Files wng96.k to wng99.k and Tables 4.x) indicate the local disturbances of the geomagnetic field resulting from particle radiation. Their meaning in detail:

K: geomagnetic three-hourly index, quasi-logarithmic measure of the maximum disturbance in steps of 0 to 9; lower limit for $K = 9$: 500 nT.

sum: Sum of the eight three-hourly indices of a day.

Ak: Mean value of the equivalent amplitudes derived from the eight three-hourly indices. The mean value of the daily disturbance of the geomagnetic field is $2 Ak$ nT.

Ck: daily character figure derived from *Ak* and scaled from 0.0 to 2.5.

C: estimated daily character figure; scale: 0, 1, 2.

The indices were derived using the IAGA-recommended FMI-routine (Häkkinen, 1992).

7 Contents of the CDrom

The enclosed CDrom contains recorded minute values as well as derived (hourly, daily, monthly) mean values and indices for the reporting period. It also provides recalculated epoch values from 1939.5 on and those of Wilhelmhaven Observatory before then, a complete revised data set of hourly means (since 1943) and minute values starting 1981. A revised set of indices (since 1944) is also included.

Using a visualisation software, the one-minute, hourly and daily values located at `data/19YY/hourYY` and `minYY`, respectively, can be displayed as graphs.

Files and Directories on the Cdrom:

readme.txt: General information

tree.txt: File structure

1996, 1997, 1998 and 1999 data (1 nT and 0.1' values, respectively):

yearb/: Directory containing the report and its tables; YY means 96, 97, 98 or 99, respectively

yearb/yearb.pdf: This report

yearb/info.txt: Contains information about instruments and data

yearb/tabs5_YY/: Directory containing tables wngYYmmm.e of hourly and daily mean values for the month mmm of the element e

yearb/tabs6/tab6_YY.txt: Tables of indices

yearb/longterm.pdf: Reprint of SCHULZ, 1998a

progs/yearb.exe: Visualisation programme for hourly and daily mean values as well as one-minute values located in data/

progs/readme.txt: Notes concerning operation of the programme year.exe and the meaning of the parameters in year.ini

progs/setup.bat: Installs the programme year under the local directory c:\year and starts the visualisation software

1943, 1944, ..., 1999 data:

data/: Directory containing the data from 1943 on; YY means 43, 44, ..., 99, respectively

data/wlh+wng.yr: Updated epoch values WLH and WNG (*D* and *I* in 0.1'; *F*, *H*, *X*, *Y*, and *Z* in nT)

data/wng.mon: Updated monthly mean values WNG (since 1943; *D* and *I* in 0.1'; *F*, *H*, *X*, *Y*, and *Z* in nT)

data/wng.day: Updated daily mean values WNG (since 1943; *D* and *I* in 0.1'; *F*, *H*, *X*, *Y*, and *Z* in nT)

data/wng.k: Updated indices WNG (since 1944)

data/wng.qd: International quiet (*Q*) and disturbed (*D*) days used

data/19YY/: Directory containing the following data

wngYY.yr: Epoch values (*D* and *I* in 0.1'; *F*, *H*, *X*, *Y*, and *Z* in nT)

wngYY.mon: Monthly mean values (*D* and *I* in 0.1'; *F*, *H*, *X*, *Y* and *Z* in nT)

wngYY.day: Daily mean values (*D* and *I* in 0.1'; *F*, *H*, *X*, *Y* and *Z* in nT)

wngYY.hr: Hourly mean values in the format WDC (ICSU, 1989)

wngYY.k: Activity figures *K*, *Ak*, *Ck*, and *C* as well as monthly and annual mean values of *Ak*, *Ck*, and *C*

hourYY/wngYYmmm.e: Hourly and daily mean values for the month mmm of the element e in tabular form

yeab.exe input files:

hourYY/wngYYmmm.wdc: Hourly mean values of the month mmm in the format WDC (ICSU, 1989)

minYYmm/wngYYmmm.0nn: One-minute values of the days nn for the month mm or mmm, respectively, in the format WDC (ICSU, 1989)

1943, 1944, ..., 1999 data (0.1 nT and 0.01' values, respectively):

data/iaga/: Directory containing the following data in the IAGA2000 format (<http://www.ngdc.noaa.gov/IAGA/wg2>); YY means 96, 97 98 or 99, respectively

YR.WNG: Epoch values WNG starting 1939 (from 1981 on: *D* and *I* in 0.01'; *X*, *Y*, *Z*, *H* and *F* in 0.1 nT; before then: 0.1' or 1 nT, respectively)

19YYMT.WNG: Monthly means (*D* and *I* in 0.01'; *X*, *Y*, *Z*, *H* and *F* in 0.1 nT)

19YYDY.WNG: Daily means (*D* and *I* in 0.01'; *X*, *Y*, *Z*, *H* and *F* in 0.1 nT)

19YYmmHR.WNG: Hourly means (*F*, *X*, *Y* and *Z* in 0.1 nT) of the month mm

19YYmmMN.WNG: Minute means (*F*, *X*, *Y* and *Z* in 0.1 nT) of the month mm

References

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Appendix 1: Figures and Tables

