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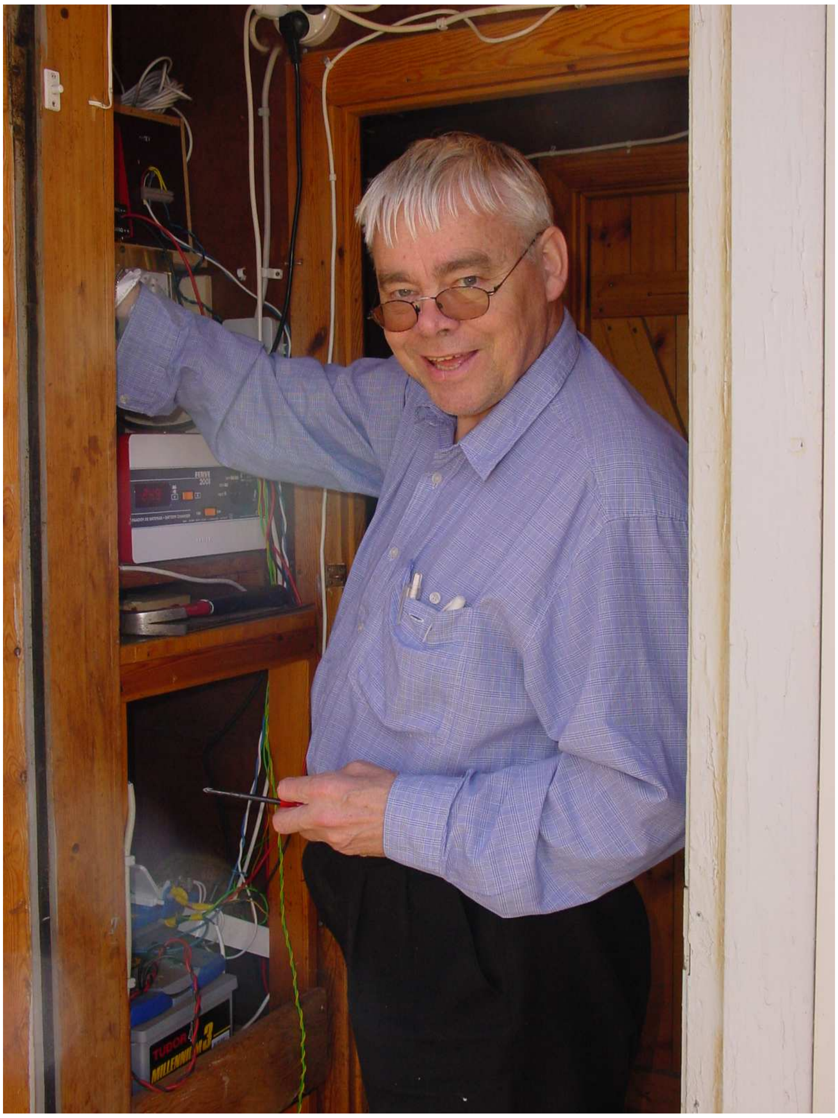
LEIRVOGUR

MAGNETIC RESULTS

2007

REYKJAVíK 2008



Jón Sveinsson (1944-2007) came to the Science Institute in 1971, and first worked for the Leirvogur Observatory in 1973, when he helped with instrument repair. He designed and implemented the data loggers that were installed in 1989 and have been in use at the Observatory since that year. From 1994, he was fully employed by the Upper Atmosphere Section and continued to support and maintain the electronics at the Observatory until the very end.

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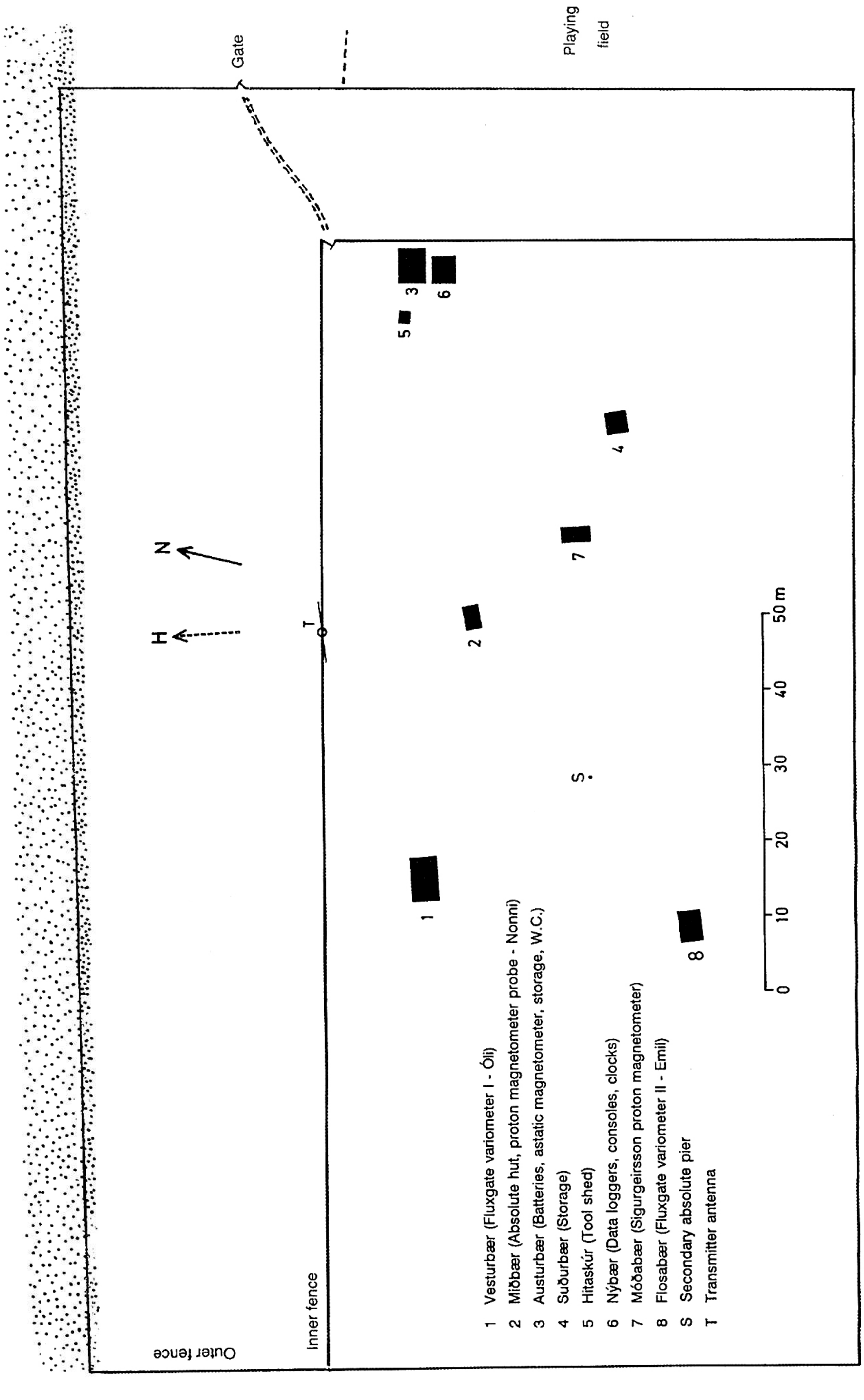
Gate
Playing field
Outer fence
Inner fence
H
N
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S
1
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0 10 20 30 40 50 m
1 Vesturbær (Fluxgate variometer I - Óli)
2 Miðbær (Absolute hut, proton magnetometer probe - Nonni)
3 Austurbær (Batteries, astatic magnetometer, storage, W.C.)
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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 2007. 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

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

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 2007 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, $30.°2$ E geographic, about 370 km from the Japanese Antarctic station Syowa.

PERSONNEL

In 2007, 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. He passed away on July 12. Former director, Þorsteinn Sæmundsson, continued to serve in an advisory capacity and made absolute measurements on occasions when Gunnlaugur was away.

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. Runólfur Valdimarsson, a retired technician of the Science Institute, overhauled the pump of the proton magnetometer Móði.

Ingi Þ. Bjarnason from the Institute of Earth Sciences visited on June 27.

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

DEVELOPMENTS

The staff made 103 trips to the observatory in 2007, an unusually high number. Most of the additional trips were due to problems with Móði. 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 January, and the highest was $+24°$C in July.

The owners of the nearby farm Leirvogstunga have converted some of their land to a housing project with about 400 houses and apartments. Preparatory work, started in 2006, continued and construction work on several dozen houses has begun. The construction phase is expected to take a few more years. This change in land use has already caused several problems for the observatory with more to be expected in the near future, in particular with increased traffic and possible intrusion. Possible counter-measures are being investigated.

The electrical supply was interrupted four times during the year, in April, May, July and December. In all cases, the cause was related to the work at the construction site next to the observatory. Due to the length of the second two outages, some data were lost.

Soil removed from the construction site was dumped on municipal land, some 200-400 m east of the observatory. In addition, in November and December a considerable amount of gravel was removed close to the northern edge of the observatory site, just over 100 m from the main pier. The magnetic properties of the gravel had been measured by Dr. Leó Kristjánsson of the Science Institute in 1969. From these measurements and an estimate of the amount of gravel removed, it is estimated that this may change the total field strength at the main pier by about 2 nT. However, as the gravel removal was gradual over several weeks, it is not possible to set a definite date to this change.

On December 20, the azimuth mark was moved as it would otherwise have been in the middle of a street in the new neighborhood. As luck would have it, it was sufficient to move it slightly uphill about 20-30 m further away from the observatory. After the move, the azimuth of the mark was lowered by $1\overset{\prime}{.}2$ and is now $69°10\overset{\prime}{.}8$.

On the weekend of June 23-24, a series of football matches was held on the sports field, attended by large crowds of people. A watch is normally kept to ensure that cars are not parked too close to the observatory and to ward off inquisitive spectators. No information was provided in advance on these matches, and no watch was kept this time. No noticeable effects were observed. Matches like these have become an annual event.

Digital fluxgate systems I and II

Testing and adjustments of the new System II continued in January and February, with final tests being done on February 7. As this new system is very similar to System I, it gives nearly identical results. Its thermal stability seems somewhat better.

On July 10, the power company cut the power to the observatory without warning, at 05:03 due to maintenance work at the nearby construction site. The reserve batteries powered the fluxgates and the data loggers for another 1.5 hours. As no warnings had been received despite agreements with the company, additional power could not be provided in time and a total of 158 minutes of data were lost.

On December 3, the power cable was accidentally cut by construction workers. The power company called to inform the observatory staff. It was estimated that the power outage would not last very long, and that the batteries would suffice to keep the fluxgates and loggers running. In the end, this estimate turned out to be wrong and a total of 193 minutes of data were lost.

On May 29, the thermostat in the variometer house Flosabær, where 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 21.

The thermostat in Vesturbær which houses System I (Óli) was adjusted from winter level ($13°$C) to summer level ($20°$C) on May 30. Readjustment took place on November 22.

Móði

Problems with the proton magnetometer Móði were the main reason for the number of extra trips to the observatory this year. The problems conformed nicely to Páll's (Páll Theodórsson of the Science Institute) rule of multiple causes: Do not assume that equipment failure is due to a single cause. The first symptoms were noticed on May 4, when the signal was observed to be very low. A new magnetizing unit was installed causing the signal to disappear altogether. The old unit was then re-installed, and resistance adjustment in the electronics restored the signal.

On August 14, loud bangs were noticed from the pump. A spare was installed on August 15, and the other pump overhauled.

On September 21, a leak of glycerol from the pump was observed that was fixed on the following day. On September 23, gaps occurred in the magnetometer data. The magnetizing unit was replaced on the 24th as well as the methanol in the system. This restored the signal. On September 25th, the signal disappeared again and a pump failure was suspected. On the 26th, all connections were checked but nothing suspicious was discovered, but the signal was restored only sporadically and unpredictably. This behavior continued until October 12, when spare parts for the reserve pump arrived and the pump was replaced. The magnetizing unit, methanol and filter were also replaced. The signal was then restored. On October 22, the signal disappeared again, but no faults were found in the system during a visit on the 23rd. On the 24th, it was discovered that the +15V power cable feeding the electronics box was at fault, as switching to another wire in the same cable restored the signal. The power cable is some decades old and connects the electronics in Móðabær to the power source in Nýbær. On November 1, the signal was again lost sporadically and it was concluded that the fault was in the power cable. On November 2, a new cable was temporarily installed, restoring the signal. The cable is presently on the ground, but will be drawn into a pipe connecting the two buildings in the spring of 2008. After the new power cable was connected there have been no electrical problems with Móði.

On December 16, the signal was again lost. Upon a visit to Móðabær, it was noticed that most of the methanol in the system had leaked out. It turned out that a screw holding a small cap in the pressure gauge had broken, releasing the cap, and the methanol was then pumped out of the system. A new gauge was bought and installed the following day. Móði has been running flawlessly since.

Geó II

The conventional proton magnetometer Geó (G856-AX) was used in the absolute measurements. As outlined in the Yearbook for 2006, the signal cable from Nýbær to Miðbær was found to be broken and a replacement was planned for the spring of 2007, as soon as the ground was frost free.

On April 18, the signal from the sensor was observed to be very weak and more fluid was added to the sensor. This did not help. On May 2, the fluid was replaced, causing the signal to essentially disappear. A spare unit (Geó I) was then used to complete the measurement. On May 4, the two magnetometers were compared in detail and the sensor of Geó II was found to be faulty and a replacement was ordered from the manufacturer. The replacement sensor was tested on May 23, but gave a reading that was 1.5 nT lower than expected. After some considerations, it was concluded that there must be some magnetic impurities in the sensor. This was confirmed on May 30 when the measurements were performed with the sensor in the normal position and then repeated in the inverted position. The average of the two conformed to the expected outcome in these measurements. After using the sensor in this way for two months (measuring in the normal and inverted positions) to verify the persistency of this behavior, the manufacturer was contacted. They promptly sent a replacement sensor. This new sensor has worked perfectly from the first day (August 22). The faulty sensor was returned to the manufacturer for inspection.

In October, a new signal cable was connected above ground between Nýbær and Miðbær, and a plastic tube connecting the houses was dug into the ground. The signal cable was passed through the pipe in November. Measurements using that cable have not always been successful, due to persistent problems with shielding.

Stefnir

In September, the DI-flux magnetometer Stefnir was sent for repair and adjustments as ’fog’ had accumulated in the optics. The instrument was returned a couple of weeks later after adjustments and testing and is apparently in perfect shape. The service was provided by Wenger Vermessungstechnik in Jena.

