ZAMG

Conrad Observatory Magnetic Results 2018

GMO Bulletin 5

Zentralanstalt für Meteorologie und Geodynamik
Hohe Warte 38
1190 Wien
Austria
www.zamg.ac.at
www.conrad-observatory.at

Team: R. Leonhardt, R. Egli, B. Leichter, I. Herzog, R. Kornfeld, R. Bailey,
N. Kompein, P. Arneitz, A. Draxler, R. Mandl, R. Steiner

Bibliographic reference:
Leonhardt, R. et al., 2018.
Conrad Observatory: Magnetic Results 2018
GMO Bulletin 5
Zentralanstal für Meteorologie und Geodynamik
Vienna

ISBN 978-3-903171-06-0 (electronic)

Published: Vienna, June 2019

Contents

Chapter 1

Introduction

The Conrad Observatory, a geophysical observatory, monitors the physical parameters of our planet. It is named after the Austrian geophysicist Victor Conrad (1876 - 1962), who for many years worked at the Zentralanstalt für Meteorologie und Geodynamik (ZAMG) in Vienna. The observatory is almost entirely underground and guarantees constant temperature for all applied techniques. With its range of supported measurement techniques, instrumentation and the layout of the underground facilities, the Conrad Observatory represents a unique research and development location for earth scientists of all disciplines. The Conrad Observatory includes two main facilities: (1) The seismo-gravimetric observatory (SGO), which was opened in 2002, and (2) the geomagnetic observatory (GMO), officially opened in 2014. The basic task for earth observatories is the observation of temporal and spatial variations of physically relevant parameters, which are crucial to our understanding of processes on earth. At the Conrad Observatory, earthquake activity (seismology), changes in gravity and mass distribution, geomagnetic field variations, geodetic parameters, atmospheric conditions and meteorological data are all continuously monitored.
This yearbook provides an overview of geomagnetic measurements performed at the Conrad Observatory. It also contains detailed descriptions of data treatment, analytical methods, quality assessment and results. Long- and short-term variations of the geomagnetic field, e.g, secular variation and geomagnetic activity, are analysed and discussed. The yearbook of the Conrad Observatory is published every year and made available online following the links provided on the title page. The electronic data from the Conrad Observatory can also be requested online.

Chapter 2

Location and Instrumentation

The geomagnetic part of the Conrad Observatory is located at Trafelberg, Lower Austria, about 50 km south-west of Vienna. Three different geological formations are found in the vicinity of the Conrad Observatory: the Gutenstein Formation, Reifling Formation, and Wetterstein Limestone. All of them are dominated by very weakly magnetic limestones and dolomites of predominantly Middle Triassic age (247.1 - 237 Ma) [*Wessely*, 2006]. The observatory is part of a large underground installation covering the full geophysical monitoring program including seismology, gravity, meteorology and geomagnetism. The geomagnetic section consists of a 1 km long tunnel system, which includes several adits dedicated to electric and magnetic measurement systems. A location map indicating the positions of various instruments described below is shown in Figure 2.1. Absolute determinations, also referred to as DI measurements, are conducted within the absolute area at the northern end of the main tunnel. The main azimuth mark is located at the southern end of the main tunnel in a distance of 380 m. A further azimuth mark is located northwards (not shown) on a mountain at a distance of $\approx$ 2.5 km.
The following instruments are deployed at the Observatory for magnetic measurements: 4 Fluxgate sensors, 4 Overhauser sensors, and several other magnetic sensors. Auxiliary temperature measurements have been performed at all Fluxgate sensor positions, at their electronics and at several other positions in the tunnel. As will be shown below, temperature variations and magnetic gradients are extremely small throughout the observatory. Details on instrumentation are provided in Table 2.1. The primary instruments used in determination of definitive data are printed in bold. Beside the above mentioned permanently running instruments, the Conrad Observatory additionally operates several DI Theodolite/Fluxgate combinations including an automated version (AutoDIF) for base value determination. There are several measurement systems for magnetic remanence measurements and rock magnetism as well as mobile sensors for field work and prospection. A three-dimensional Merritt coil system with an axis length of 3 m for sensor calibration tests complements the portfolio.

Table 2.1. Operational instruments in 2018 and their parameters.

Name	Type	Serial Number	Dynamic Range	Timestep Accuracy	Passband	Spectral Noise	Absolute Error	Orthogonality	Resolution	Setup	Operational
FGE	Fluxgate	S0252	3200nT	<10ms	1Hz	60pT/$\sqrt{Hz}$		<2mrad	100 pT	HEZ	2012-09
GP20S3EWS1	Potassium	111201									2015-07
GP20S3EWS2	Potassium	111201									2015-07
GP20S3EWS3	Potassium	111201									2015-07
GP20S3	Potassium	111201									2015-07
GP20S3NSS1	Potassium	012201									2015-07
GP20S3NSS2	Potassium	012201									2015-07
GP20S3NSS3	Potassium	012201									2015-07
GP20S3	Potassium	012201									2015-07
GP20S3VS1	Potassium	911005									2015-07
GP20S3VS2	Potassium	911005									2015-07
GP20S3VS3	Potassium	911005									2015-07
GP20S3	Potassium	911005									2015-07
GSM90	Overhauzer	14245	100000nT			22pT/$\sqrt{Hz}$	0.2nT		10 pT		2014-12
GSM90	Overhauzer	31968									2015-04
GSM90	Overhauzer	6107631									
LEMI025	Fluxgate	22	3000nT	<10ms	3.5Hz	<10pT/$\sqrt{Hz}$		<30min of arc	1 pT	HEZ	2015-08
LEMI036	Fluxgate	1	4000nT	<10ms	3.5Hz	<10pT/$\sqrt{Hz}$		<30min of arc	1 pT	HEZ	2015-12
POS1	Overhauzer	N432	80000nT				0.5nT		1 pT		2013-06

Note. — Spectral noise is determined at 0.3 Hz. Bold printed instruments are the primary source of high resolution data.

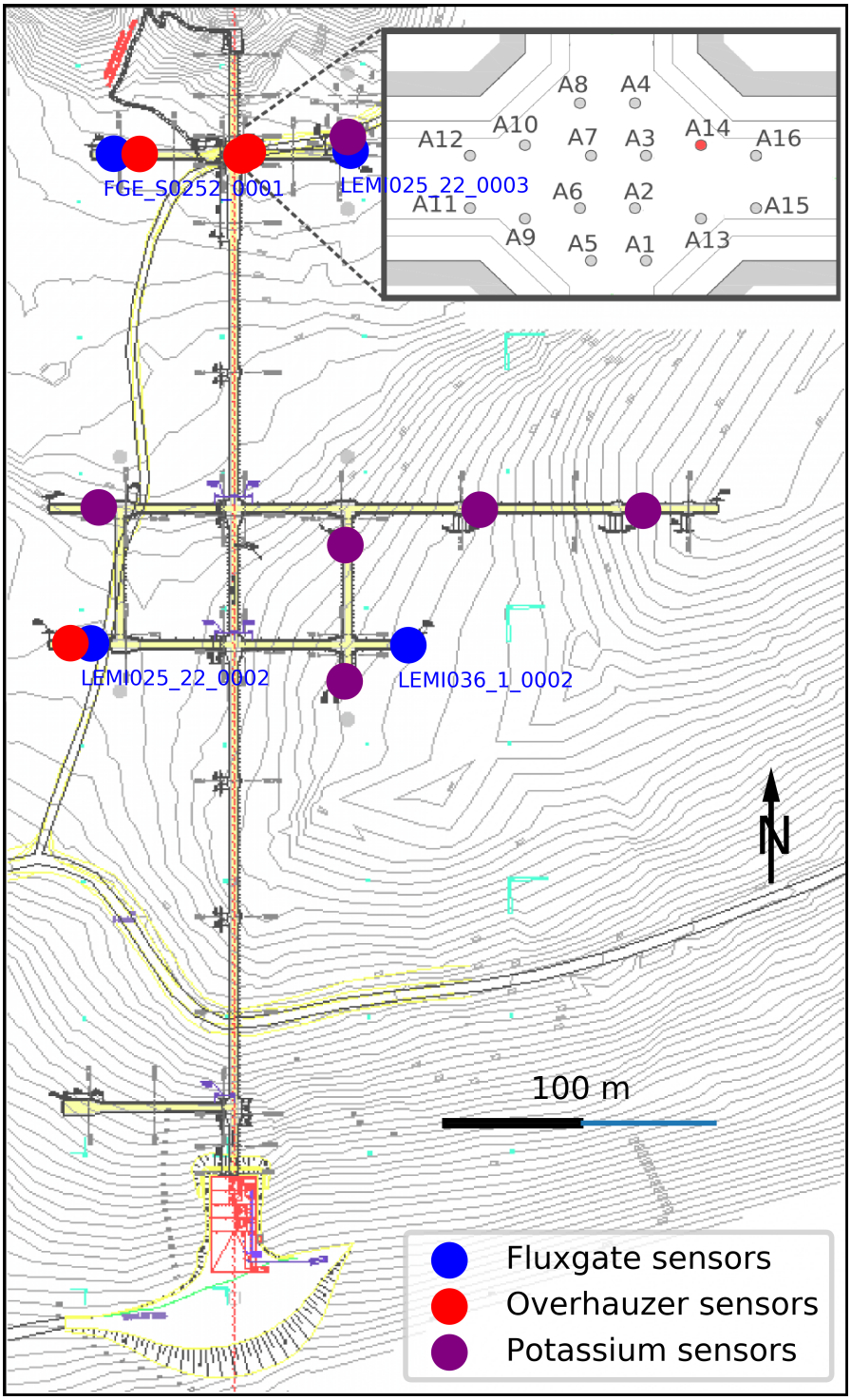

Figure 2.1: Location map of the Conrad Observatory with instrumentation

Chapter 3

Methods

3.1 Acquisition and data transmission

Variations in directional components of the Earth's magnetic field at the Conrad Observatory in 2018 are mainly based on measurements from a LEMI036 sensor. This instrument is installed in hdz orientation within the tunnel system of the geomagnetic observatory (Figure 2.1). It fullly satisfies the current one-second INTERMAGNET minimum requirements. The LEMI036 vector magnetometer samples the magnetic field and its data is digitally filtered to None. One-second and one-minute values are produced using the standard INTERMAGNET Gaussian filter [*St-Louis*, 2012]. A scalar magnetometer, which samples the field at , is used to determine the geomagnetic field intensity. As with vector measurements, filtered values are produced using a Gaussian filter. Most measurement systems at the Conrad Observatory are connected to a *Magpy Automated Realtime Acquisition System* (MARTAS) [*Leonhardt et al.*, 2013], which reads e.g. serial communication data and buffers field records. Any data is then continuously streamed using MQTT (Message Queuing Telemetry Transport). A *Magpy Automated Realtime Collection and Organisation System* (MARCOS) registers on ports of several MARTAS and collects all data and the related metadata within a MySQL database. An independent analysis process frequently checks the contents of the database and produces all data products near realtime. Adjusted data sets are then forwarded on to our FTP server and the INTERMAGNET gins every 5 minutes. GPS signals are used to ensure exact timestamps. As all measurements are performed underground, the GPS signal is transferred by optical fibres to the cabinets in the tunnel, which house the sensor electronics and the MARTAS. The time delay, conservatively estimated making use of the manufacturer's data as well as distance considerations between outside GPS antenna and cabinet, is about 10^{-6} seconds. Each setup of sensor and acquisition unit is equipped with an independent lightning protection system and a local uninterruptible power supply facilitating approximately 72 hours of service after power loss. An observatory wide uninterruptible power supply with roughly 40 hours of power adds to this two-step protection system and primarily secures data transfer towards the two redundant MARCOS servers. Data acquisition is therefore safe for about 5 days in the case of a full power loss. Data acquisition as well as all analyses including filtering procedures, baseline calculations, format conversions, and others discussed here, are performed using MagPy packages [*Leonhardt et al.*, 2016]. Version v0.4.8rc0 is available at https://github.com/geomagpy/magpy.

Table 3.1. Fluxgate theodolites used at pier A2 and their serial numbers

Theodolite (SN)	Fluxgate (SN)	Amount
T010B 160471 032019	Mingeo FluxSet1 032019	2
T010B 160391 072011	MAG01H 562-1024H 032016	12
T010B 160391 072011	MAG01H 504-0911H 032016	58
T010A 811643 042012	DTU DI0146 042012	55

3.2 Baseline adoption

Magnetic observatories record the geomagnetic field from very high frequencies, which is of particular interest for the study of externally triggered field variations such as pulsations and geomagnetic storms, up to long term variations covering months and years, which mainly have internal sources and are required to analyse secular variation over decades and centuries. However, vector magnetometers tend to drift over such long time scales, due in part to temperature variation, ageing of the device and slow pillar movements. The drift of the instruments deployed at the Conrad Observatory is rather small (less than 0.30 nT per year for 2018), nevertheless it is necessary to perform DI measurements, which precisely determine the declination and inclination using a fluxgate theodolite [*Jankowski and Sucksdorff*, 1996]. The vector value is then reconstructed by additionally using independent measurements of a scalar magnetometer. Their drift, which is usually assumed to be negligible, is tested by comparing independent records of several instruments. For absolute measurements we use several different types of fluxgate theodolites. The primary instrument is a T010B 160391 072011 equipped with a MAG01H 504-0911H 032016 fluxgate magnetometer. In addition, we also perform frequent measurements with other fluxgate theodolites as listed in table 3.1. Most measurements are conducted on the absolute pier A2. The primary azimuth mark is 380 m away at the southern end of the tunnel, which ensures the absence of any thermal fluctuations when aiming. The primary, permanently recording F instrument, located on pier None, is 100 m distant from the main absolute pier A2 and shows a total constant F difference of -1.57 nT. Magnetic field differences between all absolute piers are regularly measured by an additional scalar magnetometer, which is moved every week on another of the 16 piers. Table 3.2 summarizes all delta values within the absolute area of the Conrad Observatory. Overall the horizontal gradients within this area of the tunnel system at pier height are on average less than 0.13 nT/m (maximum: 0.43 nT/m), indicating perfect measurement conditions by international standards [*Jankowski and Sucksdorff*, 1996]. Since the opening of the observatory, absolute measurements have been made on average every 7.0 days, which is sufficient to monitor expected variation/drift signals at this location. Measurements make use of the 'residual' technique [*Lauridsen*, 1985]. DI values are measured, typed into an online form, automatically analysed using MagPy and stored within the observatory databases. It should be noted here that the analysis algorithm requires variation data in a magnetic coordinate system (HDZ, HEZ). Beside routine measurements on pier A2, automatic measurements are periodically performed on pier A16 using an AutoDIF system [*Rasson and Gonsette*, 2011]. Furthermore, DI measurements are conducted once a month in a wooden hut (pier H1) outside the tunnel approximately 350 m south-west of A2 using a mire perpendicular to the two main azimuth marks of A2 for stability control. These measurements are discussed below.

Table 3.2. Delta values for all piers with respect to A2. These delta values need to be added to data from the respective pier to correct the measurements towards A2.

Pier	Distance to A2 [m]	δF [nT]	Epoch (F)	δD [ArcSec]	δI [ArcSec]	Epoch (Dir)
A1	1.75	-0.09	2018			
A10	4.38	-0.85	2017	-26.244	-0.684	2016
A11	7.38	-0.51	2017			
A12	7.47	-0.35	2016			
A13	2.38	-0.13	2018			
A14	2.65	0.41	2018			
A15	5.56	-0.11	2015			
A16	5.73	0.81	2018	90.612	-16.308	2018
A3	2.20	-0.10	2018			
A4	3.96	0.83	2018	0.000	-8.352	2018
A5	2.41	-0.39	2018	0.000	0.000	2018
A6	1.75	-0.75	2018			
A7	2.69	-0.07	2018	0.000	-5.256	2018
A8	4.39	0.62	2018	33.912	0.000	2017
A9	4.22	-1.01	2018			
H1	353.89	1.08	2018	0.000	0.000	2018

3.3 Data analysis and products

Principally we publish and submit three types of data sets, which are distinguished by their information content and speed of availability: adjusted data, quasi-definitive data and definitive data. Adjusted data sets are produced and published completely automatically every 5 minutes. The following analysis steps are routinely performed every 5 minute cycle:

1. Filter incoming MQTT data streams from all instruments to one-second IAGA/INTERMAGNET recommended products.
2. Check availability of data and define primary instruments according to a priority list.
3. An automatic outlier detection tool (MagPy) is checking and flagging the one-second data product.
4. Get primary one-second variometer data, apply the flags, apply compensation fields, eventually transform towards HEZ.
5. Read all existing basevalues and calculate a constant baseline approximation using the geometric mean of the last three months.
6. Perform baseline correction with adopted constant baseline.
7. Get one-second scalar data, apply flags, apply latest pier offset.
8. Merge variation data and scalar data.
9. Store distribution formats (ImagCDF, IAGA-2000) and submit data to Edinburgh GIN.
10. Filter final data set to one-minute and repeat storage and submission.
11. Special analysis: k-value determination, storm detection, gradient analysis, web page plots.

As the baseline is very stable at the Conrad Observatory, the constant baseline approach is a fast and reasonable approximation of the definitive values (Figure 4.1. The automated outlier identification method uses relatively weak criteria. Therefore some outliers and artificial disturbances are still present in this data set.
Quasi-definitive data sets are produced in a semi-automatic routine. Once a week an automated job checks for current flagging information for the primary systems within the database. Whenever an observer has finished the flagging procedure by inspecting the data of the primary instruments for a certain time range, these dates are updated within the database. The QD job now extracts all yet unanalyzed data prior to the last inspected data minus one week. The additional week makes sure that basevalues are available as they are determined in a weekly period. Then basevalues are obtained and a one-year baseline is calculated using the latest baseline function parameters (see below). All other steps follow the procedure of adjusted data production.
Definitive data is produced once a year using a manual iterative process. In a first step, we review all existing flagging information for the respective year starting in December the year before until end of January, thus covering 14 month. For flagging we consider observatory notes and many additional sensors indicating traffic, environmental changes etc. We use difference analysis and gradients of individual instruments and analyse derivatives of signals. Any additional flag is added into the flagging database. Then we analyse one year of data using a constant baseline hypothesis (see next chapter for details). Step1 definitive data is calculated and the overall delta values are examined. For step 2 we eventually add any additional flagging information. The baseline is now calculated using optimal functional parameters. Step 2 data is used to obtain and analyze pier differences. In the final step 3 we finally consider all pier differences and produce the final result. All analyses steps are performed on high-resolution data, usually with one-second intervals, for all sensors and combinations. One-minute definitive data is a filtered product of these results. Please note that for one-second data we do not fill gaps with data from other sensors as they might have different frequency characteristics. All final dissemination products (IAF, ImagCDF, IAGA-2000) are obtained from the final step 3 results .Further details are depicted in chapter 5.
K values are calculated according to the FMI approach [*Sucksdorff et al.*, 1991], which is one of the IAGA recommended routines [*Menvielle et al.*, 1995]. The method uses three major steps: in the first run, K values are calculated by simply determining the maximum-minimum difference of the minute variation data within three hour segments. This is done for both horizontal components and the maximum difference is selected. Using a transformation table related to the Niemegk scale and a $K9$ level of 500 nT, the K values are then calculated. Based on this step, a first estimate of the quiet daily variation (S_r) is obtained. Finally, hourly means with extended time ranges (30min + m + n) are obtained for each half hour. m refers to 120 minutes (0-3a.m., 21-24p.m.), 60 minutes (3-6, 18-21) or 0 minutes. n is determined by $K^{3.3}$. Using these newly obtained hourly means, the final K values are calculated. Preliminary data are made publicly available within 5 min on the ZAMG data distribution server and on the INTERMAGNET's website (www.intermagnet.org). Quasi-definitive data are produced following the methods described above and are usually provided within three weeks after acquisition on the same servers. Definitive data for each year are prepared within a couple of months after the end of the year. They can be retrieved from INTERMAGNET's website or from the website of the Conrad Observatory, Zentralanstalt fuer Meteorologie und Geodynamik (http://www.conrad-observatory.at). After a final cross-check by specialists from other institutions participating in INTERMAGNET, definitive data are published on a DVD/USB medium together with the definitive data from the whole INTERMAGNET network.

data should include an acknowledgement statement of this form: The results presented rely on data collected at the Conrad Observatory, Austria. We thank the Zentralanstalt fuer Meteorologie and Geodynamik (ZAMG) for supporting its operation.

Chapter 4

Accuracy and Coverage

4.1 Basevalues and Baseline

4.1.1 Primary baseline adoption

One measure of the accuracy of geomagnetic data is the quality of the baseline, i.e. the calibration curves that are used to correct the slow drift in time of the vector magnetometer in order to produce definitive data. Baselines for the Conrad Observatory are obtained for H (horizontal), D (declination) and Z (downward vertical) components by fitting a cubic spline curve to the correction values deduced from the absolute measurements. Each year the spline curve is calculated using data from mid-December of the previous year to mid-January of the following year in order to avoid discontinuities from one year to the next.
Base values and the corresponding best fitting baseline are shown in Figure 4.1. 125 absolute measurements by the WIC observers on pier A2 were considered for the analysis of 2018 (each one represented by a gray point). On average, DI measurements were performed with a period of 7 days. In a first run, a constant baseline approximation based on a median value of all basevalues is used. This approach is depicted by the blue line in Figure 4.1. Making use of this approximation and calculating the difference between this baseline corrected directional data and a independently recording F value will result in a delta F value as shown in the blue curve in the lower plot of Figure 4.1. The here observed variation gives an indication about the actual complexity of the baseline. An optimal baseline was determined using MagPy's fitting function with a spline fit (knot parameter = 0.3, which is the normalized distance between spline knots) as shown by the red line in Figure 4.1. A more complex fitting function (e.g. magenta curve) does not improve the delta F value. For each component, a measure of quality of the absolute measurements was assessed by calculating the standard deviation of the residuals between all measurements and the baseline curve. The obtained standard deviations are 0.27 nT for H, 0.13 nT for Z and 5.2 arcsec for D, which are well within INTERMAGNET requirements. Calculated baseline curves have a maximum amplitude of 0.65 nT in the X and Z components, and 10.2 arcsec in the declination. Base values indicate a long term variation of the baseline with signal periods larger than half a year, therefore the typical frequency of one absolute measurement per week is sufficient to observe and correct these trends. Baseline variations are very limited throughout 2018. The resulting δF (see section 4.2) and and variometer differences after baseline correction are virtually zero.

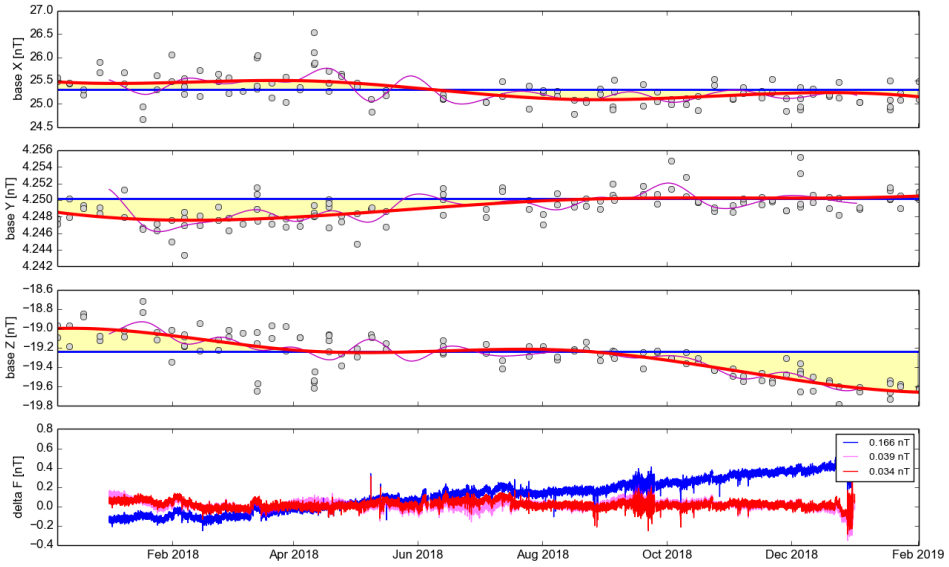

Figure 4.1: Basevalues for the primary vectorial system LEMI036 and iterative choice of optimal baseline. The first analysis step makes use of a constant baseline approximation (blue line). The resulting delta F values between baseline-corrected variometer and permanently recording F are depicted in the lower plot (also in blue) and show a considerable trend. According to this remaining trend a cubic spline fit (red) is chosen, leading to a significantly improved delta F close to zero and characterized by a very low variance. Fitting small scale variations of basevalues (magenta) will not improve the delta F value. Actually the variance is getting larger again as expressed by the overall standard deviations given in the legend of the delta F plot. The red curve is therefore chosen as optimal baseline for definitive data.

4.1.2 Consistency between measurement piers

Beside manual DI determination, an automatic DI measurement system (AutoDIF) [*Rasson and Gonsette*, 2011] is in operation at Conrad Observatory. The system is located on pier A16 (Figure 2.1). This automatic unit is configured to measure base values every 60 minutes. For analysis of this data, the site differences between A16 and the main pier A2, as listed in Table 3.2, are accounted for. As done for the manual measurements at pier A2 we also calculated the standard deviation of the residuals as a measure of quality. The obtained standard deviations are 0.70 nT for H, 0.34 nT for Z and 20.2 arcsec for D. A maximum amplitude of 1.68 nT in the X and Z components, and 12.6 arcsec in the declination is obtained. In 2018 DI measurements have been performed on six piers, A2, A4, A5, A7, A16, and H1. Beside the main pier A2, where most manual measurements were done, we do monthly manual determinations on piers A7, H1 and non-periodical measurements on A4, A5. Automatic AutoDIF measurements on pier A16 are performed every hour and are available until June. Figure 4.2 shows the average daily basevalues of all piers analysed for the main variometer. All basevalues are almost identical and exhibit a very similar almost linear trend which underlines the high quality and stability of the chosen adopted baseline shown as red line in Figure 4.2. Please note that for this plot the piers

delta values as given in table 3.2 have been taken into account. AutoDIF data is continuously available since until June 2018. The quality of these measurements is very good. After upgrading the system it will commence operations in 2019. In summary all tests support the high quality of the baseline of the Conrad Observatory.

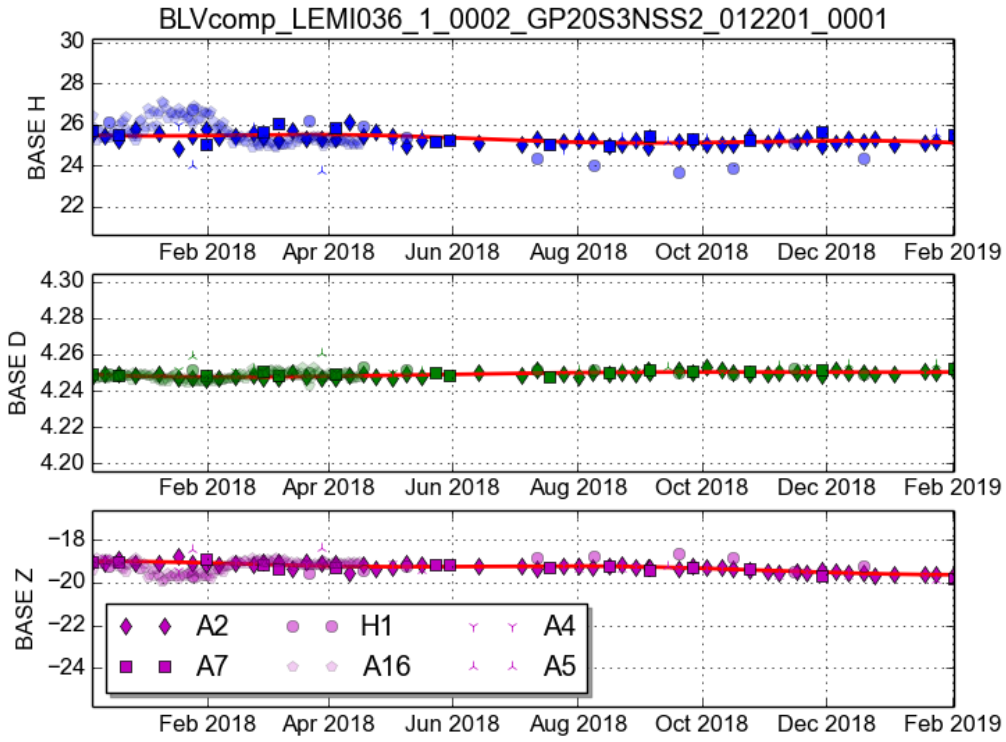

Figure 4.2: Combined plot of all basevalues for the LEMI036 variometer as determined on the piers given in the legend. Average pier differences as listed in Table 3.2 have been regarded for.

4.2 Delta F

The quality of the measurements can further be assessed by looking at the scalar residual, which is the difference between the field strength directly measured by a scalar magnetometer and the field strength derived from the vector measurement after drift correction with the baseline curve. As can be seen in Figure 4.3, the scalar residual of minute mean values corresponds to an average of 0.02 nT with a standard deviation of 0.03 nT. The maximum amplitude remains below 0.60 nT for the year 2018. Taking baseline and delta F uncertainty estimates into consideration by combining the scalar residual and statistical variation of absolute measurements results in a 2-σ uncertainty scenario with maximum values of $\pm$ 0.30 nT for all components in 2018.This is well within INTERMAGNET's requirement of a 5 nT accuracy for definitive data [*St-Louis*, 2012].

Figure 4.3: Delta F values between the scalar magnetometer and the field strength calculated from the baseline corrected vectorial data set. The scale of the figure is related to the INTERMAGNET 5 nT criteria.

4.3 Variometer differences

A third measure of quality comes from the comparison of records from different variometers after baseline correction. Additionally this test also provides an independent check of correctness of adopted baseline algorithms, especially if the the two instruments are not identically oriented. For difference analysis, the orthogonal X, Y, and Z components of available variometer records after baseline correction are subtracted from each other. In 2018, variometer data from 2 independent systems are compared. In Figure 4.4, we depict these differences for each component and for each variometer relative to the primary variometer LEMI036. The scale of the figure is related to the INTERMAGNET 5 nT criteria, and the analysis makes use of filtered one-minute data. The average residual of the X component and its standard deviation is -0.03±0.10 nT. For the Y and Z component values of 0.04±0.09 nT and -0.02±0.08 nT are obtained. Variation data of two instruments is available for a, full records from a LEMI036 and a LEMI025. All variometers are set up in HEZ orientation. Due to secular variation, the magnetic reference system changes with time and all systems slightly deviate from "perfect" orientation of Y towards magnetic east. These angular differences are considered in basevalue determination and a detailed manuscript on significance and application is in preparation. After baseline adoption, the differences of all instruments is negligibly small, supporting the following three conclusions: 1) the algorithms and the calculation of adopted baselines, as depicted in section 3.2, are correct; 2) all instruments record an identical geomagnetic field at all periods; and 3) the combination of all accuracy tests

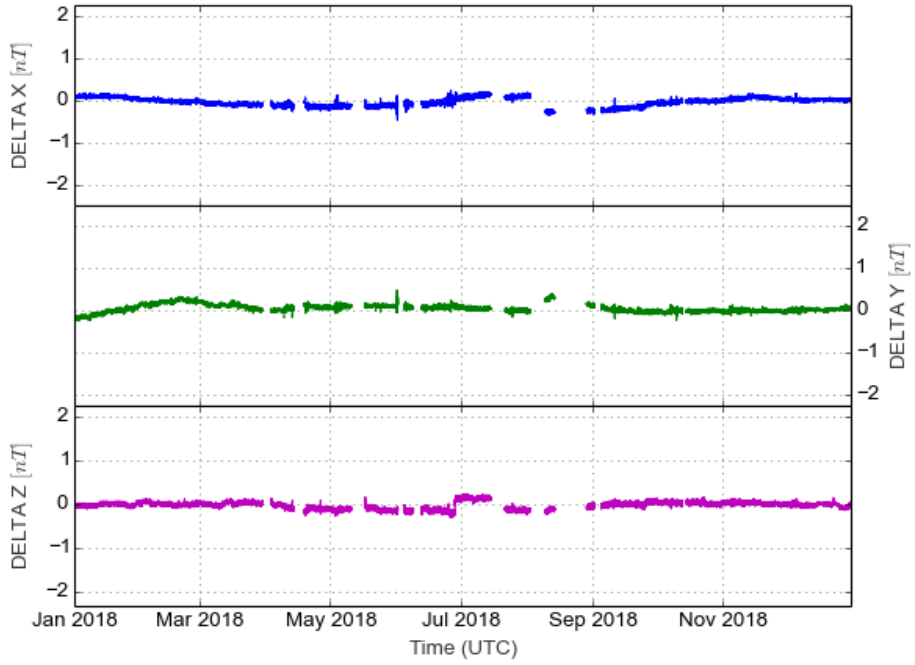

Figure 4.4: Delta values of vectorial components of baseline corrected variometer data.

underlines the very high quality of the geomagnetic field record.

4.4 Residuals between absolute DI and definitive data

Another internal quality check makes use of absolute DI measurements, by calculating the residual between these absolute values and the definitive data product. If all analysis steps are valid and correct, the residual between DI and definitive data needs to be almost zero. For difference analysis both measurements are transferred into an XYZ coordinate system and subtracted from each other. Please note, that we are using the minute resolution definitive data here, requiring some interpolation. The average residuals are 0.003 nT for X, 0.045 nT for Y and -0.005 nT for Z underlying the correctness and quality of our analysis procedure and our final data products.

4.5 Data coverage

A data coverage of 99.7 % of vectorial data in minute resolution was established for 2018. For filtering we use the recommended approach: minute means are only calculated if at least 90 % of one-second data is available within the filtering window. Therefore the relative recovery rate for one-second data is eventually higher. For scalar minute data, a data coverage of 98.9 % was obtained. One-second definitive data provided online consists solely of variation data from LEMI036 and scalar data from GP20S3NSS2 (see table 2.1). For minute data, gaps within the variation sequence were filled using secondary variometers. Gaps in the scalar one-minute record

are filled by data from secondary scalar systems. For 2018 the composite minute data set consists of contributions from all instruments shown in figure 4.5. Yellow shaded regions indicates the availability of variation data, green shaded regions indicate the presence of scalar data. The lowermost plot indicates average differences between all scalar values. The basic reason for only using single instrument records for our definitive one-second data is to maintain the frequency characteristics of the underlying instruments. For filtered one-minute data and longer periods, all instruments have widely similar characteristics within the frequency domain, which means an averaging and gap filling procedure is justified. Variation data is available almost continuously

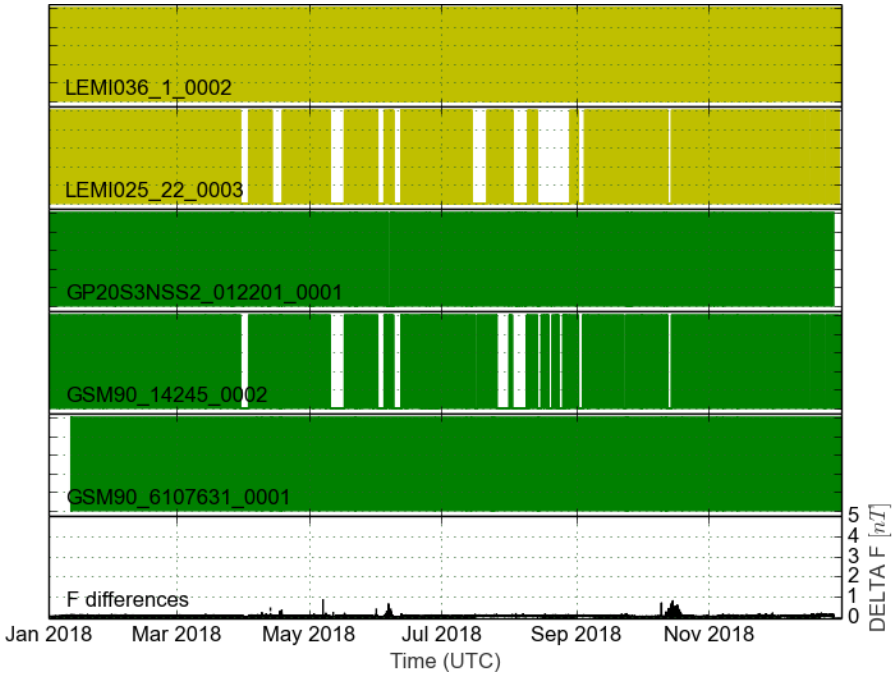

Figure 4.5: Contributions of each sensor for the analysis of 2018. Yellow shaded regions indicate time ranges of respective variometer data, green shaded regions mark scalar data which has been averaged for the composite one-minute record. The lowermost plot depicts the average difference between all scalar data.

for 2018. Minor gaps are mainly related to thunderstorms and disturbances due to wood work in the vicinity of the observatory. Thunderstorms occurred frequently and produced a lot of spikes. Table 9.2 in appendix gives an overview about days with thunderstorms and an estimate of independent lightning events with magnetic signatures. The one-second data record consists solely from data of LEMI036. For minute values, the LEMI025 record was merged into LEMI036 data to fill gaps, a procedure which is absolutely valid looking at the similarity of both records after baseline correction. Scalar data was mainly recorded with three instruments in 2018. One-second data is based solely on GP20S3NS2. For minute data, gaps are filled. Minor gaps in the scalar record have the same reasons as listed above for the variometer.

