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LEIRVOGUR

MAGNETIC RESULTS

2006

REYKJAVíK 2007

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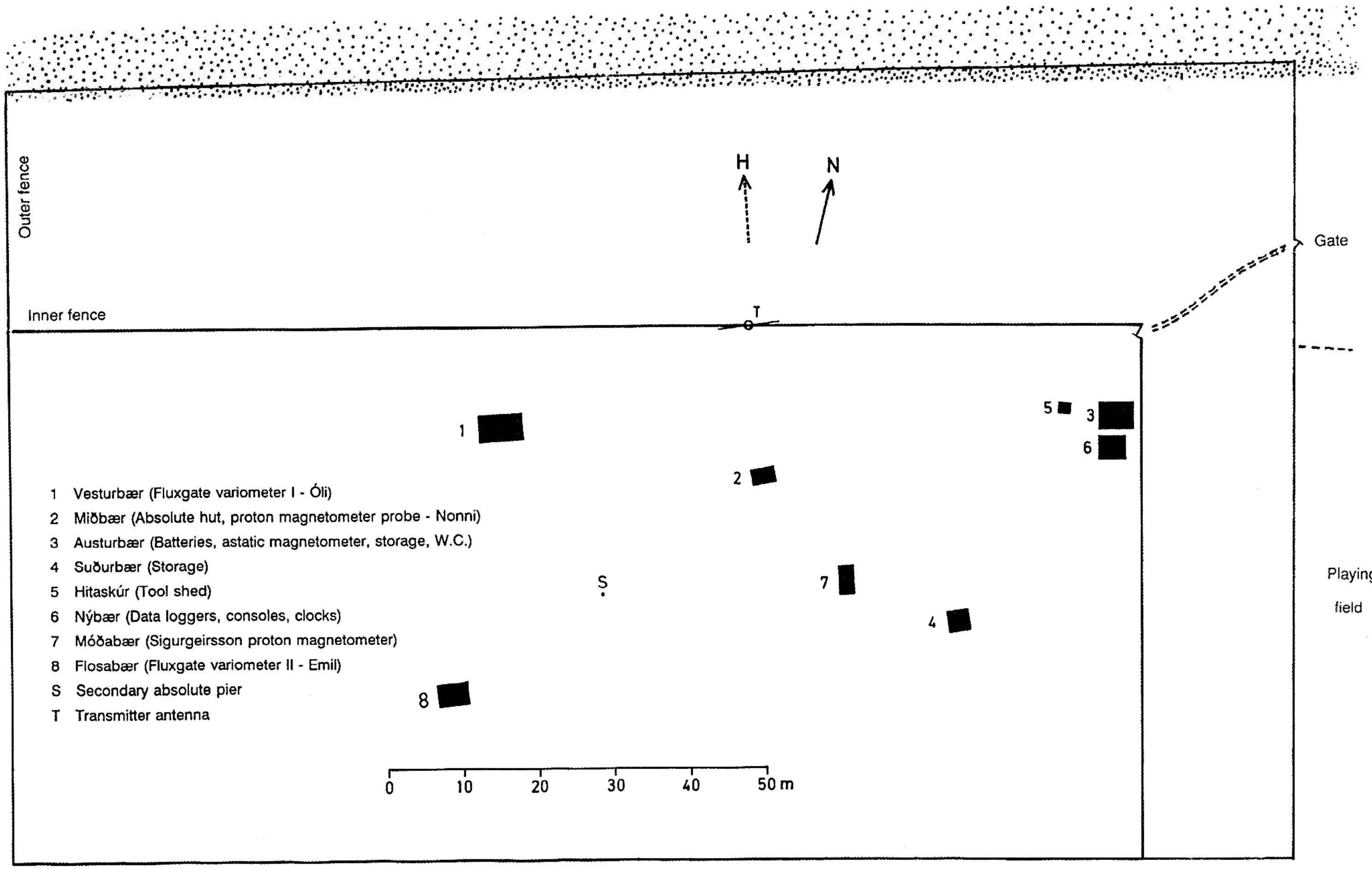
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INTRODUCTION

This volume contains the results of geomagnetic measurements carried out at the Leirvogur Magnetic Observatory in Iceland during the year 2006. The observatory, which was established in 1957, is run by the Upper Atmosphere Section of the Science Institute, University of Iceland. A description of the observatory and its development up to 1968 may be found in a report published in 1969. More recent events are covered in the yearbooks.

The observatory is located on a river estuary, 5 m above mean sea level, 12 km ENE of Reykjavík (20 km by road). The geographic coordinates of the observatory's reference point are

$$64°10'.986\ \mathrm{N}, \quad 21°41'.920\ \mathrm{W} \quad (\mathrm{WGS84}).$$

The geomagnetic coordinates relative to a pole position of $79°.4$ N, $71°.7$ W are $69°.4$ N, $71°.8$ E. The McIlwain L-parameter of the observatory in 2006 was approximately 5.5 earth-radii, the corresponding corrected geomagnetic latitude being $64°.8$. The geomagnetic conjugate point at 100 km altitude was at $69°.1$ S, $30°.5$ E geographic, about 360 km from the Japanese Antarctic station Syowa.

PERSONNEL

In 2006, the Upper Atmosphere Section had a staff of three: Gunnlaugur Björnsson, director, Jón Sveinsson, electronics technician, and Pálmi Ingólfsson, research assistant. Jón worked part-time for health reasons. Former director, Þorsteinn Sæmundsson, continued to serve in an advisory capacity and made absolute measurements on occasions when Gunnlaugur was abroad.

Marteinn Sverrisson of the Physics Division continued to maintain and update the Linux operating system used for handling the 10-second data at Leirvogur. He also helped in fault analyzing and rewiring of some of the instruments, mainly the Geó magnetometer. Ágúst H. Bjarnason of the firm Rafagnatækni also helped diagnosing problems with Geó.

Selma Bjarnadóttir at the nearby farm Leirvogstunga contributed to the security of the observatory by watching out for uninvited visitors.

DEVELOPMENTS

The staff made 89 trips to the observatory in 2006. A Skoda Fabia belonging to the Upper Atmosphere Section was used for transportation to and from Leirvogur.

The environment

Weather was mild most of the year with only slight snow that did not cause any problems. The lowest temperature was $-13°$C in November, and the highest was $+24°$C in July.

The electrical supply was uninterrupted throughout the year.

The land around the observatory has long been defined as a recreational area by planning authorities. The owners of the nearby farm Leirvogstunga have decided to convert some of their land to a housing project with about 400 houses and apartments. Planning authorities have now accepted this project and preparatory work started during the summer and fall. The construction phase is expected to take 2-4 years. This change in land use may have consequences for the observatory in the near future, in particular with increased traffic and possible intrusion. Possible counter-measures are being investigated.

Soil removed from the construction site was dumped on municipal land, some 200-400 m east of the observatory.

On the weekend of June 3-4, a series of football matches was held on the sports field, attended by large crowds of people. A watch was kept to ensure cars were not parked too close to the observatory and to ward off inquisitive spectators. Matches like these have become an annual event.

Digital fluxgate systems I and II

On October 9, system I failed and the continuous proton magnetometer Móði also stopped working. A clamp connecting their charger to the batteries had broken, disconnecting the charger. Reconnecting the charger restored both instruments. The records from system II were used for backup for a total of 6.9 hours.

In preparations for installing a new backup instrument (system II) as well as upgrading the data loggers, a new signal cable had to be installed between Flosabær and Nýbær. Although provisions had been made for such wirings when Flosabær was constructed, it turned out to be impossible to pass the cable through the pipe connecting the two houses. This was later discovered to be due to too many right angle turns in the pipe underneath Flosabær. On April 12, a hole was cut in the floor of Flosabær to gain access to the pipe. Due to the unknown layout of the pipe, it was accidentally cut, along with the power and signal cables. To minimize data loss, temporary connections were made. Work continued in Flosabær over the next couple of weeks, with final connections in place on April 26. In total, recordings of this instrument for 6.5 days were lost.

On June 7, system II was connected to an ICP-DAS A/D-converter that is controlled by a laptop computer in Nýbær. This runs in parallel with the old data loggers, but reads the instrument every second. This is the first step in upgrading the data loggers of the observatory.

On November 1, system I was turned by 1.1° to compensate for the secular variation in D. System II was similarly turned on November 6.

A new fluxgate instrument of the type FGE, version K, was purchased in October. It is practically identical to system I and will serve as a backup instrument in the future. It was installed on the pier in Flosabær on December 18. Tests of the instrument were carried out in the following days for it to be fully functional by the new year.

On May 2, the thermostat in the variometer house Flosabær, were system II (Emil) is located, was adjusted from winter level (13°C) to summer level (21°C). Readjustment to winter level took place on November 13.

The thermostat in Vesturbær which houses system I (Óli) was adjusted from winter level (13°C) to summer level (20°C) on May 8. Readjustment took place on November 15.

Móði

The magnetizing unit of the continuous proton magnetometer Móði was renewed on May 2 and a fresh filter installed. A replacement system pump was also installed at the same time but the instrument did not work. The old pump as installed again, but no signal was received until the following day when a new magnetizing unit was installed and the circulating fluid renewed. The signal was lost again on May 8 for about 3 hours, as more fluid had to be added to the system. On October 5, the pump was finally replaced and data was lost for about 15 minutes.

Geó II

The conventional proton magnetometer Geó (G856-AX) was used in the absolute measurements. Obtaining a satisfactory functioning with the 50 m cable to Nýbær proved problematic throughout the year. Interference with chargers and other equipment in Nýbær was initially suspected. However, a number of causes contributed to these problems and made them difficult to isolate. After sporadic readings from Nýbær, the instrument started to show similar symptoms when the unit was placed near Miðbær. This turned out to be due to lack of fluid in the probe. Near the end of the year the main problem was finally traced to the cable connecting Nýbær and the absolute hut.

In August the serial connection stopped working and an identical instrument was borrowed while the unit was sent to the manufacturer for repair.

Backup computer

The PC-computer “Muninn”, which has been used at the Science Institute for receiving and storing 10-second data from Leirvogur, worked without problems throughout the year.

Real-time displays on the Web

The real-time display of the Leirvogur recordings on the World Wide Web were uninterrupted during the year. Transmissions at hourly intervals for display at the World Data Centre in Kyoto were occasionally affected due to temporary loss of network connection to WDC.

Time control

A quartz clock of the type Omegaface is used for timing the data. Two clocks are maintained, a main clock and a backup unit. These are corrected by means of GPS signals once a week. This is generally sufficient for keeping the timings correct to within 1 second. The clocks are also compared with time signals from Rugby on 60 kHz.

The old crystal clock, which served as the main observatory clock from 1963 to 1988 was kept running. It is believed to be the oldest Icelandic-built electronic device still working.

ADSL connection

The ADSL-connection worked without problems most of the year. Backup data is transferred to the Science Institute from system I every 10 minutes. A laptop computer reads and stores system II data every second and transfers each day to the Institute.

General maintenance and modifications

Trees and hedges were pruned and fertilizer applied in the spring. Because of the warm weather, tree growth was rather rapid.

Miðbær was painted in October.

During the summer and autumn, the grass around the observatory was cut from time to time with a lawnmower and a brush cutter.

MAGNETOMETERS

The observatory possesses the following instruments:

1. A triaxial fluxgate variometer, "Óli" (Óli II), of the type FGE, version E, from the Danish Meteorological Institute, with suspended sensors and a digital data logger designed and built at the Science Institute. This is the primary recording instrument at Leirvogur. The sensor elements are oriented in the approximate directions of Z (vertical), H (magnetic north) and D (magnetic east). The logger uses an Acorn BBC B+ microcomputer with two floppy drives, each able to store 12 days of data. The records contain 1-minute means of the elements and show the extreme departures from the mean during each minute. Hourly means are both stored and printed out. Momentary values at 10-second intervals are recorded by a PC laptop computer linked to BBC monitoring and display computers. The 10-second values are also transmitted by UHF radio to the Science Institute in Reykjavík and stored there on a PC computer.

2. A triaxial fluxgate variometer "Emil" (Emil II), of the type FGE, version K, from the Danish Meteorological Institute, with suspended sensors. It was installed in December and will serve as a backup instrument. The data logger is an industrial A/D converter and a laptop computer running Linux and runs in parallel with the old data loggers and BBC computer. This will be continued while the data handling routines are being upgraded. Data delivery is automatic to the Institute every morning at 3:15.

3. A triaxial fluxgate variometer, Emil I, of the type FG84C with a BBC+ data logger identical to that of Óli. This serves as a

backup for Óli. All the 1-minute data from this instrument are fully processed. This instrument was replaced by Emil II on December 18, but it will be kept in Flosabær as a reserve unit.

4. A triaxial fluxgate variometer, Óli I, of the same type as Emil I, superseded by Óli II in October 1998.

5. A Sigurgeirsson proton magnetometer ("Móði") producing an uninterrupted record of the total force F. The precession cycles are counted and 1-minute averages recorded using the data loggers serving the fluxgate variometers Óli and Emil. Hourly means are also printed out. 10-second averages are recorded on a PC computer at Leirvogur and transmitted by radio to a backup computer and a display in Reykjavík.

6. A Geometrics G856-AX proton magnetometer ("Geó II").

7. A Declination-Inclination fluxgate magnetometer (DI-flux, "Stefnir") based on a Zeiss Jena Theo 010 B theodolite, with electronics from the Auroral Observatory, Tromsø.

8. A second, identical DI-flux instrument, "Stefnir-II", also with electronics from Tromsø.

9. A portable fluxgate magnetometer ("Ferðaflosi") made by Fjarskiptatækni for diverse applications.

In addition, the observatory has an astatic magnetometer and access to two portable proton magnetometers, a Barringer GM-122 ("Barri") and a second Geometrics G856-AX ("Geó"). These three instruments belong to Dr. Leó Kristjánsson of the Geophysics Division of the Science Institute.

The above list includes only those instruments that are in active use or are kept in reserve.

TIME CONTROL

The older digital fluxgate loggers are controlled by a quartz crystal clock which is adjusted using a signal from the Global Positioning System (GPS). The aim has been to keep the timing correct to within one second. This limit was exceeded eleven times in 2006. The *ntp* network service is used to correct the time on the laptop computers. It is typically accurate to within a few of milliseconds.

ABSOLUTE MEASUREMENTS

To determine the base-line values for the triaxial fluxgates Óli and Emil, absolute measurements were carried out by means of the proton magnetometers Geó and Móði and the DI-fluxgate magnetometer Stefnir. Traditionally, these measurements have been made once a week, on Wednesday afternoons, irrespective of the magnetic conditions.

The magnetometer Geó was used for measuring the total intensity (F) on the absolute pier. The crystal oscillator correction for Geó was checked regularly in 2006 and found quite stable, about -0.3 nT.

While measurements with Stefnir are in progress, the proton magnetometer probe must be removed from the absolute pier. Simultaneous measurements of the total field can be made, however, feeding the electronics with the signal from Móði. As the probe of Móði is situated some 15 meters from the absolute pier, a site correction must be applied. This correction is subject to changes whenever magnetic parts of the Móði system are moved or modified. Its value is checked by comparison measurements once a week. In 2006, the correction varied between -4.0 nT and -4.6 nT.

Stefnir measures the declination (D) and the inclination (I) of the geomagnetic field. The theory of the DI-fluxgate has been treated by Kring Lauridsen (Danish Meteorological Institute Geophysical Papers, R-71, 1985). For measurements of declination, the standard measuring scheme at Leirvogur involves four readings with the telescope facing west and four readings with the telescope facing east. For every reading with the telescope in an upright position (with the fluxgate sensor on top) there is a corresponding reading in an inverted position. From such a set of measurements the declination can be derived, along with the collimation angles of the sensor and the zero correction of the sensor output.

For the measurements of inclination, the adopted measuring scheme consists of eight measurements with the telescope oriented in the magnetic meridian and tilted at right angles to the total field vector. Four measurements are made with the telescope pointing south and four with the telescope pointing north. All readings are made with the telescope in the same (upright) position. In each case the total field is measured simultaneously and the total intensity, both the vertical and horizontal intensities can be calculated.

BASE LINES

Digital Fluxgate I (Óli)

The base-line values derived from the absolute measurements are shown in graphic form on page **??**. Individual measurements are indicated by squares. The solid lines which shift in steps are the adopted base-line values Z_0, H_0 and D_0, the definition of which will be given below.

The method used to derive Z, H, and D from the observed fluxgate readings will now be described. The first step occurs in the logging program where the raw values are multiplied by 0.16 to make the output unit correspond to 1 nT. Fixed constants are then added to give suitable base levels. For the electronics installed in 2002, these constants are 47802 for Z, 10164 nT for H and 2199 nT for D (see yearbook 2002, p. 14). The resulting outputs are the "observed" readings Z_1, H_1 and D_1. These readings are then corrected as follows (in units of nanotesla):

$$\begin{pmatrix} Z_2 \\ H_2 \\ D_2 \end{pmatrix} = \begin{pmatrix} 138 \\ 38 \\ -200 \end{pmatrix} + \begin{pmatrix} 1-3\epsilon & \epsilon & 0.0 \\ 0.0 & 1-3\epsilon & -\epsilon \\ 0.0 & 0.0 & 1-3\epsilon \end{pmatrix} \begin{pmatrix} Z_1 \\ H_1 \\ D_1 \end{pmatrix}$$

where $\epsilon = 0.001$. These corrections allow for the sensors' departure from orthogonality, found by rotating the instrument under controlled conditions. The fact that the scale values depart slightly from unity is also allowed for. The additive constants are adjusted to make the horizontal component similar to that in the absolute hut, Miðbær, both in size and direction.

The formulae giving the field in the absolute hut are then

$$\begin{aligned} Z &= Z_0 + Z_2 \\ H &= H_0 + \sqrt{H_2^2 + D_2^2} \\ D &= D_0 + \arctan(D_2/H_2) \end{aligned}$$

where Z_0, H_0, and D_0 are the base-line values. The adopted base-line values for 2006 were as follows:

Vertical intensity (Z_0):

		nT
Jan 1	– May 8 (14:43)	-0.5
May 8	– May 8 (17:02)	0.0
May 8	– May 8 (19:21)	0.5
May 8	– May 8 (21:40)	1.0
May 8	– Jun 2	1.5
Jun 3	– Aug 4	1.0
Aug 5	– Sep 23	0.5
Sep 24	– Nov 15 (15:05)	1.0
Nov 15	– Nov 15 (16:35)	0.5
Nov 15	– Nov 15 (18:05)	0.0
Nov 15	– Nov 15 (19:35)	-0.5
Nov 15	– Nov 25	-1.0
Nov 25	– Dec 31	-0.5

Horizontal intensity (H_0):

		nT
Jan 1	– Mar 11	-4.0
Mar 12	– Mar 25	-3.5
Mar 26	– May 8 (14:43)	-4.0
May 8	– May 8 (17:02)	-3.0
May 8	– May 8 (19:21)	-2.0
May 8	– Jun 17	-1.0
Jun 18	– Aug 31	-0.5
Sep 1	– Nov 1 (12:29)	-1.0
Nov 1	– Nov 15 (14:26)	-3.0
Nov 15	– Nov 15 (15:17)	-3.5
Nov 15	– Nov 15 (16:08)	-4.0
Nov 15	– Nov 15 (16:59)	-4.5
Nov 15	– Nov 15 (17:50)	-5.0
Nov 15	– Nov 15 (18:41)	-5.5
Nov 15	– Nov 15 (19:35)	-6.0
Nov 15	– Nov 25	-6.5
Nov 26	– Dec 31	-6.0

Declination (D_0):

Jan 01	– Jan 15	$344°\ 04.'7$
Jan 16	– Feb 14	$344°\ 04.'8$
Feb 15	– Mar 31	$344°\ 04.'9$
Apr 01	– May 8 (14:43)	$344°\ 04.'8$
May 08	– May 8 (17:02)	$344°\ 04.'7$
May 8	– May 8 (19:21)	$344°\ 04.'6$
May 8	– May 8 (21:40)	$344°\ 04.'5$
May 8	– May 12	$344°\ 04.'4$
May 13	– Jul 14	$344°\ 04.'3$
Jul 15	– Jul 22	$344°\ 04.'5$
Jul 23	– Aug 12	$344°\ 04.'6$
Aug 13	– Sep 2	$344°\ 04.'4$
Sep 3	– Sep 15	$344°\ 04.'3$
Sep 16	– Nov 1 (12:29)	$344°\ 04.'4$
Nov 1	– Nov 11	$345°\ 08.'4$
Nov 12	– Nov 15 (15:05)	$345°\ 08.'5$
Nov 15	– Nov 15 (16:35)	$345°\ 08.'6$
Nov 15	– Nov 15 (18:05)	$345°\ 08.'7$
Nov 15	– Nov 15 (19:35)	$345°\ 08.'8$
Nov 15	– Nov 25	$345°\ 08.'9$
Nov 26	– Dec 16	$345°\ 08.'7$
Dec 17	– Dec 23	$345°\ 08.'8$
Dec 24	– Dec 31	$345°\ 08.'9$

The changes in base lines on November 1 were caused by the turning of the instrument, while the changes on May 8 and November 15 were caused by adjustments of the thermostat in the variometer building Vesturbær. The temperature coefficient is about 0.25 nT/°C for Z and 0.4 nT/°C for H and D.

Scale values. The scale values of Óli are close to unity (1 nT/unit). This was confirmed by indirect tests in 1998 (see yearbook p. 18). The tests have not been repeated since a new electronic unit was installed in October 2002. The intrinsic sensitivity of the instrument is actually higher by a factor of 6.25 but is reduced by inserting a suitable term in the program of the logging computer as explained above.

Digital fluxgate II (Emil)

The base-line values derived from the absolute measurements are shown graphically on page **??**. The data are handled in the same way as the data for system I (Óli), except that the observed values Z_1, H_1 and D_1 represent the raw data and are not altered by the logging program. The corrections to the observed values were determined by a Helmholtz coil. In 2006 the following formulae were used:

$$\begin{pmatrix} dZ \\ dH \\ dD \end{pmatrix} = \begin{pmatrix} 70 \\ 50 \\ -178 \end{pmatrix} + \begin{pmatrix} -\epsilon & -3\epsilon & 2\epsilon \\ 0.0 & 0.0 & -9\epsilon \\ -2\epsilon & 3\epsilon & -\epsilon \end{pmatrix} \begin{pmatrix} Z_1 \\ H_1 \\ D_1 \end{pmatrix}$$

where $\epsilon = 0.001$. The adopted base-line values for 2006 were as follows:

Vertical intensity (Z_0):

		nT
Jan 01	– Jan 31	6.0
Feb 01	– Feb 04	5.5
Feb 05	– Feb 13	5.0
Feb 14	– May 02	4.0
May 03	– May 19	-8.0
May 20	– May 24	-7.0
May 25	– May 29	-6.0
May 30	– Jun 09	-5.5
Jun 10	– Jul 14	-4.5
Jul 15	– Aug 04	-6.0
Aug 05	– Aug 25	-7.5
Aug 26	– Sep 08	-8.5
Sep 09	– Oct 06	-8.0
Oct 07	– Oct 20	-7.0
Oct 21	– Oct 26	-6.5
Oct 27	– Nov 01	-5.5
Nov 02	– Nov 06 (12:45)	-5.0
Nov 06	– Nov 13 (14:00)	-4.5
Nov 13	– Nov 13 (16:00)	-2.5
Nov 13	– Nov 13 (18:00)	-0.5
Nov 13	– Nov 13 (20:00)	1.5
Nov 13	– Nov 13 (22:00)	3.5

		nT
Nov 13	– Nov 13 (23:00)	5.5
Nov 13	– Nov 13 (24:00)	7.0
Nov 14	– Nov 17	8.0
Nov 18	– Dec 17	8.5

Horizontal intensity (H_0):

		nT
Jan 01	– Jan 31	5.5
Feb 01	– Feb 04	5.0
Feb 05	– Mar 31	4.5
Apr 01	– May 02	5.0
May 03	– May 19	1.0
May 20	– May 29	1.5
May 30	– May 31	2.0
Jun 01	– Jun 30	2.5
Jul 01	– Jul 31	2.0
Aug 01	– Sep 08	1.0
Sep 09	– Sep 23	1.5
Sep 24	– Sep 30	1.0
Oct 01	– Oct 26	1.5
Oct 27	– Nov 06 (12:45)	2.5
Nov 06	– Nov 13 (14:00)	-2.0
Nov 13	– Nov 13 (16:00)	-1.5
Nov 13	– Nov 13 (18:00)	-1.0
Nov 13	– Nov 13 (20:00)	-0.5
Nov 13	– Nov 13 (22:00)	0.0
Nov 13	– Nov 13 (23:00)	0.5
Nov 13	– Nov 13 (24:00)	1.0
Nov 14	– Nov 25	1.5
Nov 26	– Dec 09	3.0
Dec 10	– Dec 17	3.5

Declination (D_0):

Jan 01	– Jan 31	$344° 15'.8$
Feb 01	– Mar 18	$344° 15'.9$
Mar 19	– May 02	$344° 16'.0$
May 03	– May 24	$344° 16'.3$

May 25	– Jun 30	$344° 16'.5$
Jul 01	– Sep 02	$344° 16'.4$
Sep 03	– Sep 15	$344° 16'.3$
Sep 16	– Oct 06	$344° 16'.4$
Oct 07	– Oct 20	$344° 16'.6$
Oct 21	– Nov 06 (12:45)	$344° 16'.7$
Nov 06	– Nov 13 (14:00)	$345° 18'.4$
Nov 13	– Nov 13 (16:00)	$345° 18'.3$
Nov 13	– Nov 13 (18:00)	$345° 18'.2$
Nov 13	– Nov 13 (22:00)	$345° 18'.1$
Nov 13	– Nov 13 (24:00)	$345° 18'.0$
Nov 14	– Nov 25	$345° 17'.9$
Nov 26	– Dec 05	$345° 17'.7$
Dec 06	– Dec 17	$345° 17'.6$

The steps in the base lines on November 6 were caused by the turning of the instrument while the steps on May 2 and November 13 were caused by adjustments of the thermostat in the variometer house. A change in $1°$C at the sensors of Emil alters the Z base line by ~ 1.5 nT, the H base line by ~ 0.5 nT and the D base line by ~ 0.3 nT. Occasionally the Z base line apparently shifts because of an instability of the electronics (cf. yearbook 2001, p. 8). The anomalous values on April 12 were caused by a reel of electrical cable that was left in Flosabær during the rewiring mentioned on page **??**. The instrument was removed from the pier on December 18.

Scale values. The scale values of Emil implicit in the formulae for dZ, dH and dD are based on an evaluation of measurements carried out with a Helmholtz coil in 1988 and 2001. The values are close to unity (1 nT/unit) for all sensors.

D-correction. Because of a zero-point anomaly in the A-D converters (see yearbook for 1988), readings below 125 nT from the D sensor were given a correction amounting to $+1$ to $+6$ nT. Such a correction is not needed for the primary system (Óli) where the readings are actually offset far from the zero point and then brought back towards zero by a compensating term in the logging program.

ONE-MINUTE MEANS

Calculations of 1-minute means of Z, H, and D are based on measurements with the triaxial fluxgate variometers, chiefly system I (Óli). The magnetometers measure at 1-second intervals at, $02^{\mathrm{s}} - 09^{\mathrm{s}}$, $12^{\mathrm{s}} - 19^{\mathrm{s}}$, $22^{\mathrm{s}} - 29^{\mathrm{s}}$, $32^{\mathrm{s}} - 39^{\mathrm{s}}$, $42^{\mathrm{s}} - 49^{\mathrm{s}}$and $52^{\mathrm{s}} - 59^{\mathrm{s}}$ past each minute mark, giving a total of 48 measurements per minute. An exception occurs during the first minute of each quarter-hour, when measurements from 02^{s} to 07^{s} past the minute are left out, resulting in 42 measurements per minute. During the first minute of each day, measurements at $12^{\mathrm{s}} - 17^{\mathrm{s}}$ are left out as well.

The 10-second momentary recordings, which are made at 08^{s}, 18^{s}, 28^{s}, 38^{s}, 48^{s} and 58^{s}, are used to compensate for the gaps at the quarter-hours and the larger gap at the beginning of each day.

The 1-minute means of F are calculated from the number of proton precession cycles of the continuous proton magnetometer Móði. From the number, N, of precession cycles per minute, the mean value of F is found:

$$F = 0.3914534 \cdot N + \delta F \quad (\mathrm{in\ \ nT}).$$

The numerical constant corresponds to $(2\pi/\gamma_{\mathrm{p}})/60$, where γ_{p} is the proton gyromagnetic ratio and δF is the sum of a site reduction and a clock correction. A site reduction is needed because the probe of Móði is some distance away from the observatory reference pier as mentioned earlier. A clock correction arises if the Móði reference clock runs too slowly or too fast; this correction is generally small (< 0.1 nT). The value of δF is found by comparing the signal from Móði with that from the proton magnetometer Geó, the probe of which is situated on the pier. This comparison is made once a week.

The adopted values of δF in 2006 were as follows:

		δF (nT)
Jan 01	– Jan 15	-4.1
Jan 16	– Feb 08	-4.2
Feb 09	– Mar 18	-4.0
Mar 19	– Mar 31	-4.1
Apr 01	– May 31	-4.3
Jun 01	– Jun 16	-4.6
Jun 17	– Jun 21	-4.5

Jun 22	– Jun 30	-4.2
Jul 01	– Jul 08	-4.1
Jul 09	– Jul 22	-4.3
Jul 23	– Aug 12	-4.2
Aug 13	– Oct 06	-4.5
Oct 07	– Oct 26	-4.3
Oct 27	– Nov 01	-4.2
Nov 02	– Dec 05	-4.1
Dec 06	– Dec 31	-4.0

On occasions when Móði was not functioning, F was calculated from the fluxgate components to fill the gaps in the records.

All 1-minute data were checked visually in graphic form on a computer screen. The 1-minute values of Z and H were also checked by comparing them with the 1-minute values of F. The expression

$$M = \sqrt{Z^2 + H^2} - F,$$

was evaluated for this purpose. The mean value of M over the year was -0.18 nT. Most of the values (99.96%) were in the range -1 to $+1$ nT, 0.04% reached ± 2 nT and there were 14 cases of higher values.

Non-zero values of M may be explained by a combination of several factors. To begin with, the field values of Z and H are only recorded to the nearest nanotesla. The base-line values are rounded to the nearest 0.5 nT. Finally, the fluxgate sensors are sampled at discrete intervals which are not spaced evenly within the minute. All these factors can cause M to depart from zero, especially during magnetic storms.

In 2006, 1438 minutes of data were lost from the proton magnetometer Móði on May 2-3 as discussed on page **??**. In addition, gaps occurred in the 1-minute values from Móði on May 8 when fluid had to be added to the system, and on October 5 when the pump was replaced. Gaps and errors from Móði numbered 1712 or 0.33% of the total time.

HOURLY MEANS

The hourly mean values of the magnetic elements Z, H, D and F were found by averaging the 1-minute means from the fluxgate variometers and the proton magnetometer Móði.

The hourly means of Z and H were checked by comparing them with the hourly means of F and tabulating the difference M (see p. **??**). In 2006, individual round values of the difference rarely exceeded 1 nT.

K-INDICES

K-indices were derived from the digital 1-minute values by a straightforward measurement of the 3-hour ranges of H and D, as explained in the yearbook for 1993.

MAGNETIC ACTIVITY

As measured by Ak, the magnetic activity in 2006 was well below average and the number of highly disturbed days was low. The most significant disturbances occurred on the following dates:

Date	*K-sum*	*C9*	*L9*
Mar 18-19	(31,39)	(6,6)	(5,6)
Apr 4	(24)	(2)	(2)
Apr 9	(47)	(7)	(6)
Apr 14	(49)	(7)	(8)
Jul 28	(33)	(6)	(5)
Oct 1	(36)	(5)	(6)
Dec 14-15	(40,51)	(7,8)	(6,8)

These and other disturbances are displayed in the graphical records on pages 35-126. The index L9 was explained in the yearbook for 1998.

The storm that began on December 14 was the greatest of the year. The ranges in the various components measured from the 10-seconda data were 2180 nT in Z, 2974 nT in H and $13\overset{\circ}{.}6$ in D.

K reached the extreme value 9 only three times in 2006. The quietest time of the year was on January 5 when the field kept steady to the nearest nanotesla in all elements for 123 consecutive 10-second readings (21 minutes).

COMPUTER PROGRAMS

Approximately 100 programs are used for data handling and processing. Most are in Comal, nine in Fortran, four in Turbo-Pascal, four in BBC-Basic with 6502 assembly language, one in C and ten in GNU-awk and Linux command scripts.

DATA DISTRIBUTION

Magnetic results from Leirvogur are sent to two data centers: WDC-C2 in Kyoto and WDC-A in Boulder. The data are transmitted over the Internet. Preliminary 10-second data are sent daily to Kyoto where they are displayed graphically on the World Wide Web. The address is:
http://swdcdb.kugi.kyoto-u.ac.jp/magqldir/q/LRVryestd.html

Final 10-second values are sent to Kyoto after the end of each month along with the 1-minute means, hourly means, monthly means and K-indices. The 1-minute means and hourly means are converted from a special Leirvogur format to WDC format before transmission. Monthly transmissions to Boulder are restricted to 1-minute means and hourly means.

Preliminary values of Z, H and D are sent every hour to Kyoto, to be displayed graphically on the World Wide Web at
http://swdcwww.kugi.kyoto-u.ac.jp/magqldir/q/LRVrtoday.html.

The same preliminary data are also placed in graphical form on the Leirvogur website: *http://www.raunvis.hi.is/∼halo/leirvogur.html*. The data on this site cover the last 24 hours and are renewed every 10 minutes.

Both preliminary and final data are available over the Internet by ftp-transfer. The address is *ftp.raunvis.hi.is* logging in as "anonymous". The files are kept in the directory "pub/lrv". The annual means are sent to WDC-C2 in Kyoto, WDC-C1 in Edinburgh and the Analytical Centre on Secular Variations in Troitsk (IZMIRAN). The annual means are accessible by FTP at the above address under the file name ANNMEANS.LRV. Also kept in the same location is the file ADQMEANS.LRV which contains an extended list of annual means, including disturbed-day and quiet-day means.

FIELD STATION OBSERVATIONS

In 2006, observations were made at one field station, Guðnastaðir at $63°34'.728$ N, $20°09'.567$ V, 101 km from Leirvogur. The above coordinates were measured with a GPS receiver and refer to WGS84. The observations were made on August 31 under magnetically quiet conditions for the first two thirds of the measurements. The DI-flux instrument Stefnir II and the proton magnetometer Barri were used to measure the magnetic field components. Three series of measurements were made with Stefnir II, and four with Barri. Discarding the last sets of measurements due to field variations, the results were as follows:

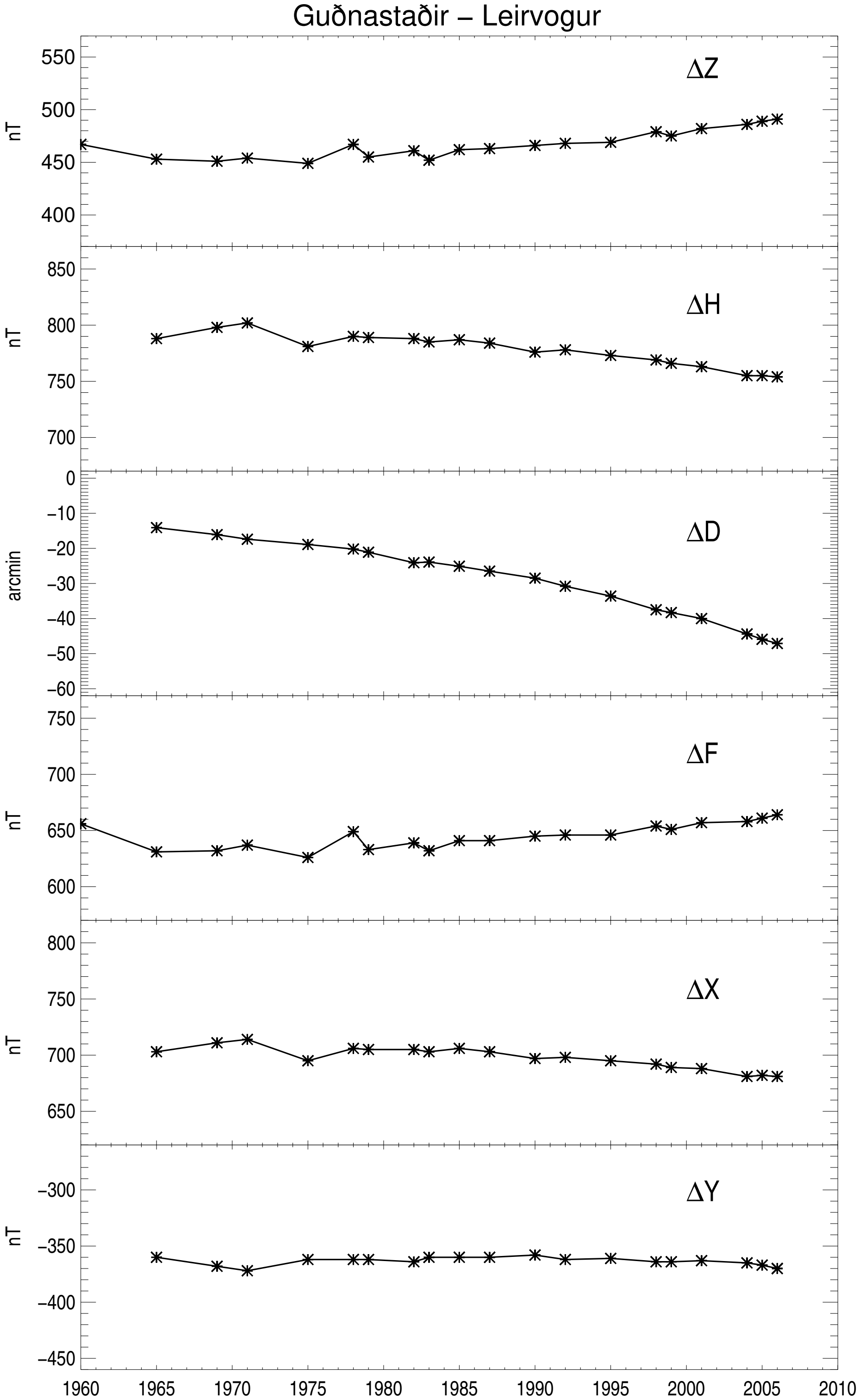
Guðnastaðir minus Leirvogur

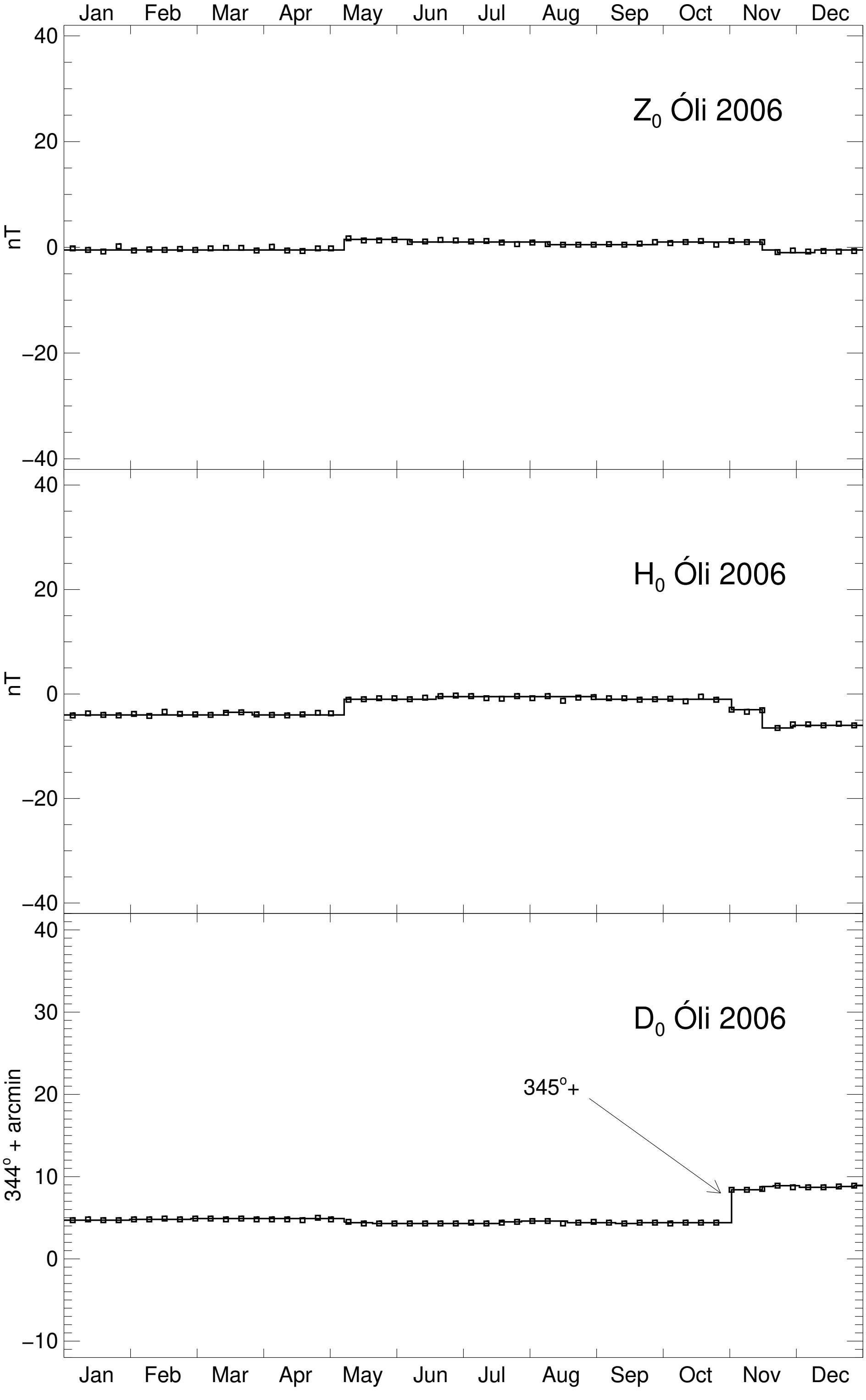
	dF	dZ	dH	dD
2006	+664	+491	+754	$-47'.1$
2005	+661	+489	+755	$-45'.9$

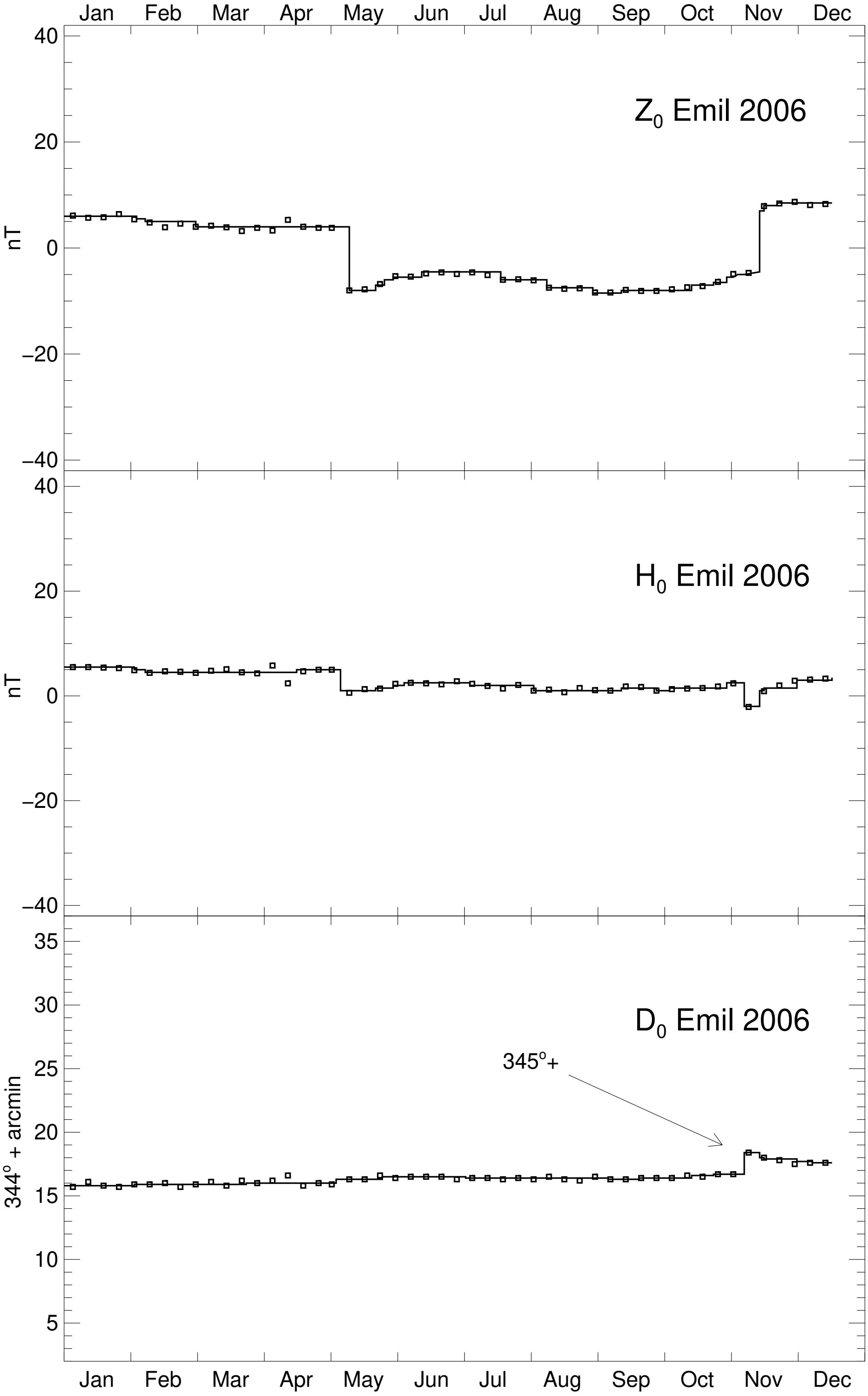
The units of F, Z and H are nanoteslas. As can be seen from the graphs on the following pages, the results are in conformity with a previously established trend.

October 2007

Gunnlaugur Björnsson


Guðnastaðir – Leirvogur
ΔZ
ΔH
ΔD
ΔF
ΔX
ΔY
nT
arcmin
550
500
450
400
850
800
750
700
0
−10
−20
−30
−40
−50
−60
750
700
650
600
800
750
700
650
−300
−350
−400
−450
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010


Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Z0 Óli 2006
nT
H0 Óli 2006
nT
D0 Óli 2006
344° + arcmin
345°+


Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Z0 Emil 2006
nT
40
20
0
−20
−40
H0 Emil 2006
nT
40
20
0
−20
−40
D0 Emil 2006
345°+
344° + arcmin
35
30
25
20
15
10
5
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

EXPLANATION OF TABLES

Monthly and annual means

In the table of monthly means on the following page, the declination is reckoned towards the east from 0 to 360 degrees. Thus $344°$ corresponds to $16°$ W. The letters Q and D mark the international quiet and disturbed days, respectively. The days were selected according to circulars from the International Service of Geomagnetic Indices in Potsdam.

Annual means (all days) since 1958 are given on pages **??**-129.

Diurnal variations

The tables on pages **??**-**??** show the mean diurnal inequalities of the magnetic elements Z, H, D and F at Leirvogur in 2006. The units are nanoteslas (for Z, H and F) or tenths of a minute (for D). The top row in each group of four gives the mean of all months of the year, while the other rows show the mean for the winter months (W = January, February, November, December), the equinoctial months (E = March, April, September, and October) and summer months (S = May, June, July and August).

The averages for the international quiet and disturbed days are shown separately and are identified by Q or D as a second letter.

The last three columns give the positions of the minimum and the maximum values in each row, and the range. In cases where there are two or more extreme values of equal size, the number 99 is printed.

K-indices

The three-hourly K-indices, based on the components H and D, are shown in tabular from on page **??**. The daily K-sums are shown on page **??** in runs of 27 days. The table on page **??** shows the distribution of K-indices for each month of the year. The columns give the number of cases when $K = 0$, $K = 1$ etc. The column marked "–" shows how many indices are missing owing to breaks in the record. The final columns give the average values of K and the equivalent amplitudes Ak. A summary for all years since 1958 is given on pages **??**-**??**.

LEIRVOGUR 2006
MEAN VALUES OF THE MAGNETIC ELEMENTS

VERTICAL INTENSITY (Z) IS 50000 PLUS TABULAR VALUES IN NANOTESLAS
HORIZONTAL INTENSITY (H) IS 12000 PLUS TABULAR VALUES IN NANOTESLAS
DECLINATION (D) IS 345 DEGREES PLUS TABULAR VALUES IN TENTH-MINUTES
TOTAL INTENSITY (F) IS 51000 PLUS TABULAR VALUES IN NANOTESLAS
Q=QUIET DAYS, D=DISTURBED DAYS

	Z	ZQ	ZD	H	HQ	HD	D	DQ	DD	F	FQ	FD
JAN	162	164	157	556	561	544	104	100	118	709	713	702
FEB	159	162	148	561	562	560	116	116	114	708	711	697
MAR	160	161	151	554	563	533	131	125	133	707	710	693
APR	162	166	145	539	562	472	152	140	177	705	714	673
MAY	161	166	163	561	568	551	160	165	159	709	716	710
JUN	159	162	160	565	572	554	170	175	159	709	714	707
JUL	162	163	164	568	573	546	187	186	205	713	715	709
AUG	165	168	174	563	569	565	203	200	199	714	718	724
SEP	165	168	170	557	568	527	217	214	229	713	718	710
OCT	169	170	160	556	571	502	231	223	256	716	721	695
NOV	169	173	159	558	573	518	247	241	268	717	725	698
DEC	179	182	177	556	573	521	267	256	300	726	732	716
MEAN	164	167	161	558	568	533	182	178	193	712	717	703

LEIRVOGUR 2006

MEAN DIURNAL INEQUALITIES

UT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MIN	MAX	RANGE
Z		-17	-20	-22	-19	-17	-18	-16	-12	-7	-4	0	3	7	11	17	24	27	27	24	18	11	2	-6	-12	3.	17.	49
ZW		-17	-20	-24	-17	-16	-16	-11	-8	-4	-2	1	4	7	10	14	17	21	19	18	17	11	7	-2	-11	3.	17.	45
ZE		-20	-19	-15	-17	-16	-19	-20	-17	-11	-5	-1	4	9	13	18	26	29	29	27	19	8	-3	-10	-11	7.	18.	49
ZS		-16	-21	-27	-23	-20	-18	-18	-11	-7	-4	-2	1	4	10	20	28	32	31	26	19	12	3	-5	-13	3.	17.	58
ZQ		-9	-11	-9	-6	-2	-1	-1	-1	-2	-3	-3	-3	-2	0	3	6	8	9	8	7	6	4	2	-1	2.	18.	20
ZQW		-2	-7	-9	-3	0	0	0	0	-1	-2	-3	-4	-2	-1	1	3	4	4	4	4	5	3	2	3	3.	21.	14
ZQE		-9	-10	-8	-5	-3	-2	-2	-3	-3	-3	-3	-3	-2	0	4	8	9	10	9	7	5	3	3	-1	2.	18.	20
ZQS		-16	-16	-11	-9	-4	0	0	0	-2	-3	-3	-3	-2	0	5	9	12	14	13	11	8	6	1	-5	2.	18.	30
ZD		-6	-4	-4	-9	-27	-44	-41	-37	-23	-13	1	11	21	29	41	52	55	43	28	8	-12	-27	-15	-24	6.	17.	99
ZDW		-25	-16	-19	-17	-40	-54	-31	-15	-7	-6	5	17	24	31	39	45	56	41	22	15	0	-16	-7	-40	6.	17.	110
ZDE		-8	-23	10	-10	-21	-45	-47	-55	-34	-12	4	19	33	35	42	59	56	50	42	4	-26	-44	-23	-6	8.	16.	114
ZDS		15	26	-3	-1	-18	-34	-46	-41	-26	-21	-8	-2	6	20	41	51	52	37	18	4	-11	-20	-16	-26	7.	17.	98
H		-39	-49	-50	-49	-33	-17	-8	2	4	2	-1	-3	-1	5	15	26	35	43	46	45	36	21	-4	-24	3.	19.	96
HW		-38	-40	-47	-45	-28	-15	-1	6	10	10	6	3	5	6	14	18	25	27	28	29	27	17	-1	-19	3.	20.	76
HE		-39	-57	-55	-53	-37	-20	-8	4	7	4	1	0	1	7	16	29	36	45	51	50	36	16	-8	-24	2.	19.	108
HS		-41	-51	-49	-49	-35	-17	-14	-6	-4	-10	-12	-13	-8	1	15	32	44	58	60	55	44	29	-3	-28	2.	19.	111
HQ		-2	-2	-2	-2	0	1	0	-1	-3	-8	-12	-15	-15	-11	-6	0	4	9	12	13	13	11	8	6	12.	99.	28
HQW		-2	-5	-5	-2	-1	1	2	3	2	0	-3	-6	-7	-5	-2	1	2	3	4	4	5	4	4	3	13.	21.	13
HQE		1	2	2	2	2	3	3	2	0	-5	-12	-17	-19	-15	-8	-2	0	5	9	11	11	10	9	7	13.	21.	30
HQS		-5	-4	-3	-5	-2	0	-3	-7	-12	-18	-20	-20	-18	-14	-7	2	9	17	22	23	22	20	13	8	12.	20.	44
HD		-90	-124	-145	-176	-121	-62	-42	-9	9	12	21	26	36	50	72	98	117	134	124	103	67	17	-29	-86	4.	18.	310
HDW		-104	-97	-148	-186	-103	-64	-23	7	19	27	26	24	37	41	69	72	93	104	82	70	64	28	14	-49	4.	18.	290
HDE		-83	-201	-171	-213	-170	-80	-41	-7	8	17	38	51	60	74	85	121	127	147	151	140	73	1	-39	-88	4.	19.	364
HDS		-83	-74	-116	-130	-91	-43	-62	-26	-1	-10	-1	2	11	33	62	102	132	150	140	99	64	23	-61	-121	4.	18.	280

LEIRVOGUR 2006

MEAN DIURNAL INEQUALITIES

UT 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MIN	MAX	RANGE
D	19	26	29	47	49	47	44	36	28	20	8	-10	-31	-50	-61	-59	-51	-39	-29	-19	-13	-9	3	12	15.	5.	109
DW	26	34	23	39	31	25	18	9	1	-3	-8	-18	-28	-40	-43	-41	-34	-23	-16	-7	2	8	20	25	15.	4.	82
DE	18	32	34	59	64	57	44	30	19	14	4	-12	-38	-58	-70	-65	-53	-41	-25	-11	-10	-8	6	11	15.	5.	134
DS	14	13	31	45	52	60	69	68	63	50	29	1	-27	-52	-68	-71	-67	-55	-46	-38	-31	-26	-17	1	16.	7.	141
DQ	8	9	11	12	17	23	28	33	36	33	22	5	-15	-34	-45	-44	-36	-26	-18	-12	-9	-6	-1	6	15.	9.	81
DQW	13	13	12	7	7	8	9	9	12	13	10	0	-14	-23	-26	-23	-18	-13	-8	-5	-3	4	8	12	15.	99.	39
DQE	8	12	13	14	18	22	24	26	32	32	22	4	-17	-37	-50	-47	-36	-25	-14	-7	-5	-3	3	13	15.	99.	81
DQS	4	4	8	13	25	39	53	63	65	54	36	12	-12	-40	-58	-62	-54	-41	-31	-23	-18	-18	-12	-7	16.	9.	127
DD	35	58	61	160	139	99	71	38	1	-13	-26	-35	-55	-71	-83	-82	-77	-62	-55	-42	-34	-23	-29	26	15.	4.	243
DDW	56	69	34	166	105	55	35	5	-22	-36	-55	-58	-54	-71	-75	-75	-58	-30	-25	-10	5	9	-14	42	16.	4.	242
DDE	21	83	95	202	214	141	77	28	-36	-44	-35	-38	-74	-88	-101	-86	-82	-81	-52	-39	-41	-34	-31	-1	15.	5.	315
DDS	29	22	55	111	99	101	101	81	60	42	11	-8	-37	-56	-74	-86	-92	-77	-88	-77	-66	-44	-41	36	17.	4.	203
F	-26	-31	-33	-30	-25	-22	-18	-11	-6	-3	-1	2	6	12	20	29	35	36	34	29	19	7	-6	-17	3.	18.	70
FW	-26	-29	-35	-27	-22	-19	-11	-6	-1	1	3	4	8	11	17	21	26	25	24	24	18	12	-2	-15	3.	17.	61
FE	-28	-33	-28	-29	-24	-23	-22	-15	-9	-3	0	4	9	14	22	32	37	39	39	30	16	1	-12	-16	2.	18.	72
FS	-25	-32	-38	-34	-28	-22	-20	-13	-8	-7	-5	-2	2	10	23	35	42	44	40	32	22	10	-6	-20	3.	18.	82
FQ	-9	-11	-9	-6	-2	-1	0	-1	-3	-4	-6	-7	-6	-3	2	6	9	11	11	10	9	7	4	0	2.	19.	23
FQW	-3	-8	-10	-4	0	0	0	0	-1	-2	-3	-5	-4	-2	0	3	4	5	5	5	6	4	3	3	3.	21.	16
FQE	-8	-9	-7	-5	-2	-2	-1	-2	-2	-4	-6	-7	-7	-4	2	6	9	10	11	9	7	6	5	1	2.	19.	20
FQS	-17	-17	-11	-10	-4	0	0	-2	-5	-7	-8	-8	-7	-3	3	9	14	17	18	16	13	10	4	-3	1.	19.	35
FD	-28	-34	-39	-52	-55	-58	-50	-38	-20	-10	5	17	29	40	57	74	82	74	57	32	4	-22	-22	-44	6.	17.	139
FDW	-50	-40	-54	-61	-64	-68	-36	-13	-3	0	11	21	32	40	55	61	77	64	42	32	15	-9	-4	-51	6.	17.	144
FDE	-28	-71	-32	-61	-62	-62	-56	-55	-32	-7	13	31	46	52	62	87	85	85	77	38	-8	-43	-32	-27	2.	16.	158
FDS	-5	8	-31	-33	-39	-44	-60	-46	-26	-23	-8	-1	8	27	55	75	83	72	51	28	4	-14	-30	-54	7.	17.	143