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 the 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. On several occasions did the GPS not correctly adjust the clocks, leaving them 1 second late. This was checked against the *ntp*-service as well as other time signals. On these occasions, the clocks were adjusted manually. The reason for these errors are not known.

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's data to the Institute. The connection was lost a few times during the year due to the nearby construction work, when the phone line was accidentally cut. This does not result in data loss of course, but delays delivery to the Institute until the connection is restored.

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. The pavement in front of Nýbær was repaired in May. 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. This was installed in December 2006. 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. This system serves as a backup for Óli. All the 1-minute data from this instrument are fully processed. 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 instrument was replaced by Emil II on December 18, 2006, 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 I”). 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 2007. The *ntp* network service is used to correct the time on the laptop computers. It is typically accurate to within a few 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 2007 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 2007, the correction varied between -3.6 nT and -4.2 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 24. 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 nT 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):

$$\begin{pmatrix} Z_2 \\ H_2 \\ D_2 \end{pmatrix} = \begin{pmatrix} 138 \\ 38 \\ -200 \end{pmatrix} + \begin{pmatrix} 1-3\epsilon & \epsilon & 0 \\ 0 & 1-3\epsilon & -\epsilon \\ 0 & 0 & 1-3\epsilon \end{pmatrix} \begin{pmatrix} Z_1 \\ H_1 \\ D_1 \end{pmatrix}$$

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 2007 were as follows:

Vertical intensity (Z_0):

		nT
Jan 1	– Mar 17	-0.5
Mar 18	– Apr 7	0.0
Apr 8	– May 26	-0.5
May 27	– May 30 (17:20)	-1.0
May 30	– May 30 (19:50)	-0.5
May 30	– May 30 (22:20)	0.0
May 30	– Sep 1	0.5
Sep 2	– Oct 12	1.0
Oct 13	– Oct 27	0.5
Oct 28	– Nov 22 (12:10)	1.0
Nov 22	– Nov 22 (15:30)	0.5
Nov 22	– Nov 22 (18:50)	0.0
Nov 22	– Nov 22 (22:10)	-0.5
Nov 22	– Dec 1	-1.0
Dec 2	– Dec 8	-0.5
Dec 9	– Dec 23	-1.0
Dec 24	– Dec 31	-0.5

Horizontal intensity (H_0):

		nT
Jan 1	– May 5	-6.0
May 6	– May 30 (16:05)	-5.5
May 30	– May 30 (17:20)	-5.0
May 30	– May 30 (18:35)	-4.5
May 30	– May 30 (19:50)	-4.0
May 30	– May 30 (21:05)	-3.5
May 30	– May 30 (22:20)	-3.0
May 30	– Jun 15	-2.5
Jun 16	– Jun 30	-3.0
Jul 1	– Jul 12	-2.5
Jul 13	– Jul 26	-3.0
Jul 27	– Aug 3	-2.0
Aug 4	– Sep 21	-3.0
Sep 22	– Nov 22 (12:10)	-2.5
Nov 22	– Nov 22 (13:50)	-3.0
Nov 22	– Nov 22 (15:30)	-3.5
Nov 22	– Nov 22 (17:10)	-4.0
Nov 22	– Nov 22 (20:30)	-4.5
Nov 22	– Nov 22	-5.0
Nov 23	– Dec 8	-5.5
Dec 9	– Dec 23	-6.0
Dec 24	– Dec 31	-5.5

Declination (D_0):

Jan 1	– Jan 20	$345^\circ\ 08'.8$
Jan 21	– Feb 3	$345^\circ\ 08'.9$
Feb 4	– Mar 17	$345^\circ\ 08'.8$
Mar 18	– May 10	$345^\circ\ 08'.9$
May 11	– May 30 (16:46)	$345^\circ\ 08'.8$
May 30	– May 30 (18:35)	$345^\circ\ 08'.7$
May 30	– May 30 (21:05)	$345^\circ\ 08'.6$
May 30	– May 30 (22:20)	$345^\circ\ 08'.5$
May 30	– May 31	$345^\circ\ 08'.4$

		nT
Jun 1	– Jun 15	$345° 08'.6$
Jun 16	– Jul 6	$345° 08'.4$
Jul 7	– Oct 19	$345° 08'.5$
Oct 20	– Nov 22 (13:50)	$345° 08'.3$
Nov 22	– Nov 22 (17:10)	$345° 08'.4$
Nov 22	– Nov 22 (18:50)	$345° 08'.5$
Nov 22	– Nov 22 (22:10)	$345° 08'.6$
Nov 22	– Nov 22 (24:00)	$345° 08'.7$
Nov 23	– Dec 23	$345° 08'.8$
Dec 24	– Dec 31	$345° 08'.9$

The changes in base lines on May 30 and November 2 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 25. With the new fluxgate being nearly identical to System I, the data are now handled in the same way as the data for that system. The constants added to the output values are determined in the same fashion as for System I. They are 50204 nT for Z, 12640 nT for H and 39 nT for D. The "observed" readings Z_1, H_1 and D_1, are corrected as follows (in units of nanotesla):

$$\begin{pmatrix} Z_2 \\ H_2 \\ D_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ -200 \end{pmatrix} + \begin{pmatrix} 1 & 0 & \epsilon \\ 0 & 1 & -\epsilon \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} Z_1 \\ H_1 \\ D_1 \end{pmatrix}$$

where $\epsilon = 0.001$. Note that due to better alignment of this instrument, most of the correction coefficients are zero. The adopted base-line values for 2007 were as follows:

Vertical intensity (Z_0):

		nT
Jan 1	– May 29 (12:00)	-0.5
May 29	– May 29 (20:00)	-1.0
May 29	– May 29 (24:00)	-1.5
May 30	– Aug 10	-2.0
Aug 11	– Aug 24	-1.5
Aug 25	– Sep 14	-2.0
Sep 15	– Nov 20	-1.5
Nov 21	– Dec 14	-0.5
Dec 15	– Dec 31	-1.0

Horizontal intensity (H_0):

		nT
Jan 1	– May 29 (12:00)	-5.0
May 29	– May 29 (16:00)	-5.5
May 29	– May 29 (20:00)	-6.0
May 29	– May 29 (24:00)	-6.5
May 30	– May 31	-7.0
Jun 1	– Jul 14	-7.5
Jul 15	– Jul 26	-8.0
Jul 27	– Sep 07	-7.5
Sep 8	– Oct 12	-8.0
Oct 13	– Oct 27	-7.5
Oct 28	– Nov 3	-8.0
Nov 4	– Nov 20	-7.5
Nov 21	– Dec 31	-5.5

Declination (D_0):

Jan 1	– Jun 15	$345° \; 8.'8$
Jun 16	– Jun 30	$345° \; 8.'7$
Jul 1	– Sep 14	$345° \; 8.'8$
Sep 15	– Oct 19	$345° \; 8.'9$
Oct 20	– Nov 20	$345° \; 8.'8$
Nov 21	– Dec 22	$345° \; 8.'7$
Dec 23	– Dec 31	$345° \; 8.'9$

The steps in the base lines on May 29 were caused by adjustments of the thermostat in the variometer house. On November 21, the change was set at midnight. The temperature coefficients are approximately 0.1 nT/°C for Z, 0.4 nT/°C for H and less than 0.2 nT/°C for D.

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:

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

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 2007 were as follows:

		δF (nT)
Jan 1	– Feb 9	-3.9
Feb 10	– Feb 23	-4.0
Feb 24	– Mar 17	-3.9
Mar 18	– Mar 31	-3.8
Apr 1	– Apr 7	-3.7
Apr 8	– Apr 30	-3.9
May 1	– May 5	-3.7
May 6	– May 26	-3.6
May 27	– May 31	-3.7
Jun 1	– Jun 15	-4.1
Jun 16	– Jul 6	-4.2
Jul 7	– Jul 26	-4.1
Jul 27	– Jul 31	-4.0
Aug 1	– Aug 17	-4.1
Aug 18	– Sep 21	-4.0
Sep 22	– Oct 19	-3.8
Oct 20	– Nov 9	-4.1
Nov 10	– Nov 16	-4.2
Nov 17	– Nov 22	-4.0
Nov 23	– Dec 1	-4.1
Dec 2	– Dec 8	-3.9
Dec 9	– Dec 23	-4.2
Dec 24	– 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 -0.04 nT. Most of the values (99.96%) were in the range -1 to $+1$ nT, 0.04% reached ± 2 nT, and there were 3 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 2007, there were 351 gaps in the 1-minute values for Z, H and D or 0.07% of the total time. These were all caused by loss of power for extended periods of time as already mentioned. Due to the numerous problems with Móði in 2007, it was not attempted to get a reliable statistics on gaps in its data. As the larger gaps were sporadic as discussed above, and sometimes numerous for several days, F was calculated from the fluxgate components for a total of about 20 days.

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. 19). In 2007, 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 2007 was one of lowest on record at Leirvogur and there were no highly disturbed days. The most significant disturbances occurred on the following dates:

Date	*K-sum*	*C9*	*L9*
Feb 28	(40)	(5)	(6)
Apr 1-2	(42,37)	(6,5)	(6,6)
Apr 27-30	(32,40,33,31)	(4,6,5,4)	(3,6,5,5)
May 22-24	(24,42,40)	(4,6,6)	(2,6,6)
Sep 27-29	(22,35,40)	(5,6,6)	(2,6,6)

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

K never reached the extreme value 9 in 2007, and the value 8 only once. The quietest time of the year was on January 13 when the field kept steady to the nearest nanotesla in all elements for 189 consecutive 10-second readings (31 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://swdcwww.kugi.kyoto-u.ac.jp/magqldir/

Preliminary values of Z, H and D are sent every hour to Kyoto, to be displayed graphically on the World Wide Web, also available at the above address. 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. 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.

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 2007, observations were made at one field station, Húsey I at $65°38.'630$ N, $14°16.'554$ V. The above coordinates were measured with a GPS receiver and refer to WGS84. The observations were made on August 23 under magnetically quiet conditions. 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. The results were as follows:

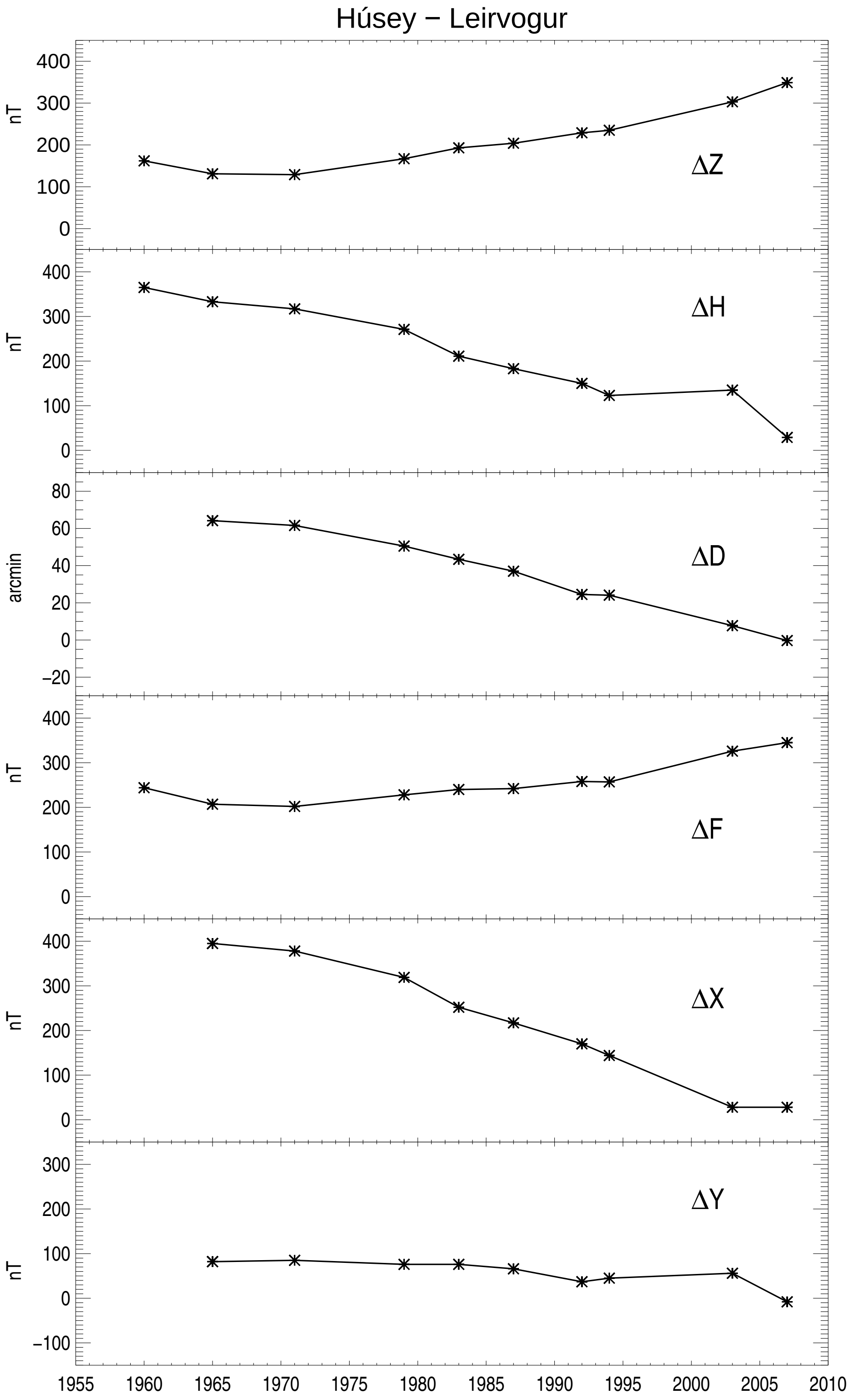
Húsey I minus Leirvogur

	dF	dZ	dH	dD
2007	+345	+349	+39	$-0.'3$
2003	+326	+303	+135	$+7.'7$

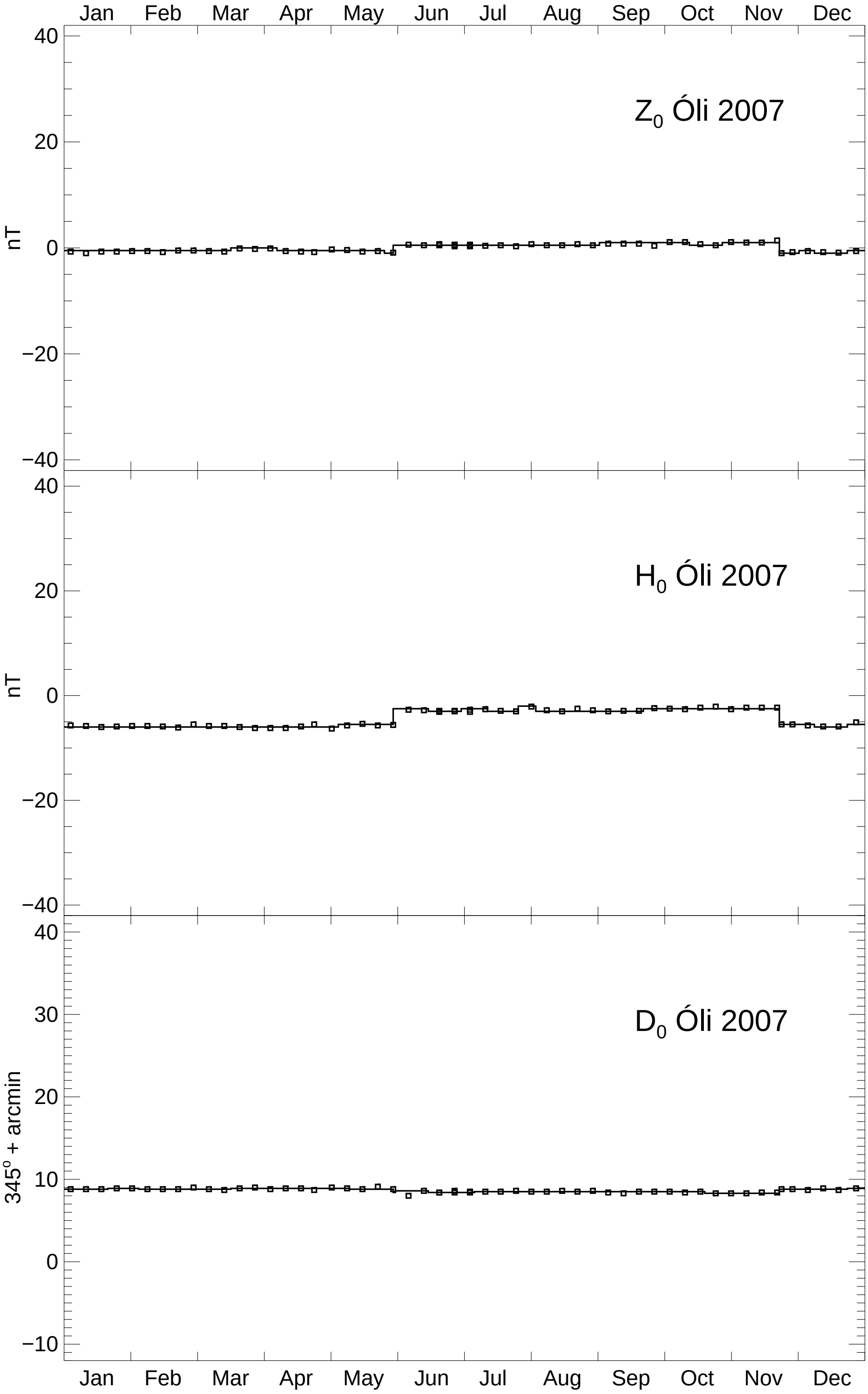
The units of F, Z and H are nanoteslas. As can be seen from the graph on the following page, the results are in conformity with a previously established trend, apart from the results from 2003. Those should be viewed as rather abnormal, as the measurements were performed under rather strongly disturbed conditions. See the yearbook for 2003 for further discussion of those results.

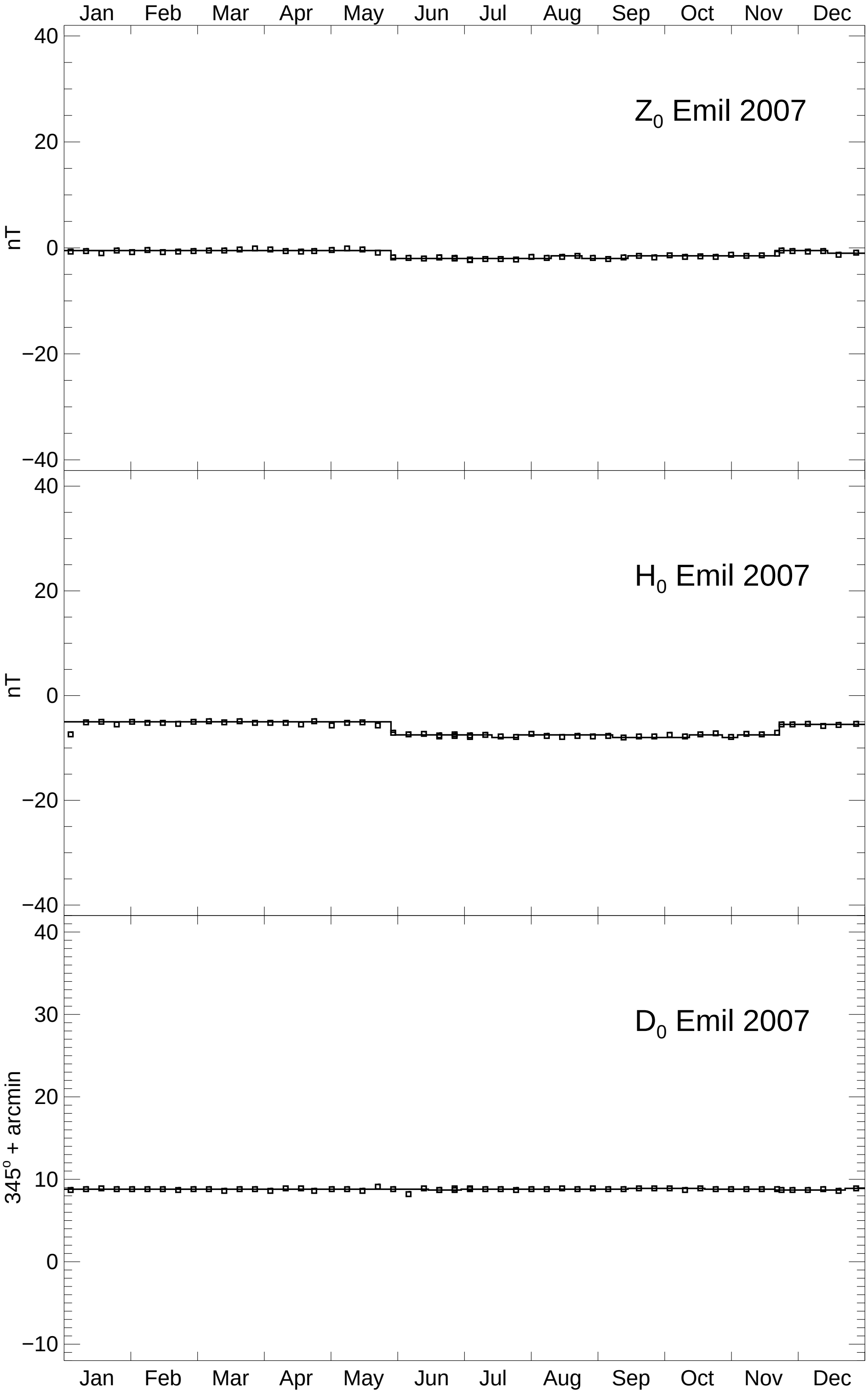
February 2008

Gunnlaugur Björnsson



Húsey − Leirvogur
ΔZ
ΔH
ΔD
ΔF
ΔX
ΔY
nT
arcmin
400
300
200
100
0
80
60
40
20
−20
−100
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010


Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
40
20
0
−20
−40
nT
Z0 Óli 2007
H0 Óli 2007
D0 Óli 2007
345° + arcmin
30
10
−10



Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Z_0 Emil 2007
nT
40
20
0
−20
−40
H_0 Emil 2007
nT
40
20
0
−20
−40
D_0 Emil 2007
345° + arcmin
40
30
20
10
0
−10

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 128-129.

Diurnal variations

The tables on pages 28-29 show the mean diurnal inequalities of the magnetic elements Z, H, D and F at Leirvogur in 2007. 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 30. The daily K-sums are shown on page 31 in runs of 27 days. The table on page 32 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 33-34.

LEIRVOGUR 2007
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	179	183	170	565	572	545	275	272	294	728	733	715
FEB	181	181	179	569	575	550	283	284	290	731	732	725
MAR	178	183	176	565	578	522	299	291	325	727	735	715
APR	176	177	181	558	577	518	320	310	343	723	729	719
MAY	175	176	171	577	580	565	329	324	327	727	728	720
JUN	172	177	172	583	587	581	342	341	333	725	732	725
JUL	175	178	174	579	585	582	355	353	353	728	732	728
AUG	175	179	168	579	584	571	371	365	374	728	732	719
SEP	176	178	175	568	583	525	389	378	412	726	732	715
OCT	179	182	173	578	585	576	395	392	398	731	736	726
NOV	181	181	175	586	587	583	411	405	422	735	736	729
DEC	185	183	185	587	590	578	426	420	434	739	738	738
MEAN	178	180	175	575	582	558	350	345	359	729	733	723

LEIRVOGUR 2007

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	-20	-25	-21	-21	-17	-15	-10	-8	-5	-2	0	3	6	10	15	20	25	26	24	18	12	4	-4	-12		2.	18.	51
ZW	-12	-22	-16	-17	-13	-9	-7	-6	-5	-2	0	2	4	6	9	12	16	16	16	14	10	6	-1	-5		2.	99.	38
ZE	-28	-25	-21	-18	-18	-18	-12	-10	-6	-2	1	4	9	14	18	23	30	30	27	19	11	0	-6	-19		1.	99.	57
ZS	-21	-26	-28	-27	-21	-18	-12	-9	-5	-2	-1	2	5	10	16	24	30	32	29	22	14	6	-5	-14		3.	18.	60
ZQ	-8	-11	-11	-8	-5	-2	-2	-2	-2	-3	-3	-3	-2	0	4	7	10	10	9	7	6	5	3	0		3.	18.	21
ZQW	-6	-7	-5	-4	-3	-2	-2	-1	-1	-1	-2	-2	-1	0	1	3	4	4	3	2	3	6	6	5		2.	23.	13
ZQE	-11	-11	-11	-8	-5	-4	-4	-3	-3	-4	-4	-4	-3	0	4	9	13	14	12	10	7	6	2	-3		3.	18.	25
ZQS	-8	-15	-16	-13	-6	-1	0	-2	-3	-4	-4	-3	-1	2	6	10	13	14	12	10	8	4	1	-3		3.	18.	30
ZD	-17	-20	-12	-16	-24	-32	-32	-30	-19	-7	3	11	19	26	33	40	47	43	34	18	2	-19	-26	-24		6.	17.	79
ZDW	-28	-43	-19	-33	-22	-14	-19	-18	-15	-3	6	12	23	27	28	35	40	40	35	17	0	-18	-16	-16		2.	17.	83
ZDE	-26	-16	4	10	-26	-43	-29	-31	-19	-3	8	13	21	28	39	39	47	38	30	14	1	-30	-42	-29		6.	17.	90
ZDS	4	-1	-20	-25	-26	-39	-47	-41	-24	-15	-6	8	11	22	33	46	55	52	37	22	6	-8	-20	-28		7.	17.	102
H	-39	-45	-44	-38	-24	-15	-2	4	5	1	-4	-6	-4	2	11	20	30	36	40	40	31	20	0	-20		2.	20.	86
HW	-19	-30	-26	-32	-17	-11	0	7	9	6	2	-1	-1	2	7	12	16	20	22	24	19	11	-2	-16		4.	20.	56
HE	-59	-59	-62	-45	-27	-16	3	9	11	7	1	-2	0	6	15	26	36	39	44	43	34	24	1	-29		3.	19.	106
HS	-40	-47	-42	-37	-27	-17	-8	-6	-4	-10	-15	-16	-11	-2	11	23	39	50	55	54	39	24	2	-16		2.	19.	102
HQ	-1	-2	-3	-3	-1	1	2	0	-3	-7	-12	-17	-17	-13	-7	0	6	10	12	14	14	12	9	5		13.	21.	31
HQW	-5	-3	-1	-2	-2	0	2	2	2	1	-3	-7	-8	-6	-2	1	3	4	4	5	4	5	3	1		13.	22.	13
HQE	1	2	-1	-1	1	1	3	3	0	-6	-14	-20	-21	-19	-10	-2	3	8	11	15	15	15	12	7		13.	21.	36
HQS	1	-5	-7	-6	-1	1	-1	-5	-10	-16	-20	-23	-21	-15	-7	3	11	17	21	22	22	17	12	8		12.	99.	46
HD	-99	-114	-102	-85	-58	-54	-20	-3	12	13	10	12	22	35	49	65	83	94	95	87	57	17	-40	-79		2.	19.	209
HDW	-68	-98	-89	-102	-50	-34	-4	15	20	20	14	8	19	30	31	49	53	79	69	64	47	9	-10	-71		4.	18.	182
HDE	-150	-153	-148	-120	-93	-78	-3	7	26	33	34	37	45	54	71	83	96	95	108	94	75	32	-60	-86		2.	19.	261
HDS	-78	-90	-70	-34	-31	-49	-54	-31	-10	-12	-18	-8	3	22	45	64	101	106	108	102	50	12	-49	-81		2.	19.	199