Chapter 5

Definitive Data

5.1 Definitive data production

A compilation of all results is shown in Figure 5.1. Vectorial components, after baseline correction, comprise the upper three plots. An independently measured value of the field strength F is shown below. Temperature variation is very small. The average temperature corresponds to $6.05 \pm 0.03\ ^{\circ}C$. Please note that the absolute value of temperature is not accurately known; its variation, however, is very precise and almost negligible. The lower two plots show the locally determined K value and the global index K_p provided by the GFZ Potsdam, which have similar characteristics. All variometers located at the Conrad Observatory were set up in HEZ direction at the time of installation. Due to secular variation, the magnetic coordinate system is slowly moving in time. This will lead to increasing deviations from a perfect HEZ orientation for all variometers. The baseline correction technique of *Lauridsen* [1985], however, requires HEZ orientation. Even slight deviations from this boundary condition will lead to an improper variation correction which can result in slight offsets of δF, as an example. The LEMI036 variometer was set up in December 2015. Since then, the east component has moved by an angle of -0.582 degrees, which can be easily tested with reasonable accuracy by rotating the yearly average HEZ so that the average E component results in zero. For definitive data production, all calculations are performed on such coordinate-transformed data. A few magnetic events are visible in 2018 (Figure 5.1), marked by large vectorial deviations and high K indices. The events correspond to geomagnetic storms, in particular to coronal-mass ejections hitting earth. Throughout the year a gradual increase of Z and a west-ward trend in declination is visible, as also found in the long-term trend in central Europa (see next chapter).

5.2 Comparison to preliminary and quasi-definitive data

Adjusted and quasi-definitive (QD) data is available from December 2015 onwards, although QD datasets are regularly uploaded to the GIN in Edinburgh only since end of 2018. Since then these data sets are primarily based on LEMI036 variation data as this instrument is characterized by the smallest noise level. For 2018 quasi-definitive data has not been created regularly. Therefore we are only discussing adjusted data in the following. Adjusted data and definitive data show average differences of less than 1.13 nT in x, less than 0.24 nT in y, less than 0.09 nT in z and less than 0.06 nT in F. Please note that for 2018, definitive data and QD/adjusted data originate from different instruments. The differences are well within the 5 nT range for suitable

quasi-definitive data.

5.3 Disturbances and anthropogenic signals

5.3.1 Temperature effects

Although the temperature within the tunnel is very stable and variations are very limited, once in a while maintenance work is necessary. Usually the tunnel temperature is not affected. However, electronic cabinets need to be opened, which usually contain sensor electronics, GPS equipment, and industry PC's for data buffering. The temperature in the cabinets, which is slightly enhanced by up to 3 degrees due to the electronics, drops towards the tunnel temperature. By closely looking at such temperature variations it is observed that changes of the LEMI025 (and also LEMI036) electronics affect the stability of the variometer record. This is clearly expressed by comparing delta F values of the variometer with temperature variation (Figure 5.2). The variometer sensor, the F sensor and the F electronics used for delta F calculation remain at constant T. A small phase shift is observed between temperature and delta F variation of 4 minutes. By plotting normalized variations of temperature and delta F a linear dependency is observed (Figure 5.3) at ambient temperatures of about 8 degrees.

5.3.2 Frequency characteristics and noise levels

As we provide high resolution (one-second) data it is necessary to investigate and discuss the spectral content of our data. Spectral content and signal-to-noise ratio are dependent on instrument and site characteristics. The LEMI instruments deployed at the Conrad Observatory are referred to show very low noise levels (see table 2.1), conform with INTERMAGNET one-second standard recommendations. As shown in Figure 5.4 the noise level of our primary variometer, LEMI036, is found to be even lower with values of 8 $p\mathrm{T}/\sqrt{Hz}$ during quiet days. Here we look at the digitally filtered 10Hz raw data of the instrument. A distinct technical peak at 1 Hz is present here. The reason for this remains to be clarified with the manufacturer. The primary scalar magnetometer, GP20S3NSS2, which is a particulary low noise potassium sensors, exhibits noise levels of about 1 $p\mathrm{T}/\sqrt{Hz}$ for F (Figure 5.5), almost 10 times lower than the variometer, and approximately 10 $f\mathrm{T}/\sqrt{Hz}$ for F gradients. The gradually decreasing powerspectrum indicates that even at 1 Hz (Figure 5.4) we are well above the white-noise-level.

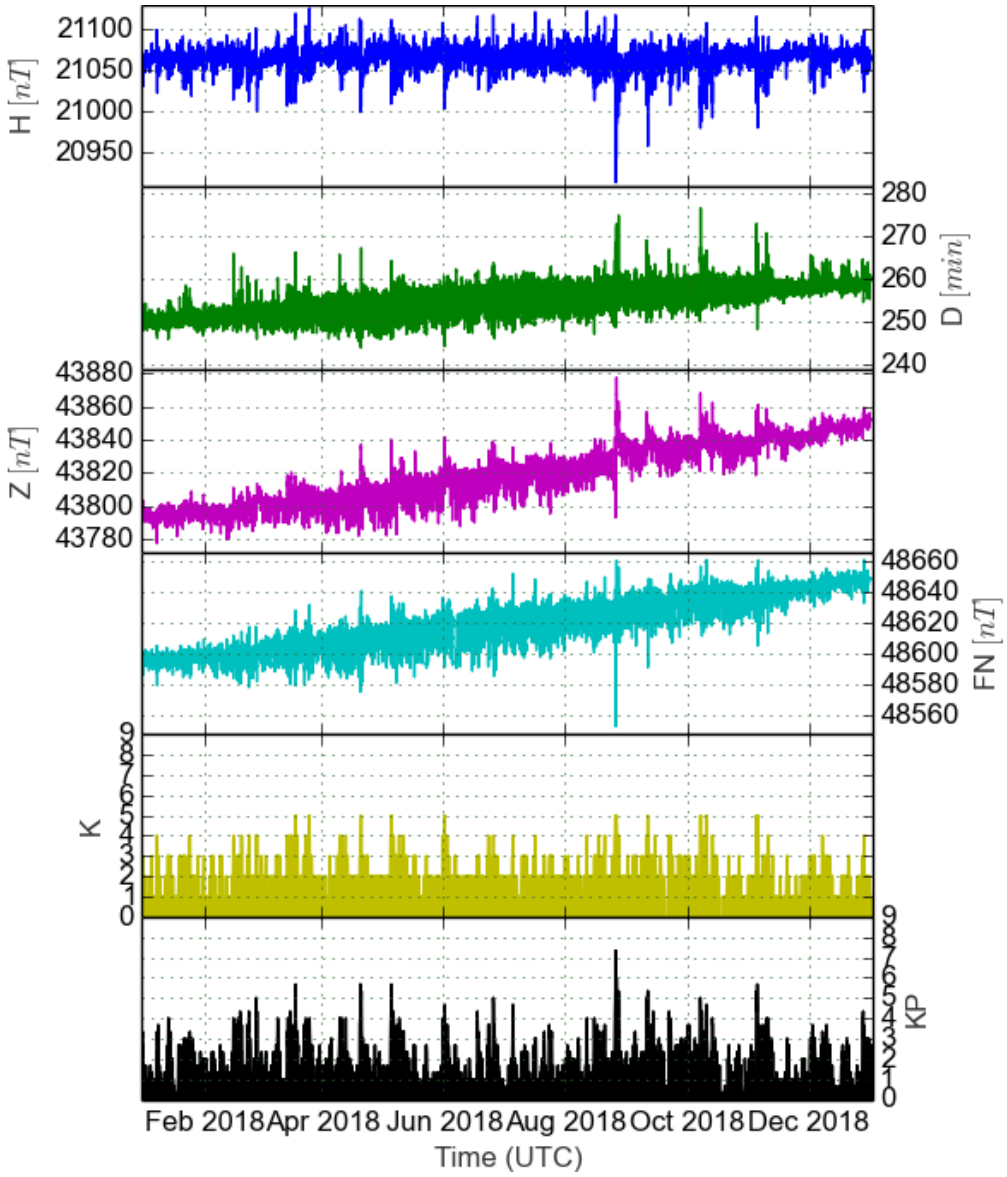

Figure 5.1: Definitive one-minute data of WIC. Shown are the three baseline corrected vectorial components, the independently determined F value and the temperature variation at the sensor position, as well as local K and global K_p indices.

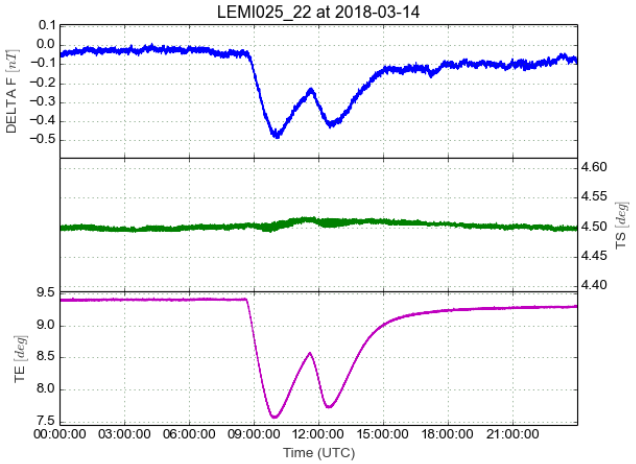

Figure 5.2: Delta F values of the definitive data from the secondary variometer LEMI025 (SN: 22) relative to the primary F sensor, as well as temperatures of the variometers sensor (Ts) and its electronics (Te) for a single day when the cabinet containing the electronics was opened. The effect on delta F is clearly visible.

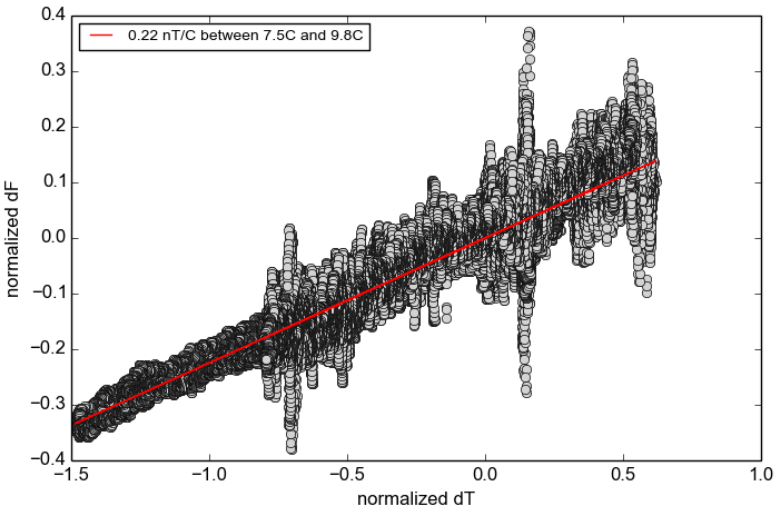

Figure 5.3: Cumulative plot of normalized temperature variations of the sensor electronics versus normalized delta F variations for altogether 5 days when the electronics cabinet was opened. Sensor temperature variations are negligible.

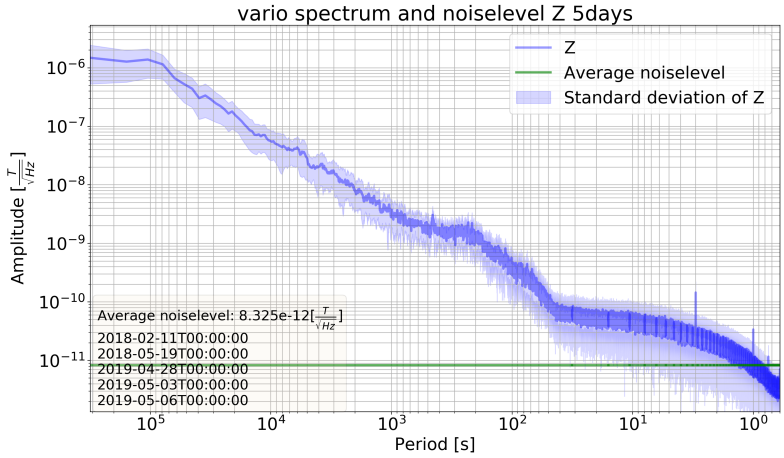

Figure 5.4: Representative quiet day powerspectrum of the primary variometers Z component. Horizontal components show similar values.

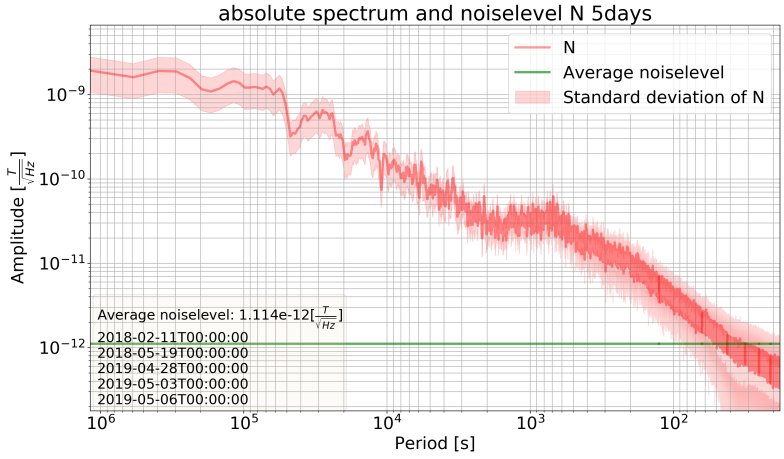

Figure 5.5: Representative quiet day powerspectrum of the primary scalar instrument.

Chapter 6

Geomagnetic Characteristics

6.1 Secular Variation

Geomagnetic secular variation originates in the dynamo processes of the Earth's outer core, where fluid flows generate the main magnetic field. In order to reduce geomagnetic contributions of external origin such as the interaction of the Sun's magnetic field with the Earth's magnetosphere, monthly and annual means are calculated. It should be mentioned that this procedure does not completely remove external field contributions. The monthly and yearly mean data for Conrad Observatory are provided in tables 6.1 and 6.2, respectively. After combining yearly means of the two Vienna observatories Cobenzl, WIK (running from 1955 to 2015), and the Conrad Observatory, WIC (from 2014 onwards), a secular variation diagram as shown in Figure 6.1 has been obtained. In the combination of both data sets, the Cobenzl annual means have been corrected towards the Conrad Observatory values using the average differences of years 2014 and 2015. Fortunately, the location difference ($\approx$ 50 km) and thus the averaged difference in each component is not large and constant in time between the two years of overlapping records (diff X = 169 $\pm$ 2 nT, diff Y = -30 $\pm$ 1 nT, diff Z = -272 $\pm$ 1 nT).
As can be seen in Figure 6.1, field strength F and vertical component Z have been gradually increasing since 1955. Declination has been monotonously moving westwards and the magnetic meridian (Declination = 0 deg) passed the Conrad Observatory in 1973. The H component has also increased since the beginning of observation, but has shown minimal variation since 1980. Considering the last two years, a secular variation rate of dX = 8.0 nT/year, dY = 54.0 nT/year and dZ = 52.0 nT/year is obtained. Fitting and extrapolating an average annual derivative curve using cubic splines results in the following predicted average field values for 2019: H = 21081 nT, D = 4.40 deg, Z = 43872 nT. Please note that for this approximation it is assumed that the 50 km distant locations WIK and WIC have exhibited the same secular variation pattern in the past, as the WIK data has been corrected using constant offsets.

6.2 Geomagnetic Activity

6.2.1 Local K values and K_p

The K-index (K) and the planetary K-index (K_p) are used to characterize the magnitude of geomagnetic activity. K_p is an excellent indicator of disturbances in the Earth's magnetic field and is used by many space weather prediction centres. Geomagnetic storms typically result in DC fluctuations in power grids, interruptions to spacecraft operations and GNSS due to

Table 6.1. Monthly arithmetric means at the Conrad Observatory. These mean values are deduced from minute data sets. If less then 90% of data is available then averages are not calculated.

Date	X [nT]	Y [nT]	Z [nT]	Fn [nT]
2018-01	21006.042	1534.019	43795.544	48596.826
2018-02	21005.717	1539.450	43797.408	48598.581
2018-03	21005.419	1544.528	43802.879	48603.560
2018-04	21008.630	1548.435	43805.761	48607.691
2018-05	21009.810	1553.124	43811.135	48613.126
2018-06	21008.213	1559.062	43817.383	48618.177
2018-07	21011.517	1563.261	43820.754	48622.797
2018-08	21004.195	1569.188	43827.663	48626.149
2018-09	21000.918	1573.552	43835.101	48631.487
2018-10	21004.337	1576.823	43838.832	48636.524
2018-11	21006.246	1581.267	43842.698	48640.959
2018-12	21007.544	1585.567	43847.359	48645.810

Table 6.2. Yearly arithmetric means at the Conrad Observatory. These mid-year mean values are deduced from the yearly hourly data sets and therefore are not necessarily exactly equal to an average of the monthly means.

Date	x [nT]	y [nT]	z [nT]	f [nT]
2014	20995.000	1353.000	43633.000	48440.000
2015	20991.000	1402.000	43678.000	48480.000
2016	20999.000	1452.000	43718.000	48521.000
2017	20999.000	1507.000	43768.000	48568.000
2018	21007.000	1561.000	43820.000	48620.000

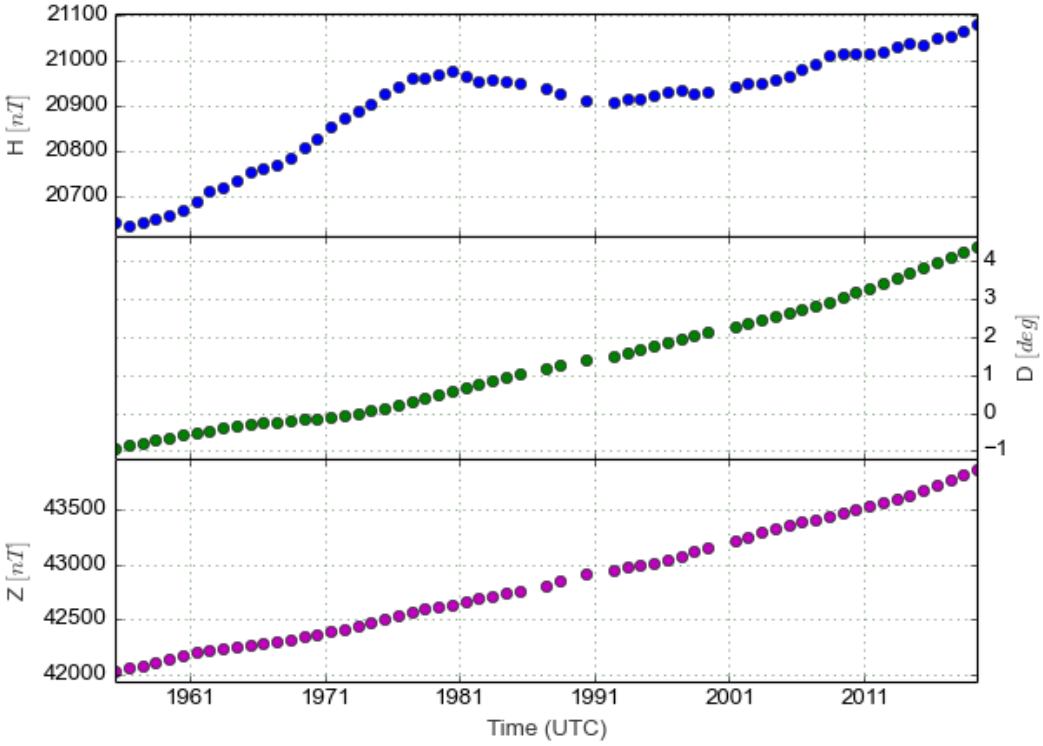

Figure 6.1: Yearly means since 1955. Data from 1955 until 2015 was obtained at the Cobenzl Observatory and corrected for the average offset of years 2014 and 2015 to the Conrad Observatory. Shown is also a predicted value for 2019.

ionospheric radio signal disturbances, and visible aurorae. The average local K for 2018 at Conrad Observatory corresponds to 1.4, which is in perfect agreement with the yearly average K_p of 1.4 provided by the GFZ Potsdam (http://www.gfz-potsdam.de/kp-index/). Figure 6.2 depicts the yearly and seasonal distribution of K values. As to be expected because of the orbital distance, the summer term is characterized by slightly higher average activity.

6.2.2 Quiet and disturbed days

On a global scale, quiet and disturbed days are identified based on three characteristics which each are used to define a single yearly or monthly ordering number (see http://www.gfz-potsdam.de/sektion/erdmagnetfeld/daten-produkte-dienste/kp-index/erklaerung/qd-days/). These parameters include (a) the sum of all K_p values of one day, (b) the sum of squares of all K_p, and (c) the maximum values of K_p. The three ordering numbers are then averaged and lowest and highest averages are selected. Is has to be noted that this measure is purely relative and is not representative for classifying and comparing disturbance levels of different time periods. Therefore additional notes and codes are used based on the average daily A_p index, originating from eight a_p values which are the nT thresholds for each K_p. Detail can be found in the link above. For describing quiet and disturbed days at the

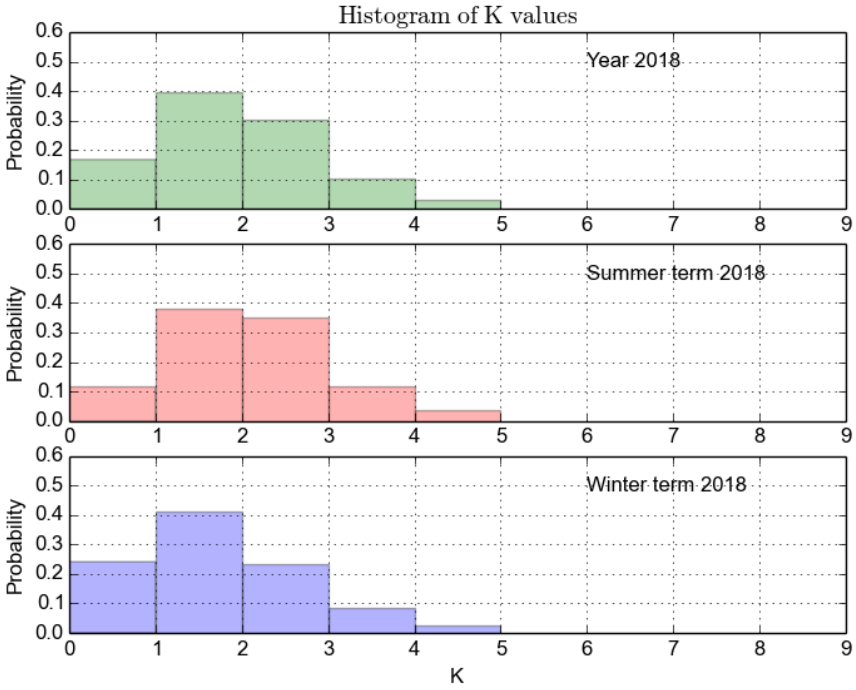

Figure 6.2: Distribution of K values.

Conrad Observatory, and to assure that data from all time periods is comparable, we prefer to use solely the average daily K index. Disturbed days are defined as days in which the average daily K index exceeds a value of 3.0. Such values were found for the following 7 days: 2018-03-16, 2018-04-20, 2018-05-06, 2018-06-01, 2018-08-26, 2018-09-11, 2018-11-05.
For quiet days the average daily K index needs to be below 0.5, and this was found for 26 days: 2018-01-03, 2018-01-06, 2018-01-07, 2018-01-11, 2018-01-18, 2018-02-11, 2018-02-14, 2018-04-16, 2018-05-21, 2018-09-20, 2018-10-17, 2018-10-18, 2018-10-19, 2018-10-20, 2018-10-29, 2018-11-17, 2018-11-18, 2018-11-22, 2018-11-26, 2018-11-28, 2018-12-13, 2018-12-14, 2018-12-15, 2018-12-16, 2018-12-22, 2018-12-23.

6.2.3 Geomagnetic Storms

Using an automated storm detection method [*Bailey and Leonhardt*, 2016], which aims to detect storms likely to cause geomagnetically induced currents, no storm alerts were issued in the year 2018. In the previous year, a total of 6 storms were detected, showing a decline in solar activity.

Chapter 7

Special: IAGA workshop 2018

In June 2018, earth magnetic field researchers from all over the world met at the Conrad Observatory in Austria. Three events were organized there: The XVIIIth IAGA Workshop, the IAGA Observatory Summer School for young Observers, and a meeting of the INTERMAGNET Committee. Summer School and the IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing took place at the Conrad Observatory of the Zentralanstalt fuer Meteorologie und Geodynamik (ZAMG), Austria. IAGA Observatory summer school was organized in the days before the IAGA Workshop for the first time, with the aim of providing young technicians and scientists as well as new observers with a good basic understanding of a wide range of observatory topics. Altogether 23 participants, sponsored by the LOC participated. The summer school provided an in-depth course on DI measurements, instrumentation and data processing with accompanying practical sessions given by experts in the specific fields: Alan Berarducci, Tim White and Chris Turbitt. The IAGA Workshop started on 24. June. The event attracted 110 participants from 36 different countries from all over the world. There were made 123 DI measurements by 32 different observers on four pillars at the tunnel system of the Conrad Observatory. In total 39 oral presentations were given and 35 posters were presented. Alan Thomson from the British Geological Survey gave an invited talk during the opening ceremony. Beside the poster sessions, an excursion to a winery and BBQ evening provided also an excellent opportunity for the geomagnetic research community for discussions about latest research, new developments, methods and measurement procedures.
Four different piers were dedicated to comparison measurements. From each DI measurement, base values are calculated in relation to a LEMI036 variometer and a GP20S3 potassium scalar magnetometer located in the North-eastern part of the Conrad Observatory tunnel system. In comparison to the preliminary individual results, which were sent out to each observer in 2018, the following different analysis procedures are conducted:

1. δD and δI values of the piers relative to A2 are now considered as given in Table 3.2. The determination of δD and δI does not consider measurements during the workshop.

2. δF values, as determined for definitive 2018 data are now used. The earlier analysis made use of 2017 values.

3. The reference values used for comparison are now based on all definitive 2018 data of the Conrad Observatory.

Means and uncertainty ranges are determined by geometric mean (median) and the normal standard deviation for reference and workshop data. All reference basevalues determined by Conrad

Table 7.1. Average DI base values for all observers

Observer	Pier	N	baseH[nT]	baseD[min]	baseZ[nT]	c_I[nT]	c_D[sec]
A Muslim	A2	2	24.68±0.68	255.12±0.09	-19.31±0.33	0.51	5.18
C Hegymegi	A5	5	25.51±0.31	254.88±0.18	-19.37±0.10	0.21	11.03
M Relly	A5	2	25.07±0.26	255.08±0.03	-19.16±0.07	0.17	1.97
A Domjan	A2	5	21.78±0.77	254.96±0.17	-17.59±0.35	0.56	10.08
	A5	2	25.32±0.01	254.89±0.10	-19.26±0.01	0.01	5.76
Luminita	A2	2	25.80±0.35	254.93±0.02	-19.55±0.15	0.25	1.14
	A5	1	24.07	254.81	-18.70	-	-
F Gracia	A2	4	24.77±0.67	254.83±0.07	-19.12±0.16	0.42	4.23
S Asari	A4	2	25.29±0.11	255.02±0.07	-19.32±0.02	0.06	3.96
E Hernandez	A7	1	23.91	254.00	-18.69	-	-
	A5	1	59.38	254.09	-35.77	-	-
T Raita	A4	5	25.20±0.44	254.77±0.08	-19.24±0.07	0.26	4.79
J Rasson	A5	4	22.97±0.45	255.12±0.09	-18.21±0.21	0.33	5.39
T Martyn	A4	5	24.82±0.86	255.00±0.17	-19.15±0.44	0.65	10.42
A Lewis	A7	3	24.35±0.39	254.76±0.15	-18.82±0.18	0.28	9.15
	A5	3	24.19±0.32	255.04±0.06	-18.79±0.11	0.21	3.72
M Lim	A2	2	25.94±0.50	255.03±0.19	-19.57±0.26	0.38	11.21
S Khomutov	A4	4	25.40±0.55	254.85±0.07	-19.38±0.24	0.40	3.91
A Caccavari	A2	1	25.86	254.76	-19.66	-	-
	A5	2	25.65±0.19	251.52±2.90	-19.58±0.08	0.14	173.78
A Gonsette	A5	6	23.59±0.67	255.08±0.05	-18.55±0.32	0.49	3.12
Alec Berarducci	A4	13	24.53±0.82	256.00±3.26	-18.88±0.44	0.63	195.34
T Swan	A4	2	25.44±0.18	254.92±0.00	-19.46±0.06	0.12	0.19
A Willer	A4	2	25.50±0.22	254.90±0.06	-19.29±0.06	0.14	3.88
J Morris	A2	7	22.65±3.24	254.57±0.20	-18.03±1.61	2.43	11.90
T Petersen	A2	1	3.96	255.15	-8.96	-	-
	A7	2	23.35±0.47	255.15±0.02	-18.41±0.26	0.36	1.50
Phani	A2	3	26.13±1.80	254.89±0.07	-19.75±0.98	1.39	4.05
	A7	2	26.10±0.98	255.20±0.02	-19.80±0.47	0.73	1.15
Csontos	A5	2	26.14±0.06	255.06±0.06	-19.64±0.04	0.05	3.33
M Vlk	A5	2	24.83±0.02	254.70±0.05	-19.17±0.12	0.07	3.03
I Mandic	A7	5	26.01±0.20	255.03±0.14	-19.65±0.11	0.16	8.37
T Bayer	A4	3	25.45±0.33	254.87±0.06	-19.38±0.13	0.23	3.63
Vaczyova	A7	3	23.18±2.42	255.79±1.07	-18.61±1.04	1.73	64.04
Alan Berarducci	A2	2	24.64±0.46	254.95±0.05	-19.06±0.05	0.26	3.03
	A4	6	24.94±0.57	255.14±0.45	-19.22±0.25	0.41	26.78
G Difuentes	A7	1	26.42	254.55	-19.92	-	-
	A2	2	25.02±0.14	254.67±0.13	-19.28±0.05	0.09	7.73
H Yufei	A7	3	25.27±0.32	255.00±0.06	-19.32±0.18	0.25	3.49
B Heumez	A2	6	25.70±0.40	254.92±0.04	-19.61±0.21	0.30	2.68

Note. — BaseH,D,Z are the average base values with uncertainty estimate for all measurements by the observer at the given pier. c_I and c_D are directly obtained from the uncertainties (c_I is the average deviation of baseH and baseZ in nT, c_D the uncertainty of baseD in seconds). These values provide a quantitative estimate of the consistency of repeated measurements.

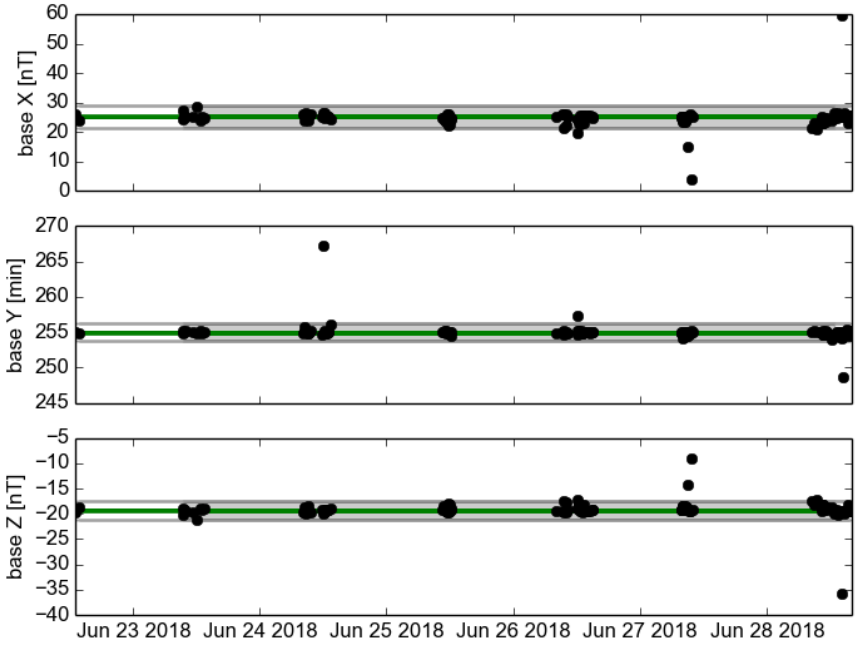

Figure 7.1: Black points denote all basevalues measured by the observers throughout the IAGA workshop 2018 on all piers. The gray shaded region indicates the standard deviation of all these measurements for each component. The green shaded area indicates the variation range of the reference measurements based on 2018 definitive data on pier A2 of the Conrad Observatory.

Observatory personnel in 2018 are used as reference. Workshop measurements are not used for reference calculation. This procedure is perfectly justified as all values can be well fitted by a straight horizontal adopted baseline for such short time ranges.
Figure 7.1 shows all individual measurements from all piers in comparison to the average reference base value. The mean value of workshop measurements lies within the green reference field for all components indicating that on average the workshop measurements perfectly agree with Conrad Observatory data. A few outliers within the workshop measurements are responsible for the relative wide deviation range of these measurements. Figure 7.2 provides the same information for each pier separately. Here the reference also only refers to measurements from this pier. Table 7.1 gives an overview about measurements of all observers. Provided are number of individual measurements on each pier and difference values relative to the median reference base. In order to estimate the quality of individual DI measurements, two main quality indicators are checked. Firstly, we test the internal consistency of all measurements, i.e. the reproducibility between individual measurements for each pier. The variables c_D and c_I in Table 7.1 provide a numerical quality parameter. c_D denotes the average standard deviation of individually measured horizontal base values in seconds of arc. c_I corresponds to the average standard deviation of vertical base values in nT. c-values within the 1σ range of reference values (see below) are considered to be excellent. Secondly, the deviation from the observatory reference values for each pier are tested. Overlapping one σ uncertainties indicate that both data sets are statistically

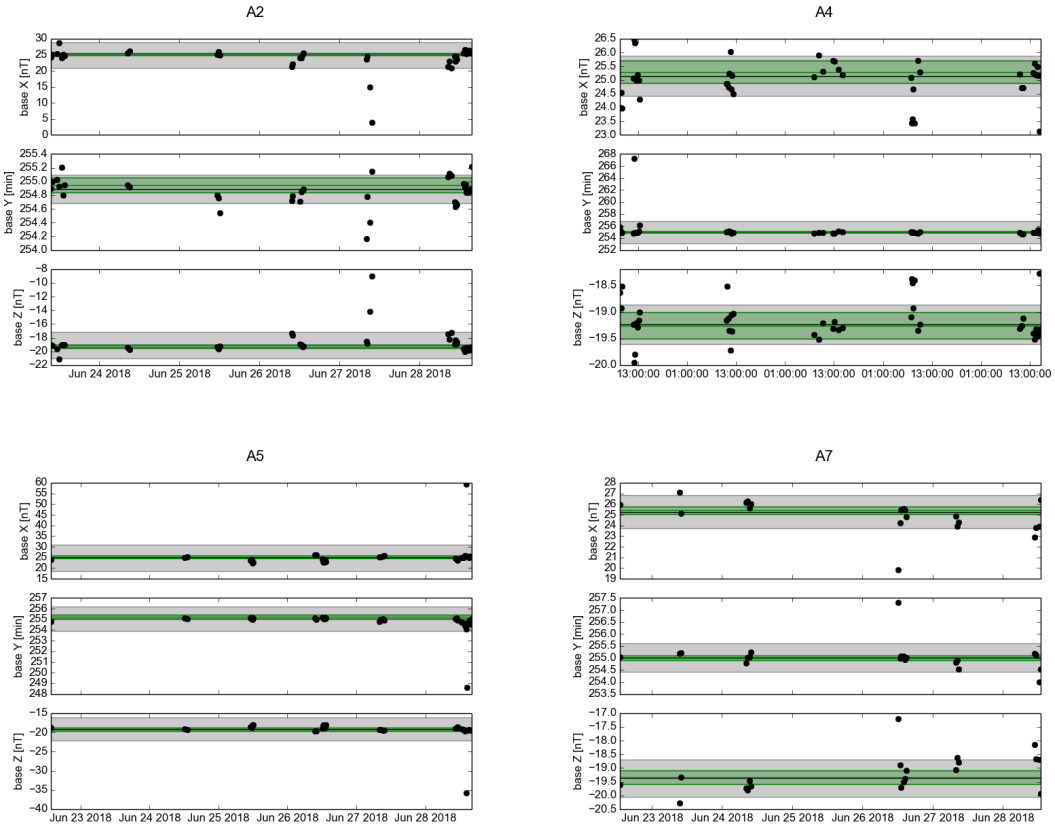

Figure 7.2: Same plot as above but now data is plotted separately for each pier.

similar. For a quality estimate we check the maximum difference between the 1σ range of the observer relative to the reference range for baseD, baseH and baseZ. Maximum differences of less than one σ are excellent, values within 2σ is very good, and so on. These results have been provided to all observers. Please note that good data requires both excellent internal consistency and excellent agreement to the reference. Overall consistency and agreement to the reference are very good. This is emphasized by the bar charts in Figure 7.1 summarizing all quality indicators of Table 7.1.

Beside DI experiments, two absolute scalar instruments were tested during the workshop. A GSM19 system from the BGS (T Swan, SN: 2055239) was set up for a few hours on pier A9. A POS4 sensors from the Quantum Magnetometry Laboratory unfortunately did not arrive in time due to customs problems. The instrument was installed after the workshop on pier A12 and comparison measurements were performed in September. Analyzed are differences regarding the Conrad Observatory 2018 definitive data considering respective pier differences relative to A2 (see table 3.2). The average F difference for GSM19 (SN: 2055239) is 0.03±0.02 nT considering 180 minutes of data starting from 2019-06-28 09:00 UTC with 10 seconds sampling period. The average difference for POS4 is 0.72±0.01 nT considering data of a full day (2019-09-17) with 5 seconds sampling period. This value has to be treated with care as the delta reference value for A12 is pretty old and will be redetermined in 2019.

Analysis has been done using MagPy 0.4.7.