LEIRVOGUR MAGNETIC OBSERVATORY 2006
K-INDICES FOR THREE HOUR INTERVALS IN U.T.
LOWER LIMIT FOR K-9 = 1500 NANOTESLAS IN H

DAYS	K-INDICES						
1- 7	42012113	01111213	21000111	00010010	00011122	24223223	52121210
8- 14	21121000	11000000	00000001	21001110	42000003	20001111	21001100
15- 21	32010121	13233445	45231112	43232233	21222224	21011221	34111100
22- 28	01211210	25334336	43431100	00111146	57233646	52333333	33221133
29- 35	20000001	10000100	10000101	10122104	31011144	11010142	44110001
36- 42	20111010	25324346	42200126	51111100	00111011	10000013	53111210
43- 49	44111100	00001211	00000000	11222255	53332244	33321112	00011100
50- 56	42212244	53345555	65344536	64433323	34321102	43122110	41001000
57- 63	23111325	32111113	00021235	63212310	10110002	10011211	11111002
64- 70	10011101	10012345	76222233	32111133	20011241	23222327	64332212
71- 77	01222210	01011021	00022114	42222330	13222212	10011001	02453467
78- 84	76534455	67542476	56322555	65322335	44221212	30011335	34222330
85- 91	12122555	56112226	15112212	22122236	21021134	10112231	00012111
92- 98	00012010	00022212	10223556	67635444	45522234	20111100	20022222
99-105	86645468	66433432	34112212	00111110	11334424	68774557	65554566
106-112	64323325	42112225	74221223	40111220	00123210	11113422	77443321
113-119	23323214	54221114	61121320	43212100	34222222	45632221	11111211
120-126	00011110	00112110	10111120	22111222	01334422	75422213	33124545
127-133	55643344	56221221	11122211	01122135	56433337	66534335	65222234
134-140	53222223	12011212	10111211	34212322	32333555	44412234	42221332
141-147	51221453	54222334	63222111	11122211	11112215	32121220	21122101
148-154	13122224	31122213	22123333	61112221	42232345	54312222	31112212
155-161	01111211	10121322	44433565	76433347	55534565	55323344	54313445
162-168	43232312	21122212	21111112	21122226	23444446	45222334	45523322
169-175	13332212	31121100	31112210	00011122	13122232	00111211	00122212
176-182	32022212	10112111	12122334	43323344	44223445	54323333	23222211
183-189	01102211	01012110	12123346	56623336	64332433	42223331	11111212
190-196	01111213	43224443	01122234	53334323	33221110	02124565	23322222
197-203	13112220	22111221	12121110	23111111	11112011	11112110	12222101
204-210	22112111	01223332	65222225	52122201	11222344	78533223	41222220
211-217	11111211	24434336	56433423	66223326	52221214	22111111	32121011
218-224	10122201	66744645	46323332	56223224	10112224	42123321	44313221
225-231	10121211	11012211	11111222	11122111	00222325	56422323	21225677
232-238	77323345	44323557	64454645	44321222	42122334	30011111	10012222
239-245	32124553	65422434	53222321	12322331	01223656	63123467	62121346
246-252	33222213	77433545	53322334	32223332	22223431	32222212	31111100
253-259	22222332	64222212	31221221	14521210	22211211	00111110	00011221
260-266	21233254	75433556	64432223	44111110	01011211	01011112	01111346
267-273	76544326	42243223	34312233	42111100	10112124	30012221	14432335
274-280	77643324	31213335	24222113	21111211	21011212	00121111	10112446
281-287	42122222	22211111	21111100	10011101	30012214	34443366	66433457
288-294	55332245	51212335	30011113	32110122	01011100	20123444	64423556
295-301	54323445	10121113	01221211	22121111	11012100	20011133	32233457
302-308	66443447	53332213	40011225	43111225	42222245	43123220	23222233
309-315	11122212	00011102	00011000	20011000	10001246	56643345	66534455
316-322	53221101	21100000	01112246	54011234	74111200	34212210	00011011
323-329	12121000	00011000	10001000	00012144	21333356	66633235	34323356
330-336	46333345	52232231	31012223	35211024	46666532	22111123	10111101
337-343	22011112	00000001	00011103	56344565	77444345	68543454	42211337
344-350	34233445	55432136	66534466	54221122	43235779	99765555	54121243
351-357	41111221	22112224	53344235	74324566	74454433	45443355	34535444
358-364	53323334	54322211	11113110	11001001	10000012	20000111	10010101
365	20000002						

LEIRVOGUR MAGNETIC OBSERVATORY 2006

K-SUMS IN 27-DAY RUNS

DAYS	K-SUMS																										
1- 27	14	10	6	2	7	20	14	7	2	1	6	9	6	5	10	25	19	22	17	10	11	8	29	16	14	36	25
28- 54	18	3	2	3	11	15	10	11	6	29	17	10	5	5	14	12	5	0	20	26	16	3	21	35	36	28	16
55- 81	14	6	18	13	13	18	5	7	7	5	16	27	15	11	23	23	10	6	10	18	15	4	31	39	41	33	29
82-108	18	16	19	23	25	15	20	14	11	6	4	9	24	39	27	6	12	47	31	16	5	22	49	42	28	19	23
109-135	11	9	15	31	20	20	16	13	19	25	9	4	6	7	13	19	26	27	34	21	11	15	34	35	26	21	10
136-162	8	19	29	24	19	23	25	18	11	14	13	10	17	15	19	16	25	21	13	8	12	34	37	38	29	29	20
163-189	13	10	18	31	25	26	17	9	11	7	16	7	10	14	8	18	26	28	26	15	8	6	22	34	28	20	10
190-216	10	26	15	26	13	25	18	12	12	9	11	8	8	11	11	16	26	15	19	33	15	9	29	30	30	19	10
217-243	11	9	42	26	26	13	18	20	9	9	11	10	16	27	32	34	33	38	20	21	8	10	25	30	20	17	25
244-270	32	25	18	38	25	20	19	16	8	18	21	14	16	12	5	7	22	38	26	13	7	7	17	37	22	21	10
271-297	12	11	25	36	21	17	10	10	7	19	17	11	7	5	13	33	38	29	22	10	12	4	20	35	30	10	10
298-324	11	6	11	29	38	22	15	19	23	17	19	12	5	2	4	14	36	38	15	4	17	20	16	15	4	7	2
325-351	2	12	26	34	29	31	20	14	18	38	13	6	10	1	6	38	38	39	23	28	29	40	19	40	51	22	13
352-365	16	29	37	34	33	32	26	20	9	4	4	5	4	4													

LEIRVOGUR MAGNETIC OBSERVATORY 2006

DISTRIBUTION OF K-INDICES AND AVERAGES OF K AND Ak

	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	-	$\bar{K}$	$\overline{Ak}$
JAN	74	71	45	33	14	6	4	1	0	0	0	1.5	9
FEB	53	67	33	27	24	15	5	0	0	0	0	1.9	12
MAR	35	64	68	30	15	18	12	6	0	0	0	2.2	17
APR	32	56	59	24	28	16	15	7	3	0	0	2.5	22
MAY	11	69	79	39	21	19	8	2	0	0	0	2.4	15
JUN	14	58	67	44	32	18	5	2	0	0	0	2.4	15
JUL	17	81	77	38	17	8	8	1	1	0	0	2.1	13
AUG	13	58	74	36	28	17	16	6	0	0	0	2.6	20
SEP	20	62	68	41	24	10	10	5	0	0	0	2.3	16
OCT	28	78	51	35	27	14	10	5	0	0	0	2.2	16
NOV	54	51	48	33	21	16	16	1	0	0	0	2.1	16
DEC	38	53	34	33	39	28	11	8	1	3	0	2.7	27
YEAR	389	768	703	413	290	185	120	44	5	3	0	2.3	17
%	13.3	26.3	24.1	14.1	9.9	6.3	4.1	1.5	0.2	0.1			

	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	–	K	Ak
1958	76	267	459	591	510	488	328	87	12	2	100	3.6	33
1959	46	260	360	567	562	547	388	138	33	8	11	3.9	39
1960	75	275	399	539	468	492	304	165	32	4	175	3.7	38
1961	224	477	475	518	482	351	222	87	19	1	64	3.1	27
1962	17	346	592	569	444	412	259	94	10	0	177	3.4	30
1963	181	494	543	550	371	353	259	99	10	0	60	3.1	27
1964	328	699	573	451	325	238	159	54	3	0	98	2.5	19
1965	416	799	567	455	247	199	111	35	0	0	91	2.2	15
1966	247	644	648	535	309	299	158	48	8	1	23	2.6	20
1967	178	561	685	523	386	294	189	58	7	3	36	2.8	23
1968	114	411	569	596	489	387	256	75	9	0	22	3.2	27
1969	174	469	619	610	418	351	195	52	4	2	26	3.0	23
1970	48	388	676	640	478	378	209	58	11	4	30	3.2	26
1971	13	316	768	684	448	367	215	81	8	0	20	3.3	26
1972	20	321	812	682	453	356	172	73	24	4	11	3.2	27
1973	55	213	603	586	484	459	326	171	17	0	6	3.7	35
1974	41	237	400	563	509	533	392	209	24	1	11	3.9	41
1975	81	364	621	603	432	425	260	111	19	3	1	3.4	30
1976	109	413	701	589	417	377	223	84	12	3	0	3.1	27
1977	131	460	757	547	396	337	189	91	10	2	0	3.0	25
1978	135	352	601	569	458	392	270	122	17	4	0	3.3	31
1979	87	270	644	680	492	441	227	70	9	0	0	3.3	27
1980	142	448	826	612	400	303	160	35	2	0	0	2.8	20
1981	33	301	573	663	585	440	241	67	15	2	0	3.4	29
1982	20	182	366	648	566	554	389	156	29	10	0	4.0	41

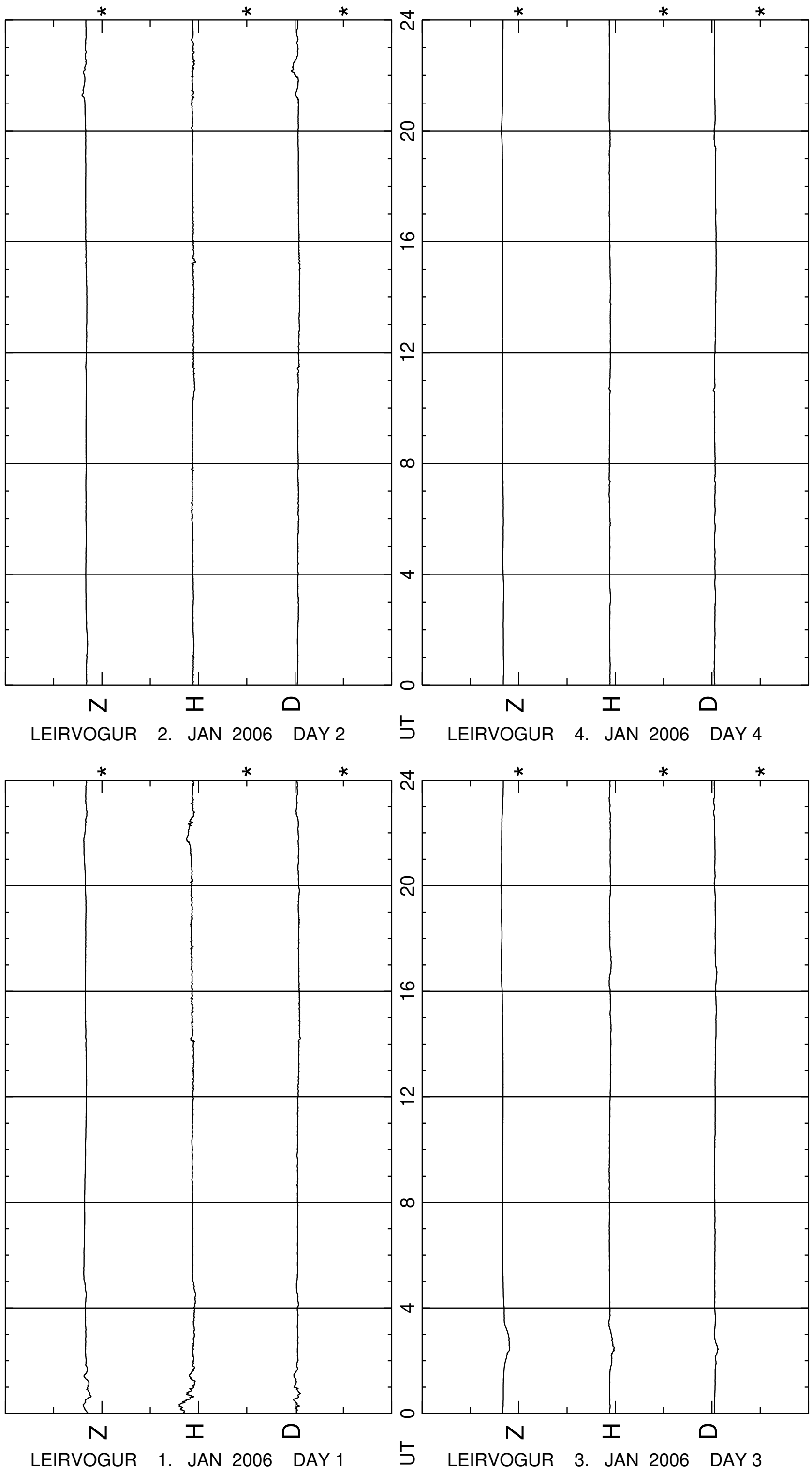
	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	-	K	Ak
1983	10	150	494	595	596	585	330	137	17	6	0	3.9	37
1984	9	117	516	676	568	497	367	151	24	3	0	3.9	38
1985	2	231	806	695	454	386	237	85	23	1	0	3.4	29
1986	14	300	927	645	399	322	194	96	20	3	0	3.2	27
1987	17	371	931	687	385	314	143	55	5	1	11	3.0	22
1988	14	249	814	694	495	374	182	63	10	0	25	3.3	26
1989	3	122	601	711	520	475	346	111	19	4	8	3.8	35
1990	16	230	665	661	527	444	246	98	12	2	19	3.5	30
1991	10	186	531	620	505	497	375	134	37	5	20	3.8	38
1992	98	293	669	655	469	402	242	77	23	0	0	3.3	28
1993	92	372	712	598	437	361	234	95	19	0	0	3.2	28
1994	100	368	546	546	445	409	322	157	26	1	0	3.5	34
1995	200	547	638	493	389	339	212	82	12	1	7	2.9	25
1996	206	557	845	578	304	231	148	52	7	0	0	2.6	19
1997	398	659	737	482	265	214	124	33	8	0	0	2.3	17
1998	228	516	729	525	361	295	186	61	13	5	1	2.8	23
1999	163	440	687	583	397	355	213	71	7	0	4	3.0	24
2000	157	321	673	616	446	399	219	75	13	5	4	3.2	27
2001	182	479	747	591	408	275	165	59	9	5	0	2.8	22
2002	133	356	720	647	420	367	198	60	8	0	11	3.1	24
2003	43	197	406	588	530	519	414	186	30	7	0	4.0	41
2004	154	431	706	599	415	323	212	71	11	6	0	3.0	25
2005	218	463	676	557	366	305	232	75	20	8	0	3.0	26
2006	389	768	703	413	290	185	120	44	5	3	0	2.3	17

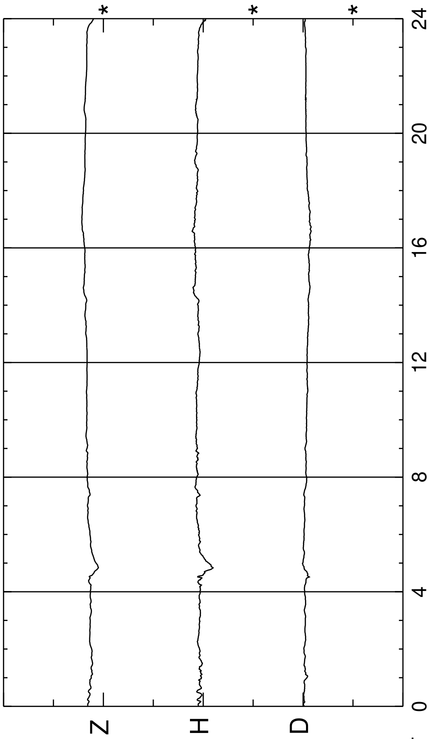
EXPLANATION OF DAILY GRAPHS

The graphs on pages 36-127 show the 1-minute means of the magnetic elements Z, H, and D at Leirvogur in 2006. Vertical divisions are spaced at intervals of 500 nT in Z and H and $2\overset{\circ}{.}31$ in D. The last figure is equivalent to 500 nT in the direction of magnetic east for average values of H at Leirvogur.

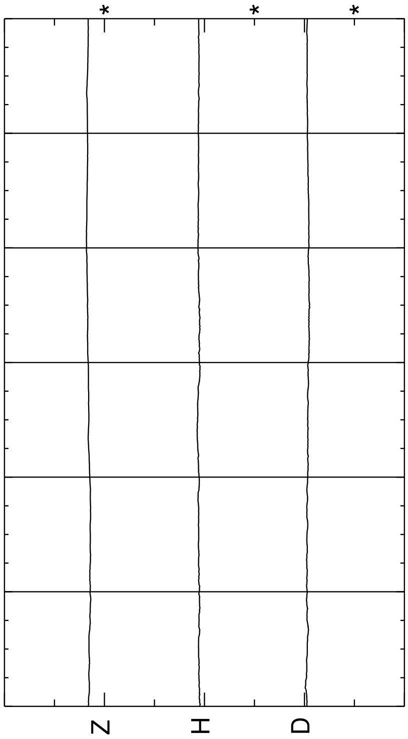
Levels marked with asterisk (*) are as follows:
Z: 50000 nT
H: 12000 nT
D: 343° E

In several cases the H and D components had to be shifted upwards or downwards by one interval (500 nT) to disentangle the lines or prevent them from disappearing off scale. The storm on December 15 is shown separately on pages **??**–**??**, where the components are plotted individually from the ten second data.

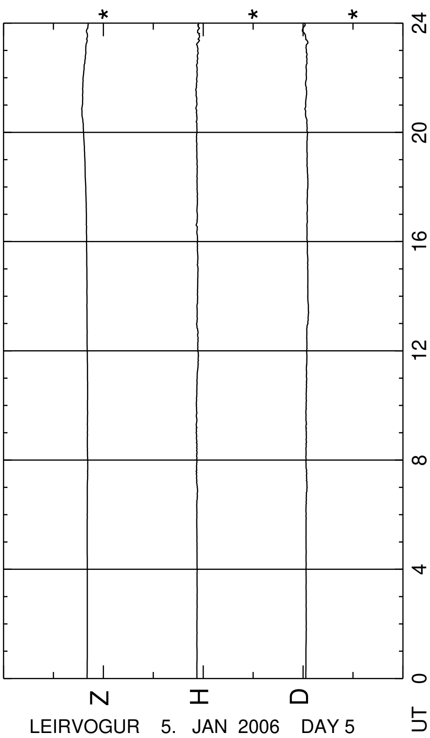

LEIRVOGUR 2. JAN 2006 DAY 2
LEIRVOGUR 4. JAN 2006 DAY 4
LEIRVOGUR 1. JAN 2006 DAY 1
LEIRVOGUR 3. JAN 2006 DAY 3
Z
H
D
UT
0
4
8
12
16
20
24



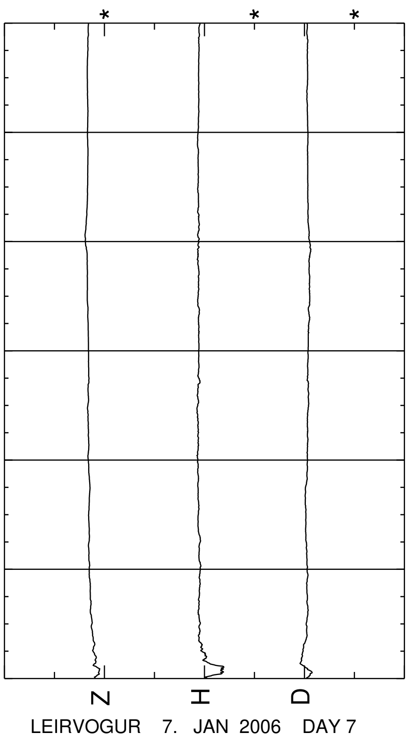
LEIRVOGUR 6. JAN 2006 DAY 6



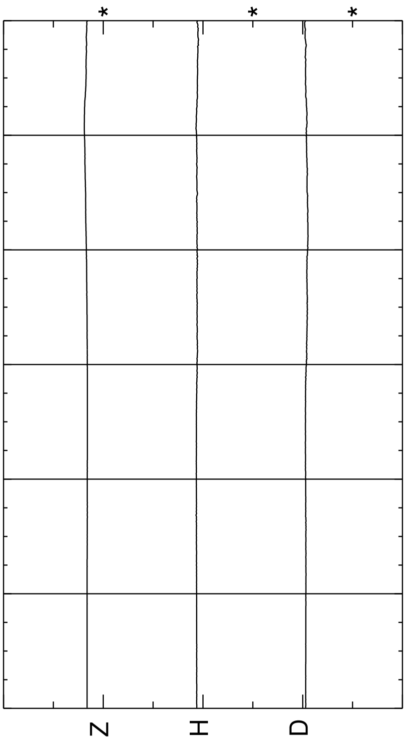
LEIRVOGUR 8. JAN 2006 DAY 8



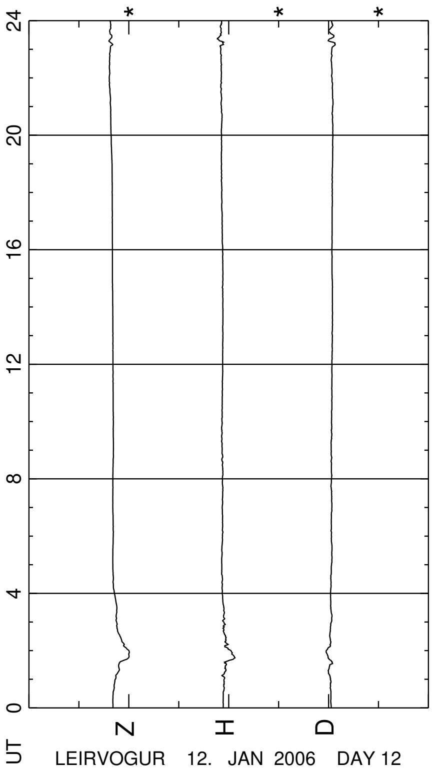
LEIRVOGUR 5. JAN 2006 DAY 5



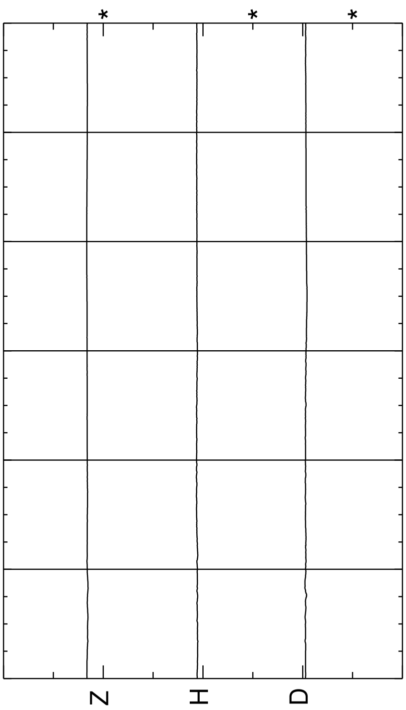
LEIRVOGUR 7. JAN 2006 DAY 7



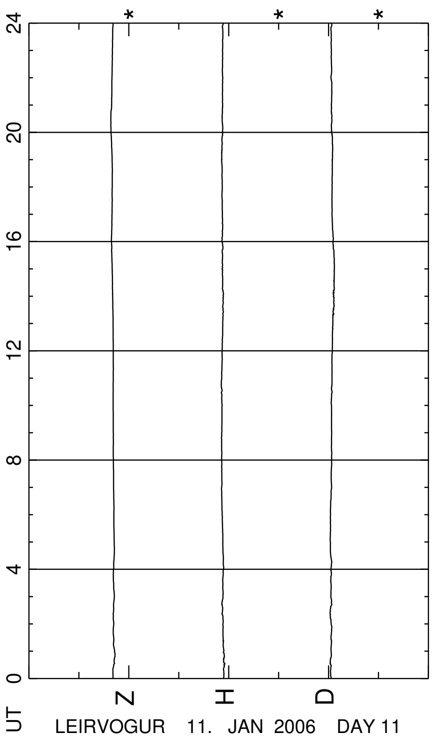
LEIRVOGUR 10. JAN 2006 DAY 10



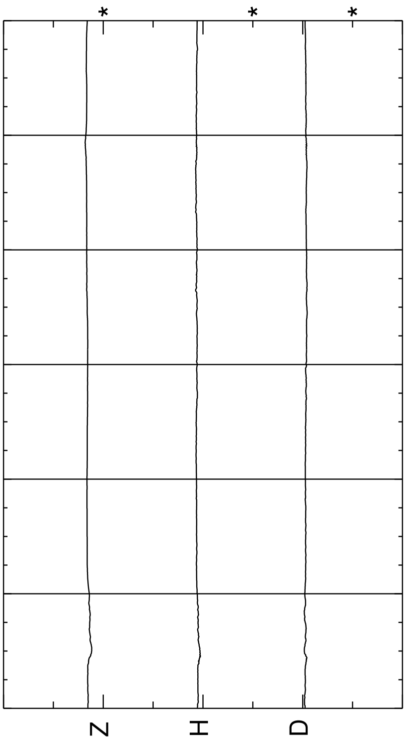
LEIRVOGUR 12. JAN 2006 DAY 12



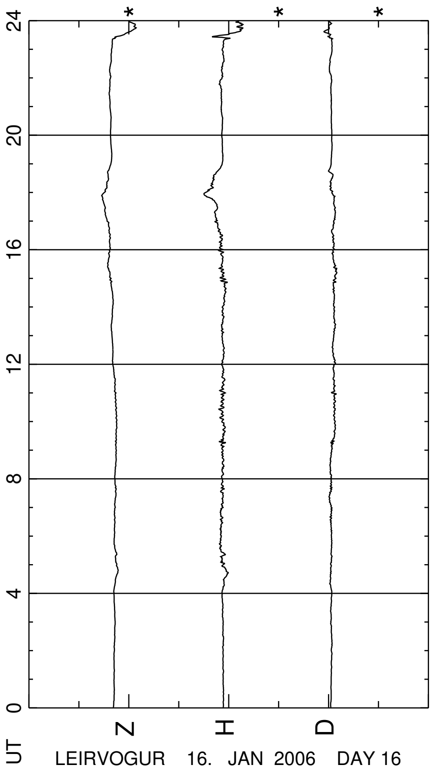
LEIRVOGUR 9. JAN 2006 DAY 9



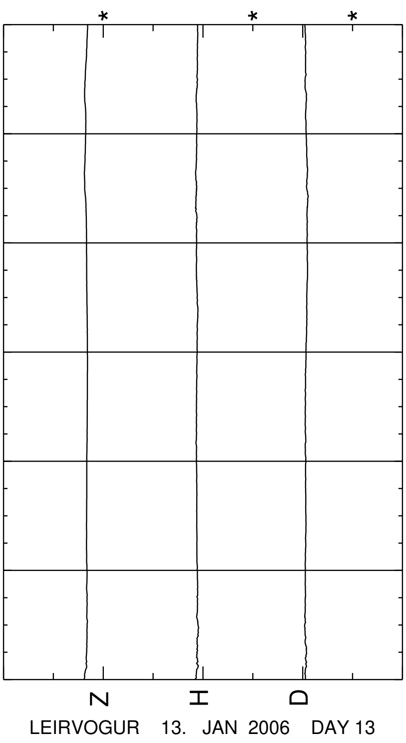
LEIRVOGUR 11. JAN 2006 DAY 11



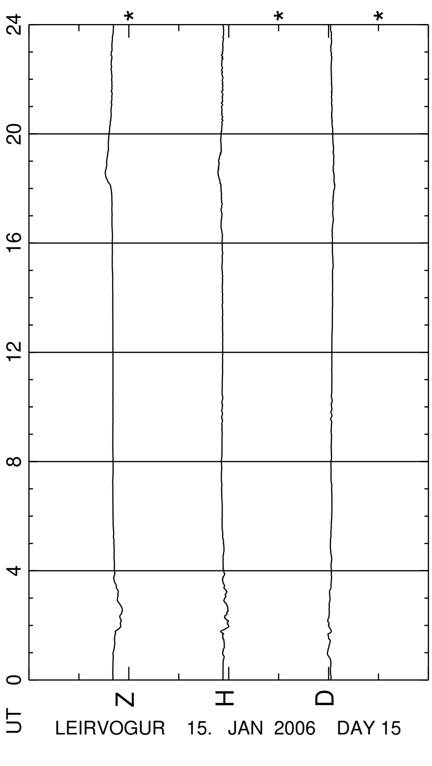
LEIRVOGUR 14. JAN 2006 DAY 14



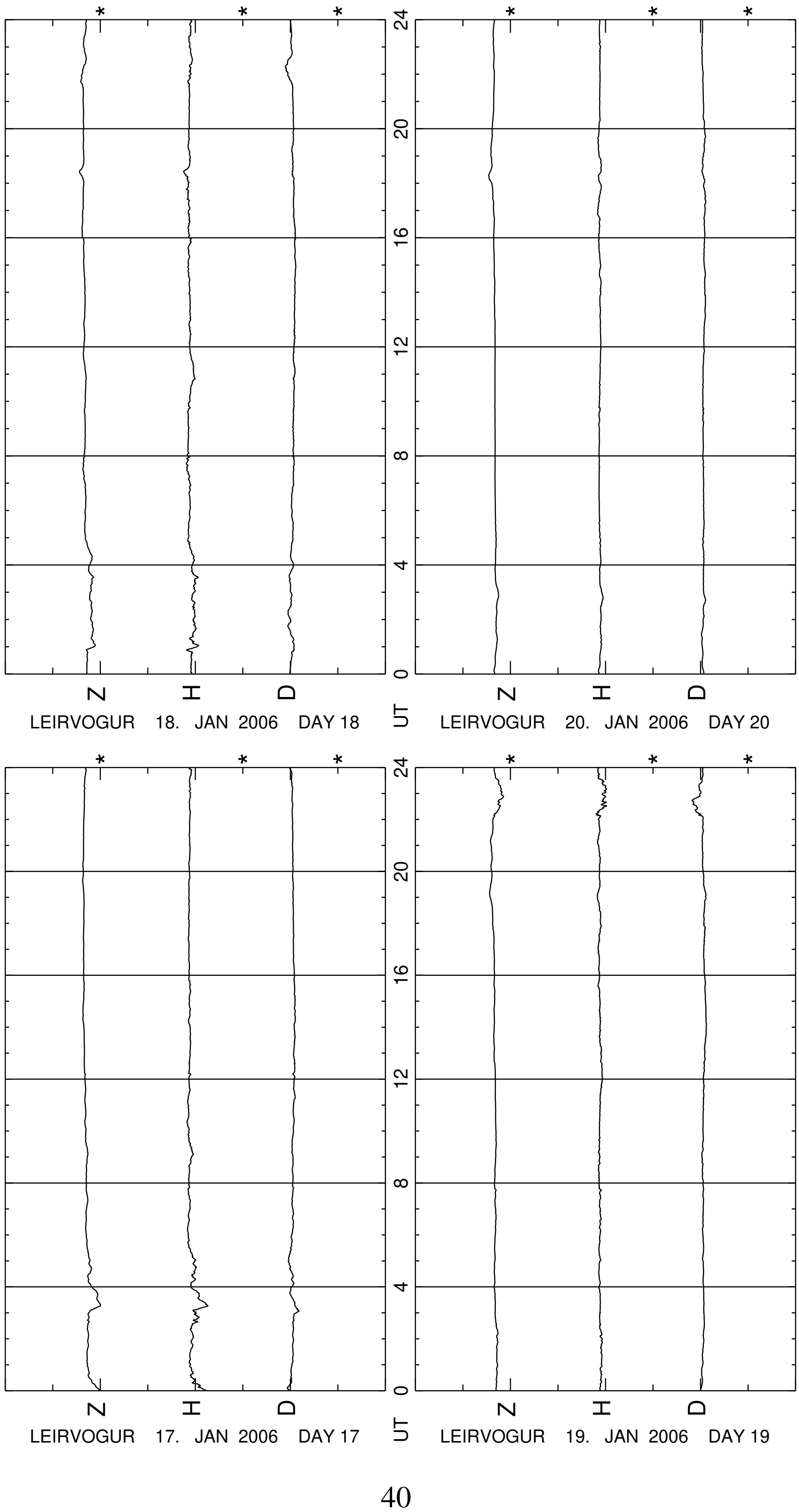
LEIRVOGUR 16. JAN 2006 DAY 16

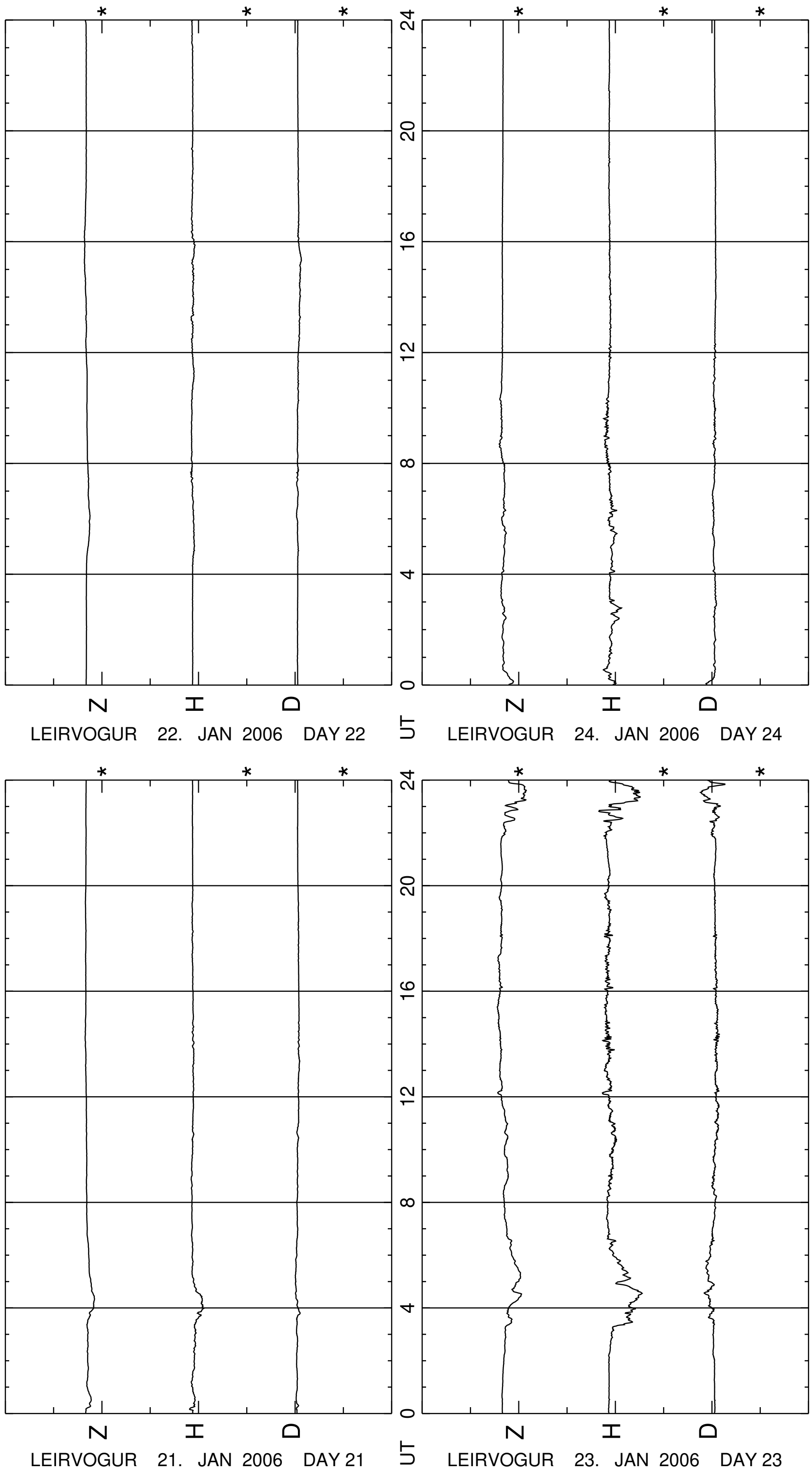


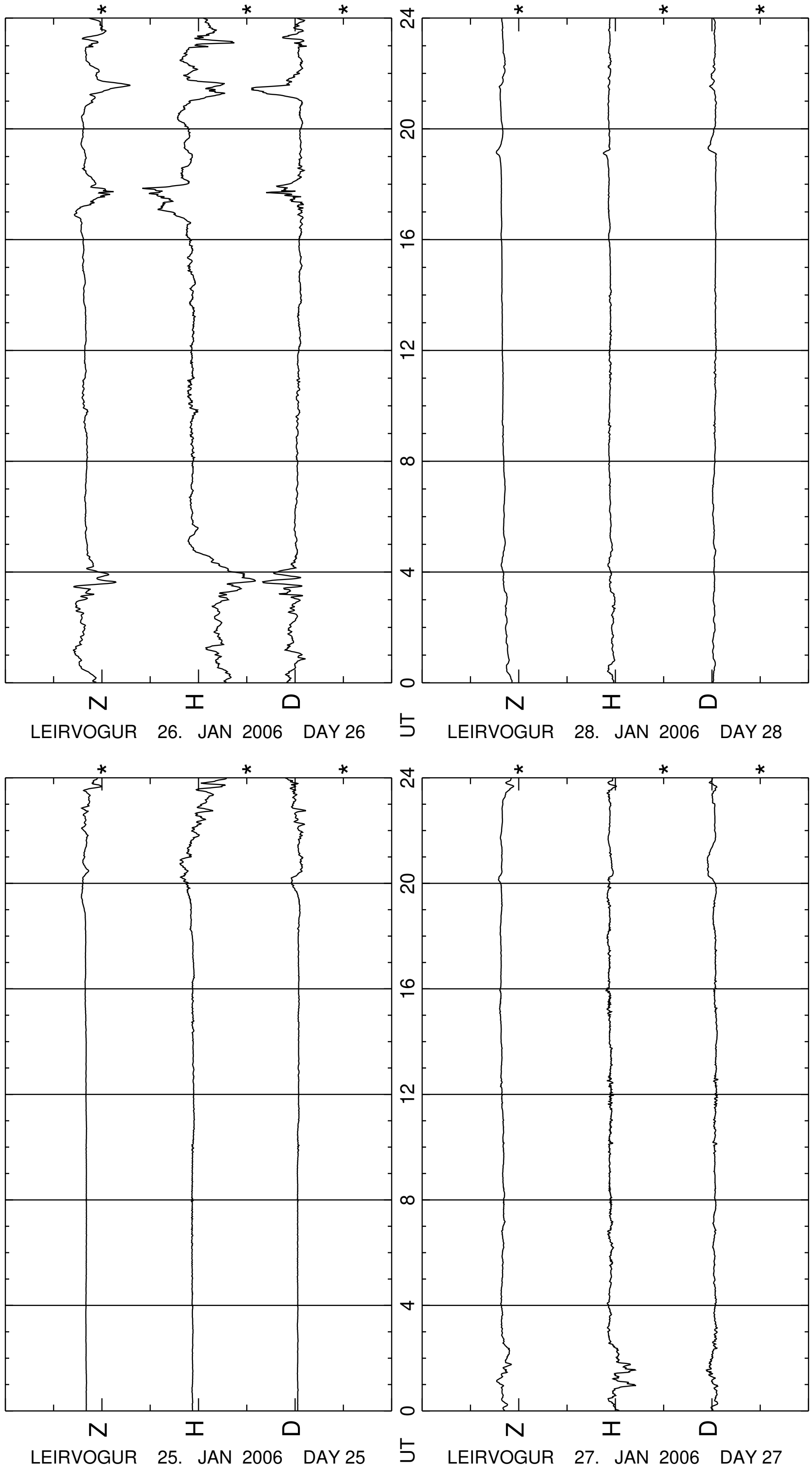
LEIRVOGUR 13. JAN 2006 DAY 13



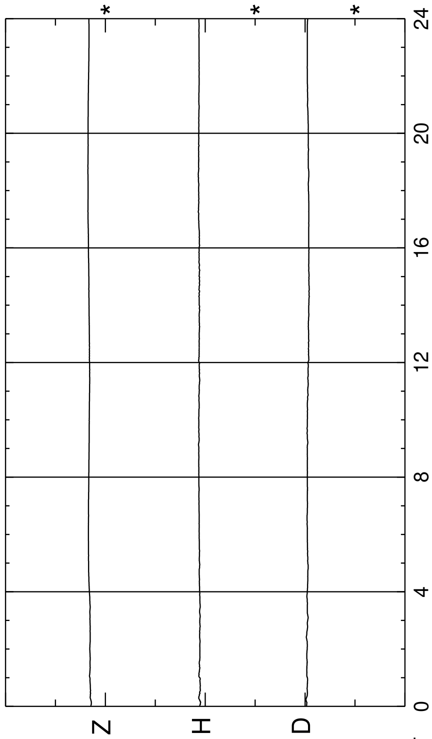
LEIRVOGUR 15. JAN 2006 DAY 15


LEIRVOGUR 18. JAN 2006 DAY 18
LEIRVOGUR 20. JAN 2006 DAY 20
LEIRVOGUR 17. JAN 2006 DAY 17
LEIRVOGUR 19. JAN 2006 DAY 19
Z
H
D
UT
0
4
8
12
16
20
24

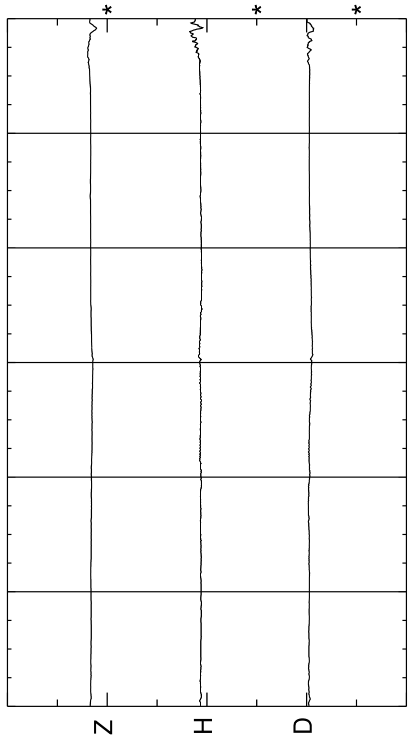

LEIRVOGUR 22. JAN 2006 DAY 22
LEIRVOGUR 24. JAN 2006 DAY 24
LEIRVOGUR 21. JAN 2006 DAY 21
LEIRVOGUR 23. JAN 2006 DAY 23
Z
H
D
UT
0
4
8
12
16
20
24



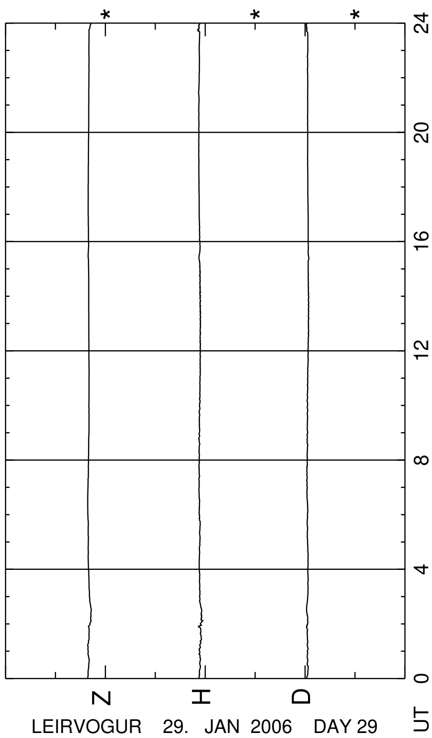
Z H D
LEIRVOGUR 26. JAN 2006 DAY 26
Z H D
LEIRVOGUR 28. JAN 2006 DAY 28
Z H D
LEIRVOGUR 25. JAN 2006 DAY 25
Z H D
LEIRVOGUR 27. JAN 2006 DAY 27
UT
0 4 8 12 16 20 24