LEIRVOGUR 2007

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	21	25	29	32	38	43	38	33	28	23	10	-8	-29	-48	-59	-59	-50	-39	-24	-15	-8	-2	6	13		16.	6.	102
DW	27	20	17	15	16	21	18	7	2	-3	-7	-11	-23	-30	-37	-37	-28	-23	-10	-5	3	17	24	27		99.	1.	64
DE	30	31	41	41	50	47	34	26	22	19	5	-15	-38	-58	-68	-67	-55	-39	-19	-8	-2	-2	11	12		15.	5.	118
DS	5	24	29	38	49	59	64	66	60	52	33	3	-27	-55	-71	-73	-67	-55	-42	-31	-25	-22	-15	1		16.	8.	139
DQ	9	10	8	12	18	23	30	35	37	34	23	4	-19	-40	-50	-48	-38	-25	-14	-8	-6	-2	3	7		15.	9.	87
DQW	13	13	8	6	8	8	11	12	11	11	8	-1	-14	-27	-29	-25	-18	-11	-7	-6	-3	5	9	15		15.	24.	44
DQE	13	9	8	15	21	25	32	36	38	37	26	3	-23	-46	-60	-58	-42	-24	-10	-4	-5	-2	7	9		15.	9.	98
DQS	0	7	8	14	26	36	48	58	60	55	34	9	-19	-46	-61	-61	-54	-41	-26	-15	-11	-9	-8	-4		16.	9.	122
DD	36	51	61	58	69	85	57	26	6	0	-14	-28	-48	-63	-74	-72	-67	-59	-29	-18	-16	-3	19	23		15.	6.	158
DDW	50	40	37	22	16	40	28	-17	-29	-39	-44	-36	-43	-44	-53	-52	-36	-44	10	13	15	60	50	54		15.	22.	113
DDE	64	71	94	103	113	108	46	19	-7	-11	-36	-46	-68	-89	-97	-89	-80	-61	-25	-7	-13	-23	35	1		15.	5.	210
DDS	-7	42	53	48	79	107	96	76	56	49	37	-2	-33	-57	-71	-76	-84	-72	-73	-59	-51	-45	-26	14		17.	6.	191
F	-29	-35	-31	-29	-22	-18	-11	-7	-4	-2	-1	1	5	10	16	24	32	34	33	28	19	8	-4	-17		2.	18.	69
FW	-16	-29	-22	-24	-16	-11	-7	-4	-3	0	0	1	4	7	11	15	20	21	21	20	15	8	-1	-8		2.	19.	50
FE	-41	-39	-36	-28	-24	-22	-11	-8	-3	-1	1	3	9	14	21	28	38	38	36	29	19	6	-6	-26		1.	18.	79
FS	-30	-37	-37	-35	-27	-22	-13	-10	-6	-5	-5	-2	2	10	18	29	38	43	42	35	22	11	-5	-17		3.	18.	80
FQ	-8	-11	-11	-9	-5	-2	-2	-2	-3	-5	-6	-7	-6	-3	2	8	11	12	11	10	9	8	5	1		3.	18.	24
FQW	-6	-7	-5	-4	-3	-2	-1	-1	-1	-1	-2	-3	-3	-2	1	3	4	5	4	3	4	7	7	5		2.	22.	15
FQE	-10	-10	-11	-8	-4	-4	-3	-2	-3	-5	-8	-8	-8	-4	2	9	13	15	14	13	11	10	5	-1		3.	18.	26
FQS	-7	-15	-17	-14	-6	-1	-1	-3	-5	-8	-9	-9	-7	-2	4	11	15	17	16	15	13	8	4	-1		3.	18.	35
FD	-40	-47	-36	-36	-38	-44	-36	-30	-16	-4	5	14	23	34	44	55	66	65	56	39	16	-14	-35	-43		2.	17.	113
FDW	-44	-65	-40	-57	-33	-21	-20	-14	-10	2	9	13	27	33	35	46	52	58	51	33	11	-15	-18	-32		2.	18.	123
FDE	-62	-53	-31	-19	-47	-60	-29	-28	-13	4	15	22	31	41	55	58	68	60	56	37	20	-22	-55	-49		1.	17.	130
FDS	-15	-22	-37	-33	-33	-50	-58	-47	-25	-18	-10	6	11	27	43	60	79	76	63	46	18	-5	-31	-46		7.	17.	137

LEIRVOGUR MAGNETIC OBSERVATORY 2007
K-INDICES FOR THREE HOUR INTERVALS IN U.T.
LOWER LIMIT FOR K-9 = 1500 NANOTESLAS IN H

DAYS	K-INDICES						
1- 7	30023224	56324235	47343346	66333333	43223322	22000222	00001001
8- 14	22001221	00001120	23112312	32312210	41000000	00000000	00012114
15- 21	43325431	17122247	67444354	55335336	66223245	52222113	44332220
22- 28	10011110	22021100	00011100	00011003	00111101	22001004	42011133
29- 35	53325555	66534346	65443355	52222223	21221112	12110000	10010000
36- 42	10112253	35422202	63322254	44222222	32211112	32001222	11000023
43- 49	10013224	45222458	64443463	56223353	33312235	54312226	30112221
50- 56	00022200	00011101	10000000	00001123	31101112	40011102	32001132
57- 63	45101000	00222245	67643347	65423311	01221213	10011112	00122115
64- 70	50122244	66333316	76433336	53111211	10012234	42221133	21133343
71- 77	24133343	77443446	64233322	34233326	56122227	53222210	10212312
78- 84	00022211	00012110	00121100	11112211	21123347	75554221	21243224
85- 91	13223435	44432343	54311221	11000111	31122110	01212211	75644457
92- 98	66633346	56223434	65322235	31112213	31112114	52012101	00022101
99-105	32221112	30023425	51011100	43234332	00011110	01111325	45112200
106-112	00011100	01123445	55222344	44211213	23011212	11112211	32132344
113-119	77622310	00122221	43112211	41122334	53233457	67435447	56433336
120-126	77433322	65322323	33121100	11121331	30022110	21022001	11111111
127-133	33333544	36323335	43222221	10122222	11122222	01111210	13011110
134-140	00122221	21122222	01122213	23122335	43333445	33333335	62122224
141-147	41112222	11123457	75654366	66425476	45534465	66434333	43333433
148-154	44112111	11111311	32122210	11222223	33122323	11222223	32122444
155-161	44123540	11122112	00112202	11121221	34223445	44222325	55311211
162-168	32102222	11021212	11122333	66633655	45422312	44213331	32122321
169-175	11122323	42212221	11112200	13333436	65333335	65322225	43222223
176-182	31112223	00122212	32222223	32112222	32112344	45212111	22122212
183-189	11111201	11122424	55434432	33222123	12123333	44122234	43122322
190-196	22011210	00022215	55644323	34223222	11111211	11135567	65422333
197-203	32222222	31111111	21012210	00112101	01333326	67323243	22222211
204-210	11121222	01122101	00112111	00122345	64223111	22111214	46333335
211-217	66423332	11213214	76632335	23322321	22212211	00111101	00111112
218-224	10212446	76434445	45322222	31111111	01124554	54323445	44222221
225-231	22111211	21122212	63223323	55222224	31221222	31111100	00013300
232-238	10112112	31012110	00123220	00112100	02111110	41123243	33223554
239-245	43523266	75333234	41122223	32121112	21122224	41233336	67334455
246-252	44323425	32322213	55322245	53222557	66212331	33213322	00111101
253-259	11011110	00021121	21221101	00121112	20112322	21011222	20111210
260-266	00000123	54001100	11211210	01013356	63223324	53223353	66633226
267-273	66412324	51122233	41121110	10022557	66422357	76444357	74333233
274-280	43122323	32211116	64423345	76332330	33322222	21221213	20121101
281-287	00011102	20011100	00011100	00011102	00122134	00022103	21222200
288-294	41011100	00112200	10011101	22232244	54323465	66322241	11112123
295-301	21011246	64212231	21011102	11023665	45324444	53233424	43022321
302-308	41123377	64223223	33212132	50001122	01110001	11011001	10002223
309-315	02111000	00001000	11010000	10100111	20012202	30111200	20011002
316-322	10001113	55112125	44212222	42111235	11222235	52311210	22001100
323-329	20001115	31246566	66343322	23312557	65332133	53122444	43323335
330-336	43333224	13101122	30112112	10011210	00011001	31010001	00010000
337-343	00000001	00001001	41000000	01012011	12000000	00000000	20001131
344-350	02222246	54433365	45322123	33111220	11121121	11011101	10000014
351-357	12334335	55333446	64332223	55222555	53322362	13122253	22222213
358-364	01011110	10001100	10000001	11111112	42100100	00000003	22000100
365	00001032						

LEIRVOGUR MAGNETIC OBSERVATORY 2007

K-SUMS IN 27-DAY RUNS

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

LEIRVOGUR MAGNETIC OBSERVATORY 2007

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	61	41	47	41	24	18	12	4	0	0	0	2.2	17
FEB	53	45	61	26	17	12	7	2	1	0	0	2.0	14
MAR	26	67	59	44	25	11	10	6	0	0	0	2.3	17
APR	28	58	49	40	28	17	11	9	0	0	0	2.5	20
MAY	17	67	64	51	21	13	12	3	0	0	0	2.4	16
JUN	10	57	87	45	21	13	7	0	0	0	0	2.3	13
JUL	18	72	77	40	20	10	9	2	0	0	0	2.2	14
AUG	26	70	73	34	22	13	7	3	0	0	0	2.2	14
SEP	30	55	56	42	17	18	15	7	0	0	0	2.5	20
OCT	43	61	65	36	23	6	11	3	0	0	0	2.0	14
NOV	63	70	47	28	11	14	6	1	0	0	0	1.7	11
DEC	94	59	39	27	11	13	5	0	0	0	0	1.4	9
YEAR	469	722	724	454	240	158	112	40	1	0	0	2.1	15
%	16.1	24.7	24.8	15.5	8.2	5.4	3.8	1.4	0.0	0.0			

	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	-	$\overline{K}$	$\overline{Ak}$
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

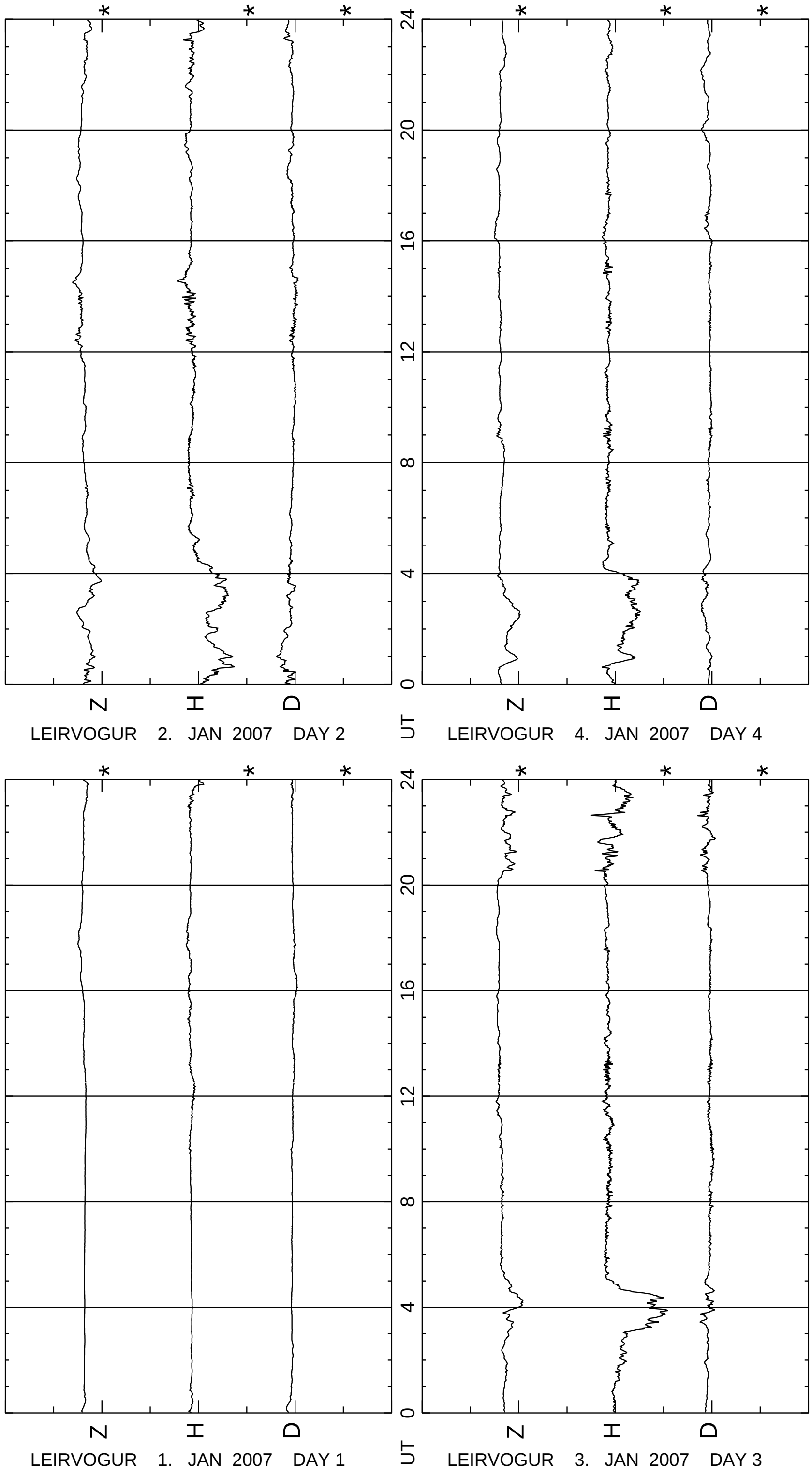
	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	-	$\overline{K}$	$\overline{Ak}$
1982	20	182	366	648	566	554	389	156	29	10	0	4.0	41
1983	10	150	494	595	596	585	330	137	17	6	0	3.9	37
1984	9	117	516	676	568	497	367	151	24	3	0	3.9	38
1985	2	231	806	695	454	386	237	85	23	1	0	3.4	29
1986	14	300	927	645	399	322	194	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
2007	469	722	724	454	240	158	112	40	1	0	0	2.1	15