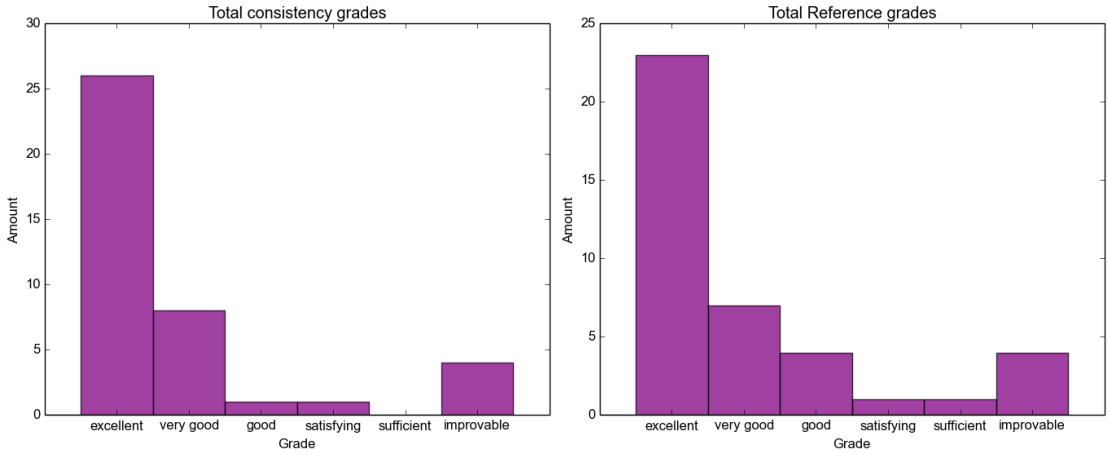

Figure 7.3: Bar chart of distribution of quality paremeters. Excellent measurements are dominating the distribution.

Chapter 8

Publications and Presentations

In 2018 the geomagnetism group contributed to the following presentations and publications:

- Arneitz, P. *Variations of the past geomagnetic field: global reconstruction based on historical, archeo- and paleomagnetic data*, Doctoral thesis, University Wien, *2018*
- Bailey, R. *Space weather and geomagnetically induced currents in Austria*, Doctoral thesis, University Wien, *2018*
- R. L. Bailey and T. S. Halbedl and I. Schattauer and G. Achleitner and R. Leonhardt *Validating GIC Models With Measurements in Austria: Evaluation of Accuracy and Sensitivity to Input Parameters*, Space Weather, 16, 887-902, *2018*
- Giampaolo Buticchi and Davide Barater and Roman Leonhardt and Rachel-Louise Bailey and Jingnan Guo *Active Power Filter to mitigate Geomagnetically Induced Currents effects in HV transformers*, EGU, *2018*

Bibliography

Bailey, R. and R. Leonhardt, Automated detection of geomagnetic storms with heightened risk of GIC, *Earth, Planets and Space*, *68:99*, 2016.

Jankowski, J. and C. Sucksdorff, *Guide for Magnetic Measurements and Observatory Practice*, 1996, ISBN 0965068625.

Lauridsen, K., Experiences with the DI Fluxgate magnetometer inclusive theory of the instrument and comparison with other methods, *Danish Meteorological Institute, Geophysical Papers*, *71*, 1–25, 1985.

Leonhardt, R., R. Bailey, M. Miklavec, and J. Matzka, GeomagPy, 2016.

Leonhardt, R., J. Matzka, and M. Wack, MagPy – A python based software for analyzing geomagnetic observatory measurements, in *Proceedings o f the XVth IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition, and Processing 3/13*, edited by P. Hejda, A. Chulliat, and M. Catalán, pp. 169–172, San Fernando, Cadiz, 2013.

Menvielle, M., N. Papitashvili, L. Häkkinen, and C. Sucksdorff, Computer Production of K indices : Review and Comparison of Methods, *Geophysical Journal International*, *123*, 866–886, 1995, ISSN 0956540X.

Rasson, J. and A. Gonsette, The mark II automatic DIflux, *Data Science Journal*, *10*, 169–173, 2011.

St-Louis, B., *INTERMAGNET Technical Reference Manual*, INTERMAGNET, Edinburgh, 2012.

Sucksdorff, C., R. Pirjola, and L. Häkkinen, Computer production of K-values based on linear elimination, *Geophysical Transactions*, *36*, 333–345, 1991.

Wessely, G., *Geologie der österreichischen Bundesländer: Niederösterreich*, Geologische Bundesanstalt, Vienna, 2006, ISBN 3-85316-23-9.

Chapter 9

Appendix

Table 9.1. K indicies: K indicies according to the FMI method as described in the text. Quiet and disturbed days are marked by Q and D respectively

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-01-01	2.0	2.0	2.0	3.0	2.0	1.0	1.0	2.0	
2018-01-02	1.0	0.0	1.0	0.0	1.0	1.0	2.0	1.0	
2018-01-03	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	Q
2018-01-04	1.0	0.0	1.0	0.0	0.0	1.0	2.0	1.0	
2018-01-05	0.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	
2018-01-06	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	Q
2018-01-07	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	Q
2018-01-08	0.0	2.0	3.0	2.0	4.0	3.0	2.0	2.0	
2018-01-09	3.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	
2018-01-10	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	
2018-01-11	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	Q
2018-01-12	1.0	1.0	1.0	0.0	1.0	2.0	0.0	0.0	
2018-01-13	0.0	0.0	2.0	1.0	2.0	1.0	3.0	3.0	
2018-01-14	3.0	3.0	2.0	1.0	2.0	2.0	1.0	2.0	
2018-01-15	3.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	
2018-01-16	2.0	0.0	1.0	2.0	1.0	1.0	1.0	1.0	
2018-01-17	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	
2018-01-18	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	Q
2018-01-19	1.0	2.0	2.0	2.0	1.0	0.0	3.0	2.0	
2018-01-20	3.0	3.0	2.0	1.0	1.0	1.0	2.0	1.0	
2018-01-21	1.0	1.0	2.0	2.0	3.0	3.0	3.0	3.0	
2018-01-22	2.0	2.0	1.0	1.0	0.0	3.0	3.0	2.0	
2018-01-23	1.0	1.0	1.0	0.0	1.0	2.0	1.0	0.0	
2018-01-24	0.0	0.0	1.0	1.0	3.0	3.0	2.0	4.0	
2018-01-25	3.0	1.0	2.0	1.0	1.0	2.0	2.0	2.0	
2018-01-26	2.0	1.0	2.0	1.0	1.0	1.0	2.0	2.0	
2018-01-27	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	
2018-01-28	0.0	0.0	0.0	1.0	1.0	1.0	1.0	3.0	
2018-01-29	0.0	1.0	2.0	1.0	1.0	1.0	1.0	0.0	
2018-01-30	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	
2018-01-31	0.0	0.0	1.0	2.0	2.0	2.0	2.0	3.0	
2018-02-01	2.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	
2018-02-02	1.0	1.0	1.0	0.0	1.0	1.0	1.0	0.0	
2018-02-03	0.0	1.0	1.0	1.0	0.0	1.0	2.0	2.0	
2018-02-04	1.0	0.0	1.0	1.0	0.0	1.0	3.0	2.0	
2018-02-05	1.0	1.0	1.0	2.0	3.0	2.0	0.0	0.0	
2018-02-06	0.0	1.0	2.0	2.0	2.0	0.0	1.0	2.0	
2018-02-07	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	
2018-02-08	0.0	1.0	1.0	1.0	1.0	0.0	1.0	3.0	
2018-02-09	1.0	2.0	1.0	0.0	0.0	0.0	0.0	3.0	
2018-02-10	1.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	
2018-02-11	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	Q
2018-02-12	0.0	1.0	2.0	1.0	1.0	0.0	1.0	1.0	
2018-02-13	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-02-14	1.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	
2018-02-15	1.0	0.0	2.0	1.0	2.0	4.0	3.0	3.0	
2018-02-16	1.0	2.0	2.0	2.0	1.0	1.0	2.0	3.0	
2018-02-17	2.0	2.0	2.0	1.0	2.0	2.0	1.0	3.0	
2018-02-18	3.0	1.0	1.0	2.0	3.0	3.0	2.0	3.0	
2018-02-19	3.0	3.0	2.0	2.0	2.0	2.0	4.0	3.0	
2018-02-20	1.0	0.0	0.0	1.0	2.0	1.0	0.0	0.0	
2018-02-21	0.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	
2018-02-22	1.0	0.0	1.0	2.0	2.0	3.0	3.0	3.0	

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-02-23	0.0	3.0	3.0	4.0	1.0	2.0	4.0	2.0	
2018-02-24	2.0	1.0	2.0	2.0	1.0	1.0	0.0	2.0	
2018-02-25	0.0	1.0	2.0	1.0	0.0	2.0	2.0	2.0	
2018-02-26	2.0	1.0	2.0	1.0	1.0	2.0	1.0	4.0	
2018-02-27	4.0	4.0	2.0	3.0	4.0	2.0	1.0	1.0	
2018-02-28	2.0	1.0	1.0	2.0	2.0	2.0	1.0	1.0	
2018-03-01	0.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	
2018-03-02	1.0	0.0	0.0	1.0	1.0	1.0	1.0	2.0	
2018-03-03	2.0	0.0	1.0	2.0	0.0	1.0	2.0	3.0	
2018-03-04	2.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	
2018-03-05	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	
2018-03-06	1.0	1.0	1.0	1.0	1.0	2.0	2.0	0.0	
2018-03-07	0.0	1.0	1.0	0.0	0.0	0.0	2.0	1.0	
2018-03-08	0.0	1.0	2.0	1.0	0.0	1.0	1.0	1.0	
2018-03-09	3.0	2.0	1.0	1.0	1.0	1.0	3.0	3.0	
2018-03-10	3.0	3.0	2.0	1.0	2.0	0.0	3.0	3.0	
2018-03-11	2.0	1.0	1.0	1.0	0.0	1.0	2.0	1.0	
2018-03-12	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-03-13	0.0	1.0	1.0	1.0	0.0	1.0	2.0	1.0	
2018-03-14	1.0	1.0	1.0	1.0	1.0	4.0	3.0	3.0	
2018-03-15	3.0	1.0	2.0	2.0	1.0	3.0	4.0	3.0	
2018-03-16	3.0	3.0	2.0	2.0	4.0	4.0	3.0	4.0	D
2018-03-17	4.0	1.0	2.0	1.0	2.0	1.0	2.0	3.0	
2018-03-18	2.0	2.0	1.0	2.0	4.0	4.0	5.0	5.0	D
2018-03-19	3.0	3.0	3.0	1.0	2.0	2.0	2.0	4.0	
2018-03-20	1.0	1.0	0.0	1.0	1.0	1.0	2.0	1.0	
2018-03-21	1.0	1.0	0.0	0.0	0.0	0.0	2.0	1.0	
2018-03-22	1.0	1.0	0.0	1.0	1.0	2.0	3.0	3.0	
2018-03-23	3.0	2.0	2.0	3.0	2.0	2.0	4.0	4.0	
2018-03-24	1.0	1.0	2.0	2.0	2.0	3.0	2.0	3.0	
2018-03-25	1.0	3.0	2.0	2.0	3.0	3.0	2.0	5.0	
2018-03-26	2.0	2.0	3.0	2.0	2.0	2.0	3.0	3.0	
2018-03-27	2.0	2.0	2.0	1.0	2.0	2.0	0.0	1.0	
2018-03-28	1.0	1.0	2.0	1.0	1.0	1.0	0.0	0.0	
2018-03-29	0.0	0.0	1.0	2.0	1.0	1.0	1.0	1.0	
2018-03-30	1.0	1.0	1.0	1.0	2.0	1.0	1.0	0.0	
2018-03-31	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-04-01	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	
2018-04-02	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	
2018-04-03	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	
2018-04-04	0.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	
2018-04-05	3.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0	
2018-04-06	1.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	
2018-04-07	0.0	1.0	2.0	1.0	1.0	1.0	0.0	2.0	
2018-04-08	1.0	1.0	1.0	1.0	0.0	1.0	3.0	2.0	
2018-04-09	1.0	1.0	2.0	1.0	2.0	2.0	3.0	4.0	
2018-04-10	1.0	3.0	3.0	2.0	3.0	2.0	2.0	4.0	
2018-04-11	2.0	2.0	3.0	1.0	2.0	1.0	2.0	1.0	
2018-04-12	2.0	1.0	2.0	2.0	2.0	2.0	2.0	3.0	
2018-04-13	4.0	1.0	2.0	1.0	1.0	1.0	3.0	3.0	
2018-04-14	1.0	0.0	0.0	1.0	2.0	2.0	2.0	2.0	
2018-04-15	2.0	2.0	2.0	1.0	1.0	0.0	1.0	2.0	
2018-04-16	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	Q

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-04-17	2.0	1.0	2.0	0.0	0.0	1.0	1.0	2.0	
2018-04-18	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	
2018-04-19	0.0	1.0	2.0	2.0	1.0	1.0	1.0	0.0	
2018-04-20	3.0	3.0	4.0	4.0	3.0	4.0	5.0	3.0	D
2018-04-21	3.0	2.0	3.0	2.0	2.0	3.0	2.0	1.0	
2018-04-22	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	
2018-04-23	3.0	1.0	0.0	3.0	2.0	1.0	3.0	3.0	
2018-04-24	0.0	1.0	1.0	1.0	2.0	1.0	2.0	2.0	
2018-04-25	2.0	1.0	1.0	1.0	1.0	1.0	0.0	2.0	
2018-04-26	2.0	0.0	1.0	2.0	2.0	1.0	1.0	1.0	
2018-04-27	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	
2018-04-28	2.0	2.0	2.0	1.0	2.0	2.0	1.0	0.0	
2018-04-29	0.0	1.0	2.0	2.0	1.0	1.0	0.0	1.0	
2018-04-30	2.0	1.0	1.0	2.0	2.0	2.0	1.0	0.0	
2018-05-01	1.0	2.0	2.0	1.0	1.0	0.0	0.0	1.0	
2018-05-02	1.0	1.0	2.0	2.0	1.0	0.0	nan	nan	
2018-05-03	1.0	1.0	1.0	2.0	1.0	0.0	2.0	2.0	
2018-05-04	0.0	1.0	1.0	1.0	2.0	1.0	2.0	2.0	
2018-05-05	1.0	1.0	1.0	3.0	4.0	4.0	4.0	5.0	
2018-05-06	4.0	3.0	3.0	3.0	3.0	2.0	3.0	4.0	D
2018-05-07	4.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0	
2018-05-08	1.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0	
2018-05-09	2.0	2.0	2.0	1.0	2.0	2.0	4.0	2.0	
2018-05-10	3.0	1.0	2.0	2.0	3.0	3.0	1.0	3.0	
2018-05-11	1.0	3.0	3.0	2.0	3.0	3.0	3.0	4.0	
2018-05-12	2.0	2.0	2.0	2.0	2.0	1.0	2.0	3.0	
2018-05-13	0.0	1.0	2.0	2.0	3.0	3.0	2.0	2.0	
2018-05-14	1.0	1.0	1.0	2.0	1.0	1.0	1.0	2.0	
2018-05-15	0.0	1.0	1.0	0.0	1.0	2.0	1.0	1.0	
2018-05-16	0.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	
2018-05-17	3.0	2.0	2.0	3.0	2.0	2.0	1.0	3.0	
2018-05-18	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-05-19	0.0	0.0	0.0	2.0	1.0	2.0	2.0	1.0	
2018-05-20	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	
2018-05-21	0.0	1.0	1.0	1.0	0.0	0.0	0.0	1.0	
2018-05-22	0.0	1.0	2.0	1.0	2.0	2.0	2.0	1.0	
2018-05-23	1.0	2.0	2.0	3.0	2.0	2.0	0.0	1.0	
2018-05-24	1.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	
2018-05-25	1.0	2.0	2.0	2.0	2.0	1.0	1.0	0.0	
2018-05-26	0.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	
2018-05-27	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-05-28	1.0	2.0	2.0	2.0	2.0	1.0	1.0	0.0	
2018-05-29	1.0	2.0	1.0	2.0	2.0	1.0	1.0	1.0	
2018-05-30	0.0	1.0	0.0	0.0	1.0	1.0	2.0	1.0	
2018-05-31	2.0	2.0	2.0	2.0	2.0	4.0	3.0	2.0	
2018-06-01	3.0	3.0	3.0	4.0	5.0	3.0	2.0	3.0	D
2018-06-02	1.0	3.0	2.0	2.0	3.0	3.0	4.0	3.0	
2018-06-03	2.0	2.0	1.0	2.0	2.0	3.0	2.0	2.0	
2018-06-04	1.0	1.0	1.0	1.0	1.0	2.0	2.0	0.0	
2018-06-05	1.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	
2018-06-06	0.0	0.0	1.0	2.0	1.0	2.0	3.0	2.0	
2018-06-07	3.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	
2018-06-08	1.0	2.0	1.0	2.0	1.0	1.0	1.0	0.0	

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-06-09	0.0	1.0	2.0	1.0	1.0	1.0	1.0	0.0	
2018-06-10	1.0	1.0	1.0	1.0	1.0	2.0	1.0	0.0	
2018-06-11	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	
2018-06-12	1.0	2.0	1.0	2.0	1.0	2.0	1.0	0.0	
2018-06-13	0.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	
2018-06-14	2.0	2.0	2.0	2.0	1.0	2.0	1.0	1.0	
2018-06-15	0.0	1.0	1.0	2.0	1.0	1.0	1.0	0.0	
2018-06-16	0.0	2.0	1.0	0.0	0.0	1.0	0.0	0.0	
2018-06-17	1.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	
2018-06-18	3.0	2.0	3.0	3.0	3.0	2.0	3.0	3.0	
2018-06-19	1.0	2.0	2.0	2.0	1.0	0.0	1.0	2.0	
2018-06-20	0.0	1.0	2.0	2.0	1.0	2.0	1.0	1.0	
2018-06-21	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	
2018-06-22	1.0	2.0	1.0	1.0	1.0	1.0	2.0	1.0	
2018-06-23	3.0	3.0	2.0	4.0	4.0	3.0	3.0	3.0	D
2018-06-24	2.0	3.0	3.0	3.0	2.0	1.0	1.0	1.0	
2018-06-25	1.0	2.0	1.0	2.0	2.0	2.0	3.0	4.0	
2018-06-26	3.0	2.0	2.0	3.0	3.0	3.0	3.0	1.0	
2018-06-27	1.0	1.0	1.0	2.0	2.0	2.0	1.0	3.0	
2018-06-28	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	
2018-06-29	1.0	1.0	2.0	2.0	2.0	2.0	1.0	0.0	
2018-06-30	0.0	0.0	1.0	2.0	2.0	2.0	1.0	1.0	
2018-07-01	1.0	2.0	2.0	1.0	0.0	1.0	1.0	0.0	
2018-07-02	0.0	1.0	1.0	2.0	2.0	1.0	0.0	0.0	
2018-07-03	0.0	0.0	0.0	1.0	2.0	2.0	1.0	1.0	
2018-07-04	0.0	1.0	1.0	0.0	1.0	2.0	0.0	0.0	
2018-07-05	2.0	1.0	1.0	3.0	3.0	4.0	4.0	4.0	
2018-07-06	3.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	
2018-07-07	2.0	1.0	0.0	1.0	1.0	2.0	2.0	1.0	
2018-07-08	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-07-09	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	
2018-07-10	1.0	2.0	2.0	3.0	3.0	2.0	2.0	1.0	
2018-07-11	1.0	2.0	2.0	2.0	3.0	2.0	3.0	2.0	
2018-07-12	1.0	2.0	2.0	2.0	3.0	2.0	1.0	2.0	
2018-07-13	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	
2018-07-14	1.0	2.0	2.0	1.0	1.0	1.0	2.0	0.0	
2018-07-15	0.0	2.0	2.0	1.0	1.0	1.0	1.0	0.0	
2018-07-16	1.0	2.0	3.0	2.0	1.0	3.0	2.0	4.0	
2018-07-17	2.0	3.0	1.0	1.0	1.0	2.0	0.0	1.0	
2018-07-18	1.0	2.0	1.0	1.0	1.0	0.0	1.0	1.0	
2018-07-19	0.0	1.0	0.0	2.0	1.0	1.0	2.0	1.0	
2018-07-20	1.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	
2018-07-21	2.0	1.0	3.0	2.0	3.0	3.0	2.0	2.0	
2018-07-22	1.0	1.0	2.0	2.0	2.0	2.0	2.0	1.0	
2018-07-23	0.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	
2018-07-24	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	
2018-07-25	2.0	3.0	1.0	2.0	2.0	3.0	2.0	1.0	
2018-07-26	0.0	1.0	0.0	2.0	2.0	2.0	1.0	1.0	
2018-07-27	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	
2018-07-28	1.0	2.0	0.0	2.0	2.0	1.0	2.0	1.0	
2018-07-29	1.0	2.0	2.0	1.0	1.0	0.0	2.0	1.0	
2018-07-30	0.0	1.0	1.0	0.0	2.0	1.0	1.0	2.0	
2018-07-31	1.0	0.0	1.0	2.0	1.0	1.0	2.0	3.0	

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-08-01	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
2018-08-02	2.0	2.0	1.0	2.0	3.0	2.0	1.0	0.0	
2018-08-03	1.0	1.0	1.0	2.0	2.0	2.0	1.0	1.0	
2018-08-04	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	
2018-08-05	1.0	2.0	2.0	2.0	2.0	1.0	0.0	1.0	
2018-08-06	1.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	
2018-08-07	1.0	2.0	2.0	2.0	3.0	3.0	2.0	2.0	
2018-08-08	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	
2018-08-09	0.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	
2018-08-10	1.0	0.0	1.0	2.0	2.0	2.0	1.0	1.0	
2018-08-11	2.0	2.0	2.0	2.0	3.0	3.0	2.0	4.0	
2018-08-12	1.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	
2018-08-13	0.0	0.0	1.0	2.0	1.0	1.0	1.0	1.0	
2018-08-14	1.0	1.0	2.0	2.0	1.0	1.0	0.0	1.0	
2018-08-15	2.0	2.0	2.0	2.0	3.0	3.0	2.0	3.0	
2018-08-16	3.0	2.0	2.0	3.0	3.0	1.0	1.0	2.0	
2018-08-17	2.0	3.0	2.0	2.0	2.0	1.0	2.0	4.0	
2018-08-18	1.0	2.0	2.0	2.0	3.0	2.0	2.0	2.0	
2018-08-19	1.0	1.0	2.0	1.0	1.0	2.0	2.0	2.0	
2018-08-20	3.0	2.0	2.0	2.0	3.0	3.0	4.0	2.0	
2018-08-21	1.0	1.0	2.0	2.0	1.0	1.0	1.0	2.0	
2018-08-22	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0	
2018-08-23	2.0	1.0	2.0	0.0	1.0	2.0	1.0	1.0	
2018-08-24	0.0	1.0	2.0	2.0	3.0	2.0	2.0	1.0	
2018-08-25	0.0	1.0	2.0	2.0	3.0	2.0	4.0	4.0	
2018-08-26	5.0	5.0	5.0	3.0	5.0	5.0	4.0	2.0	D
2018-08-27	1.0	1.0	1.0	3.0	3.0	4.0	4.0	3.0	
2018-08-28	3.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	
2018-08-29	2.0	1.0	1.0	0.0	1.0	2.0	1.0	1.0	
2018-08-30	1.0	2.0	2.0	1.0	1.0	0.0	1.0	2.0	
2018-08-31	2.0	2.0	2.0	1.0	0.0	2.0	2.0	0.0	
2018-09-01	1.0	1.0	3.0	3.0	2.0	2.0	2.0	2.0	
2018-09-02	1.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0	
2018-09-03	1.0	1.0	1.0	2.0	2.0	1.0	2.0	3.0	
2018-09-04	1.0	2.0	2.0	0.0	1.0	2.0	2.0	3.0	
2018-09-05	3.0	1.0	2.0	3.0	3.0	2.0	2.0	0.0	
2018-09-06	1.0	1.0	2.0	1.0	1.0	1.0	2.0	2.0	
2018-09-07	2.0	2.0	2.0	1.0	1.0	2.0	1.0	1.0	
2018-09-08	0.0	0.0	3.0	1.0	0.0	1.0	1.0	1.0	
2018-09-09	2.0	2.0	2.0	1.0	2.0	1.0	2.0	3.0	
2018-09-10	0.0	0.0	1.0	2.0	3.0	3.0	4.0	4.0	
2018-09-11	2.0	3.0	5.0	4.0	2.0	2.0	4.0	3.0	D
2018-09-12	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	
2018-09-13	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0	
2018-09-14	3.0	2.0	1.0	2.0	2.0	2.0	4.0	2.0	
2018-09-15	2.0	2.0	3.0	2.0	1.0	1.0	1.0	2.0	
2018-09-16	1.0	1.0	2.0	2.0	1.0	0.0	1.0	2.0	
2018-09-17	2.0	2.0	1.0	2.0	2.0	2.0	3.0	3.0	
2018-09-18	2.0	1.0	2.0	2.0	1.0	0.0	1.0	1.0	
2018-09-19	1.0	1.0	2.0	1.0	1.0	1.0	0.0	0.0	
2018-09-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Q
2018-09-21	0.0	0.0	0.0	1.0	2.0	2.0	2.0	4.0	
2018-09-22	3.0	2.0	2.0	3.0	3.0	3.0	4.0	3.0	

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-09-23	2.0	1.0	2.0	2.0	2.0	2.0	2.0	3.0	
2018-09-24	2.0	2.0	2.0	2.0	1.0	1.0	1.0	2.0	
2018-09-25	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	
2018-09-26	1.0	1.0	2.0	1.0	2.0	3.0	2.0	3.0	
2018-09-27	1.0	1.0	2.0	3.0	2.0	1.0	1.0	3.0	
2018-09-28	3.0	1.0	2.0	1.0	1.0	1.0	1.0	2.0	
2018-09-29	2.0	2.0	2.0	2.0	2.0	2.0	1.0	3.0	
2018-09-30	1.0	1.0	1.0	1.0	1.0	0.0	2.0	2.0	
2018-10-01	0.0	1.0	1.0	1.0	3.0	2.0	2.0	3.0	
2018-10-02	3.0	2.0	2.0	1.0	1.0	0.0	1.0	0.0	
2018-10-03	1.0	0.0	1.0	2.0	1.0	1.0	2.0	2.0	
2018-10-04	1.0	0.0	1.0	0.0	2.0	2.0	1.0	1.0	
2018-10-05	2.0	1.0	2.0	2.0	2.0	2.0	1.0	3.0	
2018-10-06	2.0	2.0	1.0	1.0	1.0	1.0	0.0	0.0	
2018-10-07	0.0	1.0	0.0	2.0	3.0	4.0	5.0	4.0	
2018-10-08	2.0	3.0	3.0	2.0	4.0	3.0	2.0	2.0	
2018-10-09	2.0	1.0	2.0	3.0	2.0	3.0	3.0	4.0	
2018-10-10	1.0	2.0	2.0	2.0	3.0	3.0	5.0	2.0	
2018-10-11	3.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	
2018-10-12	1.0	1.0	1.0	1.0	0.0	2.0	2.0	2.0	
2018-10-13	0.0	1.0	1.0	1.0	1.0	4.0	4.0	3.0	
2018-10-14	1.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	
2018-10-15	3.0	1.0	1.0	2.0	2.0	2.0	3.0	3.0	
2018-10-16	2.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	
2018-10-17	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	Q
2018-10-18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Q
2018-10-19	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	
2018-10-20	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	Q
2018-10-21	0.0	0.0	1.0	2.0	1.0	2.0	2.0	1.0	
2018-10-22	3.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	
2018-10-23	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	
2018-10-24	0.0	0.0	1.0	2.0	1.0	0.0	2.0	2.0	
2018-10-25	0.0	1.0	0.0	2.0	2.0	1.0	2.0	2.0	
2018-10-26	2.0	2.0	2.0	1.0	1.0	1.0	2.0	3.0	
2018-10-27	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	Q
2018-10-28	2.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	
2018-10-29	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	Q
2018-10-30	1.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	
2018-10-31	0.0	0.0	1.0	1.0	1.0	2.0	2.0	2.0	
2018-11-01	1.0	1.0	2.0	1.0	1.0	1.0	1.0	2.0	
2018-11-02	2.0	1.0	1.0	2.0	1.0	1.0	1.0	0.0	
2018-11-03	2.0	2.0	1.0	1.0	0.0	0.0	0.0	2.0	
2018-11-04	1.0	0.0	1.0	1.0	1.0	3.0	4.0	5.0	
2018-11-05	4.0	3.0	3.0	4.0	3.0	2.0	5.0	2.0	D
2018-11-06	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	
2018-11-07	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	
2018-11-08	3.0	3.0	1.0	3.0	1.0	1.0	2.0	2.0	
2018-11-09	1.0	0.0	1.0	2.0	1.0	3.0	3.0	3.0	
2018-11-10	1.0	2.0	2.0	4.0	2.0	2.0	2.0	4.0	
2018-11-11	2.0	1.0	2.0	1.0	1.0	1.0	2.0	1.0	
2018-11-12	1.0	2.0	2.0	1.0	2.0	1.0	2.0	3.0	
2018-11-13	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	Q
2018-11-14	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	

Table 9.1 (cont'd)

Date	1:30	4:30	7:30	10:30	13:30	16:30	19:30	22:30	Activity
2018-11-15	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	
2018-11-16	0.0	1.0	0.0	1.0	1.0	2.0	0.0	0.0	
2018-11-17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Q
2018-11-18	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	
2018-11-19	1.0	1.0	1.0	1.0	0.0	1.0	2.0	2.0	
2018-11-20	3.0	3.0	1.0	1.0	0.0	1.0	1.0	1.0	
2018-11-21	2.0	2.0	1.0	1.0	0.0	0.0	0.0	1.0	
2018-11-22	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	Q
2018-11-23	1.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	
2018-11-24	1.0	0.0	1.0	1.0	2.0	2.0	2.0	2.0	
2018-11-25	1.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	
2018-11-26	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	Q
2018-11-27	1.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0	
2018-11-28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	Q
2018-11-29	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	
2018-11-30	2.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	
2018-12-01	0.0	1.0	1.0	2.0	1.0	3.0	2.0	2.0	
2018-12-02	1.0	1.0	2.0	1.0	2.0	2.0	3.0	3.0	
2018-12-03	2.0	0.0	1.0	1.0	2.0	3.0	3.0	2.0	
2018-12-04	3.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	
2018-12-05	0.0	0.0	1.0	1.0	1.0	1.0	0.0	2.0	
2018-12-06	1.0	1.0	0.0	1.0	2.0	1.0	1.0	0.0	
2018-12-07	1.0	2.0	2.0	1.0	2.0	2.0	4.0	3.0	
2018-12-08	2.0	1.0	2.0	1.0	1.0	3.0	2.0	1.0	
2018-12-09	2.0	1.0	1.0	1.0	1.0	3.0	3.0	3.0	
2018-12-10	2.0	1.0	3.0	2.0	2.0	2.0	1.0	1.0	
2018-12-11	0.0	2.0	2.0	2.0	1.0	2.0	3.0	2.0	
2018-12-12	2.0	1.0	0.0	0.0	0.0	0.0	2.0	1.0	
2018-12-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Q
2018-12-14	1.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	
2018-12-15	0.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	Q
2018-12-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	Q
2018-12-17	0.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	
2018-12-18	2.0	0.0	1.0	0.0	2.0	2.0	2.0	1.0	
2018-12-19	1.0	1.0	1.0	2.0	1.0	1.0	2.0	2.0	
2018-12-20	2.0	2.0	2.0	2.0	1.0	2.0	3.0	3.0	
2018-12-21	1.0	1.0	1.0	1.0	1.0	0.0	2.0	1.0	
2018-12-22	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	Q
2018-12-23	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	Q
2018-12-24	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	
2018-12-25	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	
2018-12-26	0.0	0.0	1.0	2.0	2.0	1.0	1.0	0.0	
2018-12-27	0.0	1.0	0.0	1.0	1.0	1.0	1.0	3.0	
2018-12-28	3.0	3.0	3.0	2.0	3.0	2.0	4.0	2.0	
2018-12-29	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
2018-12-30	1.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0	

Table 9.2. Thunder and lightning: Date of thunder storms near the observatory and approximate amount of lightnings causing measureable spikes in our records.

Date	Amount
2018-05-02	476
2018-05-08	69
2018-05-10	50
2018-05-12	17
2018-05-30	33
2018-06-01	37
2018-06-12	192
2018-06-13	9
2018-07-06	9
2018-07-10	66
2018-07-16	82
2018-07-21	14
2018-07-25	6
2018-07-26	45
2018-08-02	67
2018-08-07	52
2018-08-10	23
2018-09-01	114
2018-09-03	23
2018-09-14	6

Table 9.3. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Jan01	92	99	99	110	101	100	101	104	102	89	90	96	90	82	82	94	98	99	101	101	99	95	93	99	96
Jan02	96	101	99	102	106	105	105	108	108	107	108	110	112	110	103	100	96	99	104	110	103	101	102	103	104
Jan03	102	104	108	112	116	117	116	116	108	100	101	107	111	113	112	106	107	109	107	107	107	106	104	103	108
Jan04	101	103	107	111	113	112	111	109	103	100	100	105	109	110	111	108	108	106	100	96	99	98	102	101	105
Jan05	102	103	105	110	112	109	110	112	105	106	108	110	111	106	110	108	109	106	104	108	109	110	112	110	108
Jan06	106	103	102	105	106	107	110	112	111	109	110	112	110	108	107	107	108	109	109	108	106	108	106	105	108
Jan07	108	108	107	108	110	113	116	118	114	112	113	112	111	111	114	115	114	114	112	107	108	109	111	113	112
Jan08	113	112	113	112	112	113	121	141	135	133	128	127	123	109	80	76	97	97	97	93	99	98	96	101	109
Jan09	100	106	107	101	103	105	107	108	106	104	99	96	98	99	95	89	93	96	99	106	107	100	104	107	101
Jan10	104	105	104	105	110	113	114	116	112	104	104	105	106	104	104	106	105	105	104	105	106	106	105	104	106
Jan11	105	105	107	112	110	111	114	112	107	104	102	103	103	105	107	108	108	109	109	108	106	105	107	108	107
Jan12	107	104	103	107	113	113	114	118	114	108	106	104	101	102	104	104	104	101	104	105	107	106	105	105	107
Jan13	105	106	108	110	112	114	119	129	127	117	114	111	108	112	107	116	117	118	109	88	92	94	100	101	110
Jan14	103	100	105	119	111	114	118	118	113	105	103	101	96	91	88	93	98	100	103	104	101	101	103	108	104
Jan15	103	110	98	107	111	107	108	109	100	104	106	107	104	102	98	93	100	102	93	93	97	102	100	108	103
Jan16	113	106	105	107	108	109	109	112	110	102	101	105	103	101	99	103	106	103	99	99	102	103	104	102	105
Jan17	104	104	105	105	107	108	112	115	112	107	105	109	110	108	108	108	107	108	108	108	108	107	107	107	108
Jan18	108	109	108	110	112	114	117	122	122	124	125	121	116	111	109	109	111	113	112	111	108	105	104	104	113
Jan19	104	106	108	108	110	113	119	111	110	106	112	116	114	111	110	109	107	105	96	96	98	101	98	101	107
Jan20	116	109	105	103	111	126	125	122	117	119	113	108	107	103	104	105	100	93	94	98	101	102	103	103	108
Jan21	99	100	106	105	105	111	116	125	125	126	131	133	120	93	75	89	96	100	94	93	92	96	102	104	106
Jan22	105	107	108	111	103	104	104	106	109	109	107	109	108	108	108	104	96	80	80	85	97	94	102	107	102
Jan23	95	94	93	101	101	103	105	103	101	101	104	107	106	107	101	95	100	101	103	103	103	103	104	104	101
Jan24	104	104	105	108	110	115	119	123	125	121	118	114	112	108	91	87	104	104	113	114	110	104	97	111	109
Jan25	95	92	89	93	97	100	104	109	106	106	105	103	107	102	97	84	75	68	77	90	96	96	99	97	95
Jan26	101	106	102	102	101	109	117	119	116	119	118	116	112	109	106	106	106	102	100	103	108	111	110	102	108
Jan27	99	106	106	103	105	110	112	113	111	104	104	109	106	100	98	97	98	102	102	101	98	98	101	102	103
Jan28	102	103	105	106	109	112	115	117	117	114	109	106	104	100	99	111	111	110	108	107	105	109	109	105	108
Jan29	105	104	106	109	111	114	121	127	123	109	105	102	107	106	109	109	105	102	103	103	104	104	107	107	108
Jan30	107	108	111	112	118	116	121	121	117	115	112	112	115	111	108	106	106	106	106	110	112	111	111	111	112
Jan31	111	112	112	114	115	117	119	118	116	112	109	109	105	100	104	99	100	90	86	84	89	90	105	95	104
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Jan01	51	48	42	39	33	31	33	39	41	35	30	23	20	31	23	30	32	34	36	36	41	41	42	43	36
Jan02	34	34	31	29	31	32	32	32	32	29	25	24	23	24	30	32	31	33	40	45	35	39	39	33	32
Jan03	32	29	28	26	26	29	31	35	35	31	27	21	19	24	28	30	31	31	34	36	37	37	36	34	30