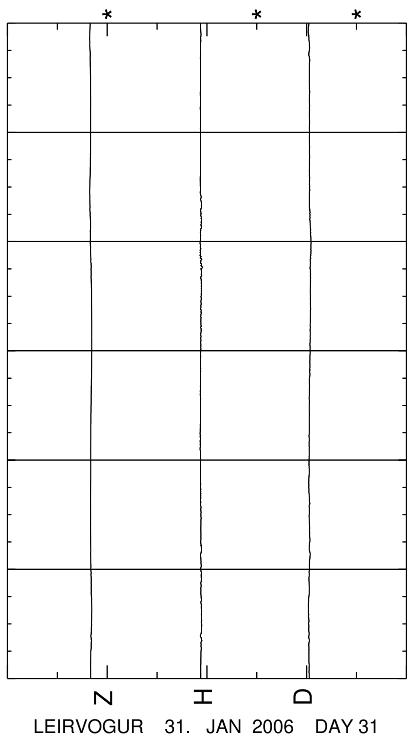
LEIRVOGUR 30. JAN 2006 DAY 30



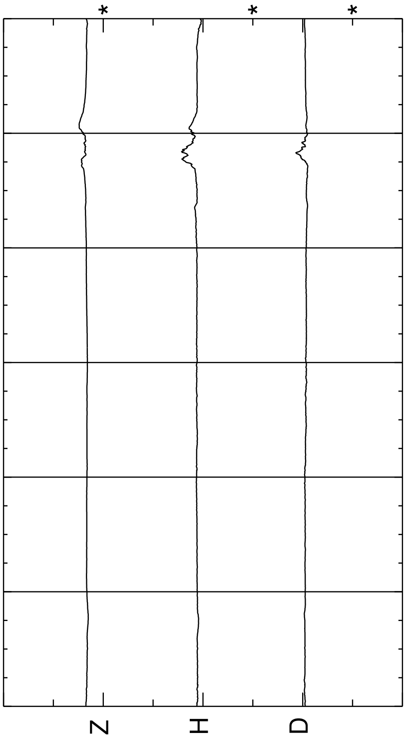
LEIRVOGUR 1. FEB 2006 DAY 32



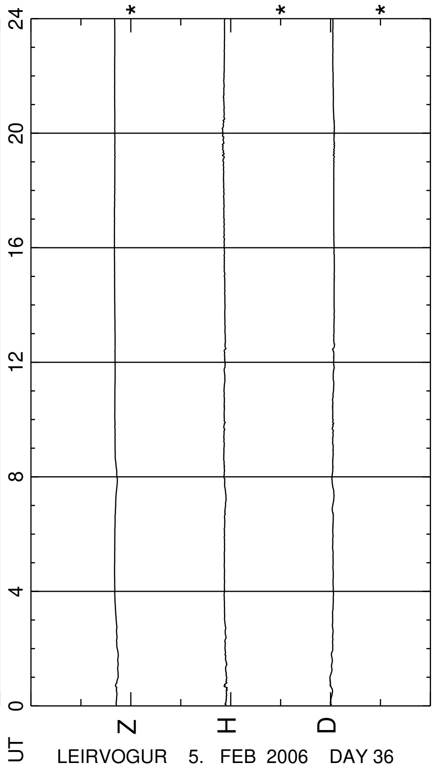
LEIRVOGUR 29. JAN 2006 DAY 29



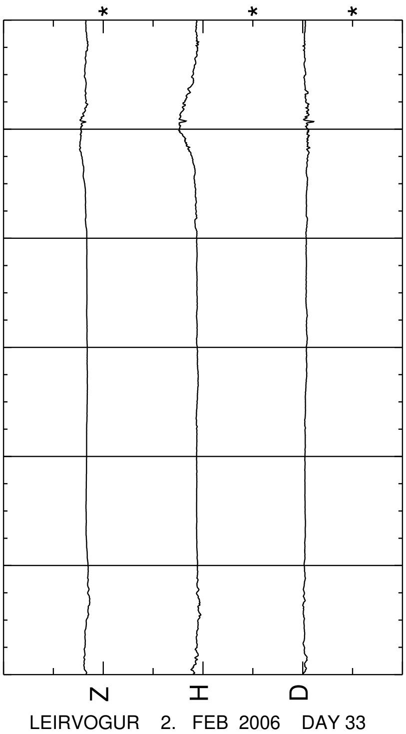
LEIRVOGUR 31. JAN 2006 DAY 31



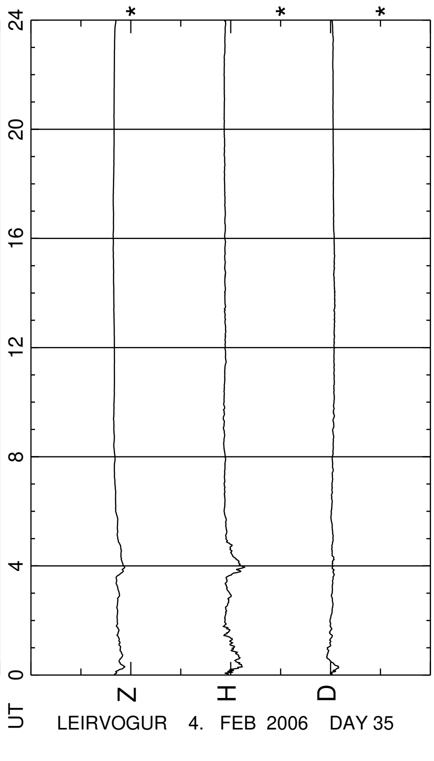
LEIRVOGUR 3. FEB 2006 DAY 34



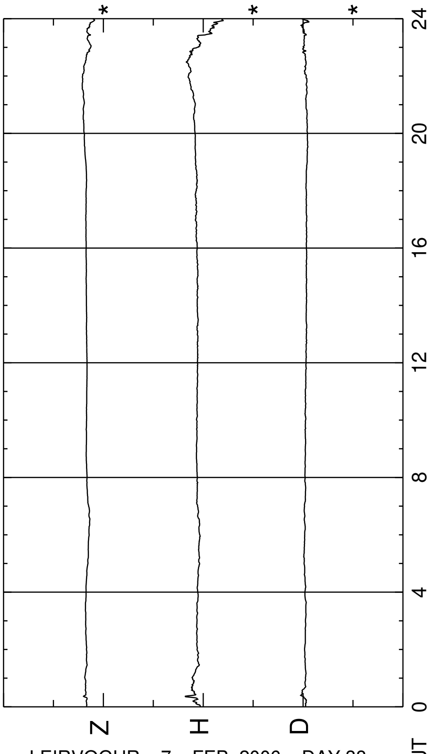
LEIRVOGUR 5. FEB 2006 DAY 36



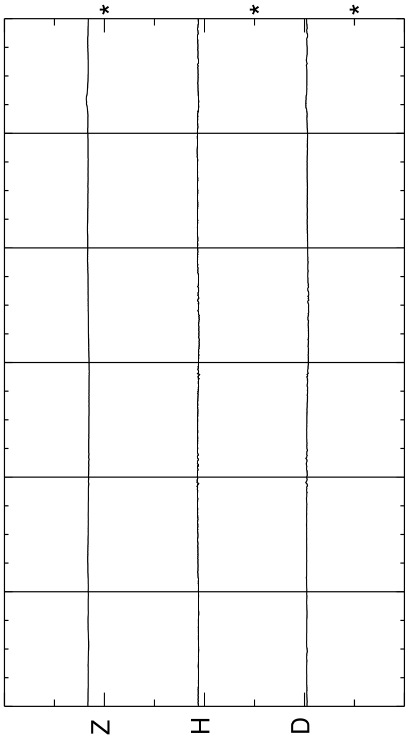
LEIRVOGUR 2. FEB 2006 DAY 33



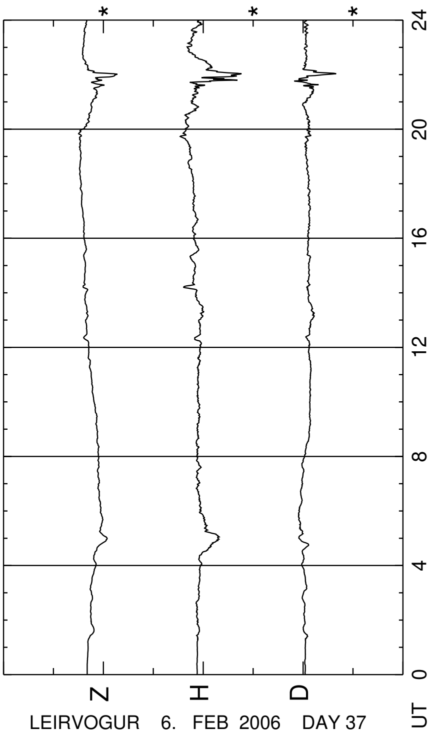
LEIRVOGUR 4. FEB 2006 DAY 35



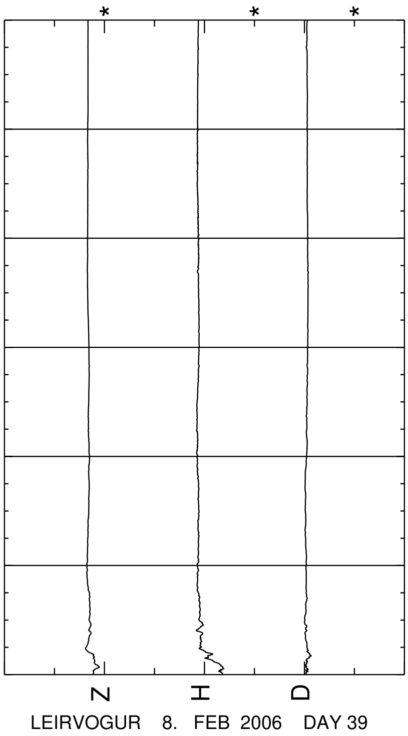
LEIRVOGUR 7. FEB 2006 DAY 38



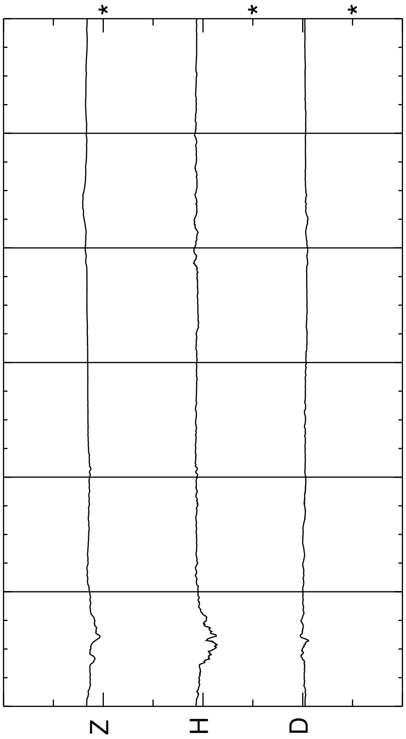
LEIRVOGUR 9. FEB 2006 DAY 40



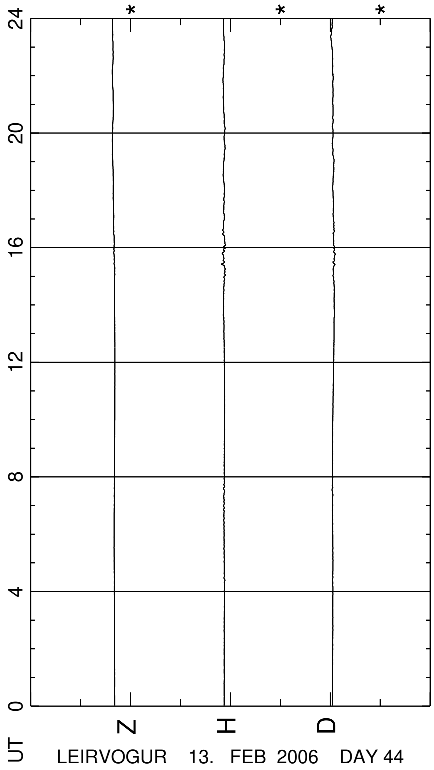
LEIRVOGUR 6. FEB 2006 DAY 37



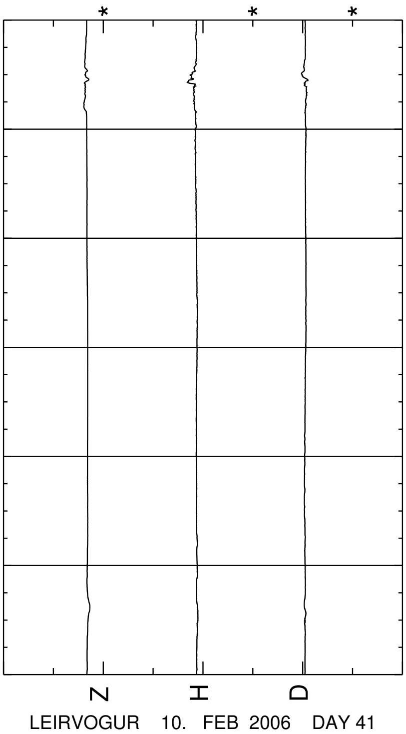
LEIRVOGUR 8. FEB 2006 DAY 39



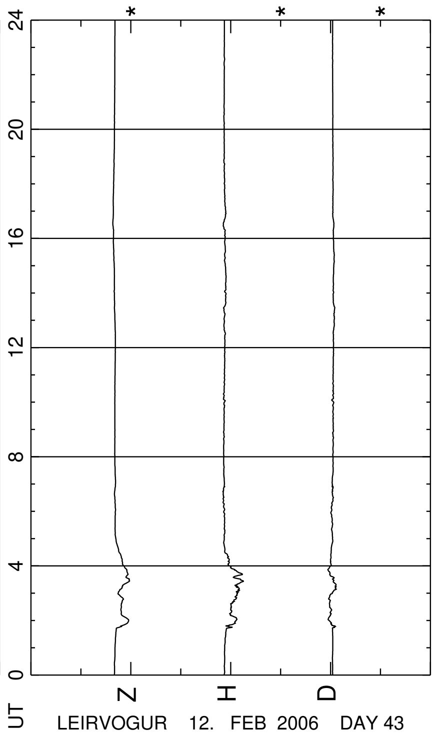
LEIRVOGUR 11. FEB 2006 DAY 42



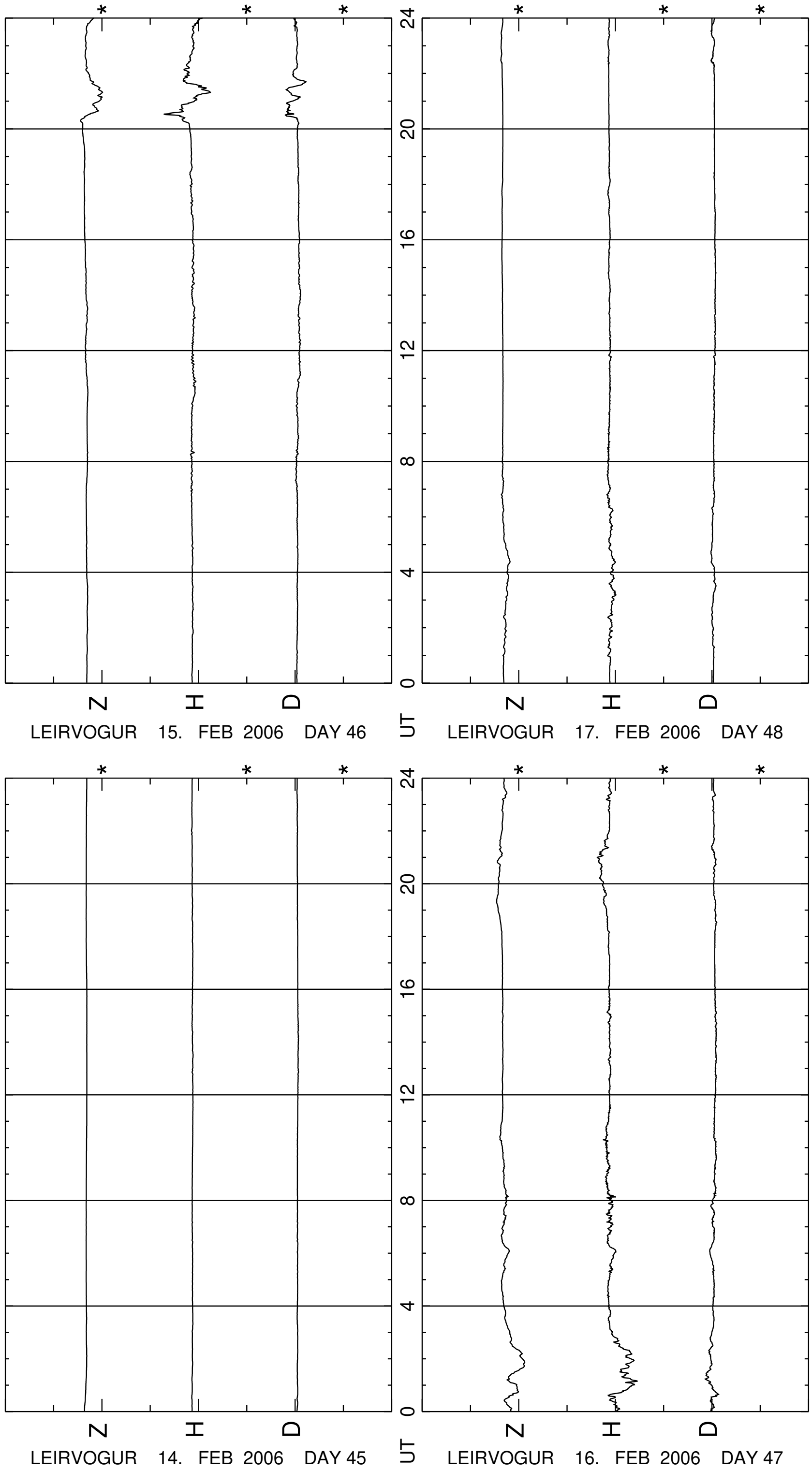
LEIRVOGUR 13. FEB 2006 DAY 44



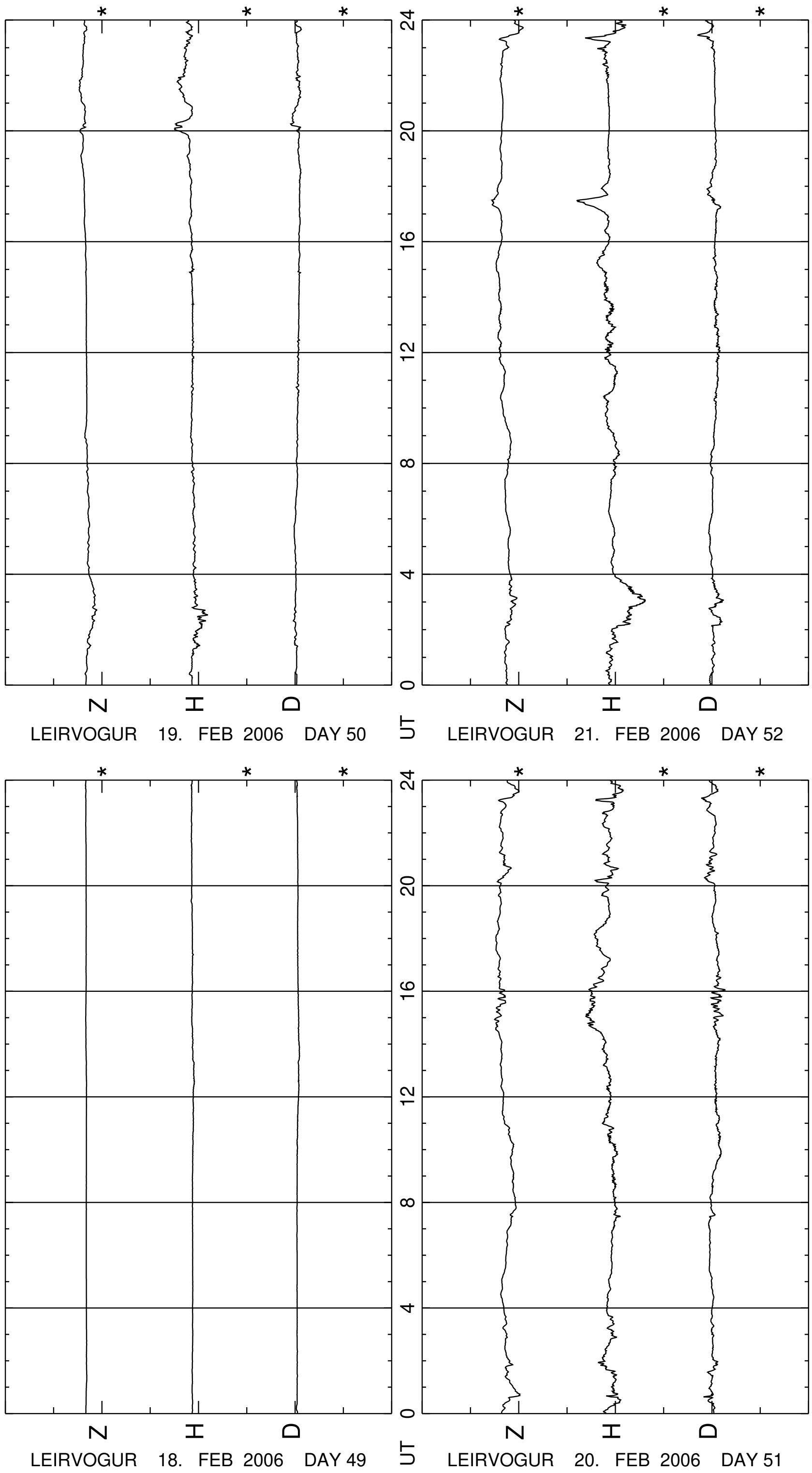
LEIRVOGUR 10. FEB 2006 DAY 41

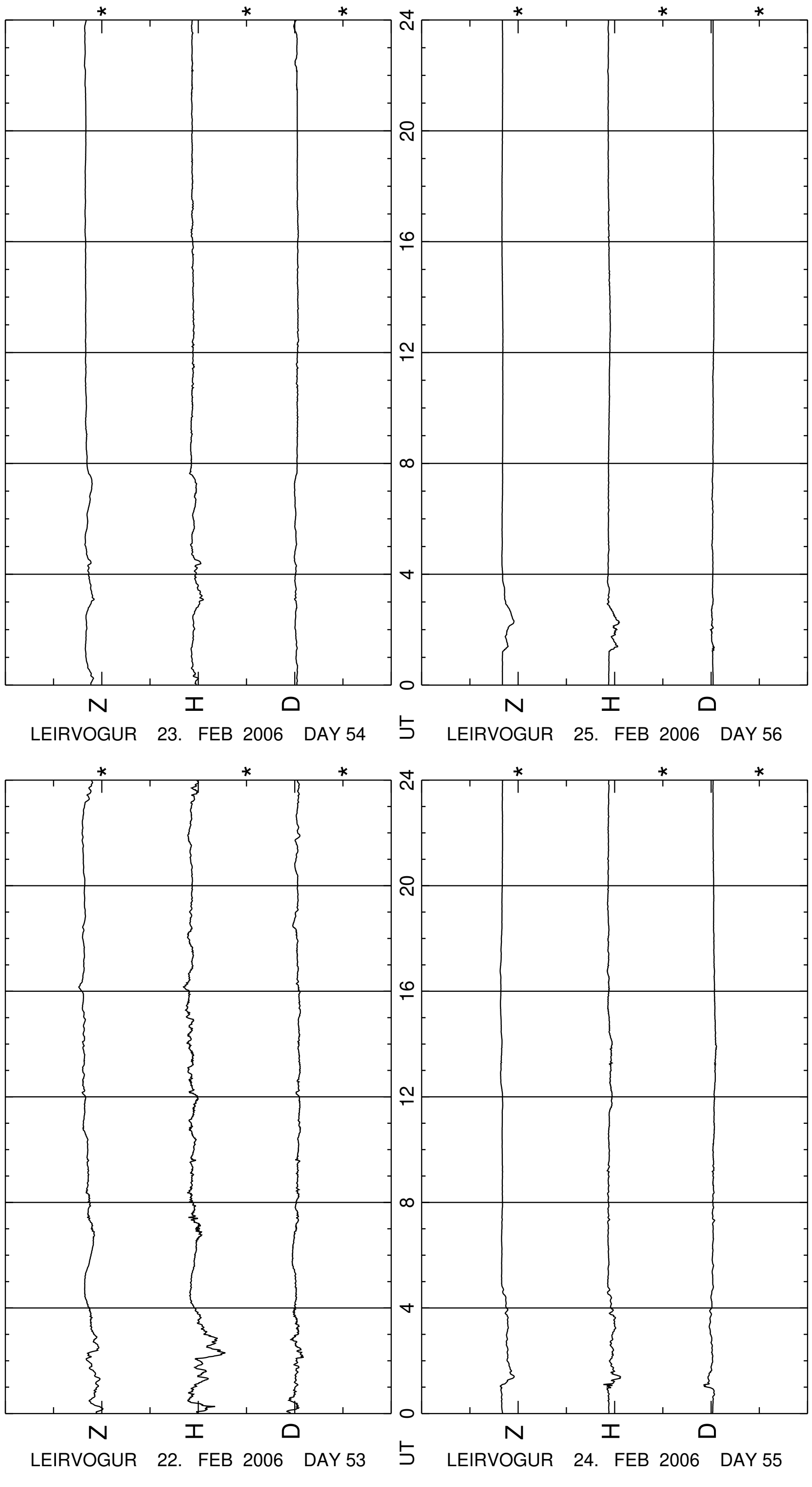


LEIRVOGUR 12. FEB 2006 DAY 43



Z H D
UT
0 4 8 12 16 20 24
LEIRVOGUR 15. FEB 2006 DAY 46
LEIRVOGUR 17. FEB 2006 DAY 48
LEIRVOGUR 14. FEB 2006 DAY 45
LEIRVOGUR 16. FEB 2006 DAY 47


Z H D
LEIRVOGUR 19. FEB 2006 DAY 50
UT
Z H D
LEIRVOGUR 21. FEB 2006 DAY 52
Z H D
LEIRVOGUR 18. FEB 2006 DAY 49
UT
Z H D
LEIRVOGUR 20. FEB 2006 DAY 51
0
4
8
12
16
20
24


LEIRVOGUR 23. FEB 2006 DAY 54
LEIRVOGUR 25. FEB 2006 DAY 56
LEIRVOGUR 22. FEB 2006 DAY 53
LEIRVOGUR 24. FEB 2006 DAY 55
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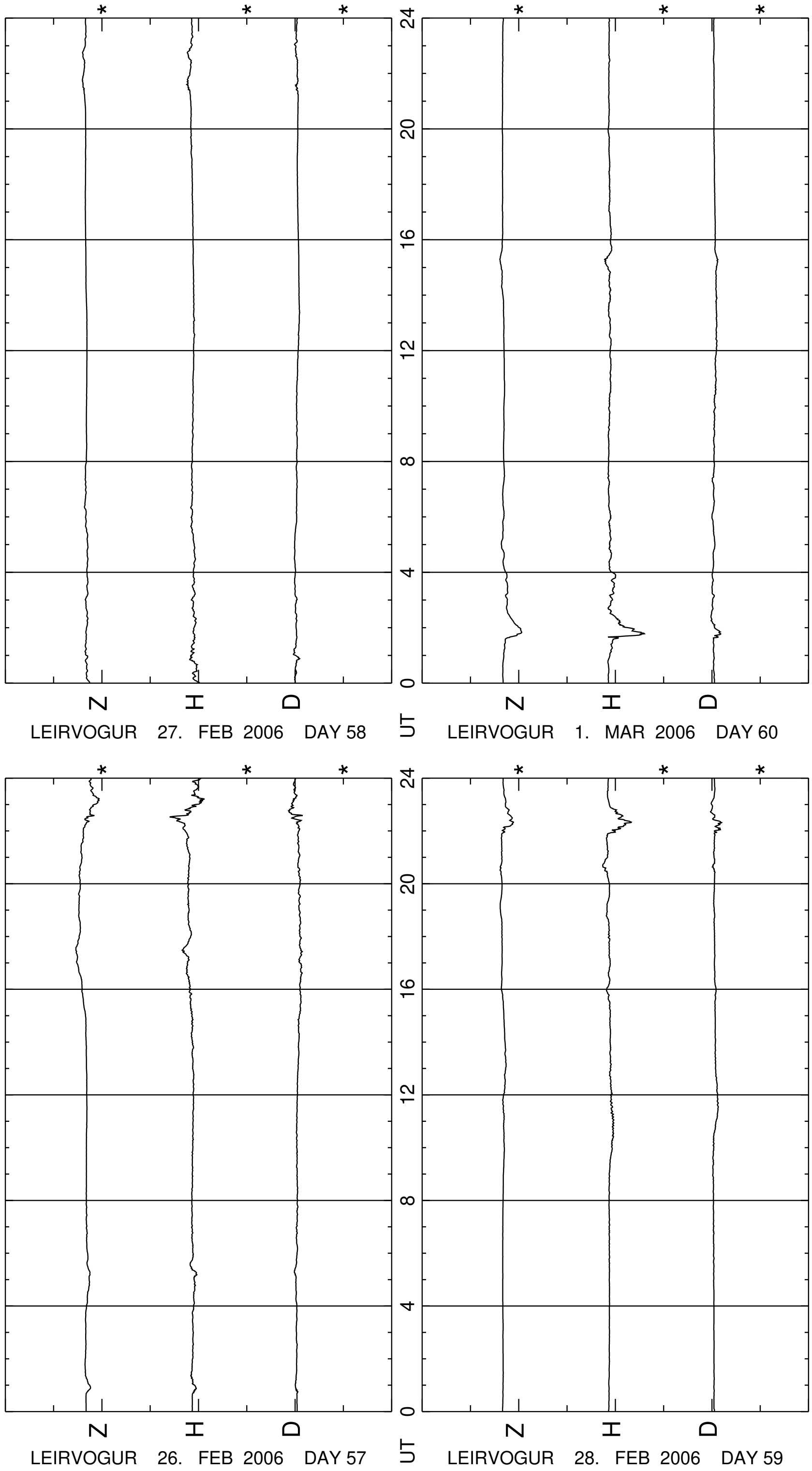
LEIRVOGUR 27. FEB 2006 DAY 58
LEIRVOGUR 1. MAR 2006 DAY 60
LEIRVOGUR 26. FEB 2006 DAY 57
LEIRVOGUR 28. FEB 2006 DAY 59
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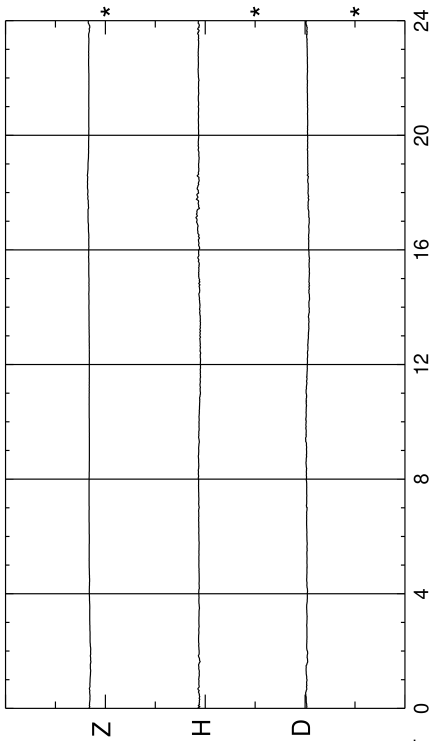
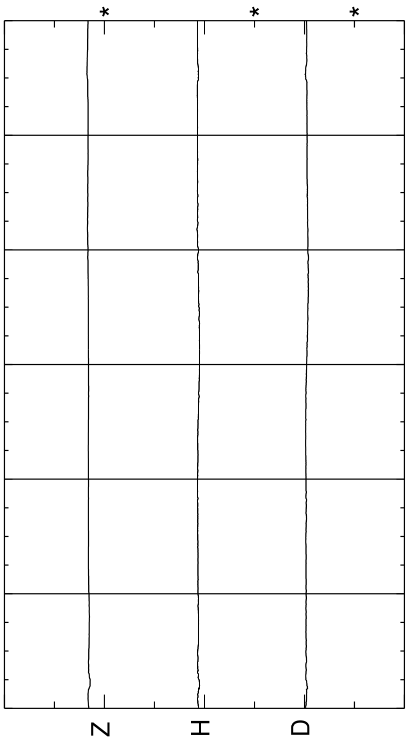
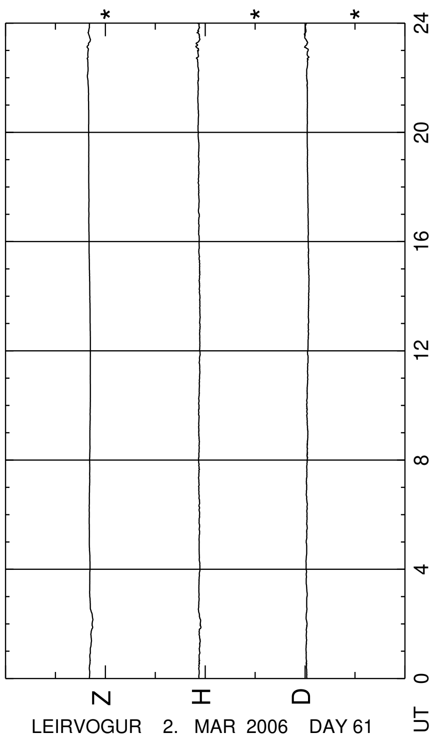


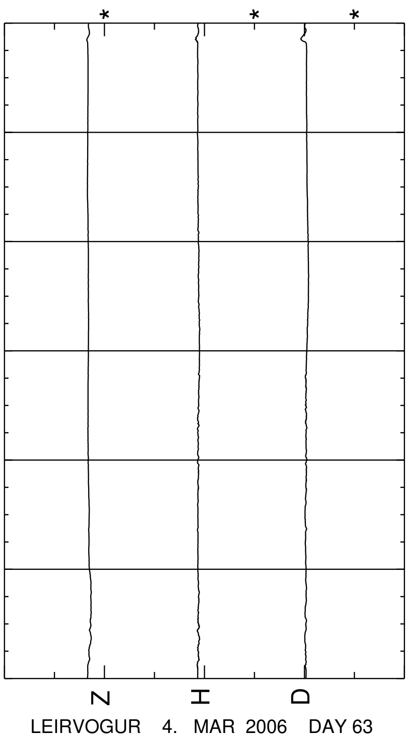
LEIRVOGUR 3. MAR 2006 DAY 62



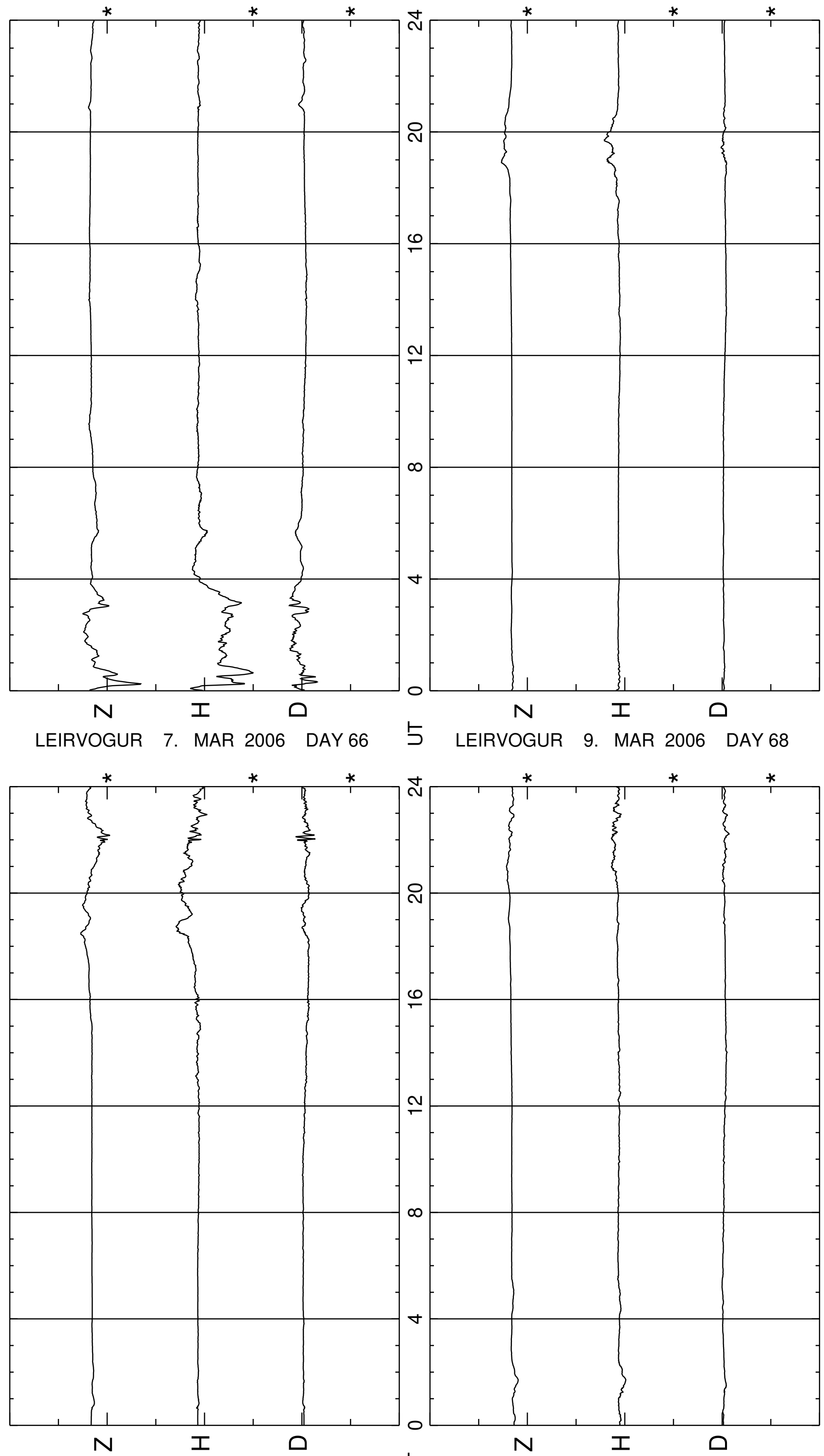
LEIRVOGUR 5. MAR 2006 DAY 64



LEIRVOGUR 2. MAR 2006 DAY 61



LEIRVOGUR 4. MAR 2006 DAY 63


LEIRVOGUR 7. MAR 2006 DAY 66
LEIRVOGUR 9. MAR 2006 DAY 68
LEIRVOGUR 6. MAR 2006 DAY 65
LEIRVOGUR 8. MAR 2006 DAY 67
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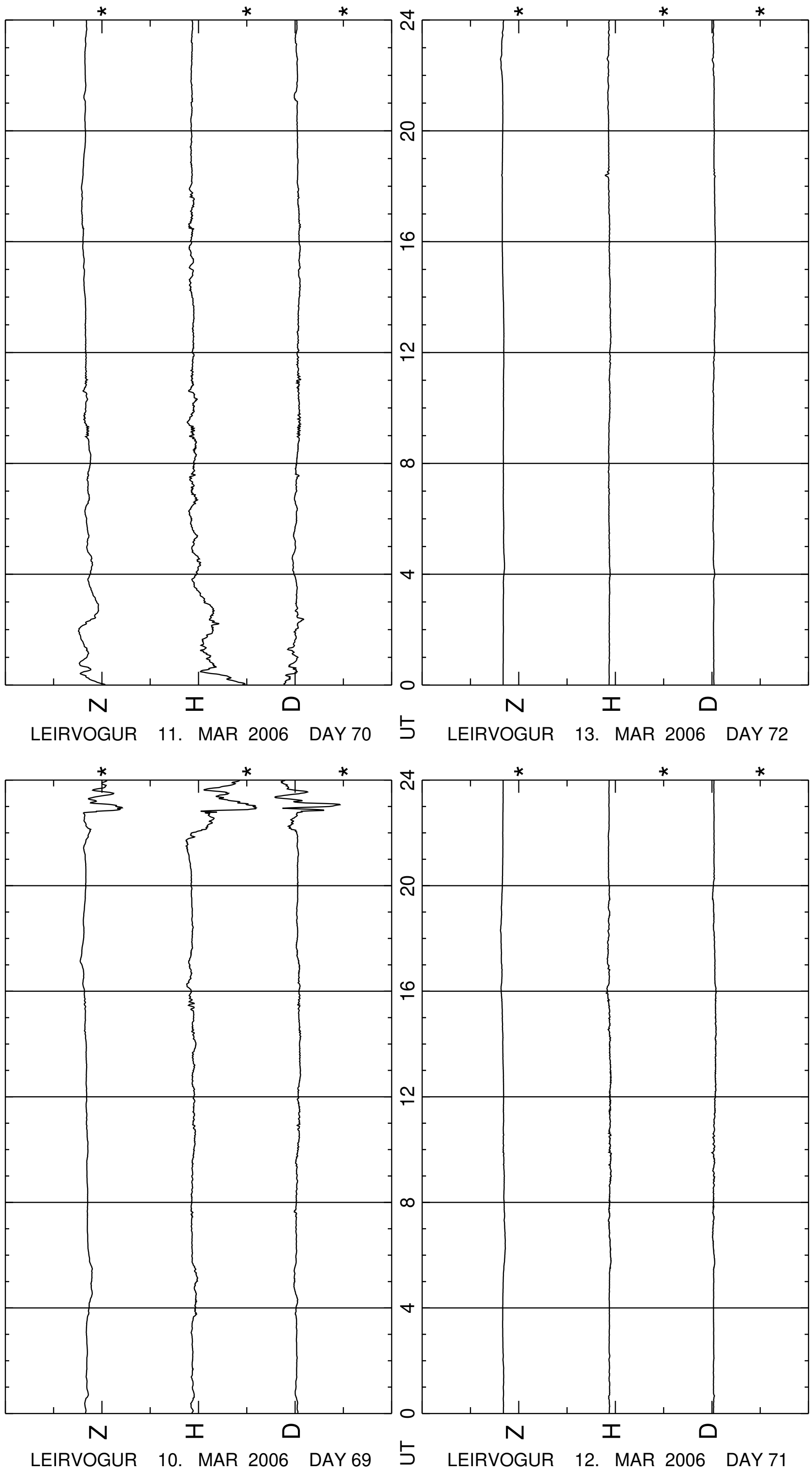
LEIRVOGUR 11. MAR 2006 DAY 70
LEIRVOGUR 13. MAR 2006 DAY 72
LEIRVOGUR 10. MAR 2006 DAY 69
LEIRVOGUR 12. MAR 2006 DAY 71
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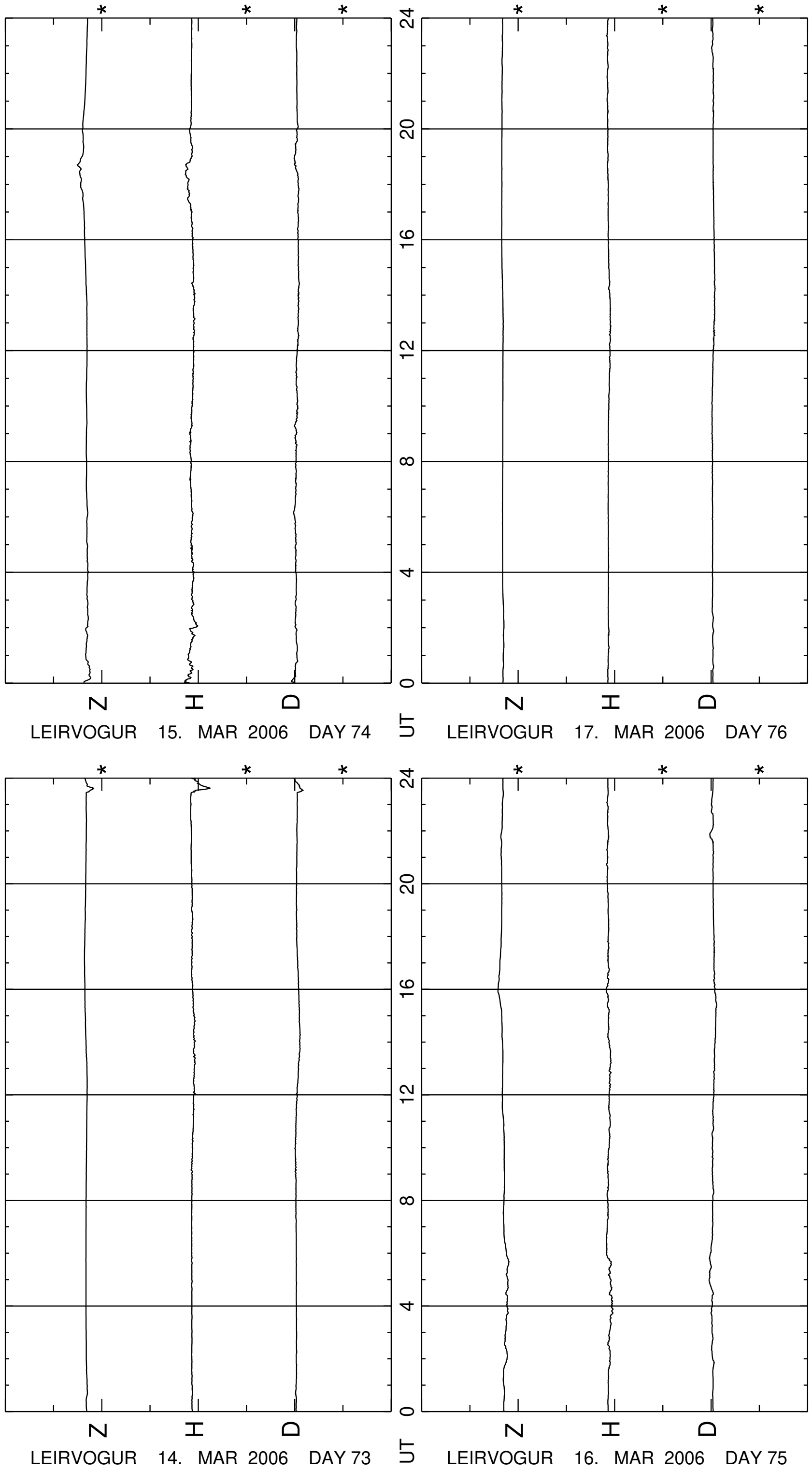
LEIRVOGUR 15. MAR 2006 DAY 74
LEIRVOGUR 17. MAR 2006 DAY 76
LEIRVOGUR 14. MAR 2006 DAY 73
LEIRVOGUR 16. MAR 2006 DAY 75
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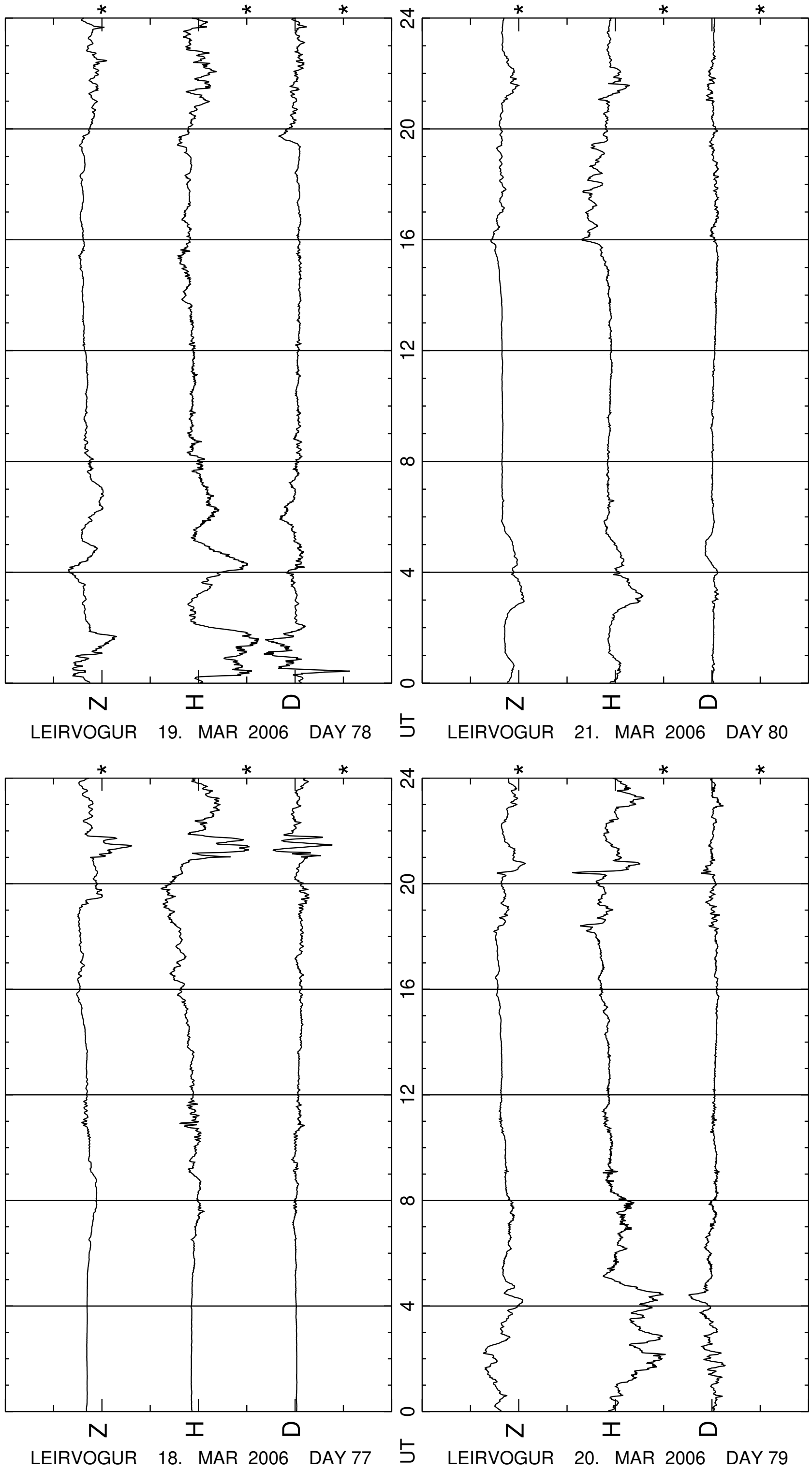
LEIRVOGUR 19. MAR 2006 DAY 78
LEIRVOGUR 21. MAR 2006 DAY 80
LEIRVOGUR 18. MAR 2006 DAY 77
LEIRVOGUR 20. MAR 2006 DAY 79
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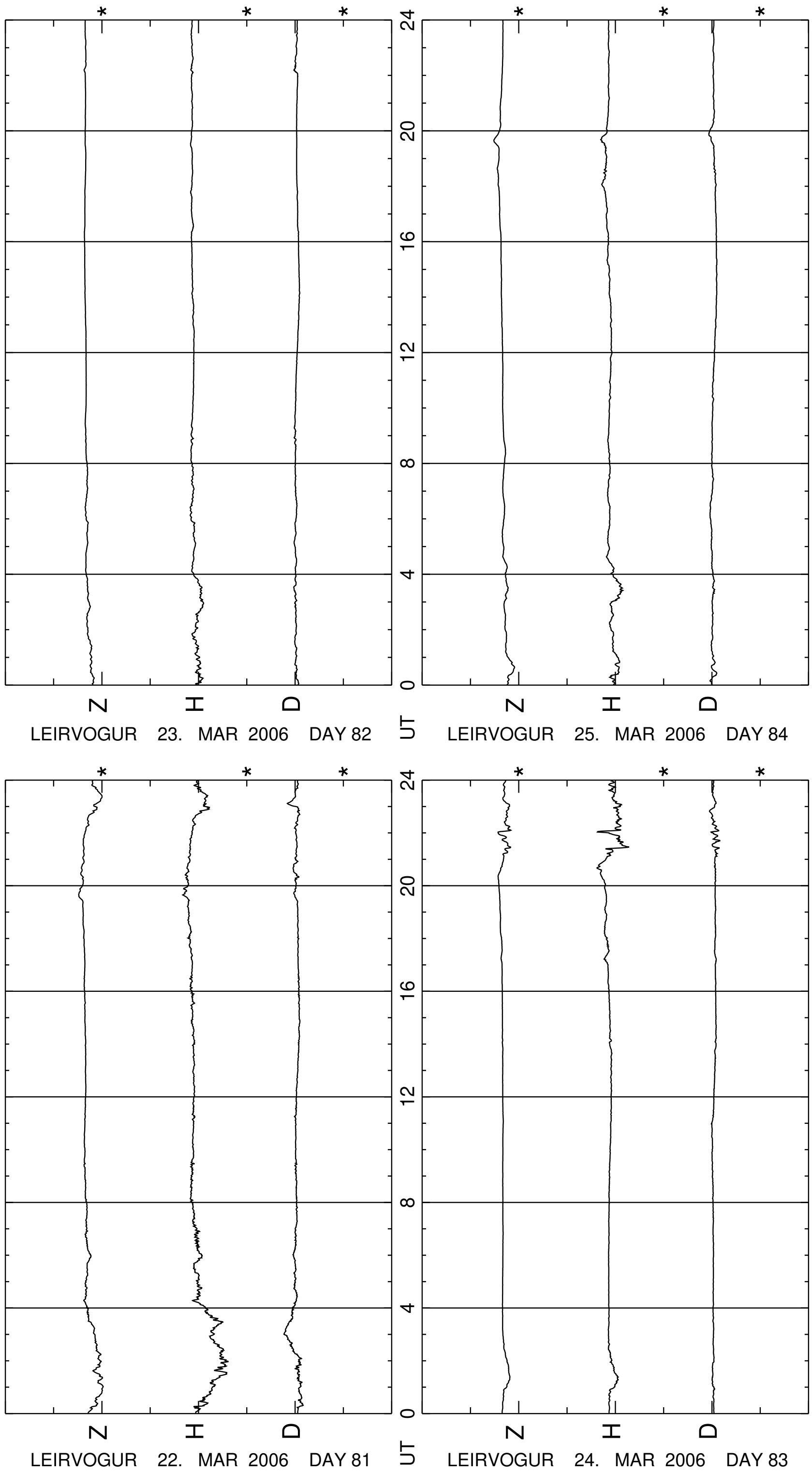
LEIRVOGUR 23. MAR 2006 DAY 82
LEIRVOGUR 25. MAR 2006 DAY 84
LEIRVOGUR 22. MAR 2006 DAY 81
LEIRVOGUR 24. MAR 2006 DAY 83
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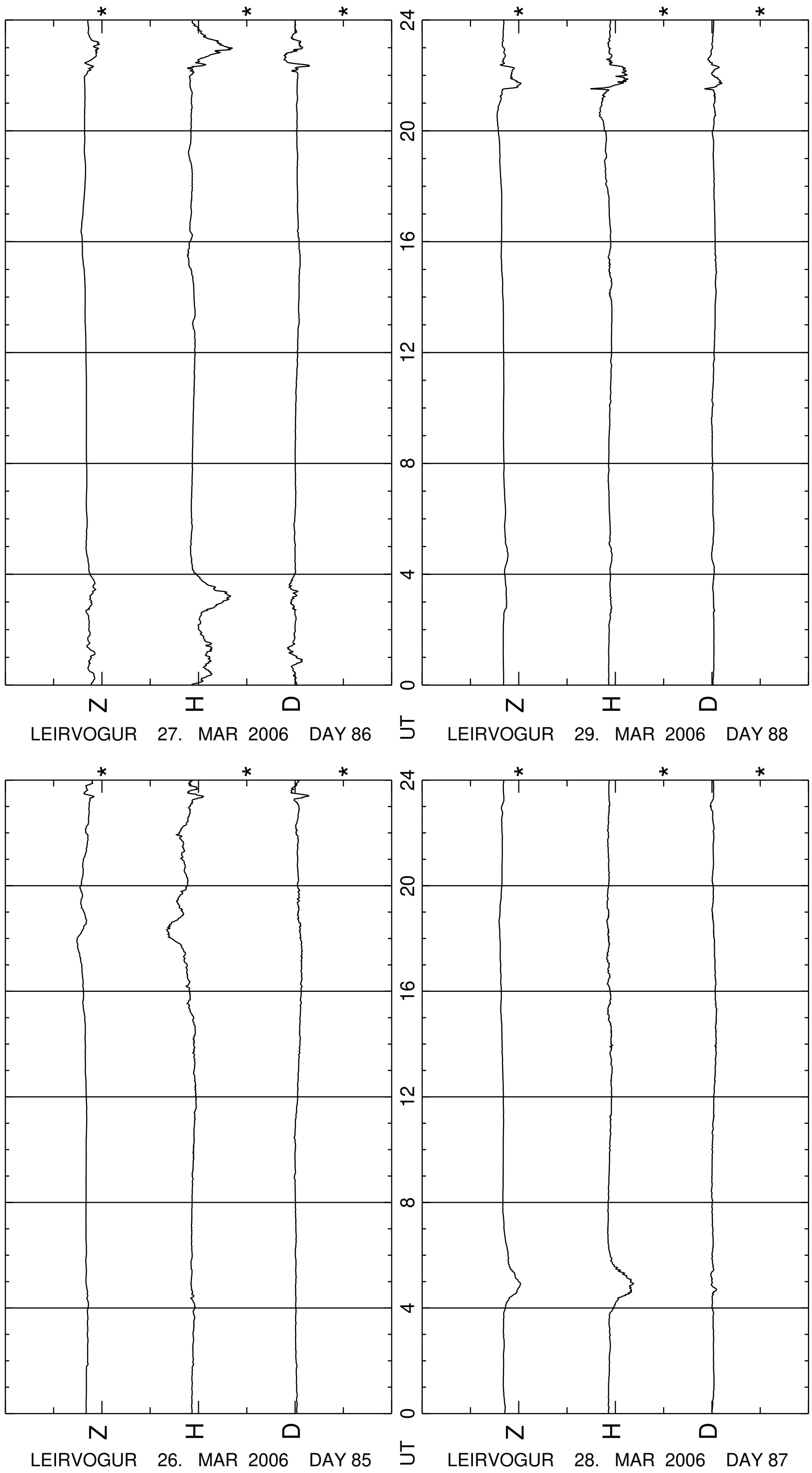
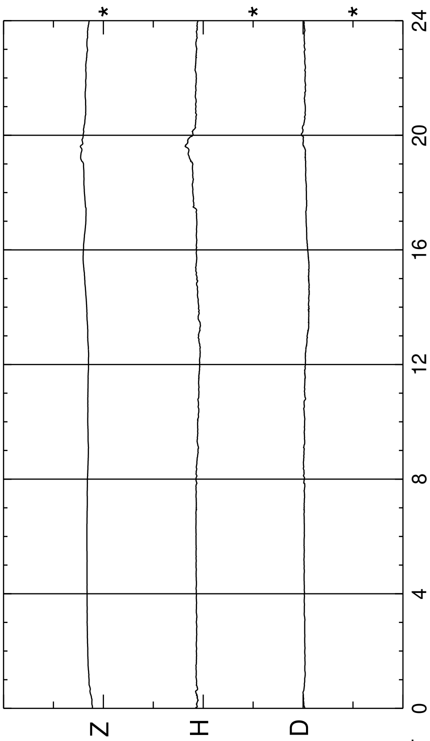
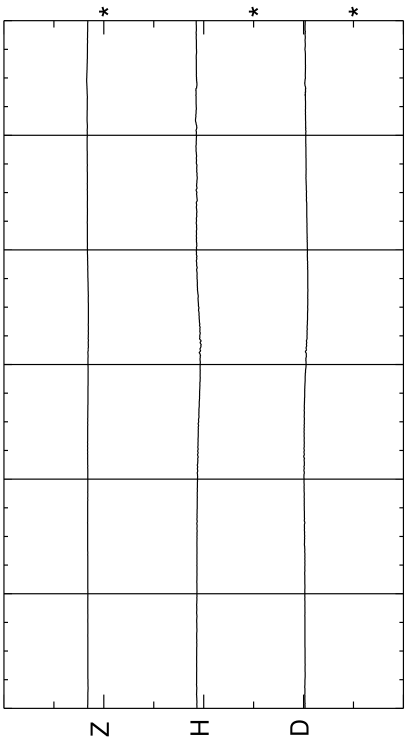
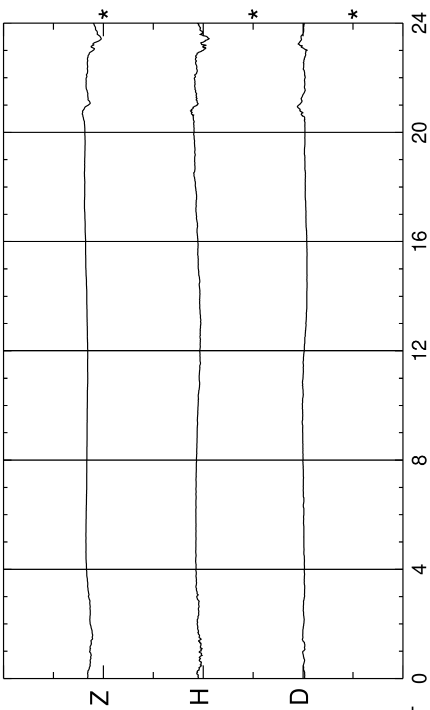

Z H D
LEIRVOGUR 27. MAR 2006 DAY 86
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 29. MAR 2006 DAY 88
Z H D
LEIRVOGUR 26. MAR 2006 DAY 85
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 28. MAR 2006 DAY 87



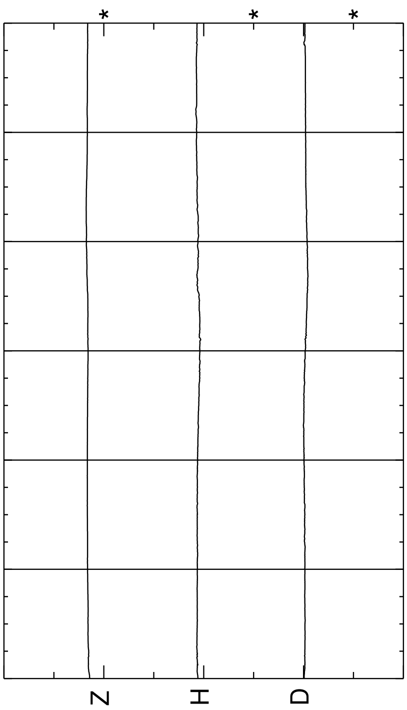
LEIRVOGUR 31. MAR 2006 DAY 90



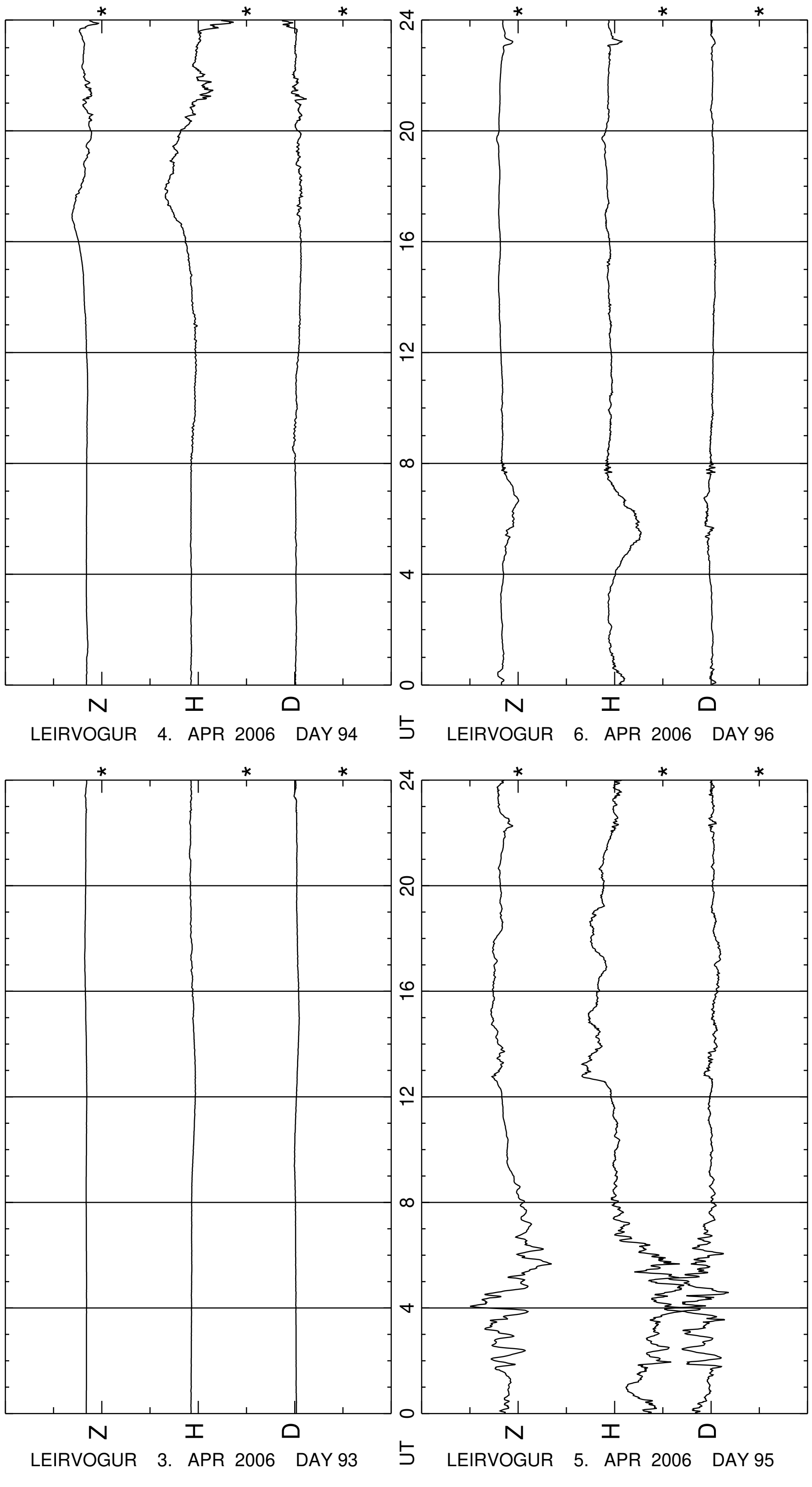
LEIRVOGUR 2. APR 2006 DAY 92



LEIRVOGUR 30. MAR 2006 DAY 89



LEIRVOGUR 1. APR 2006 DAY 91


LEIRVOGUR 4. APR 2006 DAY 94
LEIRVOGUR 6. APR 2006 DAY 96
LEIRVOGUR 3. APR 2006 DAY 93
LEIRVOGUR 5. APR 2006 DAY 95
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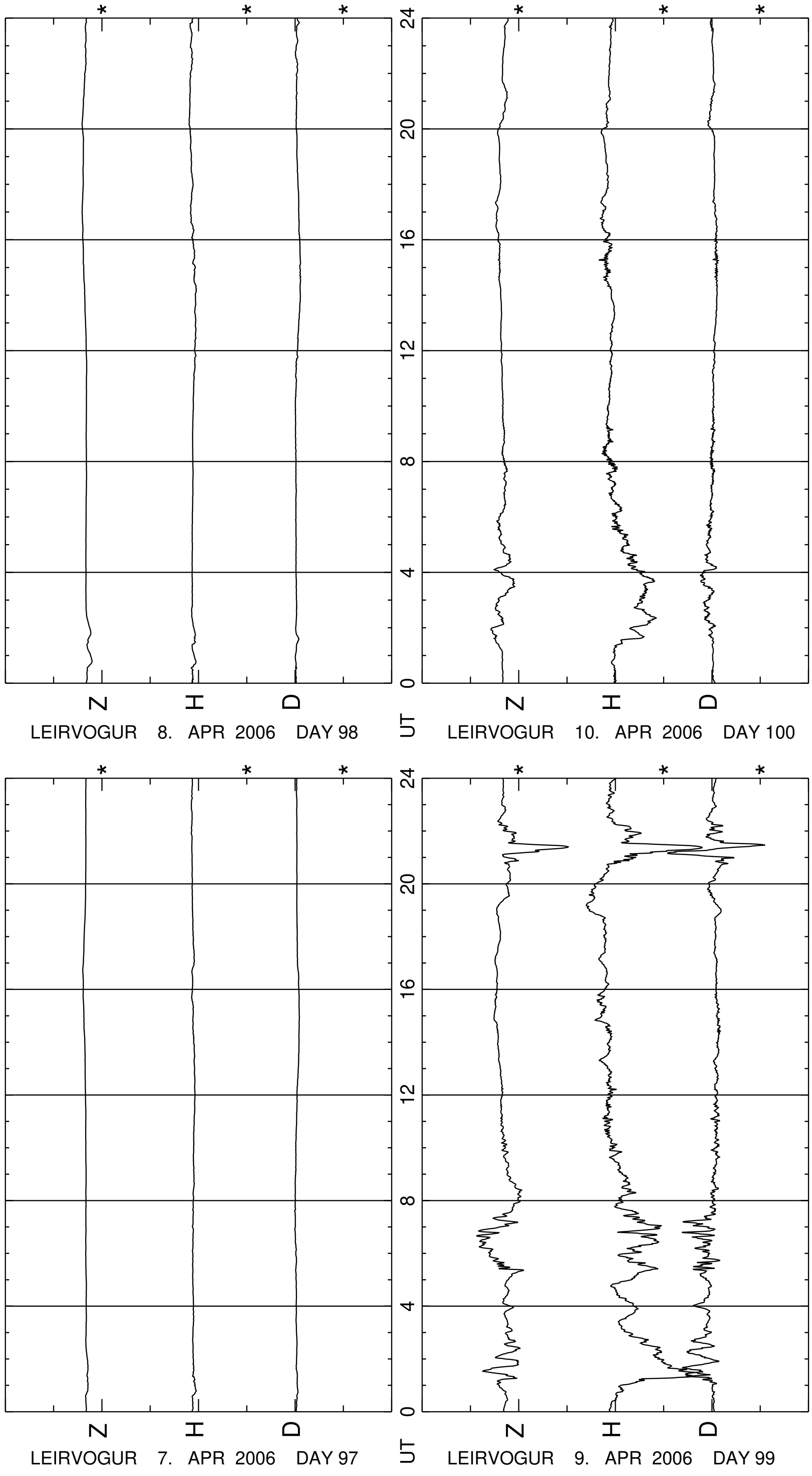