EXPLANATION OF DAILY GRAPHS

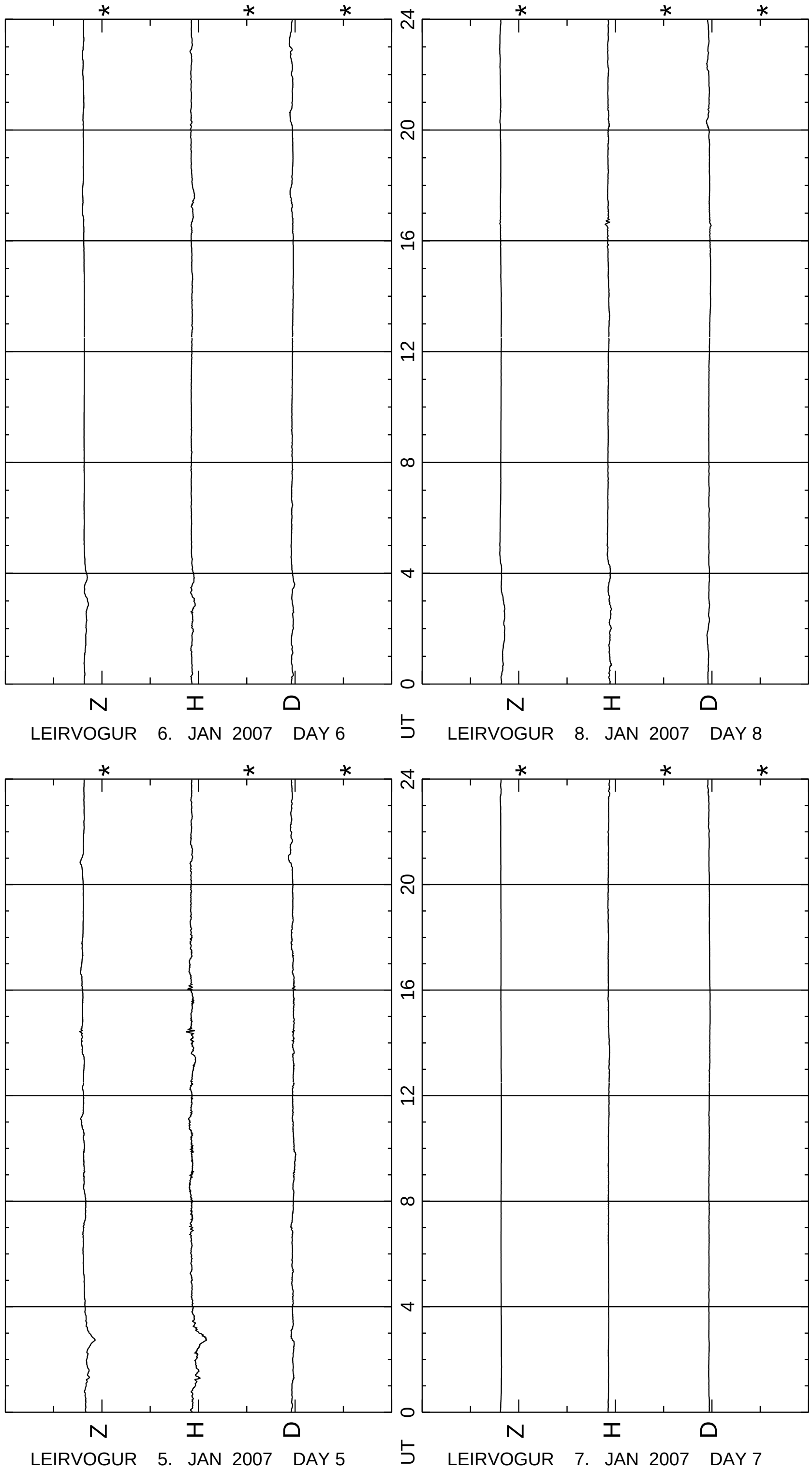
The graphs on pages 36–127 show the 1-minute means of the magnetic elements Z, H, and D at Leirvogur in 2007. Vertical divisions are spaced at intervals of 500 nT in Z and H and $2.^\circ31$ in D. The last figure is equivalent to 500 nT in the direction of magnetic east for average values of H at Leirvogur.

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

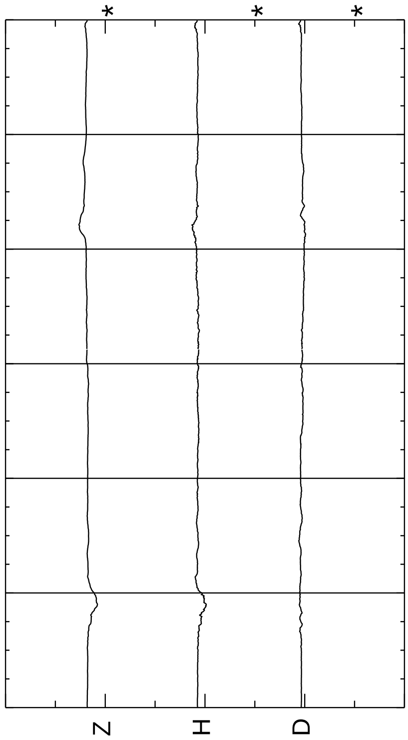
In several cases the H and D components had to be shifted upwards or downwards by one interval (500 nT) to disentangle the lines or prevent them from disappearing off scale.



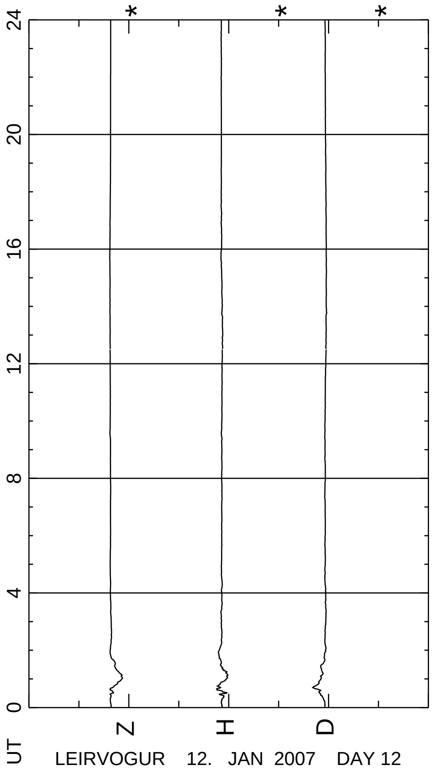
LEIRVOGUR 2. JAN 2007 DAY 2
LEIRVOGUR 4. JAN 2007 DAY 4
LEIRVOGUR 1. JAN 2007 DAY 1
LEIRVOGUR 3. JAN 2007 DAY 3
Z
H
D
UT
0
4
8
12
16
20
24



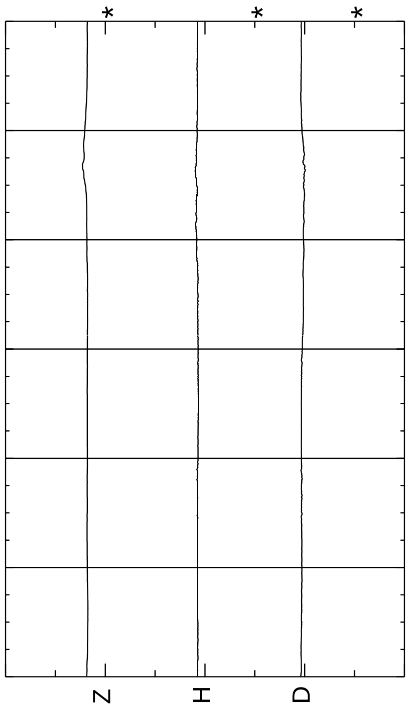
LEIRVOGUR 6. JAN 2007 DAY 6
LEIRVOGUR 8. JAN 2007 DAY 8
LEIRVOGUR 5. JAN 2007 DAY 5
LEIRVOGUR 7. JAN 2007 DAY 7
Z
H
D
UT
0
4
8
12
16
20
24