Table 9.3 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jan04	31	29	28	29	30	32	33	39	42	36	31	27	24	28	31	32	33	32	35	42	39	38	42	38	33
Jan05	33	33	31	29	29	32	34	38	39	36	33	31	26	24	26	29	29	31	34	34	36	40	42	37	33
Jan06	33	32	30	31	32	32	35	39	41	33	27	23	22	25	28	31	31	32	33	35	37	36	37	36	32
Jan07	33	34	32	30	30	31	33	39	39	32	27	23	21	24	30	31	30	30	31	32	36	35	34	33	31
Jan08	32	30	28	29	30	31	32	34	35	32	27	21	17	18	18	17	28	33	34	39	39	39	41	41	30
Jan09	37	28	33	33	31	28	33	38	42	40	35	30	26	24	31	38	34	33	37	40	40	39	36	37	34
Jan10	37	34	36	29	28	32	34	37	41	32	28	24	24	29	33	34	33	34	33	36	36	35	34	34	33
Jan11	32	31	30	31	33	34	36	42	44	38	32	23	21	26	32	33	33	34	35	35	36	36	35	33	33
Jan12	33	32	30	29	33	33	34	40	38	33	30	28	22	25	26	28	30	29	35	35	38	38	36	35	32
Jan13	32	31	31	31	31	32	30	33	37	29	24	25	22	20	22	26	28	29	25	42	44	44	39	37	31
Jan14	36	40	17	21	31	27	23	32	39	38	33	30	29	28	33	42	35	37	40	39	39	39	39	39	34
Jan15	34	48	37	34	32	32	34	37	42	36	32	30	28	30	30	33	34	33	36	45	41	40	41	37	36
Jan16	35	31	32	31	29	31	34	39	42	39	32	29	24	28	31	32	34	35	38	38	44	41	40	36	35
Jan17	34	33	32	32	31	32	35	42	46	40	33	27	23	26	29	30	32	33	35	36	36	36	38	36	34
Jan18	34	32	31	29	28	33	35	36	39	40	40	36	24	23	27	28	30	31	32	33	37	41	40	42	33
Jan19	39	36	34	31	30	26	31	33	34	29	28	27	28	29	31	32	31	31	32	35	43	53	43	43	34
Jan20	43	46	44	36	36	29	31	35	42	47	43	36	29	25	28	29	29	33	31	35	37	38	41	42	36
Jan21	42	42	40	37	35	34	31	32	30	30	31	34	28	26	30	32	35	34	37	55	42	41	40	38	36
Jan22	38	36	43	44	34	35	36	36	32	31	32	30	29	30	35	33	29	39	39	55	52	41	42	44	37
Jan23	44	44	45	40	41	40	40	43	42	36	32	29	31	33	34	36	30	31	33	36	39	40	41	41	37
Jan24	38	37	35	35	35	35	35	36	37	36	34	31	26	28	34	32	29	32	30	32	34	44	72	45	36
Jan25	58	59	53	46	39	36	37	36	38	34	28	29	28	30	29	27	28	41	36	39	41	42	40	47	38
Jan26	37	40	39	47	38	37	38	37	34	35	35	32	32	33	35	36	36	36	38	43	40	41	43	43	38
Jan27	39	37	39	41	36	38	38	37	37	33	28	24	21	23	24	30	34	37	43	39	42	43	41	39	35
Jan28	37	37	36	36	36	39	40	41	40	33	29	25	21	18	25	31	32	32	33	36	38	40	44	41	34
Jan29	42	39	36	33	33	33	35	42	47	42	33	27	19	23	27	29	32	35	35	42	40	41	39	38	35
Jan30	36	36	34	29	31	34	36	41	41	38	35	29	23	26	31	33	34	35	38	37	37	36	35	35	34
Jan31	34	32	31	31	33	35	38	41	41	34	30	19	13	18	21	21	23	21	31	38	45	48	47	53	32
2018, Field component: Z, Base: 43700.0, Unit: nT																									
Jan01	96	95	95	93	94	95	95	95	94	96	99	97	97	101	102	101	100	99	98	98	98	98	98	97	97
Jan02	97	96	96	96	96	95	95	94	91	92	95	95	98	97	95	96	97	97	97	96	96	95	96	95	96
Jan03	95	95	95	95	94	93	93	92	92	96	97	94	94	96	96	96	96	96	96	96	95	94	94	94	95
Jan04	94	94	95	95	95	95	95	95	92	91	92	90	92	95	96	95	96	95	96	97	97	97	96	96	95
Jan05	95	95	96	95	95	95	94	92	90	92	92	91	90	93	94	95	95	96	96	96	95	94	93	93	94
Jan06	93	93	94	95	95	94	94	92	89	87	87	89	91	93	94	94	95	95	95	95	95	95	95	94	93
Jan07	94	93	93	93	93	93	93	91	89	91	94	93	94	95	95	94	94	94	94	95	95	95	94	93	93

Table 9.3 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jan08	92	92	92	92	92	92	91	85	81	83	82	78	81	88	94	96	96	97	97	97	97	96	95	94	91
Jan09	94	94	91	93	94	95	95	96	94	93	95	95	95	97	98	99	99	99	98	98	97	97	96	95	96
Jan10	94	94	95	95	95	95	94	94	92	91	94	95	97	100	99	97	97	96	96	96	96	96	95	95	95
Jan11	95	94	95	94	94	94	94	94	92	94	95	92	97	100	98	96	96	96	95	95	96	95	95	95	95
Jan12	94	94	95	95	94	94	94	93	88	91	95	95	97	99	98	97	98	98	98	98	97	97	96	96	96
Jan13	96	95	95	95	95	95	94	92	89	88	91	91	93	96	96	96	94	94	95	99	101	100	99	98	95
Jan14	96	95	94	91	91	92	92	92	93	92	93	93	95	98	100	101	100	99	98	98	98	97	97	95	95
Jan15	95	91	95	95	95	95	96	96	95	93	93	96	97	98	99	100	99	98	99	99	99	98	98	97	97
Jan16	94	95	95	96	96	96	95	94	90	88	89	88	93	99	99	98	97	97	97	98	97	97	97	96	95
Jan17	96	95	96	96	96	96	95	96	94	93	92	90	94	97	96	96	96	96	96	96	96	96	96	96	95
Jan18	95	95	95	95	95	94	93	91	88	86	86	83	87	93	94	95	95	95	95	95	95	96	96	96	93
Jan19	96	95	94	95	95	95	94	95	92	93	95	95	94	95	97	96	97	97	98	99	99	99	98	98	96
Jan20	94	93	93	94	95	93	90	89	90	92	92	90	89	92	95	96	97	99	100	100	99	98	98	97	94
Jan21	97	97	96	96	95	95	93	90	88	89	89	87	91	96	100	101	100	100	100	101	101	100	99	98	96
Jan22	95	95	94	94	95	95	94	93	93	93	93	92	93	97	97	97	98	100	103	102	102	100	100	97	96
Jan23	98	99	100	99	99	98	98	97	97	98	98	95	95	98	98	99	99	99	99	99	99	99	99	98	98
Jan24	97	97	97	97	97	96	95	94	94	95	94	91	91	94	98	100	98	98	98	97	96	97	97	96	96
Jan25	92	94	96	97	98	98	97	97	96	97	98	99	99	100	101	101	104	106	108	106	104	103	101	101	100
Jan26	100	96	96	96	97	97	94	93	92	92	94	95	96	97	98	98	98	99	99	99	99	98	96	97	96
Jan27	98	97	95	96	97	96	96	96	95	96	98	95	95	98	100	100	100	100	101	101	101	101	101	100	98
Jan28	99	99	98	98	97	96	95	94	92	93	96	96	96	99	101	100	99	98	98	99	99	99	97	98	97
Jan29	98	97	97	97	96	96	95	96	94	92	92	91	93	97	99	98	98	98	98	99	99	98	98	98	97
Jan30	98	97	96	97	95	95	93	93	91	90	91	91	93	98	99	97	97	97	97	97	96	96	96	96	95
Jan31	96	95	95	95	95	95	94	94	92	89	89	87	91	98	101	100	101	102	105	106	106	105	101	100	97
2018, Field component: F, Base: 48500.0, Unit: nT																									
Jan01	92	94	94	96	93	93	94	96	93	90	93	94	91	92	92	96	97	97	97	97	96	94	93	95	94
Jan02	94	95	94	95	97	96	96	96	94	93	97	98	101	100	95	95	94	95	97	100	96	95	95	95	96
Jan03	95	95	97	98	99	99	99	98	94	95	96	96	97	100	99	97	98	98	98	97	97	96	95	95	97
Jan04	93	95	96	98	99	98	98	98	93	90	91	92	94	98	99	98	98	97	95	94	95	95	95	95	96
Jan05	95	95	96	98	98	97	97	96	92	94	94	94	94	95	97	97	97	97	96	98	98	98	97	96	96
Jan06	94	93	94	95	96	96	97	96	93	91	90	93	94	95	95	96	97	97	98	97	97	97	96	95	95
Jan07	96	95	95	96	97	98	99	98	94	96	98	97	97	98	100	100	99	99	98	97	97	97	97	98	97
Jan08	97	96	96	96	96	96	99	103	96	97	94	89	91	91	84	84	93	94	94	93	95	94	92	93	94
Jan09	93	95	93	92	94	95	97	98	96	94	93	92	92	95	94	92	94	96	96	99	98	96	97	97	95
Jan10	95	95	95	96	98	99	99	100	97	92	94	95	98	100	99	98	97	97	97	97	98	97	96	96	97
Jan11	95	95	96	98	97	98	99	98	95	94	95	92	97	100	100	99	98	98	98	97	97	96	97	97	97

Table 9.3 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jan12	96	95	95	96	99	98	98	100	94	94	96	95	96	98	98	97	98	97	99	99	99	98	97	97	97
Jan13	96	96	97	98	99	99	101	103	100	94	96	95	95	99	98	101	100	100	98	92	96	96	97	97	98
Jan14	96	94	95	97	95	97	98	99	98	93	93	92	91	92	93	96	97	97	98	98	97	96	97	97	96
Jan15	95	95	93	97	98	97	98	99	94	94	95	98	97	97	96	95	98	97	94	95	96	98	97	99	96
Jan16	99	96	96	97	97	98	98	98	94	88	89	90	93	97	97	98	98	97	96	96	97	97	97	96	96
Jan17	96	96	96	97	97	98	99	101	98	95	93	93	96	99	98	98	98	98	98	98	98	97	98	98	97
Jan18	98	97	97	98	99	99	100	100	98	96	97	92	93	97	97	98	98	99	99	98	97	97	97	97	97
Jan19	96	96	97	97	97	99	100	98	95	95	99	100	99	99	100	99	98	98	95	96	97	98	96	97	97
Jan20	100	96	94	94	98	103	100	98	97	99	97	93	91	93	96	96	96	94	95	98	98	98	98	97	97
Jan21	95	96	97	97	96	98	98	100	98	100	101	101	99	91	87	94	97	98	96	97	96	97	99	98	97
Jan22	96	97	97	98	95	96	95	95	96	95	95	95	96	99	99	97	95	90	93	94	100	96	99	99	96
Jan23	94	95	95	98	97	98	99	98	96	97	98	97	96	100	97	95	97	98	99	99	99	99	99	99	97
Jan24	98	97	98	99	100	101	102	103	104	102	101	96	95	96	92	93	98	98	102	101	99	97	96	100	99
Jan25	89	90	90	93	95	96	97	99	98	98	99	98	100	99	98	93	91	90	96	99	101	99	99	98	96
Jan26	99	97	96	96	96	99	101	100	98	99	101	101	100	99	99	99	99	98	98	99	100	101	99	97	99
Jan27	96	98	96	96	97	99	100	100	98	96	98	97	96	96	97	96	97	99	100	100	99	99	99	99	98
Jan28	98	98	99	99	99	101	100	100	98	98	98	97	96	97	99	103	102	101	100	100	99	101	100	98	99
Jan29	98	98	98	99	100	101	103	107	103	95	93	91	95	98	101	101	99	98	98	99	99	99	100	100	99
Jan30	99	99	100	100	101	101	102	102	98	96	95	95	98	101	101	99	98	98	98	100	100	99	100	99	99
Jan31	99	99	99	100	100	101	101	101	99	94	92	90	91	96	100	98	99	95	96	97	99	99	102	97	98

Table 9.4. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Feb01	97	103	106	106	107	109	112	113	114	111	105	105	110	109	110	111	110	106	104	100	102	95	96	97	106
Feb02	99	102	104	104	102	104	108	115	115	113	110	109	109	107	106	109	109	105	106	109	110	109	110	109	108
Feb03	108	110	110	112	113	115	122	128	129	124	117	110	113	112	111	110	108	111	112	111	118	110	107	107	114
Feb04	108	112	112	112	113	119	125	130	130	124	122	122	117	116	116	118	119	112	98	102	110	111	110	107	115
Feb05	108	109	112	114	110	112	117	121	115	109	111	110	100	81	91	98	98	98	103	107	107	106	106	108	106
Feb06	108	108	111	112	112	114	116	121	114	107	103	94	98	104	108	110	109	109	107	107	103	106	111	106	108
Feb07	105	106	107	110	113	116	119	114	106	102	100	96	91	99	106	110	109	108	108	108	108	109	109	107	107
Feb08	107	109	112	115	116	121	125	126	122	114	113	114	116	115	112	111	111	110	108	107	104	101	116	104	113
Feb09	104	105	109	111	109	118	117	120	119	117	116	116	116	114	111	109	109	110	109	108	109	108	115	119	112
Feb10	116	118	116	119	120	121	119	124	122	113	98	101	99	103	101	106	108	105	104	100	97	99	101	104	109
Feb11	103	107	108	110	111	112	116	119	117	112	108	103	100	100	99	101	105	109	109	109	110	111	111	111	108
Feb12	112	113	114	118	120	123	129	135	131	122	117	118	117	116	116	116	115	114	112	107	109	114	115	115	117
Feb13	114	112	110	111	114	118	122	121	119	112	112	118	122	120	115	112	112	112	110	107	105	105	102	97	113
Feb14	99	105	108	109	110	112	114	113	112	112	112	112	109	109	109	109	108	108	108	106	105	104	103	114	109
Feb15	112	112	111	112	113	114	116	116	118	126	125	126	124	113	104	89	74	81	82	95	96	96	112	101	107
Feb16	100	103	105	110	110	115	113	105	109	99	103	106	109	110	109	109	107	107	102	104	108	105	100	102	106
Feb17	111	102	100	98	100	93	110	111	101	92	90	86	83	76	90	94	92	97	98	103	104	106	106	98	98
Feb18	124	115	105	106	103	106	102	99	99	101	95	97	96	101	93	83	82	94	93	100	101	97	95	105	100
Feb19	101	109	93	110	102	109	109	113	107	104	104	100	88	87	85	82	87	83	87	108	82	92	107	95	98
Feb20	97	100	96	98	99	102	106	106	103	102	103	102	99	96	95	98	101	102	102	106	105	103	103	103	101
Feb21	102	102	102	103	103	109	117	121	115	109	111	120	120	117	109	103	102	101	104	107	105	105	106	104	108
Feb22	105	109	106	106	107	107	111	110	111	107	99	105	108	108	105	95	96	88	74	90	100	111	103	96	102
Feb23	100	101	102	99	117	113	114	108	110	92	64	85	97	98	101	95	88	89	84	109	110	102	104	99	99
Feb24	97	94	92	95	96	97	97	94	82	84	90	93	96	103	102	99	98	99	100	99	100	99	102	99	96
Feb25	104	102	103	103	103	103	107	114	113	107	101	99	102	107	109	111	104	101	99	90	95	97	102	102	103
Feb26	104	102	109	104	107	105	107	115	116	109	104	104	104	101	96	92	102	104	104	106	105	108	106	107	105
Feb27	125	106	105	111	106	118	103	101	93	89	95	100	87	52	70	77	82	85	90	97	97	99	100	99	95
Feb28	104	104	99	99	99	102	99	95	96	98	96	92	88	93	90	88	84	95	100	101	101	99	100	101	97
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Feb01	43	34	34	36	36	39	40	42	43	41	40	31	23	26	31	32	34	35	35	43	37	48	49	46	37
Feb02	43	36	37	41	41	43	42	41	41	36	29	25	24	24	26	30	32	33	36	34	36	37	38	37	35
Feb03	37	36	35	34	34	35	35	38	43	40	32	28	26	25	26	30	32	32	32	35	47	45	41	38	35
Feb04	37	35	36	36	36	36	37	41	46	47	43	40	30	26	26	27	27	28	40	38	37	39	40	40	36
Feb05	39	40	40	38	37	38	39	42	42	36	27	23	18	18	23	29	34	46	41	37	40	41	41	39	35
Feb06	38	37	36	36	32	38	39	43	48	47	36	32	29	28	32	33	34	34	36	38	43	40	42	42	37

Table 9.4 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Feb07	39	37	35	34	34	36	39	47	49	42	30	23	22	24	27	32	34	35	37	38	39	39	38	37	35
Feb08	36	35	34	33	33	33	36	40	40	33	27	26	27	26	30	30	32	33	34	36	39	41	47	45	34
Feb09	43	42	36	37	34	33	38	44	47	43	35	31	30	30	32	33	34	35	36	38	40	40	40	41	37
Feb10	39	40	38	36	36	37	38	44	49	48	34	24	20	19	28	33	33	35	38	39	52	45	41	38	37
Feb11	38	37	38	38	39	40	40	46	52	48	41	37	28	24	29	34	39	37	37	38	39	39	39	38	38
Feb12	37	36	35	34	34	34	35	42	50	47	39	32	24	22	26	30	33	35	36	46	43	39	38	37	36
Feb13	36	36	35	34	35	37	40	47	51	47	41	35	28	30	34	36	36	36	36	36	38	41	46	49	38
Feb14	44	41	37	37	38	39	40	47	48	47	45	38	31	29	33	35	35	36	37	42	41	42	43	44	40
Feb15	43	39	39	38	38	39	43	51	49	39	34	28	24	22	21	22	33	75	42	41	44	46	51	46	39
Feb16	40	38	40	40	36	37	42	47	44	40	32	28	24	27	32	34	34	34	35	39	42	41	45	50	38
Feb17	52	54	51	49	50	48	51	54	45	38	33	28	20	19	34	37	37	40	41	44	44	58	64	49	43
Feb18	38	52	49	51	52	53	55	59	55	39	36	34	34	29	28	61	41	34	41	51	54	58	56	50	46
Feb19	43	43	33	43	49	36	44	45	45	40	37	37	34	37	30	23	29	37	54	81	53	60	69	56	44
Feb20	39	40	42	40	41	42	45	53	56	54	47	39	34	31	37	39	40	39	42	43	42	43	44	44	42
Feb21	44	44	43	42	42	41	42	46	46	38	33	31	34	36	39	39	37	38	41	40	40	42	42	45	40
Feb22	44	51	54	53	49	45	44	45	43	37	34	29	24	22	32	31	29	36	69	30	37	60	54	44	41
Feb23	42	43	44	45	40	55	48	55	49	46	36	27	31	28	35	38	45	51	51	67	59	55	50	46	45
Feb24	45	54	44	50	44	52	55	56	53	45	32	27	24	28	32	36	37	37	41	42	42	45	45	43	42
Feb25	41	41	42	43	46	46	46	50	49	43	33	26	25	27	32	36	36	41	50	53	53	52	47	45	42
Feb26	46	46	44	45	49	50	53	53	47	37	25	21	20	26	32	39	41	42	43	42	44	51	52	51	42
Feb27	60	74	60	63	43	49	55	53	47	37	24	19	15	21	29	41	53	44	46	48	46	45	45	45	44
Feb28	40	43	46	52	49	50	53	54	48	40	37	31	34	37	40	40	38	38	39	42	48	46	45	47	43
2018, Field component: Z, Base: 43700.0, Unit: nT																									
Feb01	100	99	98	98	98	97	96	96	96	97	95	92	94	99	100	98	98	98	99	100	100	100	101	100	98
Feb02	100	99	98	98	99	98	96	96	96	96	95	95	94	98	99	98	98	98	99	99	99	98	97	97	97
Feb03	97	97	97	97	97	96	93	94	93	91	91	91	90	94	96	98	98	98	97	97	97	97	97	97	95
Feb04	97	96	96	96	96	95	94	94	93	91	90	89	85	89	92	94	94	95	97	99	98	97	97	97	94
Feb05	96	95	95	94	95	95	94	94	94	93	92	94	96	100	100	99	100	100	101	99	99	98	98	98	97
Feb06	97	97	97	97	97	96	95	96	96	91	90	90	93	98	99	97	97	98	98	98	98	99	97	97	96
Feb07	97	97	97	97	97	96	96	96	94	89	89	89	92	98	99	98	98	98	98	98	98	98	97	97	96
Feb08	97	97	96	96	96	95	95	95	94	93	93	95	93	94	95	95	96	97	98	98	99	100	98	98	96
Feb09	98	97	97	97	97	96	95	93	89	85	84	88	89	94	95	94	96	96	97	97	97	98	97	95	94
Feb10	94	94	94	94	94	94	94	94	93	91	90	90	92	97	97	98	98	98	98	99	99	100	99	99	95
Feb11	99	98	98	97	97	96	94	94	91	89	90	93	93	96	96	97	98	97	97	97	97	97	97	97	96
Feb12	96	96	96	95	95	94	94	94	93	88	86	85	80	82	87	91	94	94	95	96	97	96	96	95	92
Feb13	95	95	95	95	95	95	94	95	91	88	87	84	82	84	90	91	93	95	96	97	97	98	99	100	93

Table 9.4 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Feb14	100	99	98	97	97	97	98	100	96	95	92	87	85	89	92	92	94	96	96	97	98	99	99	97	95
Feb15	96	96	96	96	97	97	98	97	95	91	90	89	87	90	94	97	103	108	108	105	104	103	99	99	97
Feb16	99	99	99	99	99	98	97	99	96	95	93	93	94	97	98	96	97	99	100	100	100	100	102	102	98
Feb17	99	99	100	101	100	101	98	96	95	95	97	96	96	99	100	101	102	103	103	102	102	100	100	101	99
Feb18	97	91	95	96	97	97	98	95	91	89	87	87	87	90	95	101	105	104	104	104	103	103	102	100	96
Feb19	98	96	98	96	97	96	96	94	92	92	92	93	92	97	102	103	104	106	107	105	106	105	102	103	99
Feb20	102	100	101	101	102	101	101	100	96	94	92	92	92	95	97	99	101	101	101	101	101	101	101	101	99
Feb21	101	101	101	101	101	100	98	97	92	90	90	89	91	96	98	97	99	100	101	101	101	102	101	101	98
Feb22	101	99	99	99	99	99	98	97	96	93	92	92	89	89	92	95	99	102	107	108	105	103	103	103	98
Feb23	103	102	101	102	97	96	98	99	97	96	100	100	99	96	94	98	102	105	106	104	101	101	100	100	100
Feb24	100	98	102	102	102	102	102	101	99	95	91	92	95	98	100	101	101	102	103	103	104	104	103	103	100
Feb25	102	102	102	102	101	101	100	97	92	87	85	87	90	92	95	98	100	101	103	105	105	105	104	104	98
Feb26	103	102	101	101	101	101	101	98	93	89	90	91	94	98	101	102	102	102	103	103	103	102	102	104	99
Feb27	96	99	98	98	100	93	99	100	100	99	98	98	103	109	112	110	109	110	109	108	106	106	105	105	103
Feb28	104	102	103	103	104	105	107	107	104	104	104	107	109	110	111	108	107	107	106	106	106	107	106	105	106
2018, Field component: F, Base: 48500.0, Unit: nT																									
Feb01	98	99	99	99	99	100	100	101	101	100	96	93	97	101	102	101	101	99	99	98	99	97	98	97	99
Feb02	98	99	98	98	98	99	98	101	102	100	98	97	96	99	99	100	100	99	100	101	101	101	100	100	99
Feb03	99	99	100	101	101	101	102	105	104	101	97	94	95	98	100	100	100	101	101	101	103	100	99	99	100
Feb04	99	100	100	100	100	102	104	106	105	101	99	97	92	95	98	100	101	99	95	98	101	101	100	98	100
Feb05	98	98	99	99	98	99	100	102	100	96	96	97	94	90	94	97	98	98	100	101	100	99	99	100	98
Feb06	100	99	100	101	101	100	101	104	101	94	90	86	91	98	101	100	100	100	99	99	98	100	101	98	98
Feb07	98	98	99	100	101	102	103	101	96	90	88	86	87	96	100	100	100	100	100	100	100	100	100	99	98
Feb08	99	99	100	101	101	103	104	105	102	98	97	100	99	99	99	98	99	100	100	100	100	99	104	99	100
Feb09	98	98	100	100	99	102	101	101	97	92	91	94	95	98	99	97	98	99	99	100	100	100	102	102	98
Feb10	100	101	100	101	101	102	101	103	102	96	89	90	90	96	96	99	100	98	98	98	97	98	98	99	98
Feb11	99	100	100	100	101	100	100	101	98	94	93	93	92	94	94	96	98	100	99	100	100	100	100	100	98
Feb12	100	100	100	102	102	103	105	109	105	97	93	92	88	89	94	97	99	99	99	99	99	101	101	100	99
Feb13	100	99	99	99	100	101	103	103	99	93	92	92	91	93	96	95	97	99	99	99	98	99	98	97	97
Feb14	98	99	100	100	100	101	103	104	100	99	97	92	89	92	95	95	96	98	99	98	99	99	99	102	98
Feb15	100	100	100	100	101	102	103	103	102	101	100	100	97	95	94	91	89	98	98	101	101	100	104	99	99
Feb16	98	99	100	102	102	103	102	100	99	94	93	94	96	99	100	99	99	100	99	100	102	101	100	102	99
Feb17	103	99	99	99	99	97	102	100	94	90	91	89	87	86	94	96	97	99	100	102	102	102	102	99	97
Feb18	106	97	96	98	97	99	98	95	91	89	85	85	84	90	90	92	95	99	99	102	102	100	99	101	95
Feb19	98	99	93	99	97	99	99	99	95	93	93	92	86	90	93	92	96	96	99	107	96	100	105	99	97
Feb20	99	99	98	99	100	101	102	101	97	94	93	92	91	92	94	97	100	100	101	102	102	101	101	101	98

Table 9.4 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Feb21	100	100	100	100	101	102	105	105	98	93	94	97	99	102	100	97	98	99	101	102	102	102	102	101	100
Feb22	102	102	100	101	101	101	101	100	100	95	91	93	91	91	93	92	96	95	95	101	103	107	103	100	98
Feb23	101	101	101	100	103	102	103	102	101	91	82	91	96	94	94	95	95	99	98	107	104	101	101	99	98
Feb24	98	95	97	98	99	100	100	97	90	87	86	88	92	97	99	98	98	100	101	101	102	101	102	101	97
Feb25	102	101	101	101	101	101	102	102	98	90	85	87	90	94	98	101	100	100	101	99	101	102	104	103	98
Feb26	103	102	104	102	102	101	103	104	99	92	91	92	94	97	98	97	101	102	103	103	103	104	103	105	100
Feb27	107	101	100	102	101	100	100	99	96	93	94	96	95	86	96	98	100	101	102	104	103	103	103	103	99
Feb28	104	102	101	101	102	104	104	103	101	101	100	101	101	105	104	100	98	102	104	104	104	104	104	104	102

Table 9.5. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Mar01	99	101	102	102	101	105	108	103	102	98	99	99	96	97	100	103	101	96	88	93	102	93	103	111	100
Mar02	101	100	104	104	103	101	101	99	97	98	99	104	107	105	102	101	103	106	108	106	105	103	109	108	103
Mar03	108	105	106	106	106	108	109	105	100	104	103	105	106	107	107	107	104	107	109	114	118	109	104	111	107
Mar04	114	114	107	99	103	104	103	102	104	102	107	110	111	111	112	107	103	104	102	100	101	102	106	107	106
Mar05	106	109	112	111	114	117	118	115	111	109	110	113	115	114	113	115	108	111	113	112	113	112	112	109	112
Mar06	110	108	110	109	111	112	111	105	100	102	105	109	113	116	113	110	106	110	114	115	112	111	111	109	110
Mar07	111	111	110	112	113	116	117	112	105	104	106	113	115	117	116	113	110	111	111	108	107	109	109	110	111
Mar08	113	112	113	114	118	119	115	117	111	103	106	113	118	121	119	116	113	115	114	118	115	114	111	113	114
Mar09	117	124	113	114	119	120	121	115	107	104	105	110	116	115	110	111	110	111	123	123	117	125	119	114	115
Mar10	122	130	125	126	112	106	108	99	93	90	96	101	101	107	106	98	92	90	97	101	117	118	112	110	107
Mar11	107	108	107	108	108	105	106	106	106	101	95	95	99	102	103	100	102	107	109	111	110	109	108	109	105
Mar12	108	107	108	109	112	113	114	114	111	108	107	110	114	118	119	116	110	110	109	109	111	114	113	112	112
Mar13	112	112	112	113	116	120	120	120	113	107	105	109	111	113	112	108	107	109	109	107	106	108	108	111	111
Mar14	112	112	113	114	116	118	120	115	110	108	112	117	120	122	119	105	86	68	82	75	72	86	97	98	104
Mar15	101	117	96	95	95	102	104	102	105	102	99	113	119	117	111	97	63	64	88	98	86	98	106	111	100
Mar16	114	102	103	98	117	116	104	101	91	76	87	102	108	105	90	62	67	66	64	73	87	106	87	91	92
Mar17	119	97	97	94	95	96	95	88	89	96	98	100	99	103	99	99	99	98	105	103	104	104	121	115	101
Mar18	108	102	98	98	101	104	105	102	98	96	102	108	113	103	77	68	91	96	107	74	71	113	75	77	95
Mar19	97	86	85	96	90	88	85	98	88	82	88	94	99	101	93	92	96	96	98	96	97	87	110	93	93
Mar20	95	95	97	106	105	104	105	103	101	99	96	95	97	100	102	101	101	102	102	99	94	97	100	98	100
Mar21	97	97	101	104	105	107	104	102	98	96	96	96	101	105	105	105	106	104	102	92	94	104	104	104	101
Mar22	102	103	105	106	107	112	115	115	115	114	116	123	122	119	117	115	112	114	116	104	86	79	90	92	108
Mar23	89	103	106	101	101	98	109	114	117	109	92	102	103	108	113	108	103	96	99	107	122	109	115	119	106
Mar24	103	104	99	99	103	111	111	118	123	116	111	104	109	113	109	102	91	101	101	97	94	95	89	99	104
Mar25	98	97	101	105	115	100	104	101	102	99	104	109	112	106	95	85	90	97	105	103	101	145	123	100	104
Mar26	101	98	109	105	99	96	94	102	102	87	89	97	103	103	98	100	96	87	93	96	112	100	101	101	99
Mar27	101	105	113	115	109	108	108	93	90	91	96	99	104	107	102	101	95	93	96	100	103	102	106	107	102
Mar28	109	107	104	101	102	99	97	95	92	102	113	121	122	117	110	105	104	105	108	108	109	111	111	111	107
Mar29	109	109	109	108	106	105	106	105	110	117	117	119	124	124	120	120	116	111	111	110	108	109	111	112	112
Mar30	113	113	111	110	108	113	112	110	109	114	119	119	117	118	114	112	116	115	118	118	118	118	116	116	114
Mar31	116	116	125	113	113	117	119	116	111	112	114	117	116	113	112	108	103	104	107	112	117	117	117	115	114
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Mar01	46	43	44	45	44	43	50	53	49	41	29	25	24	27	33	40	41	44	47	57	64	49	49	62	44
Mar02	52	45	42	46	47	48	52	52	49	46	39	29	23	22	25	30	34	37	40	42	44	45	46	45	41
Mar03	48	47	46	46	47	48	53	55	51	44	32	26	15	15	21	28	32	32	35	38	44	53	57	54	40

Table 9.5 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Mar04	50	47	47	43	43	46	49	53	49	41	29	22	24	30	33	37	41	46	39	46	50	50	48	44	42
Mar05	43	43	43	43	43	44	49	54	54	48	37	27	22	22	29	32	39	38	40	41	42	42	42	46	40
Mar06	47	43	45	46	45	47	53	58	55	45	33	22	18	20	29	36	39	39	39	40	42	44	43	43	40
Mar07	42	42	42	43	43	43	49	58	60	50	33	19	15	21	28	36	39	38	40	52	67	48	44	41	41
Mar08	41	41	42	42	42	42	43	52	58	52	35	22	21	25	31	38	38	37	39	39	39	39	42	45	39
Mar09	42	39	43	35	42	45	51	57	59	52	37	25	23	28	39	44	42	40	35	35	41	81	51	44	43
Mar10	36	55	58	57	50	51	59	64	59	48	31	20	21	25	25	28	23	23	32	39	39	40	46	46	41
Mar11	46	45	43	43	44	47	47	53	53	46	39	31	28	30	34	42	44	43	43	43	44	47	45	45	43
Mar12	44	43	42	43	44	46	51	56	57	50	34	24	23	24	32	43	45	42	43	45	47	44	43	44	42
Mar13	43	43	44	44	44	44	49	57	59	50	37	25	19	22	29	36	40	40	42	47	45	46	47	43	41
Mar14	42	43	43	44	44	45	51	60	59	48	36	24	18	18	25	31	31	51	43	54	60	73	72	52	44
Mar15	61	65	60	57	51	52	57	63	59	48	36	27	26	27	31	33	41	43	72	66	57	58	57	48	50
Mar16	51	50	61	59	48	48	52	57	54	42	29	26	21	23	20	34	30	64	55	68	59	74	65	55	48
Mar17	40	54	62	61	53	53	59	62	61	51	33	26	22	20	30	36	36	43	42	51	50	49	52	58	46
Mar18	54	54	56	47	44	47	53	57	57	49	37	28	18	14	13	29	35	39	86	76	77	94	96	75	51
Mar19	66	53	31	51	57	58	52	55	56	55	43	32	26	21	29	42	40	43	51	64	69	67	51	51	48
Mar20	48	50	41	38	50	53	59	66	66	54	41	32	28	29	35	43	45	45	48	63	55	50	53	55	48
Mar21	57	51	49	43	44	48	57	67	69	59	46	34	26	23	27	37	42	43	43	59	55	48	49	51	47
Mar22	49	46	45	46	44	43	52	63	67	58	41	23	18	21	31	38	39	38	40	54	73	70	71	65	47
Mar23	58	35	46	54	58	47	53	62	60	53	42	28	21	24	27	32	33	33	39	41	53	62	63	43	44
Mar24	52	53	54	51	49	50	55	61	62	56	40	32	26	20	22	24	28	32	45	50	66	65	72	70	47
Mar25	76	65	54	50	58	53	58	64	56	48	40	31	30	23	26	38	36	50	47	44	50	72	55	46	49
Mar26	52	59	53	62	58	58	56	61	52	50	39	30	26	27	35	45	46	59	52	53	52	52	52	51	49
Mar27	51	53	51	60	59	53	57	62	57	44	27	17	26	31	39	52	53	51	46	45	45	45	42	42	46
Mar28	45	48	50	52	50	53	59	64	60	49	38	31	31	35	42	48	47	45	43	45	46	46	44	45	46
Mar29	45	46	47	49	50	51	59	66	59	45	29	19	18	24	29	29	32	35	40	44	46	45	44	45	42
Mar30	45	47	51	53	50	48	59	66	64	51	37	30	29	29	35	38	37	35	36	39	42	43	45	46	44
Mar31	46	45	49	52	50	51	56	61	61	52	40	29	22	25	32	40	48	48	42	45	44	46	47	46	45

2018, Field component: Z, Base: 43700.0, Unit: nT

Mar01	105	105	104	104	104	105	106	106	103	99	99	101	104	105	103	103	103	104	107	107	106	106	105	102	104
Mar02	103	103	103	103	103	104	104	101	94	91	91	90	91	93	97	99	102	103	103	104	104	104	103	103	100
Mar03	102	102	103	103	103	103	105	103	98	93	92	92	94	93	97	99	101	103	103	103	103	105	107	106	101
Mar04	105	104	103	104	104	105	106	104	102	99	93	92	93	95	98	99	102	103	105	105	106	105	104	103	102
Mar05	103	103	102	102	102	102	104	103	98	93	91	92	95	97	98	99	99	101	102	102	102	102	102	102	100
Mar06	101	102	101	101	101	103	105	103	98	93	91	91	92	93	96	99	99	101	101	101	101	101	101	101	99
Mar07	101	101	101	101	101	101	103	104	103	100	97	95	97	99	101	102	101	101	101	101	102	102	101	101	101

Table 9.5 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Mar08	101	100	100	100	100	101	105	105	100	94	88	90	92	93	96	98	98	100	101	101	101	101	101	101	99
Mar09	101	99	100	100	99	100	103	104	102	99	95	96	99	101	102	102	100	101	101	101	101	100	101	100	100
Mar10	98	93	92	91	92	96	100	102	99	97	100	100	102	104	105	106	107	108	108	108	106	104	104	104	101
Mar11	104	103	103	102	103	104	105	104	102	98	97	99	100	102	103	105	104	104	103	103	103	103	103	103	102
Mar12	102	102	102	102	102	102	103	103	100	95	91	92	93	94	97	101	101	101	102	102	103	102	102	102	100
Mar13	102	102	101	101	100	100	101	102	100	94	91	92	96	99	102	103	102	102	103	103	104	104	104	103	100
Mar14	102	102	102	101	101	101	104	102	97	92	91	93	95	94	96	101	105	112	113	115	117	115	113	111	103
Mar15	108	100	103	104	105	105	108	107	99	91	90	93	95	98	102	107	112	116	114	112	112	111	110	104	104
Mar16	102	103	103	104	102	99	101	102	97	93	93	94	98	98	103	112	115	118	119	117	115	108	108	109	105
Mar17	103	100	102	105	107	109	111	111	108	102	96	96	98	103	104	106	107	107	108	108	108	108	106	101	105
Mar18	104	104	105	106	105	106	107	106	102	98	92	92	96	99	109	113	111	110	110	114	115	104	99	105	105
Mar19	104	107	105	104	105	106	108	104	101	102	100	95	94	97	105	110	110	110	110	111	110	110	108	108	105
Mar20	109	109	109	105	105	108	110	109	110	106	102	102	103	106	110	111	109	109	109	109	111	110	109	109	108
Mar21	108	109	108	107	107	110	113	113	107	101	98	98	99	100	105	108	107	107	109	110	111	110	109	108	107
Mar22	108	108	107	107	107	108	110	109	103	96	89	90	93	98	102	105	105	104	106	109	112	115	114	113	105
Mar23	112	110	104	105	106	108	108	106	100	91	87	90	91	95	100	104	106	108	110	109	107	102	104	100	103
Mar24	101	103	104	105	105	106	107	104	98	94	93	91	93	96	100	105	107	107	109	110	111	112	111	110	103
Mar25	108	109	108	104	100	102	102	100	96	89	88	89	92	97	100	107	110	110	110	110	110	103	100	103	102
Mar26	105	106	105	103	105	107	109	107	103	98	95	95	96	99	104	106	107	110	111	110	109	106	107	108	105
Mar27	108	108	105	103	103	107	108	107	103	95	96	101	105	106	107	109	110	111	111	110	109	109	109	108	106
Mar28	107	107	107	107	107	109	111	110	106	100	96	97	99	103	106	107	106	105	107	107	107	107	107	107	105
Mar29	107	107	107	107	106	107	108	104	98	92	90	91	94	97	100	102	102	103	104	106	107	107	107	106	102
Mar30	106	106	106	106	107	108	111	109	100	91	93	94	97	98	101	104	104	104	104	105	105	105	106	106	103
Mar31	106	106	103	103	104	106	107	106	104	98	96	98	99	100	103	106	107	108	108	107	106	106	106	106	104
2018, Field component: F, Base: 48500.0, Unit: nT																									
Mar01	103	104	103	103	103	105	108	106	102	96	96	99	100	101	101	102	102	101	100	103	105	101	104	105	102
Mar02	102	102	103	103	103	103	103	100	92	90	90	91	93	94	96	98	101	104	105	104	105	104	106	105	100
Mar03	104	103	104	103	104	105	107	104	97	94	93	93	95	95	98	101	100	104	105	108	110	107	107	110	102
Mar04	110	108	105	102	104	105	106	104	102	99	95	95	96	98	101	101	101	103	103	103	104	105	105	105	103
Mar05	104	105	106	106	106	108	110	108	102	96	94	96	100	101	102	104	102	104	105	105	106	105	105	104	104
Mar06	104	103	104	104	105	106	108	104	98	93	92	93	96	99	100	102	100	104	105	105	105	104	104	104	102
Mar07	104	104	104	104	105	106	109	108	104	101	98	99	102	104	106	106	104	104	104	104	104	104	104	104	104
Mar08	105	104	105	105	106	108	109	111	104	94	90	94	98	101	103	103	102	105	105	107	106	105	104	105	103
Mar09	106	108	104	104	105	108	110	109	103	100	96	99	104	105	104	106	103	104	109	109	107	110	108	105	105
Mar10	106	106	103	102	96	98	103	101	95	92	96	98	100	105	105	102	100	101	105	106	111	110	108	107	102
Mar11	105	105	104	104	104	104	106	105	103	98	94	95	98	101	103	103	103	105	105	106	105	105	105	105	103