LEIRVOGUR 8. APR 2006 DAY 98
LEIRVOGUR 10. APR 2006 DAY 100
LEIRVOGUR 7. APR 2006 DAY 97
LEIRVOGUR 9. APR 2006 DAY 99
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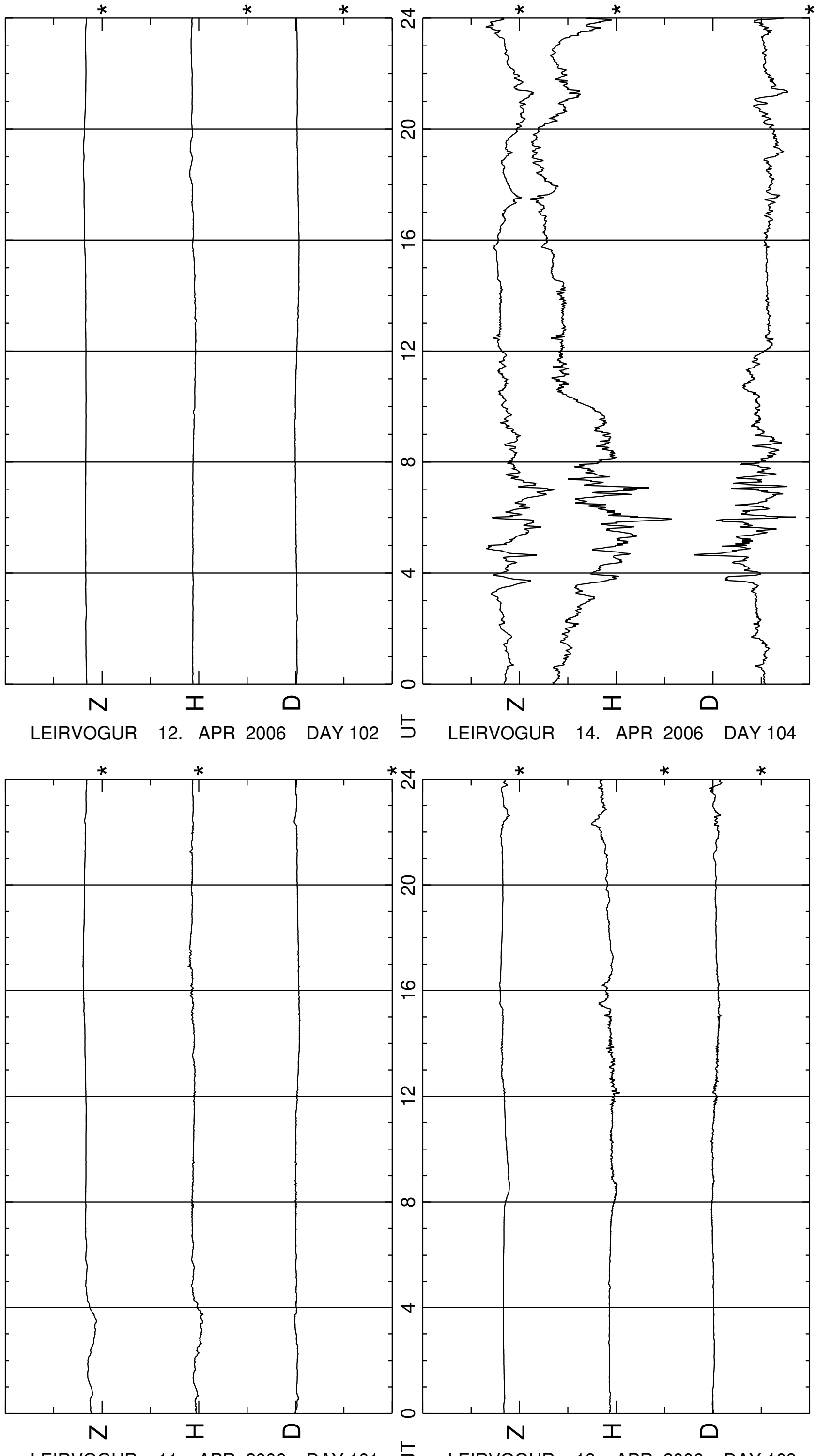
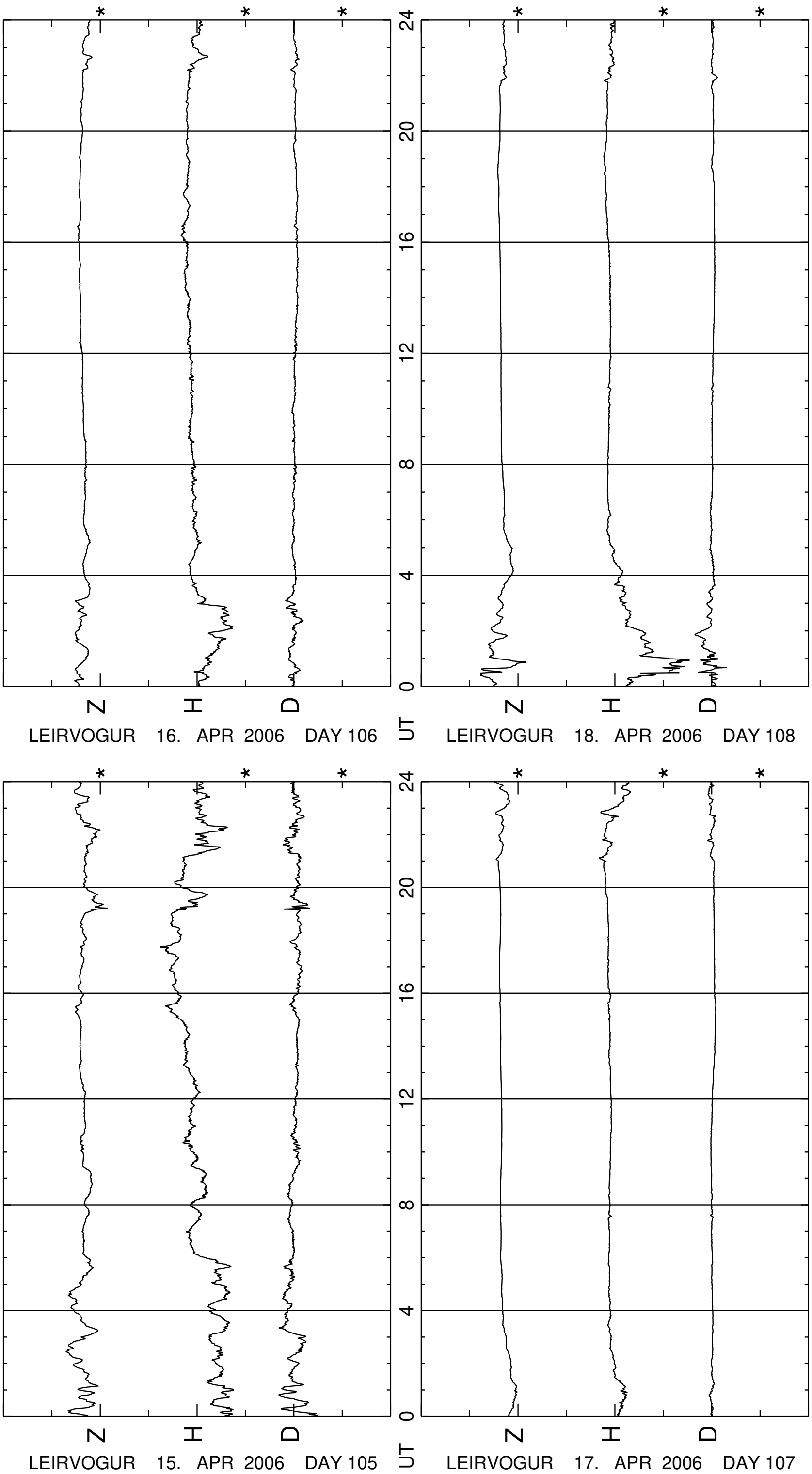


LEIRVOGUR 12. APR 2006 DAY 102

LEIRVOGUR 14. APR 2006 DAY 104

LEIRVOGUR 11. APR 2006 DAY 101

LEIRVOGUR 13. APR 2006 DAY 103


LEIRVOGUR 16. APR 2006 DAY 106
LEIRVOGUR 18. APR 2006 DAY 108
LEIRVOGUR 15. APR 2006 DAY 105
LEIRVOGUR 17. APR 2006 DAY 107
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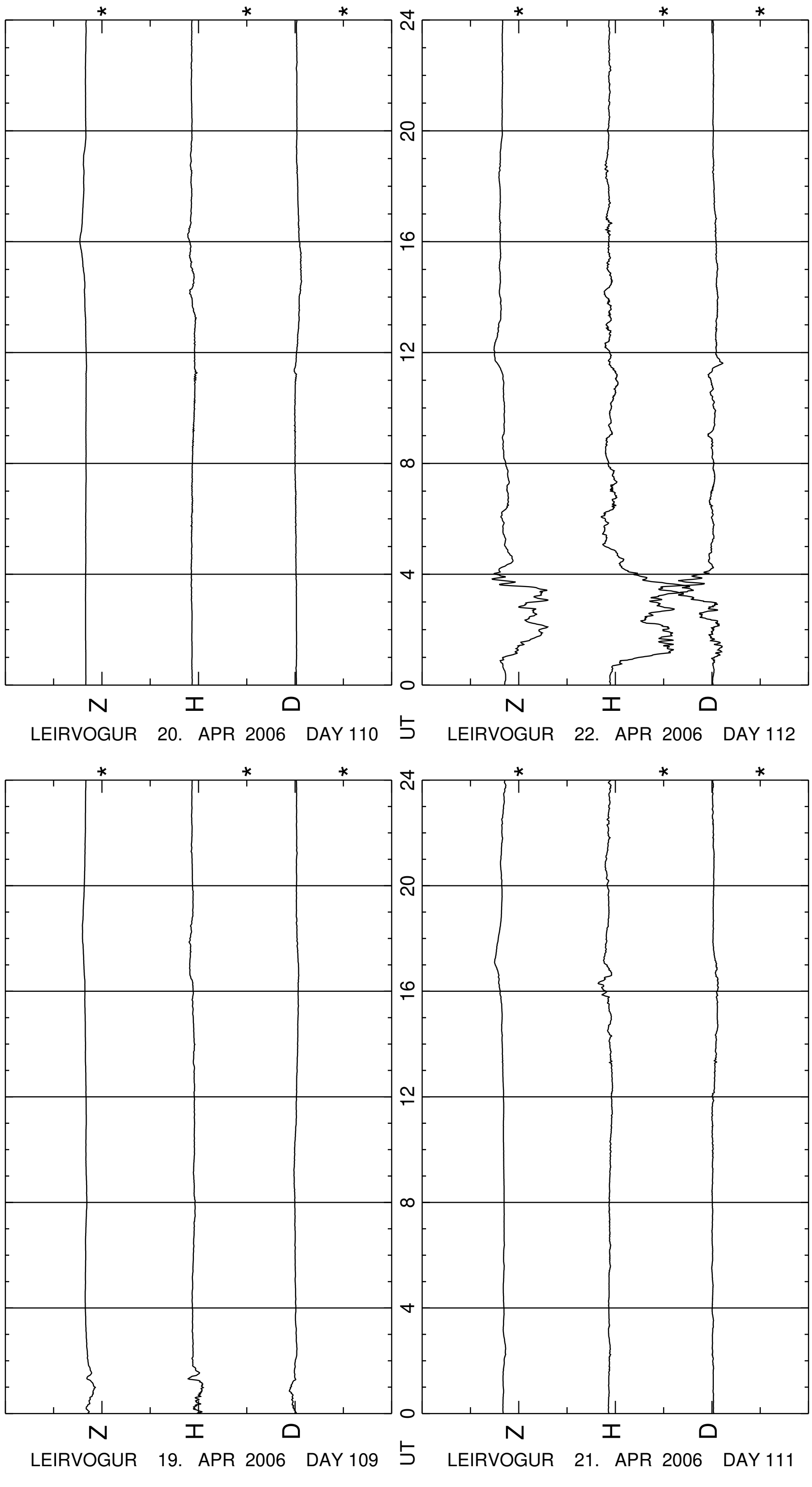
LEIRVOGUR 20. APR 2006 DAY 110
LEIRVOGUR 22. APR 2006 DAY 112
LEIRVOGUR 19. APR 2006 DAY 109
LEIRVOGUR 21. APR 2006 DAY 111
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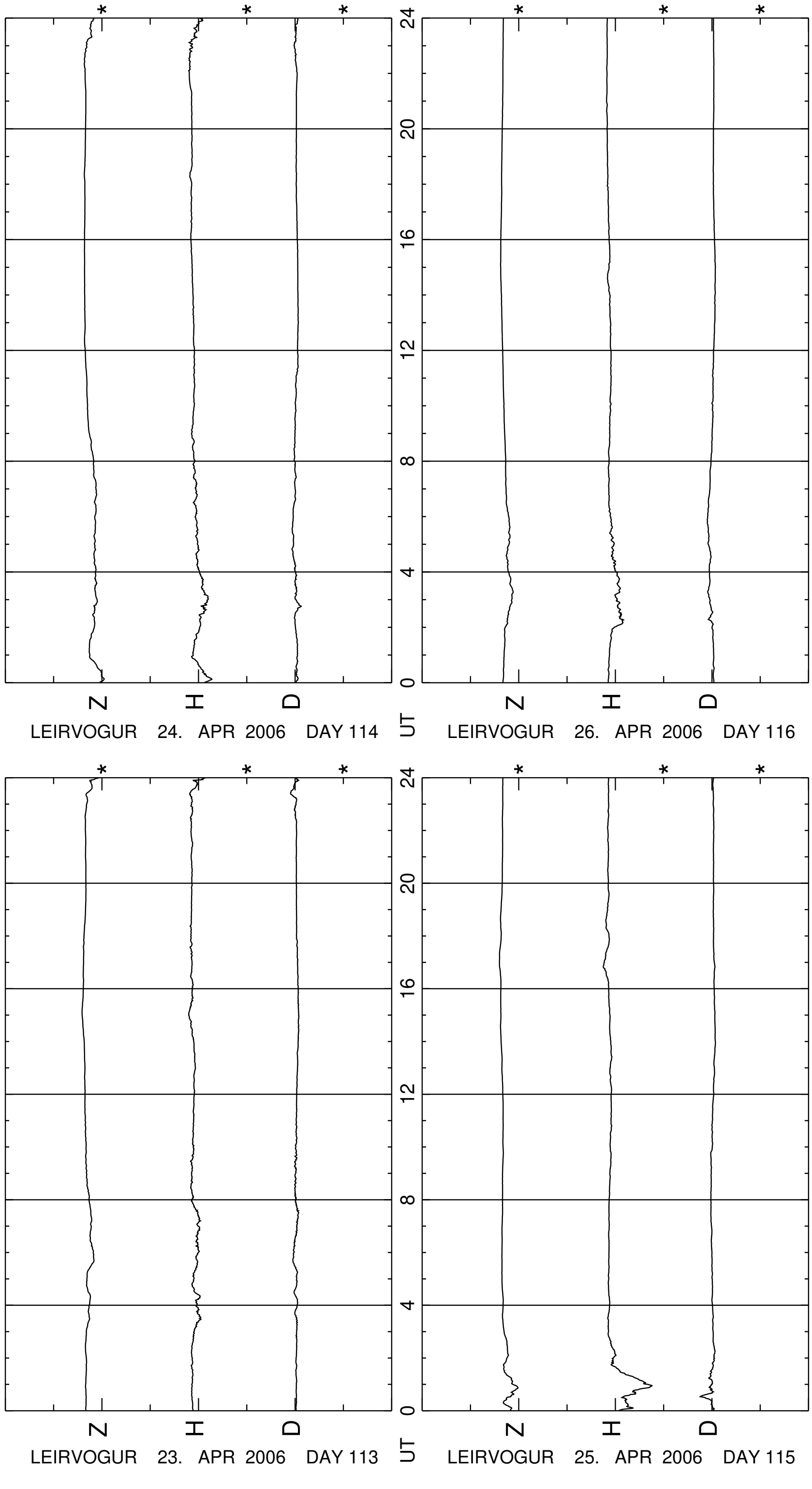
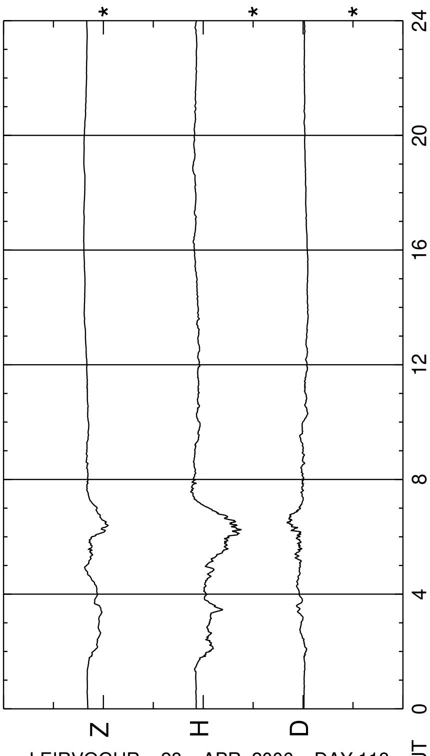
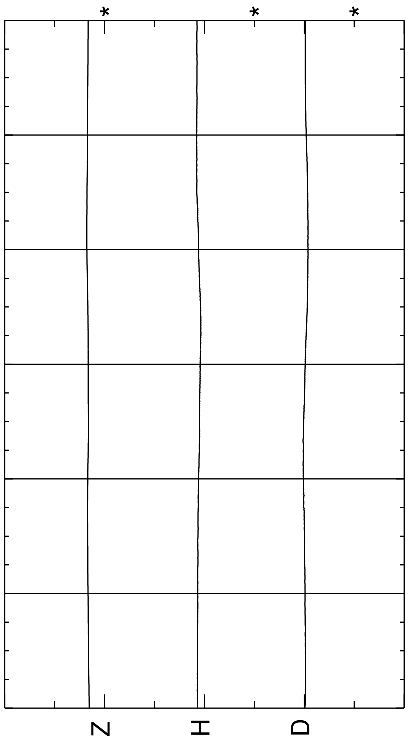
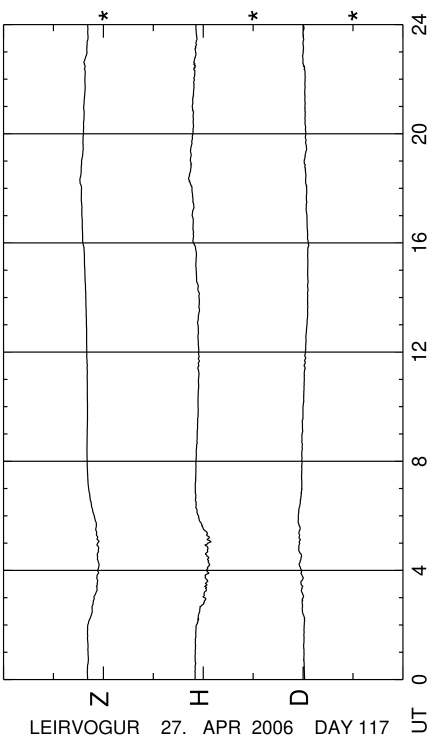

Z H D
LEIRVOGUR 24. APR 2006 DAY 114
UT
LEIRVOGUR 26. APR 2006 DAY 116
LEIRVOGUR 23. APR 2006 DAY 113
LEIRVOGUR 25. APR 2006 DAY 115
0 4 8 12 16 20 24



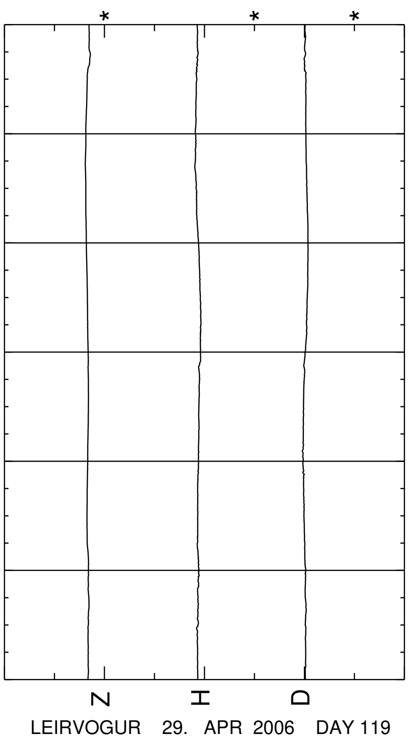
LEIRVOGUR 28. APR 2006 DAY 118



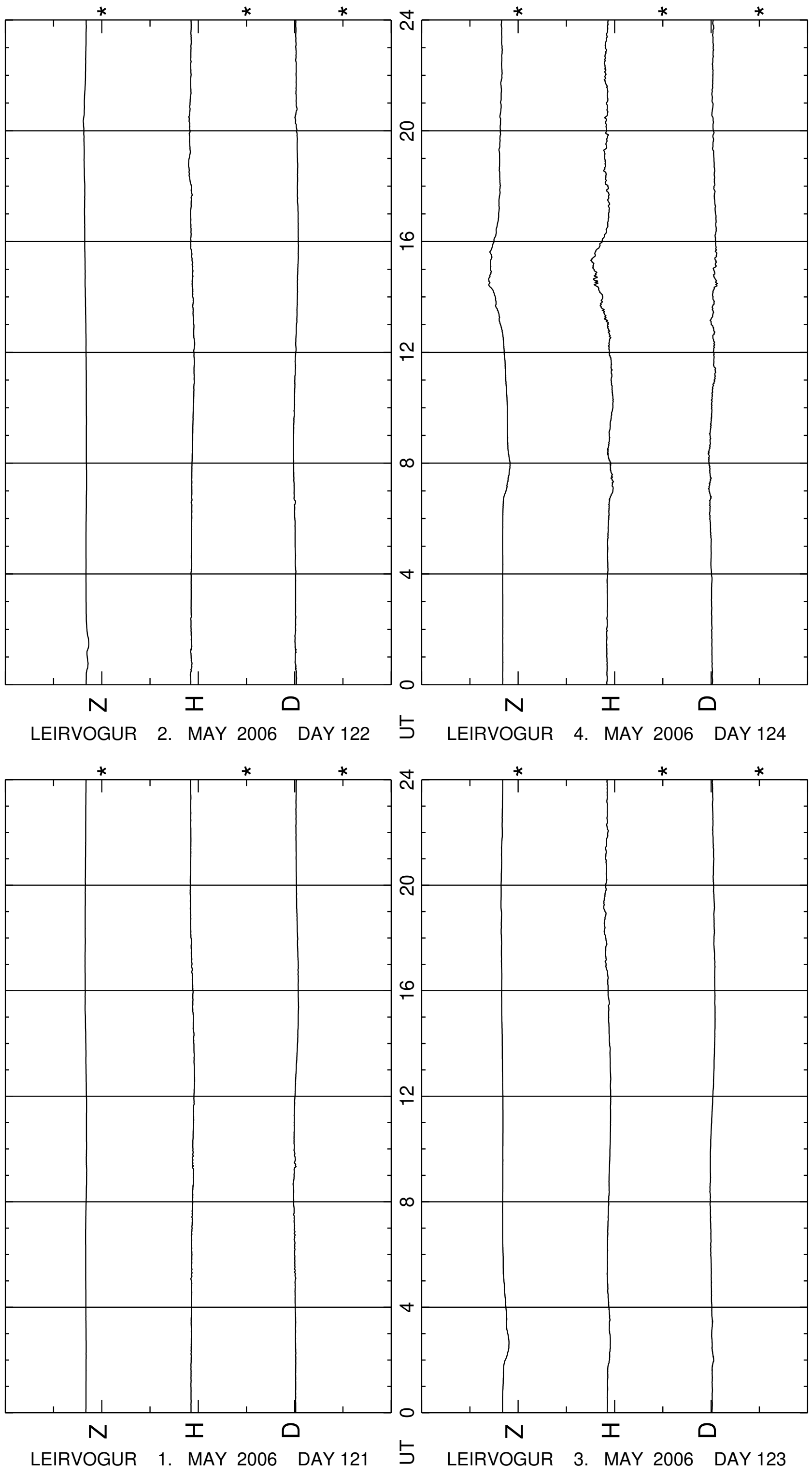
LEIRVOGUR 30. APR 2006 DAY 120



LEIRVOGUR 27. APR 2006 DAY 117



LEIRVOGUR 29. APR 2006 DAY 119


LEIRVOGUR 2. MAY 2006 DAY 122
LEIRVOGUR 4. MAY 2006 DAY 124
LEIRVOGUR 1. MAY 2006 DAY 121
LEIRVOGUR 3. MAY 2006 DAY 123
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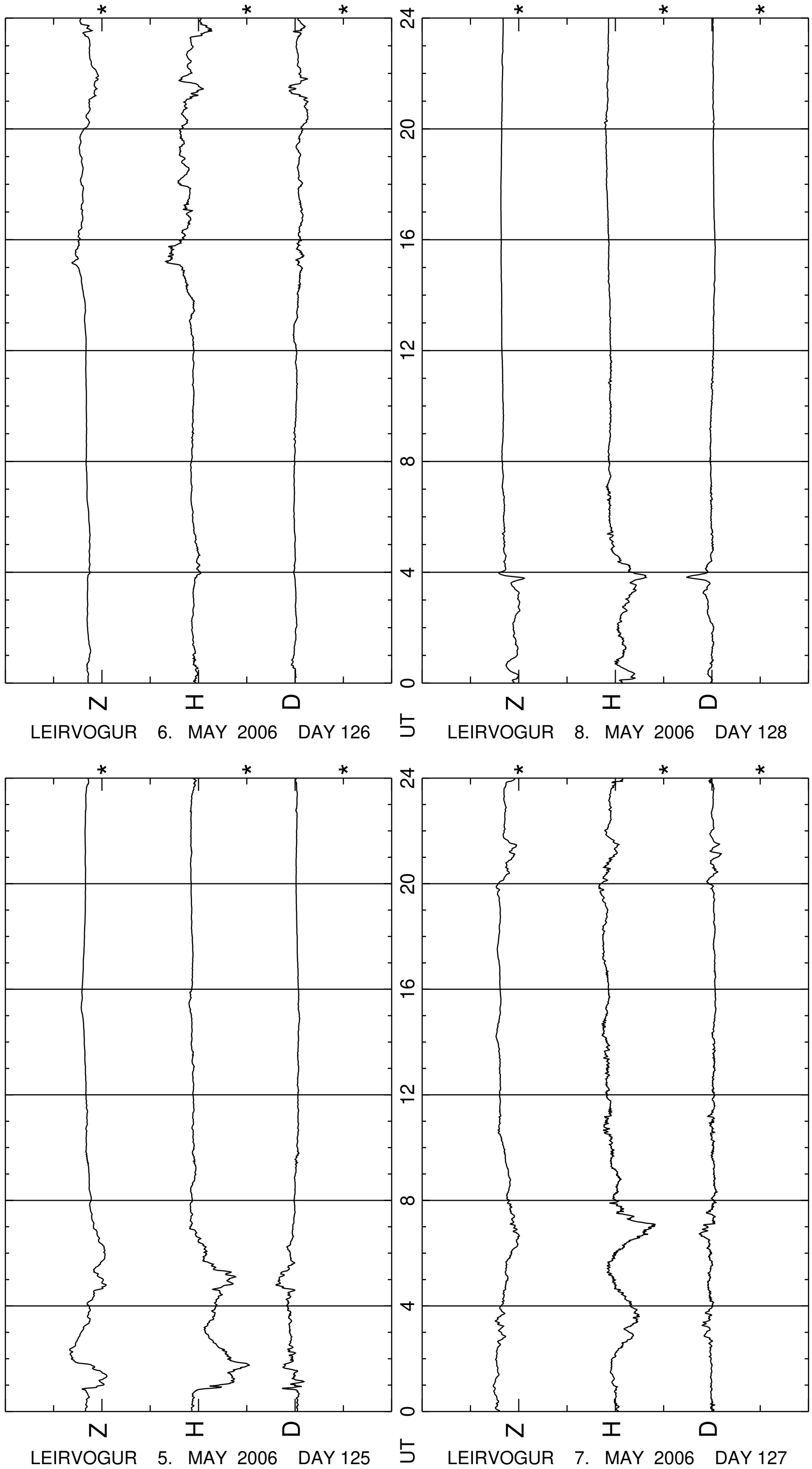
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LEIRVOGUR 6. MAY 2006 DAY 126
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LEIRVOGUR 8. MAY 2006 DAY 128
LEIRVOGUR 5. MAY 2006 DAY 125
LEIRVOGUR 7. MAY 2006 DAY 127
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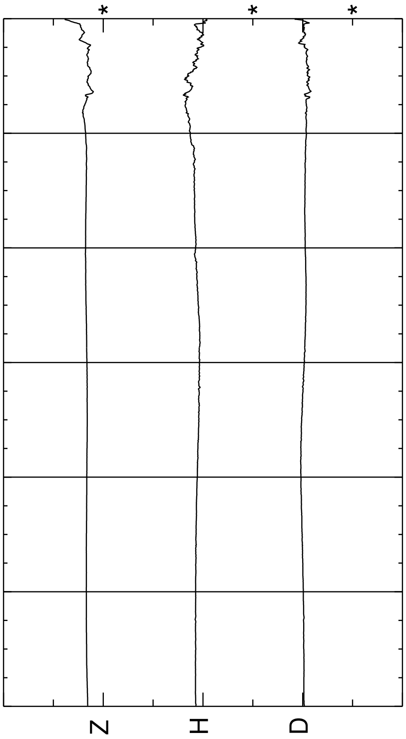
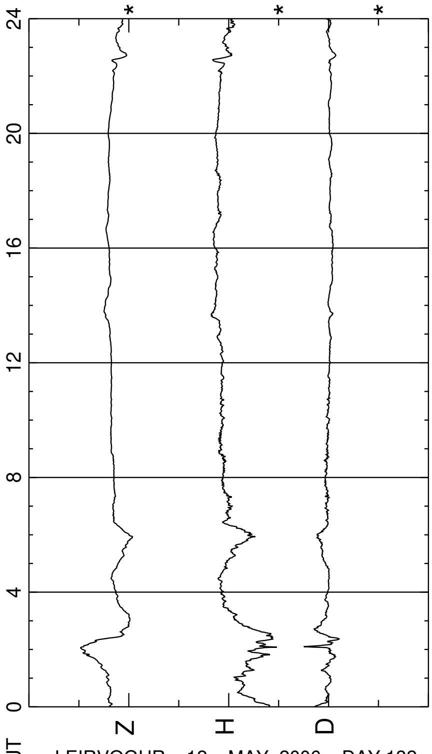
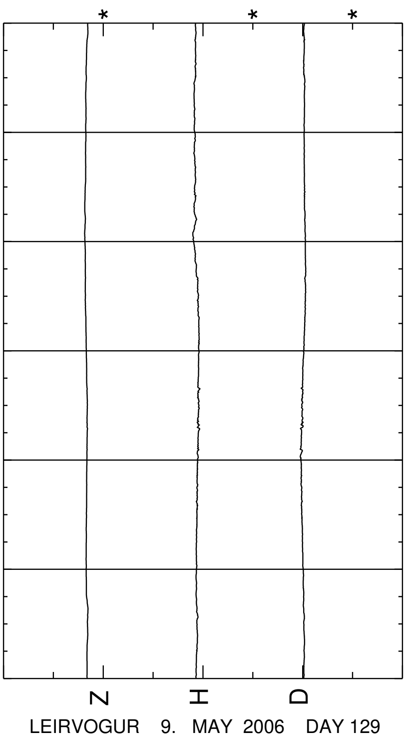


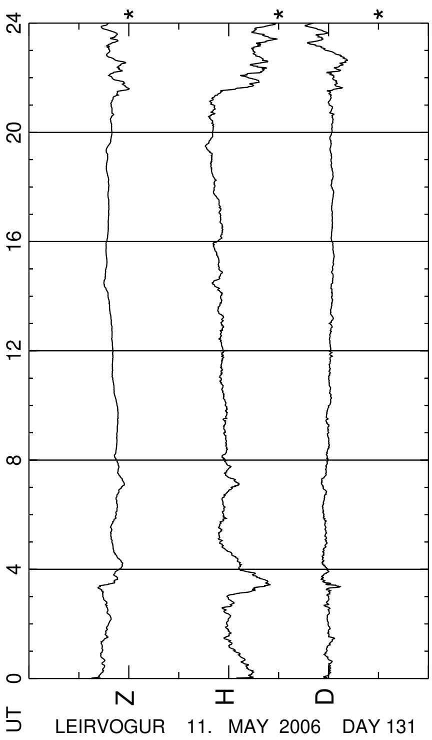
LEIRVOGUR 10. MAY 2006 DAY 130



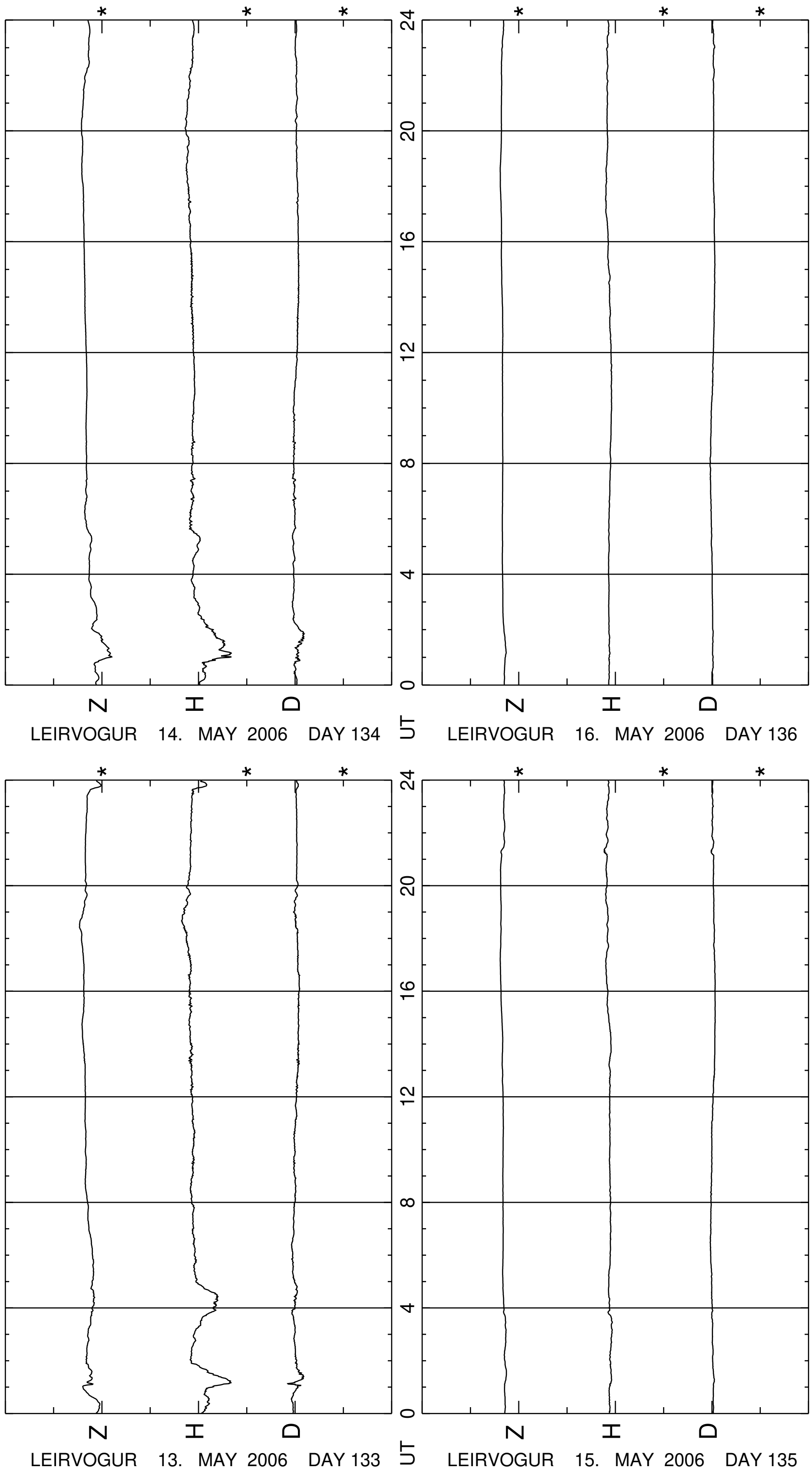
LEIRVOGUR 12. MAY 2006 DAY 132



LEIRVOGUR 9. MAY 2006 DAY 129



LEIRVOGUR 11. MAY 2006 DAY 131



LEIRVOGUR 14. MAY 2006 DAY 134
LEIRVOGUR 16. MAY 2006 DAY 136
LEIRVOGUR 13. MAY 2006 DAY 133
LEIRVOGUR 15. MAY 2006 DAY 135
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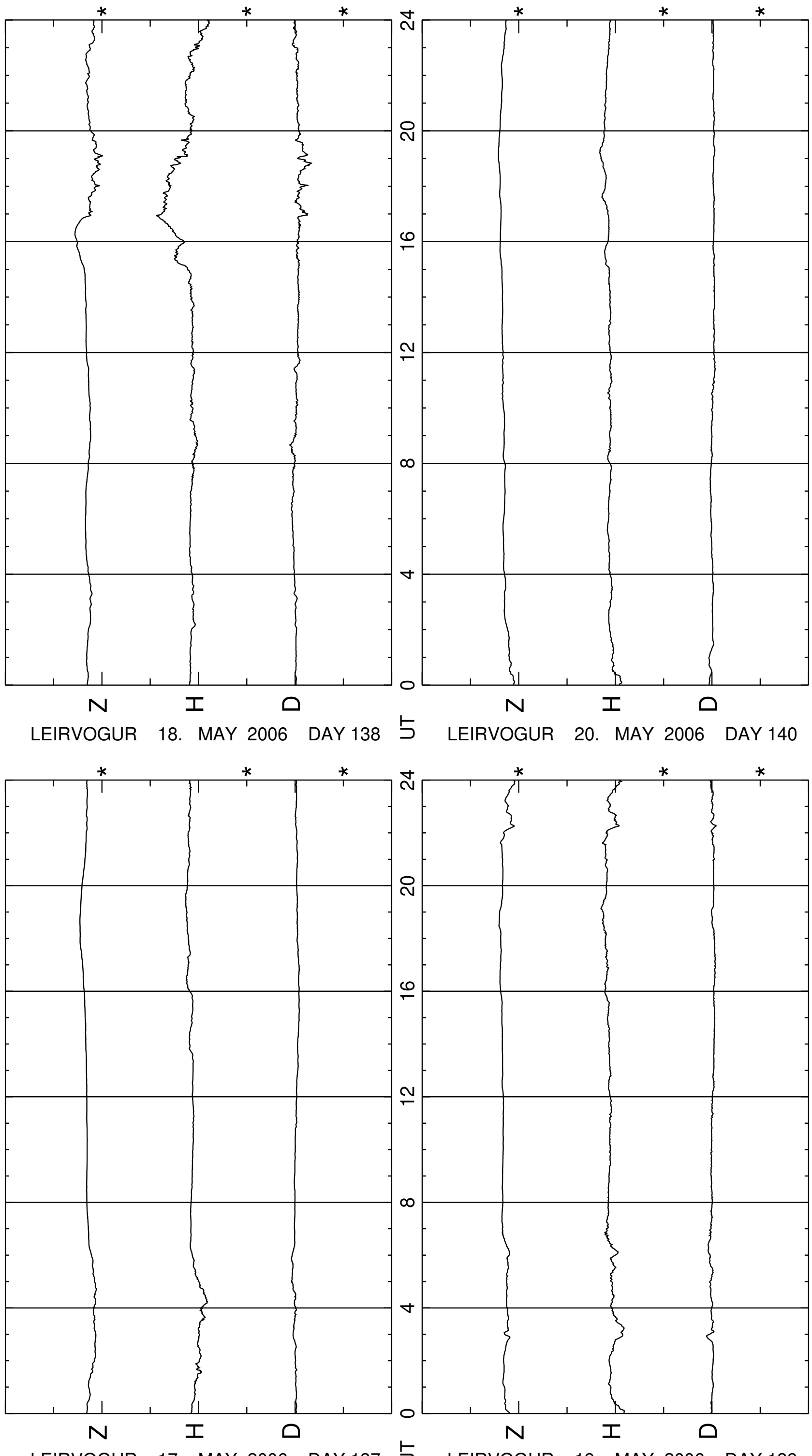
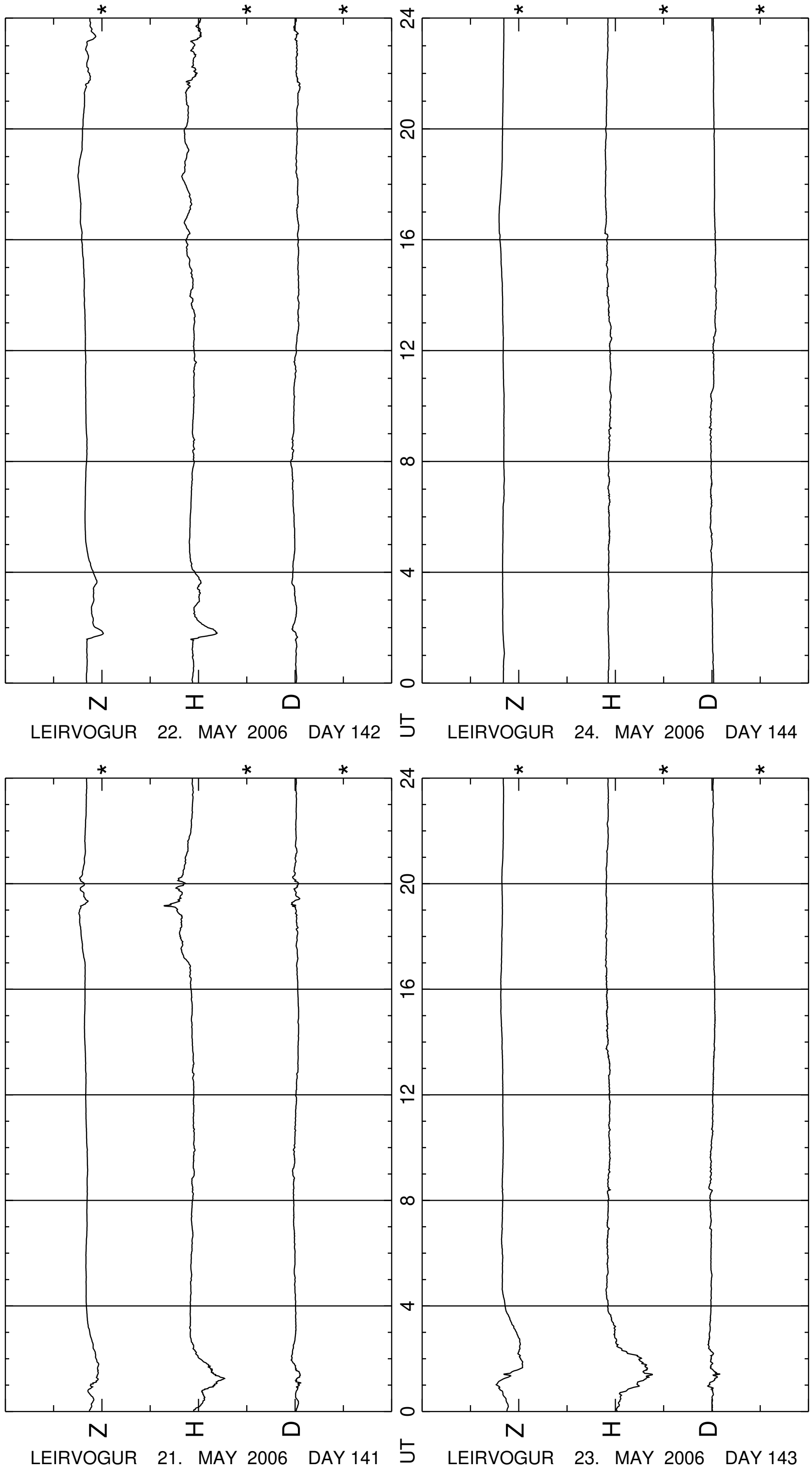


LEIRVOGUR 18. MAY 2006 DAY 138

LEIRVOGUR 20. MAY 2006 DAY 140

LEIRVOGUR 17. MAY 2006 DAY 137

LEIRVOGUR 19. MAY 2006 DAY 139



LEIRVOGUR 22. MAY 2006 DAY 142
LEIRVOGUR 24. MAY 2006 DAY 144
LEIRVOGUR 21. MAY 2006 DAY 141
LEIRVOGUR 23. MAY 2006 DAY 143
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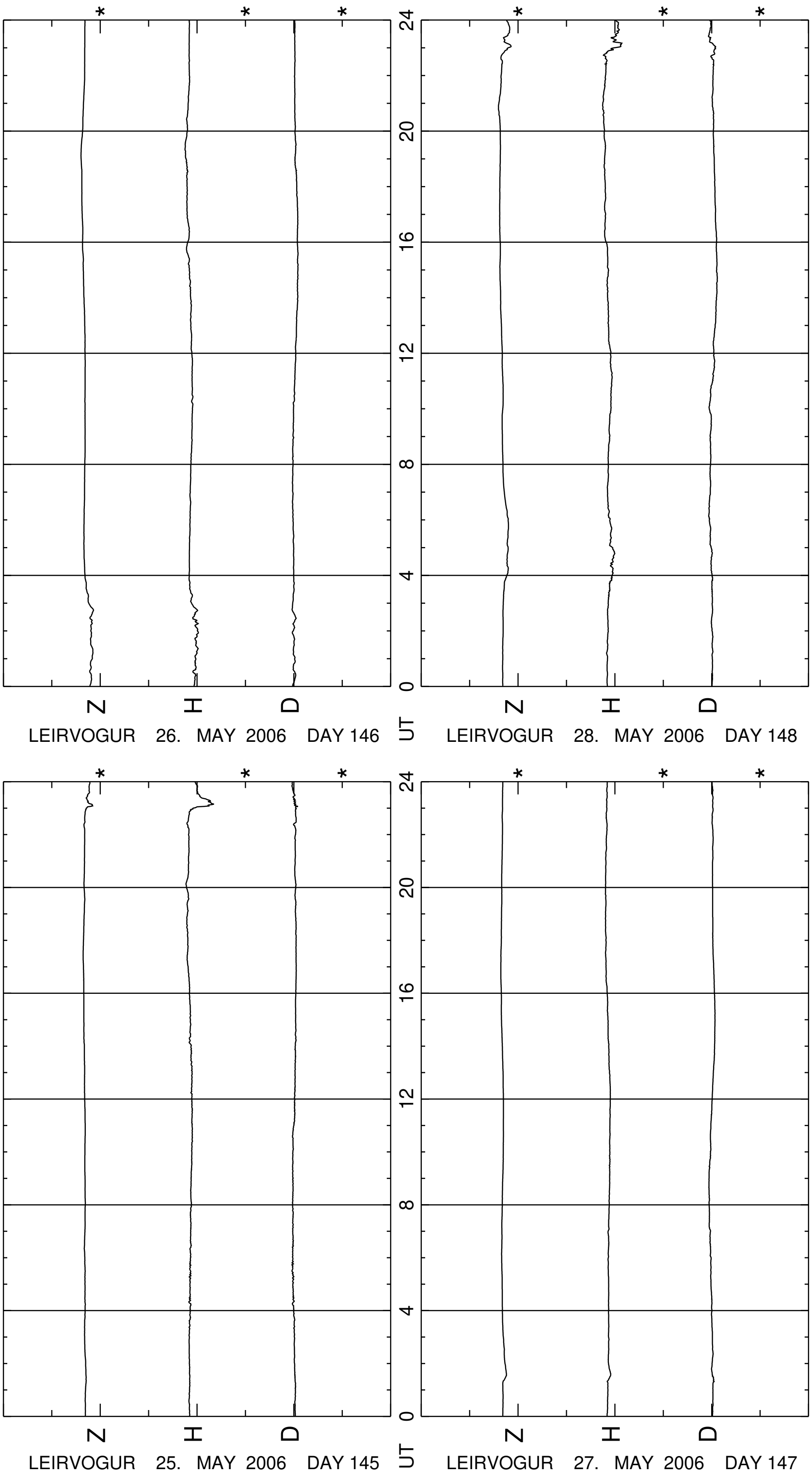
LEIRVOGUR 26. MAY 2006 DAY 146
LEIRVOGUR 28. MAY 2006 DAY 148
LEIRVOGUR 25. MAY 2006 DAY 145
LEIRVOGUR 27. MAY 2006 DAY 147
Z H D
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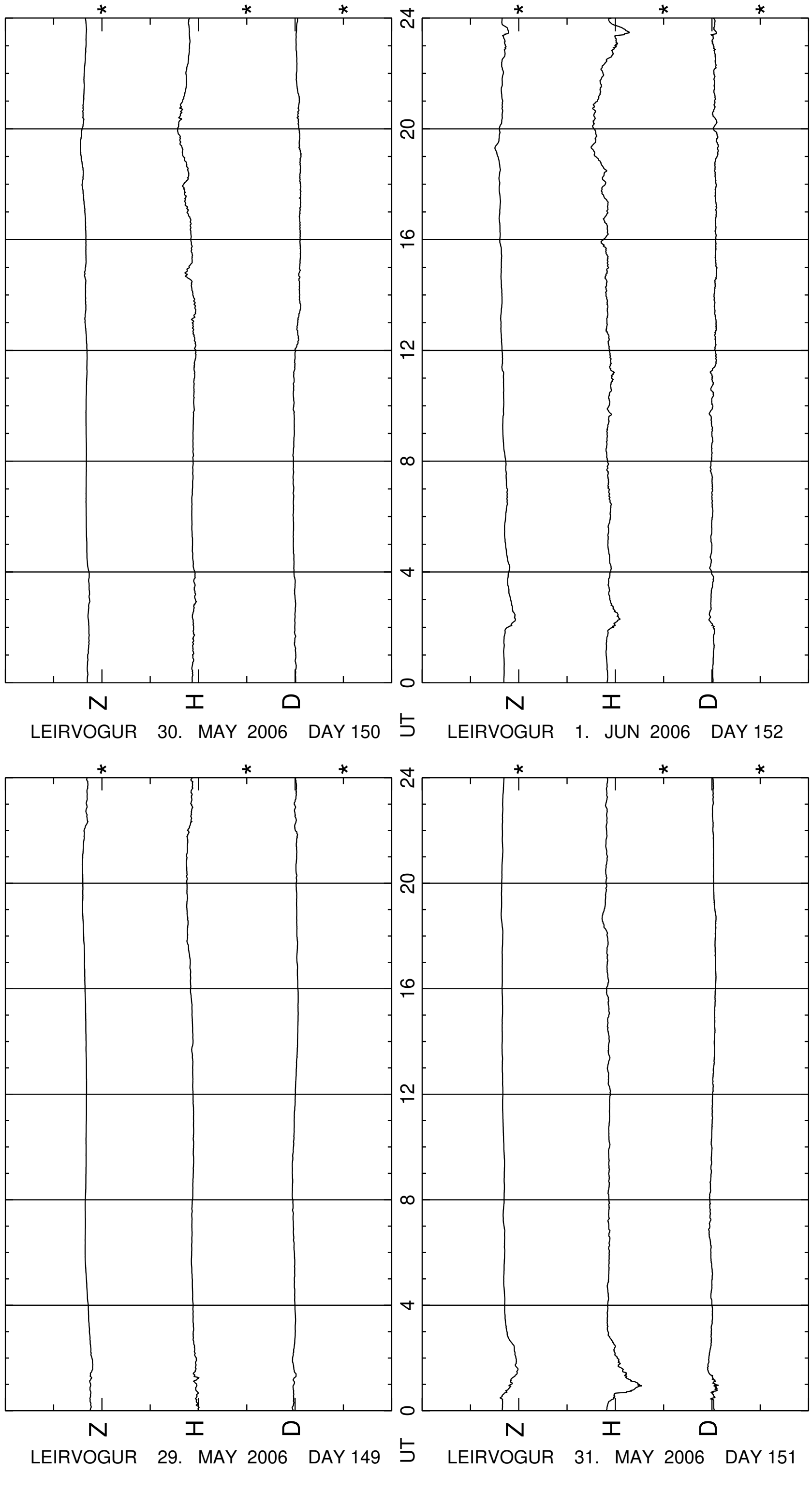
LEIRVOGUR 30. MAY 2006 DAY 150
LEIRVOGUR 1. JUN 2006 DAY 152
LEIRVOGUR 29. MAY 2006 DAY 149
LEIRVOGUR 31. MAY 2006 DAY 151
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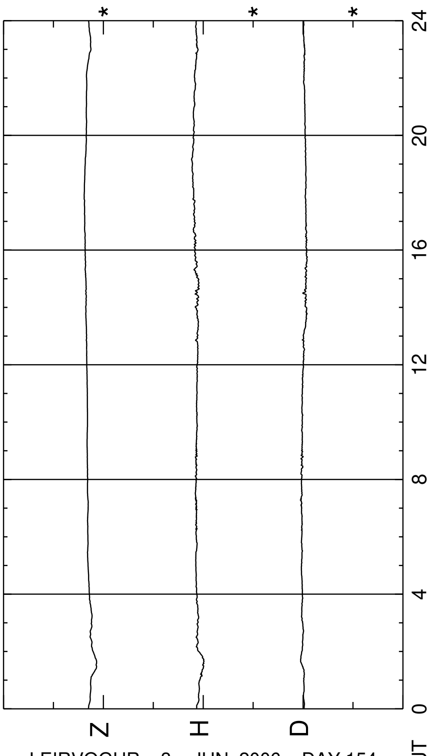
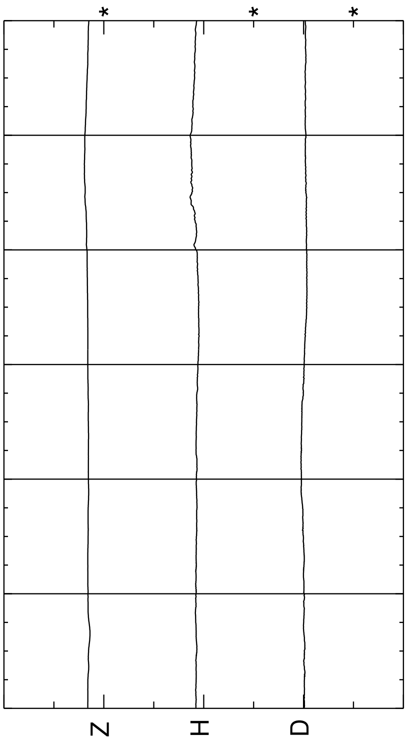
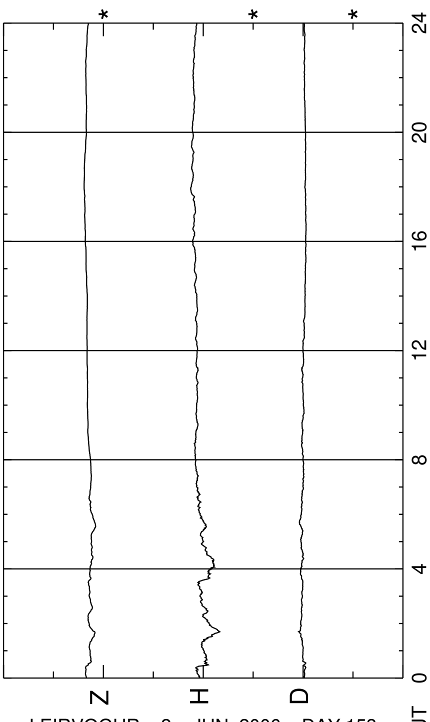