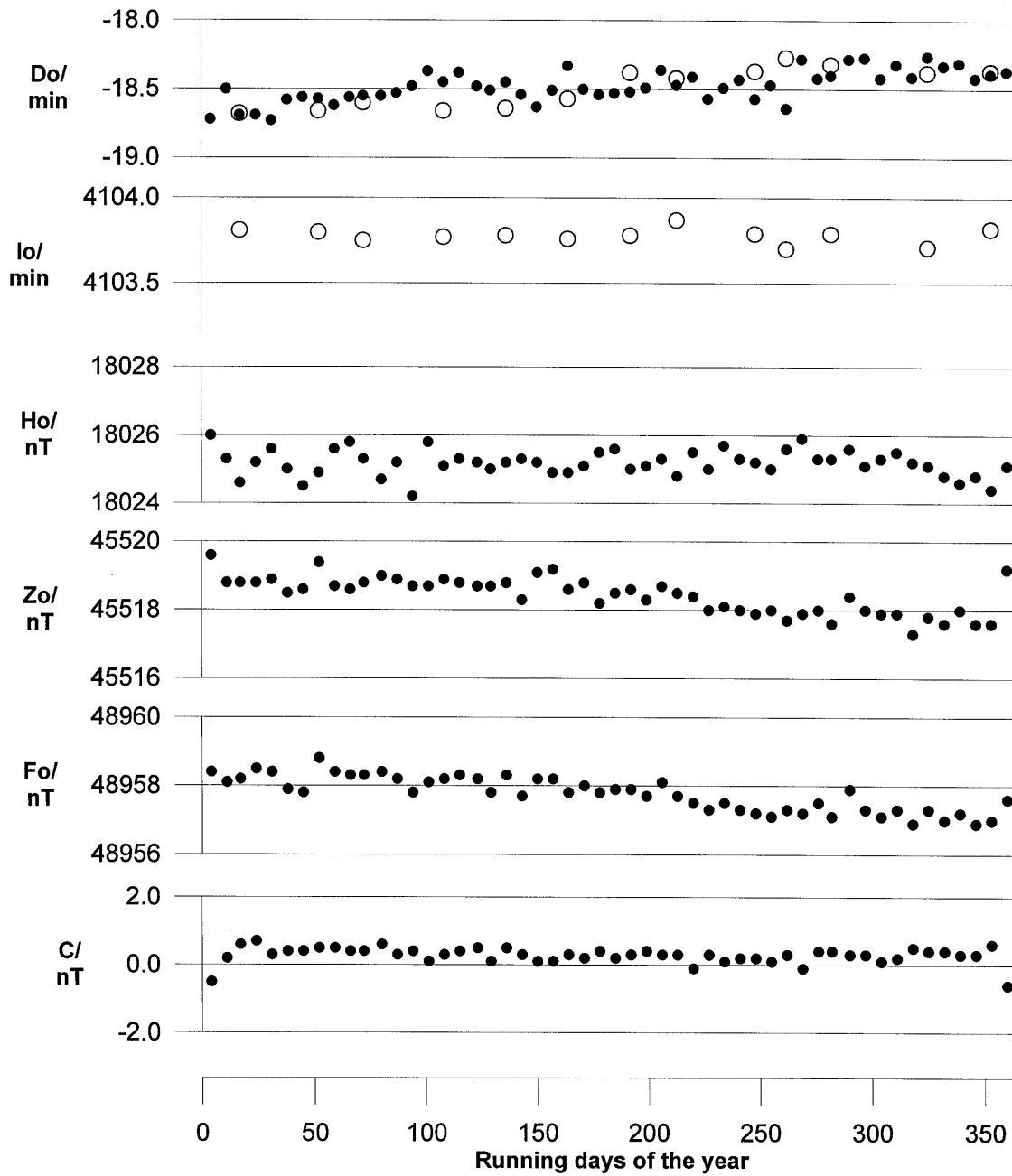


Fig. 1.1

Wingst 1996 Base line values of the digital system, IMS

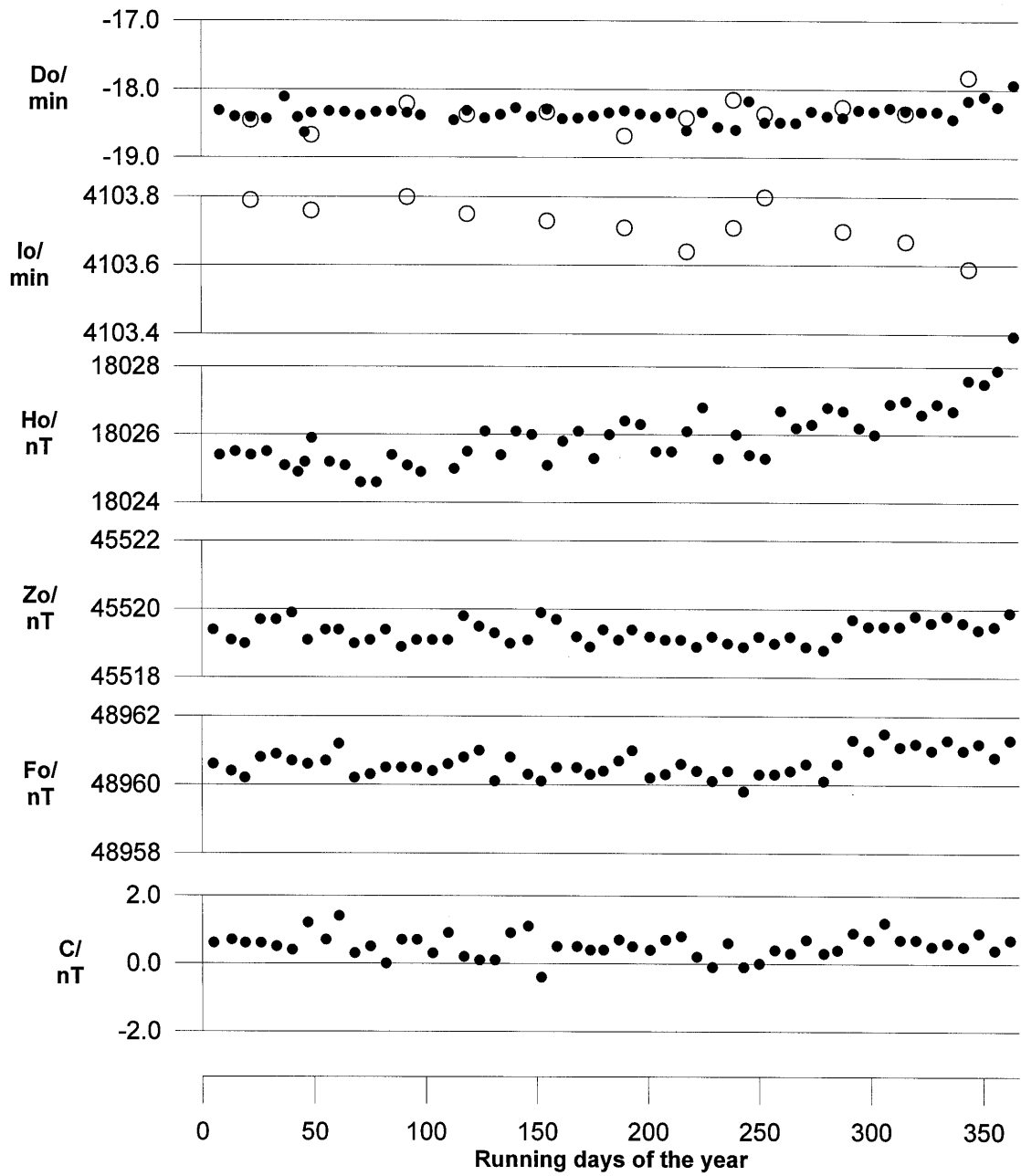


Fig. 1.2

Wingst 1997 Base line values of the digital system, IMS

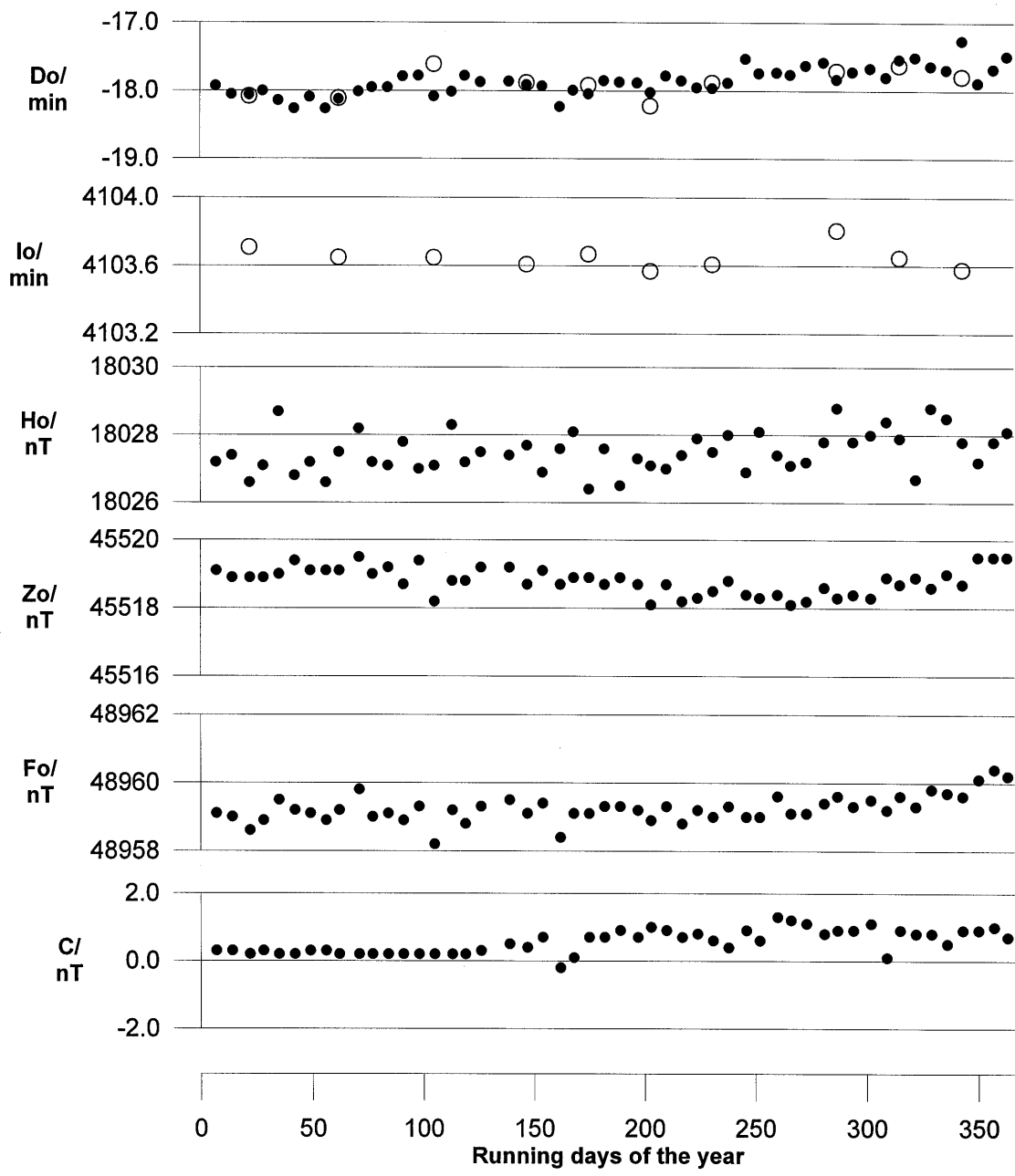


Fig. 1.3

Wingst 1998 Base line values of the digital system, IMS

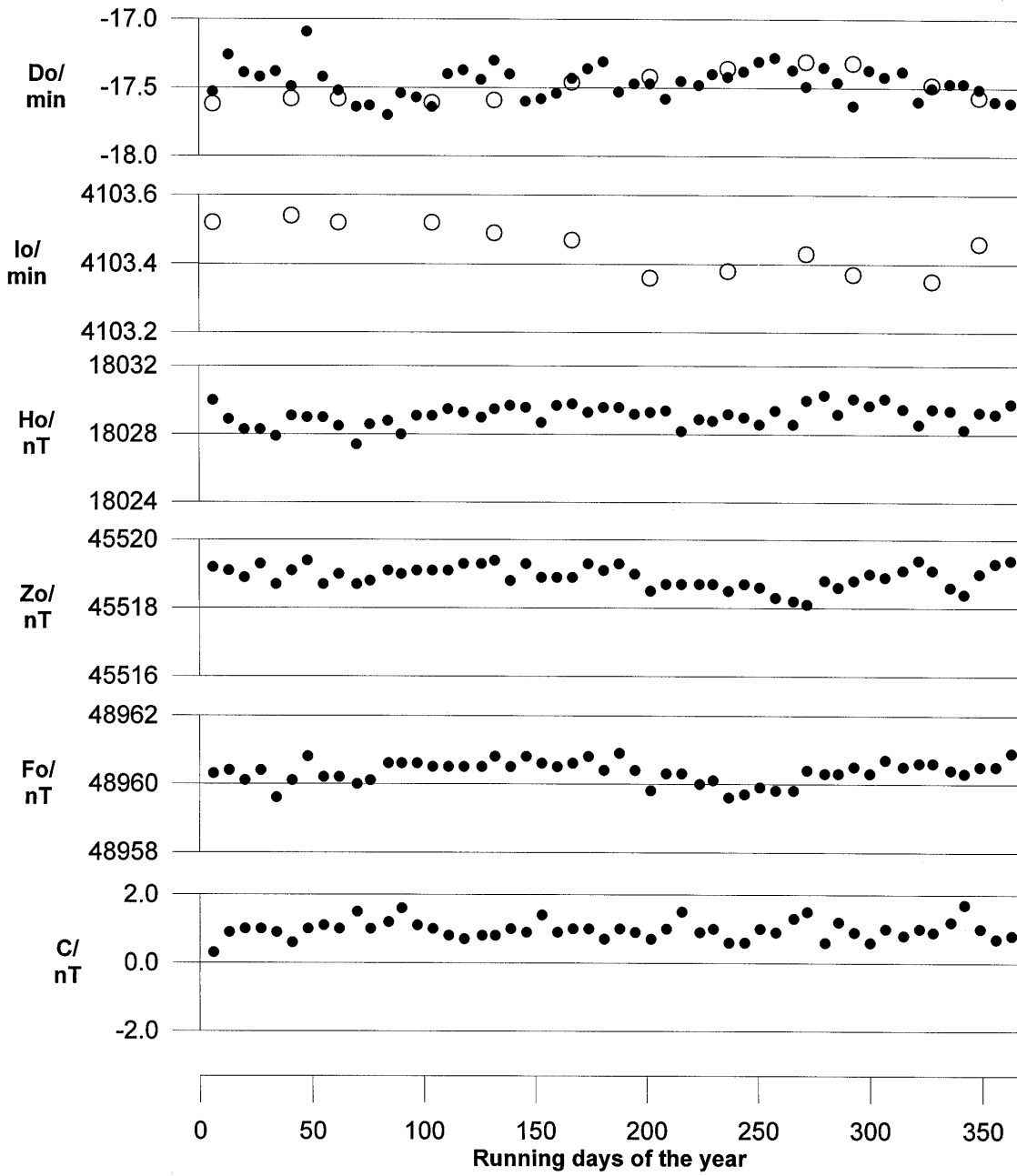


Fig. 1.4

Wingst 1999 Base line values of the digital system, IMS

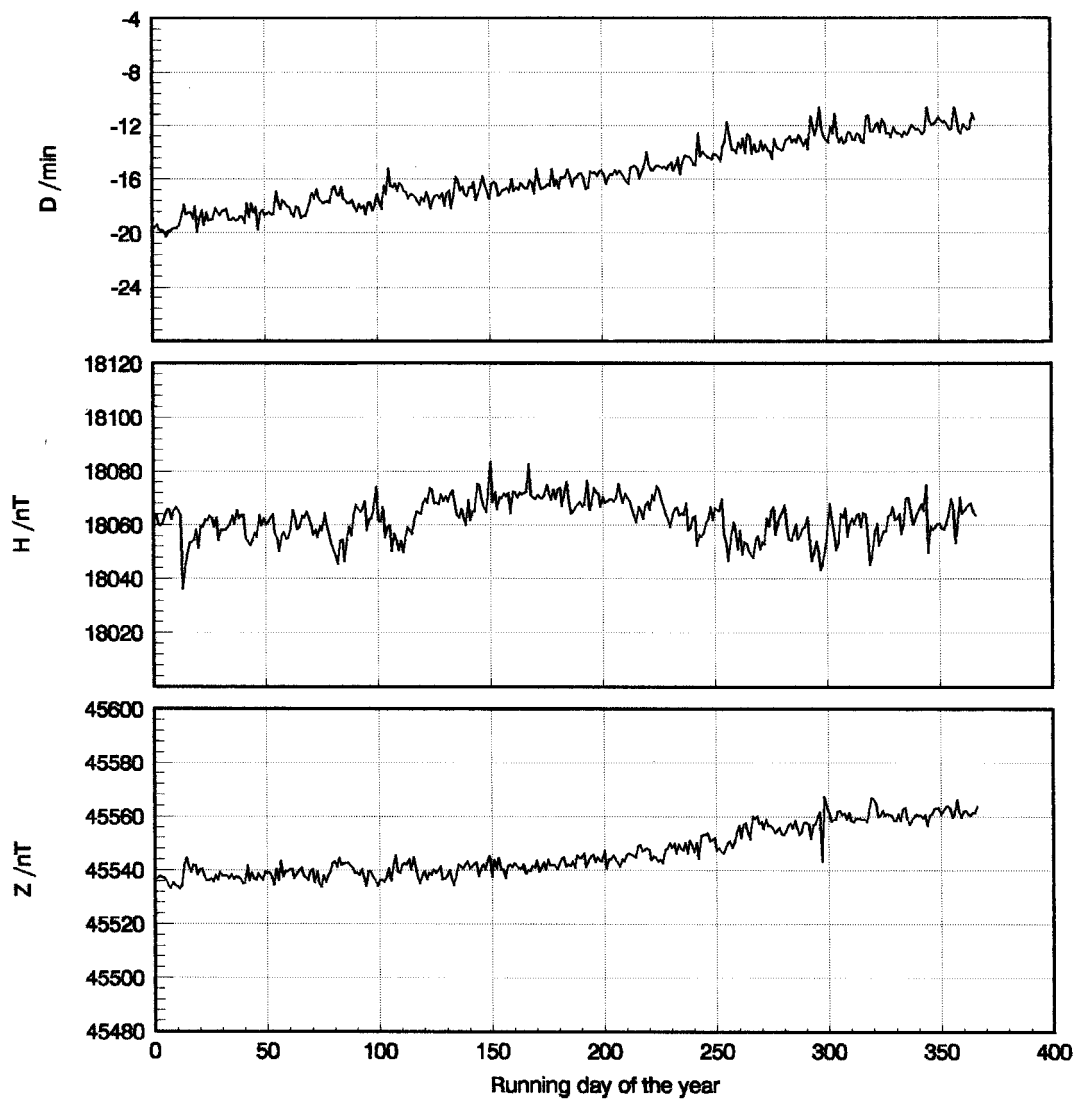


Fig. 2.1

Wingst 1996 Daily mean values D, H and Z

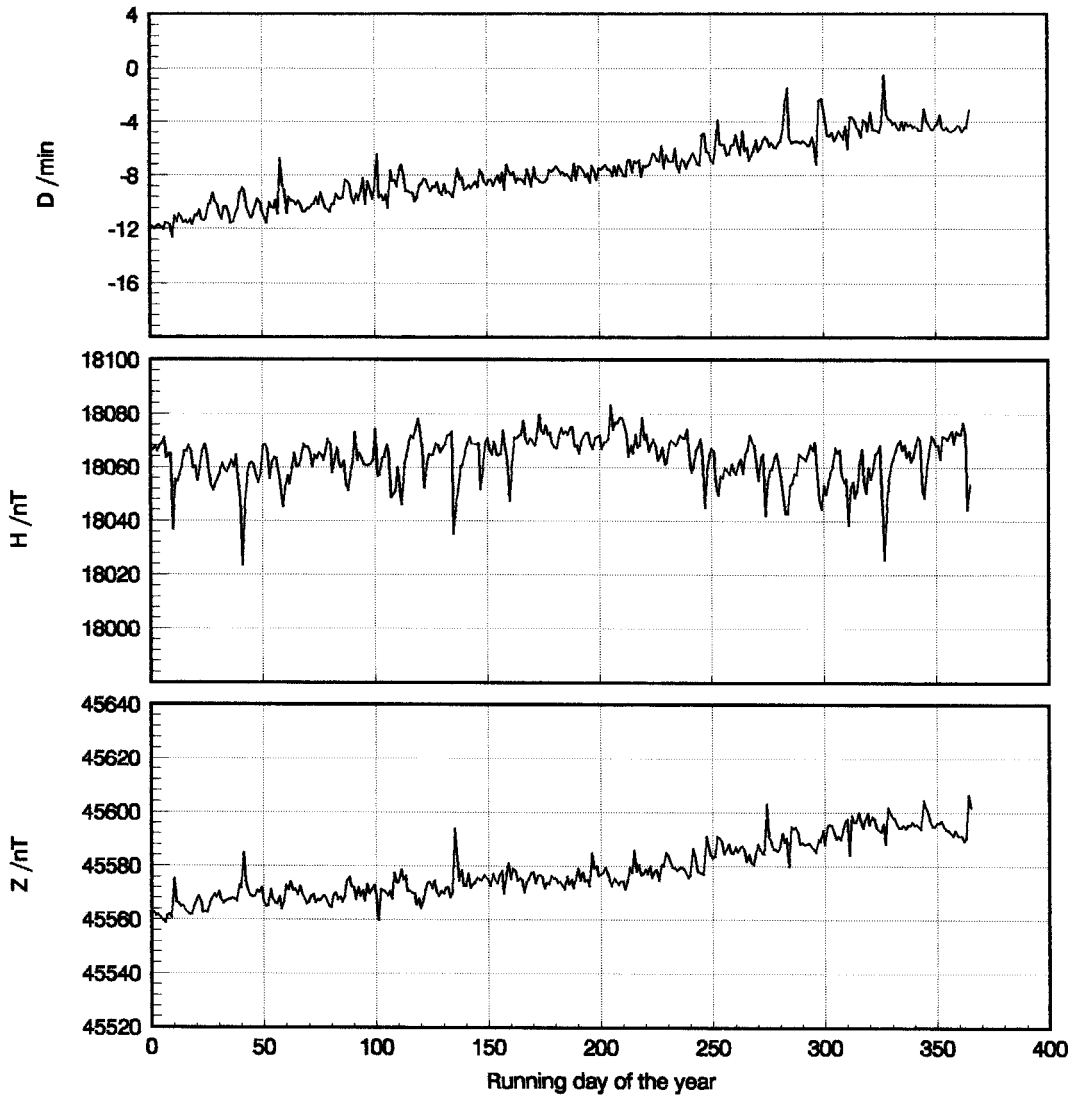


Fig. 2.2