Table 9.5 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Mar12	104	104	104	104	105	106	108	108	104	98	93	95	98	101	104	106	104	104	105	105	106	107	106	105	103
Mar13	105	105	105	105	106	107	109	110	104	97	92	95	99	102	105	104	103	104	105	105	104	105	105	106	104
Mar14	106	105	106	106	106	107	111	108	101	95	95	99	101	102	102	101	96	96	103	101	102	107	109	108	103
Mar15	107	107	100	101	101	104	108	106	100	91	89	97	101	103	105	103	94	97	107	109	104	108	111	107	103
Mar16	107	102	103	102	108	105	101	101	92	82	87	94	99	98	97	93	98	101	101	103	107	110	101	103	100
Mar17	109	98	100	101	103	106	107	104	102	99	94	95	96	102	101	103	104	104	108	108	108	108	113	107	103
Mar18	106	103	103	103	104	106	107	105	100	95	92	94	100	98	95	96	104	106	112	101	101	109	88	95	101
Mar19	102	99	96	101	100	100	100	102	95	93	93	91	92	95	99	104	106	106	107	107	107	103	110	103	100
Mar20	104	104	106	106	105	108	110	109	108	104	98	98	100	104	108	109	107	107	108	107	106	106	107	106	106
Mar21	105	105	106	107	107	111	113	112	105	99	95	95	97	100	105	108	108	107	107	105	107	109	109	108	105
Mar22	107	107	107	107	107	111	114	114	109	102	96	99	100	104	107	110	108	108	111	109	105	104	108	108	107
Mar23	105	109	105	104	104	105	110	111	106	94	83	89	91	97	103	105	105	104	107	110	115	105	110	106	103
Mar24	101	103	102	103	105	109	110	111	107	100	97	92	95	100	102	103	101	105	107	107	107	108	105	108	104
Mar25	106	106	106	105	105	101	103	100	97	88	90	92	96	98	96	98	103	107	110	109	108	122	108	101	102
Mar26	104	104	107	104	103	104	105	107	...	92	89	93	96	99	101	104	104	102	106	106	112	104	106	107	...
Mar27	107	108	109	108	105	108	110	102	97	90	93	98	104	107	106	107	106	105	107	108	108	108	109	109	105
Mar28	109	108	106	106	106	107	108	107	101	99	100	105	107	108	108	107	106	106	108	108	109	110	110	110	107
Mar29	109	109	109	108	107	107	109	106	101	99	97	98	103	106	107	108	107	106	107	108	108	109	110	109	106
Mar30	110	110	109	108	108	112	114	112	103	97	100	101	102	104	105	107	109	108	110	110	111	111	111	111	108
Mar31	111	111	112	107	108	111	114	112	107	102	101	103	104	103	106	107	106	108	109	110	112	111	111	110	108

Table 9.6. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Apr01	113	116	115	115	115	115	117	109	106	105	110	114	116	115	115	115	113	115	115	117	113	115	113	112	114
Apr02	111	110	112	111	113	115	117	111	108	110	115	113	114	113	114	110	113	112	113	114	112	110	110	110	112
Apr03	108	107	109	114	112	110	111	105	100	101	106	115	120	120	116	113	110	110	112	113	114	115	116	116	111
Apr04	116	116	115	116	118	121	121	117	110	108	107	102	102	103	105	106	105	114	114	112	113	118	123	123	113
Apr05	128	116	115	113	118	122	120	113	101	100	105	108	113	115	117	117	112	111	115	121	116	117	112	113	114
Apr06	111	111	111	107	110	115	117	112	104	103	113	115	114	113	112	113	111	111	107	109	113	113	114	118	112
Apr07	114	114	116	117	119	122	125	120	111	110	112	116	118	117	115	117	117	115	116	117	118	119	121	116	117
Apr08	114	113	113	113	117	119	120	114	108	109	113	115	119	120	121	121	120	116	114	117	120	118	120	114	116
Apr09	117	114	113	113	113	116	115	108	108	109	113	113	105	103	109	110	106	100	110	105	101	126	99	106	110
Apr10	107	106	108	106	105	117	98	98	96	93	99	100	84	79	75	85	83	85	92	99	104	131	127	103	99
Apr11	103	109	110	103	101	99	91	84	74	86	96	99	103	97	98	101	103	103	104	107	113	110	111	111	101
Apr12	108	104	104	106	109	112	106	104	103	99	93	97	99	103	100	99	102	105	108	105	105	116	106	107	104
Apr13	133	118	110	101	101	101	102	95	93	100	99	99	101	106	108	107	108	112	112	113	104	127	107	104	107
Apr14	110	105	106	104	105	107	107	104	102	100	102	107	112	111	116	111	102	98	97	106	105	98	99	107	105
Apr15	117	112	108	107	109	111	109	104	97	101	104	102	102	101	101	105	107	108	108	107	107	108	116	115	107
Apr16	108	108	108	109	111	111	112	109	103	100	99	100	102	104	105	106	108	110	111	110	112	112	113	114	108
Apr17	116	112	108	110	111	108	108	103	99	105	109	108	107	104	106	109	113	115	116	116	114	121	115	115	110
Apr18	114	112	114	112	112	113	111	104	100	99	103	112	111	111	114	114	101	100	100	104	107	111	112	111	108
Apr19	110	110	111	113	115	117	118	111	104	107	113	110	111	113	115	117	116	115	116	116	118	118	119	120	114
Apr20	136	141	131	137	126	129	113	132	95	67	62	83	75	75	58	67	75	70	65	110	108	78	81	97	96
Apr21	103	93	86	90	94	91	90	86	73	80	87	95	94	91	89	87	89	99	94	97	97	94	98	99	92
Apr22	99	95	96	95	98	98	99	93	92	93	95	100	105	99	104	107	106	103	101	100	102	101	103	103	99
Apr23	111	104	101	101	97	101	102	100	96	94	100	112	...	117	110	99	91	90	96	110	101	104	96	97	...
Apr24	98	99	99	100	102	103	101	98	99	102	112	119	119	110	109	108	103	108	113	114	122	112	110	109	107
Apr25	113	110	107	103	105	105	103	102	103	106	111	120	123	116	111	108	108	106	107	109	110	110	117	120	110
Apr26	113	106	106	110	110	111	112	112	107	106	108	122	127	123	120	120	115	113	113	112	113	114	113	112	113
Apr27	111	110	110	110	114	114	112	106	104	116	127	137	133	127	122	114	105	111	117	116	114	117	116	112	116
Apr28	116	117	115	114	116	113	107	98	92	98	109	119	126	122	120	118	116	110	111	114	114	114	112	112	113
Apr29	112	112	112	112	113	111	104	103	99	105	116	128	132	126	122	119	115	110	113	114	115	114	115	116	114
Apr30	116	122	119	113	116	115	114	112	111	114	121	132	134	129	125	119	113	112	114	114	113	113	113	112	117
2018, Field component: Y, Base: 1400.0, Unit: nT																									
Apr01	148	147	148	146	146	150	158	165	164	155	142	129	120	127	137	143	146	142	144	145	147	151	149	148	146
Apr02	149	146	147	147	148	152	160	168	166	156	143	132	122	121	126	139	144	145	145	148	156	154	152	150	146
Apr03	151	150	149	152	146	149	158	168	168	155	139	127	121	121	129	140	146	146	146	146	146	146	146	146	145
Apr04	147	147	148	148	148	151	161	171	171	160	140	123	107	111	115	124	138	141	142	149	151	149	146	148	143

Table 9.6 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Apr05	149	152	150	149	149	153	164	170	168	156	138	123	117	119	126	132	146	150	140	139	158	147	146	147	145
Apr06	148	149	151	151	151	155	162	168	167	156	137	122	120	126	132	139	144	148	146	145	148	147	148	147	146
Apr07	147	148	148	150	149	151	161	169	169	158	144	125	114	114	121	131	140	142	142	144	145	146	156	146	144
Apr08	146	147	149	150	149	153	162	168	163	149	135	125	119	123	129	138	143	143	144	155	151	165	168	153	147
Apr09	153	154	154	159	161	163	170	173	166	155	140	120	112	116	122	124	132	142	156	167	179	205	167	155	152
Apr10	156	153	156	163	154	157	164	152	155	147	139	131	121	129	125	133	147	153	151	154	153	144	169	168	149
Apr11	162	143	153	164	162	157	157	163	167	156	143	136	127	126	132	135	141	145	144	149	151	156	153	148	149
Apr12	156	153	154	155	155	158	167	168	167	156	143	136	129	131	138	147	145	149	150	155	162	168	158	155	152
Apr13	147	160	170	166	166	166	171	172	162	147	138	125	121	128	132	137	142	144	148	149	159	163	160	150	151
Apr14	148	152	152	153	152	156	163	170	167	154	140	125	111	118	127	138	154	153	148	148	154	161	158	153	148
Apr15	147	154	155	158	160	160	164	168	170	160	143	129	118	118	128	137	146	150	150	148	149	149	152	157	149
Apr16	155	154	156	158	159	159	162	164	161	158	151	135	124	124	131	136	143	148	148	149	149	149	149	156	149
Apr17	153	153	151	151	156	158	164	169	166	163	156	141	123	118	121	131	138	144	146	148	150	156	154	152	148
Apr18	154	151	150	152	153	160	169	175	173	164	148	124	111	119	125	130	138	146	145	149	152	156	154	151	148
Apr19	149	148	148	151	157	162	168	171	168	158	137	115	104	108	119	132	143	147	146	150	151	149	148	148	145
Apr20	146	149	154	152	160	147	153	140	159	157	132	115	107	98	108	118	145	152	178	209	190	176	174	149	149
Apr21	151	158	160	161	163	167	172	174	168	154	139	120	113	118	125	136	150	164	154	169	166	156	155	151	152
Apr22	155	153	155	153	156	164	172	176	170	157	143	130	122	128	138	144	150	152	152	154	153	156	157	158	152
Apr23	152	156	156	159	162	167	176	180	174	161	143	127	...	126	133	142	147	152	151	164	167	166	160	154	...
Apr24	153	154	156	159	165	169	170	169	160	147	134	120	115	124	132	138	143	146	147	151	160	154	155	154	149
Apr25	156	161	166	167	167	170	170	171	166	154	140	126	122	128	139	149	153	153	151	150	149	150	151	152	153
Apr26	152	153	155	160	167	172	178	174	164	152	138	123	118	125	136	144	149	148	148	147	148	150	150	156	150
Apr27	154	151	155	159	163	165	169	170	160	143	125	116	116	125	136	142	146	142	144	145	146	150	155	157	147
Apr28	155	154	156	158	160	164	172	174	161	143	127	114	110	120	132	139	146	149	151	151	151	151	152	152	148
Apr29	152	153	155	158	163	168	170	165	156	146	135	115	111	124	138	146	150	149	148	149	150	150	152	152	148
Apr30	154	153	160	162	165	167	167	166	157	146	135	121	111	113	123	130	138	145	148	150	150	150	151	151	146
2018, Field component: Z, Base: 43700.0, Unit: nT																									
Apr01	106	106	105	105	106	108	106	102	97	93	91	90	91	94	99	104	104	104	105	105	105	105	105	105	102
Apr02	106	106	105	105	106	107	107	106	101	96	95	93	93	96	102	106	106	105	105	106	106	106	106	106	103
Apr03	106	106	105	104	105	107	109	106	101	92	86	84	86	91	96	102	104	104	105	105	105	105	105	105	101
Apr04	105	105	105	104	105	107	109	108	105	99	90	86	89	93	98	103	106	105	106	106	107	107	106	105	102
Apr05	103	103	103	104	105	108	110	108	105	99	92	89	91	95	98	103	105	108	107	106	106	107	106	106	103
Apr06	106	106	106	106	106	107	109	106	105	100	93	92	94	97	100	104	106	106	108	107	106	106	106	105	104
Apr07	105	105	105	104	104	106	108	106	102	97	90	89	91	94	98	102	104	104	104	105	105	105	104	105	102
Apr08	105	105	105	105	105	106	107	106	101	94	89	84	88	94	97	101	102	103	105	105	105	104	104	105	101
Apr09	104	104	105	104	104	106	106	104	99	91	85	84	89	94	98	101	106	109	110	110	111	105	106	107	102

Table 9.6 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Apr10	107	108	107	107	107	104	105	104	98	98	96	96	99	107	114	117	120	119	117	115	113	107	102	105	107
Apr11	105	104	100	103	106	107	109	109	110	107	102	94	93	99	104	107	111	111	111	111	110	110	109	108	106
Apr12	108	108	109	108	108	109	111	109	105	101	95	94	97	102	105	109	110	109	110	111	110	109	109	109	106
Apr13	105	101	101	104	106	108	107	107	104	99	92	87	90	96	101	105	107	107	108	109	110	107	106	109	103
Apr14	107	108	109	109	110	110	111	110	108	100	92	86	92	99	105	111	113	113	113	111	112	112	112	111	107
Apr15	108	107	107	108	108	109	112	112	110	106	95	88	91	95	100	106	108	109	109	110	110	110	109	107	105
Apr16	108	108	108	108	109	110	112	111	106	100	92	88	91	96	100	104	106	107	107	108	108	108	108	107	105
Apr17	107	107	107	108	108	109	111	110	106	101	93	89	89	92	99	104	106	107	107	108	108	107	107	108	104
Apr18	107	108	107	107	108	110	112	109	106	104	99	92	93	100	107	112	114	115	114	113	112	111	110	109	108
Apr19	109	109	109	109	109	108	108	107	105	97	87	83	87	97	102	105	107	107	107	107	107	107	107	107	104
Apr20	106	105	105	104	104	106	108	105	105	106	99	95	94	104	108	123	129	133	133	126	117	118	118	116	111
Apr21	111	110	114	115	115	116	119	117	112	103	92	88	94	104	111	117	120	123	120	118	117	116	116	115	112
Apr22	114	115	115	115	115	117	115	113	109	105	100	99	102	105	108	110	111	113	114	115	115	115	114	114	111
Apr23	111	110	111	112	112	113	113	111	108	106	102	100	...	106	110	112	113	115	115	115	114	113	114	114	...
Apr24	114	114	114	114	114	114	115	112	110	108	101	97	102	106	109	113	112	113	112	113	112	113	113	113	111
Apr25	111	110	110	111	111	111	112	111	107	104	100	92	95	102	107	110	111	111	111	112	112	112	111	110	108
Apr26	109	111	111	112	112	110	108	105	101	97	92	92	96	100	103	108	111	110	110	111	111	111	111	111	106
Apr27	112	111	111	111	112	112	112	109	104	97	88	86	91	100	105	107	113	111	110	111	112	112	112	111	107
Apr28	111	111	111	111	113	113	114	114	111	106	101	98	100	104	107	109	110	110	109	110	110	111	111	111	109
Apr29	111	111	111	112	113	113	113	109	102	94	88	87	91	97	102	106	107	108	108	109	109	110	110	110	105
Apr30	110	110	110	111	111	108	107	106	105	103	98	92	94	103	108	111	111	111	111	111	111	111	111	111	107
2018, Field component: F, Base: 48500.0, Unit: nT																									
Apr01	110	111	110	110	110	112	112	105	99	95	95	95	96	99	104	109	108	108	110	111	109	110	109	109	106
Apr02	109	108	108	108	109	111	113	109	104	100	100	98	97	100	106	108	110	108	109	110	110	109	108	108	107
Apr03	108	107	107	109	108	110	112	107	100	92	89	90	94	98	101	106	107	106	108	109	109	110	110	110	104
Apr04	110	110	109	110	111	114	116	114	108	101	93	86	89	92	98	103	106	110	110	110	111	112	114	113	106
Apr05	113	109	108	108	111	116	117	112	105	98	93	92	96	100	104	109	108	111	111	113	112	112	110	110	107
Apr06	109	109	109	108	108	112	114	110	106	100	98	97	99	101	104	108	109	109	108	109	110	110	110	111	107
Apr07	110	110	110	110	111	114	117	113	106	101	95	95	97	99	102	107	109	109	110	110	111	111	112	110	107
Apr08	109	109	109	109	110	113	114	111	104	98	94	90	95	101	105	108	109	108	109	111	112	111	112	109	107
Apr09	110	109	109	108	108	111	111	107	102	94	91	89	90	94	100	104	106	107	112	110	110	116	104	108	105
Apr10	108	108	109	108	107	110	103	101	95	94	95	94	90	95	100	107	109	110	111	112	113	118	113	105	105
Apr11	105	106	103	104	105	105	103	101	97	99	98	92	93	96	101	105	109	110	110	111	114	112	112	111	104
Apr12	110	108	108	109	110	112	112	109	105	99	91	92	95	101	103	106	108	109	111	111	111	114	109	110	106
Apr13	117	108	104	103	105	106	107	...	100	98	91	85	89	98	102	106	108	110	111	112	110	117	107	108	...
Apr14	110	109	109	109	110	111	112	110	107	99	93	88	96	101	109	114	111	110	109	112	111	109	110	112	107

Table 9.6 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Apr15	113	110	109	109	110	112	114	112	107	105	96	89	91	93	99	106	109	110	111	110	111	111	114	112	107
Apr16	110	110	109	110	112	113	115	113	106	99	91	88	91	96	100	105	108	109	110	110	111	111	111	112	106
Apr17	112	110	109	110	111	111	...	110	105	102	97	92	91	93	99	106	109	111	112	113	113	115	112	112	...
Apr18	112	111	111	111	112	114	115	110	105	102	99	...	97	102	111	115	111	112	111	113	113	114	113	112	...
Apr19	112	112	112	113	113	114	114	110	106	99	92	86	91	101	106	110	112	112	112	112	113	113	113	113	108
Apr20	120	121	116	118	114	117	112	117	101	90	81	86	81	90	87	104	114	116	114	128	119	106	108	112	107
Apr21	110	105	105	108	110	110	112	109	99	93	85	85	90	98	104	109	112	119	114	115	114	111	112	112	106
Apr22	111	110	110	110	112	113	113	109	104	100	97	98	102	102	107	111	111	112	112	112	113	113	113	113	109
Apr23	114	110	109	110	109	111	112	109	105	102	100	104	109	111	111	109	107	108	111	117	112	113	110	110	109
Apr24	111	111	111	112	112	113	114	109	107	107	104	103	108	108	111	113	111	113	116	117	119	116	115	114	111
Apr25	115	112	111	111	112	111	111	110	107	106	103	100	104	107	110	112	113	111	112	113	114	114	116	117	110
Apr26	113	111	112	114	115	114	112	109	104	99	94	100	106	108	109	114	115	114	113	114	114	115	114	114	110
Apr27	114	113	113	114	116	116	115	110	104	102	98	101	104	110	112	111	112	113	115	116	115	117	116	114	111
Apr28	116	116	115	115	117	117	115	111	106	104	103	104	109	111	113	115	115	112	112	114	114	114	114	114	112
Apr29	114	114	114	115	116	115	113	108	100	95	94	98	103	107	110	112	112	110	112	113	113	114	114	115	110
Apr30	115	117	116	114	116	113	112	110	109	107	105	104	107	113	115	117	114	114	114	115	114	114	114	114	113

Table 9.7. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
May01113	114	113	113	117	118	115	108	101	103	110	118	121	120	120	119	120	118	118	117	114	115	116	118	115	
May02119	117	114	118	122	118	112	109	107	102	115	128	126	124	118	115	...	...	...	...	...	...	116	118	...	
May03118	119	118	120	122	122	121	116	110	105	112	121	122	119	118	116	115	115	122	121	122	124	116	118	118	
May04115	113	116	117	118	119	116	113	112	118	116	122	127	122	120	119	123	123	124	124	119	119	123	118	119	
May05118	116	112	113	115	117	114	107	106	109	129	144	133	117	120	106	105	78	63	86	99	115	122	82	109	
May06107	129	96	78	86	93	87	83	88	74	73	83	82	90	97	93	99	99	99	106	134	121	120	115	97	
May07108	119	115	109	97	86	95	92	91	92	103	101	97	97	82	82	96	98	99	102	107	120	126	113	101	
May08108	104	101	104	106	92	94	85	87	90	97	110	110	107	108	85	...	...	104	103	117	101	109	104	...	
May09105	104	101	101	95	92	85	91	91	104	106	105	96	95	92	97	97	102	104	117	109	106	112	107	101	
May10111	106	99	106	105	101	96	80	77	84	90	99	99	99	95	...	...	...	94	99	101	110	105	99	...	
May1199	102	103	108	98	106	98	73	86	97	115	123	120	111	90	91	94	97	98	107	93	93	115	115	101	
May1299	102	102	105	94	99	94	97	104	107	110	...	...	106	101	102	102	105	109	109	107	107	112	114	...	
May13105	104	104	106	107	104	104	101	98	102	109	112	105	98	101	111	110	118	122	121	116	112	117	117	109	
May14108	106	104	104	104	99	97	97	99	103	112	116	113	106	103	103	107	109	110	110	114	116	116	111	107	
May15109	111	110	110	110	101	93	90	87	91	97	104	107	108	108	109	108	105	110	113	113	108	108	111	105	
May16113	112	111	111	111	108	103	99	104	113	119	120	117	113	112	112	113	114	115	117	120	119	121	117	113	
May17118	129	119	114	123	122	117	110	106	110	102	107	103	101	97	95	87	86	91	91	89	96	102	108	105	
May18118	115	112	108	102	97	89	89	93	93	93	93	88	94	98	102	106	104	108	109	111	113	114	111	102	
May19110	108	107	108	109	106	100	95	92	85	83	91	100	104	109	108	112	117	117	117	116	114	115	114	106	
May20113	111	110	112	115	112	108	103	104	98	97	100	102	100	105	106	106	109	112	113	113	112	111	111	108	
May21111	110	109	111	112	104	98	93	93	97	104	113	117	115	112	111	108	111	114	118	119	120	120	123	110	
May22118	116	116	115	116	111	102	97	101	109	118	121	127	126	125	127	127	126	133	133	129	129	125	123	120	
May23122	122	122	124	124	114	105	101	94	110	112	107	97	99	94	97	108	110	113	117	117	116	113	112	111	
May24112	111	110	114	116	115	107	95	94	100	107	116	116	107	106	111	112	109	113	114	114	114	114	116	110	
May25115	111	115	116	117	113	104	98	99	105	114	117	111	102	97	103	111	115	119	119	119	118	115	115	111	
May26116	117	116	117	117	110	97	90	94	107	117	124	123	117	115	113	114	117	125	126	128	128	126	122	116	
May27121	122	123	123	119	113	100	95	95	99	104	112	115	117	113	116	116	118	119	120	122	119	121	123	114	
May28120	120	120	121	123	120	112	104	100	105	116	129	125	117	117	113	116	119	120	123	125	127	127	126	119	
May29126	127	126	127	129	125	117	113	114	114	124	129	125	112	108	112	116	117	117	118	120	115	116	117	119	
May30115	115	116	118	120	117	110	104	103	102	106	...	116	115	118	116	120	118	118	126	126	124	122	126	...	
May31119	122	122	124	127	123	117	111	104	103	112	126	130	122	122	131	138	129	131	119	121	123	121	121	122	
2018, Field component: Y, Base: 1500.0, Unit: nT																									
May0152	53	54	56	61	65	71	71	62	50	38	24	15	19	29	38	46	50	49	50	50	49	52	53	48	
May0253	53	53	53	57	65	70	73	64	46	33	21	17	18	26	35	...	...	...	...	...	...	52	53	...	
May0354	53	54	55	56	58	66	75	75	62	46	26	15	17	27	38	45	48	47	48	49	53	55	57	49	

Table 9.7 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
May0455	54	52	54	56	57	66	71	65	49	35	23	18	19	21	27	33	40	42	46	49	53	57	57	46	
May0554	54	54	56	60	62	69	73	70	62	49	31	17	21	15	12	31	61	77	58	65	89	96	101	56	
May0688	97	88	60	53	65	73	75	68	59	52	31	14	27	29	36	52	55	51	50	66	68	54	84	58	
May0766	73	63	72	75	71	68	76	63	52	46	37	37	35	38	50	51	55	54	52	52	72	65	74	58	
May0870	70	61	64	75	77	71	72	62	47	39	27	29	33	34	41	...	...	54	74	66	58	53	53	...	
May0953	48	36	59	71	74	77	75	68	52	40	26	23	24	38	46	58	54	58	77	60	59	69	78	55	
May1059	62	58	57	71	78	81	73	53	45	36	25	27	40	46	...	...	...	57	55	56	54	59	59	...	
May1154	52	56	62	69	58	59	60	43	40	36	32	33	29	38	47	49	56	60	76	66	64	71	65	53	
May1262	60	59	71	83	83	85	76	59	42	36	...	...	38	46	52	56	56	54	55	58	61	61	56	...	
May1357	61	64	70	77	81	78	71	59	43	28	19	16	21	26	24	39	43	44	48	54	61	59	59	50	
May1458	57	63	68	76	77	69	57	46	36	29	22	21	27	37	42	48	49	52	51	54	62	58	57	51	
May1555	55	58	63	70	78	73	66	54	37	26	22	23	29	36	42	47	48	49	56	56	57	56	58	51	
May1659	60	61	64	68	70	71	68	62	54	42	26	19	23	30	37	45	48	53	60	59	54	58	60	52	
May1762	65	79	80	86	81	80	78	68	54	41	23	20	24	41	44	52	57	60	62	62	59	55	57	58	
May1861	60	62	66	67	75	76	76	70	57	41	26	17	22	29	41	47	50	52	54	54	56	54	54	53	
May1957	57	58	61	65	70	74	76	69	55	39	29	22	22	29	38	43	55	58	56	56	57	57	58	53	
May2060	62	63	62	68	77	81	77	69	58	46	32	28	32	34	40	49	53	54	55	55	55	56	57	55	
May2157	58	59	61	68	76	79	78	67	53	41	35	30	29	33	40	46	50	51	52	53	53	55	60	53	
May2259	60	62	66	72	78	77	69	56	47	33	24	20	19	22	30	39	43	41	43	46	49	53	57	49	
May2363	57	59	62	65	72	73	61	58	43	29	17	16	21	27	39	51	55	54	53	54	53	53	55	50	
May2457	59	61	64	70	79	80	76	62	48	44	38	38	39	43	51	54	58	57	54	54	54	53	54	56	
May2555	56	59	65	73	77	74	73	72	61	47	36	33	36	40	46	53	57	54	52	52	52	54	54	55	
May2656	57	56	59	69	75	75	70	63	53	39	26	25	29	39	49	52	50	46	47	48	50	53	56	52	
May2757	57	59	66	74	83	80	75	65	51	35	25	28	32	37	45	50	50	50	50	51	52	53	51	53	
May2855	58	60	67	76	82	73	69	60	51	42	27	23	27	35	44	49	52	50	49	54	51	52	53	52	
May2955	58	61	65	71	78	74	74	69	53	45	37	33	30	31	39	48	55	57	55	55	56	57	56	55	
May3058	57	58	62	68	77	83	86	86	71	55	...	30	29	31	38	43	47	50	51	53	54	56	57	...	
May3159	57	60	62	69	74	73	75	67	51	36	23	17	18	20	22	31	34	49	68	71	59	64	70	51	
2018, Field component: Z, Base: 43700.0, Unit: nT																									
May01111	111	111	112	112	110	109	105	99	95	93	88	87	92	99	103	106	108	108	109	109	109	110	110	104	
May02110	109	110	111	110	111	112	110	111	113	106	96	92	94	99	102	106	...	...	...	...	...	110	110	...	
May03110	110	110	110	111	111	113	115	116	112	96	84	84	90	99	106	107	108	108	109	109	108	109	109	106	
May04109	110	110	110	111	110	113	110	106	103	100	93	92	98	104	106	106	108	108	109	110	110	109	109	106	
May05109	109	109	111	110	112	113	109	105	105	98	88	92	94	101	110	121	134	136	133	127	122	112	112	111	
May06104	96	100	108	110	115	117	118	116	112	109	106	107	113	116	120	121	122	120	120	115	111	109	107	112	
May07108	109	106	108	109	111	113	112	111	106	99	95	99	107	113	117	120	122	122	119	118	114	112	110	111	

Table 9.7 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
May08111	112	114	115	114	114	115	109	102	92	88	85	88	96	108	118	...	...	118	118	117	117	116	115	...	
May09115	115	113	111	115	114	114	114	114	112	107	103	104	109	114	117	119	121	121	119	117	117	115	114	114	
May10110	110	112	112	112	110	110	110	107	107	106	102	103	109	116	...	...	...	124	122	121	117	117	116	...	
May11118	117	117	119	119	114	108	107	106	100	98	102	109	115	119	122	123	125	126	125	124	123	120	117	116	
May12116	116	116	116	118	114	108	104	99	98	101	...	...	111	114	115	116	115	115	116	117	117	116	114	...	
May13115	115	116	117	118	115	112	105	100	98	96	96	97	104	109	112	111	112	112	114	115	115	115	112	110	
May14113	114	115	117	118	115	115	113	107	105	102	100	104	112	116	117	116	115	115	115	115	114	114	114	113	
May15115	115	115	116	119	118	115	109	102	96	96	96	100	104	108	113	116	117	117	117	116	116	116	116	111	
May16116	116	116	116	117	116	114	110	104	100	93	96	102	105	111	113	114	114	115	116	115	115	115	114	111	
May17114	113	111	114	114	114	112	109	108	103	93	96	101	108	112	122	127	132	130	128	126	124	121	119	115	
May18114	113	114	114	117	119	119	117	113	110	105	103	104	111	116	117	119	117	116	116	116	116	115	115	114	
May19115	115	116	117	119	119	118	118	116	111	105	102	104	105	110	112	114	116	117	117	116	116	116	116	114	
May20115	115	116	117	118	119	120	119	114	108	101	97	99	103	108	112	114	115	114	114	115	115	115	115	112	
May21115	115	116	117	117	116	114	108	103	97	98	94	96	101	105	108	112	114	114	115	114	114	114	114	110	
May22114	114	114	115	115	116	116	116	111	104	99	98	97	95	100	104	109	113	113	114	113	113	113	113	110	
May23113	113	113	115	115	115	118	118	111	104	93	93	98	104	114	117	117	118	117	118	117	116	115	115	112	
May24116	116	117	118	118	117	114	107	100	98	102	102	99	102	109	114	116	114	114	115	115	115	115	115	111	
May25115	115	115	116	115	114	115	112	105	104	103	104	106	110	113	114	115	116	115	114	114	114	114	115	112	
May26115	115	116	117	119	118	114	113	106	99	97	99	104	109	113	115	114	112	112	113	113	113	113	114	111	
May27114	114	114	116	118	118	118	113	110	108	107	108	104	107	110	113	114	113	113	114	114	114	114	114	113	
May28114	114	115	116	117	113	113	112	109	104	99	101	103	103	106	113	114	114	114	113	113	113	113	113	111	
May29113	113	114	116	117	117	114	110	106	97	90	94	101	104	108	112	114	117	116	114	114	114	114	114	110	
May30114	114	115	117	119	121	123	121	117	115	108	...	99	97	101	108	112	114	113	113	114	114	114	113	...	
May31114	114	115	117	117	118	119	116	112	108	107	103	100	98	102	107	113	115	119	121	120	118	118	117	113	
2018, Field component: F, Base: 48500.0, Unit: nT																									
May01114	114	114	115	117	116	114	107	99	96	96	96	96	99	106	109	113	114	114	114	113	114	114	115	109	
May02116	115	114	117	118	117	115	113	112	111	110	106	102	102	105	106	109	112	112	...	115	114	114	115	...	
May03116	116	116	117	119	119	120	120	118	112	100	93	93	97	105	110	112	112	116	116	116	117	114	115	112	
May04114	113	115	116	116	116	118	115	110	109	105	101	102	106	110	111	114	115	116	117	116	116	117	115	113	
May05115	114	113	114	114	117	117	111	107	107	109	106	105	100	108	109	120	120	116	122	123	126	120	104	113	
May06107	109	98	97	102	109	109	109	108	98	96	96	96	106	111	113	118	119	116	119	127	118	116	112	109	
May07111	116	111	111	107	103	109	107	105	101	99	94	96	103	102	106	115	118	118	117	118	121	121	114	109	
May08113	113	112	115	115	109	110	101	95	87	86	88	91	97	108	108	111	117	117	117	122	115	117	115	108	
May09114	114	111	109	110	109	106	108	108	111	107	103	100	104	108	113	115	118	119	124	118	117	118	115	112	
May10113	111	109	112	112	109	107	100	95	98	99	99	100	106	111	122	121	118	118	118	118	119	116	113	110	
May11114	115	115	120	116	115	105	94	98	97	103	110	115	116	111	115	117	120	122	125	118	117	124	121	113	

Table 9.7 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
May12	113	114	114	116	113	112	105	102	100	100	103	109	111	111	111	113	115	115	117	117	118	117	119	117	112
May13	114	115	115	118	119	115	112	105	98	97	98	99	97	100	107	113	113	117	119	120	119	118	119	118	111
May14	114	114	114	116	118	113	112	110	105	104	105	105	107	111	114	115	116	116	117	117	119	119	118	116	113
May15	116	117	117	118	121	116	110	103	95	91	93	95	101	105	109	114	116	116	119	120	119	117	117	118	111
May16	119	118	118	119	119	117	113	108	105	105	101	103	107	108	113	116	116	117	119	121	121	121	121	119	114
May17	120	123	118	119	123	122	118	112	110	105	93	97	100	105	108	117	118	122	122	120	118	119	119	119	114
May18	120	118	117	116	116	115	112	110	108	104	100	97	96	105	112	115	118	115	117	118	118	119	118	117	113
May19	117	116	116	118	120	119	116	114	110	102	95	96	101	104	111	112	116	121	122	122	121	120	120	119	114
May20	119	118	118	120	122	122	121	118	113	105	98	96	98	101	108	112	114	116	117	118	118	118	117	117	113
May21	117	117	117	119	120	116	111	104	99	95	99	98	102	106	108	110	113	116	118	120	120	120	120	121	112
May22	119	118	119	120	120	119	115	112	109	106	105	105	107	105	108	113	118	122	125	125	123	123	121	121	116
May23	120	121	121	123	124	...	...	...	...	107	97	94	94	101	109	113	118	120	120	122	122	120	119	118	...
May24	119	119	118	122	123	121	116	103	97	96	104	107	104	103	109	117	118	116	117	118	119	119	119	119	113
May25	119	118	119	121	121	118	115	110	104	105	108	110	109	108	108	113	117	120	120	120	120	119	118	119	115
May26	119	120	120	121	124	120	111	107	102	101	103	107	111	113	117	118	118	117	120	121	123	123	122	121	116
May27	121	121	122	124	124	121	116	109	106	106	107	110	109	111	113	117	118	118	119	120	121	120	121	121	116
May28	120	121	121	123	125	121	117	112	107	104	104	112	111	108	112	115	118	119	120	120	121	122	122	122	117
May29	122	122	123	125	128	126	119	114	111	103	100	106	110	107	108	114	118	121	121	120	120	119	119	119	116
May30	119	118	120	122	125	126	125	121	117	114	109	105	104	102	106	113	118	120	118	122	122	122	121	122	117
May31	120	121	122	124	127	126	124	119	112	107	110	112	110	105	109	118	126	124	130	127	127	126	125	124	120