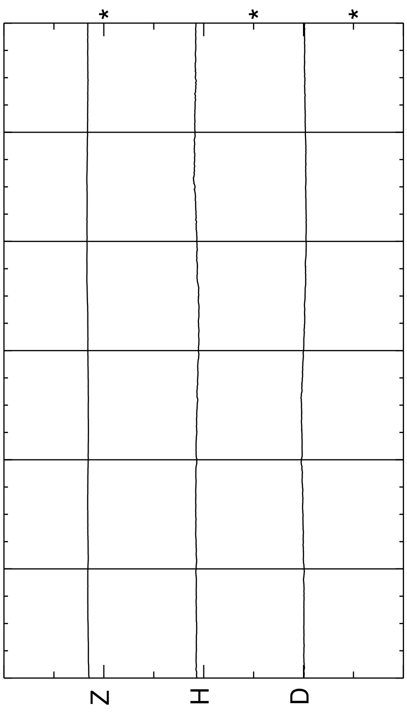
LEIRVOGUR 3. JUN 2006 DAY 154



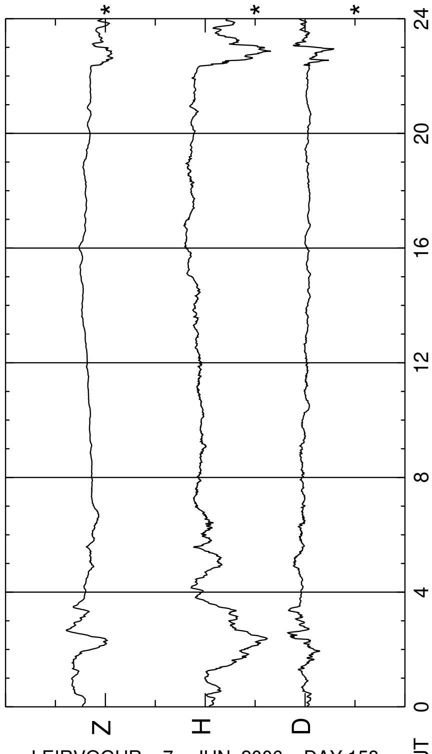
LEIRVOGUR 5. JUN 2006 DAY 156



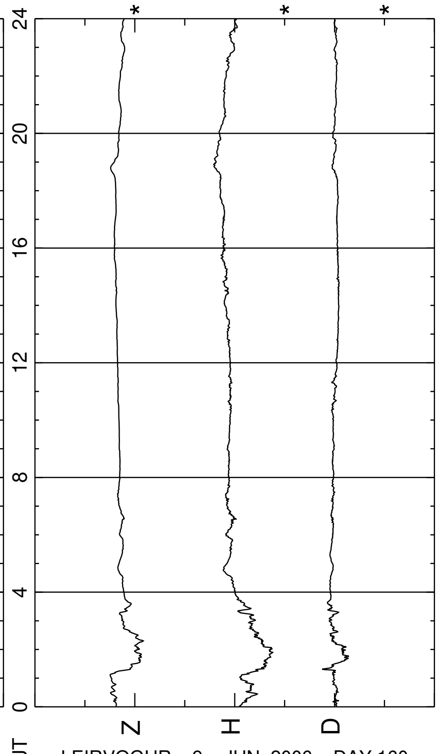
LEIRVOGUR 2. JUN 2006 DAY 153



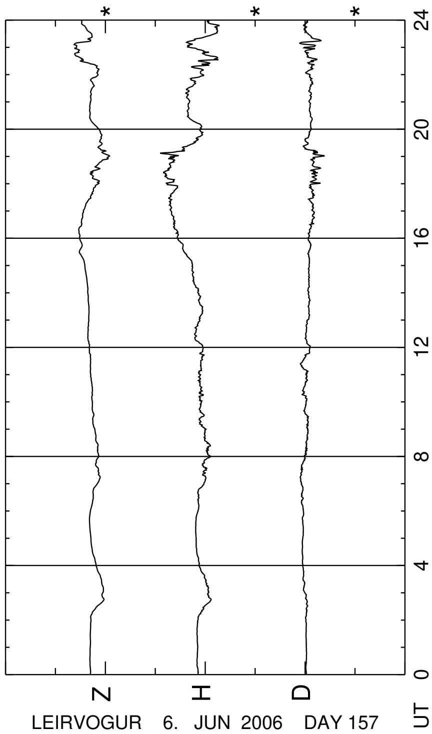
LEIRVOGUR 4. JUN 2006 DAY 155



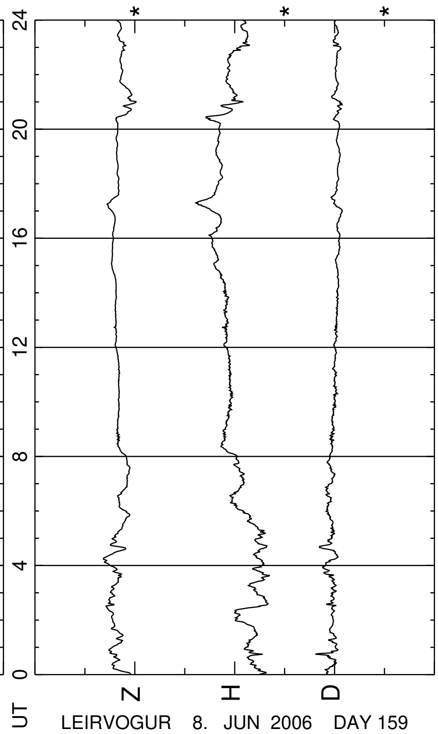
LEIRVOGUR 7. JUN 2006 DAY 158



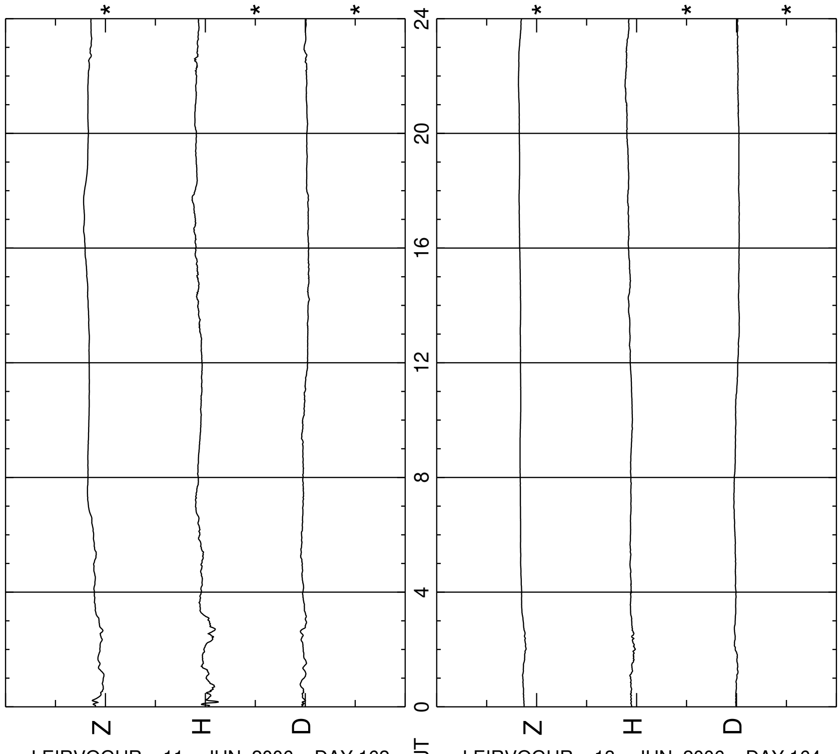
LEIRVOGUR 9. JUN 2006 DAY 160



LEIRVOGUR 6. JUN 2006 DAY 157

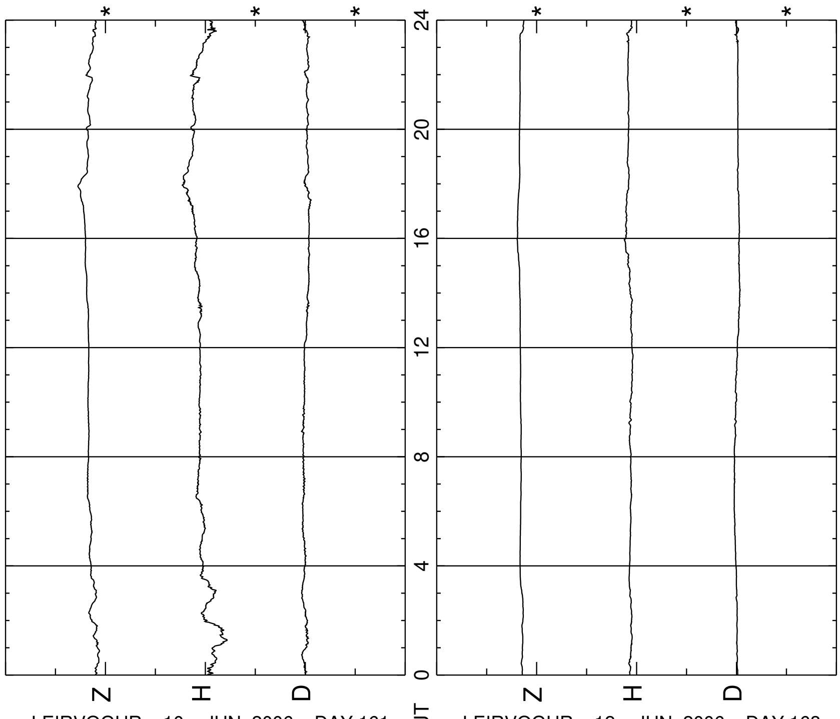


LEIRVOGUR 8. JUN 2006 DAY 159



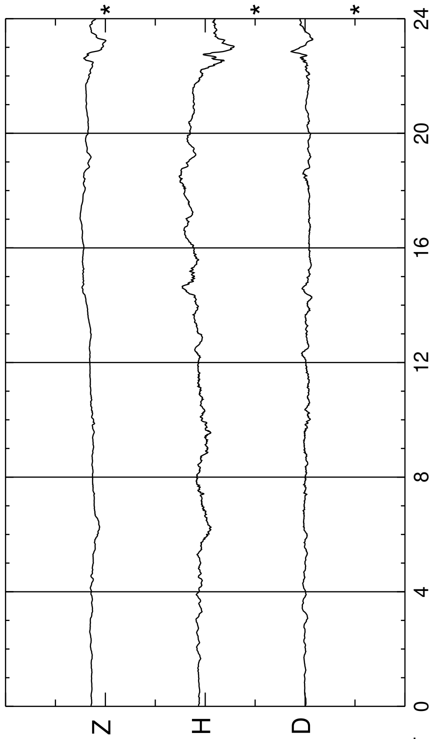
LEIRVOGUR 11. JUN 2006 DAY 162

LEIRVOGUR 13. JUN 2006 DAY 164

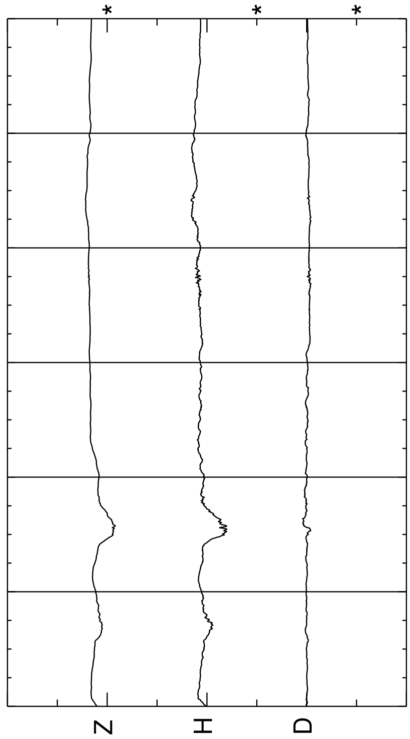


LEIRVOGUR 10. JUN 2006 DAY 161

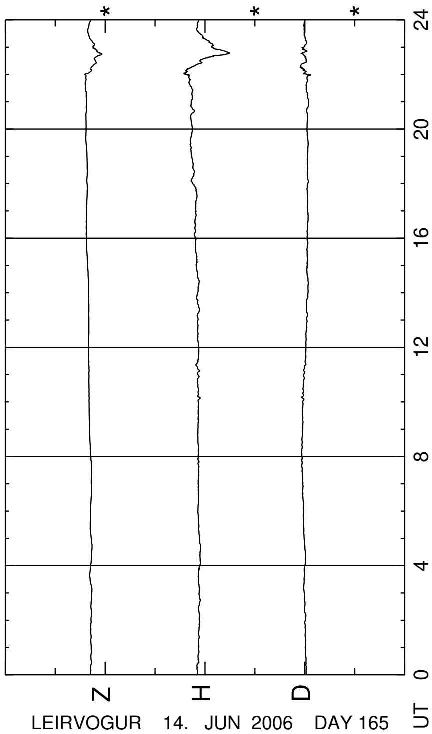
LEIRVOGUR 12. JUN 2006 DAY 163



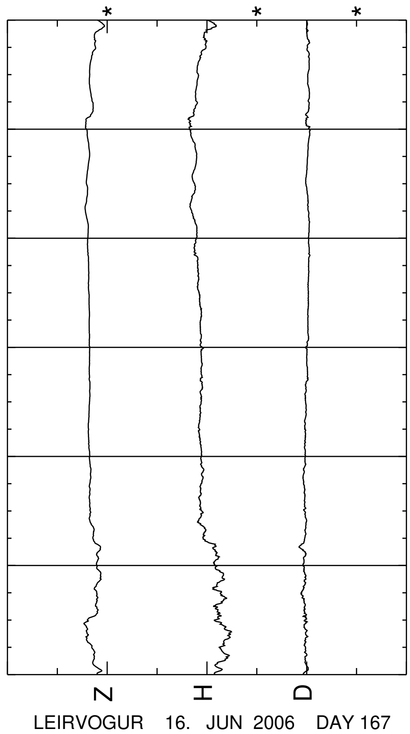
LEIRVOGUR 15. JUN 2006 DAY 166



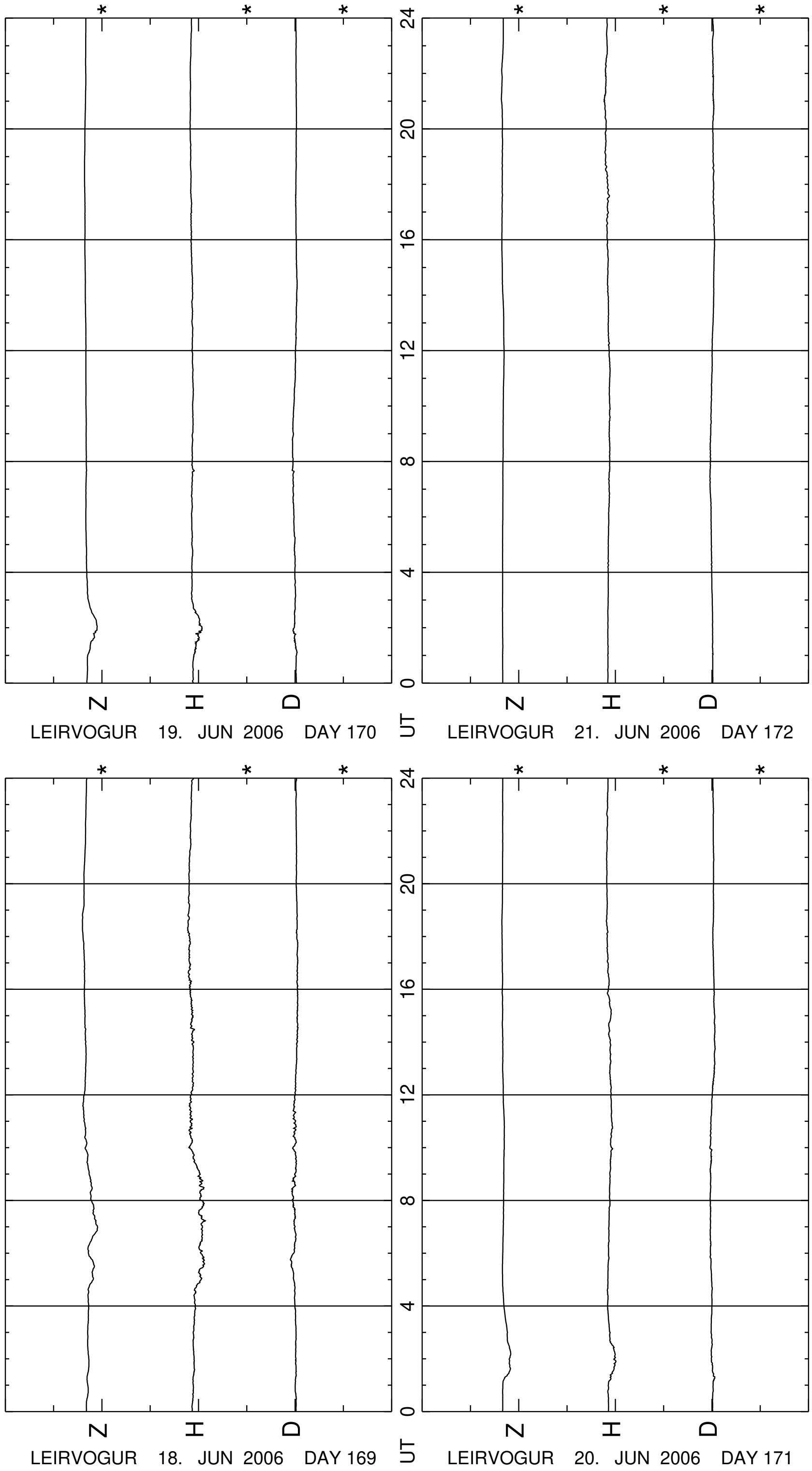
LEIRVOGUR 17. JUN 2006 DAY 168



LEIRVOGUR 14. JUN 2006 DAY 165



LEIRVOGUR 16. JUN 2006 DAY 167


Z H D
LEIRVOGUR 19. JUN 2006 DAY 170
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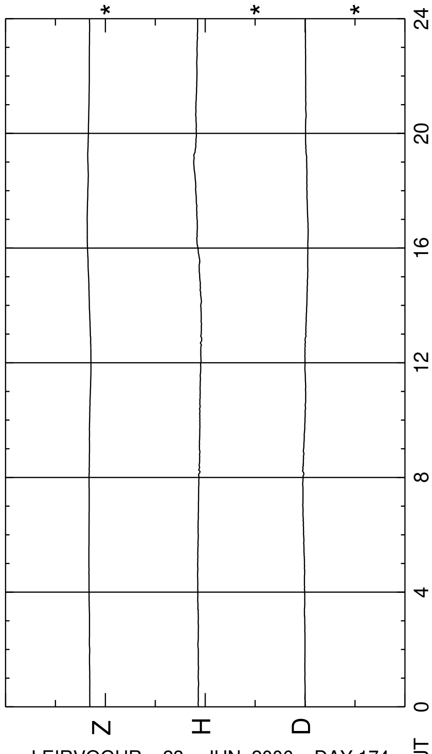
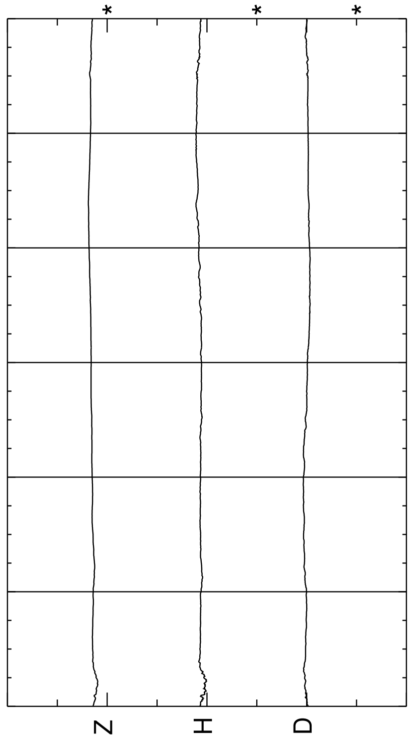
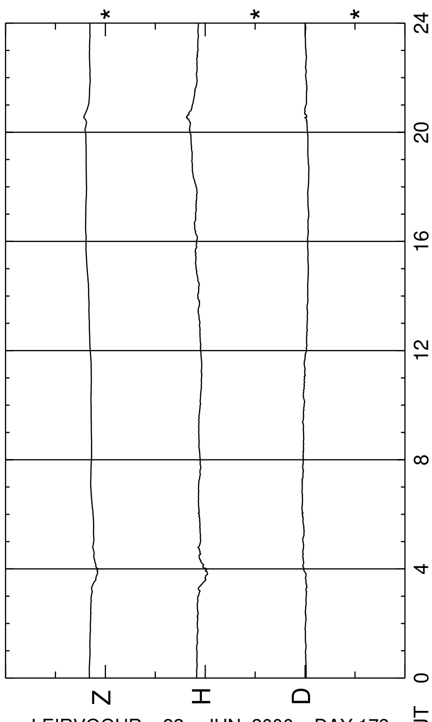
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 21. JUN 2006 DAY 172
Z H D
LEIRVOGUR 18. JUN 2006 DAY 169
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 20. JUN 2006 DAY 171



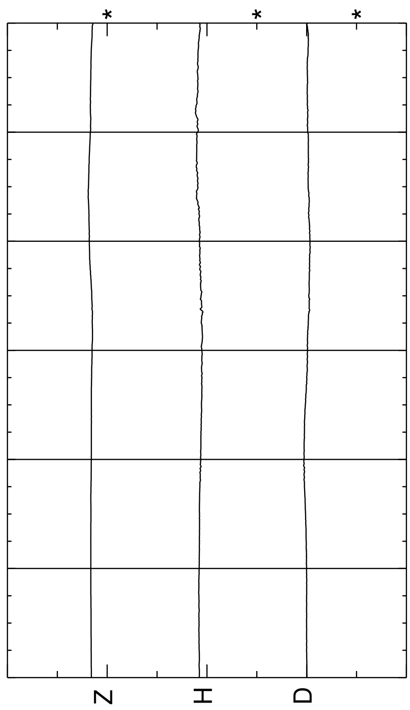
LEIRVOGUR 23. JUN 2006 DAY 174



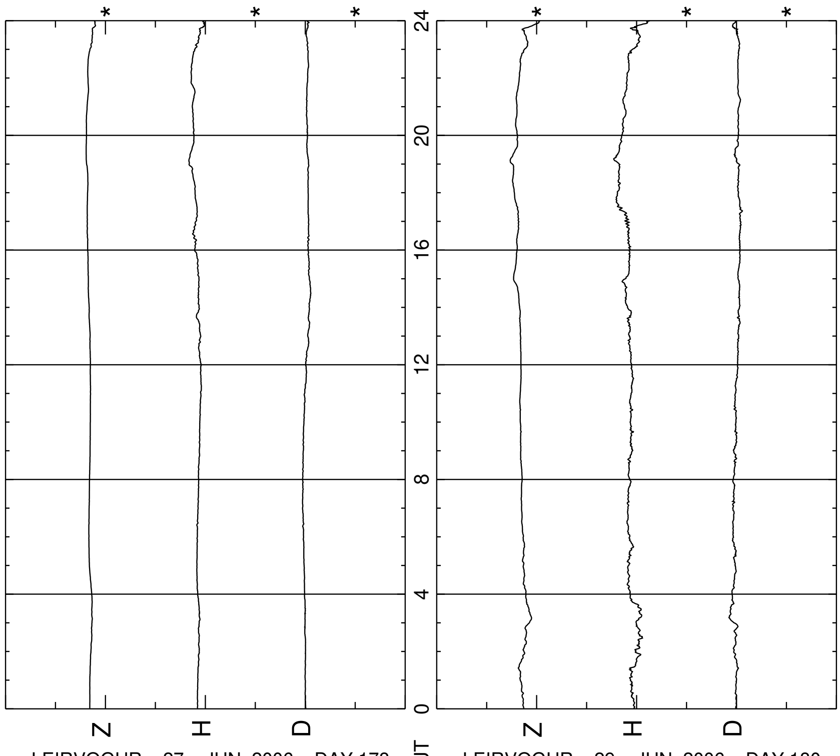
LEIRVOGUR 25. JUN 2006 DAY 176



LEIRVOGUR 22. JUN 2006 DAY 173

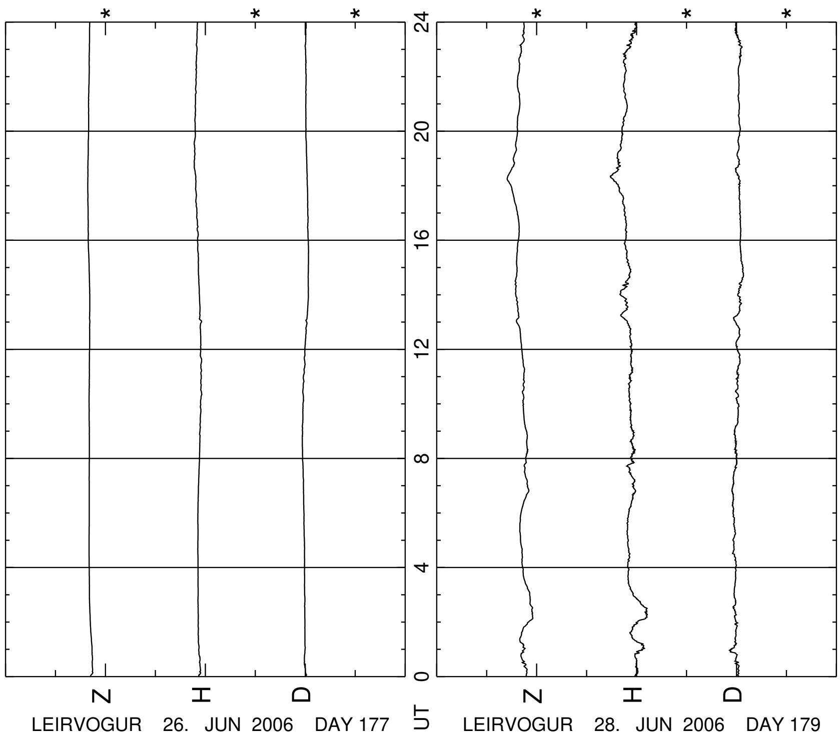


LEIRVOGUR 24. JUN 2006 DAY 175



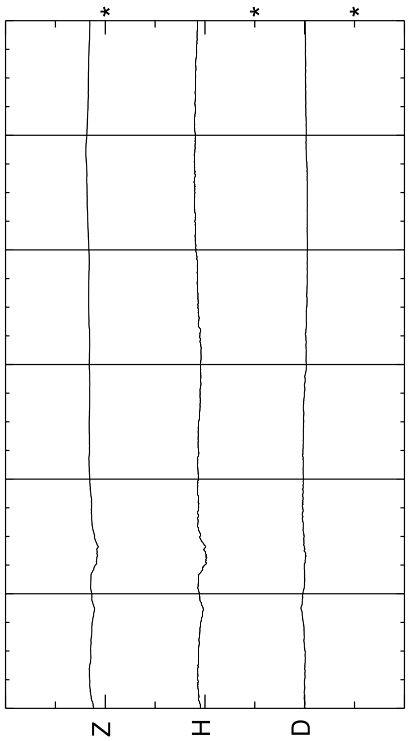
LEIRVOGUR 27. JUN 2006 DAY 178

LEIRVOGUR 29. JUN 2006 DAY 180

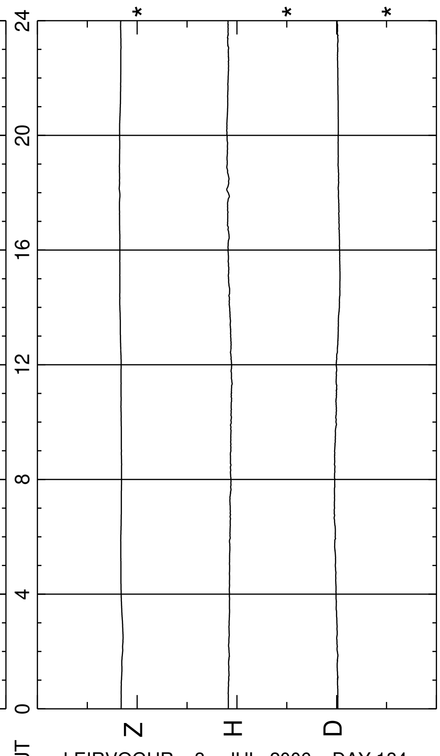


LEIRVOGUR 26. JUN 2006 DAY 177

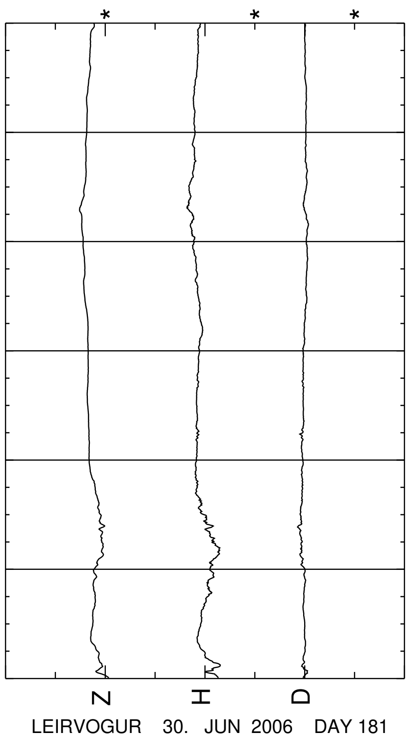
LEIRVOGUR 28. JUN 2006 DAY 179



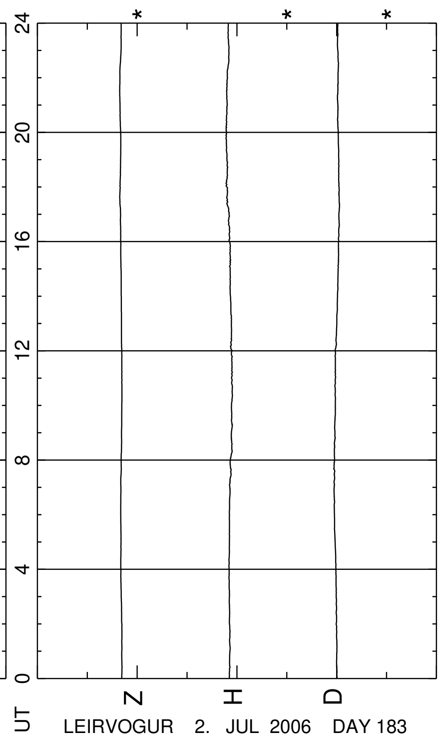
LEIRVOGUR 1. JUL 2006 DAY 182



LEIRVOGUR 3. JUL 2006 DAY 184



LEIRVOGUR 30. JUN 2006 DAY 181



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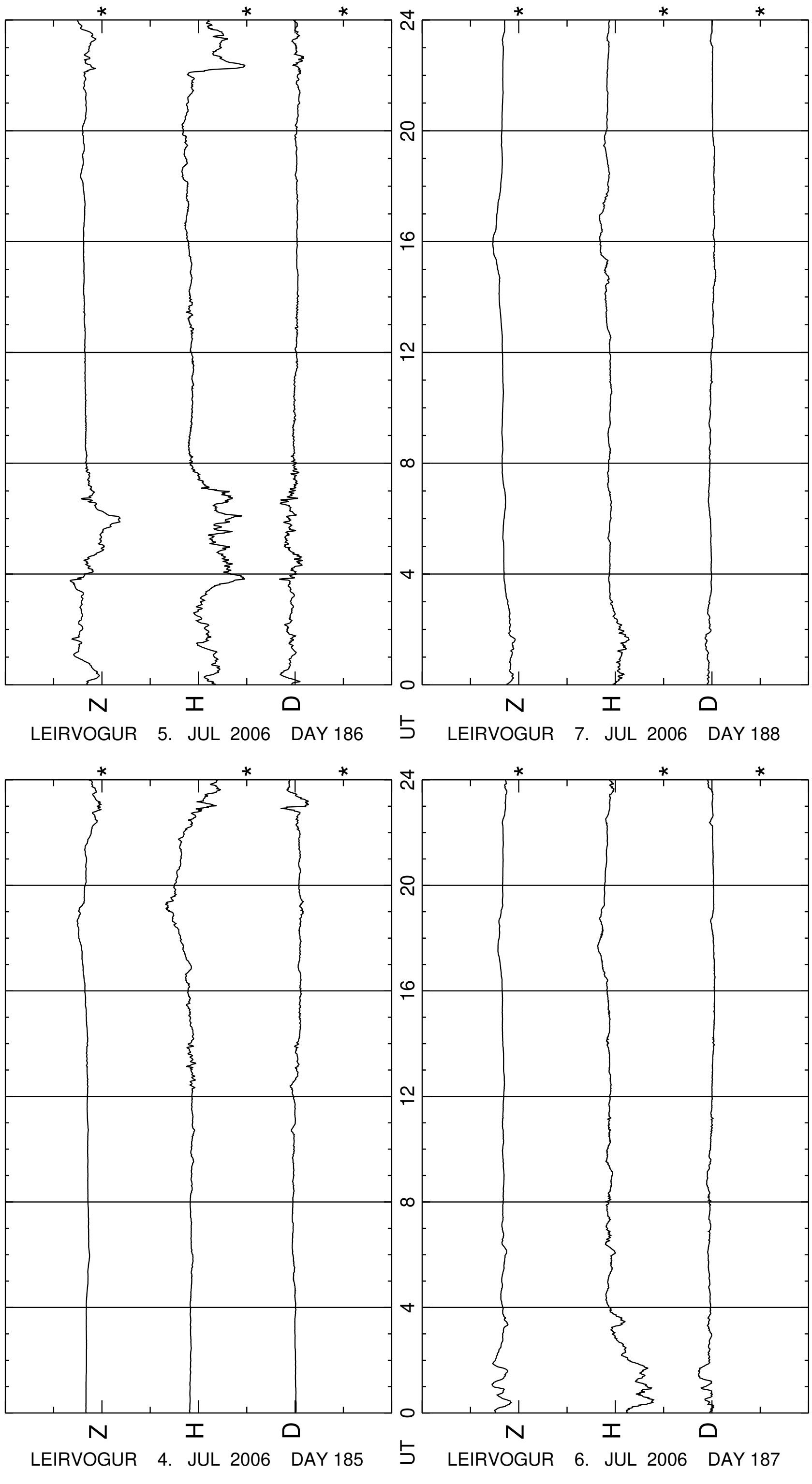
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LEIRVOGUR 5. JUL 2006 DAY 186
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LEIRVOGUR 7. JUL 2006 DAY 188
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LEIRVOGUR 4. JUL 2006 DAY 185
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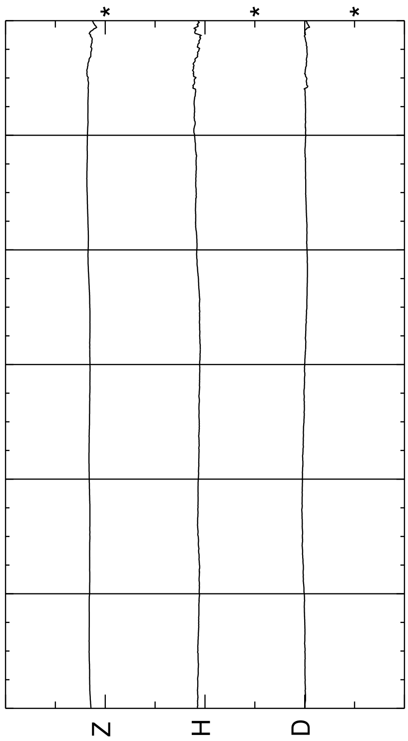
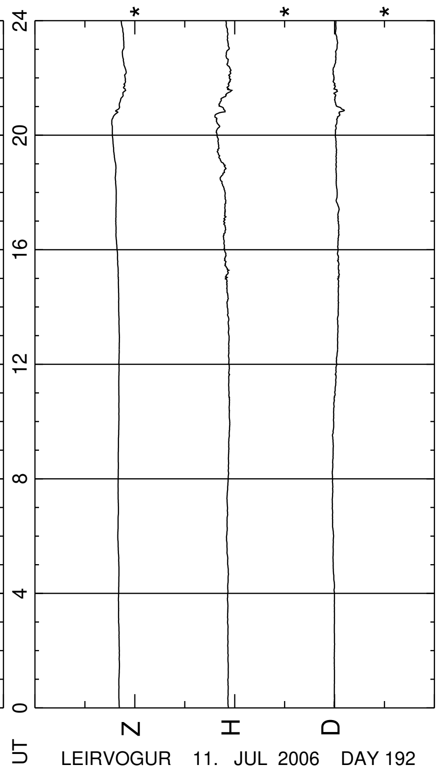
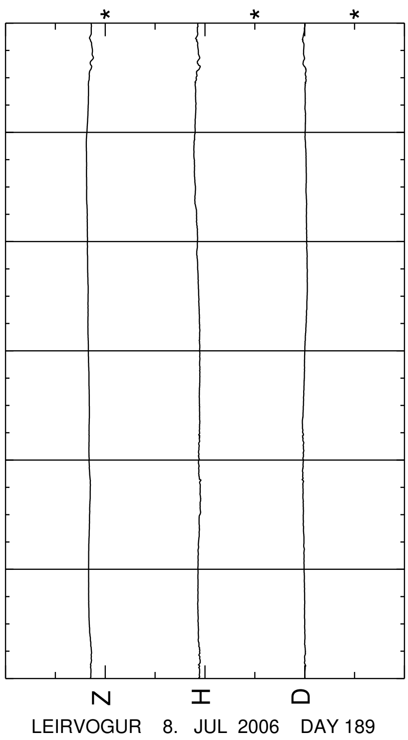
LEIRVOGUR 6. JUL 2006 DAY 187



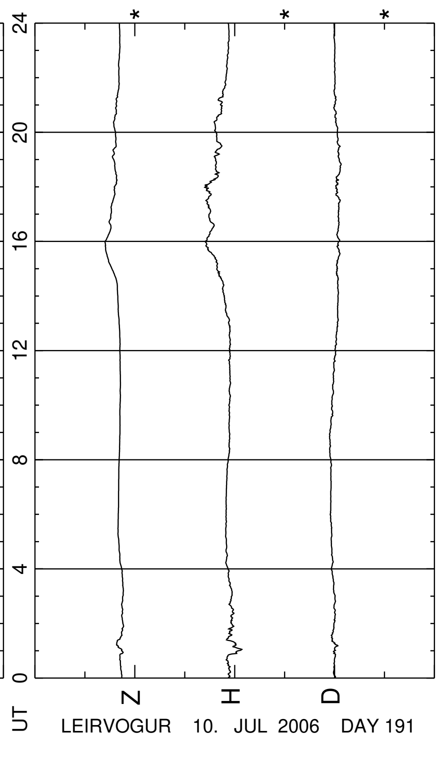
LEIRVOGUR 9. JUL 2006 DAY 190



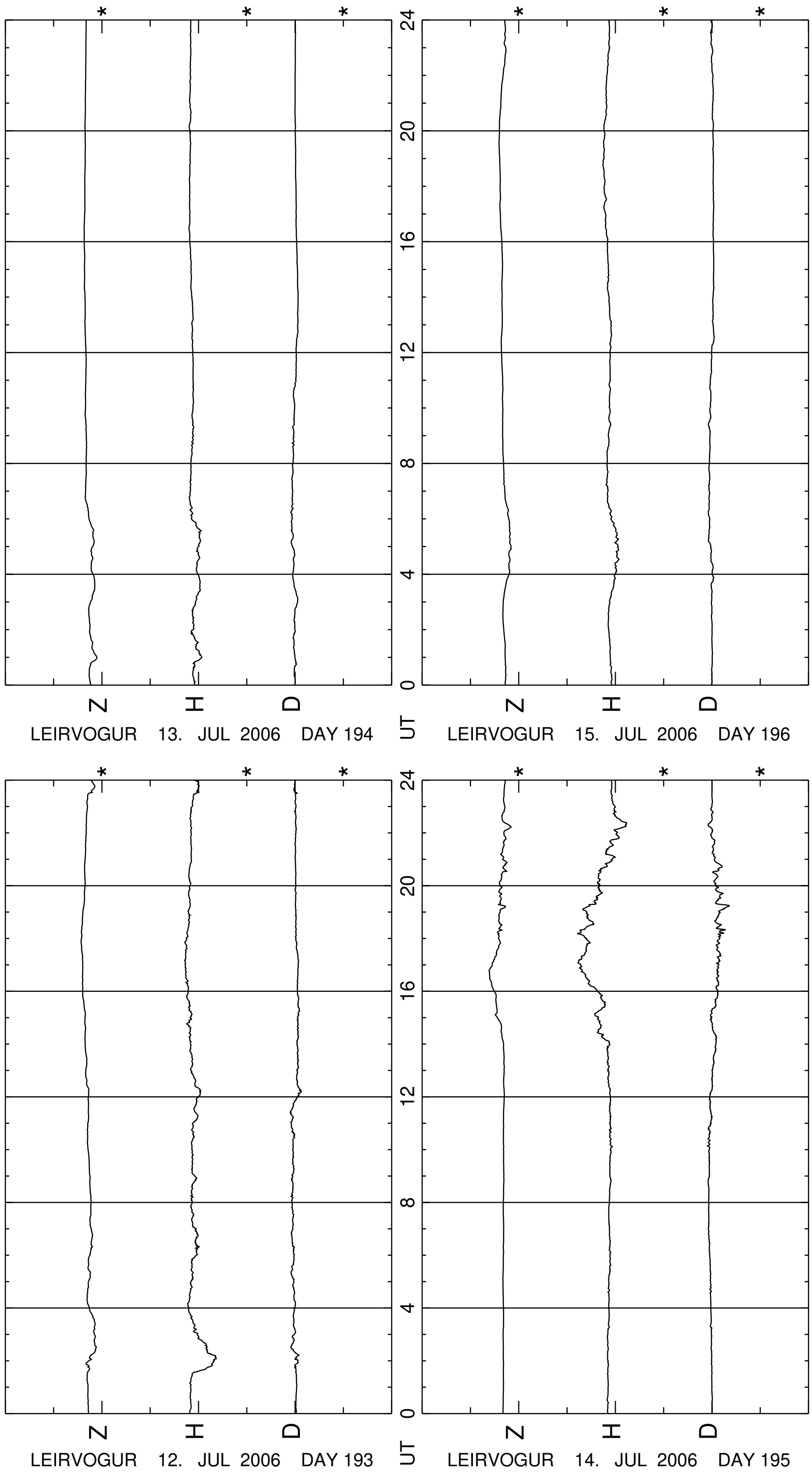
LEIRVOGUR 11. JUL 2006 DAY 192



LEIRVOGUR 8. JUL 2006 DAY 189



LEIRVOGUR 10. JUL 2006 DAY 191



LEIRVOGUR 13. JUL 2006 DAY 194
LEIRVOGUR 15. JUL 2006 DAY 196
LEIRVOGUR 12. JUL 2006 DAY 193
LEIRVOGUR 14. JUL 2006 DAY 195
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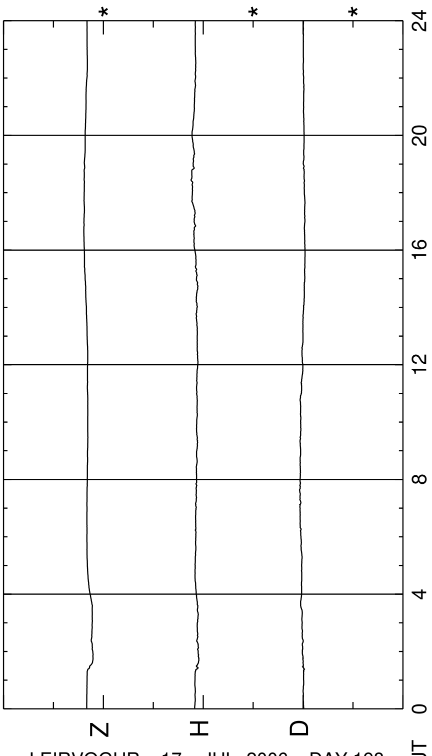
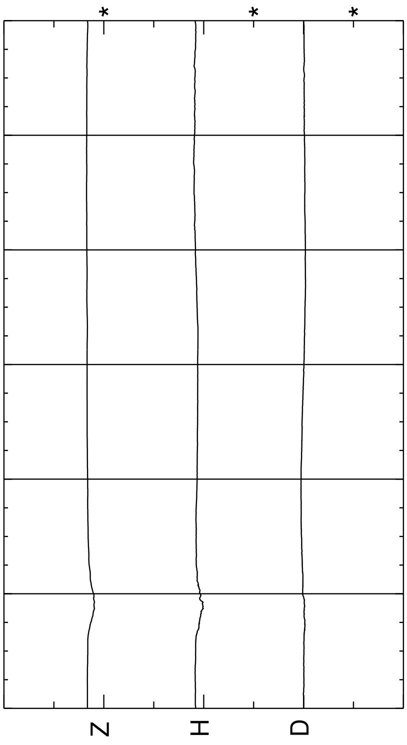


LEIRVOGUR 17. JUL 2006 DAY 198



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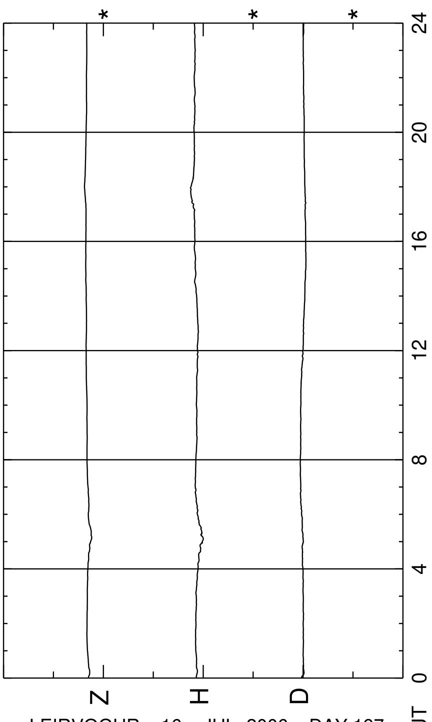
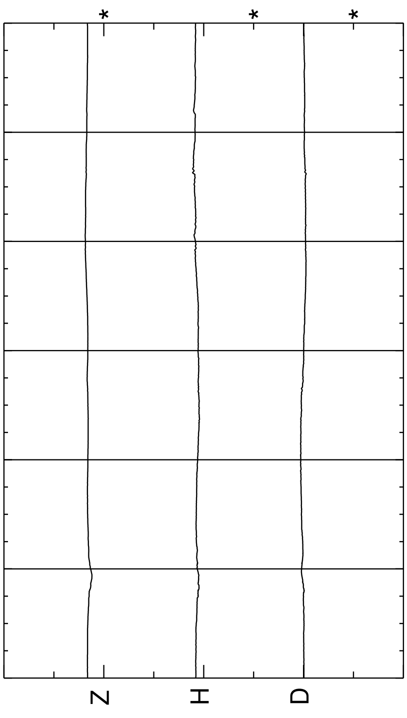
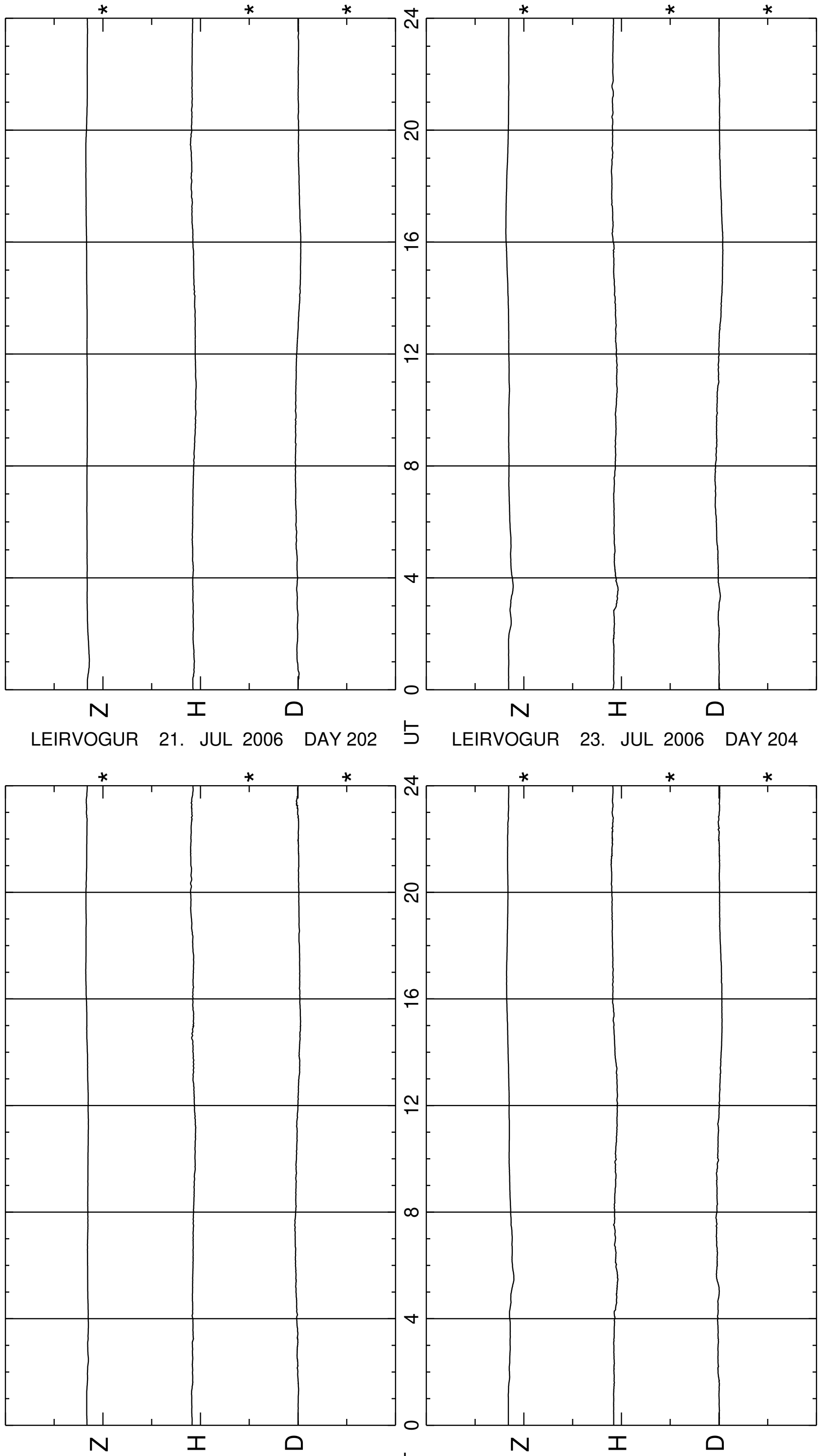


LEIRVOGUR 16. JUL 2006 DAY 197



LEIRVOGUR 18. JUL 2006 DAY 199

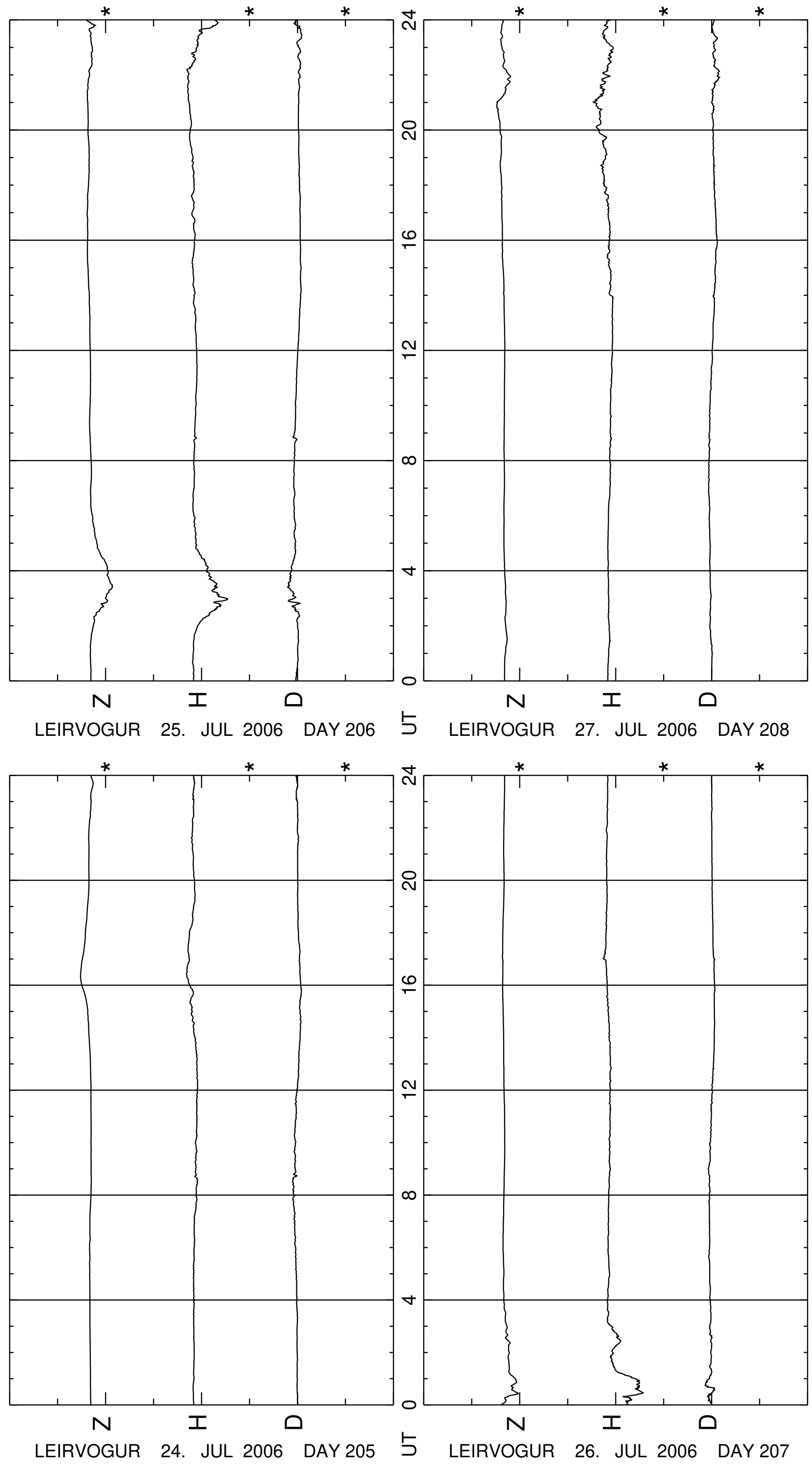


LEIRVOGUR 21. JUL 2006 DAY 202

LEIRVOGUR 23. JUL 2006 DAY 204

LEIRVOGUR 20. JUL 2006 DAY 201

LEIRVOGUR 22. JUL 2006 DAY 203


LEIRVOGUR 25. JUL 2006 DAY 206
LEIRVOGUR 27. JUL 2006 DAY 208
LEIRVOGUR 24. JUL 2006 DAY 205
LEIRVOGUR 26. JUL 2006 DAY 207
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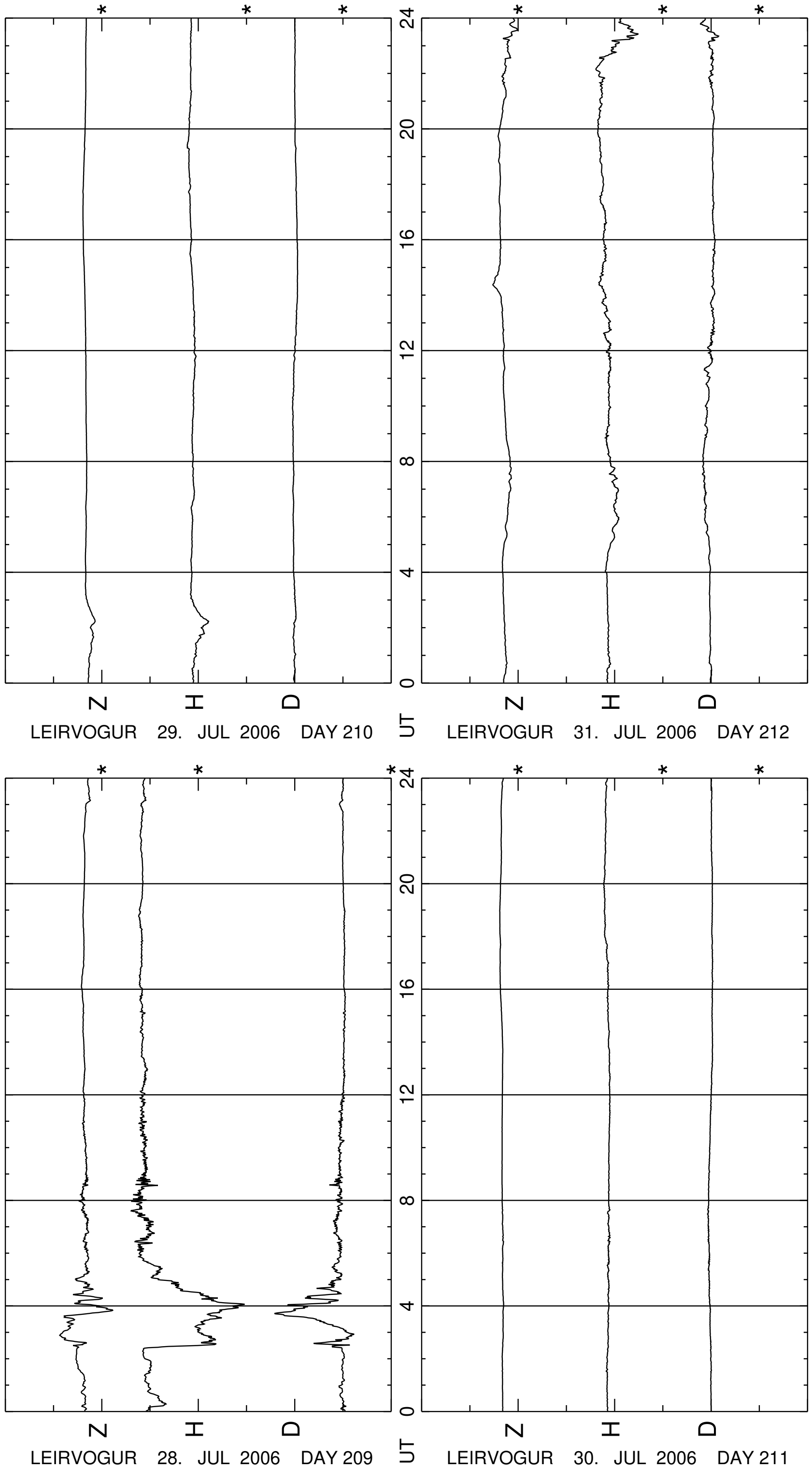
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LEIRVOGUR 29. JUL 2006 DAY 210
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LEIRVOGUR 31. JUL 2006 DAY 212
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LEIRVOGUR 28. JUL 2006 DAY 209
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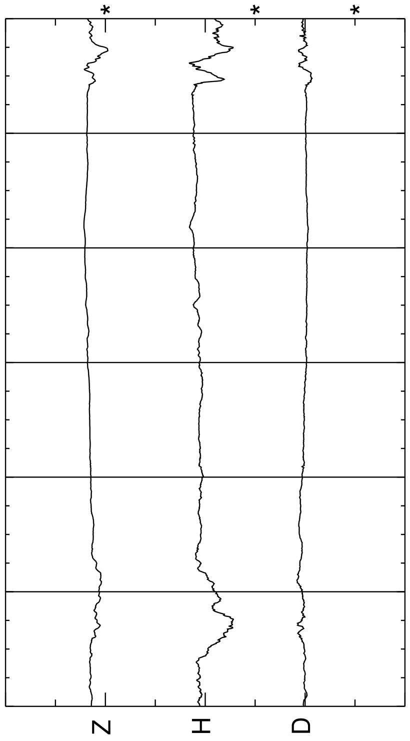
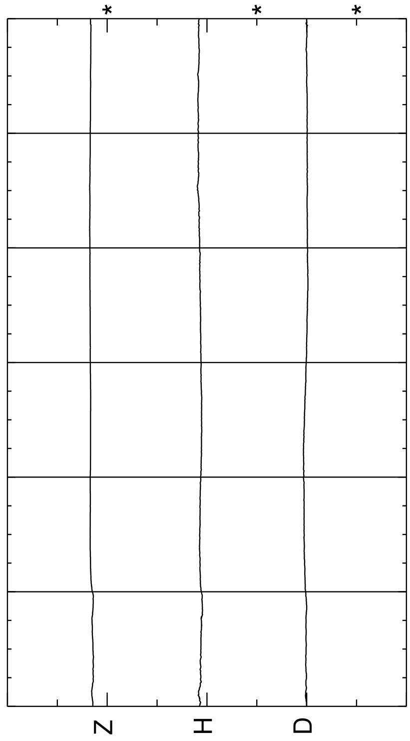
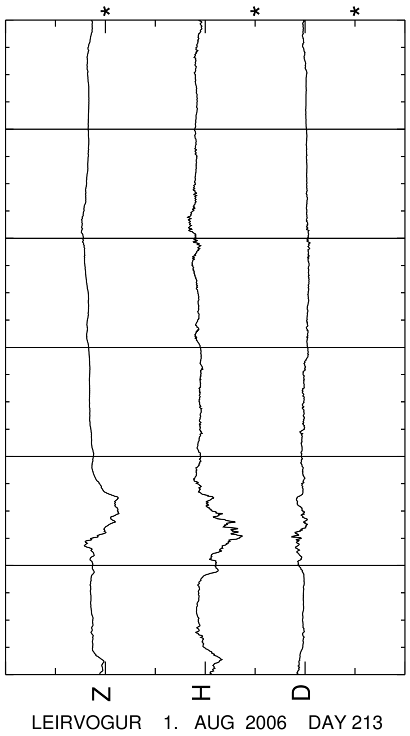
LEIRVOGUR 30. JUL 2006 DAY 211
0 4 8 12 16 20 24