Wingst 1997 Daily mean values D , H and Z

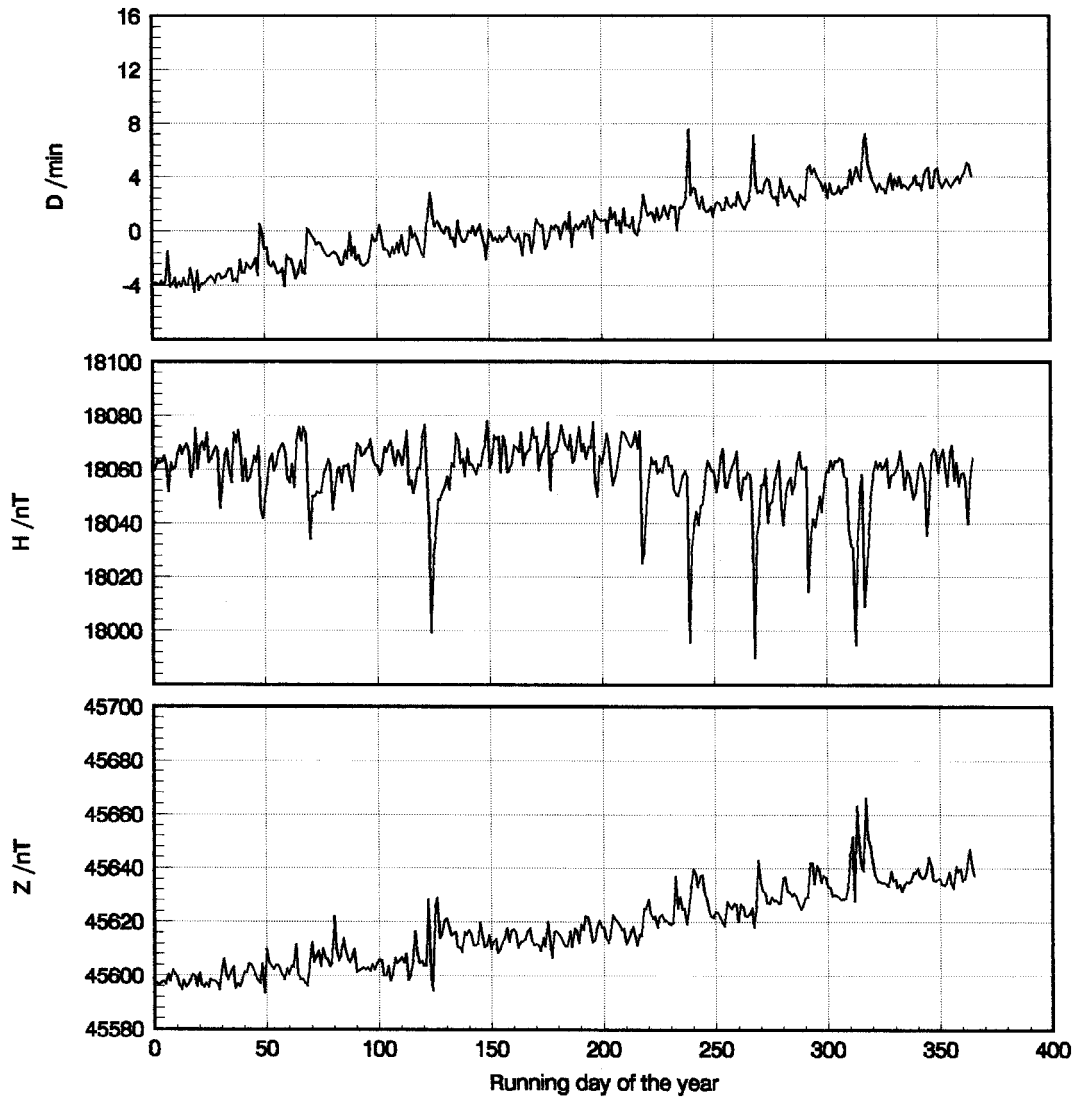


Fig. 2.3

Wingst 1998 Daily mean values D , H and Z

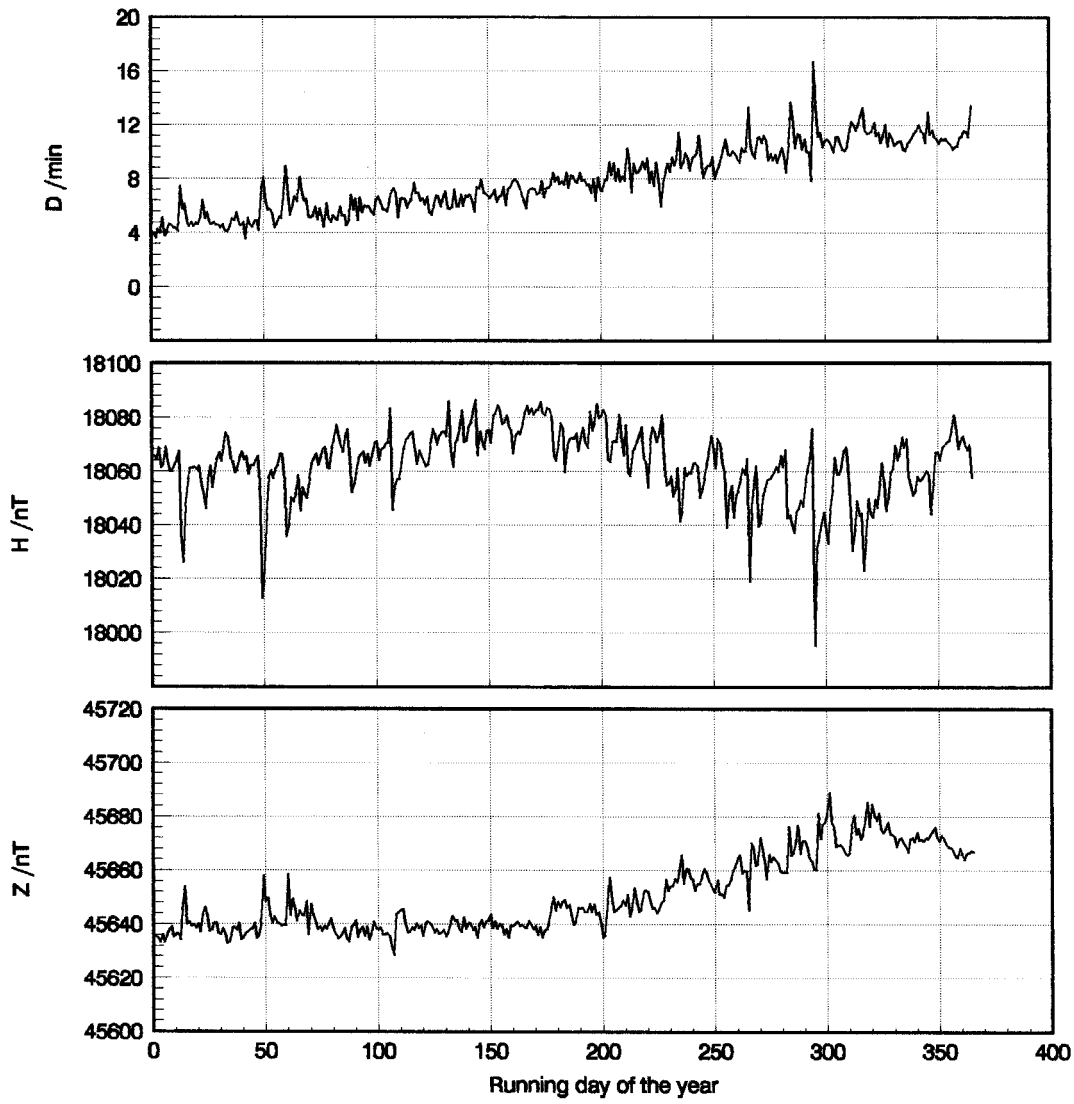


Fig. 2.4

Wingst 1999 Daily mean values D, H and Z

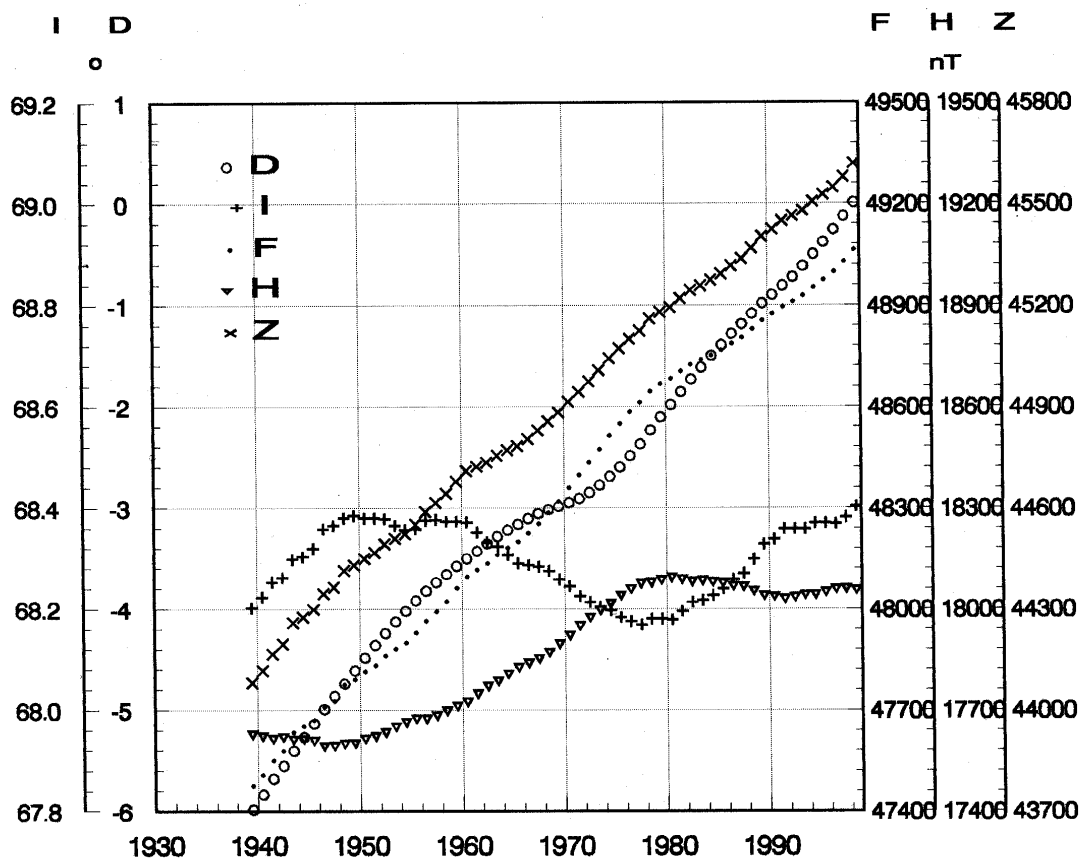


Fig. 3: Wingst Epoch Values I, D, F, H and Z

Fig. 3:

Wingst Epoch values I, D, F, H and Z

```

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  tree.txt
  progs/
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    herc.bgi
    vesal6.bgi
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      wng43dec.h
      wng43dec.z

```

p.t.o.

Fig 4, cont'd

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1944/
    wng44.yr
    wng44.mon
    wng44.day
    wng44.hr
    wng44.k
    hour44/

.
1981/
    hour81/
    .
    min8101/
        wng81jan.001
        .
        wng81jan.031
    min8102/
    .
    min8112/
        wng81dec.001
        .
        wng81dec.031

1982/
.
1999/
.
iaga/
    YR.WNG
    1996MN.WNG
    1996DY.WNG
    199601HR.WNG
    .
    199612HR.WNG
    199601MN.WNG
    .
    199612MN.WNG
    .
    1999MN.WNG
    1999.WNG
    199901HR.WNG
    .
    199912HR.WNG
    199901MN.WNG
    .
    199912MN.WNG