Table 9.8. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Jun01	115	121	127	117	114	94	78	83	83	...	...	...	100	63	70	81	71	95	100	104	110	118	107	107	...
Jun02	105	106	105	102	111	104	93	81	79	75	80	86	92	104	100	99	107	110	120	103	113	118	124	105	101
Jun03	106	107	101	102	102	95	85	80	81	85	87	93	93	94	95	99	113	117	105	108	112	114	110	105	100
Jun04	102	101	103	103	104	100	93	92	90	91	95	101	107	108	106	105	110	105	112	118	117	114	113	113	104
Jun05	116	116	114	109	110	108	102	94	96	100	106	108	107	103	108	117	113	110	111	111	112	113	113	110	108
Jun06	110	110	110	108	106	103	98	96	94	98	104	114	115	113	113	114	117	122	121	121	109	105	102	104	109
Jun07	101	102	122	107	104	97	90	85	92	99	104	108	112	109	107	105	104	109	112	114	117	114	116	115	106
Jun08	116	114	112	118	120	111	105	101	99	98	106	111	112	114	115	116	116	115	115	120	119	119	117	116	113
Jun09	116	117	115	116	118	112	104	97	95	102	113	121	122	117	114	114	112	115	114	118	118	118	116	115	113
Jun10	115	113	116	116	116	112	106	105	104	106	110	115	115	110	109	112	111	116	119	118	117	116	114	112	113
Jun11	110	108	112	115	116	109	100	92	92	102	109	121	123	120	119	120	114	113	122	124	125	122	121	122	114
Jun12	118	114	114	126	125	121	113	106	102	103	104	106	108	...	...	109	...	...	...	118	117	117	116	114	...
Jun13	115	115	115	116	118	111	99	92	93	101	113	124	...	128	129	128	125	125	129	130	122	120	121	125	...
Jun14	123	119	119	122	123	120	107	94	87	96	105	118	115	116	113	117	114	118	120	122	125	124	125	123	115
Jun15	123	122	121	123	123	118	112	111	107	95	93	102	111	115	118	118	112	111	117	120	121	121	119	118	115
Jun16	119	120	121	124	125	122	109	104	101	101	105	108	111	112	113	117	116	117	120	121	119	119	117	116	115
Jun17	117	119	123	127	130	123	114	109	101	103	111	111	109	111	112	115	122	121	120	124	134	133	134	137	119
Jun18	137	136	149	127	125	123	120	111	85	78	86	90	81	89	99	101	103	107	106	110	114	115	108	108	109
Jun19	107	108	108	114	114	115	107	92	97	93	92	98	98	98	101	105	110	113	112	113	115	116	113	110	106
Jun20	109	110	110	112	115	109	103	102	96	99	109	106	101	97	99	108	111	112	117	116	115	116	116	117	109
Jun21	111	107	108	112	115	116	112	106	99	99	103	105	109	113	113	114	113	115	117	117	116	116	115	116	111
Jun22	114	113	114	118	122	112	102	101	108	109	111	110	111	111	114	115	115	116	117	116	121	121	123	121	114
Jun23	120	126	117	119	125	126	119	109	96	97	76	99	109	92	110	97	102	98	108	112	122	110	105	113	109
Jun24	108	102	105	110	114	113	98	79	71	75	96	106	101	93	99	97	100	104	109	109	107	108	104	105	101
Jun25	106	107	112	116	116	108	95	87	87	95	105	118	113	115	113	112	103	100	96	98	92	106	138	105	106
Jun26	101	111	93	98	93	91	91	80	82	87	83	99	103	94	96	93	96	97	95	99	107	105	105	105	96
Jun27	105	106	106	107	101	94	88	83	79	82	83	94	94	93	101	105	102	101	104	109	111	123	106	109	99
Jun28	106	104	105	107	112	101	91	86	86	98	107	107	106	107	109	108	107	110	111	114	109	107	107	109	105
Jun29	107	109	109	109	104	101	92	82	84	87	97	100	101	101	108	110	112	110	109	110	111	109	109	108	103
Jun30	108	109	110	114	114	109	105	102	97	93	97	99	97	106	108	107	107	114	113	115	117	115	113	112	108
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Jun01	77	67	65	76	89	79	58	62	76	...	...	...	9	12	28	33	57	53	57	59	58	57	55	60	...
Jun02	58	56	62	50	61	76	75	72	62	48	32	26	24	27	30	47	52	52	55	59	60	71	48	60	53
Jun03	61	60	65	69	83	90	91	90	76	57	42	30	23	27	31	39	57	63	58	57	55	59	61	63	59
Jun04	64	62	62	66	71	82	86	84	74	65	52	41	35	34	37	43	49	52	53	58	59	58	58	59	59

Table 9.8 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jun05	56	62	64	67	75	83	84	82	67	49	36	31	26	32	37	42	48	56	57	57	55	55	55	59	56
Jun06	60	62	63	69	76	80	79	75	66	54	43	35	28	29	32	35	44	44	53	71	77	83	82	82	59
Jun07	86	83	79	80	90	101	94	85	69	47	36	29	29	32	39	48	55	57	57	56	57	57	57	60	62
Jun08	62	66	67	64	70	80	78	76	70	57	43	32	33	36	36	39	45	49	51	51	52	55	58	58	55
Jun09	57	55	60	67	74	79	75	73	68	61	47	39	35	36	41	51	56	54	53	53	53	53	56	57	56
Jun10	59	62	65	72	83	93	89	87	78	64	50	42	38	37	41	49	53	54	57	55	54	54	55	58	60
Jun11	62	62	66	71	77	80	77	77	71	55	37	25	23	25	32	42	49	51	49	49	51	55	56	63	54
Jun12	66	67	66	66	77	84	87	87	78	62	45	36	34	...	...	47	...	...	...	55	56	58	62	60	...
Jun13	60	61	63	69	75	82	81	71	61	46	32	23	...	20	27	34	42	47	50	54	55	59	61	68	...
Jun14	70	68	70	78	82	86	84	86	79	60	42	25	22	24	31	41	47	52	56	56	55	55	56	59	58
Jun15	61	62	62	68	77	81	82	81	72	58	44	30	21	17	24	35	46	53	57	56	57	56	58	59	55
Jun16	61	62	63	67	73	80	82	80	70	55	45	38	32	29	33	38	47	54	56	57	57	57	59	59	56
Jun17	58	58	61	68	80	93	97	95	85	73	59	46	37	31	28	32	41	49	48	47	49	53	57	57	58
Jun18	54	41	57	65	65	77	95	96	85	73	62	44	33	34	31	37	45	54	55	60	64	59	60	58	58
Jun19	65	65	63	65	75	83	79	76	78	71	61	48	44	41	42	47	53	56	55	57	55	55	56	60	60
Jun20	62	62	66	72	79	80	78	80	77	67	59	52	49	46	45	48	55	58	59	58	57	57	64	67	62
Jun21	67	65	64	70	76	78	75	77	80	76	62	50	43	37	37	44	50	52	56	57	57	57	58	59	60
Jun22	60	62	63	70	75	80	79	81	79	65	53	46	41	36	34	37	48	55	56	58	56	53	53	56	58
Jun23	61	68	74	64	75	87	84	82	74	61	42	35	28	26	39	39	51	49	48	59	61	74	78	69	59
Jun24	71	68	66	69	77	86	89	86	73	59	54	39	34	39	43	51	60	62	62	65	66	65	65	64	63
Jun25	59	61	61	68	75	78	80	84	77	60	43	26	17	17	30	41	47	60	66	68	77	95	93	104	62
Jun26	98	104	77	83	97	103	104	98	84	59	35	30	20	21	33	41	49	62	66	63	65	58	58	61	65
Jun27	64	66	71	75	80	87	90	87	76	62	50	40	36	39	46	50	54	61	60	59	63	70	63	65	63
Jun28	69	66	67	70	80	92	88	84	75	62	44	32	24	28	34	46	57	58	59	57	61	61	63	65	60
Jun29	66	67	67	70	76	81	84	82	75	65	51	40	35	34	35	44	52	61	63	62	62	63	62	63	61
Jun30	64	64	66	72	83	90	90	88	83	73	63	47	40	33	34	46	55	60	60	60	59	64	64	65	63
2018, Field component: Z, Base: 43700.0, Unit: nT																									
Jun01	115	115	111	114	117	117	119	117	116	...	...	...	110	120	131	138	138	128	125	124	122	118	118	119	...
Jun02	119	119	119	118	114	113	116	119	118	117	118	117	117	118	125	125	125	123	124	125	124	121	118	117	120
Jun03	117	118	119	123	125	125	125	122	121	118	116	114	113	116	119	127	128	128	128	124	123	120	119	119	121
Jun04	119	120	121	123	125	125	124	121	118	111	104	101	102	108	116	121	123	123	121	121	119	118	119	119	118
Jun05	118	117	118	120	120	116	114	112	106	100	94	93	97	102	111	115	116	118	119	120	119	118	118	118	112
Jun06	118	117	119	120	121	120	121	120	114	111	108	106	106	112	119	123	121	120	123	123	121	121	121	120	118
Jun07	119	120	117	118	122	120	116	111	104	95	93	93	97	106	115	120	120	121	120	120	119	119	118	118	113
Jun08	117	117	118	118	116	117	116	113	108	103	100	103	109	112	116	119	118	117	116	117	117	117	117	118	114
Jun09	118	117	117	119	120	120	117	114	106	96	88	91	98	108	114	118	119	118	116	116	117	118	118	118	113

Table 9.8 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jun10	117	117	118	121	121	119	116	113	108	102	99	101	104	110	115	117	119	118	116	117	117	117	117	118	114
Jun11	118	119	118	117	117	116	114	113	108	105	100	102	109	117	117	121	122	120	118	117	117	117	117	117	115
Jun12	117	117	119	120	119	120	117	117	114	108	103	103	103	...	...	122	...	...	...	116	116	116	117	117	...
Jun13	117	118	119	120	118	114	117	119	113	110	109	107	...	106	110	116	120	118	116	117	118	118	118	118	...
Jun14	118	118	118	120	121	119	115	114	116	110	104	105	100	105	109	114	119	121	119	118	118	118	118	118	115
Jun15	117	117	118	118	119	117	117	117	116	106	94	92	99	104	110	118	121	122	119	118	117	117	116	117	114
Jun16	117	117	117	118	119	121	121	120	110	104	96	91	95	104	113	119	121	120	118	118	117	117	117	117	114
Jun17	117	117	117	118	120	121	119	113	108	102	99	99	99	102	106	112	116	120	119	118	117	117	117	117	113
Jun18	117	116	107	108	114	118	120	118	119	114	107	109	108	111	122	127	127	126	126	124	122	121	121	121	118
Jun19	121	121	122	122	121	119	119	121	120	115	109	109	105	107	111	117	118	120	121	121	121	120	120	120	118
Jun20	120	120	121	123	122	117	116	118	114	111	108	107	109	109	114	117	118	121	120	119	120	120	119	119	117
Jun21	118	119	121	122	120	117	116	118	113	111	106	106	103	107	115	119	118	119	120	119	119	119	119	118	116
Jun22	118	118	120	121	120	118	118	116	111	108	108	110	111	109	115	121	123	122	121	121	120	120	120	120	117
Jun23	119	117	118	120	119	118	119	118	110	103	107	110	115	121	125	128	126	126	124	123	125	123	123	117	119
Jun24	119	122	124	122	118	116	122	122	120	112	108	109	112	119	126	125	125	125	124	124	124	123	124	123	120
Jun25	123	122	124	125	125	125	124	127	125	118	112	116	120	127	134	137	137	138	138	137	136	131	117	116	126
Jun26	116	112	116	116	119	121	118	114	111	103	98	102	105	115	122	125	128	130	136	133	130	128	127	125	119
Jun27	125	124	125	127	127	126	124	120	116	109	100	100	109	118	122	126	127	127	125	125	124	124	124	123	121
Jun28	123	124	125	127	128	127	125	121	117	111	108	109	113	113	120	125	128	127	126	126	125	125	124	124	122
Jun29	124	124	124	125	126	124	125	122	118	116	112	113	113	114	120	127	127	126	125	124	123	122	122	122	122
Jun30	123	123	124	126	126	125	125	127	126	126	122	117	120	122	125	128	126	125	123	122	123	123	123	122	124
2018, Field component: F, Base: 48500.0, Unit: nT																									
Jun01	120	122	121	120	121	113	107	107	107	102	99	109	107	100	113	124	121	122	122	122	124	123	118	119	115
Jun02	119	119	119	116	117	113	110	108	106	103	106	108	109	116	121	121	124	123	130	123	127	126	125	117	117
Jun03	117	119	117	121	123	120	116	112	111	109	107	108	107	110	113	122	130	132	126	124	124	123	120	118	118
Jun04	117	117	119	121	124	122	118	115	112	105	100	100	103	109	115	119	123	122	123	126	123	121	122	122	117
Jun05	122	121	122	122	122	118	114	108	103	99	95	95	98	101	112	120	119	119	...	...	...	...	121	119	...
Jun06	120	119	120	121	121	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jun07	...	...	...	...	...	...	...	...	99	94	94	95	100	107	115	...	...	...	...	...	...	122	122	121	...
Jun08	122	121	121	124	123	...	...	...	107	101	101	105	111	115	119	123	122	121	120	123	123	123	122	122	...
Jun09	122	122	121	123	126	123	117	111	103	96	94	99	106	112	117	122	121	122	119	121	122	123	122	121	116
Jun10	121	120	122	125	126	123	117	114	108	103	102	106	108	112	116	119	120	122	122	121	121	121	121	120	117
Jun11	119	119	121	122	122	118	112	108	103	104	102	109	116	122	122	126	124	122	124	124	124	124	124	124	118
Jun12	122	121	122	128	127	127	121	118	113	108	103	104	104	107	116	122	125	127	123	121	121	121	121	121	118
Jun13	121	122	123	125	124	117	114	113	108	108	112	115	114	115	120	125	127	126	125	127	124	124	125	127	120
Jun14	125	123	124	127	129	126	117	110	108	106	105	110	105	109	112	118	121	126	125	125	126	125	126	125	119

Table 9.8 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jun15	124	124	125	126	126	123	120	120	117	103	90	92	102	108	115	122	122	123	123	124	123	123	122	122	117
Jun16	122	123	124	126	128	128	123	119	109	103	97	94	98	107	115	123	125	125	124	124	123	123	122	122	118
Jun17	122	123	124	128	131	129	123	116	108	103	103	102	102	105	109	115	122	126	124	125	129	129	129	131	119
Jun18	130	128	127	118	122	125	126	121	111	103	100	102	97	104	118	123	125	125	125	125	125	124	122	121	119
Jun19	121	122	123	125	125	123	119	115	117	110	104	106	103	104	109	116	119	123	123	124	124	124	123	122	118
Jun20	121	122	123	125	126	119	115	117	111	109	110	108	108	106	110	118	120	123	125	123	123	124	124	123	118
Jun21	120	119	122	125	124	122	119	118	111	108	106	106	105	111	117	122	120	122	124	124	123	123	123	122	118
Jun22	122	121	123	126	127	121	117	114	113	110	111	112	113	111	118	124	126	126	125	125	126	126	126	126	120
Jun23	125	126	123	125	127	127	126	120	107	101	94	107	116	113	126	123	123	122	123	126	131	124	123	121	120
Jun24	120	120	123	124	122	119	119	111	105	99	105	109	110	113	122	120	122	123	125	125	123	124	122	122	118
Jun25	122	122	126	128	129	126	119	119	117	113	112	121	121	129	135	137	133	134	132	132	129	130	131	117	126
Jun26	116	116	111	113	114	115	113	104	102	96	89	100	104	109	116	118	122	125	129	128	129	127	125	124	114
Jun27	124	124	125	127	125	121	117	111	105	99	92	95	104	111	119	124	124	124	124	126	126	131	123	124	118
Jun28	123	122	124	127	130	124	119	113	109	108	108	109	113	113	120	125	127	128	127	128	126	125	123	124	121
Jun29	124	124	125	126	125	122	119	112	108	108	108	110	111	112	119	127	129	127	126	125	125	123	123	123	120
Jun30	123	124	125	129	129	126	124	125	122	120	118	114	115	121	124	126	126	127	125	125	127	126	125	124	124

Table 9.9. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Jul01	111	109	109	114	115	111	100	89	86	88	89	93	95	96	99	106	110	113	114	117	118	117	117	115	106
Jul02	114	114	114	117	121	117	112	109	99	94	86	84	94	103	108	112	114	115	117	119	120	119	117	116	110
Jul03	116	115	116	119	121	118	114	110	104	98	98	102	109	117	118	114	112	113	123	128	129	129	128	127	116
Jul04	126	125	126	127	130	124	119	112	105	98	99	101	105	112	115	113	121	118	121	122	125	125	124	123	117
Jul05	122	121	126	122	123	122	120	120	115	106	101	109	128	113	128	108	111	114	114	101	108	131	113	115	116
Jul06	128	109	109	116	112	113	102	97	96	96	98	104	109	109	116	117	119	112	...	114	118	123	122	114	...
Jul07	114	117	120	121	118	111	107	102	98	92	93	100	102	103	100	101	104	114	117	117	124	120	115	112	109
Jul08	111	115	115	119	120	112	108	104	98	96	98	101	102	99	97	102	108	112	116	119	121	120	115	114	109
Jul09	115	116	116	115	116	113	108	102	97	95	100	108	111	114	112	113	115	114	116	117	117	117	116	117	112
Jul10	120	120	122	122	122	128	119	106	98	99	...	...	128	116	106	115	116	117	117	119	117	117	118	117	...
Jul11	115	113	113	121	126	121	105	101	102	96	98	109	113	119	124	117	118	119	127	128	121	121	117	127	115
Jul12	123	126	125	128	133	130	117	103	103	104	106	101	105	113	107	109	110	113	116	115	120	120	121	121	115
Jul13	119	116	121	115	115	111	101	90	85	92	104	108	113	105	104	105	114	119	120	120	118	115	114	114	110
Jul14	120	119	121	124	124	120	111	99	96	96	98	102	104	102	107	109	110	108	109	114	114	112	112	112	110
Jul15	112	114	116	122	125	120	108	97	89	86	91	100	102	104	108	108	107	108	115	119	118	115	117	118	109
Jul16	119	121	123	120	121	128	129	114	89	87	87	87	...	...	96	107	110	111	117	125	128	146	132	125	...
Jul17	124	120	121	125	123	107	97	100	100	99	99	97	92	93	92	97	108	109	111	113	113	114	116	114	108
Jul18	111	110	109	111	114	116	112	106	104	105	108	102	105	107	111	111	111	113	114	115	117	117	116	114	111
Jul19	112	112	113	116	120	122	118	112	107	99	98	101	101	104	113	116	117	113	112	117	117	118	118	117	112
Jul20	116	119	119	121	125	126	124	113	99	91	90	97	99	108	112	110	110	113	116	121	128	127	120	123	113
Jul21	125	120	120	122	118	115	117	113	97	101	95	99	102	99	92	...	98	111	116	116	113	115	116	114	...
Jul22	108	111	111	111	115	112	107	100	93	87	95	111	114	110	107	108	108	118	117	113	113	115	115	112	109
Jul23	112	110	110	111	113	111	106	100	100	111	113	110	110	108	106	107	110	113	115	118	117	116	118	121	111
Jul24	139	136	121	128	130	131	109	104	111	106	101	109	114	114	112	109	98	104	111	110	113	127	107	111	115
Jul25	116	121	117	125	102	111	106	100	96	95	99	110	112	107	99	98	103	109	109	113	112	109	107	106	108
Jul26	108	108	108	109	112	109	108	107	102	94	96	104	108	107	102	101	103	...	...	112	112	112	113	115	...
Jul27	112	109	108	111	115	110	104	97	90	94	101	110	116	114	114	112	116	117	120	121	121	121	121	119	111
Jul28	117	117	115	123	129	121	112	103	96	93	95	97	103	114	117	111	107	106	107	113	117	115	114	112	111
Jul29	113	113	118	114	114	110	100	90	87	93	97	107	111	110	108	104	103	106	110	112	125	116	113	112	108
Jul30	109	110	110	112	113	113	108	100	93	90	92	99	112	117	119	123	121	120	119	122	121	111	113	118	111
Jul31	116	114	118	116	116	111	106	101	94	89	88	103	113	117	121	126	124	124	128	134	133	124	123	129	115
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Jul01	64	65	66	67	76	84	92	94	87	74	55	44	34	26	27	37	49	59	61	60	60	62	62	64	61
Jul02	65	65	67	68	76	84	86	87	83	73	57	40	25	20	26	40	52	57	58	59	63	61	61	62	60
Jul03	63	65	68	70	74	82	89	91	83	67	50	36	32	30	35	39	49	52	56	55	56	57	58	60	59

Table 9.9 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jul04	65	66	64	72	78	89	94	88	75	63	48	33	28	27	31	38	45	49	55	54	59	58	61	62	58
Jul05	60	57	67	74	78	90	94	95	88	74	53	40	24	29	24	31	40	48	50	65	75	65	62	59	60
Jul06	66	77	74	69	80	82	83	84	76	64	49	35	27	24	25	38	47	54	...	58	61	58	65	70	...
Jul07	64	61	58	67	81	95	96	94	88	76	58	48	43	39	40	45	52	59	64	60	60	59	59	62	64
Jul08	62	59	67	70	74	81	84	89	84	70	54	44	39	38	41	48	55	59	62	61	62	60	60	62	62
Jul09	63	64	64	65	70	78	80	79	70	65	55	47	46	43	46	52	58	62	61	60	58	59	60	63	61
Jul10	61	64	62	74	88	95	95	89	79	65	...	...	31	33	44	53	61	65	63	61	62	62	62	64	...
Jul11	65	66	67	73	84	95	98	88	80	65	50	37	32	34	32	40	47	54	57	57	63	60	61	65	61
Jul12	64	64	64	63	81	96	96	83	73	64	46	37	34	31	35	47	61	65	68	59	57	59	62	61	61
Jul13	61	68	70	78	80	92	97	93	85	75	58	44	41	43	47	50	54	59	61	65	69	66	66	67	66
Jul14	64	64	67	70	81	89	94	92	82	62	41	30	31	38	44	51	59	62	67	64	60	60	60	63	62
Jul15	63	64	66	73	86	94	99	98	87	73	57	43	35	36	38	48	56	59	60	60	63	61	60	60	64
Jul16	62	63	64	63	73	85	96	96	89	76	60	45	...	...	28	30	40	53	55	58	63	80	77	74	...
Jul17	71	71	70	71	80	82	70	76	88	83	70	55	46	39	36	42	49	54	59	62	64	66	71	71	64
Jul18	71	70	70	75	83	86	87	91	93	87	69	53	42	41	43	46	54	58	62	62	64	66	62	62	66
Jul19	63	64	63	71	80	84	88	91	84	73	54	45	39	38	40	46	57	65	64	61	57	59	60	60	63
Jul20	65	61	67	75	82	86	86	87	84	76	60	49	43	43	41	47	51	56	58	57	62	65	68	62	64
Jul21	70	69	71	77	84	85	81	80	69	62	54	50	49	40	36	...	51	58	61	61	61	63	63	67	...
Jul22	68	65	68	73	80	85	87	90	80	68	58	48	39	40	44	47	63	66	63	63	63	64	64	64	65
Jul23	64	66	68	74	84	88	84	81	78	69	53	41	35	34	36	45	57	62	62	63	62	62	62	60	62
Jul24	60	82	74	81	88	91	88	87	84	71	59	47	40	39	38	42	67	70	68	69	85	93	68	66	69
Jul25	60	64	63	78	82	89	93	95	82	67	54	46	41	40	41	47	54	62	63	64	68	75	73	70	65
Jul26	69	70	71	73	78	83	82	81	77	70	61	49	39	36	43	55	65	...	...	65	65	65	66	67	...
Jul27	66	66	69	73	86	92	90	89	79	68	59	51	45	45	51	58	61	63	63	63	62	65	68	63	67
Jul28	64	65	64	68	74	81	91	95	90	80	67	50	43	41	40	47	55	62	67	65	64	67	67	67	66
Jul29	68	68	68	79	84	87	85	84	79	67	56	41	37	39	43	47	56	62	62	63	70	70	71	70	65
Jul30	72	72	71	73	79	83	86	85	80	65	52	39	26	21	25	34	49	54	55	56	71	69	73	71	61
Jul31	73	74	78	80	89	91	91	85	74	66	52	40	35	38	43	51	57	60	59	62	60	59	63	75	65
2018, Field component: Z, Base: 43700.0, Unit: nT																									
Jul01	121	122	123	125	125	120	119	123	123	120	118	111	108	106	112	121	123	123	122	121	121	121	121	121	120
Jul02	121	122	123	125	126	123	121	121	123	119	113	111	106	105	115	123	122	123	123	122	121	121	120	120	120
Jul03	121	121	122	123	124	122	118	123	124	119	115	115	112	113	116	122	125	123	121	120	119	119	119	120	120
Jul04	119	120	120	122	124	123	122	122	121	119	113	110	107	107	115	121	122	122	122	122	122	121	120	120	119
Jul05	121	121	119	121	123	123	121	121	119	113	107	103	106	102	115	117	122	129	133	132	132	127	126	126	120
Jul06	118	121	123	123	123	121	122	122	121	114	107	103	99	106	114	120	122	124	...	123	124	123	121	122	...
Jul07	121	122	122	122	123	122	119	120	123	119	115	111	110	114	122	125	122	121	122	122	122	122	123	123	120

Table 9.9 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jul08	123	122	122	123	123	124	122	119	121	120	115	112	111	113	120	122	121	122	122	123	122	121	121	122	120
Jul09	122	122	122	123	123	123	121	121	117	111	105	103	106	110	112	116	118	121	122	122	122	122	121	121	118
Jul10	121	121	122	124	123	120	120	114	108	102	...	...	104	112	115	119	120	122	121	121	121	121	121	121	...
Jul11	121	121	122	124	123	122	121	117	108	104	102	102	103	107	115	120	122	120	119	120	120	121	121	119	116
Jul12	119	120	121	122	120	116	114	116	115	111	111	106	108	109	112	121	128	130	127	124	123	123	122	122	118
Jul13	122	122	122	126	128	125	124	123	122	118	116	113	114	118	123	124	128	127	125	123	122	123	123	123	122
Jul14	123	122	121	123	122	123	127	126	123	120	119	115	115	121	124	129	128	130	128	126	124	123	123	123	123
Jul15	123	124	124	126	125	125	126	124	118	117	115	115	118	119	124	129	130	129	125	123	123	124	124	123	123
Jul16	123	123	124	126	128	125	126	126	127	124	118	120	...	...	124	128	128	129	128	127	127	123	121	122	...
Jul17	122	123	123	123	124	125	126	129	131	127	120	113	109	114	121	127	128	130	127	126	125	124	124	124	124
Jul18	124	124	125	126	126	125	127	128	123	117	109	108	112	116	120	124	123	124	125	124	124	124	124	123	122
Jul19	123	124	124	124	123	123	122	122	119	114	108	101	103	108	113	119	124	128	126	125	125	124	123	123	119
Jul20	123	123	123	126	125	121	121	121	118	115	110	111	110	114	117	122	124	124	125	126	125	123	123	124	121
Jul21	123	123	124	125	123	121	118	119	114	112	108	110	108	110	116	...	127	127	126	125	125	126	125	124	...
Jul22	125	125	125	127	127	124	123	122	121	116	111	111	114	115	120	125	128	130	128	126	125	124	124	124	122
Jul23	125	125	125	128	129	124	122	122	119	114	107	103	104	114	117	121	124	125	125	124	124	124	123	124	120
Jul24	121	117	120	121	122	119	122	123	115	112	102	96	102	105	114	125	134	134	131	130	128	124	124	125	120
Jul25	125	120	120	118	119	118	120	124	120	115	113	114	114	118	123	126	126	128	126	125	125	125	125	126	121
Jul26	125	125	126	127	127	126	128	128	127	121	112	111	112	116	123	130	128	...	...	125	125	125	125	125	...
Jul27	124	124	125	127	127	125	123	121	120	114	110	107	110	117	120	119	122	124	123	123	124	123	123	123	121
Jul28	123	123	124	123	122	124	124	124	119	117	110	109	115	115	120	126	129	128	129	129	127	126	125	125	122
Jul29	125	125	124	126	128	126	127	126	125	125	121	114	111	114	118	123	126	128	127	127	126	125	125	125	124
Jul30	125	125	126	127	127	126	127	127	128	124	117	112	110	108	110	118	122	124	124	126	126	127	126	125	122
Jul31	125	125	125	128	130	129	127	125	117	110	111	111	109	113	117	119	121	122	122	124	123	123	124	123	121
2018, Field component: F, Base: 48500.0, Unit: nT																									
Jul01	123	123	124	128	128	123	118	116	115	112	110	105	103	101	109	120	124	125	125	125	126	126	125	125	119
Jul02	124	125	126	130	132	127	124	123	120	114	105	102	101	104	115	124	125	126	127	127	127	126	125	125	121
Jul03	125	125	126	128	130	128	123	125	123	116	111	113	112	117	120	124	126	125	128	129	128	129	128	129	124
Jul04	128	128	129	131	134	131	128	125	121	115	110	107	106	110	118	123	128	126	127	129	130	129	128	127	124
Jul05	127	127	128	128	130	130	127	127	124	114	105	105	115	106	123	117	123	131	135	129	132	137	128	129	124
Jul06	127	123	124	127	126	124	120	119	117	110	104	102	101	107	118	124	127	126	124	126	128	130	128	125	120
Jul07	124	126	127	128	128	125	121	119	119	113	110	109	108	112	118	122	121	124	126	126	129	128	126	125	121
Jul08	125	125	126	129	129	127	123	119	119	116	112	110	109	110	115	120	121	124	126	128	128	127	125	125	122
Jul09	125	126	126	126	127	126	122	119	113	107	104	105	109	114	115	119	122	124	126	126	126	126	125	125	120
Jul10	127	127	129	131	130	130	126	115	106	100	102	108	114	116	115	122	124	126	126	126	125	125	126	125	121
Jul11	124	124	125	130	131	129	121	116	107	101	100	104	107	113	122	124	126	125	128	129	126	127	125	129	121

Table 9.9 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Jul12	126	128	129	131	132	127	120	116	114	111	111	104	...	...	112	121	129	132	130	127	128	128	128	128	...
Jul13	127	126	128	129	131	128	122	116	113	112	115	114	116	117	121	123	129	132	130	128	127	126	126	127	124
Jul14	128	127	127	130	130	129	129	123	118	116	114	113	114	118	124	129	129	130	128	...	127	125	125	125	...
Jul15	125	126	128	132	133	132	127	121	112	108	108	112	116	117	124	128	129	128	128	128	128	127	128	128	124
Jul16	128	129	131	132	134	134	136	130	119	115	109	111	109	113	118	126	128	130	132	135	135	140	133	130	127
Jul17	129	129	129	131	131	125	121	126	128	124	117	109	104	107	114	121	128	129	129	128	127	127	128	127	124
Jul18	125	125	126	128	129	130	129	128	122	117	111	107	111	116	122	125	124	127	128	128	129	129	128	126	124
Jul19	126	126	126	128	129	130	128	125	120	112	106	100	102	107	115	123	128	130	128	129	128	128	128	127	122
Jul20	127	128	128	131	133	131	129	125	115	109	104	107	107	115	119	123	125	126	129	132	134	132	129	130	124
Jul21	131	128	130	131	129	125	123	122	110	111	104	108	107	107	109	120	122	128	130	128	128	128	129	127	121
Jul22	125	126	127	129	131	127	123	120	115	108	107	113	117	117	120	124	128	134	132	128	127	128	127	126	123
Jul23	126	126	127	130	131	127	122	119	117	116	111	105	107	114	116	120	125	127	128	129	128	127	128	130	122
Jul24	135	131	127	131	133	131	124	122	118	113	102	99	106	109	116	125	129	132	132	131	131	134	124	127	123
Jul25	129	126	125	127	118	121	121	122	117	111	110	116	117	117	119	121	124	128	126	127	127	126	126	125	122
Jul26	126	126	126	127	129	127	128	128	125	116	108	111	113	116	120	127	126	128	129	127	127	127	127	128	124
Jul27	126	125	125	128	131	127	122	117	113	109	109	110	115	120	123	121	125	128	129	129	130	129	129	128	123
Jul28	127	127	127	130	132	131	127	123	116	112	106	106	113	119	123	127	128	127	128	131	131	129	128	127	124
Jul29	128	128	129	129	131	128	125	119	116	119	116	114	113	115	118	121	124	127	127	129	133	129	127	127	124
Jul30	126	126	127	129	130	129	127	125	122	116	110	109	112	112	115	124	128	130	129	132	132	129	129	130	124
Jul31	129	128	129	132	134	131	127	123	112	103	103	110	112	117	123	127	128	129	131	135	135	130	130	133	125

Table 9.10. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20800.0, Unit: nT																									
Aug01	218	220	220	225	226	219	209	196	189	192	203	215	215	214	218	216	215	215	221	226	221	227	230	227	216
Aug02	230	230	225	224	226	215	207	207	204	208	218	229	233	225	...	...	215	218	222	223	223	222	220	219	...
Aug03	219	218	225	226	228	221	213	209	205	198	191	202	210	207	205	207	205	212	217	221	220	219	219	220	213
Aug04	221	222	221	218	218	218	211	205	199	201	204	209	212	210	210	212	212	212	213	218	219	218	219	220	213
Aug05	218	218	216	216	222	220	209	197	194	200	202	201	207	213	213	209	209	207	212	216	216	216	213	212	211
Aug06	210	211	211	214	219	219	210	199	195	199	203	217	229	226	217	214	214	215	218	223	223	220	224	222	215
Aug07	224	226	228	227	224	212	208	207	208	210	211	219	223	226	...	218	229	227	223	220	218	220	225	225	...
Aug08	222	218	218	218	215	211	204	200	201	209	215	218	224	223	210	205	209	208	210	218	216	213	213	214	213
Aug09	214	213	214	212	213	210	203	196	199	199	207	214	221	222	221	219	213	211	216	216	216	216	217	216	212
Aug10	216	220	219	222	221	215	204	193	189	194	204	217	227	228	...	...	212	214	213	217	216	218	217	220	...
Aug11	226	223	223	222	230	222	215	207	195	199	209	223	222	228	206	210	214	208	222	223	224	227	242	212	218
Aug12	208	209	210	212	217	213	204	194	185	188	195	204	214	228	231	224	219	217	214	207	212	212	218	215	210
Aug13	211	212	213	211	211	208	200	195	193	187	194	209	218	221	217	213	210	210	212	215	215	215	220	220	210
Aug14	218	215	214	215	217	214	210	202	194	197	203	211	208	211	215	218	217	219	221	223	223	223	222	225	214
Aug15	230	227	224	223	223	217	208	198	190	186	192	187	189	185	176	180	193	206	201	202	206	207	213	203	203
Aug16	213	210	227	217	213	210	199	192	188	183	183	184	182	196	201	197	196	193	198	204	204	208	212	214	201
Aug17	216	209	210	227	221	212	202	190	182	179	179	189	196	195	199	206	207	207	208	207	209	197	226	208	203
Aug18	204	205	206	209	212	202	185	189	183	191	186	197	191	187	191	192	184	189	207	209	208	207	212	206	198
Aug19	203	202	204	207	206	202	198	191	187	189	199	204	211	214	211	214	212	218	214	221	224	225	222	215	208
Aug20	204	202	206	225	218	216	216	206	204	198	194	195	199	199	193	188	195	192	204	233	208	206	214	213	205
Aug21	214	211	209	209	204	195	186	182	180	185	198	208	211	209	206	204	202	205	211	211	214	214	216	215	204
Aug22	214	215	213	212	215	214	206	191	186	186	194	204	207	203	201	205	207	206	211	213	212	212	210	213	206
Aug23	218	209	208	211	210	206	197	189	183	187	196	204	210	216	214	205	206	209	210	213	212	214	213	211	206
Aug24	211	210	210	210	212	209	203	200	196	196	209	218	225	212	196	200	205	210	214	214	213	215	211	211	209
Aug25	212	213	214	215	215	208	201	197	199	199	215	223	231	235	234	231	225	220	209	191	187	202	201	201	212
Aug26	204	216	219	248	191	139	103	60	61	89	98	92	98	135	161	146	125	133	159	167	172	168	171	174	147
Aug27	173	176	175	176	175	174	163	159	160	153	166	177	184	179	163	144	158	166	184	171	183	197	192	185	172
Aug28	188	197	188	182	179	179	177	173	170	157	166	169	174	168	172	183	191	194	194	195	195	194	195	195	182
Aug29	204	195	192	193	191	187	180	173	172	174	178	184	191	192	190	191	188	186	191	193	192	197	198	196	189
Aug30	193	195	195	197	197	192	183	170	165	174	184	191	192	191	195	198	199	201	201	201	198	195	200	210	192
Aug31	202	200	199	202	206	205	199	186	181	183	191	195	200	199	195	191	193	194	197	207	202	204	202	201	197
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Aug01	73	74	73	73	82	91	95	90	78	64	52	40	36	37	42	48	55	59	60	57	60	65	71	66	64
Aug02	67	71	73	75	83	91	87	83	75	63	53	43	38	41	...	...	61	61	60	60	61	63	66	68	...
Aug03	69	68	67	70	78	86	92	94	85	72	65	56	46	40	44	49	57	62	62	64	63	63	64	65	66

Table 9.10 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Aug04	63	65	70	79	79	83	87	88	82	70	55	47	45	46	48	55	63	67	66	66	65	65	67	69	66
Aug05	69	66	69	71	79	83	85	88	81	68	51	42	41	38	44	54	59	63	63	66	68	68	67	67	65
Aug06	68	69	71	74	82	84	84	84	80	67	53	48	45	46	51	58	62	61	61	60	64	65	65	66	65
Aug07	67	71	72	84	91	90	87	82	71	58	47	37	35	35	...	55	57	55	56	62	66	63	63	66	...
Aug08	69	70	69	72	80	86	87	82	71	59	47	35	32	40	48	61	69	71	67	68	70	65	64	65	64
Aug09	67	69	66	76	86	93	93	90	79	65	57	49	39	37	47	59	67	69	65	65	65	67	67	68	67
Aug10	67	65	67	76	85	86	86	85	77	62	52	46	41	44	...	...	62	65	62	62	63	66	68	66	...
Aug11	61	62	69	74	81	89	91	87	87	76	55	32	30	30	48	60	63	67	57	59	64	81	84	80	66
Aug12	74	76	76	79	85	92	93	91	82	68	56	42	32	33	40	51	61	65	63	62	65	68	69	69	66
Aug13	71	72	72	76	82	86	88	90	80	66	50	42	43	46	53	63	69	69	65	65	66	67	66	66	67
Aug14	66	64	70	75	82	85	84	84	75	66	59	47	37	39	46	54	63	66	63	64	65	66	67	67	65
Aug15	68	75	69	70	72	75	76	70	67	62	47	32	24	17	27	44	60	83	88	65	66	79	96	81	63
Aug16	73	63	76	81	85	88	101	104	92	79	64	48	47	42	44	50	62	68	69	77	77	77	76	68	71
Aug17	70	72	61	63	88	91	96	97	87	75	64	58	53	48	46	52	62	67	68	76	99	81	83	80	72
Aug18	74	71	74	77	81	80	82	86	77	67	62	54	44	49	56	59	68	71	73	67	66	67	76	74	69
Aug19	72	72	66	73	84	88	92	91	85	70	57	47	43	42	48	55	67	65	59	59	62	64	71	81	67
Aug20	81	84	82	89	89	93	101	99	90	76	65	54	47	46	47	71	73	72	78	97	71	71	66	69	76
Aug21	61	72	78	78	84	88	87	87	79	69	59	53	49	52	54	60	65	68	70	66	68	68	68	71	69
Aug22	72	75	74	75	84	88	93	94	84	74	60	53	48	49	53	60	68	65	67	68	69	72	71	70	70
Aug23	68	74	74	79	86	92	94	91	82	69	53	44	41	45	49	57	64	64	67	68	69	72	73	72	69
Aug24	71	72	74	76	83	89	93	93	86	74	61	51	37	32	39	47	55	62	63	66	69	72	72	71	67
Aug25	71	72	73	79	85	89	94	93	81	60	44	36	34	39	44	51	60	60	60	71	83	107	111	130	72
Aug26	123	137	124	111	47	67	90	99	88	75	58	47	62	56	67	52	110	89	71	80	141	86	80	80	85
Aug27	81	79	85	86	85	90	92	90	80	71	60	52	53	63	84	78	84	117	105	76	70	77	74	76	79
Aug28	72	61	85	88	90	93	97	97	90	79	64	54	54	55	62	69	72	71	71	72	75	75	75	77	75
Aug29	72	78	80	82	88	90	94	94	86	75	64	57	53	56	63	69	72	80	77	78	78	75	76	78	76
Aug30	80	79	77	79	82	85	90	91	85	74	58	48	45	50	57	63	66	68	70	72	78	73	75	79	72
Aug31	83	80	81	79	85	95	101	99	92	78	64	53	43	42	51	58	66	74	65	65	71	73	75	75	73

2018, Field component: Z, Base: 43800.0, Unit: nT

Aug01	24	23	24	27	27	22	23	24	22	21	18	15	13	11	12	19	24	24	24	24	24	24	23	23	22
Aug02	22	22	23	24	24	23	22	22	23	20	15	11	9	14	...	...	25	24	21	22	23	23	23	23	...
Aug03	23	23	23	24	26	26	25	24	22	19	19	16	17	16	21	28	28	27	26	25	24	24	24	24	23
Aug04	24	24	23	24	27	25	24	24	23	19	17	16	17	17	18	23	26	26	25	24	24	24	24	24	23
Aug05	23	23	24	26	27	27	27	25	22	18	13	15	17	19	24	28	28	25	25	26	26	25	25	25	23
Aug06	25	25	25	26	27	24	24	23	23	22	14	10	14	19	23	24	24	22	23	24	24	25	24	24	22
Aug07	24	23	22	22	25	20	21	21	21	16	13	11	10	...	...	21	24	23	24	26	28	27	26	24	...