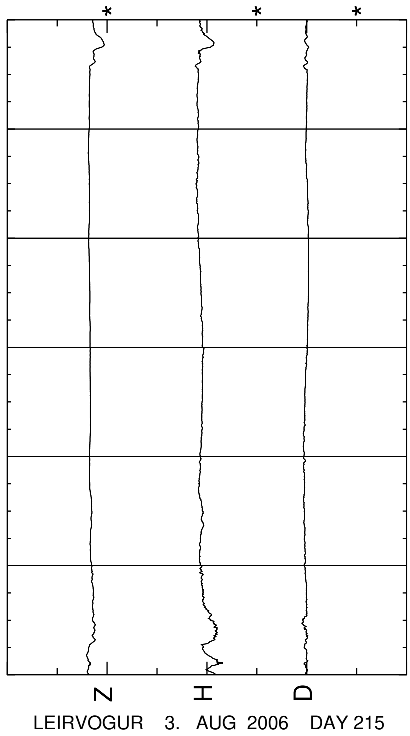
LEIRVOGUR 2. AUG 2006 DAY 214



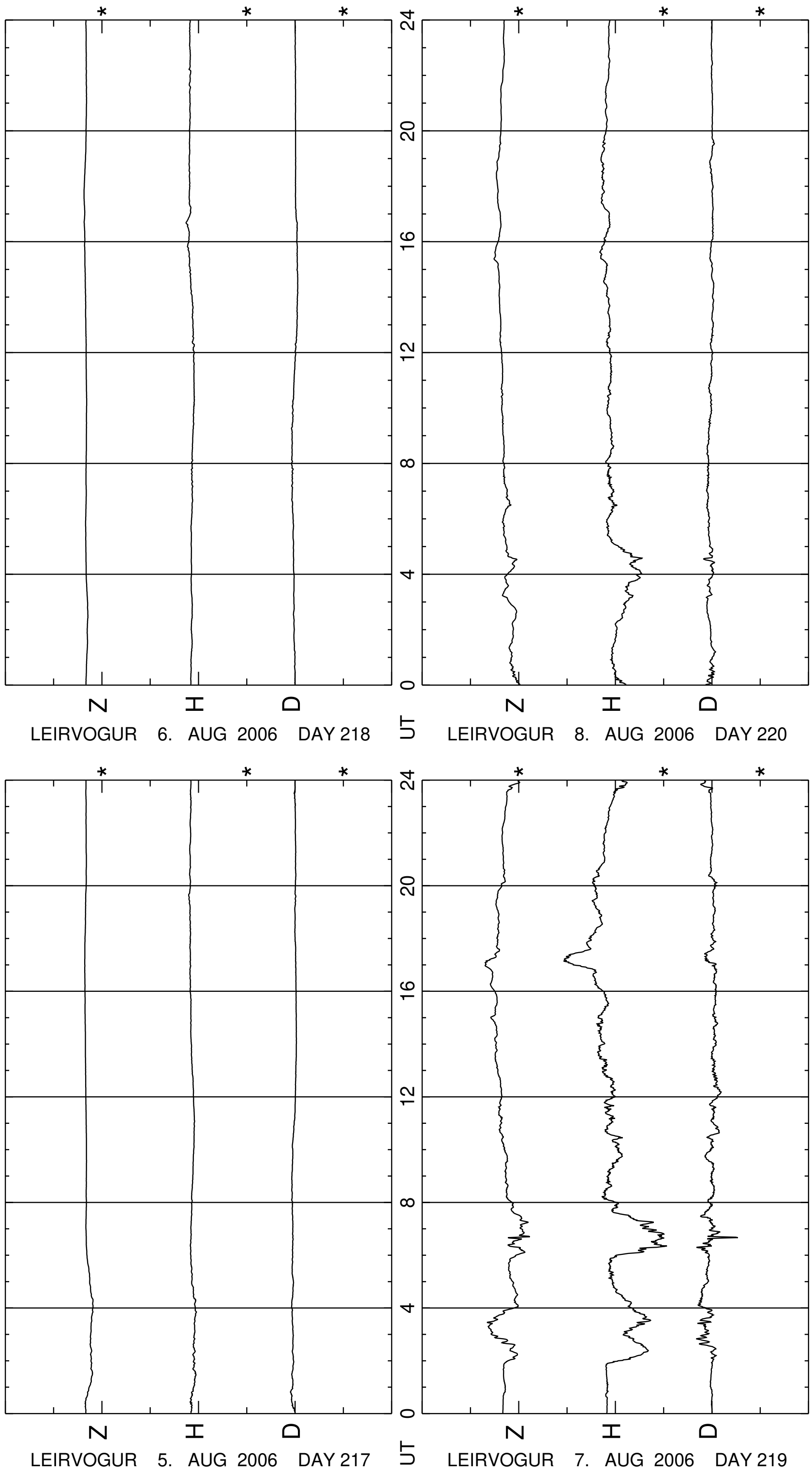
LEIRVOGUR 4. AUG 2006 DAY 216



LEIRVOGUR 1. AUG 2006 DAY 213



LEIRVOGUR 3. AUG 2006 DAY 215


LEIRVOGUR 6. AUG 2006 DAY 218
LEIRVOGUR 8. AUG 2006 DAY 220
LEIRVOGUR 5. AUG 2006 DAY 217
LEIRVOGUR 7. AUG 2006 DAY 219
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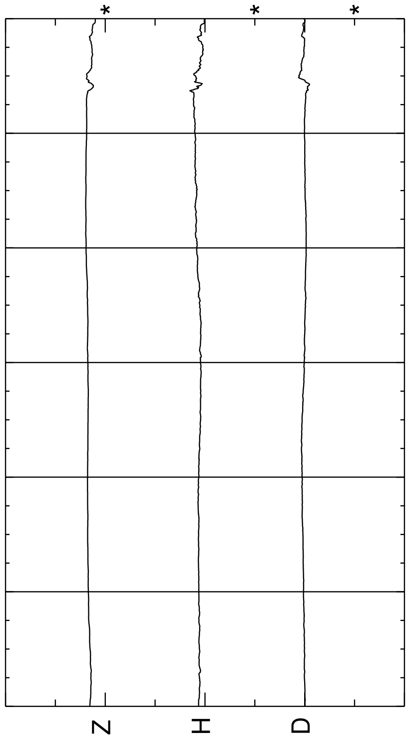
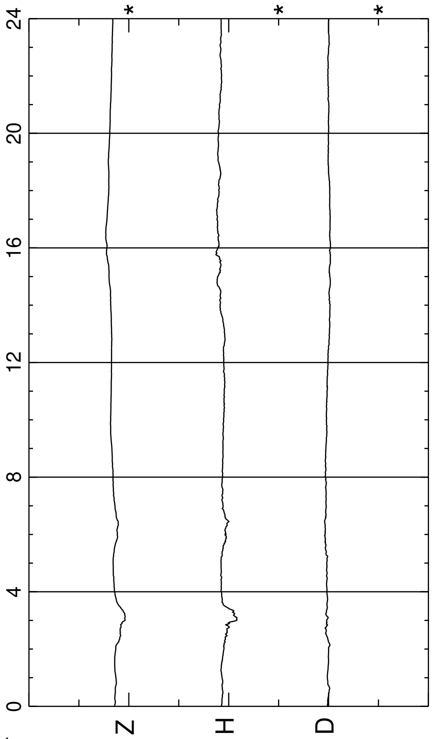
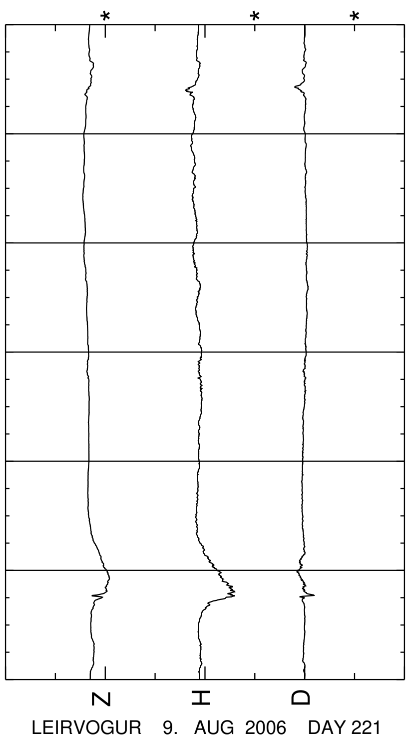


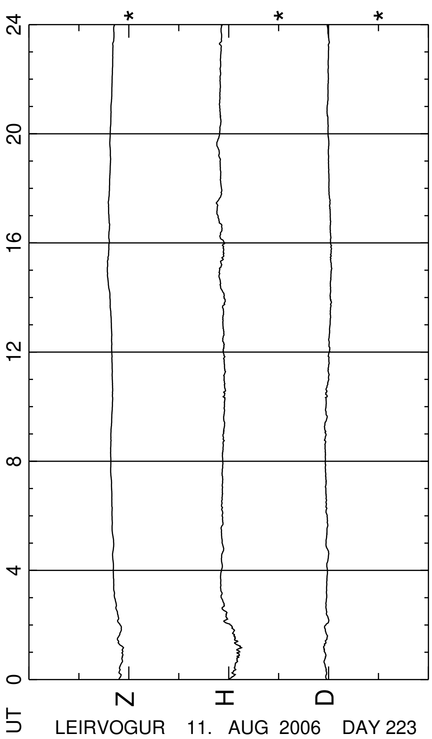
LEIRVOGUR 10. AUG 2006 DAY 222



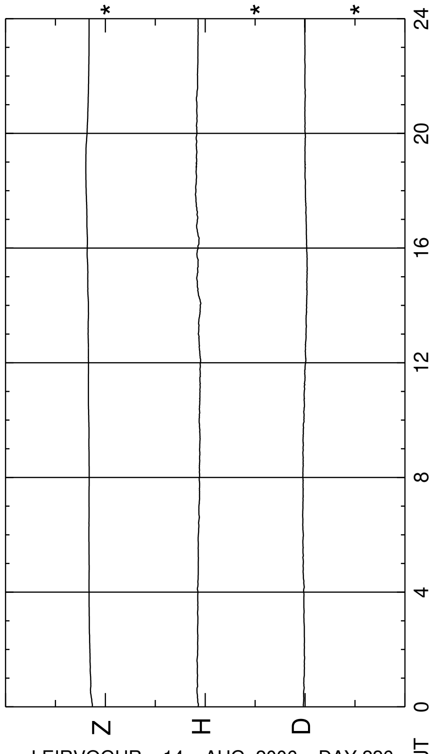
LEIRVOGUR 12. AUG 2006 DAY 224



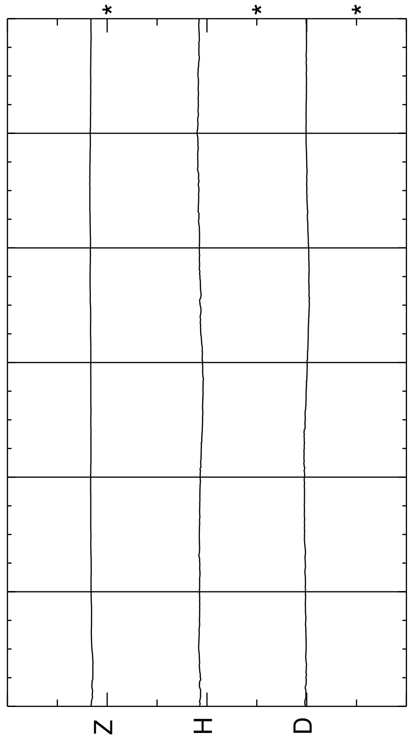
LEIRVOGUR 9. AUG 2006 DAY 221



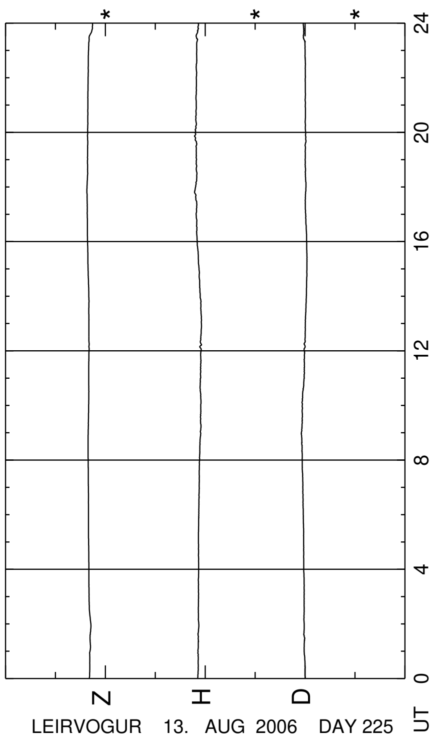
LEIRVOGUR 11. AUG 2006 DAY 223



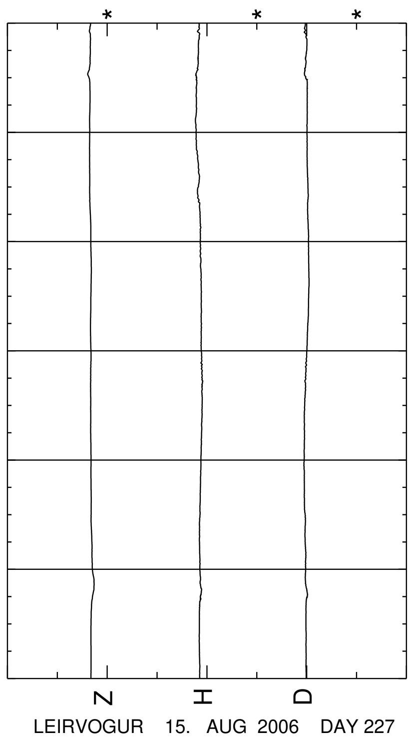
LEIRVOGUR 14. AUG 2006 DAY 226



LEIRVOGUR 16. AUG 2006 DAY 228



LEIRVOGUR 13. AUG 2006 DAY 225



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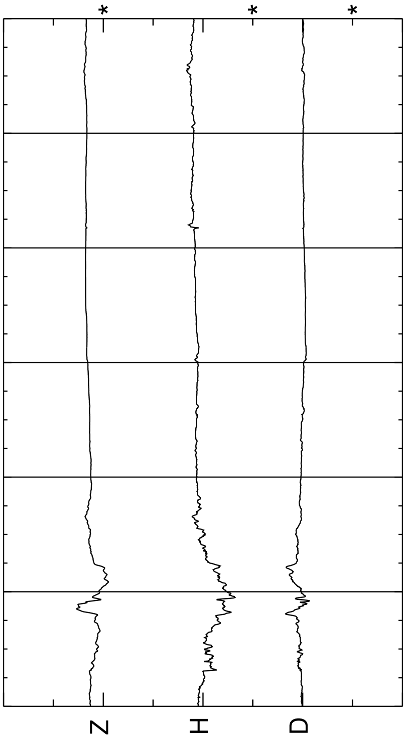
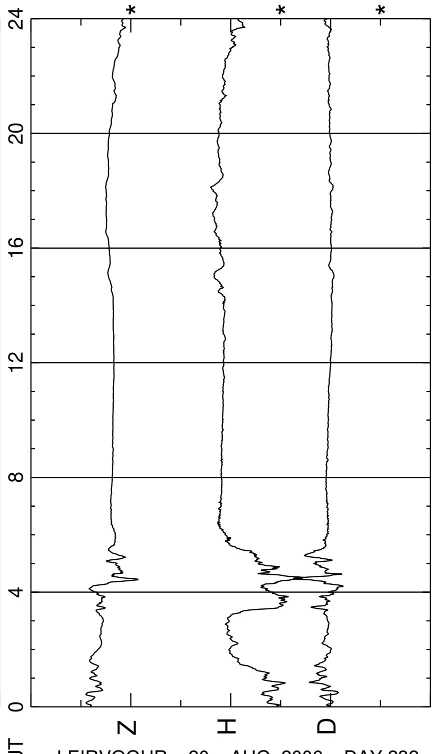
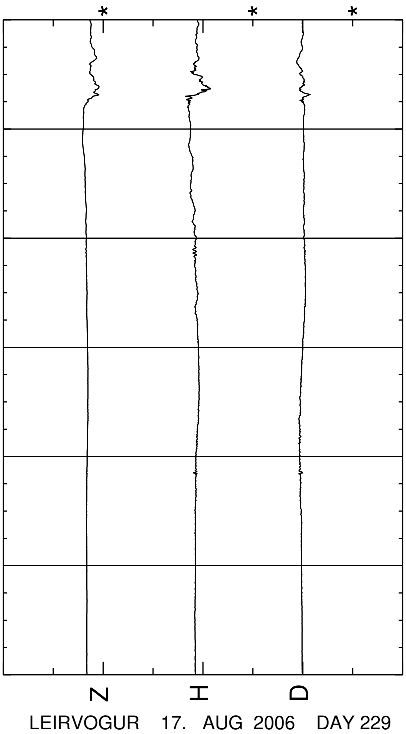


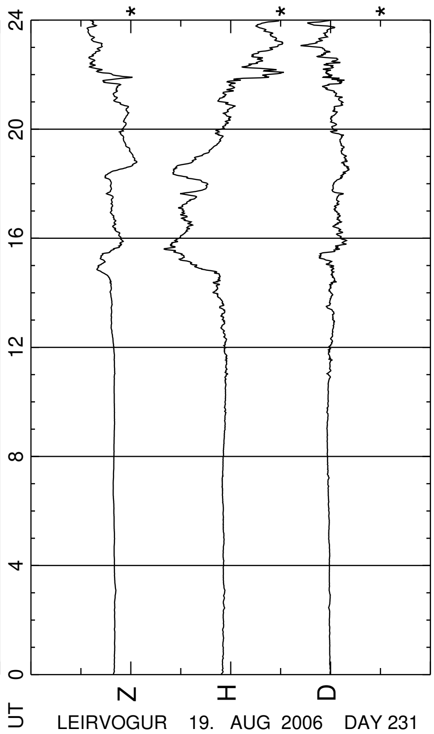
LEIRVOGUR 18. AUG 2006 DAY 230



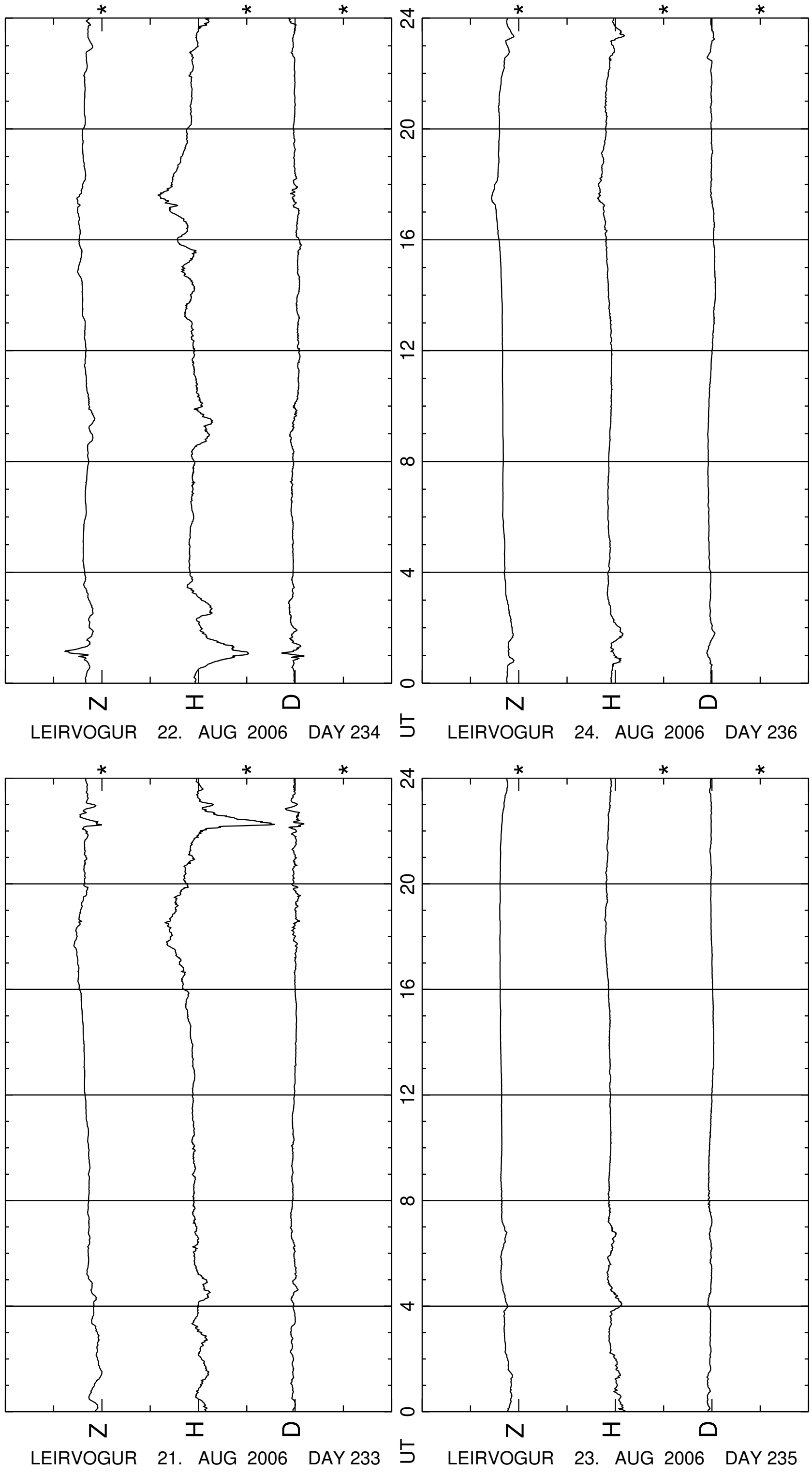
LEIRVOGUR 20. AUG 2006 DAY 232



LEIRVOGUR 17. AUG 2006 DAY 229



LEIRVOGUR 19. AUG 2006 DAY 231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LEIRVOGUR 22. AUG 2006 DAY 234
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LEIRVOGUR 24. AUG 2006 DAY 236
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LEIRVOGUR 21. AUG 2006 DAY 233
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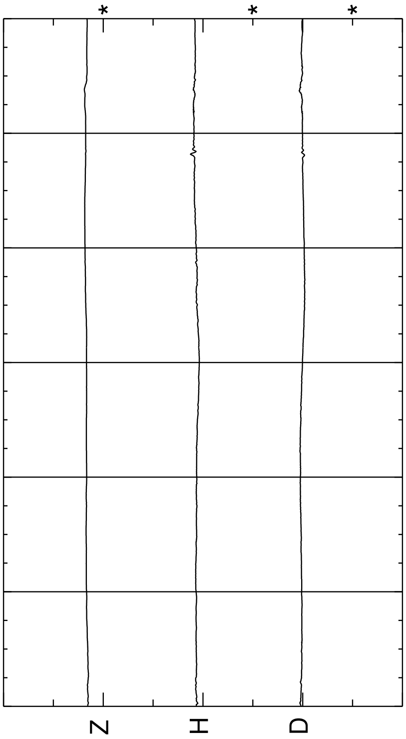
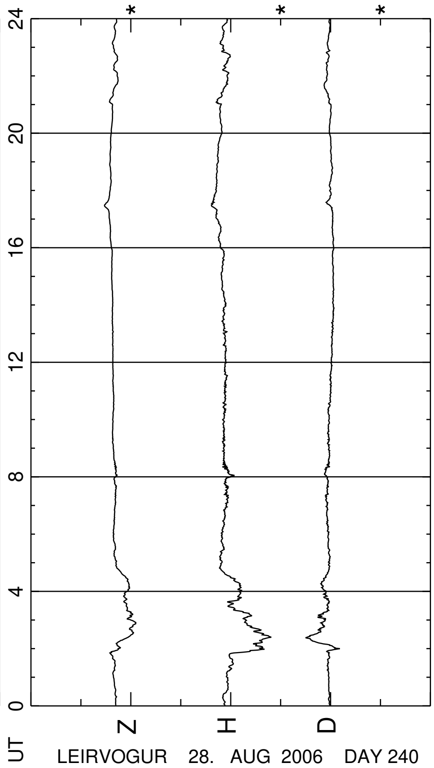
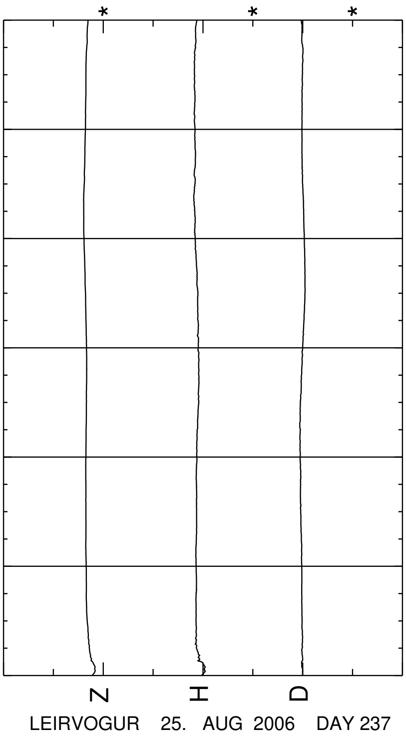


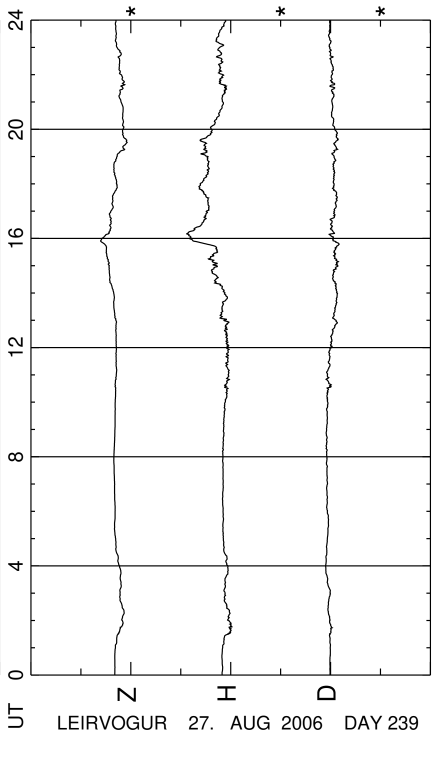
LEIRVOGUR 26. AUG 2006 DAY 238



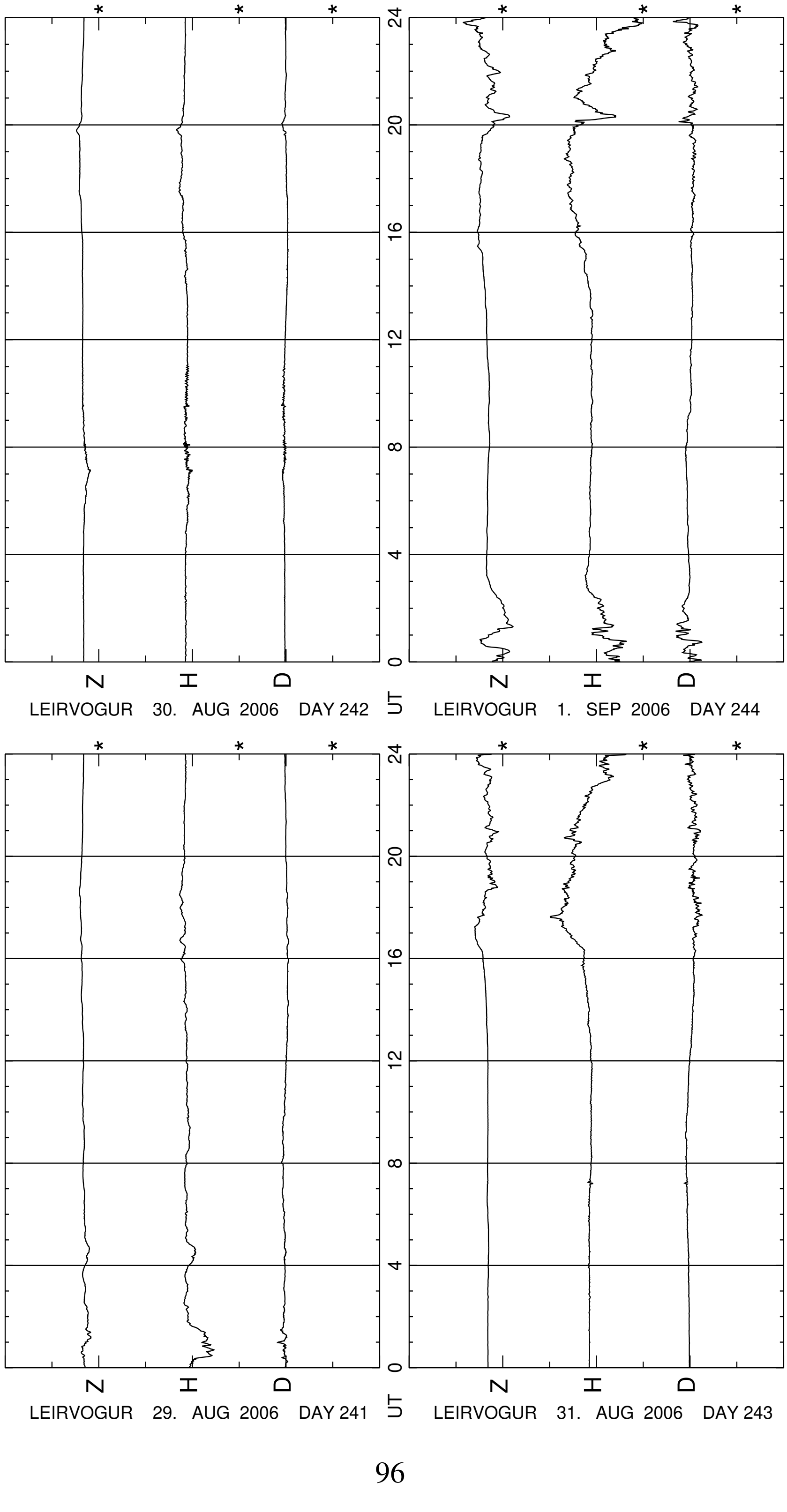
LEIRVOGUR 28. AUG 2006 DAY 240



LEIRVOGUR 25. AUG 2006 DAY 237



LEIRVOGUR 27. AUG 2006 DAY 239


LEIRVOGUR 30. AUG 2006 DAY 242
LEIRVOGUR 1. SEP 2006 DAY 244
LEIRVOGUR 29. AUG 2006 DAY 241
LEIRVOGUR 31. AUG 2006 DAY 243
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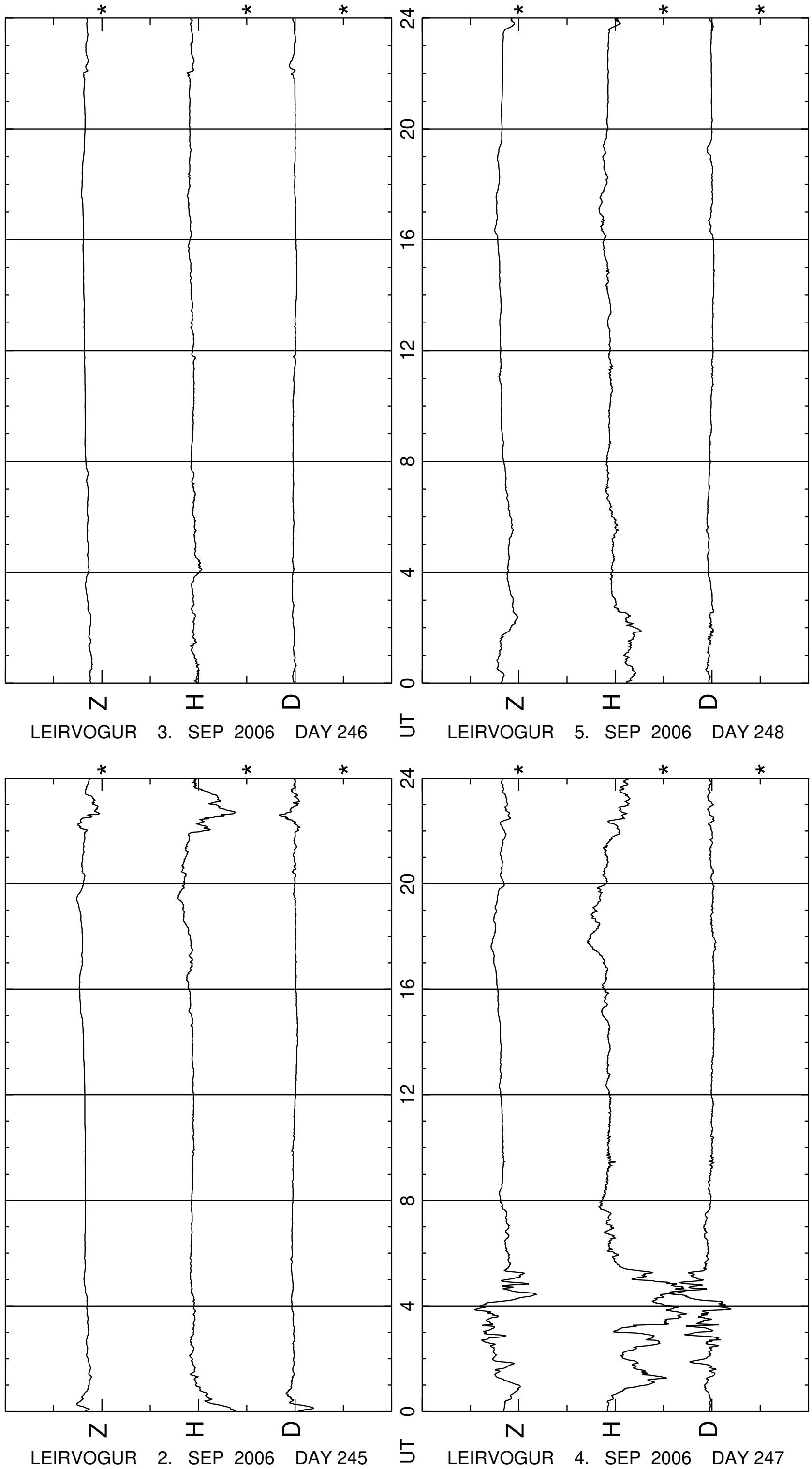
LEIRVOGUR 3. SEP 2006 DAY 246
LEIRVOGUR 5. SEP 2006 DAY 248
LEIRVOGUR 2. SEP 2006 DAY 245
LEIRVOGUR 4. SEP 2006 DAY 247
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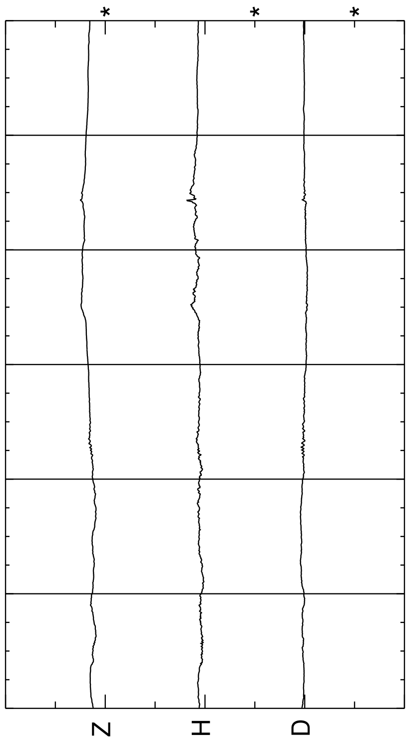
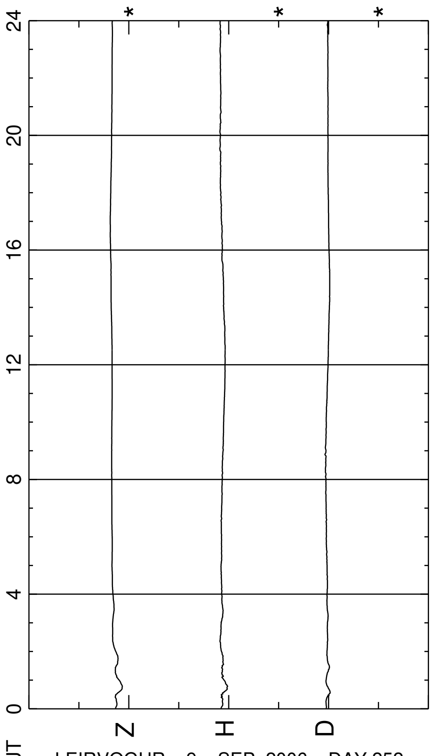
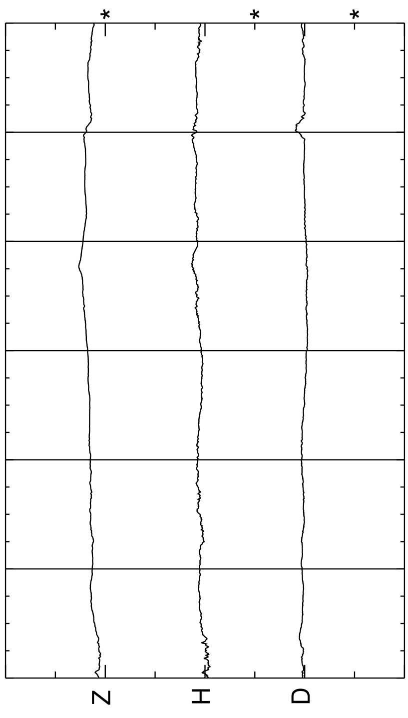


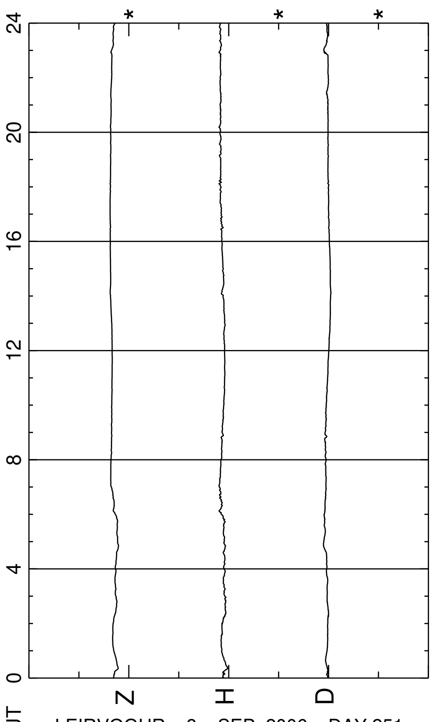
LEIRVOGUR 7. SEP 2006 DAY 250



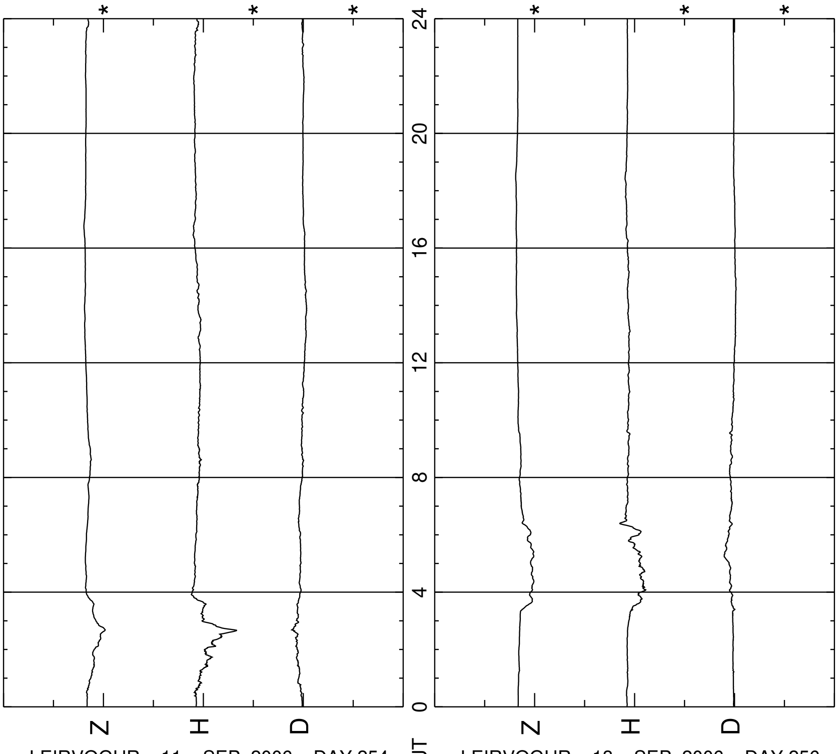
LEIRVOGUR 9. SEP 2006 DAY 252



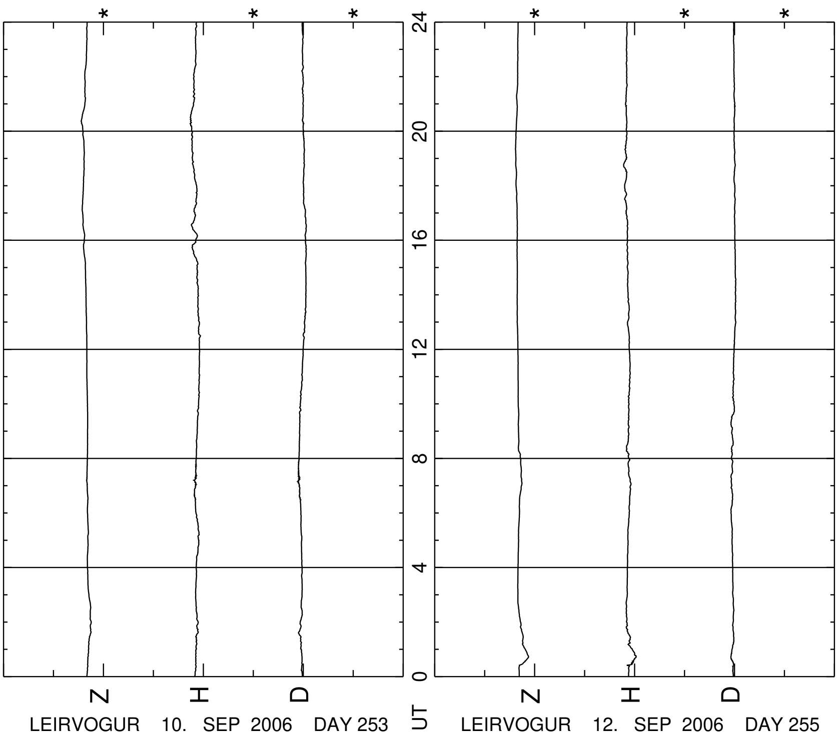
LEIRVOGUR 6. SEP 2006 DAY 249



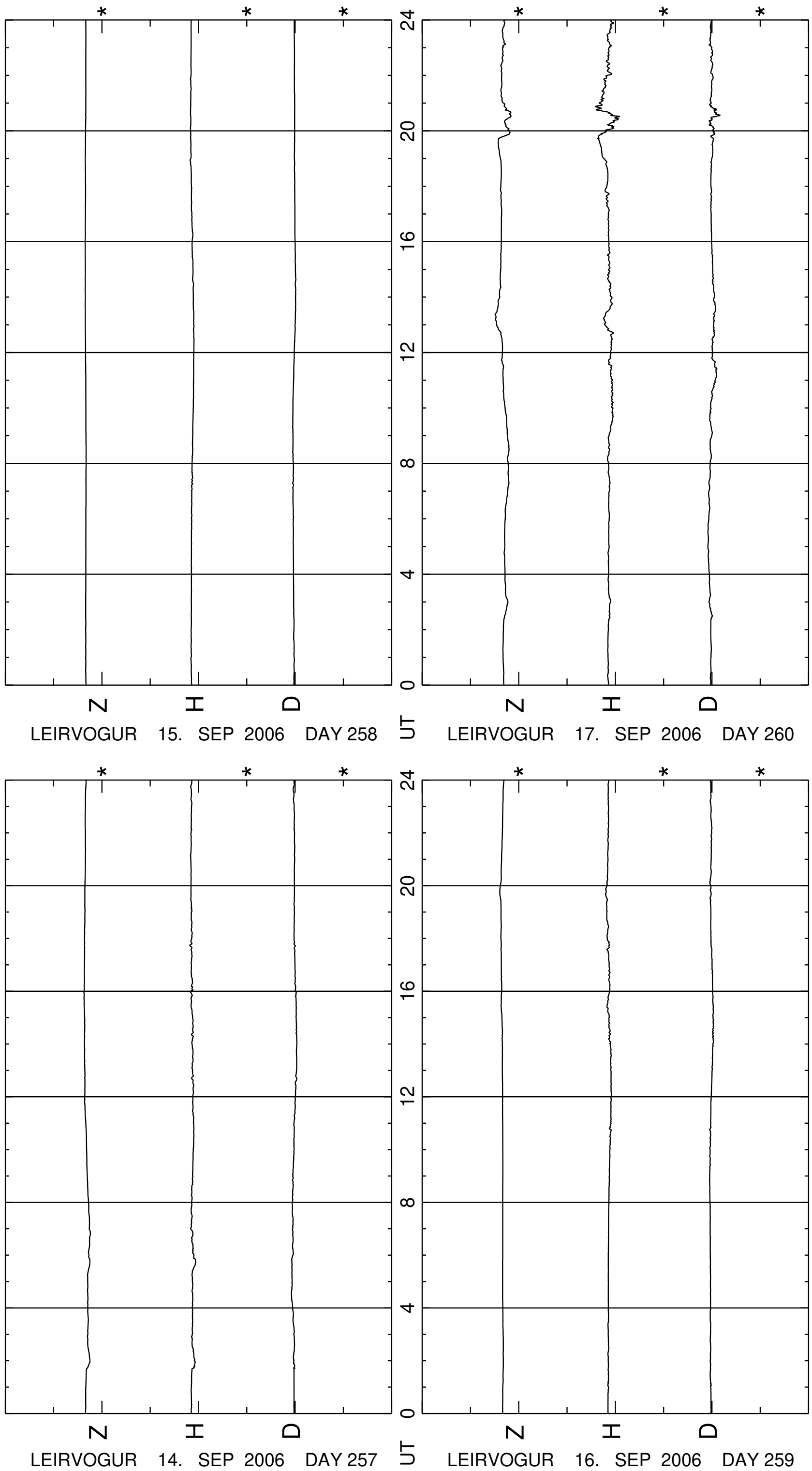
LEIRVOGUR 8. SEP 2006 DAY 251



LEIRVOGUR 11. SEP 2006 DAY 254 — LEIRVOGUR 13. SEP 2006 DAY 256



LEIRVOGUR 10. SEP 2006 DAY 253 — LEIRVOGUR 12. SEP 2006 DAY 255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LEIRVOGUR 15. SEP 2006 DAY 258
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LEIRVOGUR 17. SEP 2006 DAY 260
Z H D
LEIRVOGUR 14. SEP 2006 DAY 257
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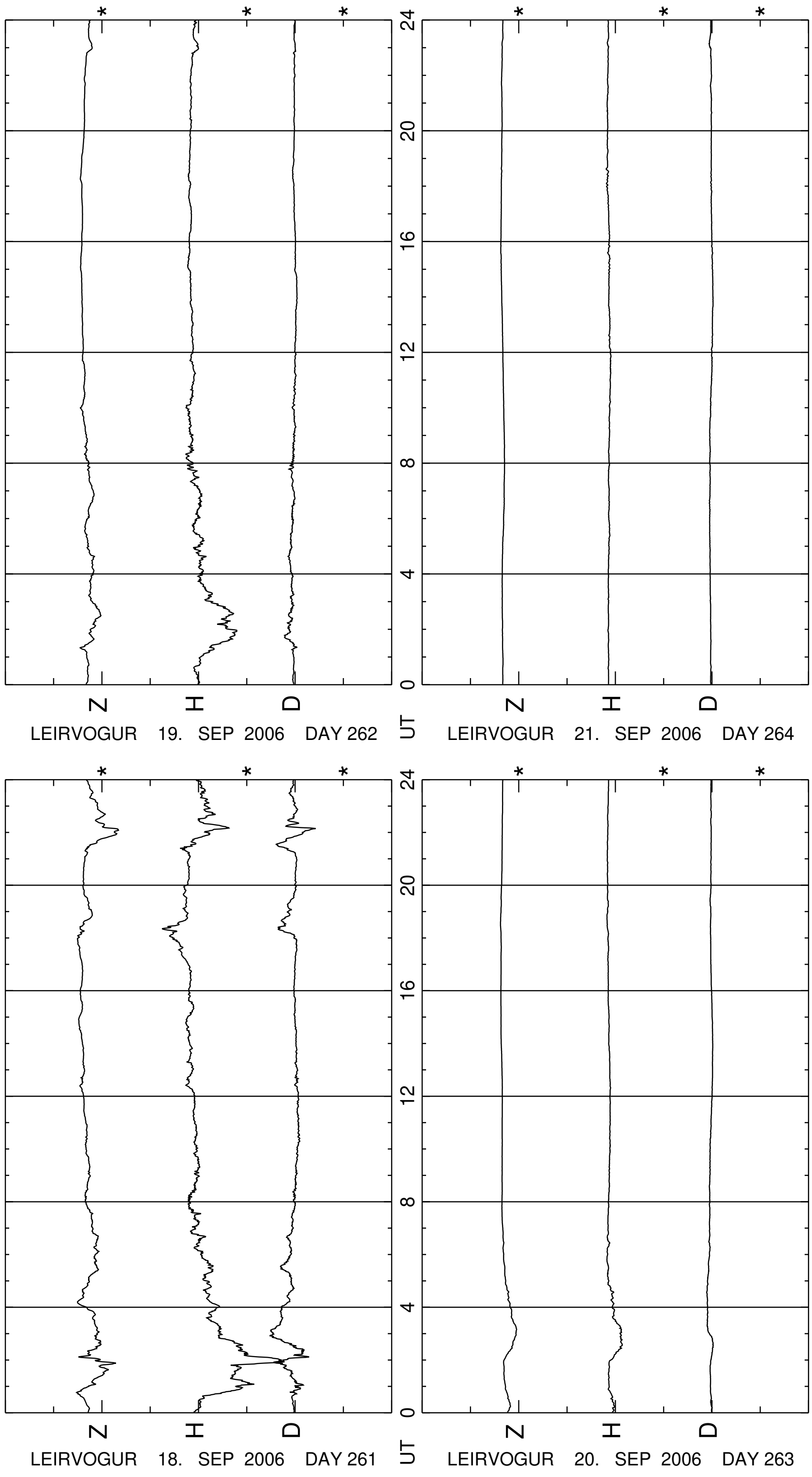
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 16. SEP 2006 DAY 259


LEIRVOGUR 19. SEP 2006 DAY 262
LEIRVOGUR 21. SEP 2006 DAY 264
LEIRVOGUR 18. SEP 2006 DAY 261
LEIRVOGUR 20. SEP 2006 DAY 263
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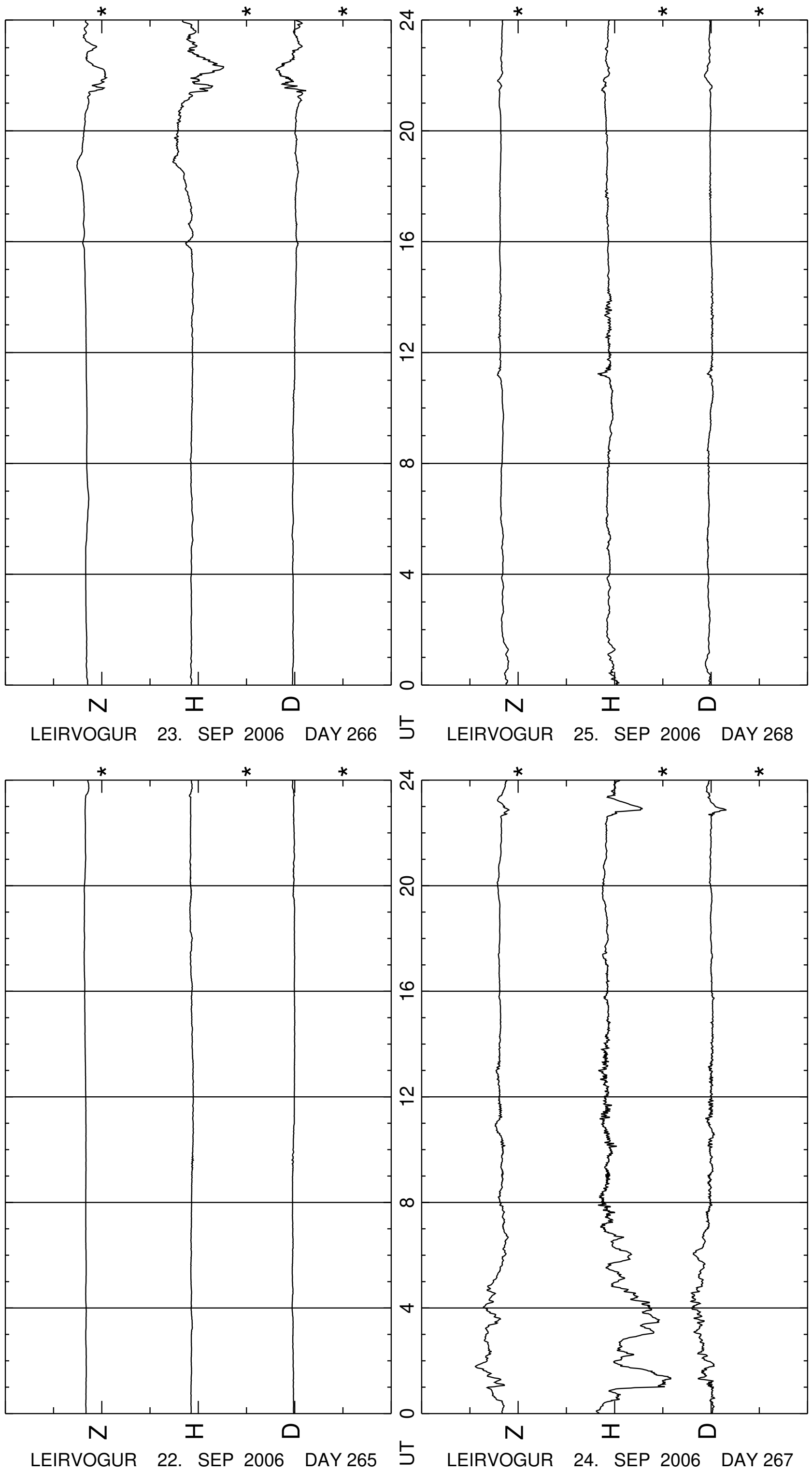