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Fig. 4

Structure of the file set on CDrom

Wingst 1996

Base-line measurements, system FGE125, IMS

Month	day	Do(abs)	Do(rel)	Io	Fo nT	Ho nT	Zo nT	C nT	E
Jan.	4		-0°18.72'		48958.4	18026.0	45519.6	-0.5	
	11		-0 18.50		48958.1	18025.3	45518.8	+0.2	
	17	-0°18.68'	-0 18.69	+68°23.81'	48958.2	18024.6	45518.8	+0.6	-0.03'
	24		-0 18.69		48958.5	18025.2	45518.8	+0.7	
	31		-0 18.73		48958.4	18025.6	45518.9	+0.3	
Feb.	7		-0 18.58		48957.9	18025.0	45518.5	+0.4	
	14		-0 18.56		48957.8	18024.5	45518.6	+0.4	
	21	-0 18.66	-0 18.57	+68 23.80	48958.8	18024.9	45519.4	+0.5	-0.04
	28		-0 18.62		48958.4	18025.6	45518.7	+0.5	
March	6		-0 18.56		48958.3	18025.8	45518.6	+0.4	
	12	-0 18.60	-0 18.55	+68 23.75	48958.3	18025.3	45518.8	+0.4	-0.05
	20		-0 18.55		48958.4	18024.7	45519.0	+0.6	
	27		-0 18.53		48958.2	18025.2	45518.9	+0.3	
April	3		-0 18.48		48957.8	18024.2	45518.7	+0.4	
	10		-0 18.37		48958.1	18025.8	45518.7	+0.1	
	17	-0 18.66	-0 18.45	+68 23.77	48958.2	18025.1	45518.9	+0.3	-0.04
	24		-0 18.38		48958.3	18025.3	45518.8	+0.4	
May	2		-0 18.48		48958.2	18025.2	45518.7	+0.5	
	8		-0 18.51		48957.8	18025.0	45518.7	+0.1	
	15	-0 18.64	-0 18.45	+68 23.78	48958.3	18025.2	45518.8	+0.5	-0.02
	22		-0 18.54		48957.7	18025.3	45518.3	+0.3	
	29		-0 18.63		48958.2	18025.2	45519.1	+0.1	
June	5		-0 18.51		48958.2	18024.9	45519.2	+0.1	
	12	-0 18.57	-0 18.33	+68 23.76	48957.8	18024.9	45518.6	+0.3	-0.06
	19		-0 18.50		48958.0	18025.1	45518.8	+0.2	
	26		-0 18.54		48957.8	18025.5	45518.2	+0.4	
July	3		-0 18.53		48957.9	18025.6	45518.5	+0.2	
	10	-0 18.38	-0 18.52	+68 23.78	48957.9	18025.0	45518.6	+0.3	-0.03
	17		-0 18.49		48957.7	18025.1	45518.3	+0.4	
	24		-0 18.36		48958.1	18025.3	45518.7	+0.3	
	31	-0 18.42	-0 18.47	+68 23.87	48957.7	18024.8	45518.5	+0.3	+0.05
Aug.	7		-0 18.41		48957.5	18025.5	45518.4	-0.1	
	14		-0 18.57		48957.3	18025.0	45518.0	+0.3	
	21		-0 18.49		48957.5	18025.7	45518.1	+0.1	
	28		-0 18.43		48957.3	18025.3	45518.0	+0.2	
Sep.	4	-0 18.37	-0 18.57	+68 23.79	48957.2	18025.2	45517.9	+0.2	+0.01
	11		-0 18.47		48957.1	18025.0	45518.0	+0.1	
	18	-0 18.27	-0 18.64	+68 23.70	48957.3	18025.6	45517.7	+0.3	-0.05
	25		-0 18.28		48957.2	18025.9	45517.9	+0.0	
Oct.	2		-0 18.42		48957.5	18025.3	45518.0	+0.4	
	8	-0 18.32	-0 18.40	+68 23.79	48957.1	18025.3	45517.6	+0.4	+0.03
	16		-0 18.28		48957.9	18025.6	45518.4	+0.3	
	23		-0 18.27		48957.3	18025.1	45518.0	+0.3	
	30		-0 18.42		48957.1	18025.3	45517.9	+0.1	
Nov.	6		-0 18.32		48957.3	18025.5	45517.9	+0.2	
	13		-0 18.41		48956.9	18025.2	45517.3	+0.5	
	20	-0 18.38	-0 18.26	+68 23.71	48957.3	18025.1	45517.8	+0.4	-0.07
	27		-0 18.33		48957.0	18024.8	45517.6	+0.4	
Dec.	4		-0 18.31		48957.2	18024.6	45518.0	+0.3	
	11		-0 18.42		48956.9	18024.8	45517.6	+0.3	
	18	-0 18.37	-0 18.39	+68 23.82	48957.0	18024.4	45517.6	+0.6	+0.00
	25		-0 18.37		48957.6	18025.1	45519.2	-0.6	

Table 1.1 1996 Base line values of the digital system

Wingst 1997

Base-line measurements, system FGE125, IMS

Month	day	Do(abs)	Do(rel)	Io	Fo nT	Ho nT	Zo nT	C nT	E
Jan.	8		-0°18.31'		48957.6	18025.4	45518.0	+0.4	
	15		-0 18.40		48958.8	18025.5	45519.3	+0.4	
	22	-0°18.45'	-0 18.41	+68°23.79'	48958.8	18025.4	45519.1	+0.6	-0.01'
	29		-0 18.43		48958.8	18025.5	45519.2	+0.5	
Feb.	6		-0 18.11		48958.3	18025.1	45518.9	+0.4	
	12		-0 18.41		48958.8	18024.9	45519.2	+0.7	
	15		-0 18.63		48957.3	18025.2	45517.6	+0.6	
	18	-0 18.67	-0 18.34	+68 23.76	48958.1	18025.9	45518.5	+0.3	+0.01
	26		-0 18.32		48958.8	18025.2	45519.3	+0.5	
March	5		-0 18.33		48958.5	18025.1	45518.9	+0.6	
	12		-0 18.38		48957.9	18024.6	45518.4	+0.7	
	19		-0 18.33		48958.3	18024.6	45518.6	+0.9	
	26		-0 18.32		48957.9	18025.4	45518.2	+0.6	
April	2	-0 18.21	-0 18.34	+68 23.80	48958.0	18025.1	45518.7	+0.3	-0.01
	8		-0 18.38		48958.2	18024.9	45518.6	+0.7	
	23		-0 18.45		48958.0	18025.0	45519.0	+0.1	
	29	-0 18.37	-0 18.31	+68 23.75	48958.3	18025.5	45519.1	+0.1	-0.04
May	7		-0 18.42		48957.5	18026.1	45518.0	+0.1	
	14		-0 18.37		48957.6	18025.4	45518.4	+0.1	
	21		-0 18.27		48957.6	18026.1	45518.1	+0.1	
	28		-0 18.40		48957.9	18026.0	45518.6	+0.0	
June	4	-0 18.33	-0 18.29	+68 23.73	48957.5	18025.1	45518.4	+0.1	-0.07
	11		-0 18.43		48957.5	18025.8	45518.1	+0.1	
	18		-0 18.42		48957.6	18026.1	45518.2	+0.0	
	25		-0 18.39		48957.4	18025.3	45518.3	+0.0	
July	2		-0 18.34		48957.7	18026.0	45518.3	+0.0	
	9	-0 18.68	-0 18.31	+68 23.71	48957.3	18026.4	45517.7	+0.1	+0.01
	16		-0 18.36		48957.5	18026.3	45517.9	+0.1	
	23		-0 18.40		48958.0	18025.5	45518.9	+0.0	
	30		-0 18.34		48957.5	18025.5	45518.3	+0.0	
Aug.	6	-0 18.42	-0 18.60	+68 23.64	48957.8	18026.1	45518.3	+0.1	-0.09
	13		-0 18.33		48958.5	18026.8	45518.8	+0.1	
	20		-0 18.55		48957.5	18025.3	45518.4	+0.0	
	27	-0 18.15		+68 23.71	99999.9	99999.9	99999.9		
	28		-0 18.59		48957.5	18026.0	45518.1	+0.0	
Sep.	3		-0 18.17		48958.0	18025.4	45518.8	+0.1	
	10	-0 18.36	-0 18.48	+68 23.80	48957.8	18025.3	45518.7	+0.0	+0.01
	17		-0 18.48		48958.2	18026.7	45518.6	+0.0	
	24		-0 18.49		48958.7	18026.2	45519.3	+0.0	
Oct.	1		-0 18.32		48958.7	18026.3	45519.3	+0.0	
	8		-0 18.39		48958.7	18026.8	45519.0	+0.1	
	15	-0 18.26	-0 18.41	+68 23.70	48958.7	18026.7	45519.1	+0.0	-0.01
	22		-0 18.30		48958.7	18026.2	45519.3	+0.0	
	29		-0 18.32		48958.8	18026.0	45519.5	+0.0	
Nov.	5		-0 18.27		48959.0	18026.9	45519.3	+0.1	
	12	-0 18.35	-0 18.31	+68 23.67	48959.1	18027.0	45519.4	+0.1	-0.03
	19		-0 18.32		48959.3	18026.6	45519.8	+0.0	
	26		-0 18.32		48959.6	18026.9	45520.0	+0.0	
Dec.	3		-0 18.43		48959.3	18026.7	45519.7	+0.1	
	10	-0 17.82	-0 18.16	+68 23.59	48959.4	18027.6	45519.5	+0.0	-0.07
	17		-0 18.10		48959.3	18027.5	45519.4	+0.1	
	23		-0 18.25		48959.4	18027.9	45519.4	+0.0	
	30		-0 17.93		48959.8	18028.9	45519.3	+0.1	