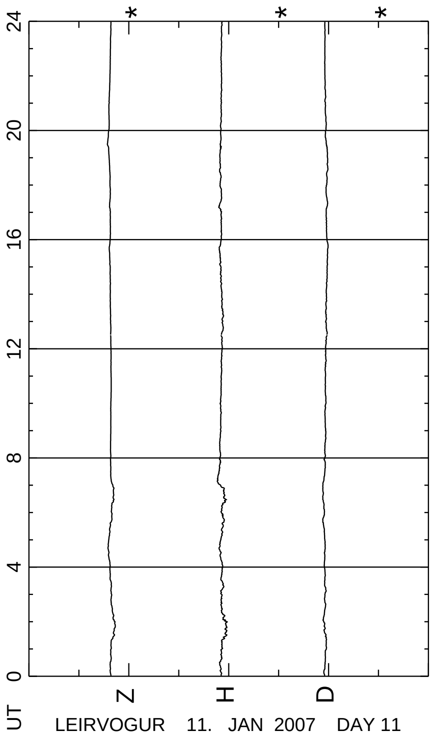
LEIRVOGUR 10. JAN 2007 DAY 10



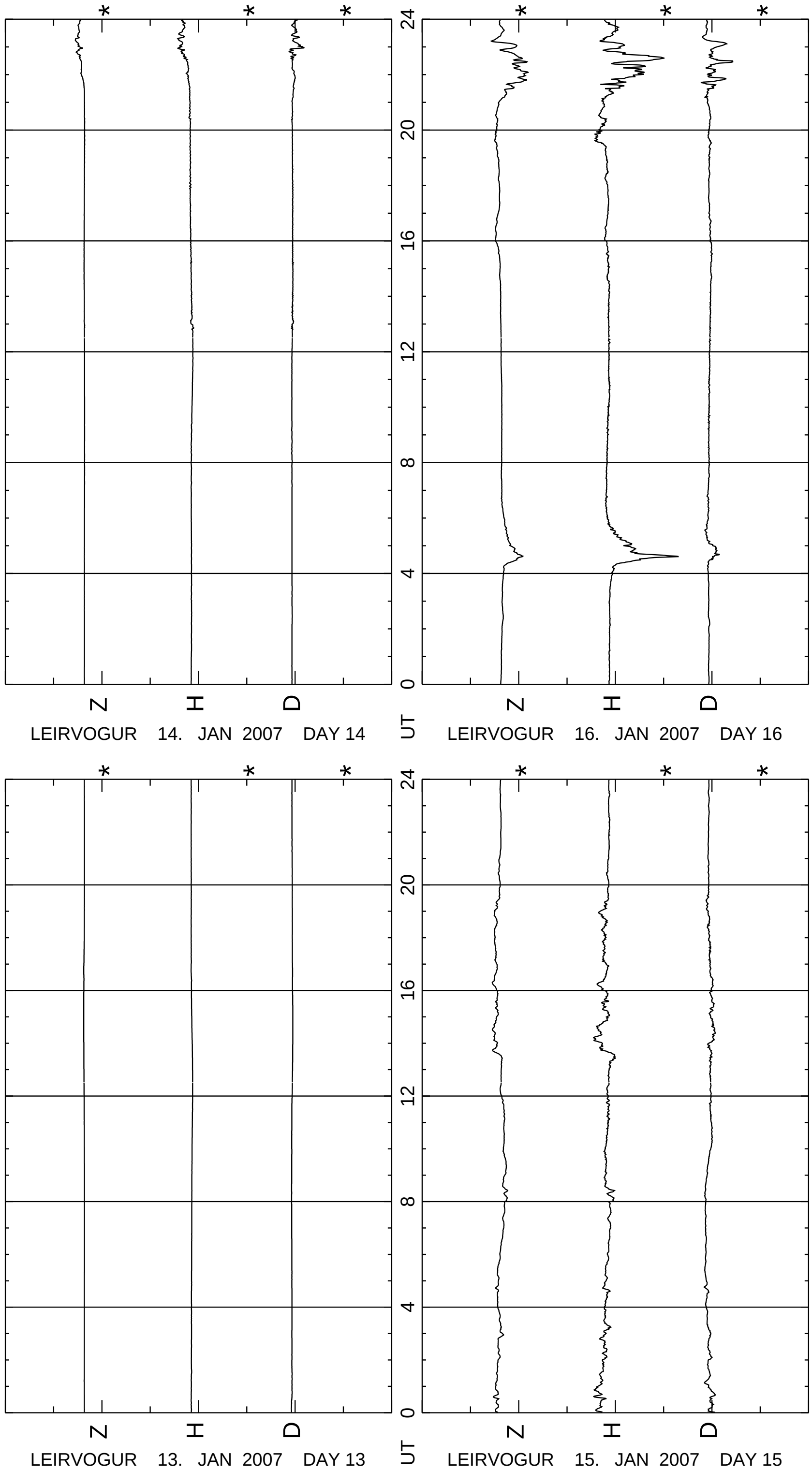
LEIRVOGUR 12. JAN 2007 DAY 12

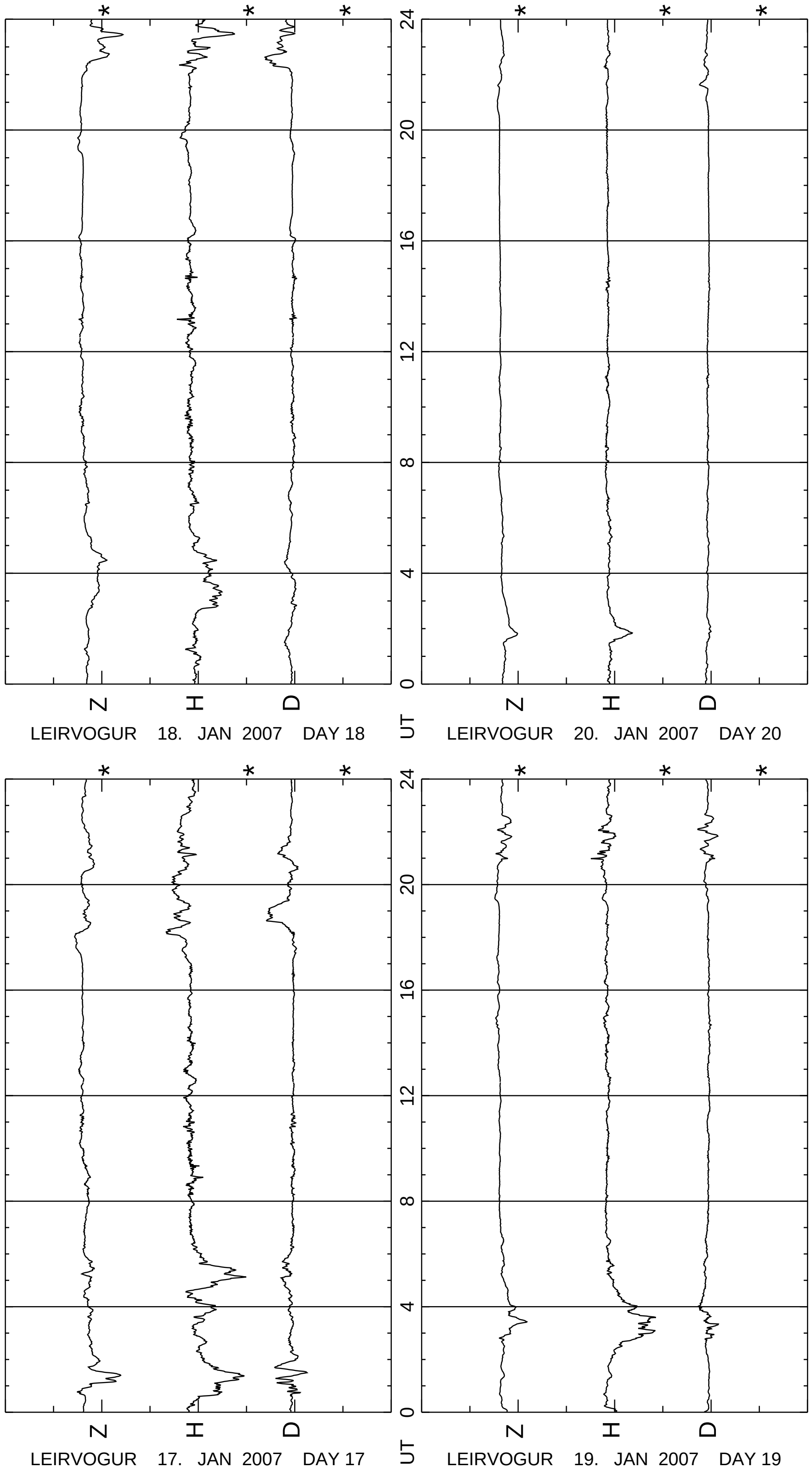


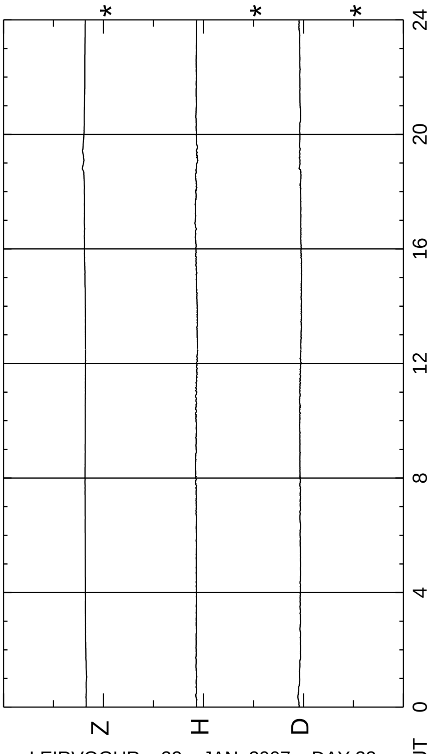
LEIRVOGUR 9. JAN 2007 DAY 9



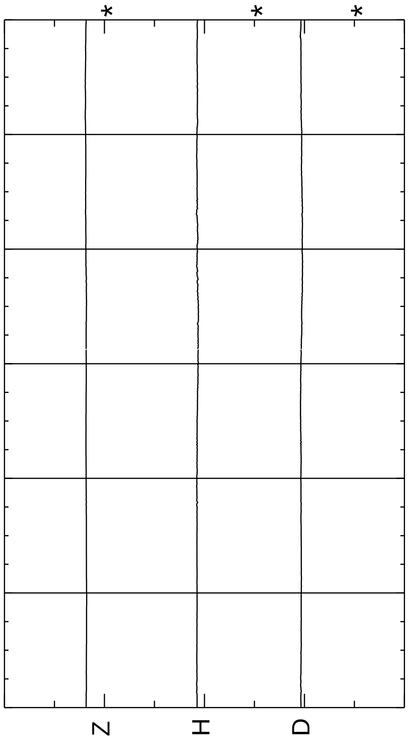
LEIRVOGUR 11. JAN 2007 DAY 11


LEIRVOGUR 14. JAN 2007 DAY 14
LEIRVOGUR 16. JAN 2007 DAY 16
LEIRVOGUR 13. JAN 2007 DAY 13
LEIRVOGUR 15. JAN 2007 DAY 15
Z
H
D
UT
0
4
8
12
16
20
24

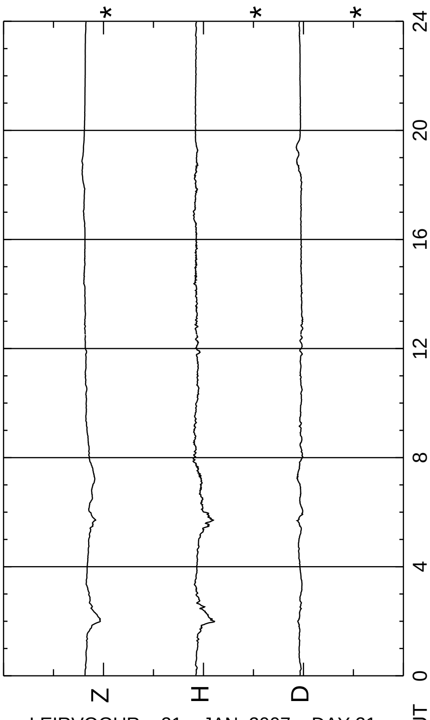

LEIRVOGUR 18. JAN 2007 DAY 18
LEIRVOGUR 20. JAN 2007 DAY 20
LEIRVOGUR 17. JAN 2007 DAY 17
LEIRVOGUR 19. JAN 2007 DAY 19
Z H D
UT
0 4 8 12 16 20 24