Table 9.10 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Aug08	24	25	25	27	27	25	26	25	22	20	20	17	13	16	19	25	29	29	27	26	26	26	26	26	24
Aug09	26	25	26	28	31	28	27	25	22	15	15	15	11	11	16	22	26	26	25	25	25	25	26	26	23
Aug10	26	25	25	25	27	25	25	22	22	20	20	18	16	17	...	...	27	25	24	25	26	26	25	26	...
Aug11	25	23	23	26	28	29	31	24	16	11	10	11	17	21	22	26	29	30	28	26	26	25	20	22	23
Aug12	25	26	27	28	29	27	26	28	29	28	20	16	17	19	24	28	26	24	25	27	28	28	26	25	25
Aug13	26	26	27	29	31	28	28	28	29	24	21	22	22	24	24	27	29	27	26	26	26	26	25	25	26
Aug14	24	25	25	27	29	30	33	31	28	18	17	13	10	18	23	26	27	25	25	25	24	24	25	24	24
Aug15	24	23	24	26	28	26	27	26	24	20	14	12	20	27	35	38	39	39	39	37	34	32	29	29	28
Aug16	27	28	19	22	27	29	30	33	30	26	24	22	22	24	27	31	35	35	36	35	34	33	31	30	29
Aug17	29	29	30	23	22	26	27	28	28	26	23	19	20	24	25	29	31	31	31	31	30	31	26	24	27
Aug18	26	27	28	30	32	34	33	27	29	26	21	20	23	22	27	34	39	38	36	32	31	32	31	30	29
Aug19	30	31	31	30	32	32	32	30	24	22	21	20	21	24	21	26	30	31	28	28	28	28	28	28	27
Aug20	28	25	25	21	23	26	24	24	22	23	26	22	23	25	27	32	39	37	35	30	30	31	30	28	27
Aug21	28	26	28	30	31	29	29	26	23	24	21	20	20	21	24	26	29	29	29	30	30	28	29	29	27
Aug22	29	28	28	28	28	28	27	27	28	24	20	16	20	23	26	29	31	30	29	30	29	29	29	29	27
Aug23	26	27	29	30	31	30	32	33	30	23	19	20	23	25	27	30	32	31	29	30	30	29	29	29	28
Aug24	29	29	29	30	31	31	34	32	28	26	22	18	18	20	22	28	31	30	30	30	30	30	29	30	28
Aug25	30	29	29	29	29	26	25	22	16	14	14	13	16	17	18	21	25	27	31	35	39	32	30	26	25
Aug26	23	17	15	3	3	1	9	21	28	35	42	47	52	53	50	59	73	69	58	52	49	48	47	46	38
Aug27	45	44	44	44	42	40	38	39	39	37	38	37	38	43	53	61	55	53	54	49	47	42	41	42	44
Aug28	43	39	38	42	43	45	45	41	36	31	32	34	39	41	40	41	41	40	40	40	40	40	40	40	40
Aug29	39	38	39	40	41	43	42	39	36	32	26	25	29	30	33	38	41	41	41	40	40	40	39	38	37
Aug30	39	39	39	39	40	40	43	42	39	34	32	30	30	32	31	34	36	36	37	38	38	39	39	37	37
Aug31	36	37	37	38	39	41	41	36	31	28	25	27	29	32	35	37	39	39	39	38	38	38	38	37	36

2018, Field component: F, Base: 48500.0, Unit: nT

Aug01	129	129	130	134	136	128	125	120	115	115	117	119	117	115	117	123	127	127	129	132	130	133	133	131	125
Aug02	132	132	131	131	133	127	123	122	122	121	120	121	120	122	123	125	128	129	128	129	130	130	129	129	126
Aug03	129	128	130	132	135	133	128	126	121	116	112	115	118	116	120	127	127	129	130	131	129	129	130	130	126
Aug04	130	130	129	129	132	130	126	...	120	117	116	117	119	118	119	125	128	128	127	129	129	129	129	129	...
Aug05	128	128	128	130	134	133	128	122	117	116	111	112	117	121	126	128	129	125	126	130	130	129	128	127	125
Aug06	126	127	127	129	132	130	125	120	119	119	113	115	124	127	127	127	126	125	127	131	131	130	131	130	126
Aug07	131	131	131	132	133	123	122	122	122	118	115	116	117	124	120	126	133	132	130	132	132	132	134	132	127
Aug08	131	129	129	132	131	127	125	123	120	121	123	122	120	122	120	124	130	129	128	131	130	128	128	129	126
Aug09	129	128	129	130	133	130	126	121	119	113	116	118	118	117	122	127	128	128	129	129	129	129	130	129	125
Aug10	130	131	130	132	133	129	124	117	115	115	119	122	124	125	128	130	128	128	126	129	129	130	130	131	126
Aug11	132	130	131	132	138	136	134	125	112	109	112	118	122	129	121	127	132	130	133	132	133	134	136	124	128

Table 9.10 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Aug12	125	127	128	130	134	130	125	122	119	119	115	114	119	127	134	134	131	129	128	127	129	130	131	128	127
Aug13	128	128	129	131	133	128	125	124	123	116	116	122	126	130	128	129	130	128	128	129	130	130	131	131	127
Aug14	129	129	128	130	...	...	...	...	...	...	...	115	111	119	126	130	131	131	131	131	131	131	131	132	...
Aug15	133	132	132	133	134	131	128	122	117	112	108	103	111	116	119	124	131	137	135	133	132	131	132	127	126
Aug16	129	128	129	127	129	130	127	127	122	116	113	111	110	118	123	125	129	128	131	133	132	133	133	133	126
Aug17	132	129	131	132	129	129	125	122	118	114	111	111	115	118	121	128	131	131	130	130	132	127	134	125	125
Aug18	125	126	128	130	134	131	123	119	118	119	112	116	115	113	119	126	128	129	135	132	131	131	132	129	125
Aug19	128	128	129	130	131	130	128	123	116	114	117	119	123	126	123	128	132	135	131	133	135	135	134	131	127
Aug20	126	123	125	130	129	130	129	125	122	119	120	117	119	121	120	123	132	129	132	141	130	130	133	131	126
Aug21	131	128	129	131	130	124	120	116	112	114	117	121	122	122	123	124	126	128	130	131	132	131	132	132	125
Aug22	132	131	130	130	131	131	127	121	119	115	114	115	120	121	123	127	130	129	131	132	131	130	130	131	126
Aug23	131	128	129	131	132	130	128	125	120	115	115	119	124	129	129	128	131	131	130	132	131	132	131	131	128
Aug24	130	130	130	131	133	132	132	128	123	121	123	123	125	121	117	124	129	131	132	132	132	132	131	131	128
Aug25	131	132	132	132	133	127	123	119	114	111	117	120	126	128	129	131	133	132	130	127	129	130	128	125	127
Aug26	124	124	123	125	98	74	67	59	65	83	93	94	102	119	127	129	134	133	134	133	134	130	129	130	111
Aug27	129	130	129	130	127	125	119	118	118	112	119	122	126	129	131	131	131	134	142	131	134	137	133	130	128
Aug28	133	133	129	130	130	132	131	125	119	110	113	116	123	122	123	129	133	133	133	134	134	133	134	133	128
Aug29	136	132	131	133	134	133	130	124	120	117	114	115	121	123	125	130	131	131	133	133	133	134	133	132	128
Aug30	132	133	133	134	134	132	131	125	120	119	121	122	123	123	125	129	132	132	133	134	134	132	135	137	129
Aug31	133	133	133	135	138	139	137	127	119	117	118	121	125	127	128	128	131	132	134	137	135	135	135	134	130

Table 9.11. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Sep01	103	103	102	102	103	...	97	88	80	78	86	...	...	102	100	98	96	92	95	103	99	100	103	109	...
Sep02	103	103	105	105	104	100	94	88	84	88	95	92	95	104	108	108	105	100	99	105	105	107	109	119	101
Sep03	110	107	107	106	103	102	100	97	91	88	94	98	103	104	...	98	99	102	108	107	107	106	107	120	...
Sep04	120	120	115	113	106	99	101	102	96	96	99	101	104	110	109	104	100	96	98	98	92	98	102	120	104
Sep05	112	103	118	104	104	102	97	88	77	78	74	83	100	...	87	84	87	93	96	101	108	104	103	101	...
Sep06	100	99	101	101	100	100	95	86	87	92	99	102	99	93	92	97	101	103	103	104	107	110	116	118	100
Sep07	122	116	115	114	117	114	111	102	99	101	107	114	112	108	100	98	97	100	105	106	106	107	105	107	108
Sep08	105	105	105	105	106	105	101	108	102	103	108	105	106	107	107	106	104	102	104	107	108	111	112	111	106
Sep09	117	107	109	108	109	108	100	88	85	84	93	102	110	114	113	112	113	108	108	112	113	118	116	105	106
Sep10	106	105	105	106	104	100	95	88	84	88	95	98	99	92	84	84	78	73	54	86	107	101	80	71	91
Sep11	101	90	94	99	95	99	97	63	22	13	52	62	75	85	77	76	78	77	90	81	104	104	93	92	80
Sep12	96	94	93	94	93	91	83	78	76	77	84	90	102	108	106	101	92	92	91	94	106	105	106	107	94
Sep13	129	113	111	104	112	105	79	77	74	75	73	69	83	94	94	80	69	88	92	95	99	102	102	118	93
Sep14	100	100	100	93	94	90	82	78	73	71	78	81	...	99	98	102	104	98	104	111	91	98	100	100	...
Sep15	98	96	95	97	97	96	88	77	72	76	86	95	97	98	98	102	101	99	98	101	102	105	115	108	96
Sep16	104	104	103	103	99	100	98	95	88	88	96	104	108	110	110	110	108	107	106	107	111	114	108	114	104
Sep17	111	114	114	112	111	112	106	96	95	94	95	110	123	126	124	118	111	104	95	113	107	109	97	102	108
Sep18	108	104	104	104	101	102	96	90	85	82	84	92	106	112	113	113	110	107	107	109	111	110	111	109	103
Sep19	109	106	103	105	100	100	98	92	88	92	98	98	101	106	108	105	106	109	110	110	110	109	108	108	103
Sep20	107	106	105	106	107	103	100	97	96	97	102	108	111	113	112	112	109	108	109	110	109	110	110	109	107
Sep21	109	107	107	107	108	109	107	104	102	100	101	107	113	121	119	116	114	118	119	121	118	118	110	106	111
Sep22	101	107	128	121	111	104	99	90	83	75	77	70	62	78	80	88	84	85	91	85	107	103	115	113	94
Sep23	110	106	99	108	107	101	94	87	80	74	81	87	89	93	91	92	88	93	100	99	98	111	105	103	96
Sep24	109	114	113	109	108	110	106	101	91	93	91	95	102	106	111	113	111	107	107	108	107	112	109	116	106
Sep25	110	114	113	114	113	115	109	106	101	97	100	98	99	107	109	102	102	106	107	104	95	97	105	107	105
Sep26	106	105	106	106	106	104	100	95	91	95	101	104	100	92	79	71	82	96	98	98	103	105	112	113	99
Sep27	108	108	107	107	105	106	105	100	88	74	86	98	101	105	105	109	111	111	115	118	117	118	116	123	106
Sep28	114	120	111	111	111	109	101	103	99	102	102	107	111	114	113	109	108	112	114	115	112	112	117	109	110
Sep29	111	119	118	116	120	115	111	98	84	83	85	93	86	94	97	98	99	91	101	106	107	109	113	108	103
Sep30	108	105	106	106	110	107	105	102	96	94	92	92	93	96	103	106	107	107	104	109	105	107	114	107	103
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Sep01	76	77	77	80	86	...	101	99	88	73	59	...	...	52	61	70	75	73	72	86	80	73	73	75	...
Sep02	75	76	77	78	86	90	95	93	84	72	60	53	52	54	59	65	68	66	65	69	70	70	71	72	72
Sep03	74	77	79	80	84	83	87	85	78	67	54	46	46	48	...	55	60	62	62	66	69	71	73	69	...
Sep04	75	78	79	81	81	78	74	78	77	64	56	51	47	49	55	63	70	70	69	74	78	76	77	83	70

Table 9.11 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Sep05	92	88	94	98	94	98	102	98	91	76	64	56	55	...	62	74	69	68	73	74	80	72	73	74	...
Sep06	76	72	72	82	86	87	90	89	79	69	60	51	49	54	64	63	63	66	68	71	70	70	71	74	71
Sep07	75	78	72	79	78	77	79	78	69	57	46	40	44	57	66	68	69	72	69	71	71	72	74	79	68
Sep08	78	79	78	79	81	87	94	97	88	68	53	48	49	55	61	65	68	65	67	69	71	73	73	74	72
Sep09	71	78	78	80	82	87	91	91	80	64	52	48	52	61	69	72	72	71	72	68	71	75	83	77	73
Sep10	76	76	76	79	82	83	88	92	84	71	54	42	34	36	41	57	58	102	97	69	102	111	120	90	76
Sep11	70	80	82	77	58	86	87	81	75	59	48	43	48	59	66	72	73	83	108	88	99	82	80	81	74
Sep12	80	81	78	79	86	88	92	93	83	64	46	40	48	60	69	76	91	92	78	78	79	73	74	70	75
Sep13	62	78	88	81	74	88	87	85	77	62	47	39	52	57	71	78	84	73	74	78	76	78	81	67	72
Sep14	76	62	75	78	90	91	94	95	83	74	57	50	...	55	67	72	74	72	78	90	100	89	73	74	...
Sep15	78	76	72	76	81	88	97	98	88	78	63	52	50	56	71	70	75	78	75	75	74	76	70	70	74
Sep16	74	80	78	86	83	84	90	93	88	76	62	52	50	55	66	70	71	71	71	72	73	70	73	69	73
Sep17	73	78	83	86	85	86	89	93	89	76	63	50	43	45	50	57	59	59	67	89	87	99	85	75	74
Sep18	70	79	80	83	83	84	87	83	80	74	66	53	51	52	59	67	68	68	69	72	72	73	74	74	72
Sep19	79	81	85	84	83	83	89	91	83	73	62	57	57	61	66	70	71	68	70	71	71	72	74	76	74
Sep20	78	78	79	79	82	85	89	92	87	78	68	57	55	55	60	67	69	69	71	72	72	73	74	75	73
Sep21	76	77	79	80	81	81	88	95	93	82	66	50	48	51	59	64	61	62	64	66	71	73	80	97	73
Sep22	105	81	102	118	91	81	82	73	79	73	63	49	46	56	88	64	65	71	87	101	84	88	74	79	79
Sep23	81	84	76	84	87	87	90	92	90	82	60	44	39	45	42	52	54	60	62	72	76	86	85	89	72
Sep24	96	90	88	85	82	83	86	87	87	77	64	52	47	46	51	57	62	66	75	71	73	79	80	83	74
Sep25	84	86	84	83	77	74	80	86	88	77	62	52	46	43	50	60	67	69	78	75	94	92	78	80	73
Sep26	78	76	77	77	77	78	83	93	92	80	63	54	49	51	58	66	68	75	77	79	78	77	75	75	73
Sep27	75	78	79	80	76	76	84	90	87	77	64	52	53	56	68	71	67	69	70	71	73	74	78	75	73
Sep28	80	78	86	86	86	83	78	88	87	75	57	48	47	53	61	67	67	68	70	74	75	75	84	79	73
Sep29	79	83	81	79	82	82	87	91	88	75	66	55	54	59	59	70	71	73	76	73	73	74	94	88	76
Sep30	81	80	79	76	73	78	86	94	97	87	74	63	60	60	63	68	71	71	74	83	76	80	79	79	76
2018, Field component: Z, Base: 43800.0, Unit: nT																									
Sep01	37	37	37	37	39	...	39	37	33	33	31	...	...	38	39	38	38	38	39	39	39	39	38	36	...
Sep02	36	36	36	36	37	36	36	35	33	30	23	24	27	31	32	35	37	36	38	38	39	38	38	35	34
Sep03	35	35	35	36	35	35	35	33	32	28	19	16	20	26	...	28	32	34	36	36	37	38	37	36	...
Sep04	34	34	34	33	34	34	32	30	27	26	24	26	28	28	29	30	32	35	37	38	40	39	38	33	32
Sep05	31	31	28	31	33	36	38	37	37	31	23	24	28	...	36	39	39	38	39	38	36	37	37	37	...
Sep06	37	37	36	35	34	34	35	35	32	26	24	27	30	33	32	32	31	34	36	37	36	36	35	35	33
Sep07	34	33	33	32	31	33	34	34	31	25	19	19	24	27	29	33	34	35	36	35	35	35	36	35	31
Sep08	35	35	35	35	36	36	34	31	27	25	22	24	28	30	32	31	31	33	35	36	36	35	35	35	32
Sep09	33	34	35	35	35	34	35	32	29	26	26	32	38	39	37	34	33	33	34	34	34	33	33	34	33

Table 9.11 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Sep10	35	35	35	35	35	34	33	33	32	28	25	27	34	38	41	46	46	50	56	50	42	38	35	39	38
Sep11	33	37	39	39	37	36	39	40	39	39	38	42	45	46	47	46	44	47	47	47	43	40	40	41	41
Sep12	41	42	42	41	41	41	42	42	39	35	38	37	38	41	38	38	39	42	43	42	40	40	40	40	40
Sep13	32	31	33	35	34	35	40	39	32	28	27	34	38	38	39	44	46	45	45	44	43	41	40	37	37
Sep14	36	36	34	34	37	40	39	36	37	35	35	35	...	37	38	39	39	40	40	39	39	39	37	39	...
Sep15	39	40	40	38	39	40	42	40	33	28	27	28	32	36	37	37	39	40	40	40	40	39	37	36	37
Sep16	36	37	38	37	38	39	40	37	33	27	25	25	27	31	34	35	35	36	37	37	37	36	36	35	34
Sep17	35	35	33	32	32	34	37	37	36	31	25	20	20	21	25	28	32	36	40	37	37	36	38	38	32
Sep18	36	36	37	36	37	38	39	38	37	32	29	28	27	28	30	32	34	35	37	37	37	37	37	37	35
Sep19	36	36	37	37	36	37	37	34	32	28	26	27	29	31	34	34	35	35	36	36	36	36	36	37	34
Sep20	37	37	37	37	36	37	38	38	37	32	26	22	24	26	26	30	32	34	35	35	36	36	36	36	33
Sep21	36	36	36	36	35	36	38	38	33	27	20	21	23	24	27	30	31	32	33	34	34	35	37	38	32
Sep22	37	36	27	25	28	29	33	35	35	34	31	36	39	41	45	45	44	45	45	45	43	39	39	33	37
Sep23	34	34	34	32	33	36	40	43	42	36	29	21	26	34	36	38	42	42	42	41	42	40	39	39	36
Sep24	38	37	36	36	35	35	36	38	33	28	26	27	30	32	33	34	35	37	38	38	38	38	38	37	35
Sep25	37	36	36	35	35	36	39	40	39	31	23	26	28	29	30	32	35	37	37	39	39	41	39	38	35
Sep26	38	38	38	37	38	41	44	42	36	28	22	22	24	26	33	42	43	42	42	41	40	39	38	35	36
Sep27	37	37	37	38	38	38	42	41	35	28	23	25	28	32	35	37	37	37	37	36	36	36	36	36	35
Sep28	34	32	33	33	34	36	39	38	36	28	28	29	32	34	35	36	36	36	37	36	37	37	36	36	34
Sep29	36	35	34	33	33	35	38	39	39	37	33	31	30	33	35	37	39	41	41	40	40	39	38	38	36
Sep30	37	38	37	38	36	38	41	41	36	32	30	29	31	35	36	37	38	39	39	38	39	38	37	37	37

2018, Field component: F, Base: 48500.0, Unit: nT

Sep01	134	134	134	134	136	136	134	129	122	119	121	127	128	134	134	133	132	130	133	136	134	134	135	136	132
Sep02	133	134	135	135	135	132	130	127	123	121	118	117	121	128	131	134	135	132	133	136	136	137	137	139	131
Sep03	135	135	135	134	133	133	131	129	124	119	113	112	118	124	123	124	127	130	135	135	136	136	136	140	129
Sep04	139	139	137	135	133	130	129	127	122	121	121	123	126	128	129	128	128	129	132	133	132	134	135	138	130
Sep05	133	130	133	130	132	133	133	129	123	118	108	113	124	130	126	128	129	131	133	135	136	134	134	134	129
Sep06	133	133	132	132	131	130	130	126	123	119	121	124	126	125	124	127	128	131	133	134	135	136	138	139	130
Sep07	139	136	136	135	135	135	135	131	127	122	119	122	126	127	125	128	129	131	134	134	134	134	134	135	131
Sep08	134	134	134	134	135	135	131	131	126	124	122	123	126	129	131	130	129	130	133	134	135	136	136	136	131
Sep09	137	133	135	135	135	135	131	124	119	116	119	129	138	140	138	136	134	133	134	135	136	137	136	133	132
Sep10	133	133	134	134	133	131	127	124	122	120	119	122	128	129	129	134	131	134	131	139	141	135	124	123	130
Sep11	129	129	132	135	131	132	134	120	101	97	112	120	128	134	131	130	130	132	138	134	141	137	133	134	128
Sep12	135	135	134	134	134	133	131	129	125	121	126	127	134	140	137	134	132	134	134	135	139	138	138	139	133
Sep13	140	134	134	133	135	133	127	125	117	113	112	115	126	131	132	131	128	135	137	137	137	138	137	140	130
Sep14	132	131	130	127	130	132	128	123	122	119	121	122	127	132	133	136	136	135	138	140	132	135	133	134	130

Table 9.11 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Sep15	134	134	133	133	133	135	133	126	118	115	117	122	127	130	132	134	135	135	135	136	136	137	139	135	131
Sep16	134	135	135	134	133	135	135	131	125	119	120	123	127	131	134	135	134	135	136	136	137	138	135	137	132
Sep17	136	137	135	134	134	136	135	132	131	125	120	121	126	129	131	132	132	133	133	139	137	137	133	135	132
Sep18	136	134	134	134	134	135	133	130	126	120	119	121	126	130	132	133	134	134	136	137	137	137	137	137	132
Sep19	136	135	134	135	132	133	133	127	123	121	122	123	125	130	134	133	133	135	136	136	136	136	136	136	132
Sep20	136	135	135	136	135	135	134	133	131	127	123	122	125	128	128	131	133	133	135	135	136	136	136	136	132
Sep21	136	135	135	135	135	136	137	136	131	124	118	120	125	129	131	133	133	136	137	138	138	139	138	137	133
Sep22	134	135	137	133	130	128	129	127	124	120	118	118	117	126	132	135	132	134	137	134	141	136	141	135	131
Sep23	135	133	130	132	133	133	133	133	129	121	117	112	117	126	127	130	132	134	137	136	136	141	138	136	130
Sep24	139	140	138	136	135	135	136	...	126	122	119	121	126	130	134	135	135	136	136	137	137	139	137	...	...
Sep25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	136	133	136	137	136	...
Sep26	136	136	136	136	137	138	139	136	129	123	120	120	121	119	120	124	130	136	137	136	137	137	139	137	132
Sep27	136	136	136	137	136	136	140	137	127	114	114	120	125	130	133	136	137	138	139	140	139	140	139	142	134
Sep28	136	137	134	134	135	136	135	135	132	126	125	128	132	135	136	136	136	137	139	139	138	138	139	136	135
Sep29	137	140	139	137	138	138	139	134	128	125	123	124	120	126	130	132	134	133	137	138	138	139	140	138	134
Sep30	137	136	136	136	137	137	139	138	131	127	123	121	124	129	133	135	137	137	136	138	137	137	139	136	134

Table 9.12. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Oct01	107	106	107	109	112	112	114	112	105	95	93	94	103	103	84	100	95	99	100	111	113	106	109	117	104
Oct02	104	112	103	115	112	109	107	102	96	96	93	94	99	103	105	106	106	106	106	106	104	105	106	107	104
Oct03	108	110	108	108	110	111	115	116	109	104	100	101	104	109	112	115	114	115	117	113	112	111	119	112	110
Oct04	110	107	109	108	110	111	112	113	112	109	106	106	110	106	100	101	109	113	112	114	115	114	115	113	110
Oct05	112	115	117	120	121	122	124	115	103	99	100	100	108	116	115	104	105	106	108	107	104	107	111	123	111
Oct06	111	109	120	122	120	125	125	116	107	101	100	99	109	115	116	113	113	114	112	110	110	110	111	111	112
Oct07	110	110	111	112	115	121	121	120	116	113	115	109	94	90	96	74	39	28	57	50	84	70	75	85	92
Oct08	98	95	101	102	88	95	92	78	60	59	62	58	46	64	69	71	83	82	81	94	93	98	98	97	82
Oct09	108	104	102	101	101	99	93	74	67	68	67	60	78	97	97	93	81	71	81	91	96	119	109	95	90
Oct10	91	98	99	100	104	102	96	91	85	87	84	82	73	54	60	73	79	71	53	84	107	81	92	96	85
Oct11	101	114	102	94	93	96	89	78	76	74	78	86	88	91	95	96	95	96	98	101	97	95	102	99	93
Oct12	98	100	100	98	101	104	100	97	88	81	78	83	91	97	99	96	93	100	99	97	105	111	105	104	97
Oct13	105	104	104	107	109	112	115	117	110	102	99	102	105	106	107	108	85	46	51	77	93	97	107	92	98
Oct14	90	90	96	97	101	105	105	102	97	93	92	93	100	106	106	103	102	108	108	106	107	106	104	100	101
Oct15	111	112	104	101	104	102	102	100	96	92	88	94	101	98	98	99	99	91	94	110	115	114	112	102	102
Oct16	104	107	104	104	107	107	109	107	99	91	90	91	98	102	98	100	105	105	106	107	108	107	108	107	103
Oct17	107	107	107	108	108	111	113	106	99	96	90	91	99	103	106	107	108	109	110	111	111	109	108	109	105
Oct18	107	108	107	109	112	114	114	112	108	103	100	100	103	106	108	110	111	112	112	112	112	110	109	109	109
Oct19	108	108	108	111	113	114	113	111	109	105	100	102	106	108	108	110	111	112	113	112	113	113	113	113	110
Oct20	113	114	114	114	113	114	117	117	113	108	102	103	109	112	112	112	111	112	112	111	113	114	111	112	112
Oct21	113	113	114	116	117	120	122	122	122	118	113	98	101	102	106	109	103	111	109	103	107	112	112	110	111
Oct22	116	123	113	110	108	110	113	109	106	97	90	89	93	92	94	100	100	95	96	100	103	105	106	107	103
Oct23	111	106	107	109	112	116	121	120	113	102	97	98	104	106	109	111	113	114	113	114	114	114	112	112	110
Oct24	111	112	110	111	112	115	118	119	118	115	106	108	113	113	113	113	114	114	109	104	108	115	112	110	112
Oct25	109	110	111	111	112	114	116	114	108	102	104	115	117	117	113	111	105	101	100	98	101	109	108	108	109
Oct26	113	118	112	115	121	120	119	110	103	102	101	109	114	112	114	112	112	113	112	113	106	101	108	107	111
Oct27	104	106	107	107	110	110	108	101	98	90	87	93	101	106	108	107	108	109	109	110	111	111	110	108	105
Oct28	108	114	114	114	116	118	114	109	100	95	94	99	105	108	110	111	111	110	110	110	111	110	111	110	109
Oct29	111	112	113	114	113	112	113	111	107	103	102	106	110	113	112	113	113	113	115	116	115	114	112	112	111
Oct30	116	115	115	118	116	117	117	110	105	102	101	108	111	111	113	115	116	119	116	113	110	110	112	110	112
Oct31	113	112	112	113	115	116	116	115	108	99	96	101	103	105	104	103	111	107	113	114	114	115	110	111	109
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Oct01	78	78	76	74	74	76	84	92	92	86	71	61	51	39	70	57	56	64	79	86	86	77	84	91	74
Oct02	79	78	63	76	75	75	81	88	93	87	74	60	52	51	57	64	68	70	73	84	76	75	76	77	73
Oct03	78	78	80	79	77	77	83	92	94	91	82	66	53	46	50	59	66	68	68	72	79	80	82	81	74

Table 9.12 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Oct04	81	78	78	77	75	76	83	92	97	93	79	66	56	49	54	63	66	69	70	77	76	76	75	75	74
Oct05	70	74	72	76	79	77	81	93	97	89	73	59	49	42	52	69	72	72	73	77	79	80	77	70	73
Oct06	78	73	64	72	73	77	86	95	97	90	73	62	57	56	63	73	74	73	74	75	77	77	77	75	75
Oct07	74	74	74	75	72	74	83	91	94	86	68	54	45	34	41	48	92	104	116	115	163	122	107	88	83
Oct08	64	75	81	75	73	76	84	94	93	79	64	59	57	72	62	84	84	75	85	90	82	83	81	78	77
Oct09	67	68	77	80	79	83	87	93	97	84	71	68	61	57	57	73	105	96	81	82	90	94	98	97	81
Oct10	85	73	75	80	80	83	88	92	94	85	73	66	56	56	54	61	65	87	98	105	109	95	85	83	80
Oct11	79	72	84	83	84	90	89	93	92	86	73	63	58	62	70	74	75	90	94	84	89	86	80	79	80
Oct12	78	75	79	76	78	81	88	96	98	89	78	67	60	60	65	71	74	81	77	82	88	86	82	80	79
Oct13	78	79	76	74	74	76	84	94	98	88	72	58	51	56	65	71	70	87	81	88	84	88	100	96	79
Oct14	88	80	80	77	77	77	81	89	95	86	73	63	60	63	67	68	70	72	74	77	76	82	84	87	77
Oct15	80	83	90	80	79	77	82	87	89	82	70	58	54	56	62	68	71	71	81	84	80	90	90	93	77
Oct16	78	82	80	78	78	79	84	93	97	88	73	60	57	60	66	82	74	76	77	78	79	81	80	79	77
Oct17	78	77	77	77	76	79	86	94	97	91	78	63	54	56	64	71	73	76	77	77	78	79	79	78	76
Oct18	78	77	77	76	76	77	79	86	92	88	76	64	57	57	64	70	73	75	77	77	77	77	79	79	75
Oct19	79	79	79	77	77	77	82	91	100	94	76	63	59	63	69	73	73	75	76	76	80	77	79	78	77
Oct20	78	78	77	77	77	77	79	87	96	94	81	68	58	60	65	68	70	72	75	76	77	78	81	82	76
Oct21	80	78	77	77	76	75	77	85	91	88	72	56	47	50	61	66	67	71	73	79	81	80	79	80	74
Oct22	77	87	83	80	79	78	84	91	94	91	76	65	59	60	68	71	73	77	78	81	85	84	80	79	78
Oct23	78	79	77	80	79	78	81	88	93	89	73	62	57	61	67	71	73	75	76	75	77	78	79	79	76
Oct24	78	77	77	77	78	79	81	88	96	87	70	57	53	60	67	70	73	75	75	80	79	82	83	83	76
Oct25	80	81	79	80	77	78	78	86	90	82	65	55	55	61	67	72	74	86	84	85	91	90	85	82	78
Oct26	80	79	78	77	77	76	81	89	92	83	67	57	53	59	68	67	71	76	77	78	87	100	88	86	77
Oct27	81	79	79	78	78	82	86	93	97	89	75	59	57	60	67	73	75	77	78	79	80	80	81	81	78
Oct28	82	76	79	78	78	79	84	92	95	86	70	56	56	63	69	73	74	75	76	77	79	81	83	82	77
Oct29	81	79	77	75	76	78	82	89	94	88	72	57	52	58	67	71	73	74	76	75	77	79	79	80	75
Oct30	78	77	75	74	72	75	79	88	93	84	69	59	57	61	68	74	74	74	74	77	78	80	80	80	75
Oct31	81	79	77	76	77	78	85	95	100	93	79	62	56	58	64	70	70	74	76	78	86	88	85	82	78
2018, Field component: Z, Base: 43800.0, Unit: nT																									
Oct01	37	37	37	37	37	39	41	41	36	32	29	27	28	32	38	40	40	41	42	40	39	39	38	36	37
Oct02	36	35	36	33	35	37	39	40	39	36	30	30	32	34	37	38	38	38	38	39	39	39	38	38	36
Oct03	38	37	37	37	37	38	41	42	39	32	27	24	24	27	31	34	35	35	36	36	37	38	37	36	35
Oct04	36	37	36	36	36	38	40	40	37	33	29	29	28	31	36	38	38	37	37	37	37	36	36	37	36
Oct05	38	36	35	33	32	34	36	37	35	31	28	28	27	26	31	35	36	36	37	38	38	39	38	35	34
Oct06	35	37	34	32	33	36	38	37	33	30	31	33	33	32	33	35	35	35	36	36	37	37	37	37	35
Oct07	37	37	36	36	35	37	40	40	36	31	23	25	30	37	39	48	59	65	63	58	50	46	46	46	42

Table 9.12 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Oct08	40	37	38	39	39	43	47	49	47	45	43	45	47	53	53	52	53	50	49	48	47	45	45	45	46
Oct09	42	40	40	41	42	44	46	45	43	38	39	41	43	41	43	45	48	51	50	49	47	39	37	38	43
Oct10	42	42	40	41	41	44	45	44	41	38	36	36	39	44	49	50	50	52	56	52	43	46	46	45	44
Oct11	44	39	37	40	42	44	45	47	44	38	34	33	36	41	44	46	45	45	45	44	44	44	43	43	42
Oct12	43	43	42	43	43	44	48	48	42	37	35	33	31	32	35	39	43	43	44	43	42	41	41	41	41
Oct13	41	41	41	40	41	41	45	46	40	31	23	22	26	31	36	39	43	55	61	57	53	49	45	45	41
Oct14	45	45	45	44	44	44	48	50	48	41	35	32	30	35	39	41	42	43	42	43	43	43	43	43	42
Oct15	43	39	40	41	41	43	46	47	43	39	36	35	36	41	42	43	43	45	46	44	42	41	39	41	42
Oct16	42	40	41	41	41	43	47	49	45	41	35	33	34	38	41	42	42	42	42	42	42	42	41	41	41
Oct17	41	41	40	40	40	41	44	43	39	32	30	31	33	37	40	40	40	40	40	40	40	41	41	41	39
Oct18	41	40	40	40	40	40	43	46	44	40	37	36	36	37	39	40	40	40	40	40	40	40	40	40	40
Oct19	40	40	40	39	39	40	43	45	39	27	20	24	31	36	39	39	39	39	39	39	39	39	39	39	37
Oct20	39	39	39	38	38	38	41	42	41	35	27	24	28	36	39	38	39	40	39	40	39	39	39	39	37
Oct21	39	39	38	38	37	37	40	42	37	28	25	24	29	36	38	38	40	41	40	42	42	41	41	41	37
Oct22	40	36	37	38	39	39	40	41	35	24	20	21	28	36	40	40	41	42	43	43	43	42	42	41	37
Oct23	40	40	40	40	40	39	41	41	37	31	25	25	30	35	38	38	39	39	39	39	39	39	39	39	37
Oct24	39	39	39	39	39	39	39	40	36	28	22	22	26	30	34	36	38	38	39	41	41	40	39	39	36
Oct25	40	39	39	39	39	38	39	40	36	32	25	27	35	39	37	36	39	41	42	42	42	42	41	40	38
Oct26	40	38	38	38	38	38	39	39	38	34	29	30	35	37	38	38	39	40	39	40	40	42	41	40	38
Oct27	40	40	40	40	40	41	43	45	43	37	33	32	36	39	40	40	41	41	41	41	40	40	40	40	40
Oct28	40	40	38	38	39	39	42	42	38	30	25	30	36	40	40	39	39	40	40	40	40	40	40	40	38
Oct29	40	39	39	39	39	39	40	41	37	32	28	28	30	34	39	39	39	40	40	39	39	39	39	39	37
Oct30	38	38	38	37	38	38	40	40	38	33	30	32	35	38	39	38	39	39	39	40	41	41	40	40	38
Oct31	39	39	39	38	39	39	40	40	37	33	31	31	32	36	39	41	40	40	40	40	39	39	39	39	38
2018, Field component: F, Base: 48600.0, Unit: nT																									
Oct01	36	36	36	37	38	40	43	42	35	26	22	21	25	29	26	35	33	35	38	41	41	37	38	40	35
Oct02	34	36	33	36	36	36	38	37	33	30	24	23	27	31	34	36	36	36	37	37	37	37	37	37	34
Oct03	37	38	37	36	37	39	43	45	40	31	24	21	23	27	32	37	37	37	39	38	38	38	41	38	35
Oct04	36	36	36	36	36	38	42	42	39	34	29	28	29	29	32	34	37	38	38	39	39	38	39	38	36
Oct05	39	38	38	38	38	40	43	40	33	28	25	25	26	29	33	33	34	35	36	37	36	38	39	41	35
Oct06	36	37	38	38	38	43	45	41	34	28	27	28	32	34	36	37	36	38	37	37	37	37	38	38	36
Oct07	37	37	37	37	38	42	45	45	39	34	27	25	23	27	32	31	27	28	40	32	41	30	31	35	34
Oct08	34	30	35	36	30	36	38	35	25	23	22	22	18	32	34	34	40	37	36	41	39	40	40	39	33
Oct09	41	37	37	37	38	39	38	30	25	21	21	19	29	35	36	37	36	34	37	40	40	44	38	33	34
Oct10	34	36	35	37	39	40	39	36	31	28	25	24	22	18	26	33	35	34	31	40	43	33	38	39	33
Oct11	40	41	34	33	35	38	36	33	30	23	21	23	27	32	37	39	38	39	40	40	38	37	39	38	35