Table 1.2 1997 Base line values of the digital system

Wingst 1998

Base-line measurements, system FGE125, IMS

Month	day	Do(abs)	Do(rel)	Io	Fo nT	Ho nT	Zo nT	C nT	E
Jan.	7		-0°17.93'		48959.1	18027.2	45519.1	+0.3	
	14		-0 18.05		48959.0	18027.4	45518.9	+0.3	
	22	-0°18.08'	-0 18.06	+68°23.71'	48958.6	18026.6	45518.9	+0.2	+0.00'
	28		-0 18.00		48958.9	18027.1	45518.9	+0.3	
Feb.	4		-0 18.14		48959.5	18028.7	45519.0	+0.2	
	11		-0 18.26		48959.2	18026.8	45519.4	+0.2	
	18		-0 18.09		48959.1	18027.2	45519.1	+0.3	
	25		-0 18.26		48958.9	18026.6	45519.1	+0.3	
March	3	-0 18.11	-0 18.12	+68 23.65	48959.2	18027.5	45519.1	+0.2	-0.01
	12		-0 18.01		48959.8	18028.2	45519.5	+0.2	
	18		-0 17.95		48959.0	18027.2	45519.0	+0.2	
	25		-0 17.95		48959.1	18027.1	45519.2	+0.2	
April	1		-0 17.79		48958.9	18027.8	45518.7	+0.2	
	8		-0 17.78		48959.3	18027.0	45519.4	+0.3	
	15	-0 17.61	-0 18.08	+68 23.65	48958.2	18027.1	45518.2	+0.2	-0.01
	23		-0 18.01		48959.2	18028.3	45518.8	+0.2	
May	29		-0 17.78		48958.8	18027.2	45518.8	+0.2	
	6		-0 17.87		48959.3	18027.5	45519.2	+0.3	
	19		-0 17.86		48959.5	18027.4	45519.2	+0.5	
	27	-0 17.88	-0 17.91	+68 23.61	48959.1	18027.7	45518.7	+0.4	-0.03
June	3		-0 17.93		48959.4	18026.9	45519.1	+0.7	
	11		-0 18.23		48958.4	18027.6	45518.7	-0.2	
	17		-0 17.99		48959.1	18028.1	45518.9	+0.1	
	24	-0 17.92	-0 18.04	+68 23.67	48959.1	18026.4	45518.9	+0.7	-0.06
July	1		-0 17.85		48959.3	18027.6	45518.7	+0.7	
	8		-0 17.87		48959.3	18026.5	45518.9	+0.9	
	16		-0 17.88		48959.2	18027.3	45518.7	+0.7	
	22	-0 18.22	-0 18.02	+68 23.57	48958.9	18027.1	45518.1	+1.0	-0.09
Aug.	29		-0 17.78		48959.3	18027.0	45518.7	+0.9	
	5		-0 17.85		48958.8	18027.4	45518.2	+0.7	
	12		-0 17.95		48959.2	18027.9	45518.3	+0.8	
	19	-0 17.88	-0 17.96	+68 23.61	48959.0	18027.5	45518.5	+0.6	-0.03
Sep.	26		-0 17.88		48959.3	18028.0	45518.8	+0.4	
	3		-0 17.53		48959.0	18026.9	45518.4	+0.9	
	9		-0 17.74		48959.0	18028.1	45518.3	+0.6	
	17		-0 17.73		48959.6	18027.4	45518.4	+1.3	
Oct.	23		-0 17.76		48959.1	18027.1	45518.1	+1.2	
	30		-0 17.63		48959.1	18027.2	45518.2	+1.1	
	8		-0 17.58		48959.4	18027.8	45518.6	+0.8	
	14	-0 17.71	-0 17.83	+68 23.81	48959.6	18028.8	45518.3	+0.9	+0.26
Nov.	21		-0 17.72		48959.3	18027.8	45518.4	+0.9	
	29		-0 17.67		48959.5	18028.0	45518.3	+1.1	
	5		-0 17.80		48959.2	18028.4	45518.9	+0.1	
	11	-0 17.63	-0 17.54	+68 23.65	48959.6	18027.9	45518.7	+0.9	+0.03
Dec.	18		-0 17.51		48959.3	18026.7	45518.9	+0.8	
	25		-0 17.64		48959.8	18028.8	45518.6	+0.8	
	2		-0 17.69		48959.7	18028.5	45519.0	+0.5	
	9	-0 17.79	-0 17.26	+68 23.58	48959.6	18027.8	45518.7	+0.9	-0.05
Dec.	16		-0 17.88		48960.1	18027.2	45519.5	+0.9	
	23		-0 17.68		48960.4	18027.8	45519.5	+1.0	
	29		-0 17.49		48960.2	18028.1	45519.5	+0.7	

Table 1.3 1998 Base line values of the digital system

Wingst 1999

Base-line measurements, system FGE125, IMS

Month	day	Do(abs)	Do(rel)	Io	Fo nT	Ho nT	Zo nT	C nT	E
Jan.	6	-0°17.62'	-0°17.53'	+68°23.52'	48960.3	18030.0	45519.2	+0.3	+0.02'
	13		-0 17.26		48960.4	18028.9	45519.1	+0.9	
	20		-0 17.39		48960.1	18028.3	45518.9	+1.0	
	27		-0 17.42		48960.4	18028.3	45519.3	+1.0	
Feb.	3		-0 17.38		48959.6	18027.9	45518.7	+0.9	
	10	-0 17.58	-0 17.49	+68 23.54	48960.1	18029.1	45519.1	+0.6	-0.02
	17		-0 17.09		48960.8	18029.0	45519.4	+1.0	
	24		-0 17.42		48960.2	18029.0	45518.7	+1.1	
March	3	-0 17.58	-0 17.52	+68 23.52	48960.2	18028.5	45519.0	+1.0	-0.07
	11		-0 17.64		48960.0	18027.4	45518.7	+1.5	
	17		-0 17.63		48960.1	18028.6	45518.8	+1.0	
	25		-0 17.70		48960.6	18028.8	45519.1	+1.2	
	31		-0 17.54		48960.6	18028.0	45519.0	+1.6	
April	7		-0 17.57		48960.6	18029.1	45519.1	+1.1	
	14	-0 17.61	-0 17.64	+68 23.52	48960.5	18029.1	45519.1	+1.0	-0.04
	21		-0 17.40		48960.5	18029.5	45519.1	+0.8	
	28		-0 17.37		48960.5	18029.3	45519.3	+0.7	
May	6		-0 17.44		48960.5	18029.0	45519.3	+0.8	
	12	-0 17.59	-0 17.30	+68 23.49	48960.8	18029.5	45519.4	+0.8	-0.05
	19		-0 17.40		48960.5	18029.7	45518.8	+1.0	
	26		-0 17.60		48960.8	18029.6	45519.3	+0.9	
June	2		-0 17.58		48960.6	18028.7	45518.9	+1.4	
	9		-0 17.54		48960.5	18029.7	45518.9	+0.9	
	16	-0 17.46	-0 17.43	+68 23.47	48960.6	18029.8	45518.9	+1.0	-0.03
	23		-0 17.36		48960.8	18029.3	45519.3	+1.0	
	30		-0 17.31		48960.4	18029.6	45519.1	+0.7	
July	7		-0 17.53		48960.9	18029.6	45519.3	+1.0	
	14		-0 17.47		48960.4	18029.2	45519.0	+0.9	
	21	-0 17.42	-0 17.47	+68 23.36	48959.8	18029.3	45518.5	+0.7	-0.17
	28		-0 17.58		48960.3	18029.4	45518.7	+1.0	
Aug.	4		-0 17.45		48960.3	18028.2	45518.7	+1.5	
	12		-0 17.48		48960.0	18028.9	45518.7	+0.9	
	18		-0 17.40		48960.1	18028.8	45518.7	+1.0	
	25	-0 17.36	-0 17.42	+68 23.38	48959.6	18029.2	45518.5	+0.6	-0.15
Sep.	1		-0 17.38		48959.7	18029.0	45518.7	+0.6	
	8		-0 17.31		48959.9	18028.6	45518.6	+1.0	
	15		-0 17.28		48959.8	18029.4	45518.3	+0.9	
	23		-0 17.37		48959.8	18028.6	45518.2	+1.3	
	29	-0 17.31	-0 17.49	+68 23.43	48960.4	18030.0	45518.1	+1.5	-0.04
Oct.	7		-0 17.35		48960.3	18030.3	45518.8	+0.6	
	13		-0 17.46		48960.3	18029.2	45518.6	+1.2	
	20	-0 17.32	-0 17.63	+68 23.37	48960.5	18030.1	45518.8	+0.9	-0.11
	27		-0 17.37		48960.3	18029.7	45519.0	+0.6	
Nov.	3		-0 17.42		48960.7	18030.1	45518.9	+1.0	
	11		-0 17.38		48960.5	18029.5	45519.1	+0.8	
	18		-0 17.60		48960.6	18028.6	45519.4	+1.0	
	24	-0 17.48	-0 17.50	+68 23.35	48960.6	18029.5	45519.1	+0.9	-0.18
Dec.	2		-0 17.47		48960.4	18029.4	45518.6	+1.2	
	8		-0 17.47		48960.3	18028.3	45518.4	+1.7	
	15	-0 17.57	-0 17.51	+68 23.46	48960.5	18029.3	45519.0	+1.0	-0.08
	22		-0 17.60		48960.5	18029.2	45519.3	+0.7	
	29		-0 17.61		48960.9	18029.8	45519.4	+0.8	

Table 1.4 1999 Base line values of the digital system

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1996

Monthly mean values, IMS

D: disturbed, Q: quiet, A: all days

Month		D	F nT	H nT	I	X nT	Y nT	Z nT
Jan	A	19.1'	48988	18059	68°22.1'	18059	-100	45538
Feb	A	18.4	48988	18059	68 22.1	18059	-97	45538
Mar	A	17.7	48989	18058	68 22.2	18058	-93	45540
Apr	A	17.3	48990	18061	68 22.0	18061	-91	45539
May	A	17.0	48994	18069	68 21.5	18069	-89	45540
Jun	A	16.5	48996	18071	68 21.4	18071	-87	45542
Jul	A	15.8	48998	18070	68 21.6	18070	-83	45544
Aug	A	14.9	48999	18064	68 22.0	18064	-78	45548
Sep	A	13.7	49002	18057	68 22.6	18057	-72	45554
Oct	A	12.9	49005	18057	68 22.7	18057	-68	45557
Nov	A	12.5	49010	18060	68 22.6	18060	-66	45561
Dec	A	11.9	49012	18064	68 22.4	18064	-63	45561
Mean	A	15.6	48998	18062	68 22.1	18062	-82	45547
Jan	Q	19.8	48987	18065	68 21.6	18065	-104	45534
Feb	Q	18.8	48989	18062	68 21.9	18062	-99	45538
Mar	Q	18.5	48990	18064	68 21.8	18064	-97	45539
Apr	Q	17.7	48990	18065	68 21.7	18065	-93	45538
May	Q	17.2	48995	18069	68 21.5	18069	-91	45541
Jun	Q	16.5	48995	18070	68 21.5	18070	-87	45541
Jul	Q	15.8	48997	18070	68 21.5	18070	-83	45543
Aug	Q	15.1	48998	18070	68 21.6	18070	-80	45544
Sep	Q	14.1	49003	18061	68 22.3	18061	-74	45553
Oct	Q	13.6	49007	18064	68 22.2	18064	-71	45556
Nov	Q	12.9	49011	18065	68 22.3	18065	-68	45560
Dec	Q	12.3	49012	18067	68 22.2	18067	-65	45560
Mean	Q	16.0	48998	18066	68 21.8	18066	-84	45546
Jan	D	18.7	48987	18047	68 23.0	18047	-99	45541
Feb	D	17.8	48987	18054	68 22.4	18054	-94	45539
Mar	D	16.7	48988	18054	68 22.5	18054	-88	45539
Apr	D	16.2	48987	18055	68 22.4	18055	-85	45539
May	D	16.8	48993	18066	68 21.7	18066	-88	45540
Jun	D	16.4	48997	18071	68 21.4	18071	-86	45542
Jul	D	15.7	48997	18068	68 21.7	18068	-83	45544
Aug	D	14.3	48998	18059	68 22.4	18059	-75	45549
Sep	D	13.2	48999	18052	68 22.9	18052	-69	45553
Oct	D	12.1	49000	18051	68 23.1	18051	-64	45554
Nov	D	11.8	49009	18053	68 23.2	18053	-62	45563
Dec	D	11.5	49009	18058	68 22.7	18058	-60	45561
Mean	D	15.1	48996	18057	68 22.5	18057	-79	45547