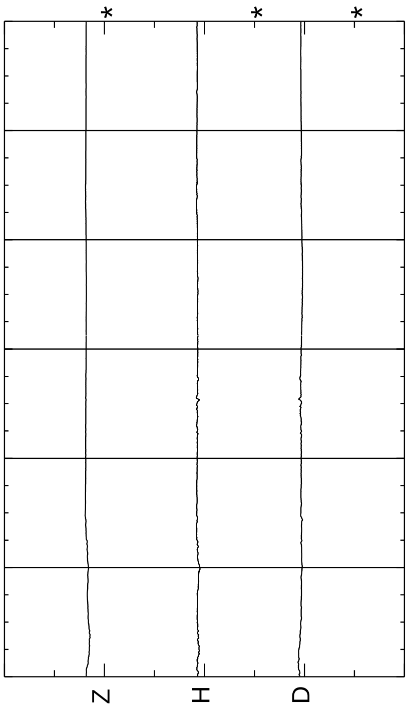
LEIRVOGUR 22. JAN 2007 DAY 22



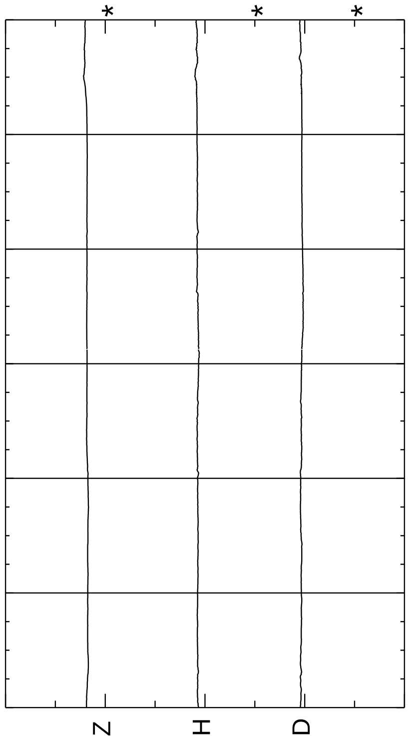
LEIRVOGUR 24. JAN 2007 DAY 24



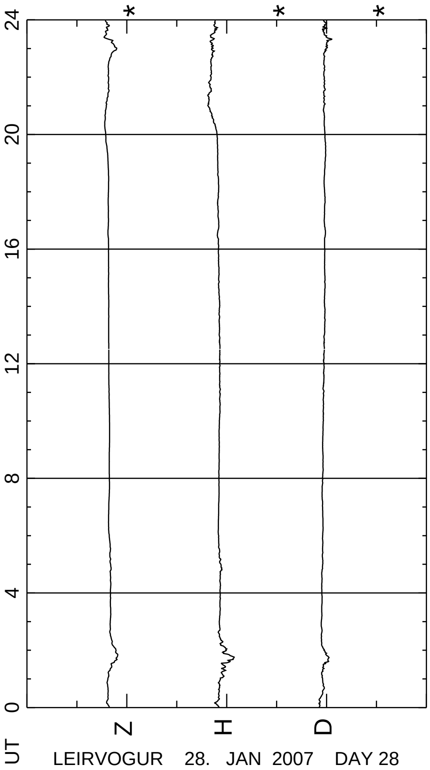
LEIRVOGUR 21. JAN 2007 DAY 21



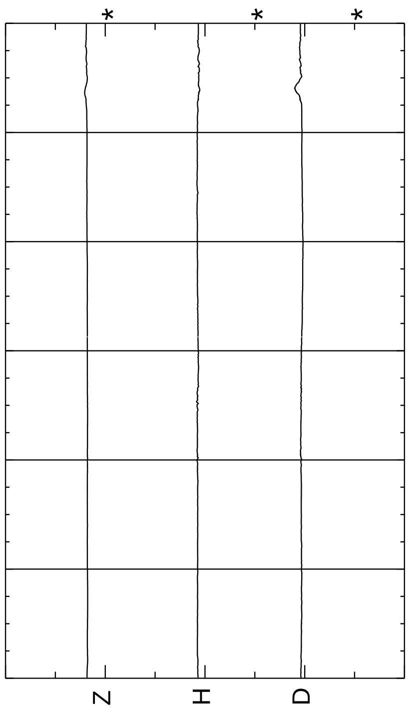
LEIRVOGUR 23. JAN 2007 DAY 23



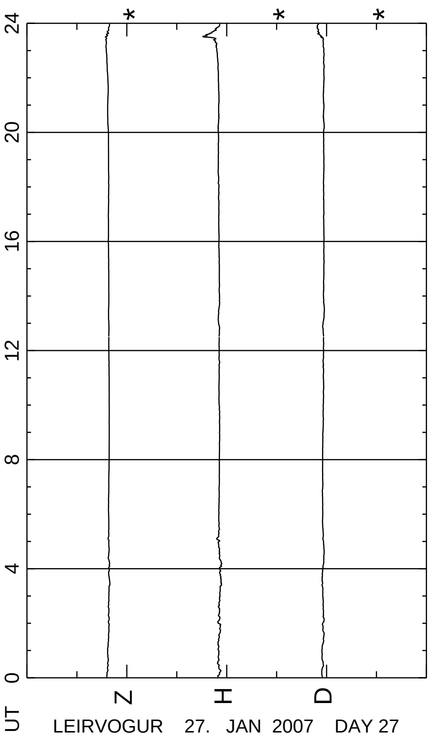
LEIRVOGUR 26. JAN 2007 DAY 26



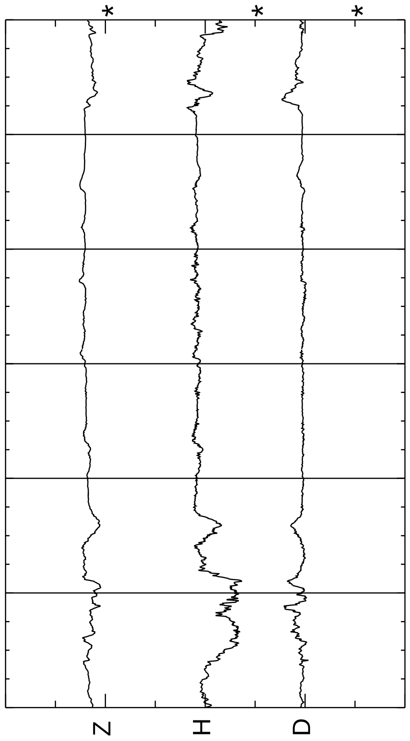
LEIRVOGUR 28. JAN 2007 DAY 28



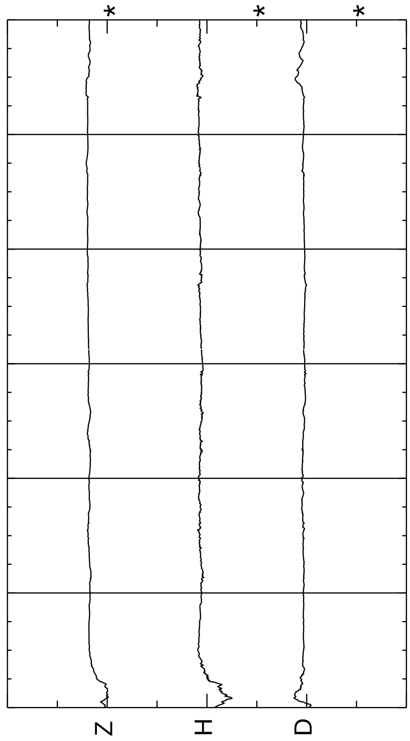
LEIRVOGUR 25. JAN 2007 DAY 25



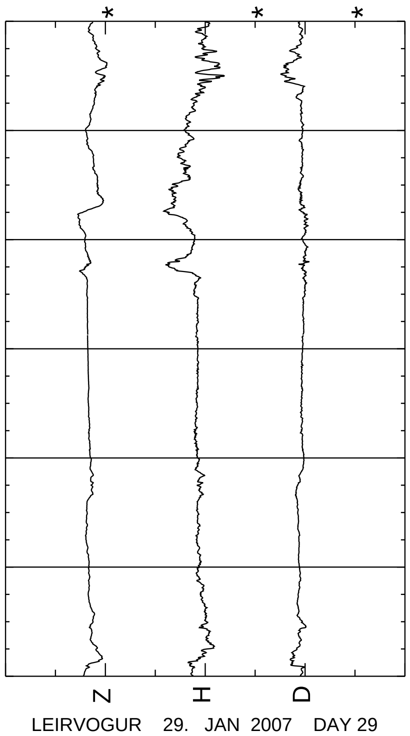
LEIRVOGUR 27. JAN 2007 DAY 27



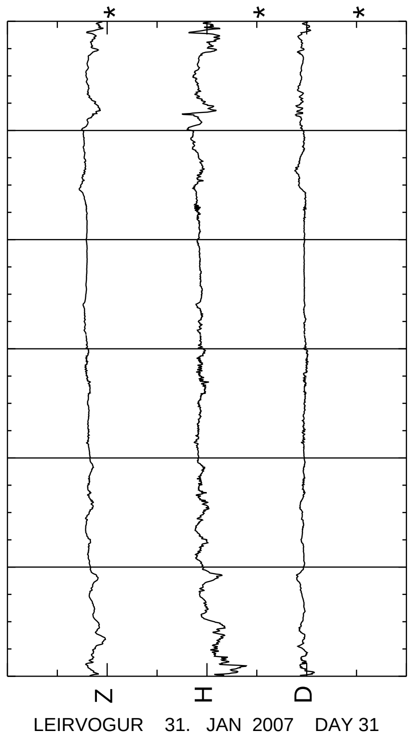
LEIRVOGUR 30. JAN 2007 DAY 30



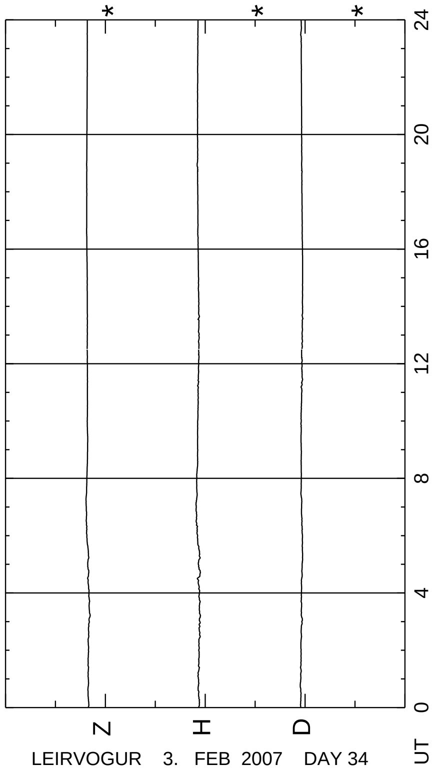
LEIRVOGUR 1. FEB 2007 DAY 32



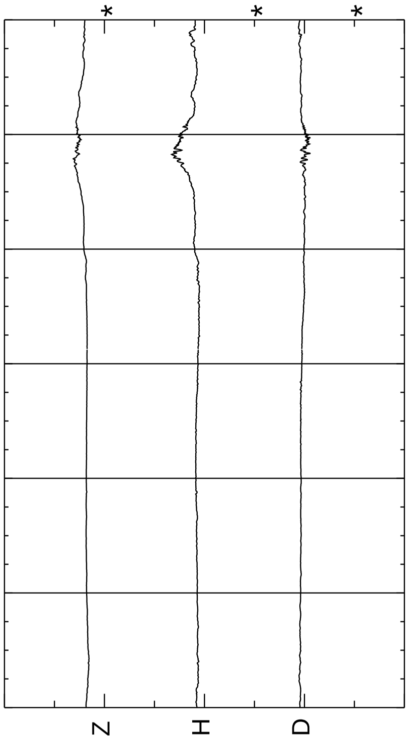
LEIRVOGUR 29. JAN 2007 DAY 29



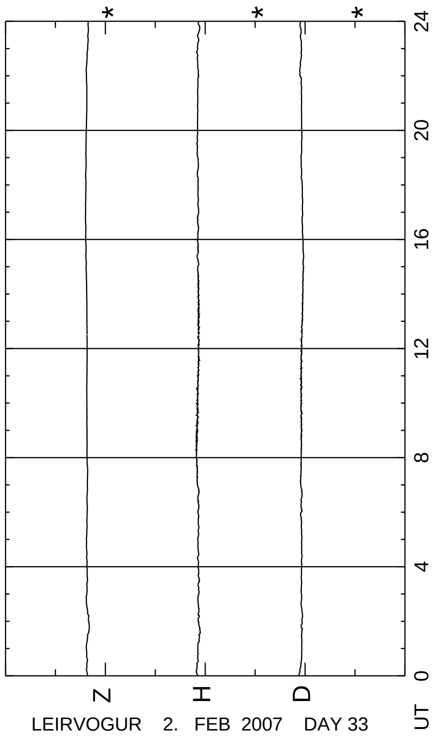
LEIRVOGUR 31. JAN 2007 DAY 31



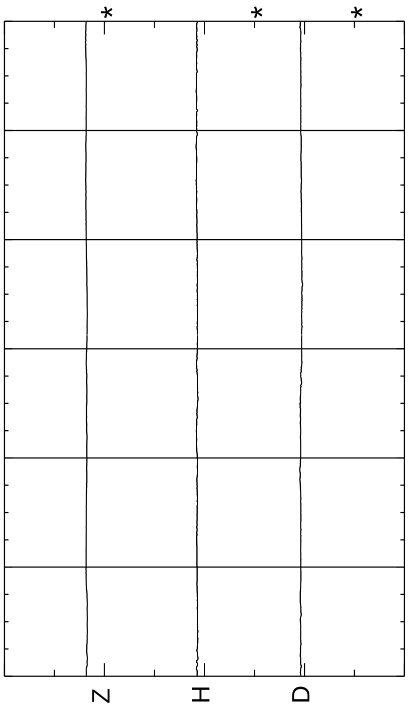
LEIRVOGUR 3. FEB 2007 DAY 34



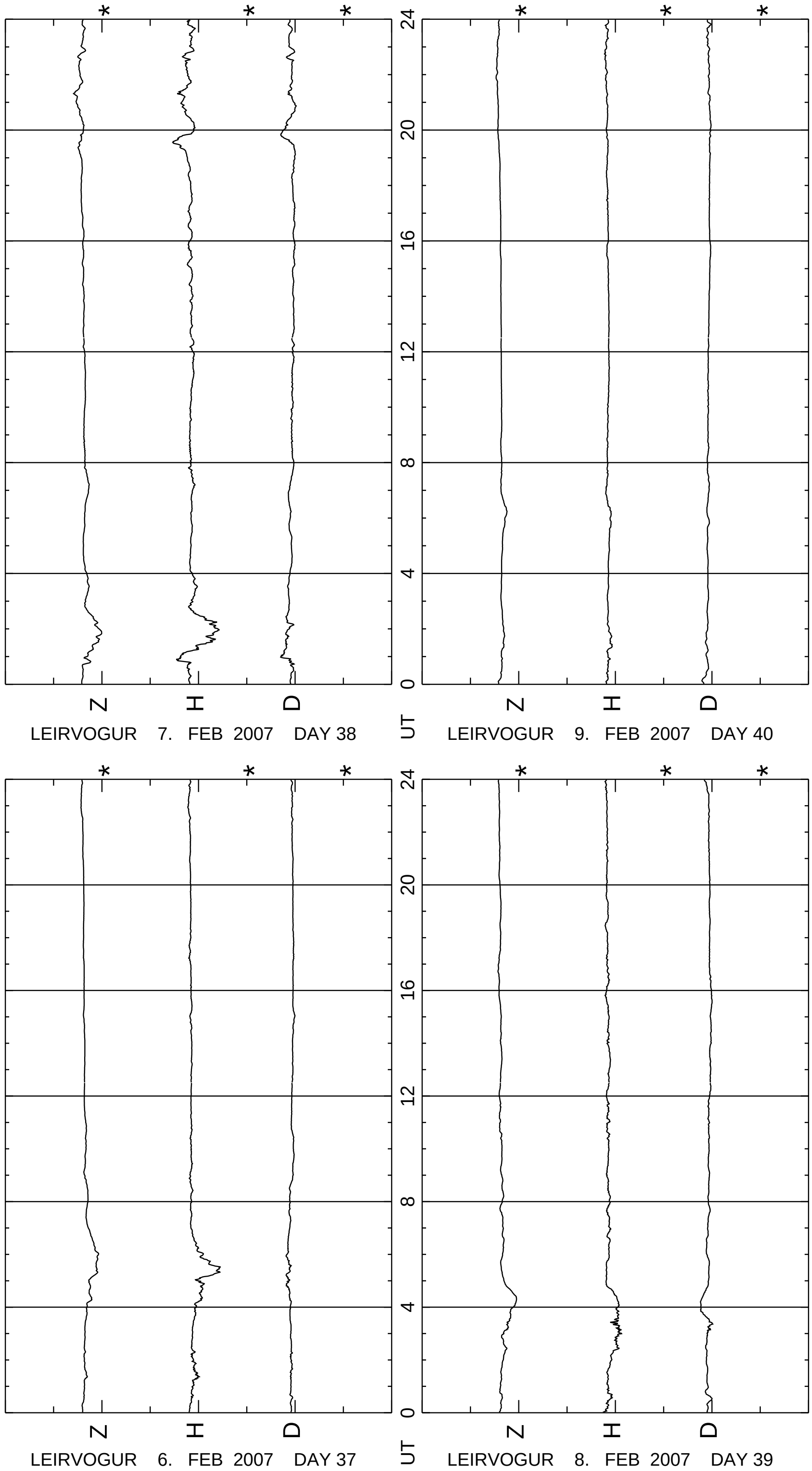
LEIRVOGUR 5. FEB 2007 DAY 36

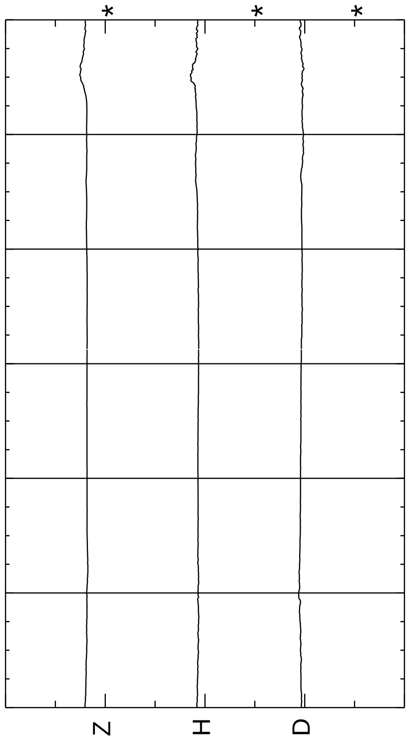


LEIRVOGUR 2. FEB 2007 DAY 33

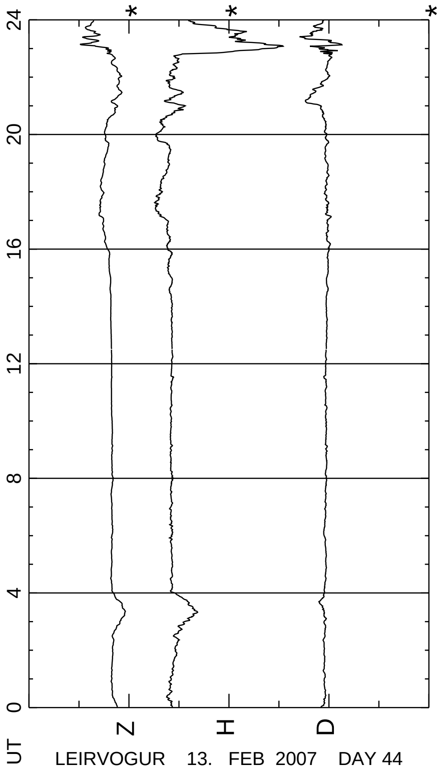


LEIRVOGUR 4. FEB 2007 DAY 35

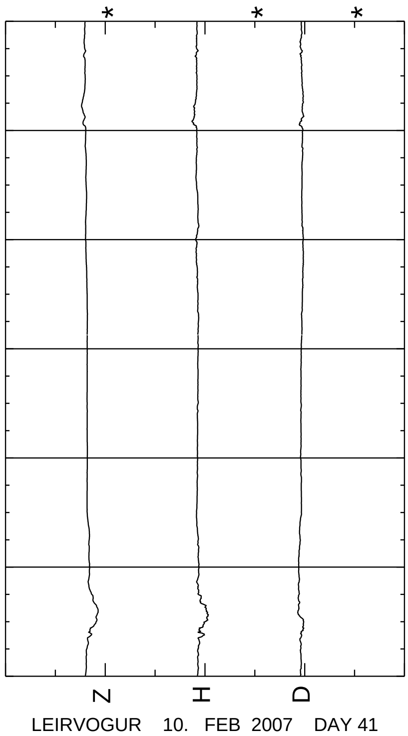

LEIRVOGUR 7. FEB 2007 DAY 38
LEIRVOGUR 9. FEB 2007 DAY 40
LEIRVOGUR 6. FEB 2007 DAY 37
LEIRVOGUR 8. FEB 2007 DAY 39
Z
H
D
UT
0
4
8
12
16
20
24