Z H D
LEIRVOGUR 23. SEP 2006 DAY 266
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LEIRVOGUR 25. SEP 2006 DAY 268
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LEIRVOGUR 22. SEP 2006 DAY 265
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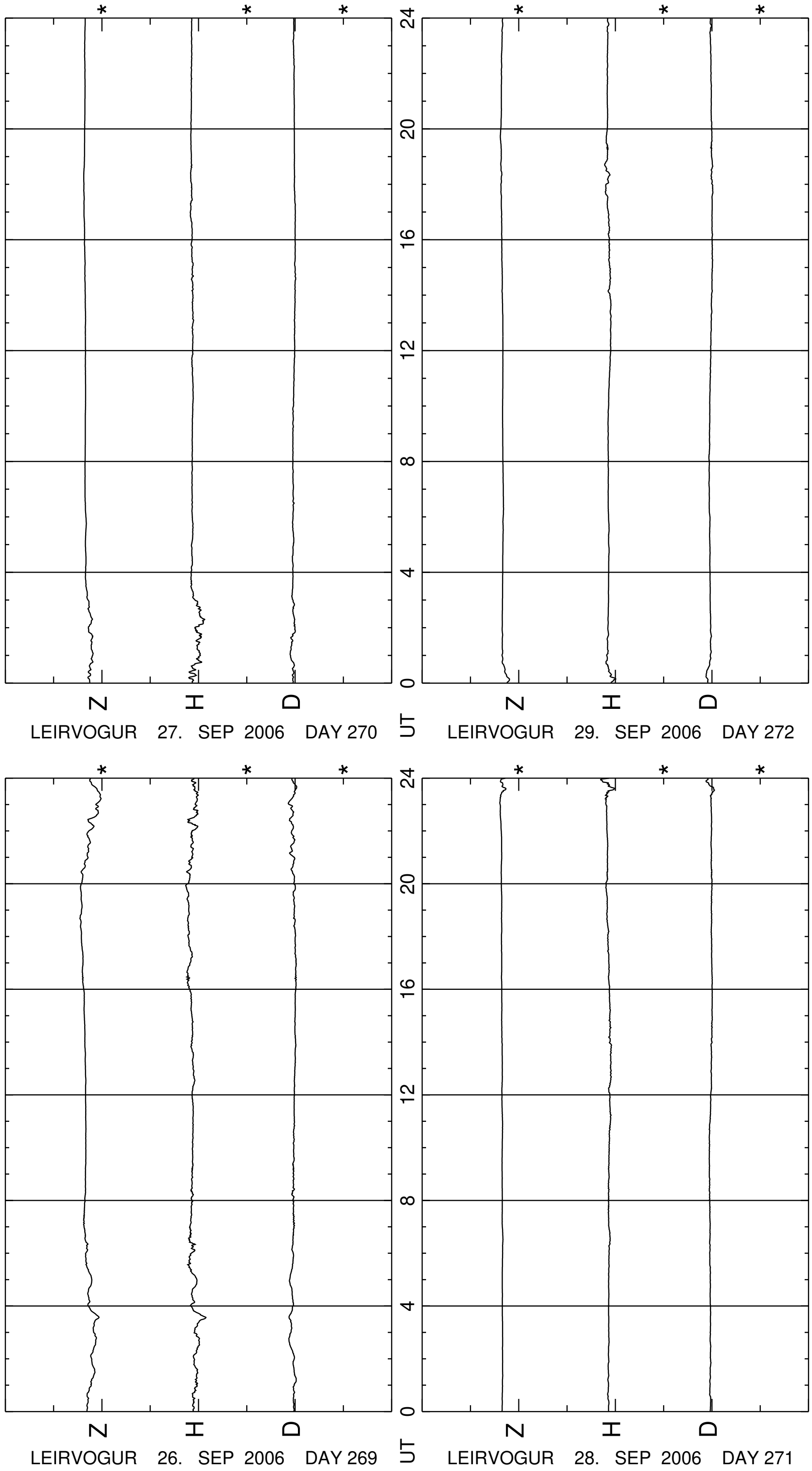
LEIRVOGUR 24. SEP 2006 DAY 267


LEIRVOGUR 27. SEP 2006 DAY 270
LEIRVOGUR 29. SEP 2006 DAY 272
LEIRVOGUR 26. SEP 2006 DAY 269
LEIRVOGUR 28. SEP 2006 DAY 271
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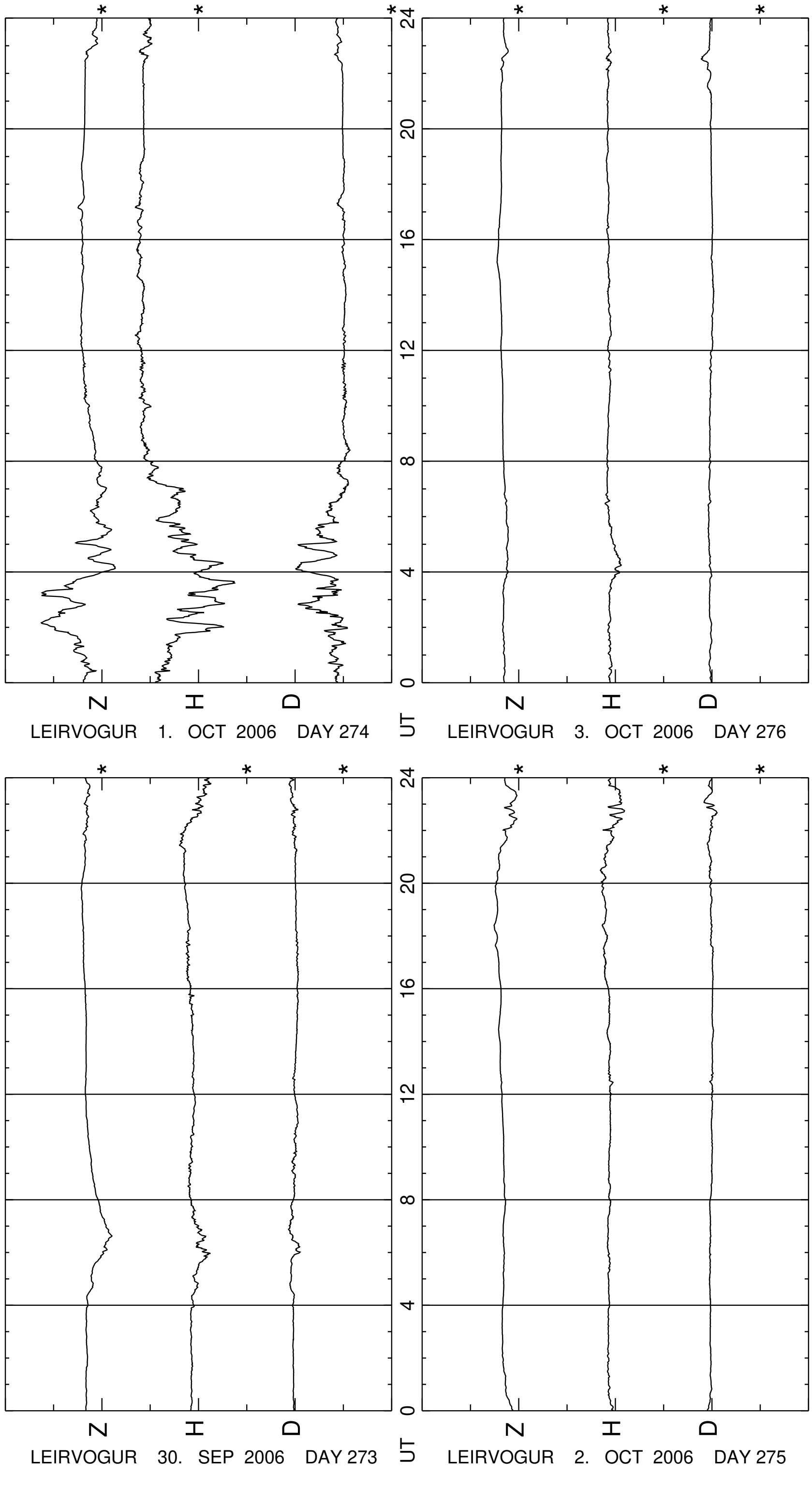

LEIRVOGUR 1. OCT 2006 DAY 274
LEIRVOGUR 3. OCT 2006 DAY 276
LEIRVOGUR 30. SEP 2006 DAY 273
LEIRVOGUR 2. OCT 2006 DAY 275
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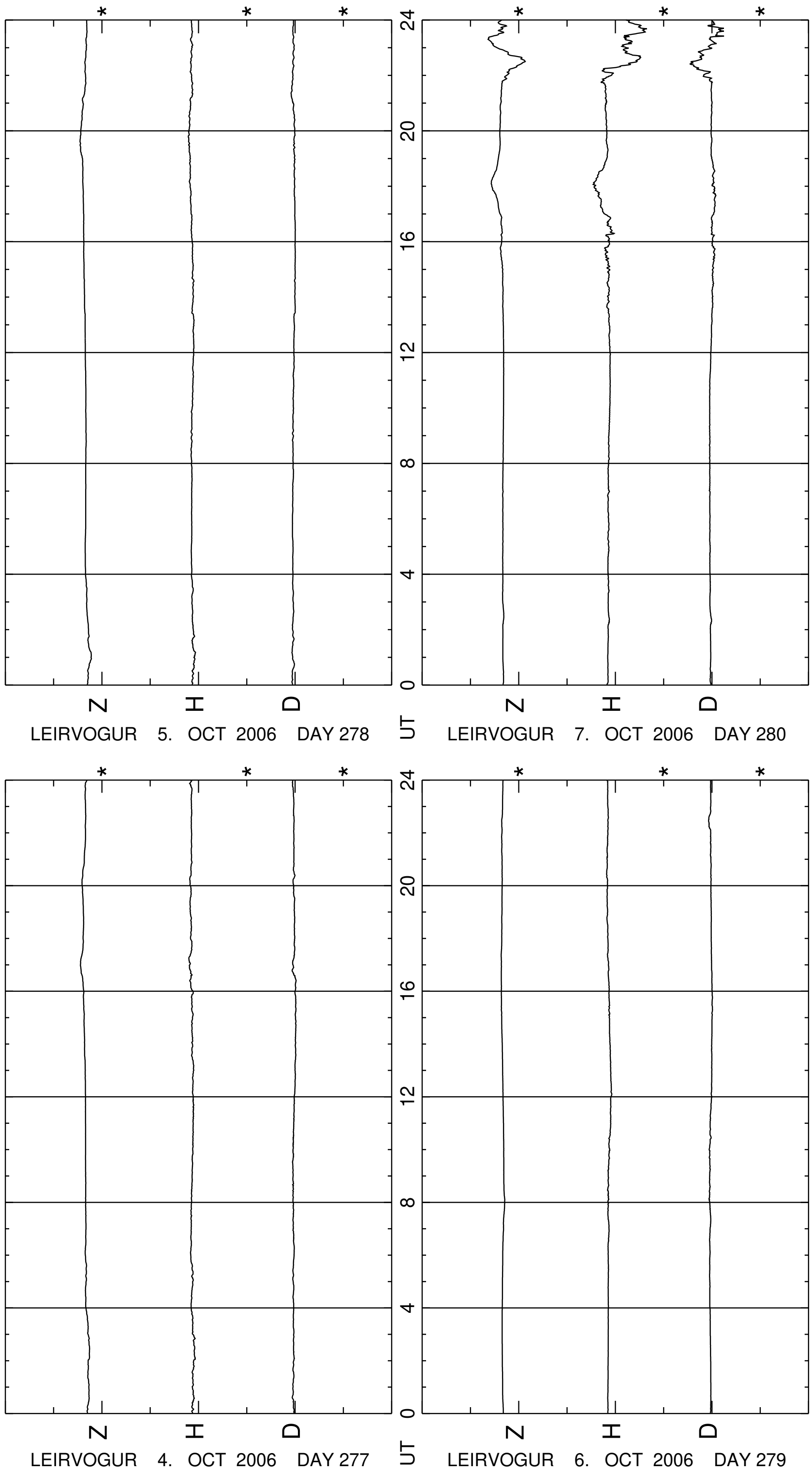

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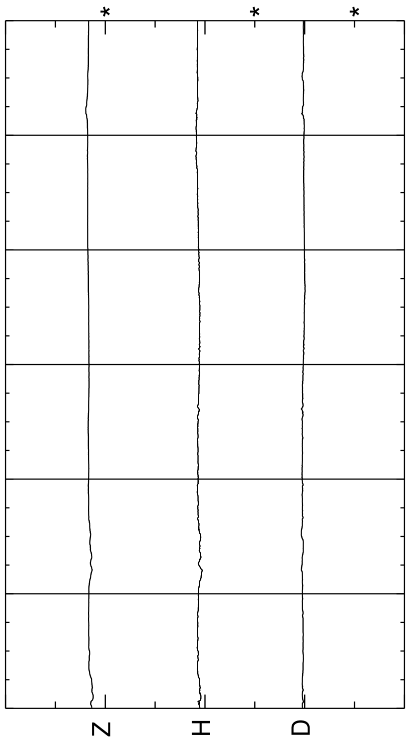
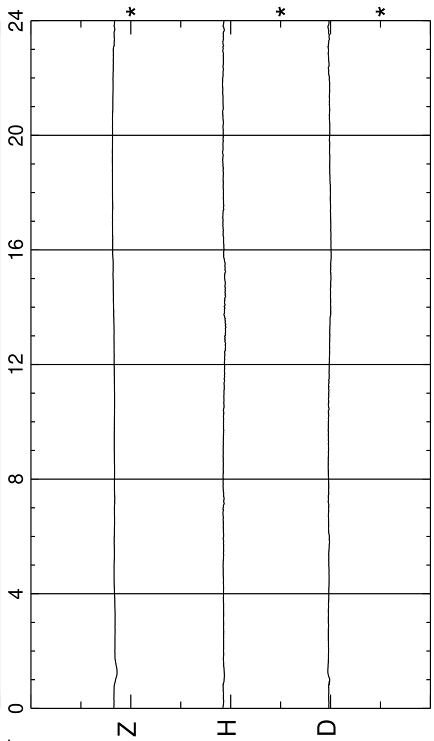
LEIRVOGUR 7. OCT 2006 DAY 280

LEIRVOGUR 4. OCT 2006 DAY 277

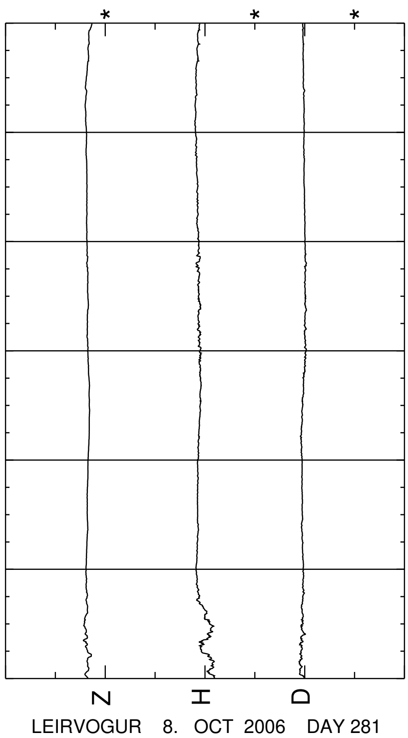
LEIRVOGUR 6. OCT 2006 DAY 279



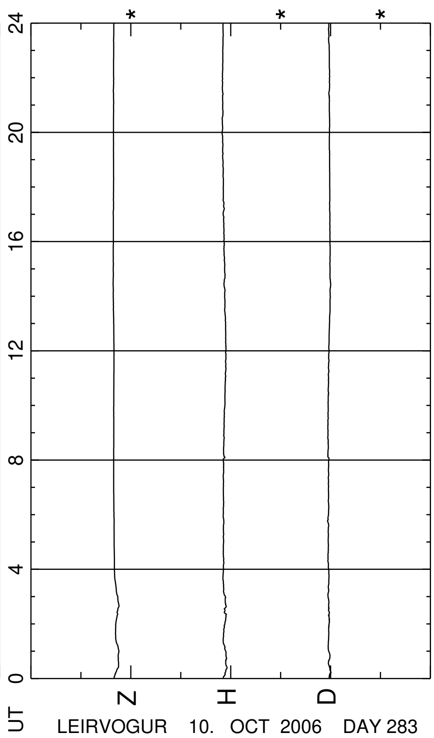
LEIRVOGUR 9. OCT 2006 DAY 282



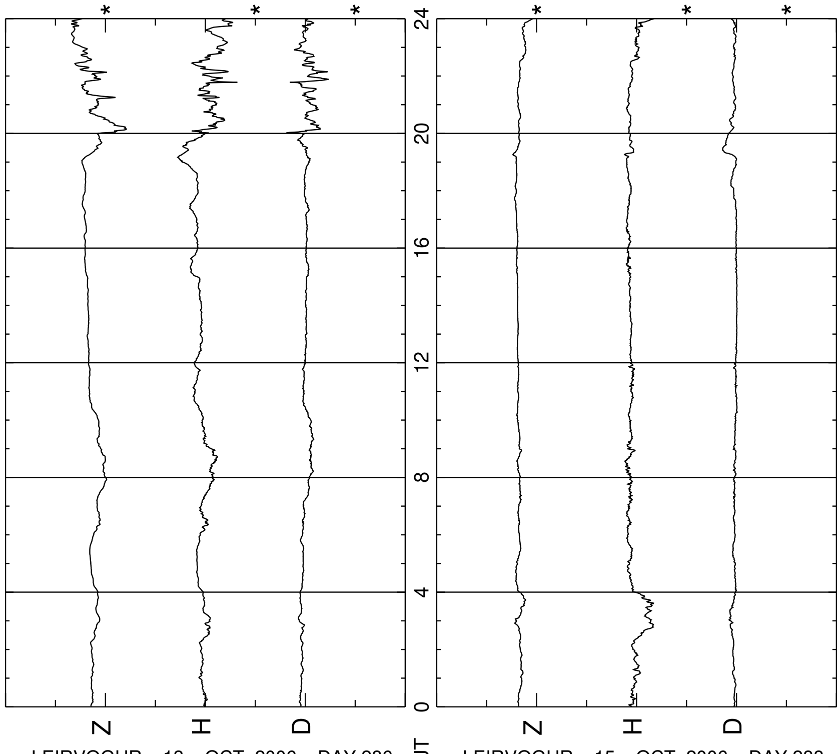
LEIRVOGUR 11. OCT 2006 DAY 284



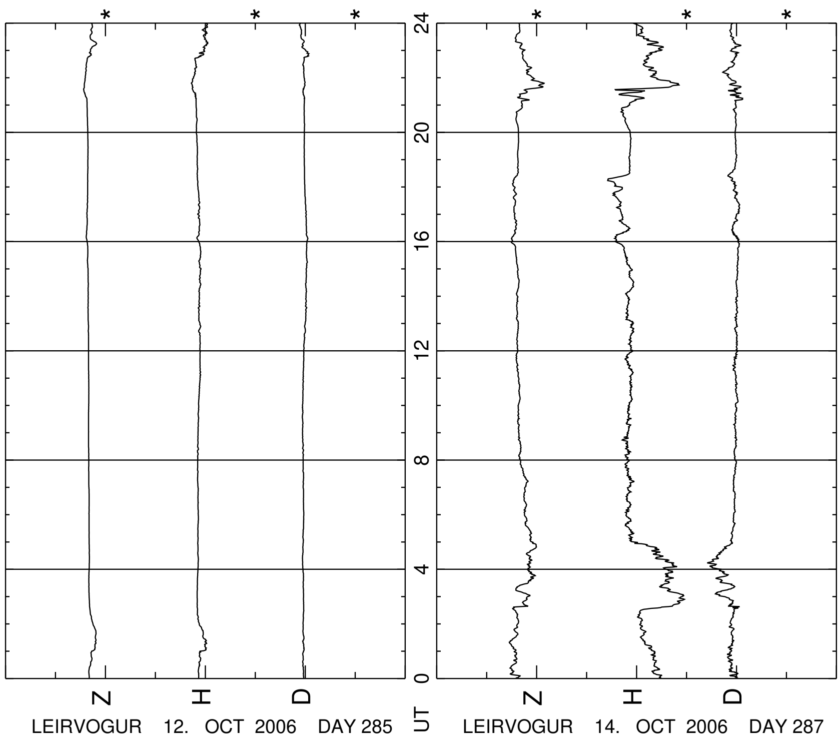
LEIRVOGUR 8. OCT 2006 DAY 281



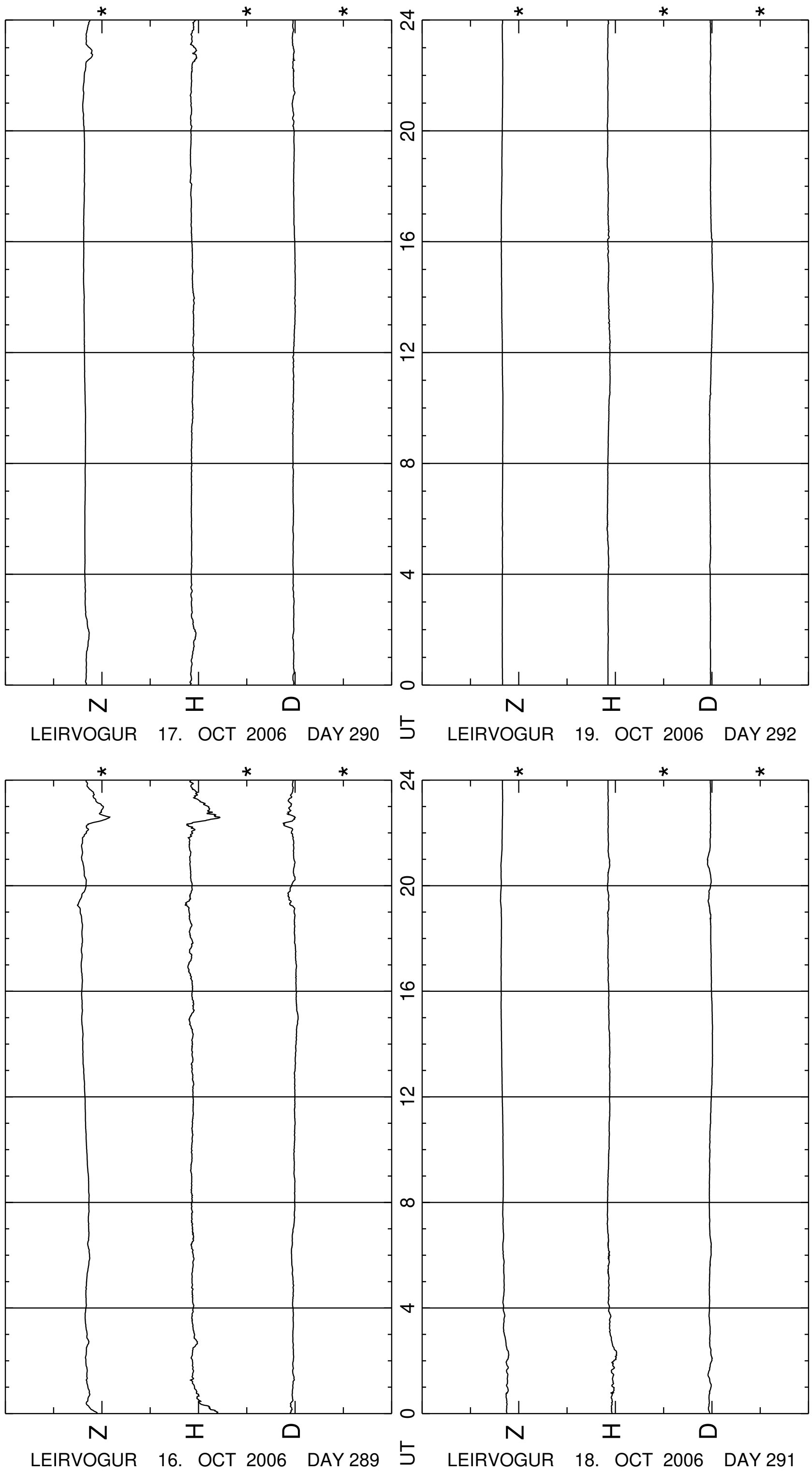
LEIRVOGUR 10. OCT 2006 DAY 283



LEIRVOGUR 13. OCT 2006 DAY 286 LEIRVOGUR 15. OCT 2006 DAY 288



LEIRVOGUR 12. OCT 2006 DAY 285 LEIRVOGUR 14. OCT 2006 DAY 287


LEIRVOGUR 17. OCT 2006 DAY 290
LEIRVOGUR 19. OCT 2006 DAY 292
LEIRVOGUR 16. OCT 2006 DAY 289
LEIRVOGUR 18. OCT 2006 DAY 291
Z
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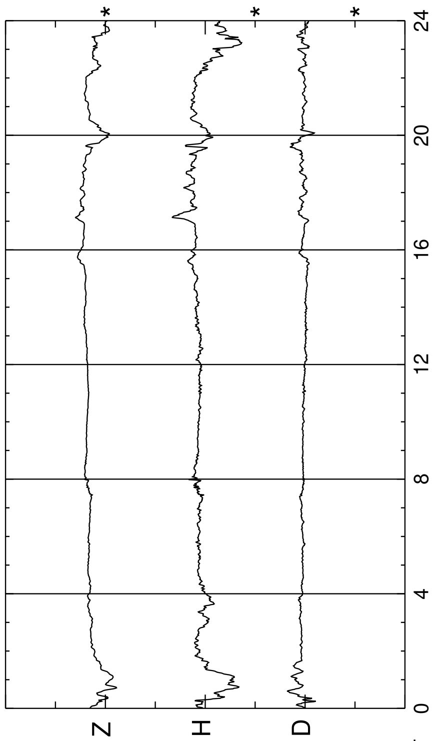
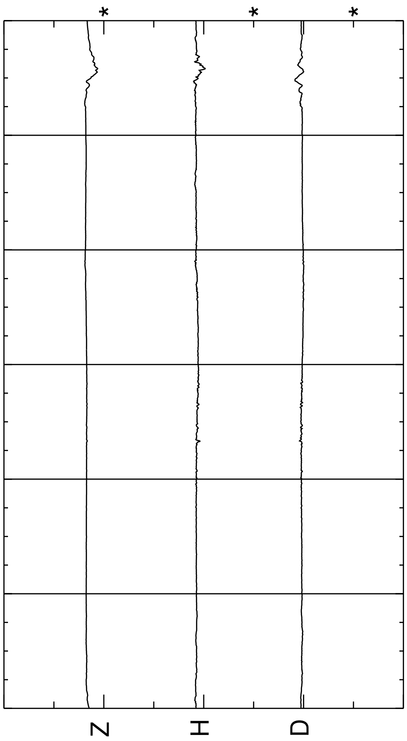
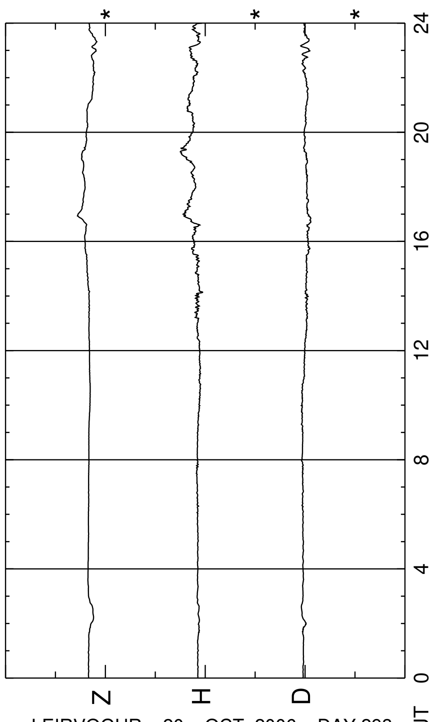


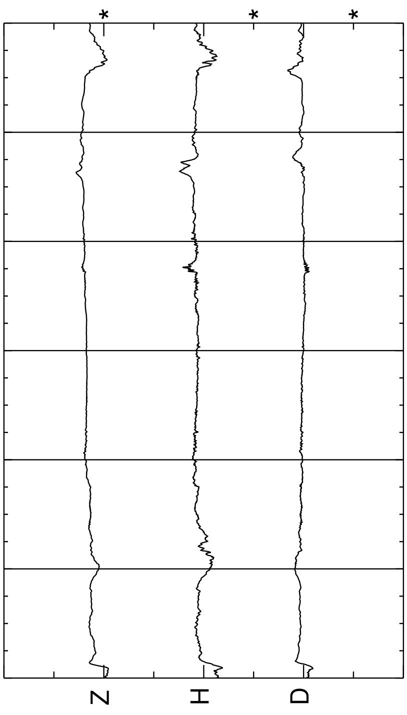
LEIRVOGUR 21. OCT 2006 DAY 294



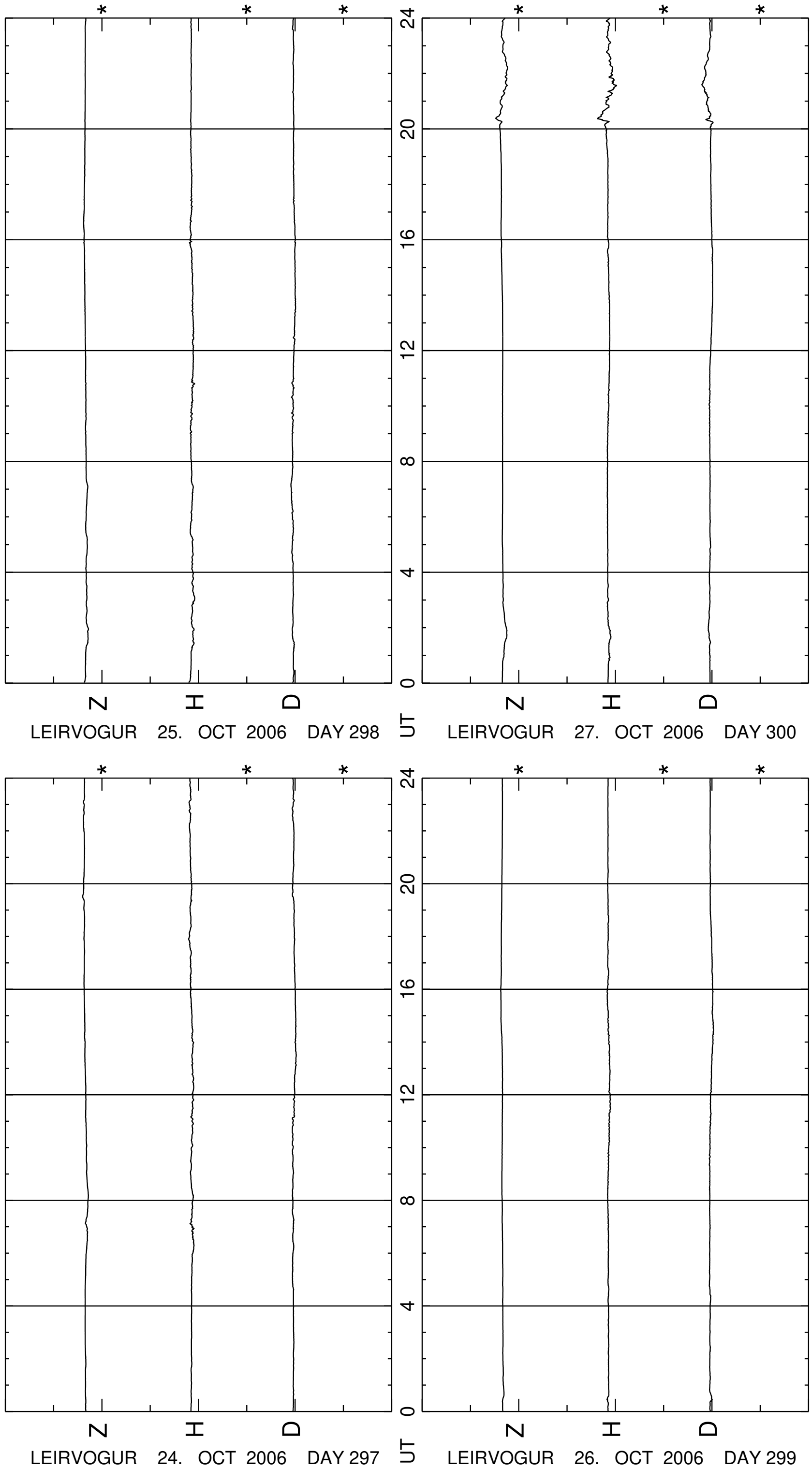
LEIRVOGUR 23. OCT 2006 DAY 296



LEIRVOGUR 20. OCT 2006 DAY 293



LEIRVOGUR 22. OCT 2006 DAY 295


LEIRVOGUR 25. OCT 2006 DAY 298
LEIRVOGUR 27. OCT 2006 DAY 300
LEIRVOGUR 24. OCT 2006 DAY 297
LEIRVOGUR 26. OCT 2006 DAY 299
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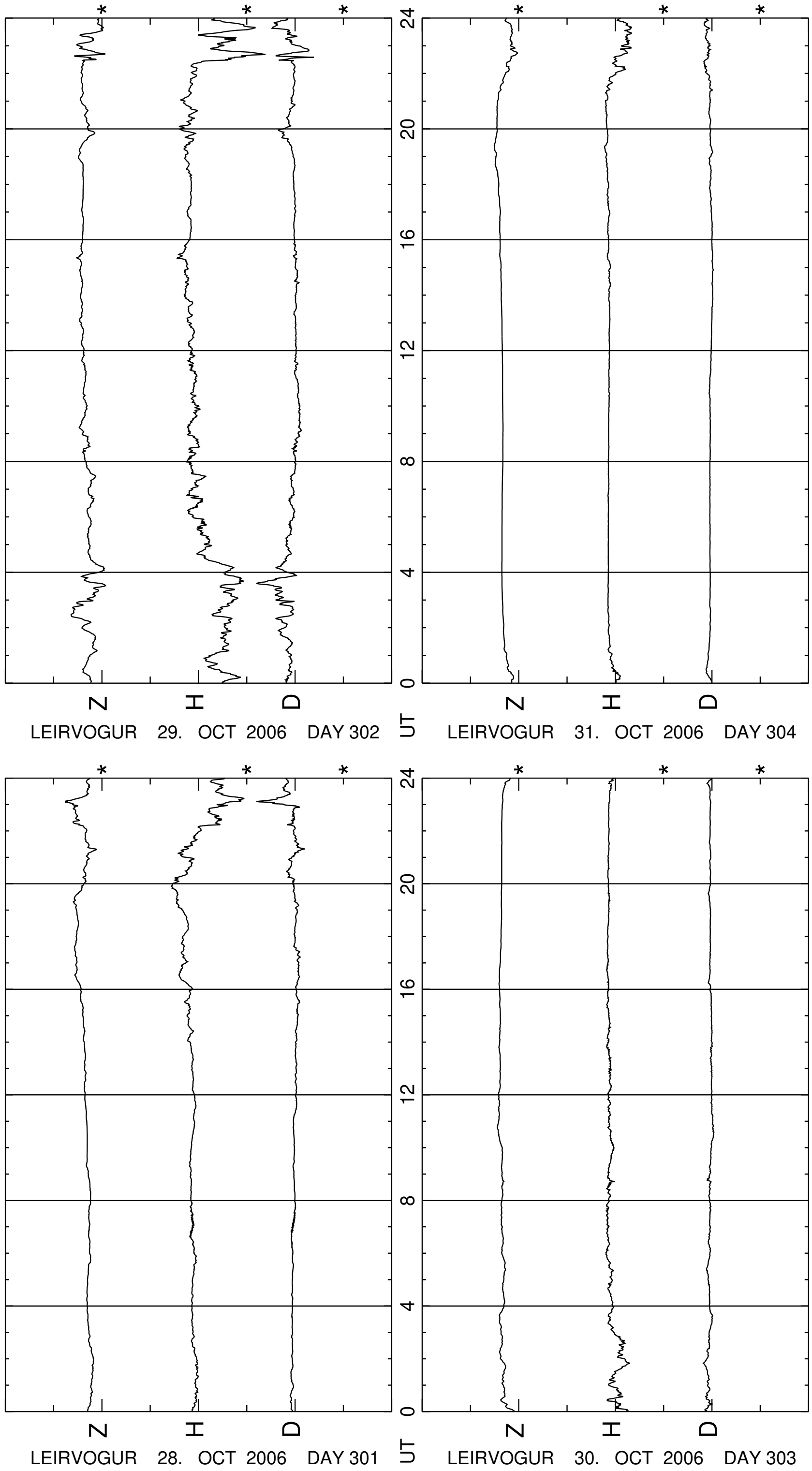
LEIRVOGUR 29. OCT 2006 DAY 302
LEIRVOGUR 31. OCT 2006 DAY 304
LEIRVOGUR 28. OCT 2006 DAY 301
LEIRVOGUR 30. OCT 2006 DAY 303
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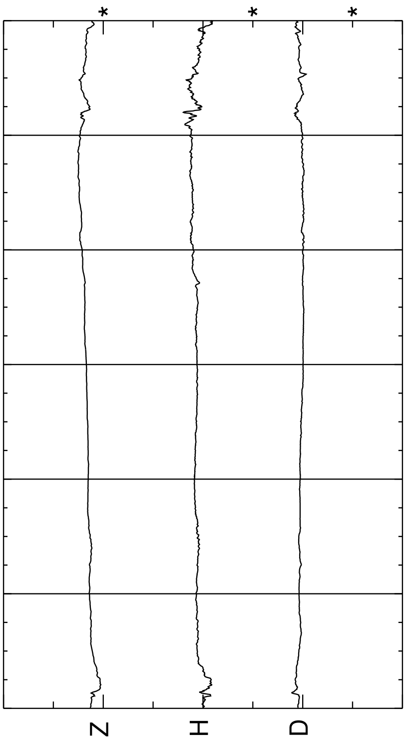
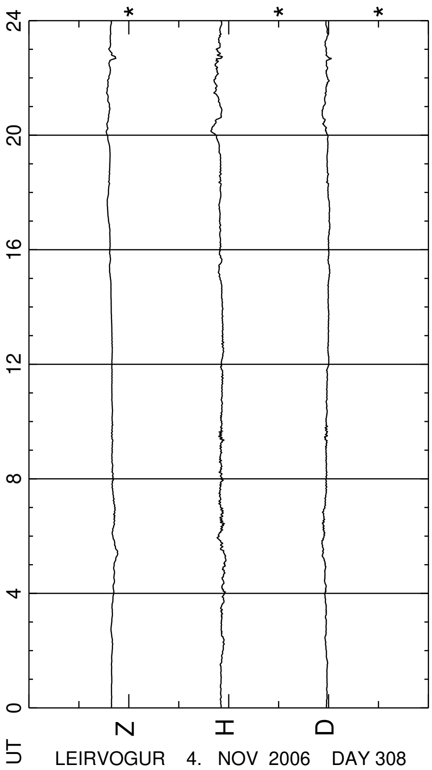
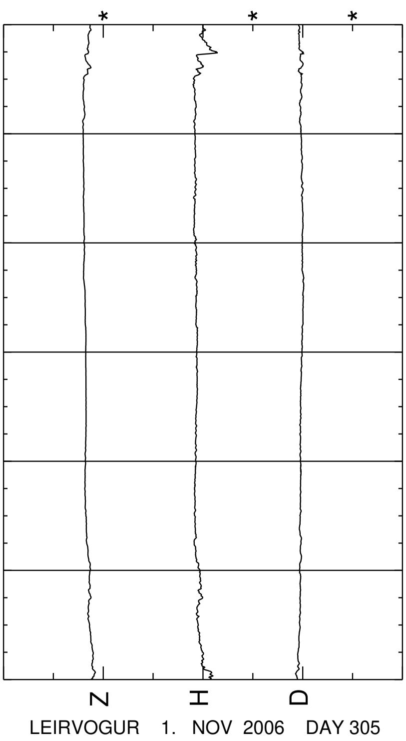


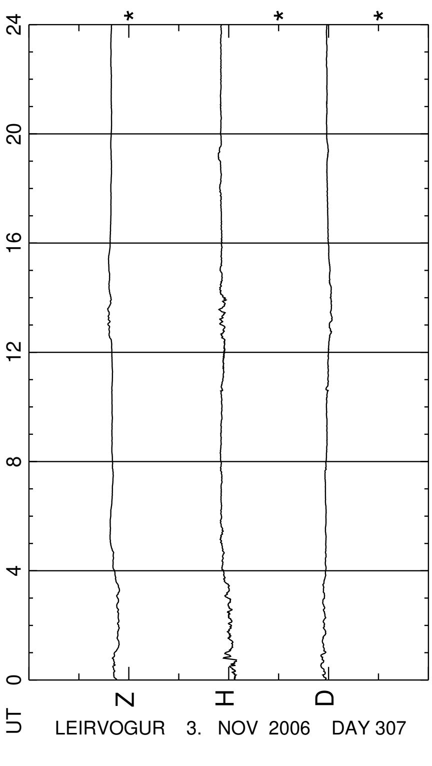
LEIRVOGUR 2. NOV 2006 DAY 306



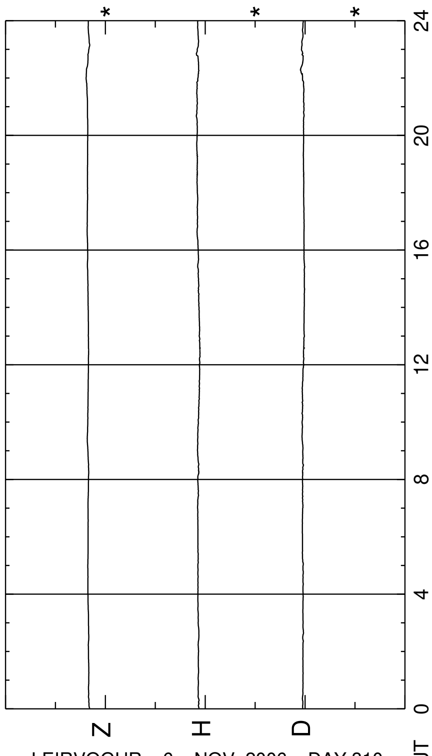
LEIRVOGUR 4. NOV 2006 DAY 308



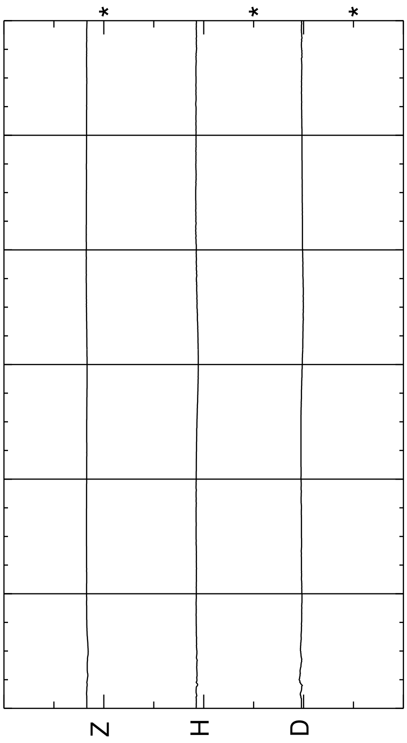
LEIRVOGUR 1. NOV 2006 DAY 305



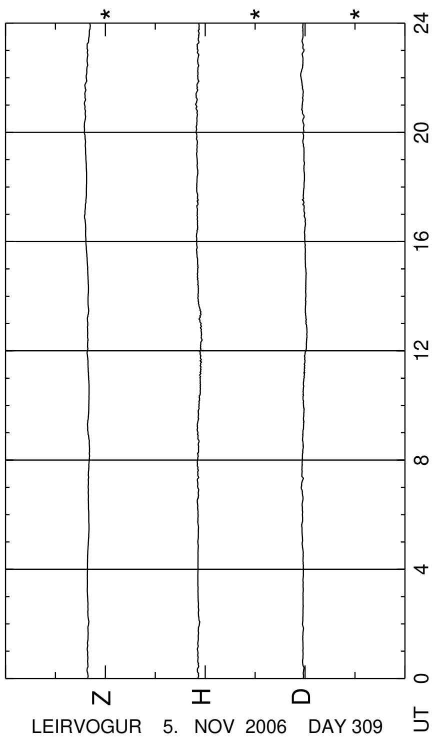
LEIRVOGUR 3. NOV 2006 DAY 307



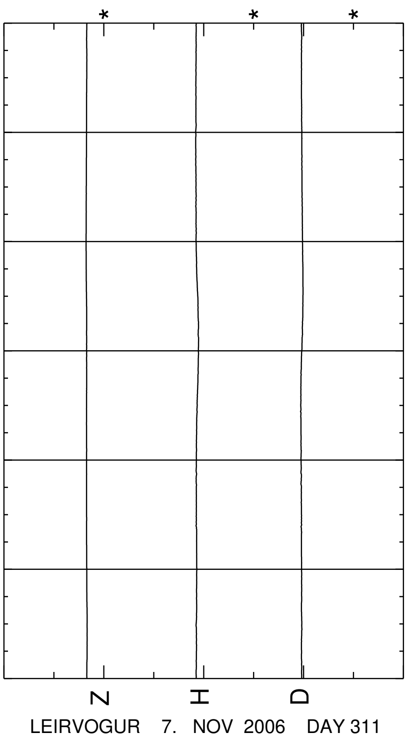
LEIRVOGUR 6. NOV 2006 DAY 310



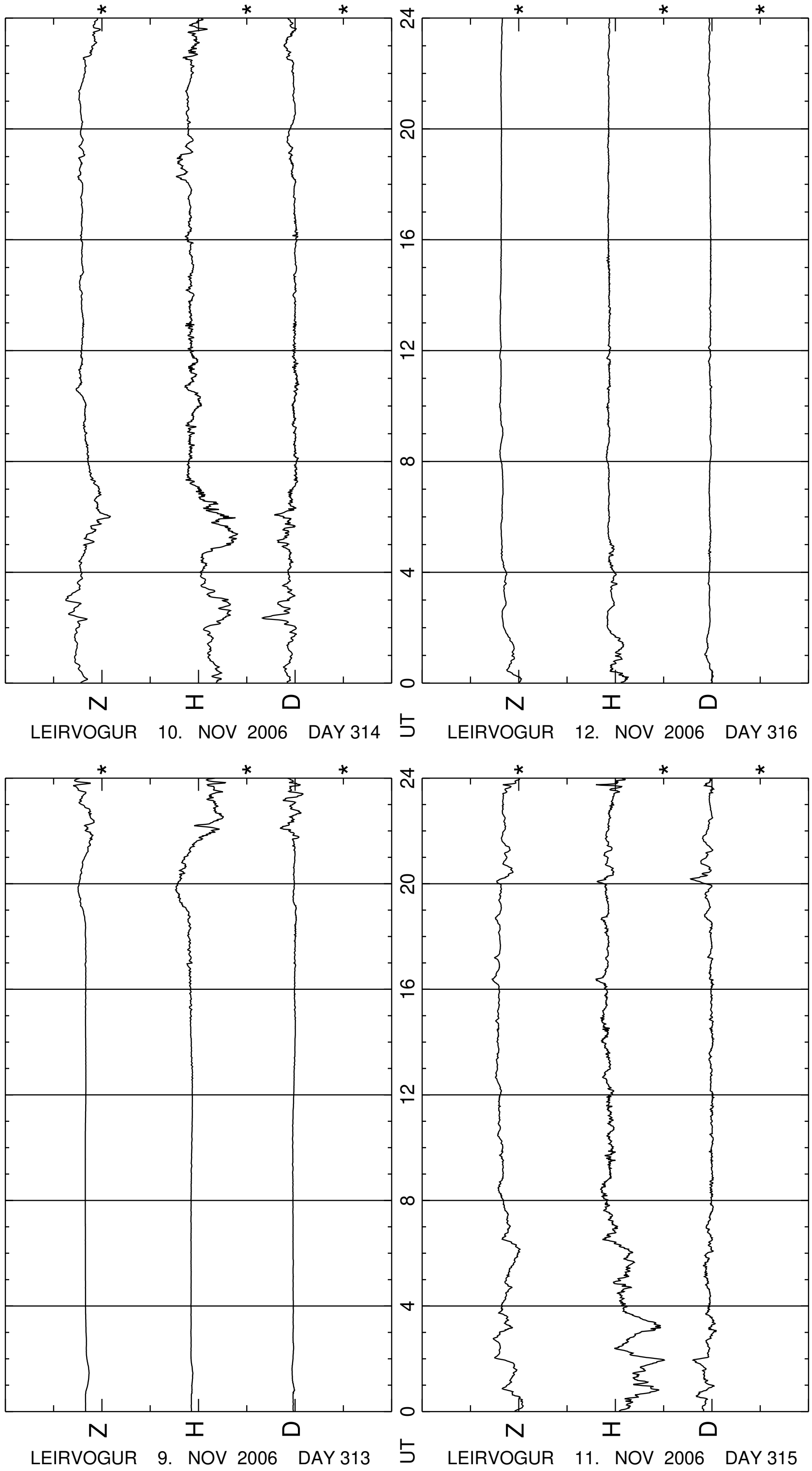
LEIRVOGUR 8. NOV 2006 DAY 312



LEIRVOGUR 5. NOV 2006 DAY 309



LEIRVOGUR 7. NOV 2006 DAY 311


LEIRVOGUR 10. NOV 2006 DAY 314
LEIRVOGUR 12. NOV 2006 DAY 316
LEIRVOGUR 9. NOV 2006 DAY 313
LEIRVOGUR 11. NOV 2006 DAY 315
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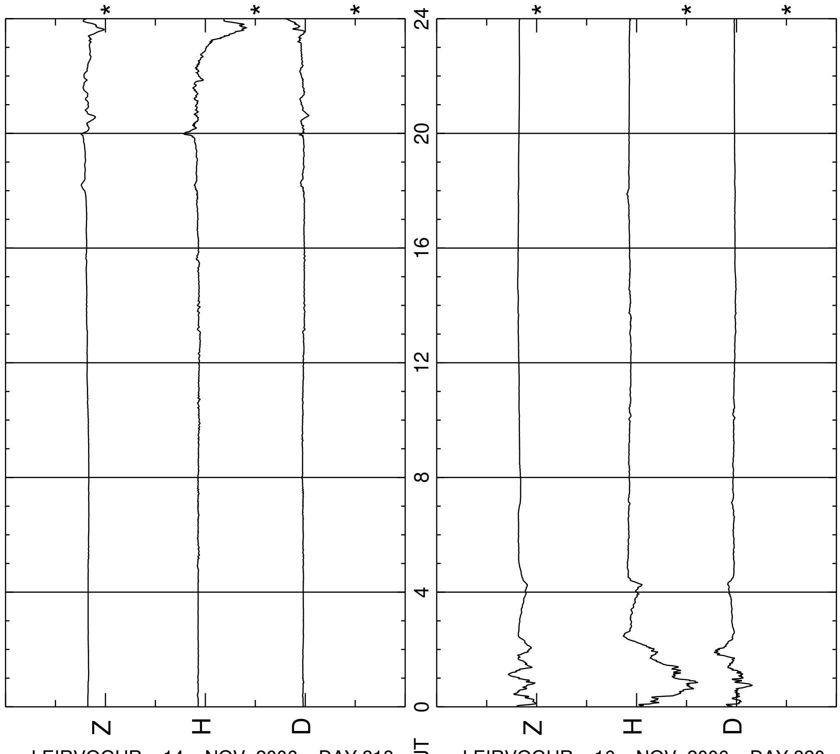
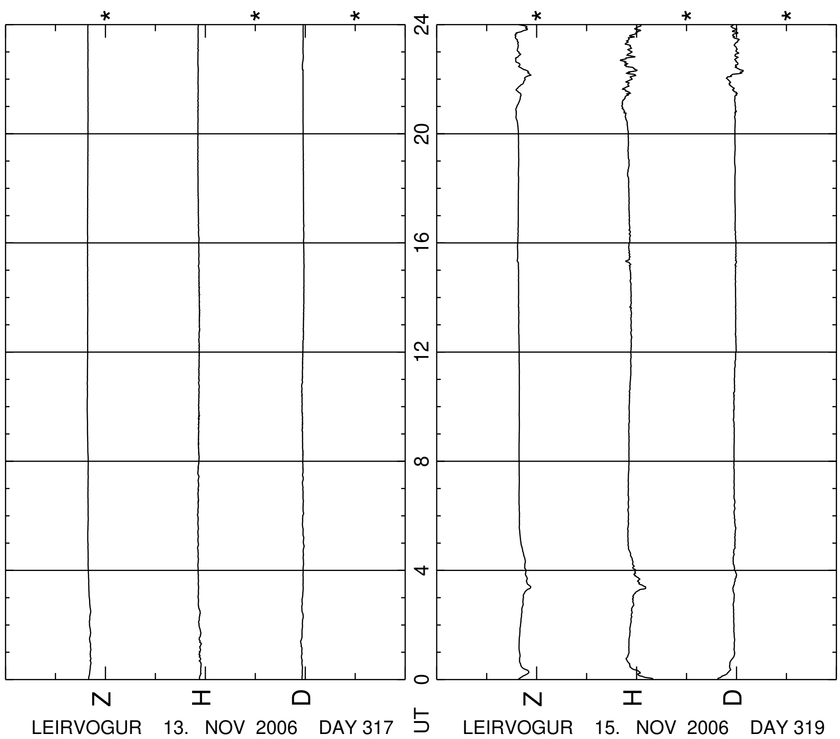
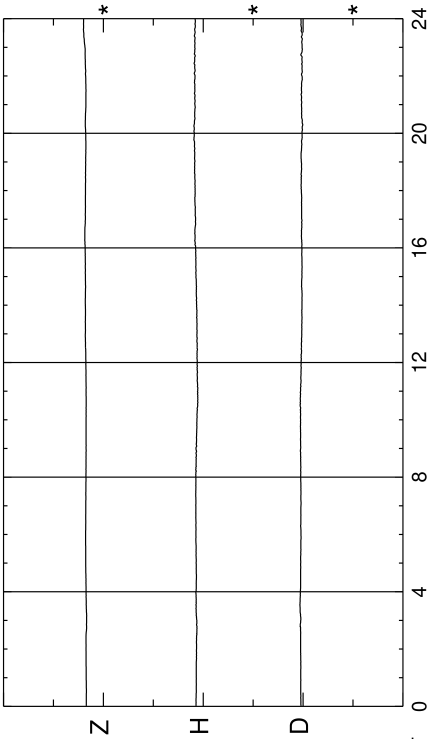


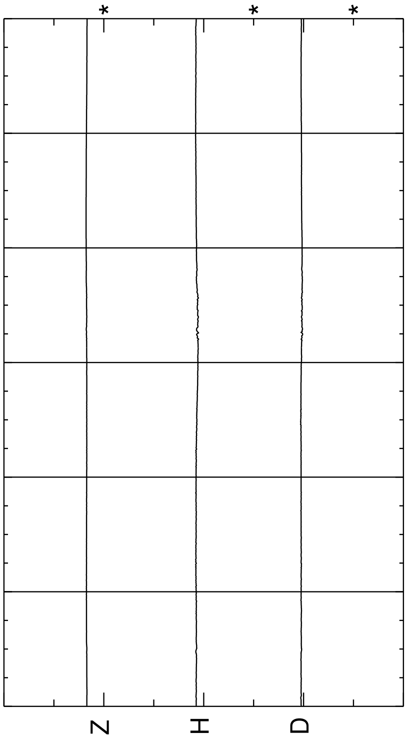
LEIRVOGUR 14. NOV 2006 DAY 318 UT LEIRVOGUR 16. NOV 2006 DAY 320



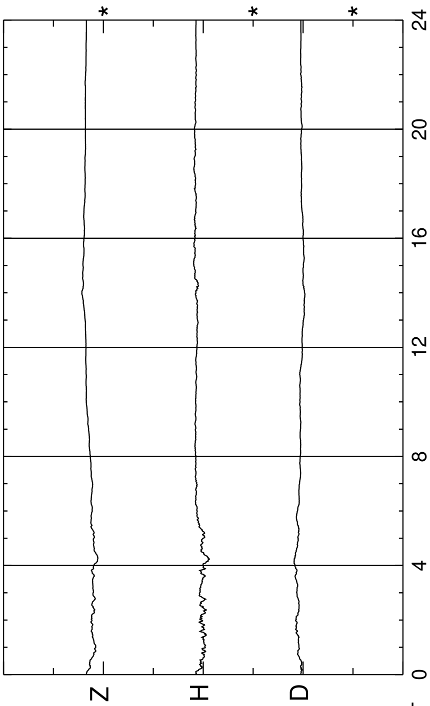
LEIRVOGUR 13. NOV 2006 DAY 317 UT LEIRVOGUR 15. NOV 2006 DAY 319