Table 2.1 1996 Monthly and annual mean values

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1997

Monthly mean values, IMS

D: disturbed, Q: quiet, A: all days

Month		D	F nT	H nT	I	X nT	Y nT	Z nT
Jan	A	11.2'	49014	18061	68°22.6'	18061	-59	45565
Feb	A	10.3	49016	18058	68 23.0	18058	-54	45569
Mar	A	9.9	49019	18062	68 22.7	18062	-52	45569
Apr	A	9.0	49020	18063	68 22.7	18063	-47	45571
May	A	8.7	49023	18064	68 22.7	18064	-46	45574
Jun	A	8.1	49027	18069	68 22.4	18069	-43	45576
Jul	A	7.8	49028	18072	68 22.2	18072	-41	45576
Aug	A	7.0	49030	18068	68 22.6	18068	-37	45580
Sep	A	6.0	49033	18061	68 23.2	18061	-31	45585
Oct	A	5.0	49036	18057	68 23.6	18057	-26	45590
Nov	A	4.3	49041	18057	68 23.7	18057	-22	45595
Dec	A	4.3	49044	18067	68 23.1	18067	-23	45595
Mean	A	7.6	49028	18063	68 22.9	18063	-40	45579
Jan	Q	11.7	49013	18068	68 22.1	18068	-61	45561
Feb	Q	10.9	49017	18065	68 22.5	18065	-57	45567
Mar	Q	10.5	49018	18068	68 22.3	18068	-55	45567
Apr	Q	9.5	49022	18073	68 22.0	18073	-50	45569
May	Q	8.8	49023	18069	68 22.4	18069	-46	45573
Jun	Q	8.3	49028	18070	68 22.4	18070	-44	45577
Jul	Q	7.8	49027	18074	68 22.1	18074	-40	45574
Aug	Q	7.0	49030	18069	68 22.5	18069	-37	45579
Sep	Q	6.5	49033	18068	68 22.7	18068	-34	45582
Oct	Q	5.6	49037	18063	68 23.1	18063	-30	45589
Nov	Q	4.5	49043	18066	68 23.1	18066	-24	45594
Dec	Q	4.5	49044	18071	68 22.7	18071	-24	45593
Mean	Q	8.0	49028	18069	68 22.5	18069	-42	45577
Jan	D	10.6	49014	18051	68 23.4	18051	-56	45569
Feb	D	8.6	49014	18043	68 24.0	18043	-45	45572
Mar	D	9.2	49019	18057	68 23.1	18057	-48	45572
Apr	D	7.4	49016	18051	68 23.5	18051	-39	45572
May	D	8.5	49022	18051	68 23.7	18051	-45	45578
Jun	D	8.0	49025	18063	68 22.8	18063	-42	45576
Jul	D	8.2	49029	18073	68 22.1	18073	-43	45577
Aug	D	6.9	49030	18064	68 22.9	18064	-37	45581
Sep	D	5.0	49032	18054	68 23.7	18054	-26	45587
Oct	D	4.1	49035	18049	68 24.2	18049	-22	45592
Nov	D	3.7	49034	18044	68 24.5	18044	-20	45593
Dec	D	4.0	49045	18054	68 24.1	18054	-21	45601
Mean	D	7.0	49026	18055	68 23.5	18055	-37	45581

Table 2.2 1997 Monthly and annual mean values

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1998

Monthly mean values, IMS

D: disturbed, Q: quiet, A: all days

Month		D	F nT	H nT	I	X nT	Y nT	Z nT
Jan	A	3.6'	49046	18064	68°23.3'	18064	-19	45598
Feb	A	2.6	49048	18062	68 23.5	18062	-14	45601
Mar	A	1.7	49051	18058	68 23.9	18058	-9	45606
Apr	A	1.2	49052	18064	68 23.5	18064	-7	45604
May	A	0.0	49058	18057	68 24.2	18057		45614
Jun	A	0.3	49061	18067	68 23.5	18067	-2	45614
Jul	A	-0.6	49064	18067	68 23.6	18067	3	45616
Aug	A	-1.7	49066	18054	68 24.7	18054	9	45624
Sep	A	-2.4	49068	18053	68 24.7	18053	12	45626
Oct	A	-3.2	49073	18052	68 25.0	18052	17	45632
Nov	A	-3.8	49079	18050	68 25.3	18050	20	45639
Dec	A	-3.8	49080	18058	68 24.7	18058	20	45638
Mean	A	-0.5	49062	18059	68 24.2	18059	3	45618
Jan	Q	3.7	49046	18067	68 23.1	18067	-20	45597
Feb	Q	3.3	49049	18069	68 23.0	18069	-17	45599
Mar	Q	2.4	49050	18069	68 23.1	18069	-12	45600
Apr	Q	1.8	49051	18067	68 23.2	18067	-9	45602
May	Q	0.3	49061	18058	68 24.2	18058	-2	45617
Jun	Q	0.0	49063	18069	68 23.4	18069		45615
Jul	Q	-0.5	49063	18070	68 23.3	18070	2	45614
Aug	Q	-1.3	49066	18061	68 24.1	18061	7	45621
Sep	Q	-2.1	49070	18059	68 24.3	18059	11	45626
Oct	Q	-2.4	49071	18060	68 24.3	18060	12	45627
Nov	Q	-3.4	49077	18059	68 24.6	18059	18	45633
Dec	Q	-3.6	49080	18064	68 24.2	18064	19	45635
Mean	Q	-0.2	49062	18064	68 23.7	18064	1	45616
Jan	D	3.0	49046	18055	68 24.0	18055	-16	45601
Feb	D	1.9	49045	18053	68 24.1	18053	-10	45601
Mar	D	0.5	49051	18048	68 24.7	18048	-2	45610
Apr	D	0.7	49052	18058	68 24.0	18058	-4	45607
May	D	-0.6	49051	18041	68 25.2	18041	3	45613
Jun	D	0.6	49061	18064	68 23.7	18064	-3	45615
Jul	D	-0.7	49064	18060	68 24.1	18060	4	45619
Aug	D	-3.4	49062	18028	68 26.5	18028	18	45630
Sep	D	-3.8	49065	18034	68 26.1	18034	20	45630
Oct	D	-4.1	49070	18038	68 25.9	18038	21	45634
Nov	D	-5.2	49079	18017	68 27.8	18017	27	45652
Dec	D	-4.2	49080	18047	68 25.5	18047	22	45641
Mean	D	-1.3	49061	18045	68 25.1	18045	7	45621

Table 2.3 1998 Monthly and annual mean values

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073 E

1999

Monthly mean values, IMS

D: disturbed, Q: quiet, A: all days

Month		D	F nT	H nT	I	X nT	Y nT	Z nT
Jan	A	-4.8'	49082	18059	68°24.7'	18059	25	45639
Feb	A	-5.1	49083	18059	68 24.7	18059	27	45640
Mar	A	-5.8	49084	18060	68 24.7	18060	31	45641
Apr	A	-6.3	49084	18066	68 24.2	18066	33	45638
May	A	-6.5	49087	18073	68 23.8	18073	34	45639
Jun	A	-7.2	49090	18079	68 23.5	18079	38	45640
Jul	A	-8.0	49093	18073	68 23.9	18073	42	45646
Aug	A	-8.9	49096	18063	68 24.8	18063	47	45653
Sep	A	-9.9	49099	18055	68 25.4	18055	52	45659
Oct	A	-10.7	49107	18050	68 26.1	18050	56	45669
Nov	A	-11.3	49113	18053	68 26.0	18053	59	45674
Dec	A	-11.1	49113	18064	68 25.1	18064	59	45670
Mean	A	-8.0	49094	18063	68 24.7	18063	42	45651
Jan	Q	-4.5	49082	18065	68 24.3	18065	24	45637
Feb	Q	-5.0	49083	18064	68 24.4	18064	26	45639
Mar	Q	-5.3	49084	18069	68 24.0	18069	28	45637
Apr	Q	-6.2	49085	18071	68 23.9	18071	32	45638
May	Q	-6.5	49086	18074	68 23.7	18074	34	45638
Jun	Q	-7.2	49090	18080	68 23.4	18080	38	45639
Jul	Q	-7.5	49093	18077	68 23.6	18077	40	45643
Aug	Q	-8.1	49096	18067	68 24.4	18067	43	45650
Sep	Q	-9.3	49101	18061	68 25.1	18061	48	45659
Oct	Q	-9.9	49107	18061	68 25.2	18061	52	45665
Nov	Q	-10.8	49114	18063	68 25.3	18063	57	45671
Dec	Q	-10.8	49114	18071	68 24.7	18071	57	45669
Mean	Q	-7.6	49095	18069	68 24.3	18069	40	45649
Jan	D	-6.1	49082	18044	68 25.8	18044	32	45645
Feb	D	-5.7	49081	18043	68 25.9	18043	30	45644
Mar	D	-6.9	49083	18049	68 25.5	18049	36	45645
Apr	D	-6.5	49081	18060	68 24.6	18060	34	45638
May	D	-6.5	49088	18068	68 24.1	18068	35	45641
Jun	D	-7.6	49093	18076	68 23.7	18076	40	45644
Jul	D	-8.4	49097	18071	68 24.2	18071	44	45650
Aug	D	-9.5	49095	18050	68 25.8	18050	50	45657
Sep	D	-10.5	49096	18049	68 25.8	18049	55	45658
Oct	D	-12.5	49103	18031	68 27.4	18031	66	45672
Nov	D	-12.2	49108	18036	68 27.1	18036	64	45677
Dec	D	-11.6	49110	18052	68 26.0	18052	61	45672
Mean	D	-8.7	49093	18052	68 25.5	18052	46	45654