Table 9.12 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Oct12	38	38	38	38	39	42	43	42	33	25	22	22	23	27	30	...	...	38	38	38	41	41	39	38	...
Oct13	38	38	38	39	40	42	47	49	41	29	20	20	24	29	35	39	32	26	34	42	44	43	44	37	36
Oct14	37	37	38	38	40	41	45	46	42	34	27	25	26	34	38	37	38	41	41	41	41	41	40	39	38
Oct15	43	40	37	37	38	40	43	42	37	31	26	28	32	35	36	38	38	36	39	44	44	43	40	38	38
Oct16	39	39	38	38	39	41	46	47	41	33	27	25	29	34	35	38	40	40	40	41	41	41	40	40	38
Oct17	40	39	39	39	39	42	45	42	35	27	22	23	28	34	38	39	39	40	40	40	41	40	40	40	37
Oct18	39	39	39	39	40	41	44	46	44	37	33	32	32	35	38	40	40	41	41	41	41	40	40	40	39
Oct19	40	39	39	40	41	42	45	46	39	26	17	22	30	35	38	38	39	40	41	40	41	41	41	41	37
Oct20	41	41	40	40	39	40	44	45	43	35	25	22	28	37	40	39	39	40	40	40	41	41	40	40	38
Oct21	41	40	40	40	41	42	45	47	43	33	27	20	25	32	36	38	37	41	40	38	41	42	42	41	38
Oct22	43	43	39	38	38	39	42	41	35	21	14	14	21	28	33	35	36	35	36	38	40	40	40	40	34
Oct23	40	39	39	40	41	42	46	45	40	29	21	21	27	33	37	38	41	41	40	41	41	41	40	40	38
Oct24	39	40	39	39	40	41	43	44	40	32	22	23	28	32	36	37	39	40	39	38	40	42	40	40	37
Oct25	39	40	40	40	40	40	42	42	36	30	23	30	38	42	39	37	37	37	37	37	38	42	40	40	38
Oct26	41	41	39	41	43	42	43	40	36	32	26	30	36	38	39	39	40	41	40	41	39	38	40	39	39
Oct27	38	38	39	39	40	41	42	41	38	29	24	25	32	37	39	39	40	40	40	40	41	40	40	39	37
Oct28	40	42	40	40	41	43	44	42	34	25	20	26	33	39	40	39	40	40	40	40	41	40	40	40	38
Oct29	40	40	40	40	40	40	41	42	37	30	25	27	30	36	39	40	40	41	42	42	41	41	40	40	38
Oct30	41	40	40	41	40	42	43	41	36	30	27	32	35	38	40	41	41	42	42	41	41	41	41	40	39
Oct31	41	40	40	40	41	42	43	43	38	29	26	28	29	33	36	37	40	39	41	42	41	42	39	39	38

Table 9.13. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Nov01	109	112	113	115	119	123	127	122	105	98	92	97	102	103	105	108	111	114	114	112	110	111	111	112	110
Nov02	115	114	116	114	117	120	122	119	111	102	97	104	108	108	111	111	113	113	117	117	116	116	116	114	113
Nov03	115	113	111	119	114	115	119	119	114	105	97	98	104	109	114	116	116	115	113	112	110	109	115	115	112
Nov04	113	112	114	116	120	124	129	131	125	123	118	113	106	100	95	88	78	64	52	56	86	122	98	87	103
Nov05	116	113	102	106	99	86	97	93	75	62	39	37	55	70	68	61	51	51	67	105	80	85	92	98	79
Nov06	91	93	94	97	103	98	100	93	82	75	74	78	84	86	83	89	94	98	101	103	106	104	104	105	93
Nov07	106	100	101	106	108	109	105	94	90	80	80	86	90	92	89	97	101	104	105	106	94	98	93	100	97
Nov08	101	103	108	124	106	108	107	102	94	89	70	91	101	104	102	97	94	96	99	101	101	101	105	102	100
Nov09	99	99	101	101	105	105	106	108	107	99	100	101	100	98	99	94	99	83	68	60	62	74	76	89	93
Nov10	91	91	96	102	100	100	107	109	112	107	99	77	101	102	98	99	97	100	96	97	87	95	110	120	100
Nov11	108	100	98	99	102	102	103	105	105	97	88	86	87	94	102	105	108	108	103	102	103	102	103	104	101
Nov12	104	101	104	104	110	105	100	101	94	88	86	86	97	100	99	103	103	103	101	94	96	106	110	102	100
Nov13	100	101	98	100	103	105	107	105	101	94	93	97	98	102	104	104	105	107	106	107	107	105	105	105	102
Nov14	105	105	105	107	109	111	112	112	108	103	100	104	106	108	106	106	111	112	108	106	107	105	107	107	107
Nov15	106	106	107	107	108	110	110	106	101	95	93	98	106	111	112	110	107	110	113	114	113	111	112	109	107
Nov16	108	109	109	109	110	113	113	110	107	100	98	105	108	109	106	106	110	115	113	113	112	112	112	110	109
Nov17	108	107	110	111	112	113	116	114	111	107	103	105	107	110	112	112	113	111	110	107	107	107	107	107	110
Nov18	107	108	108	109	111	114	118	116	114	110	105	107	110	111	114	115	115	116	117	117	118	117	117	116	113
Nov19	118	118	113	110	110	117	121	120	117	112	103	104	107	108	108	101	93	83	87	97	102	110	119	117	108
Nov20	116	106	100	102	103	114	118	113	109	106	104	107	109	109	109	108	109	114	113	114	113	109	108	108	109
Nov21	109	108	107	106	107	120	121	116	114	108	106	104	104	107	107	105	107	106	108	107	108	108	108	105	109
Nov22	104	106	105	105	107	109	111	111	109	104	104	106	107	107	108	110	109	110	109	111	112	113	112	110	108
Nov23	110	110	108	108	114	117	120	123	118	114	112	114	117	115	115	115	115	115	114	114	113	112	112	112	114
Nov24	112	112	111	112	113	115	118	118	115	114	120	124	124	122	113	109	110	115	119	117	115	115	115	113	115
Nov25	113	113	112	110	111	112	111	113	110	109	109	109	104	107	110	113	113	114	114	114	113	111	107	104	111
Nov26	105	106	107	111	111	112	115	117	115	111	112	115	116	116	115	114	114	114	113	114	114	114	111	110	113
Nov27	110	109	113	113	117	120	119	119	118	114	112	119	122	117	115	111	107	116	112	109	113	106	110	107	114
Nov28	108	107	109	109	112	113	114	114	111	107	106	108	110	113	117	115	115	115	114	113	112	113	112	105	111
Nov29	110	116	111	112	113	115	117	117	115	111	109	112	113	114	115	114	114	114	114	113	112	111	112	108	113
Nov30	111	109	109	110	114	116	117	115	110	109	109	114	115	115	115	116	115	113	111	110	113	113	113	112	113
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Nov01	79	75	76	74	74	77	81	90	94	91	75	62	55	58	66	72	75	75	77	79	80	81	80	79	76
Nov02	79	70	77	76	77	79	82	90	94	92	80	69	62	62	70	71	74	80	78	78	78	79	78	78	77
Nov03	81	82	80	80	81	79	83	92	96	90	72	61	58	62	68	74	77	79	79	80	81	83	89	86	79
Nov04	80	81	77	76	73	74	76	83	89	86	76	60	59	60	62	64	72	87	118	130	110	126	107	105	85

Table 9.13 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Nov05	71	76	80	80	54	37	72	86	92	86	87	80	76	67	76	85	95	95	119	105	93	93	86	80	82
Nov06	83	78	80	63	76	84	90	97	95	88	74	63	62	65	72	76	84	85	83	85	84	85	84	87	80
Nov07	81	81	76	67	80	83	89	98	98	93	77	65	64	66	68	74	78	80	82	82	93	107	90	82	82
Nov08	80	79	74	80	84	83	87	96	102	90	80	69	72	73	76	80	84	84	91	86	85	87	89	86	83
Nov09	85	80	81	81	81	81	86	91	96	94	84	73	71	68	67	76	68	70	104	99	116	128	108	96	87
Nov10	94	83	80	82	82	82	83	87	88	84	68	69	70	73	77	79	84	84	89	117	99	88	88	82	84
Nov11	95	89	84	78	80	78	81	89	88	82	76	71	68	73	76	76	78	77	80	98	90	87	84	82	82
Nov12	83	85	79	80	81	78	79	85	93	86	76	68	72	74	79	80	82	82	85	89	96	89	90	89	83
Nov13	85	84	82	84	82	83	86	89	89	86	76	69	69	75	80	81	81	81	81	84	84	85	83	84	82
Nov14	84	83	82	81	82	82	84	89	90	86	79	71	70	73	75	77	77	78	80	82	82	84	82	82	81
Nov15	82	82	81	81	79	80	82	88	90	87	74	65	65	71	77	78	80	80	80	81	82	83	85	83	80
Nov16	82	80	80	80	79	80	83	89	90	85	76	64	63	67	73	77	80	80	80	82	83	83	85	85	79
Nov17	84	82	79	79	80	81	83	88	91	88	77	66	65	71	77	79	80	81	82	83	83	84	84	84	80
Nov18	83	81	81	81	83	82	84	88	90	80	67	59	60	64	72	72	74	78	79	80	81	82	81	83	78
Nov19	84	86	87	86	84	83	83	89	90	87	77	67	66	70	73	74	76	79	84	88	88	90	92	93	82
Nov20	91	86	79	79	84	81	86	91	93	85	73	68	69	73	77	78	79	80	81	82	83	83	84	84	81
Nov21	82	85	83	83	87	84	84	87	85	81	77	72	73	75	79	81	81	84	85	85	85	86	89	89	83
Nov22	87	87	85	82	83	85	87	90	92	88	79	71	69	71	76	79	80	82	84	84	84	85	85	85	82
Nov23	83	83	82	82	82	83	83	84	84	84	77	73	69	70	75	77	80	82	82	83	85	85	85	83	81
Nov24	81	80	81	80	81	82	83	86	88	85	79	72	71	74	76	75	77	78	79	81	84	85	84	83	80
Nov25	82	81	81	80	81	82	83	86	84	82	78	72	71	75	78	79	80	81	83	83	85	87	90	91	82
Nov26	89	86	85	86	86	84	84	84	85	82	77	71	73	77	79	80	80	80	81	83	84	85	85	86	82
Nov27	86	85	83	82	80	80	82	84	84	78	76	68	67	73	71	74	83	78	78	87	88	93	92	88	81
Nov28	86	85	80	81	81	82	82	83	85	84	79	72	69	73	78	80	80	81	82	83	84	88	88	87	81
Nov29	83	82	84	83	82	82	83	86	88	86	80	72	72	75	78	80	82	82	83	84	84	84	86	83	82
Nov30	85	82	83	82	82	83	84	87	88	84	79	74	73	76	80	82	81	81	82	84	88	84	84	85	82
2018, Field component: Z, Base: 43800.0, Unit: nT																									
Nov01	39	39	38	38	37	37	38	39	38	34	32	35	37	41	42	41	41	40	40	40	40	40	40	40	39
Nov02	38	39	37	38	38	38	39	41	40	37	34	31	33	38	40	40	40	40	39	39	39	39	39	39	38
Nov03	38	38	38	36	37	37	38	39	36	30	28	31	35	39	41	40	39	39	40	40	41	41	40	39	37
Nov04	39	38	38	38	37	36	35	33	32	28	22	20	27	34	40	44	47	51	56	56	51	38	41	41	39
Nov05	38	33	38	39	42	39	39	44	42	43	45	50	51	52	53	54	59	60	58	52	51	50	49	46	47
Nov06	47	47	46	46	43	45	46	46	42	39	36	33	39	47	49	49	48	48	47	46	46	45	45	44	44
Nov07	43	43	44	43	41	42	44	45	46	42	40	41	44	48	49	47	47	46	46	45	46	46	47	46	45
Nov08	46	45	44	38	41	42	43	43	41	40	40	39	42	44	45	46	46	47	46	46	46	46	44	44	43
Nov09	44	44	44	45	45	45	45	45	43	39	38	39	40	44	46	46	48	50	54	57	57	54	55	53	47

Table 9.13 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Nov10	51	50	49	47	46	46	45	45	42	34	31	36	40	44	47	47	48	48	48	49	51	50	47	41	45
Nov11	41	43	44	45	45	46	46	46	45	42	43	45	47	50	49	47	46	46	46	47	48	47	47	46	46
Nov12	45	45	45	44	44	44	46	46	44	40	39	42	46	47	47	46	47	47	47	48	49	48	46	45	45
Nov13	46	45	45	46	46	46	46	47	46	43	42	43	45	48	48	47	47	46	46	46	46	46	46	46	46
Nov14	45	45	45	45	45	45	44	43	39	35	35	37	42	45	45	44	44	44	45	45	45	45	45	45	43
Nov15	45	45	45	44	44	45	46	46	43	43	39	40	46	48	47	45	45	45	44	44	44	44	44	44	44
Nov16	44	43	43	43	43	44	44	43	41	40	38	38	41	43	44	44	44	44	44	43	44	43	43	43	43
Nov17	43	43	43	43	43	43	43	41	35	30	30	36	41	44	44	43	43	44	44	44	45	45	44	44	42
Nov18	44	44	44	43	43	43	42	43	42	39	37	37	40	45	45	44	43	43	43	43	43	43	42	42	42
Nov19	41	40	40	41	41	41	42	42	37	31	27	31	39	44	45	45	45	48	49	48	48	46	42	41	41
Nov20	39	40	41	42	42	43	43	44	42	37	32	36	41	44	44	44	44	44	44	43	43	44	44	44	42
Nov21	44	43	43	42	42	41	41	43	39	38	38	42	46	48	47	46	46	45	45	45	45	44	45	45	43
Nov22	45	44	45	45	44	44	43	44	44	42	38	40	46	47	47	45	45	45	45	45	44	44	44	44	44
Nov23	44	43	43	43	43	42	41	41	39	38	37	37	40	41	42	42	42	43	43	43	43	43	43	43	42
Nov24	43	42	42	43	42	42	40	40	41	41	37	36	39	41	42	43	44	43	43	42	43	43	43	42	41
Nov25	42	42	42	43	43	43	42	41	37	37	36	36	40	44	44	43	43	43	43	42	42	43	43	44	42
Nov26	44	44	44	43	43	43	41	41	39	37	34	37	41	43	44	43	43	43	43	43	43	43	43	43	42
Nov27	43	43	42	42	42	41	40	40	41	40	38	35	38	40	42	42	44	44	44	44	45	45	45	45	42
Nov28	44	44	44	43	43	43	41	41	40	38	36	36	40	43	44	43	43	43	43	43	44	43	43	43	42
Nov29	43	41	41	42	42	42	41	41	41	42	42	40	40	42	42	42	43	43	43	43	44	43	43	43	42
Nov30	43	43	43	43	43	43	42	43	43	43	40	39	41	44	44	43	43	43	44	44	44	44	43	43	43
2018, Field component: F, Base: 48600.0, Unit: nT																									
Nov01	39	40	39	40	42	43	46	44	36	30	25	29	33	37	40	40	41	42	41	41	40	41	41	41	39
Nov02	40	40	40	40	41	43	45	45	42	34	29	29	32	37	40	40	41	41	43	42	42	42	41	41	40
Nov03	41	40	39	41	39	40	42	43	39	29	24	26	32	38	42	42	42	42	41	41	41	41	43	42	39
Nov04	40	40	40	40	41	42	44	43	39	35	28	23	26	30	33	34	32	30	30	33	41	45	37	32	36
Nov05	41	35	35	38	37	27	34	37	28	22	14	17	26	33	33	32	32	33	39	49	37	39	41	41	33
Nov06	38	39	39	40	40	39	42	39	30	24	21	19	27	35	36	39	40	42	42	43	43	42	42	41	37
Nov07	41	38	39	40	40	42	42	38	37	30	28	30	34	39	39	41	42	43	43	43	39	41	39	41	39
Nov08	41	42	43	45	39	41	42	40	35	32	23	31	37	40	41	40	39	40	41	42	41	41	42	41	39
Nov09	39	40	40	41	42	42	43	44	42	35	35	35	35	38	41	39	42	38	35	35	36	39	40	43	39
Nov10	42	41	42	43	42	41	43	44	43	34	27	21	36	40	41	41	42	43	42	43	41	43	47	45	40
Nov11	40	39	39	40	41	42	42	43	43	37	33	34	36	42	45	44	45	44	43	44	45	43	43	43	41
Nov12	42	41	42	41	43	41	41	42	37	31	29	31	39	42	41	43	43	43	43	41	43	46	46	42	41
Nov13	41	41	40	41	43	43	44	45	42	36	34	37	39	44	45	44	44	45	44	45	44	44	43	43	42
Nov14	43	42	42	43	44	44	45	44	39	32	32	35	40	44	43	42	44	45	43	44	44	43	44	43	42

Table 9.13 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Nov15	43	43	43	43	43	44	46	44	39	37	31	35	43	47	47	44	43	44	45	45	45	44	44	43	43
Nov16	42	43	42	42	43	45	45	44	40	36	33	35	40	43	42	42	44	46	45	44	44	44	44	43	42
Nov17	42	42	43	43	43	44	45	43	37	30	29	34	40	43	44	44	44	44	43	43	43	43	43	43	41
Nov18	43	43	43	43	44	44	45	45	44	39	35	35	39	44	46	46	45	45	46	46	46	46	45	44	43
Nov19	45	43	41	41	41	44	47	46	41	33	26	29	37	42	44	40	37	36	39	42	44	46	47	44	41
Nov20	42	38	37	38	39	44	47	46	42	36	30	35	41	43	43	42	44	45	45	45	45	43	43	43	41
Nov21	43	42	41	40	41	46	46	46	41	38	36	39	42	45	45	44	44	43	44	43	44	44	44	43	43
Nov22	42	43	42	42	43	44	44	45	44	39	35	38	43	45	45	45	44	45	44	45	45	45	44	44	43
Nov23	43	43	42	42	44	45	46	47	43	40	38	39	43	43	44	44	45	45	45	45	44	44	44	43	43
Nov24	43	43	43	43	44	44	44	44	43	43	42	42	45	46	43	42	43	45	46	45	45	45	45	44	44
Nov25	43	43	43	43	43	43	43	43	38	37	36	36	37	42	44	44	44	45	44	44	44	43	42	42	42
Nov26	42	42	43	44	43	43	43	44	41	38	35	39	43	46	46	45	45	45	44	45	45	45	43	43	43
Nov27	43	42	44	44	45	45	44	45	44	42	39	40	43	43	44	42	43	46	45	44	47	43	45	43	43
Nov28	43	43	43	43	44	44	43	43	41	38	35	36	40	44	46	45	45	45	45	45	45	45	44	42	43
Nov29	43	44	42	43	44	44	45	44	44	42	41	41	41	44	44	44	44	45	45	44	44	44	44	43	43
Nov30	43	42	42	43	44	45	45	45	43	42	40	41	43	46	46	45	45	45	44	44	45	45	44	44	44

Table 9.14. Hourly and daily means of field components X,Y,Z and independently measured F from the Conrad Observatory. Please note: if data is missing within one hour/day, then means are not calculated.

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
2018, Field component: X, Base: 20900.0, Unit: nT																									
Dec01	111	112	113	112	118	123	126	129	123	116	116	123	121	117	116	115	102	85	97	92	89	97	103	106	111
Dec02	107	107	110	111	110	111	111	118	118	113	109	104	100	101	96	86	91	87	100	101	102	101	114	114	105
Dec03	113	109	110	107	109	111	112	114	116	114	113	114	108	108	97	87	72	87	91	105	111	105	105	101	105
Dec04	98	112	115	105	105	108	107	108	107	108	112	115	114	114	113	113	109	98	100	109	108	105	106	105	108
Dec05	100	102	106	108	110	112	115	117	114	113	115	114	112	111	103	108	110	110	111	110	110	103	109	106	110
Dec06	104	105	110	107	108	107	111	111	109	108	108	108	99	98	102	99	97	97	103	109	109	108	109	109	106
Dec07	111	112	112	113	121	123	132	127	128	121	118	117	109	110	108	98	101	93	86	77	112	110	100	101	110
Dec08	101	105	106	101	106	106	110	109	115	111	111	109	113	109	105	79	84	91	101	102	102	104	108	106	104
Dec09	106	104	109	108	110	116	117	119	119	117	117	122	119	116	111	102	91	99	100	106	119	101	106	102	110
Dec10	104	101	99	102	107	112	117	115	102	95	101	100	103	111	107	101	104	99	98	104	104	109	110	107	105
Dec11	107	106	107	109	107	109	111	103	97	89	104	110	110	109	110	107	102	86	87	99	105	104	103	101	103
Dec12	111	107	106	104	105	108	110	109	108	106	104	104	105	107	108	108	108	108	106	103	109	106	104	104	106
Dec13	105	104	104	105	108	109	111	111	110	108	108	111	109	110	109	109	109	109	110	111	110	109	109	108	109
Dec14	108	107	108	108	111	115	114	110	105	102	103	105	107	111	113	114	114	113	113	112	110	110	110	107	110
Dec15	107	108	109	112	113	113	113	110	105	103	106	110	113	115	113	109	110	112	112	113	112	112	110	109	110
Dec16	108	108	109	110	113	115	117	116	113	115	114	115	116	116	116	114	114	113	110	110	108	106	108	111	112
Dec17	114	114	117	118	120	127	131	124	127	125	115	118	120	125	121	115	111	110	98	97	101	104	106	101	115
Dec18	104	99	96	100	104	106	108	111	109	104	106	107	109	115	106	99	101	96	92	97	103	108	108	108	104
Dec19	105	104	106	103	108	106	107	110	106	97	99	105	110	110	111	111	111	112	109	107	99	100	99	100	106
Dec20	102	100	100	108	116	122	121	116	118	110	106	109	109	104	100	102	105	104	94	96	115	102	97	104	107
Dec21	103	106	105	103	105	108	110	109	104	101	102	105	104	107	106	109	110	108	104	108	100	103	104	103	105
Dec22	103	105	106	106	107	112	115	113	108	103	102	97	98	102	107	109	109	109	109	108	106	107	107	109	107
Dec23	109	110	110	111	113	115	117	115	113	110	113	112	114	114	112	111	110	108	109	111	114	111	110	111	112
Dec24	110	110	113	113	112	113	114	116	114	111	113	119	121	120	115	113	113	112	114	114	114	112	111	108	114
Dec25	105	107	105	108	111	110	112	111	109	109	116	121	122	118	109	107	109	106	102	106	105	105	103	107	109
Dec26	108	110	110	110	111	113	115	115	111	107	112	116	115	105	103	105	106	106	109	110	109	109	109	109	110
Dec27	110	110	110	111	112	112	110	108	107	108	114	123	125	120	117	117	117	119	119	120	123	116	100	99	114
Dec28	95	106	96	121	107	107	111	96	98	104	109	115	112	90	71	86	85	92	80	104	120	96	89	99	100
Dec29	97	99	103	104	103	108	100	92	91	94	96	98	101	102	92	93	93	103	103	106	103	102	104	115	100
Dec30	110	106	106	107	104	113	105	100	90	94	104	112	115	112	110	105	104	108	112	107	105	99	97	100	105
Dec31	100	104	107	108	112	113	109	106	105	103	100	100	99	107	108	104	103	104	104	106	104	105	102	103	105
2018, Field component: Y, Base: 1500.0, Unit: nT																									
Dec01	84	82	81	80	80	81	80	80	79	78	73	69	69	73	77	75	83	88	84	92	110	96	89	86	82
Dec02	84	83	80	81	80	80	82	85	86	84	79	75	72	78	76	97	86	82	112	102	90	90	106	87	86
Dec03	92	87	84	82	82	83	83	84	85	79	80	74	77	77	74	84	83	89	89	97	95	89	91	92	85

Table 9.14 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Dec04	93	91	95	90	85	87	86	88	88	88	81	76	74	75	78	80	81	83	91	85	86	88	96	92	86
Dec05	88	84	82	80	83	86	87	90	87	83	79	73	72	75	79	79	80	82	84	86	86	90	99	95	84
Dec06	87	83	77	83	87	85	88	94	94	89	83	78	83	84	81	78	82	83	86	85	88	89	91	86	85
Dec07	84	81	78	76	77	80	80	83	79	81	79	74	75	80	77	81	80	76	83	103	95	102	94	93	83
Dec08	90	86	89	83	88	85	87	90	85	81	79	78	82	76	79	85	82	85	84	88	89	91	92	91	85
Dec09	92	90	85	82	83	83	84	86	87	82	80	75	74	75	80	78	84	92	83	93	92	100	91	105	86
Dec10	92	95	84	87	78	85	85	86	90	88	83	78	80	83	83	84	84	87	82	86	89	92	91	89	86
Dec11	86	86	84	81	85	86	88	86	90	88	80	78	78	84	87	84	83	92	85	97	90	88	90	93	86
Dec12	87	90	88	86	84	85	87	90	88	83	77	74	78	84	85	85	86	86	85	90	93	91	92	90	86
Dec13	89	87	87	85	84	86	86	87	84	81	81	81	79	82	83	83	86	84	84	86	87	88	89	88	85
Dec14	86	85	86	83	84	85	86	88	86	82	80	78	77	80	83	84	84	85	85	86	88	88	88	86	84
Dec15	86	85	84	83	84	86	87	87	85	84	83	78	77	82	85	87	85	86	86	86	88	88	88	89	85
Dec16	89	87	85	85	83	84	86	88	84	80	77	73	73	78	82	85	86	85	86	89	93	94	91	88	85
Dec17	87	85	83	83	82	80	80	82	84	80	72	69	72	80	83	83	83	84	87	104	93	97	99	99	85
Dec18	102	107	94	89	88	87	86	88	88	81	77	72	76	79	73	75	80	79	98	88	92	90	88	88	86
Dec19	92	87	86	86	85	88	89	92	92	88	80	77	81	80	82	83	84	85	88	91	98	97	103	100	88
Dec20	96	88	82	77	84	83	87	91	92	86	81	76	77	82	83	84	86	90	92	93	105	113	102	95	89
Dec21	92	85	85	83	84	85	88	93	92	87	84	80	74	77	84	86	87	86	91	91	91	95	95	93	87
Dec22	90	87	85	84	83	85	89	94	93	90	85	77	73	79	83	85	85	86	87	88	90	91	89	88	86
Dec23	87	84	84	84	82	82	84	90	89	86	78	74	77	82	83	83	85	85	87	88	89	90	91	89	85
Dec24	88	87	84	83	82	83	86	88	91	89	76	69	74	82	83	83	84	85	86	87	87	89	92	99	85
Dec25	97	93	92	86	86	86	86	87	88	84	77	74	77	78	80	79	81	81	82	87	90	92	91	90	85
Dec26	87	87	88	85	85	85	88	89	90	85	76	77	81	84	78	79	82	84	84	87	88	88	88	88	85
Dec27	88	87	87	84	85	86	88	90	90	86	79	79	87	89	86	84	84	84	84	85	85	85	92	95	86
Dec28	94	101	103	104	89	86	85	80	68	70	67	75	84	82	89	88	93	98	92	94	99	97	91	88	88
Dec29	96	94	93	88	84	90	85	84	77	75	77	86	95	91	95	94	90	89	96	86	88	90	90	79	88
Dec30	89	96	95	90	83	81	79	77	76	69	67	72	86	89	91	90	99	90	102	87	88	93	93	89	86
Dec31	91	75	92	90	89	88	88	86	81	77	69	66	77	89	93	91	90	91	90	91	92	94	92	90	86
2018, Field component: Z, Base: 43800.0, Unit: nT																									
Dec01	43	42	42	42	42	41	39	40	39	39	38	37	40	42	42	41	43	48	48	48	49	48	47	46	43
Dec02	45	44	45	44	44	44	44	43	41	39	38	39	43	45	47	48	51	50	48	48	48	47	44	43	45
Dec03	41	43	43	44	44	44	42	41	39	39	43	43	43	43	45	48	52	53	52	50	48	47	46	46	45
Dec04	46	45	41	42	43	44	43	43	41	40	41	42	45	45	45	44	45	46	47	46	46	46	46	45	44
Dec05	46	46	46	45	45	45	44	43	42	41	40	39	43	44	46	46	46	46	45	45	45	46	46	45	44
Dec06	46	46	45	45	45	46	45	44	42	41	39	38	42	46	47	48	48	48	48	47	47	46	46	45	45
Dec07	45	44	44	44	43	42	40	38	37	38	41	42	45	46	47	48	49	51	52	54	49	46	48	48	45

Table 9.14 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Dec08	47	47	46	46	46	46	45	45	42	40	42	43	47	49	48	50	52	52	52	51	50	49	48	47	47
Dec09	47	47	46	46	45	45	43	41	39	39	41	40	41	42	44	47	49	50	50	48	46	47	48	46	45
Dec10	47	46	47	47	48	46	45	44	42	44	45	45	47	49	48	48	49	50	51	50	49	49	47	47	47
Dec11	47	47	47	47	47	47	46	47	45	48	50	49	52	53	51	50	50	52	54	52	51	50	49	49	49
Dec12	48	46	46	47	48	48	48	48	47	46	46	48	51	52	50	49	49	49	49	49	49	49	49	49	48
Dec13	48	48	48	48	47	48	47	46	46	48	48	48	49	49	48	48	48	49	48	48	48	48	48	47	48
Dec14	47	47	47	47	47	47	46	45	44	45	46	46	46	48	47	47	47	47	47	47	48	47	47	46	47
Dec15	46	46	47	46	46	46	46	45	46	49	49	47	50	51	48	48	48	48	48	48	47	47	47	47	47
Dec16	47	47	47	46	46	46	45	44	43	44	42	43	46	48	47	46	46	47	47	48	48	49	48	47	46
Dec17	46	46	45	45	44	43	42	41	39	37	41	44	46	46	46	46	47	47	49	51	51	50	49	49	45
Dec18	48	47	48	48	48	47	47	46	45	46	49	49	51	50	50	50	50	52	53	54	52	51	50	49	49
Dec19	48	49	48	48	48	48	48	48	48	47	49	51	49	48	48	49	48	48	49	49	50	51	50	50	49
Dec20	49	50	50	48	47	46	44	45	41	41	44	46	48	50	50	51	51	50	52	53	50	50	51	50	48
Dec21	49	48	48	48	48	48	48	47	43	45	47	43	46	50	50	50	49	50	50	50	50	50	50	50	48
Dec22	50	50	50	50	50	49	48	47	47	48	44	42	48	51	51	50	50	49	49	49	49	49	49	48	49
Dec23	48	48	48	48	48	47	48	49	49	49	46	49	53	51	49	49	49	49	49	49	48	48	48	48	49
Dec24	47	48	48	48	48	47	47	48	49	44	40	43	48	49	48	48	49	49	48	48	48	48	47	47	47
Dec25	48	48	48	48	47	48	47	48	48	46	42	43	44	45	48	49	49	50	51	51	50	50	49	49	48
Dec26	48	48	48	48	48	48	48	48	49	47	44	49	49	50	52	51	50	50	50	50	50	49	48	48	49
Dec27	48	48	48	48	48	49	49	50	50	49	45	46	46	46	46	47	47	47	47	47	46	47	49	50	48
Dec28	51	49	48	43	46	47	49	52	52	51	50	49	52	53	54	56	56	57	58	55	49	50	51	51	51
Dec29	51	51	51	50	50	50	52	52	53	52	52	53	53	51	52	53	54	54	53	52	53	52	52	50	52
Dec30	48	49	49	50	50	49	50	49	51	51	52	52	50	48	47	49	51	52	51	51	51	52	52	52	50
Dec31	52	51	49	50	50	50	49	49	50	48	49	52	55	55	52	52	52	53	53	52	52	52	52	52	51
2018, Field component: F, Base: 48600.0, Unit: nT																									
Dec01	43	43	44	43	45	46	47	48	45	41	40	43	45	45	44	43	39	37	41	40	40	43	43	44	43
Dec02	43	43	44	44	44	45	44	46	45	41	37	37	38	41	40	37	42	39	44	45	44	43	47	45	42
Dec03	43	43	43	42	43	44	43	43	42	41	44	44	42	42	39	37	34	42	43	47	48	45	44	42	42
Dec04	41	46	44	40	41	43	42	42	40	40	42	44	46	46	46	45	44	40	42	45	45	44	44	43	43
Dec05	41	42	43	44	45	45	46	46	44	42	42	41	43	44	42	44	45	45	45	45	45	43	45	44	44
Dec06	43	43	45	43	44	44	45	45	42	40	39	38	37	41	43	42	41	42	45	47	46	45	45	45	43
Dec07	45	45	44	45	47	48	50	46	45	43	44	45	44	45	46	43	44	42	41	39	50	47	43	43	45
Dec08	43	45	44	42	44	44	44	44	44	41	42	42	48	48	45	36	40	43	47	47	46	46	47	45	44
Dec09	45	44	45	45	45	48	46	45	44	42	44	45	45	44	45	43	40	44	44	46	50	43	46	42	45
Dec10	44	42	42	43	46	47	48	46	39	37	41	40	43	49	46	44	46	44	45	47	46	48	47	45	44
Dec11	45	45	46	46	45	46	46	44	40	38	47	48	51	52	50	47	46	41	43	47	49	46	46	45	46

Table 9.14 (cont'd)

day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	mean
Dec12	47	45	45	44	45	47	47	47	46	44	43	45	48	50	49	47	47	47	46	46	48	47	46	45	46
Dec13	45	45	45	45	46	47	47	46	45	47	47	48	48	48	47	47	47	48	48	48	48	48	47	46	47
Dec14	46	45	46	46	47	49	47	45	41	41	42	43	45	47	48	49	48	48	48	48	47	47	46	45	46
Dec15	45	45	46	47	47	47	47	45	43	45	47	46	50	53	49	47	47	48	48	48	48	48	47	47	47
Dec16	46	45	46	46	47	48	48	46	45	46	44	44	48	50	49	48	48	48	47	47	47	47	47	47	47
Dec17	48	47	48	48	48	50	51	47	46	44	43	47	50	52	50	48	47	47	43	45	47	47	47	45	47
Dec18	45	42	42	43	45	45	45	47	45	43	46	47	49	51	47	44	45	45	45	47	49	49	48	47	46
Dec19	46	45	46	45	47	46	46	47	46	41	44	48	48	47	48	49	48	49	48	47	45	46	45	46	46
Dec20	46	45	45	47	49	51	49	47	45	41	42	45	47	46	45	46	48	47	44	46	52	47	45	47	46
Dec21	46	46	45	45	46	47	47	46	40	41	43	41	42	48	48	49	49	48	47	48	45	47	47	47	46
Dec22	46	47	47	47	48	50	50	48	46	45	41	37	42	46	48	49	49	48	48	48	47	47	47	47	47
Dec23	47	47	47	48	48	49	50	50	50	48	47	49	53	52	49	49	49	48	48	49	50	48	48	48	49
Dec24	47	47	48	49	48	48	49	50	50	44	42	46	51	53	49	49	49	49	50	49	49	48	47	47	48
Dec25	46	47	46	47	47	47	48	47	47	45	45	48	49	48	47	47	48	48	47	48	47	47	46	47	47
Dec26	47	48	48	47	48	49	49	50	49	46	45	51	51	47	48	48	48	48	49	49	49	48	48	47	48
Dec27	48	48	48	48	48	49	49	49	48	47	47	51	52	51	49	49	50	51	51	51	51	49	44	45	49
Dec28	44	47	42	49	45	46	49	45	45	48	48	50	52	44	36	45	44	48	44	52	53	43	42	46	46
Dec29	45	46	48	47	46	48	47	44	44	44	45	47	48	47	44	45	46	50	49	50	49	48	49	51	47
Dec30	48	47	47	48	47	50	47	43	41	43	48	52	51	48	47	46	48	50	51	49	48	46	46	47	48
Dec31	47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Conrad Observatory
Trafelberg 1-2
2763 Muggendorf
Austria