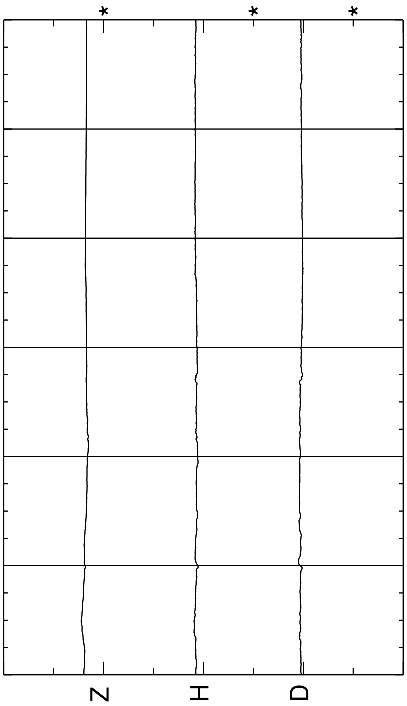
LEIRVOGUR 18. NOV 2006 DAY 322



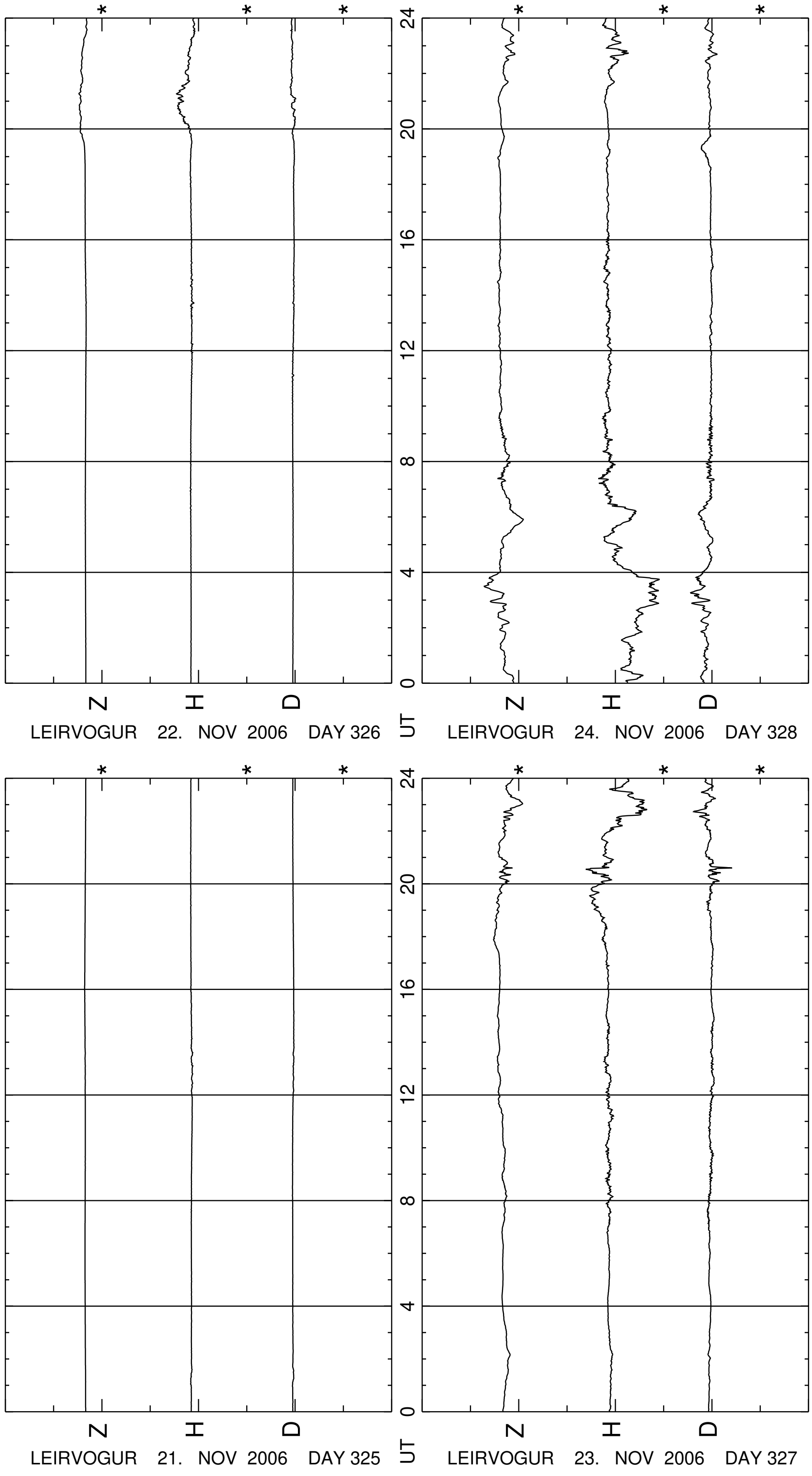
LEIRVOGUR 20. NOV 2006 DAY 324

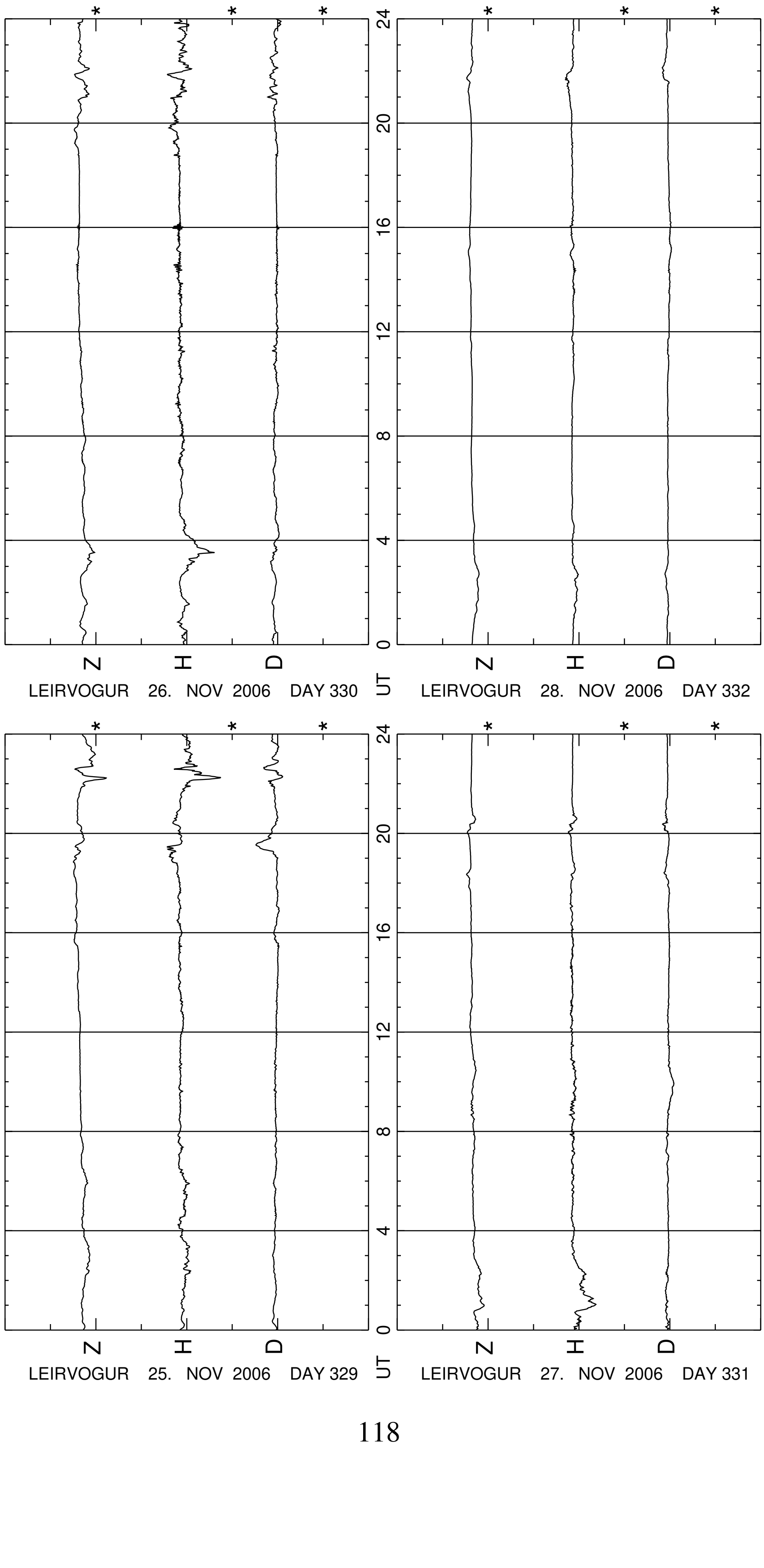


LEIRVOGUR 17. NOV 2006 DAY 321



LEIRVOGUR 19. NOV 2006 DAY 323


Z H D
LEIRVOGUR 22. NOV 2006 DAY 326
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 24. NOV 2006 DAY 328
Z H D
LEIRVOGUR 21. NOV 2006 DAY 325
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 23. NOV 2006 DAY 327


LEIRVOGUR 26. NOV 2006 DAY 330
LEIRVOGUR 28. NOV 2006 DAY 332
LEIRVOGUR 25. NOV 2006 DAY 329
LEIRVOGUR 27. NOV 2006 DAY 331
Z
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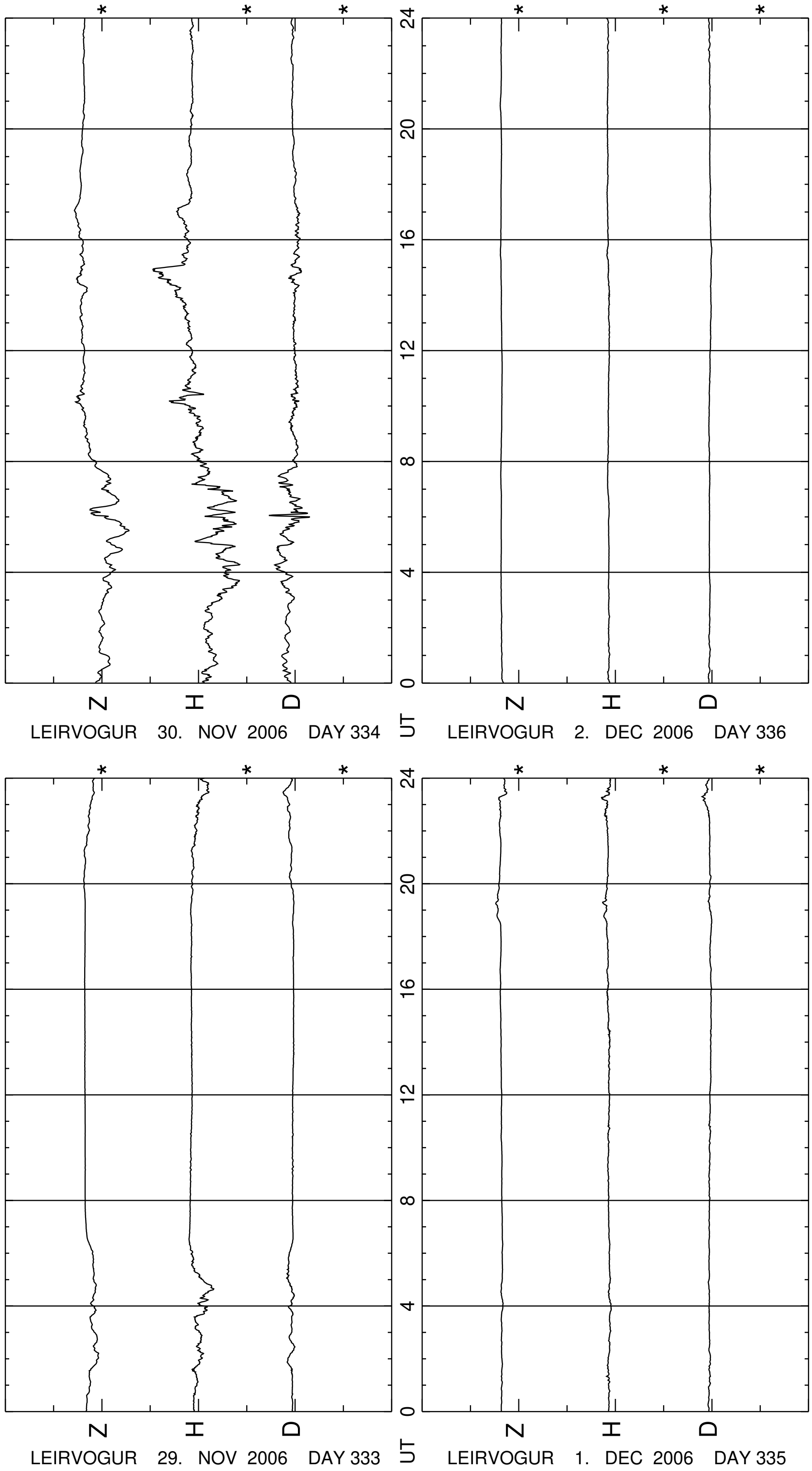
LEIRVOGUR 30. NOV 2006 DAY 334
LEIRVOGUR 2. DEC 2006 DAY 336
LEIRVOGUR 29. NOV 2006 DAY 333
LEIRVOGUR 1. DEC 2006 DAY 335
Z
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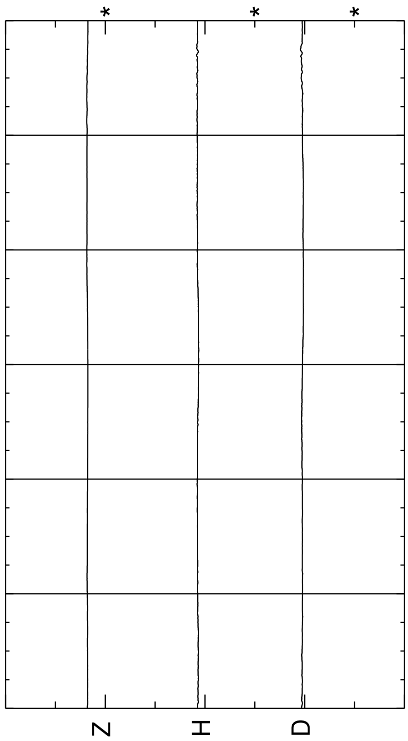
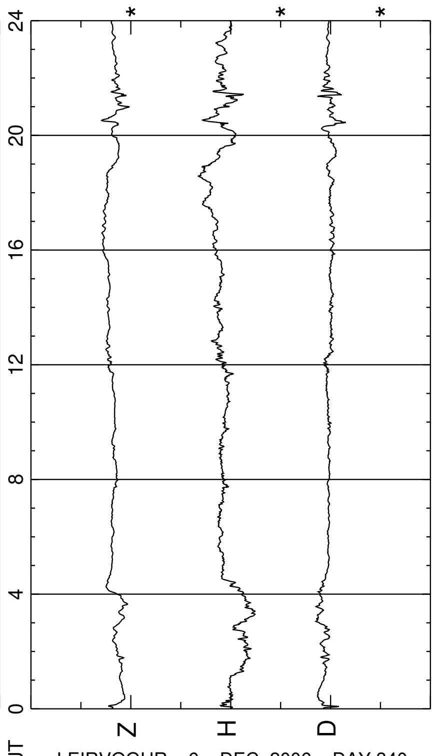
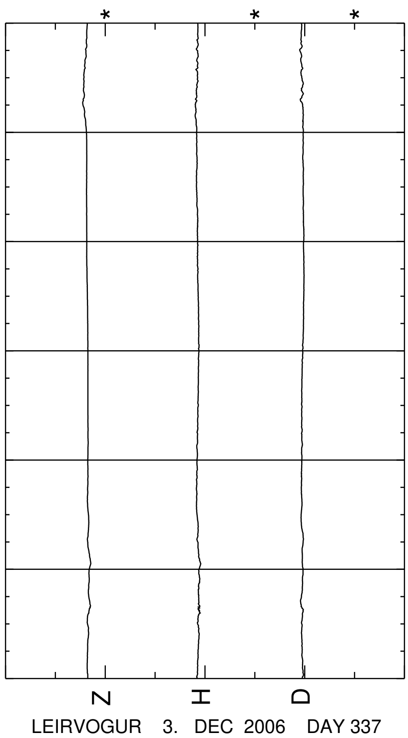


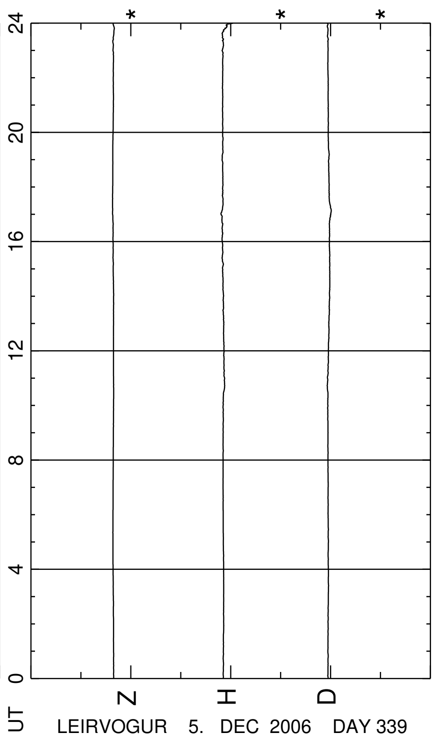
LEIRVOGUR 4. DEC 2006 DAY 338



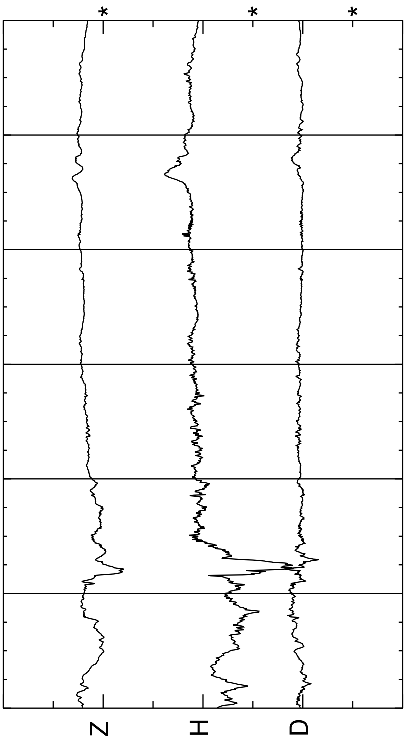
LEIRVOGUR 6. DEC 2006 DAY 340



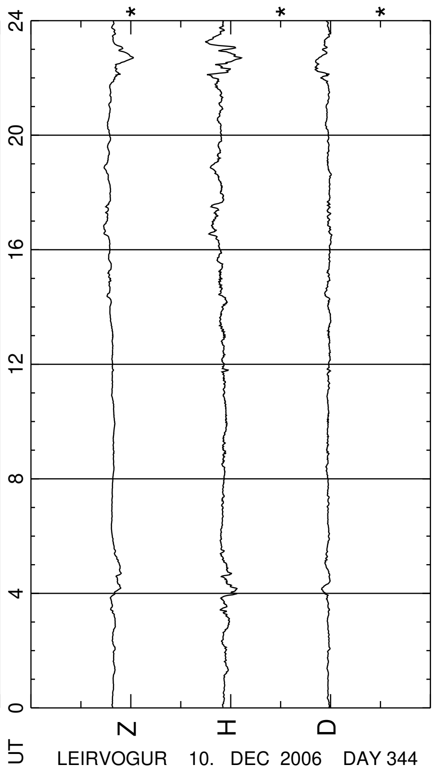
LEIRVOGUR 3. DEC 2006 DAY 337



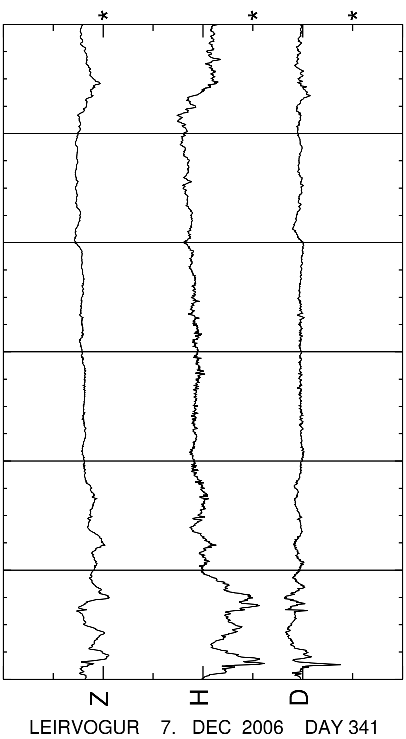
LEIRVOGUR 5. DEC 2006 DAY 339



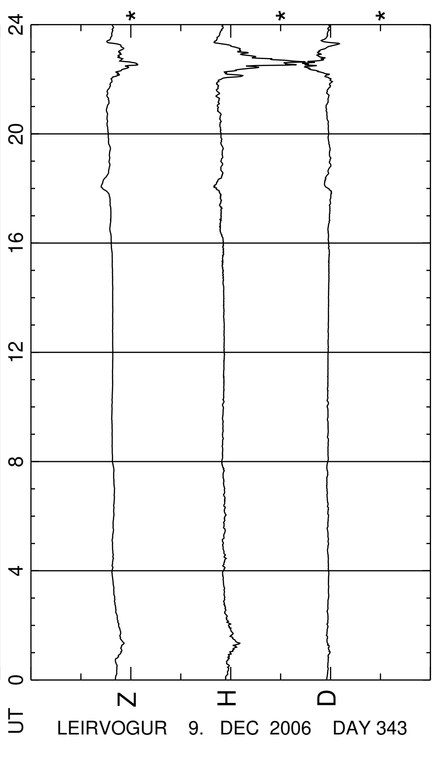
LEIRVOGUR 8. DEC 2006 DAY 342



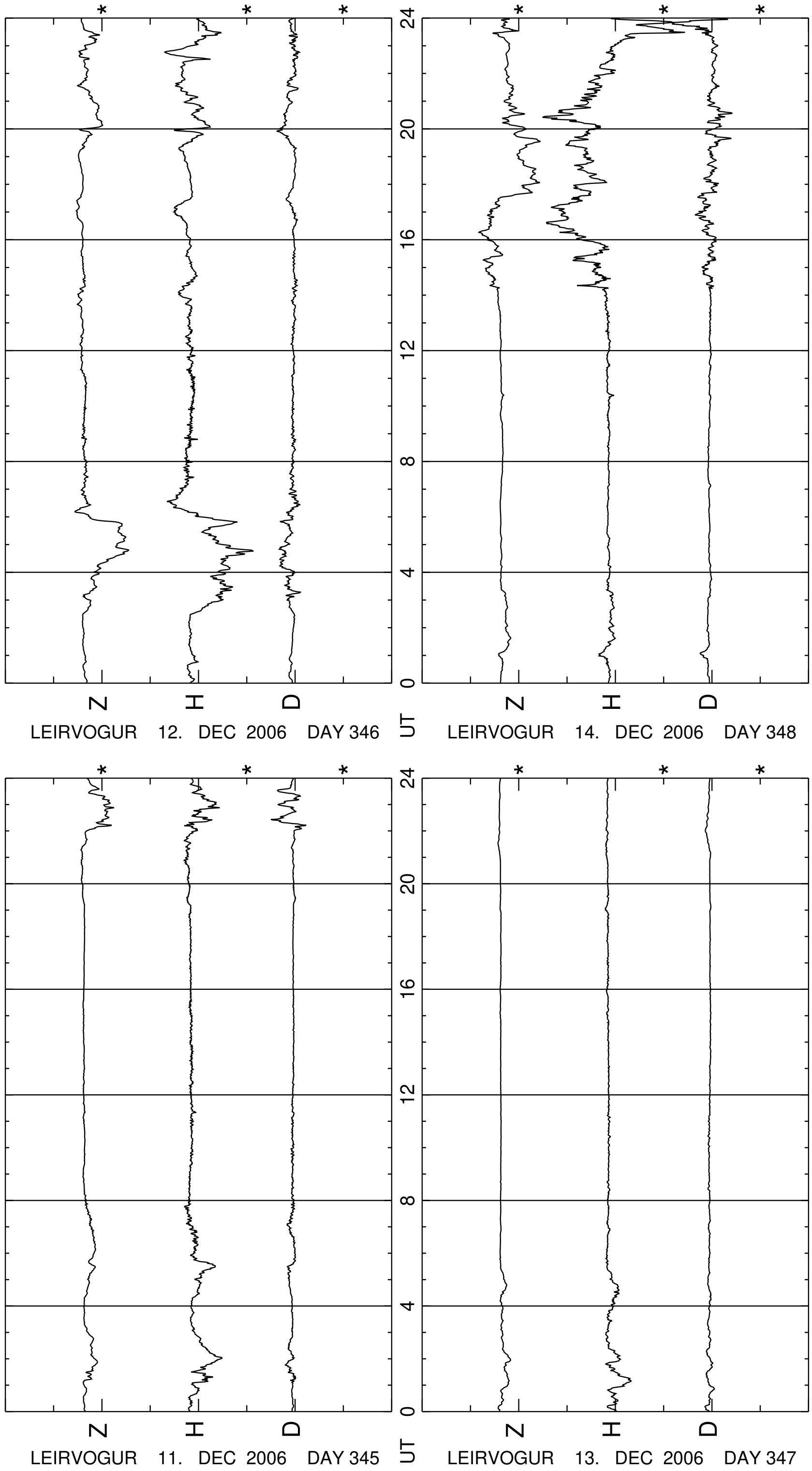
LEIRVOGUR 10. DEC 2006 DAY 344

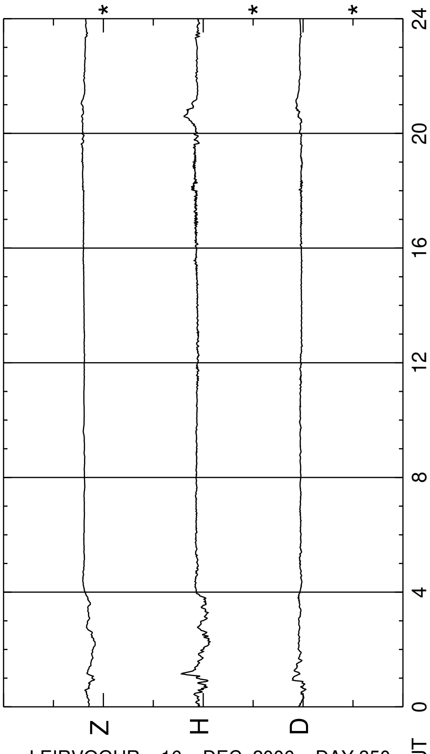


LEIRVOGUR 7. DEC 2006 DAY 341

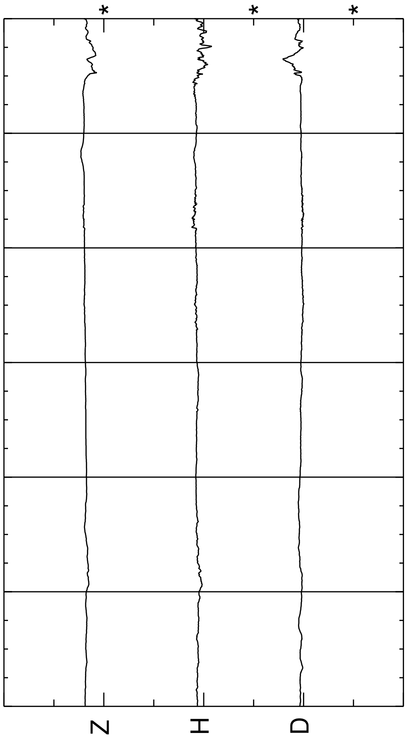


LEIRVOGUR 9. DEC 2006 DAY 343

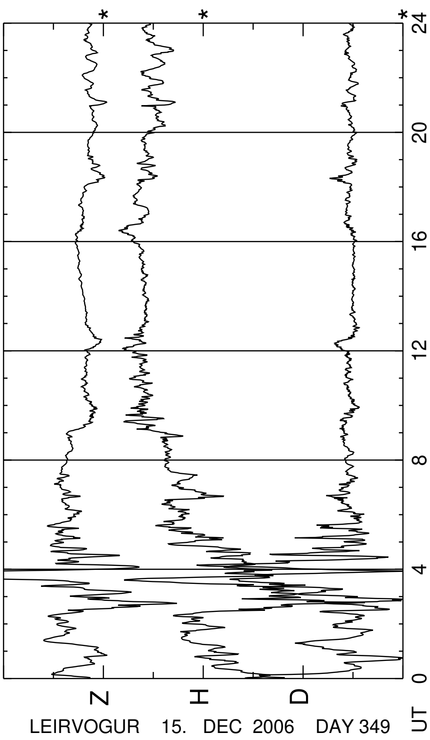

LEIRVOGUR 12. DEC 2006 DAY 346
LEIRVOGUR 14. DEC 2006 DAY 348
LEIRVOGUR 11. DEC 2006 DAY 345
LEIRVOGUR 13. DEC 2006 DAY 347
Z H D
UT
0 4 8 12 16 20 24



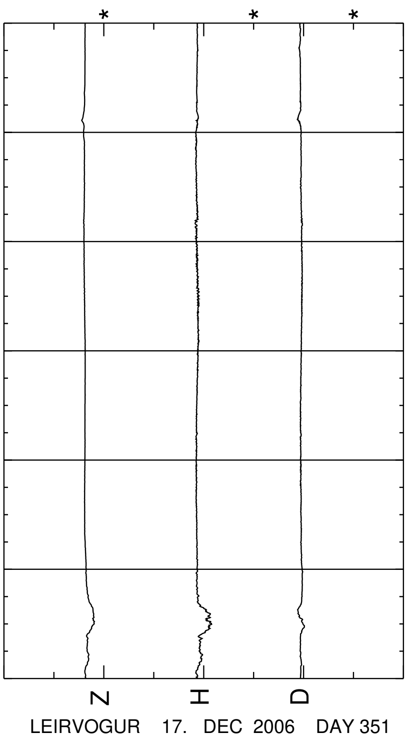
LEIRVOGUR 16. DEC 2006 DAY 350



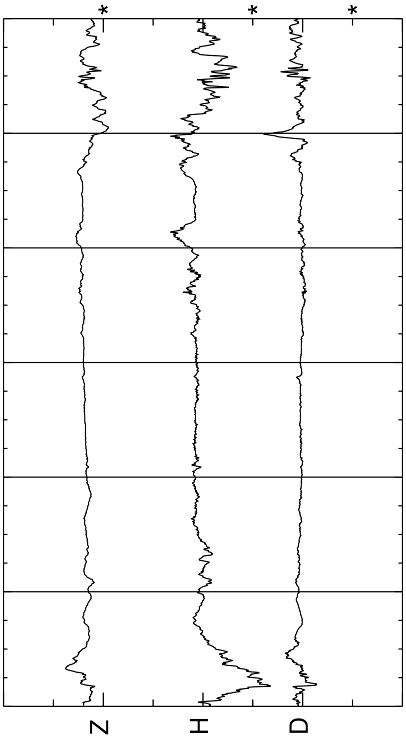
LEIRVOGUR 18. DEC 2006 DAY 352



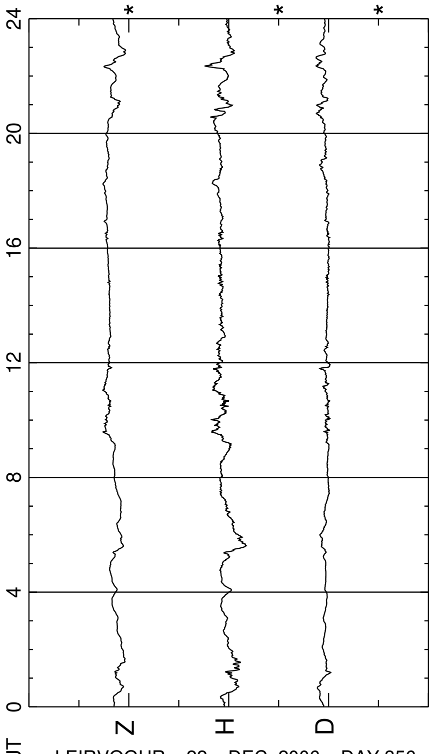
LEIRVOGUR 15. DEC 2006 DAY 349



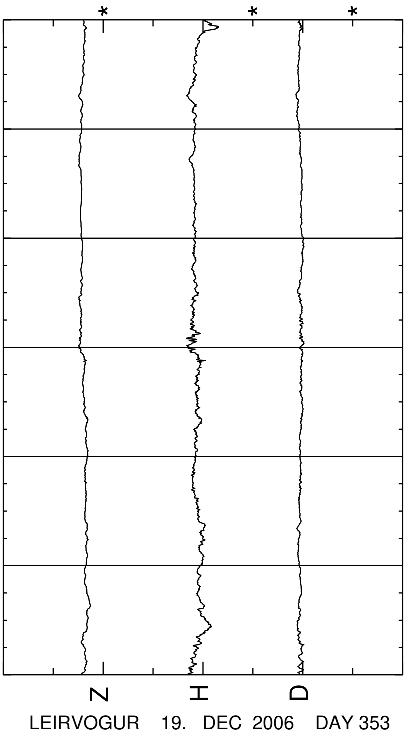
LEIRVOGUR 17. DEC 2006 DAY 351



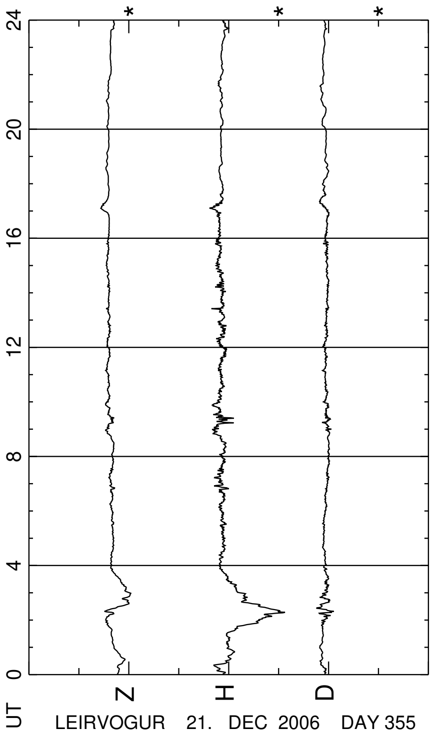
LEIRVOGUR 20. DEC 2006 DAY 354



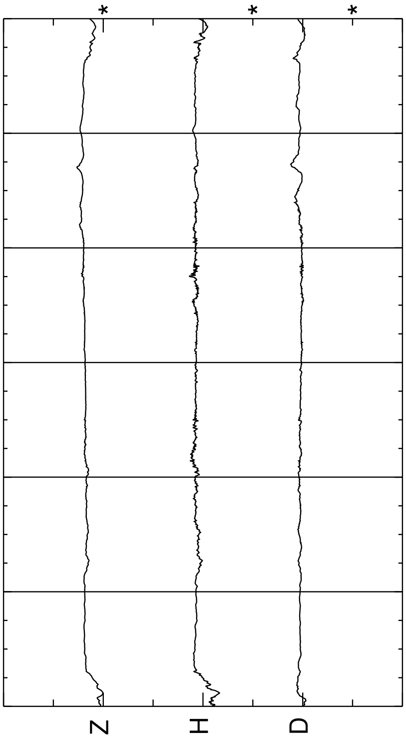
LEIRVOGUR 22. DEC 2006 DAY 356



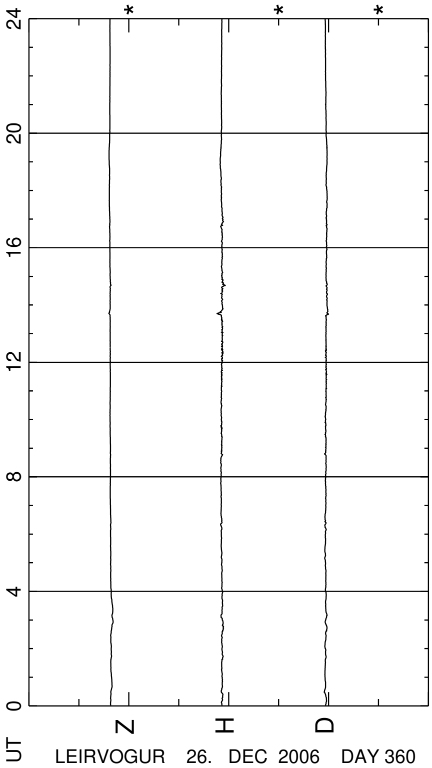
LEIRVOGUR 19. DEC 2006 DAY 353



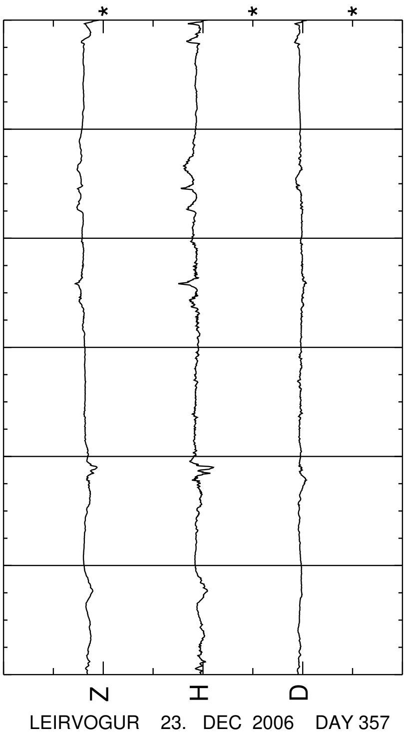
LEIRVOGUR 21. DEC 2006 DAY 355



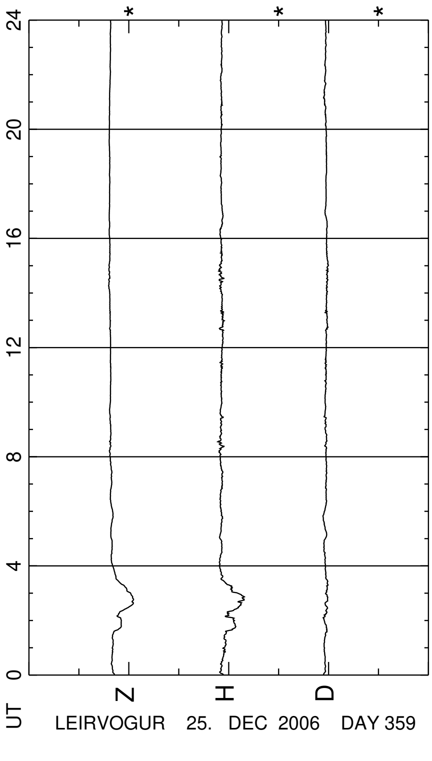
LEIRVOGUR 24. DEC 2006 DAY 358



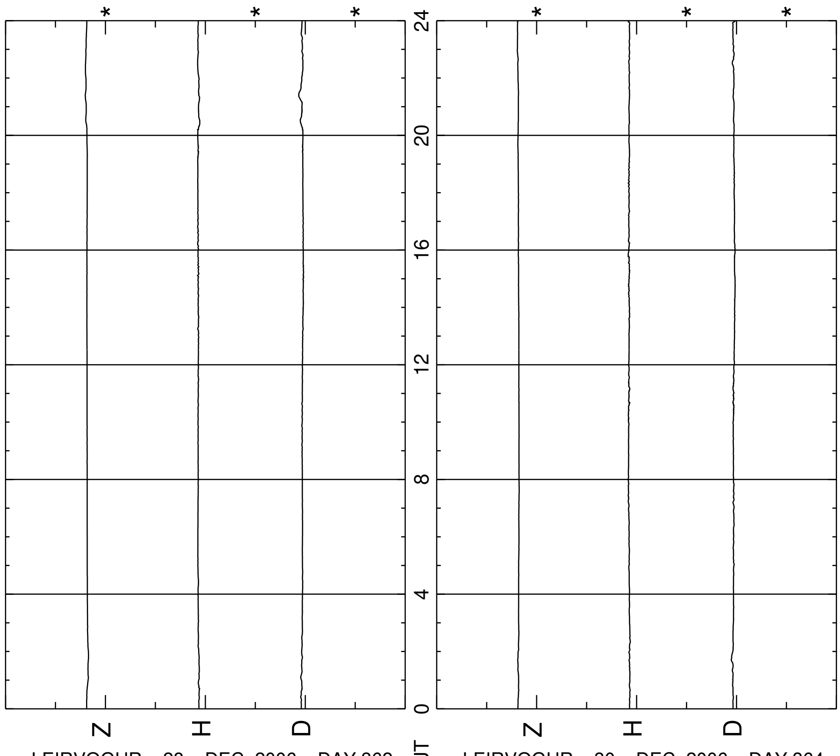
LEIRVOGUR 26. DEC 2006 DAY 360



LEIRVOGUR 23. DEC 2006 DAY 357

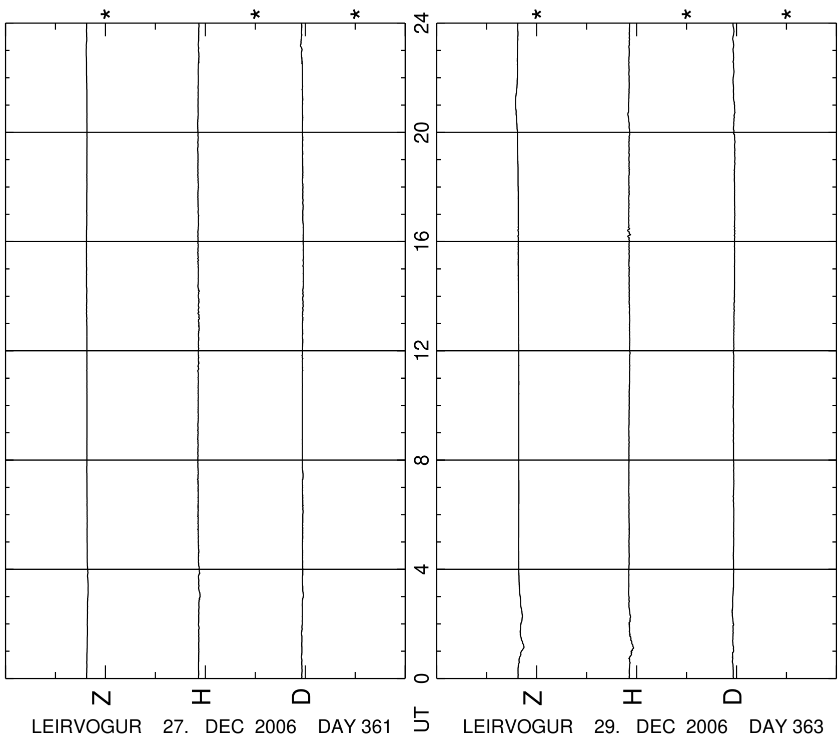


LEIRVOGUR 25. DEC 2006 DAY 359



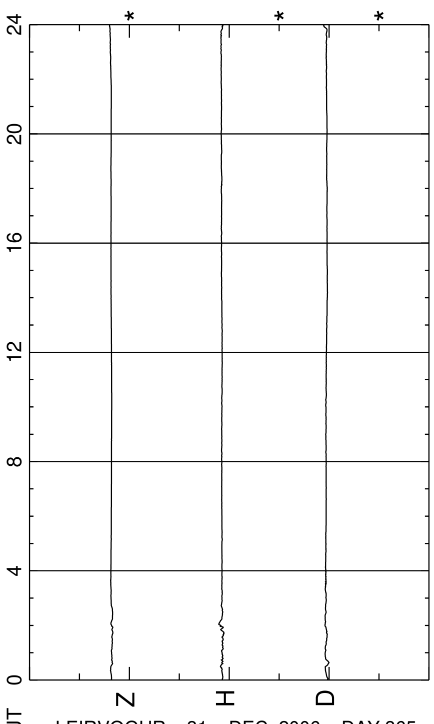
LEIRVOGUR 28. DEC 2006 DAY 362

LEIRVOGUR 30. DEC 2006 DAY 364



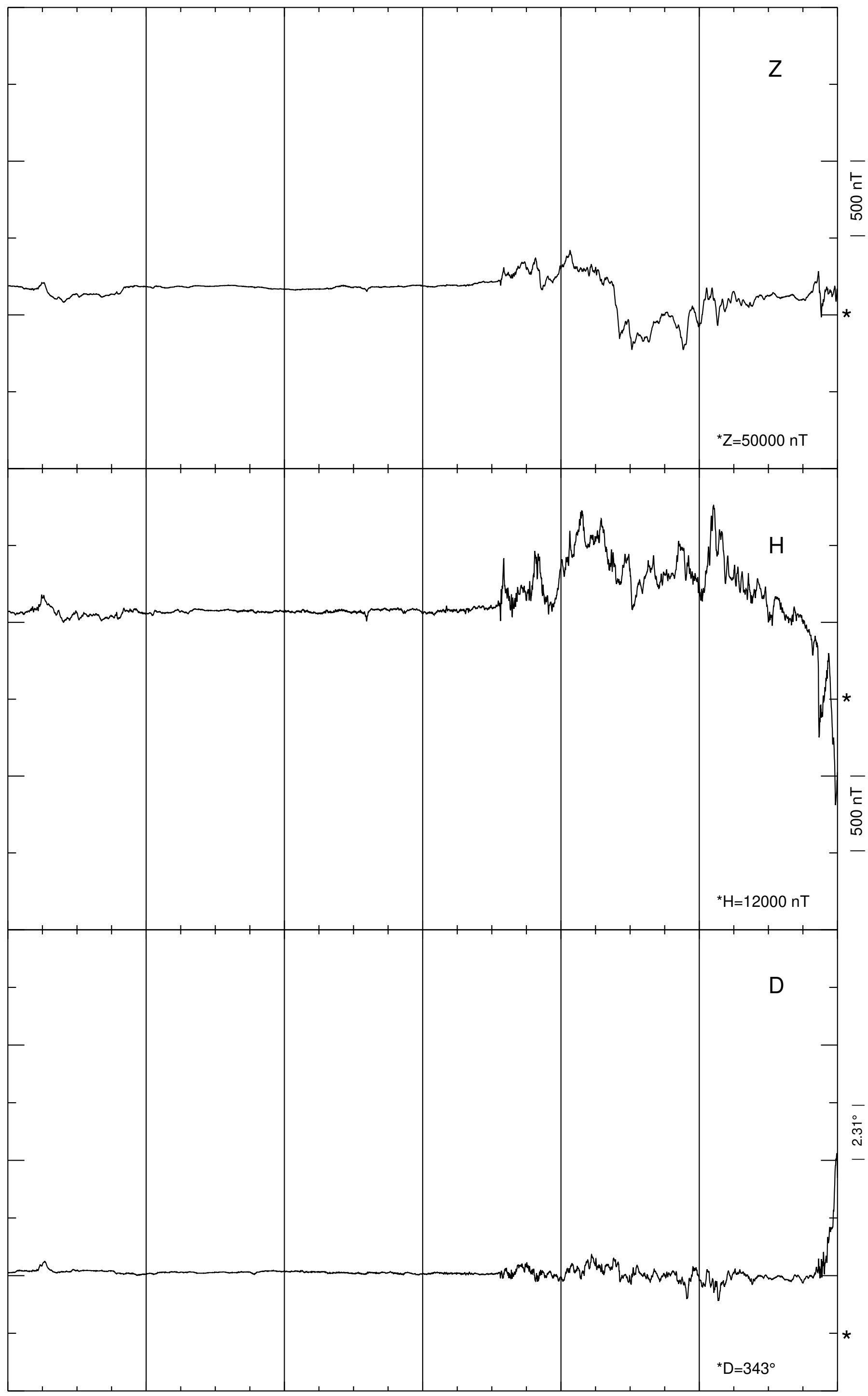
LEIRVOGUR 27. DEC 2006 DAY 361

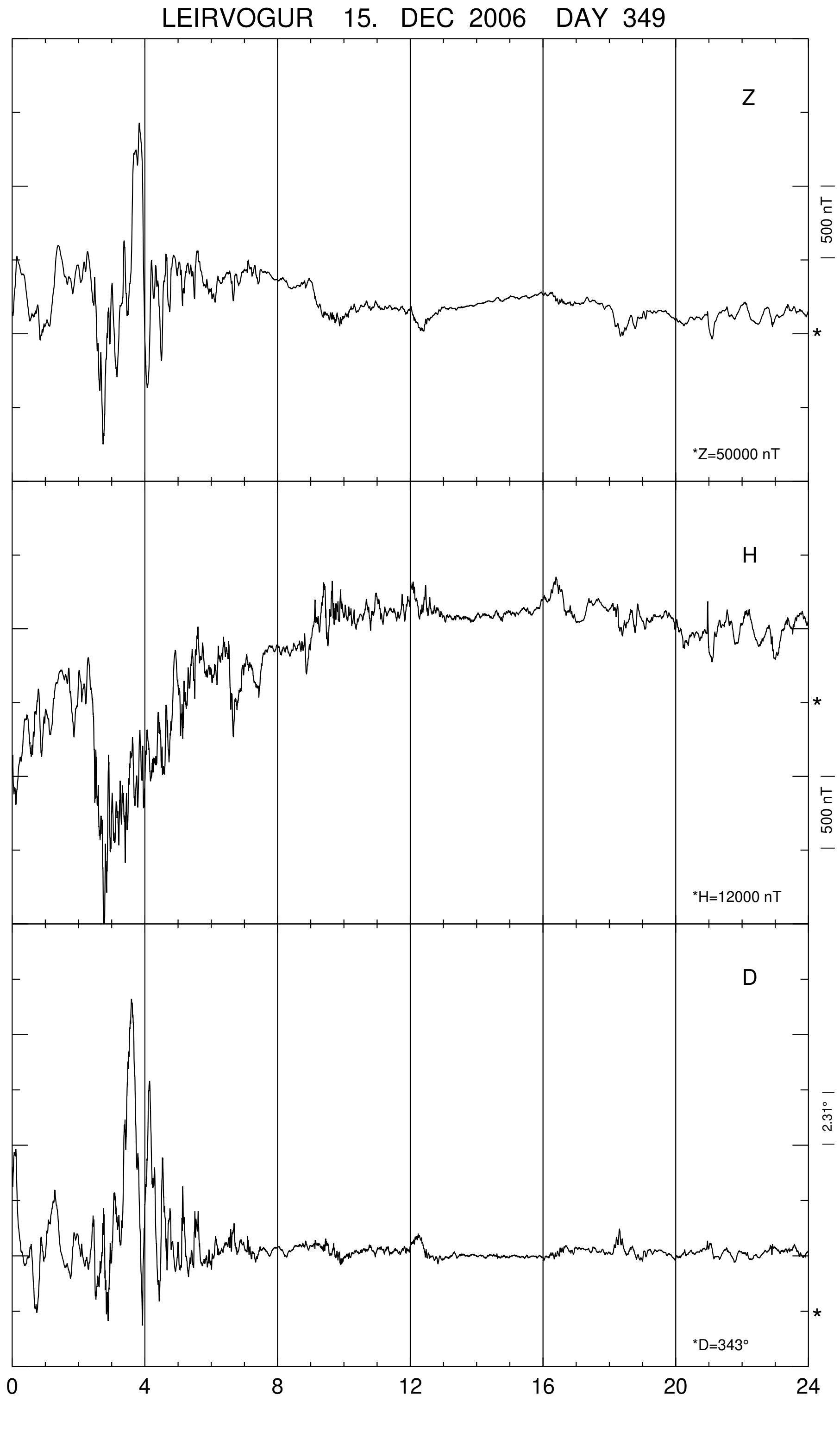
LEIRVOGUR 29. DEC 2006 DAY 363



LEIRVOGUR 31. DEC 2006 DAY 365

LEIRVOGUR 14. DEC 2006 DAY 348





LEIRVOGUR 15. DEC 2006 DAY 349
Z
500 nT
*Z=50000 nT
H
500 nT
*H=12000 nT
D
2.31°
*D=343°
0
4
8
12
16
20
24

ANNUAL MEANS AT LEIRVOGUR

In the table below, D and I are given in degrees and minutes of arc. Other values are in nanoteslas. Z, H and D are measured values, as are the values of F since 1963.

	Z	H	D	F	X	Y	I
1958	49322	11872	336 15.3	50731	10867	-4780	76 28.0
	30	14	5.5	32	20	11	-0.5
1959	49352	11886	336 20.8	50763	10887	-4769	76 27.5
	51	11	5.3	52	18	13	0.1
1960	49403	11897	336 26.1	50815	10905	-4756	76 27.6
	26	32	6.9	33	39	9	-1.7
1961	49429	11929	336 33.0	50848	10944	-4747	76 25.9
	20	33	5.6	27	38	5	-1.8
1962	49449	11962	336 38.6	50875	10982	-4742	76 24.1
	31	18	5.0	37	23	8	-0.7
1963	49480	11980	336 43.6	50912	11005	-4734	76 23.4
	24	35	5.0	31	39	3	-1.9
1964	49504	12015	336 48.6	50943	11044	-4731	76 21.5
	26	27	3.7	33	30	1	-1.3
1965	49530	12042	336 52.3	50976	11074	-4730	76 20.2
	33	22	3.3	36	25	2	-1.0
1966	49563	12064	336 55.6	51012	11099	-4728	76 19.2
	50	21	3.6	51	24	3	-0.6
1967	49613	12085	336 59.2	51063	11123	-4725	76 18.6
	44	27	4.3	47	31	4	-1.1
1968	49657	12112	337 3.5	51110	11154	-4721	76 17.5
	44	28	2.6	53	29	-3	-1.1
1969	49701	12140	337 6.1	51163	11183	-4724	76 16.4
	53	29	3.6	58	32	1	-1.0
1970	49754	12169	337 9.7	51221	11215	-4723	76 15.4
	41	29	5.1	47	34	5	-1.3
1971	49795	12198	337 14.8	51268	11249	-4718	76 14.1
	46	31	6.8	51	38	11	-1.3
1972	49841	12229	337 21.6	51319	11287	-4707	76 12.8
	40	18	8.9	43	28	22	-0.5
1973	49881	12247	337 30.5	51362	11315	-4685	76 12.3
	41	24	10.5	45	37	25	-0.9
1974	49922	12271	337 41.0	51407	11352	-4660	76 11.4
	22	33	11.4	30	46	26	-1.8
1975	49944	12304	337 52.4	51437	11398	-4634	76 9.6
	23	28	13.3	29	44	33	-1.4
1976	49967	12332	338 5.7	51466	11442	-4601	76 8.2
	13	23	13.7	18	39	37	-1.3
1977	49980	12355	338 19.4	51484	11481	-4564	76 6.9
	23	11	14.7	25	30	46	-0.4
1978	50003	12366	338 34.1	51509	11511	-4518	76 6.5
	1	22	14.0	7	39	39	-1.4
1979	50004	12388	338 48.1	51516	11550	-4479	76 5.1
	-11	13	13.1	-7	29	39	-1.0
1980	49993	12401	339 1.2	51509	11579	-4440	76 4.1
	9	4	12.6	9	20	41	-0.1
1981	50002	12405	339 13.8	51518	11599	-4399	76 4.0

ANNUAL MEANS AT LEIRVOGUR
(Continued)

	Z	H	D		F	X	Y	I	
1981	50002	12405	339	13.8	51518	11599	-4399	76	4.0
	2	-6		11.8	1	9	42		0.4
1982	50004	12399	339	25.6	51519	11608	-4357	76	4.4
	-10	8		12.7	-8	24	40		-0.6
1983	49994	12407	339	38.3	51511	11632	-4317	76	3.8
	-3	-1		12.1	-3	14	41		0.0
1984	49991	12406	339	50.4	51508	11646	-4276	76	3.8
	-9	4		11.1	-8	17	37		-0.4
1985	49982	12410	340	1.5	51500	11663	-4239	76	3.4
	0	-4		12.0	0	11	42		0.2
1986	49982	12406	340	13.5	51500	11674	-4197	76	3.6
	-2	7		11.9	-2	21	38		-0.5
1987	49980	12413	340	25.4	51498	11695	-4159	76	3.1
	12	-5		11.7	10	10	41		0.5
1988	49992	12408	340	37.1	51508	11705	-4118	76	3.6
	20	-3		11.6	20	11	41		0.6
1989	50012	12405	340	48.7	51528	11716	-4077	76	4.2
	5	1		11.3	5	14	38		0.0
1990	50017	12406	341	0.0	51533	11730	-4039	76	4.2
	11	-1		11.4	11	12	39		0.2
1991	50028	12405	341	11.4	51544	11742	-4000	76	4.4
	-3	6		12.0	-3	20	39		-0.4
1992	50025	12411	341	23.4	51541	11762	-3961	76	4.0
	-2	6		13.0	0	21	43		-0.4
1993	50023	12417	341	36.4	51541	11783	-3918	76	3.6
	7	-4		14.4	6	12	51		0.3
1994	50030	12413	341	50.8	51547	11795	-3867	76	3.9
	0	18		14.8	4	34	45		-1.1
1995	50030	12431	342	5.6	51551	11829	-3822	76	2.8
	-1	14		16.2	3	31	51		-0.9
1996	50029	12445	342	21.8	51554	11860	-3771	76	1.9
	9	12		16.9	12	30	55		-0.7
1997	50038	12457	342	38.7	51566	11890	-3716	76	1.2
	19	5		17.8	19	24	60		0.0
1998	50057	12462	342	56.5	51585	11914	-3656	76	1.2
	12	11		17.6	14	29	58		-0.5
1999	50069	12473	343	14.1	51599	11943	-3598	76	0.7
	20	8		17.8	22	26	60		-0.2
2000	50089	12481	343	31.9	51621	11969	-3538	76	0.5
	10	16		17.8	13	34	57		-0.9
2001	50099	12497	343	49.7	51634	12003	-3481	75	59.6
	18	11		18.3	20	28	61		-0.4
2002	50117	12508	344	8.0	51654	12031	-3420	75	59.2
	23	-4		18.7	22	15	67		0.6
2003	50140	12504	344	26.7	51676	12046	-3353	75	59.8
	6	23		17.7	12	39	56		-1.3
2004	50146	12527	344	44.4	51688	12085	-3297	75	58.5
	12	10		17.4	13	27	59		-0.5
2005	50158	12537	345	1.8	51701	12112	-3238	75	58.0
	6	21		16.4	11	35	52		-1.3
2006	50164	12558	345	18.2	51712	12147	-3186	75	56.7