Table 2.4 1999 Monthly and annual mean values

Wingst (WNG)

Geographic Coordinates: 53.743°N 9.073°E

Annual mean values (IMS)

Epoch	D	F nT	H nT	I	X nT	Y nT	Z nT
1939.5	-5°59.1'	47476	17630	68°12.1'	17534	-1838	44081
1940.5	-5 50.2	47506	17624	68 13.4	17533	-1792	44116
1941.5	-5 40.8	47550	17617	68 15.2	17530	-1744	44166
1942.5	-5 33.1	47579	17622	68 15.7	17540	-1705	44196
1943.5	-5 24.2	47634	17614	68 18.0	17535	-1659	44259
1944.5	-5 16.2	47652	17616	68 18.3	17541	-1618	44276
1945.5	-5 8.2	47671	17611	68 19.2	17540	-1577	44299
1946.5	-4 59.6	47708	17595	68 21.5	17528	-1532	44346
1947.5	-4 51.7	47726	17596	68 22.0	17532	-1491	44365
1948.5	-4 44.4	47775	17602	68 22.9	17541	-1454	44415
1949.5	-4 36.6	47791	17604	68 23.2	17547	-1415	44431
1950.5	-4 29.1	47814	17617	68 22.9	17562	-1378	44451
1951.5	-4 21.5	47832	17624	68 22.8	17573	-1339	44468
1952.5	-4 14.5	47861	17636	68 22.7	17587	-1304	44494
1953.5	-4 7.6	47882	17653	68 22.0	17607	-1270	44510
1954.5	-4 1.3	47899	17666	68 21.5	17623	-1239	44523
1955.5	-3 55.1	47930	17676	68 21.6	17634	-1208	44552
1956.5	-3 49.3	47964	17676	68 22.6	17636	-1178	44589
1957.5	-3 44.2	47993	17686	68 22.6	17648	-1152	44616
1958.5	-3 39.5	48023	17700	68 22.4	17663	-1129	44643
1959.5	-3 34.6	48062	17714	68 22.4	17679	-1105	44679
1960.5	-3 30.1	48095	17727	68 22.4	17693	-1082	44710
1961.5	-3 25.7	48117	17751	68 21.1	17719	-1061	44723
1962.5	-3 21.3	48136	17773	68 20.0	17742	-1040	44735
1963.5	-3 16.9	48160	17789	68 19.4	17760	-1018	44755
1964.5	-3 13.1	48183	17810	68 18.4	17782	-1000	44771
1965.5	-3 9.6	48201	17829	68 17.5	17802	-983	44783
1966.5	-3 6.3	48226	17842	68 17.3	17815	-966	44805
1967.5	-3 3.4	48254	17855	68 17.1	17829	-952	44830
1968.5	-3 1.0	48286	17874	68 16.5	17849	-941	44857
1969.5	-2 59.2	48320	17899	68 15.5	17874	-932	44883
1970.5	-2 56.9	48359	17924	68 14.7	17900	-922	44915
1971.5	-2 54.5	48397	17953	68 13.6	17930	-911	44944
1972.5	-2 51.0	48434	17977	68 12.9	17954	-894	44975
1973.5	-2 46.6	48473	17999	68 12.2	17978	-872	45008
1974.5	-2 41.4	48513	18018	68 11.9	17998	-846	45043
1975.5	-2 36.0	48549	18043	68 11.0	18024	-818	45073
1976.5	-2 29.3	48583	18062	68 10.5	18045	-784	45101
1977.5	-2 22.4	48612	18078	68 10.1	18062	-748	45126
1978.5	-2 14.1	48646	18081	68 10.9	18066	-705	45161
1979.5	-2 6.3	48668	18089	68 10.9	18076	-664	45181
1980.5	-1 59.0	48682	18096	68 10.7	18085	-626	45194
1981.5	-1 51.4	48704	18091	68 11.7	18082	-586	45220
1982.5	-1 43.9	48724	18084	68 12.8	18076	-546	45244
1983.5	-1 36.9	48738	18087	68 13.0	18080	-510	45257
1984.5	-1 29.9	48752	18083	68 13.7	18077	-473	45274
1985.5	-1 23.5	48768	18080	68 14.4	18075	-439	45292
1986.5	-1 17.0	48787	18071	68 15.5	18067	-404	45316
1987.5	-1 11.1	48804	18069	68 16.2	18065	-374	45336
1988.5	-1 5.0	48829	18056	68 17.9	18053	-341	45368
1989.5	-59.0	48856	18042	68 19.7	18039	-309	45402
1990.5	-53.9	48875	18041	68 20.3	18038	-283	45423
1991.5	-48.5	48895	18032	68 21.5	18031	-255	45448
1992.5	-43.4	48911	18038	68 21.5	18037	-228	45463
1993.5	-37.1	48928	18044	68 21.6	18043	-195	45479
1994.5	-30.0	48952	18045	68 22.2	18044	-158	45505
1995.5	-23.0	48975	18053	68 22.2	18053	-121	45526
1996.5	-15.6	48998	18062	68 22.1	18062	-82	45547
1997.5	-7.6	49028	18063	68 22.9	18063	-40	45579
1998.5	0.5	49062	18059	68 24.2	18059	3	45618
1999.5	8.0	49094	18063	68 24.7	18063	42	45651

Table 3 Wingst Epoch values from 1939 to 1999

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1996

Absolute Frequencies of the Three-hourly Index K

K	UTC	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
0		11	18	19	12	10	5	9	6
1		77	95	136	82	70	53	52	57
2		117	152	150	176	142	130	109	110
3		101	71	45	81	109	121	117	112
4		42	20	15	14	33	38	48	52
5		16	10	1	1	1	14	26	22
6		1	0	0	0	1	5	5	7
7		1	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0

Absolute Number of Days during the Year for a given K

K	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0	10	3	6	4	5	1	7	0	3	8	12	31	90
1	69	52	37	52	43	78	52	31	26	36	68	78	622
2	76	78	89	77	119	105	116	109	78	79	87	73	1086
3	64	64	78	69	65	48	58	78	67	73	48	45	757
4	21	21	25	27	16	7	14	24	41	34	17	15	262
5	7	13	11	8	0	1	1	6	20	12	7	5	91
6	1	1	2	3	0	0	0	0	5	5	1	1	19
7	0	0	0	0	0	0	0	0	0	1	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0

Absolute Number of Three-hour-intervals for a given K

Table 4.1 1996 Statistics of indices

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1997

Absolute Frequencies of the Three-hourly Index K

K	UTC	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
0		35	40	50	24	23	20	23	19
1		98	123	151	135	101	108	85	91
2		120	120	120	139	138	112	115	98
3		70	56	29	55	76	80	79	93
4		26	18	11	10	22	32	40	39
5		13	6	3	2	5	10	21	20
6		2	2	1	0	0	2	2	4
7		1	0	0	0	0	1	0	1
8		0	0	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0

Absolute Number of Days during the Year for a given K

K	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0	13	11	24	18	11	4	2	10	7	18	37	79	234
1	87	70	68	58	86	76	82	73	54	77	69	92	892
2	83	61	81	71	85	96	108	101	90	72	68	46	962
3	41	50	53	57	41	49	43	43	59	44	34	24	538
4	17	22	14	28	16	10	12	18	18	22	17	4	198
5	7	6	7	8	7	5	1	3	11	13	10	2	80
6	0	3	1	0	2	0	0	0	1	1	4	1	13
7	0	1	0	0	0	0	0	0	0	1	1	0	3
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0

Absolute Number of Three-hour-intervals for a given K

Table 4.2 1997 Statistics of indices

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1998

Absolute Frequencies of the Three-hourly Index K

K	UTC	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
0		23	30	21	10	15	16	15	20
1		78	87	135	105	91	79	58	56
2		101	132	128	141	127	93	97	96
3		101	76	57	82	76	89	96	98
4		39	23	15	18	37	52	58	68
5		18	12	5	8	16	28	28	18
6		2	2	1	1	3	8	11	9
7		3	2	3	0	0	0	2	0
8		0	1	0	0	0	0	0	0
9		0	0	0	0	0	0	0	0

Absolute Number of Days during the Year for a given K

K	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0	31	22	14	9	2	3	8	6	8	15	9	23	150
1	90	71	48	66	32	50	53	42	60	54	43	80	689
2	73	74	71	76	72	87	79	78	85	66	83	71	915
3	28	35	68	58	84	65	56	58	55	66	55	47	675
4	17	14	36	17	32	26	35	39	20	29	24	21	310
5	9	6	7	12	16	8	17	13	5	16	19	5	133
6	0	1	3	2	8	1	0	9	4	2	6	1	37
7	0	1	1	0	1	0	0	3	3	0	1	0	10
8	0	0	0	0	1	0	0	0	0	0	0	0	1
9	0	0	0	0	0	0	0	0	0	0	0	0	0

Absolute Number of Three-hour-intervals for a given K

Table 4.3 1998 Statistics of indices

Wingst (WNG)

Geographic Coordinates: 53.743° N 9.073° E

1999

Absolute Frequencies of the Three-hourly Index K

K	UTC	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
0		18	14	12	14	13	11	13	0
1		83	114	61	55	54	51	57	167
2		134	122	153	139	98	103	104	125
3		84	70	101	100	105	84	91	49
4		31	37	32	42	58	74	61	2
5		11	7	6	15	29	30	33	0
6		3	1	0	0	8	9	4	3
7		1	0	0	0	0	3	2	5
8		0	0	0	0	0	0	0	2
9		0	0	0	0	0	0	0	12

Absolute Number of Days during the Year for a given K

K	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0	9	20	8	1	4	5	4	3	1	2	8	30	95
1	80	58	45	52	69	70	68	41	30	29	44	56	642
2	81	70	81	95	99	100	94	70	76	69	71	72	978
3	51	45	66	50	49	45	52	72	68	71	66	49	684
4	14	17	32	34	20	11	17	42	42	50	31	27	337
5	7	11	11	6	5	5	10	19	16	18	15	8	131
6	2	0	4	1	0	1	0	1	6	7	3	3	28
7	1	2	0	0	1	0	2	0	1	1	1	2	11
8	0	0	0	0	0	1	0	0	0	0	1	0	2
9	3	1	1	1	1	2	1	0	0	1	0	1	12

Absolute Number of Three-hour-intervals for a given K

Table 4.4 1999 Statistics of indices