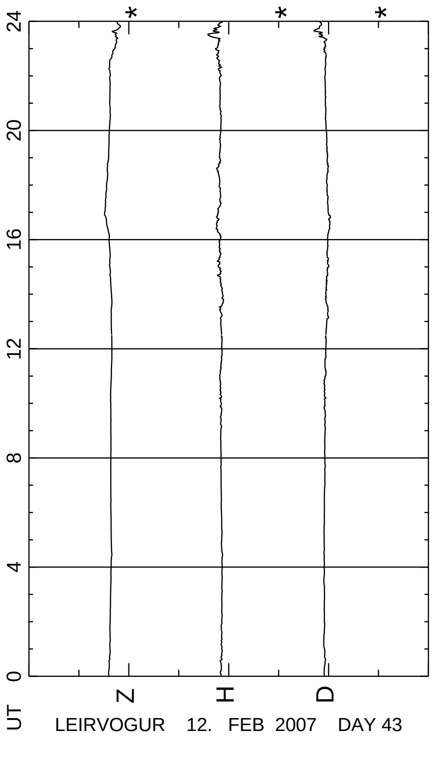
LEIRVOGUR 11. FEB 2007 DAY 42



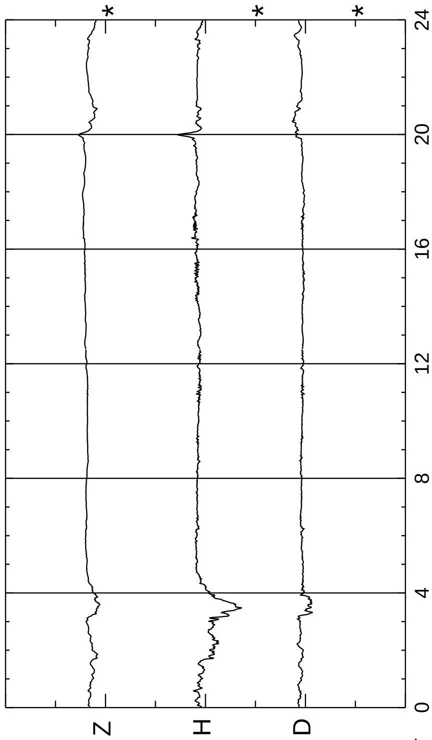
LEIRVOGUR 13. FEB 2007 DAY 44



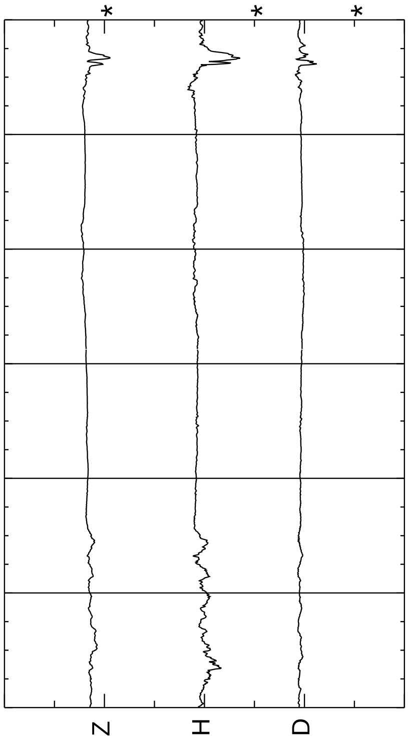
LEIRVOGUR 10. FEB 2007 DAY 41



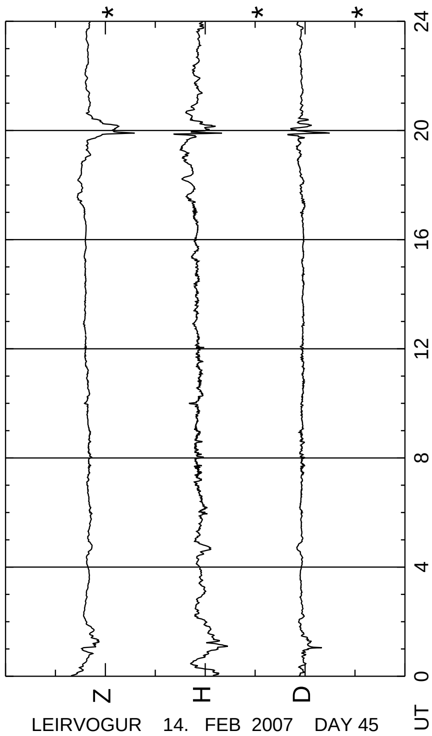
LEIRVOGUR 12. FEB 2007 DAY 43



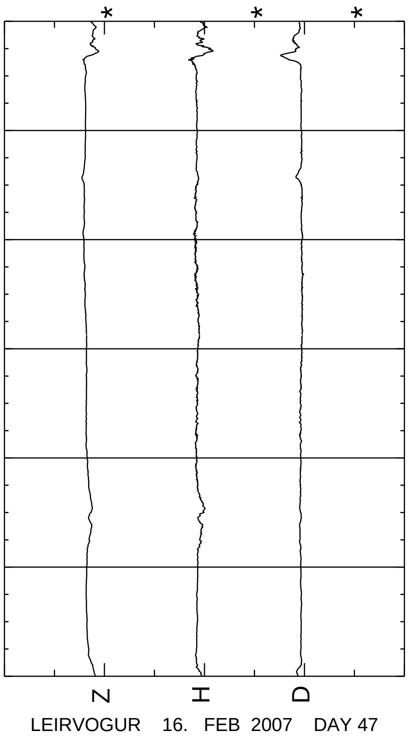
LEIRVOGUR 15. FEB 2007 DAY 46



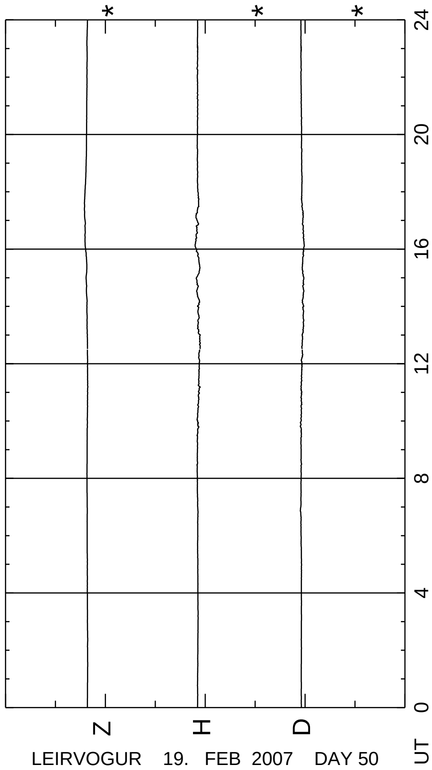
LEIRVOGUR 17. FEB 2007 DAY 48



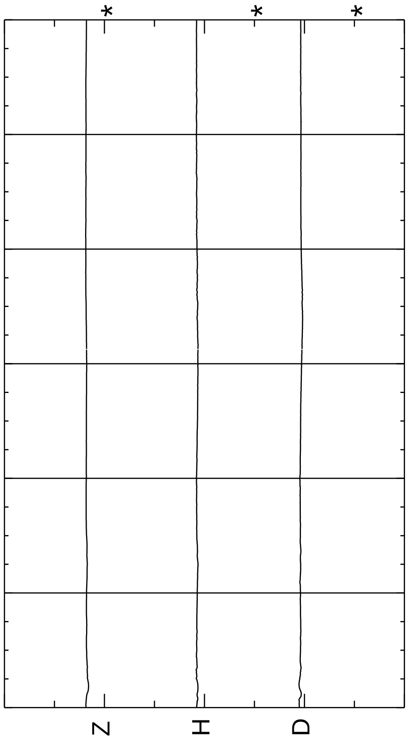
LEIRVOGUR 14. FEB 2007 DAY 45



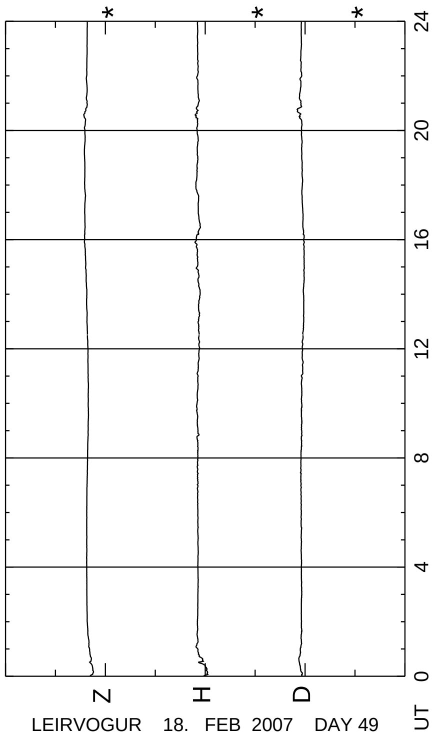
LEIRVOGUR 16. FEB 2007 DAY 47



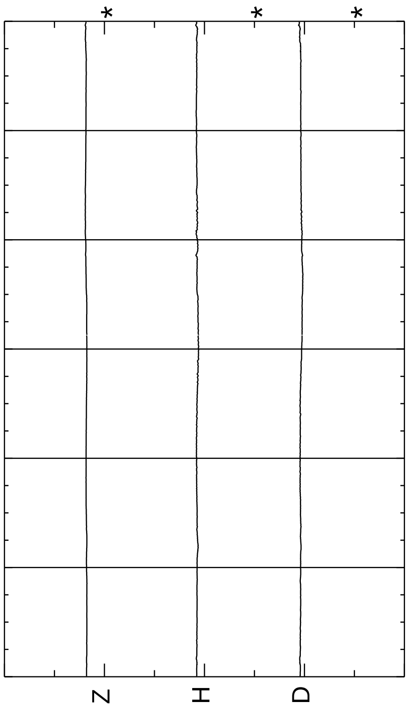
LEIRVOGUR 19. FEB 2007 DAY 50



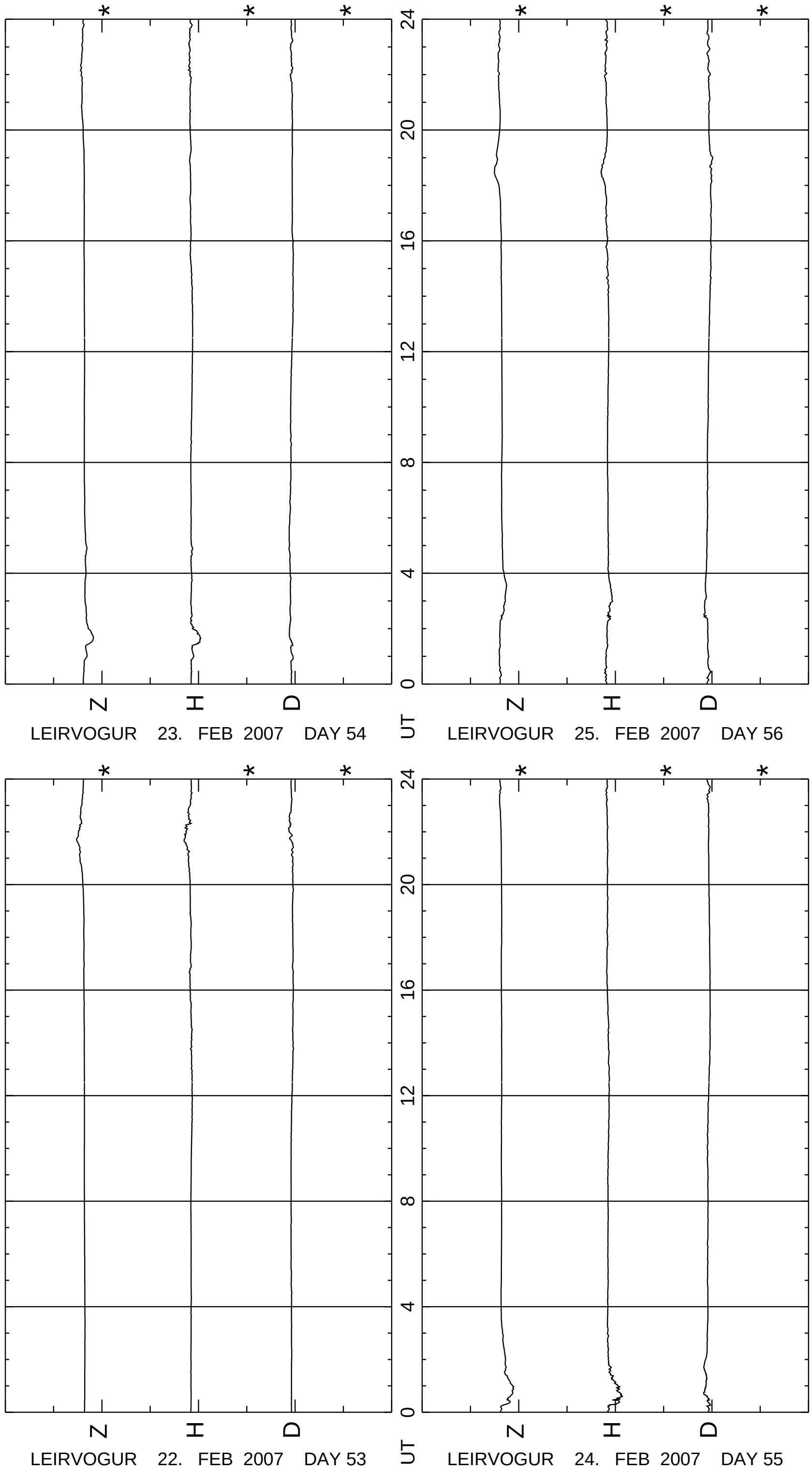
LEIRVOGUR 21. FEB 2007 DAY 52



LEIRVOGUR 18. FEB 2007 DAY 49



LEIRVOGUR 20. FEB 2007 DAY 51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LEIRVOGUR 23. FEB 2007 DAY 54
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LEIRVOGUR 25. FEB 2007 DAY 56
Z H D
LEIRVOGUR 22. FEB 2007 DAY 53
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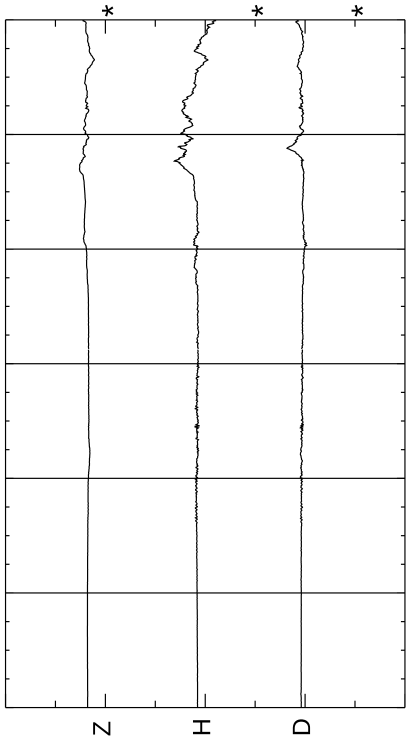
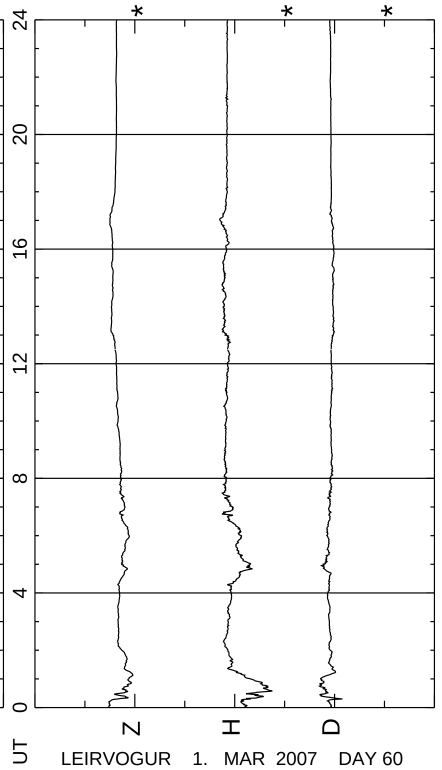
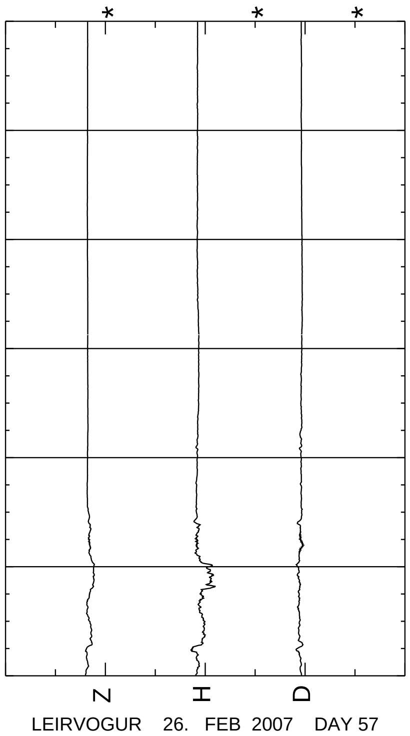
Z H D
LEIRVOGUR 24. FEB 2007 DAY 55



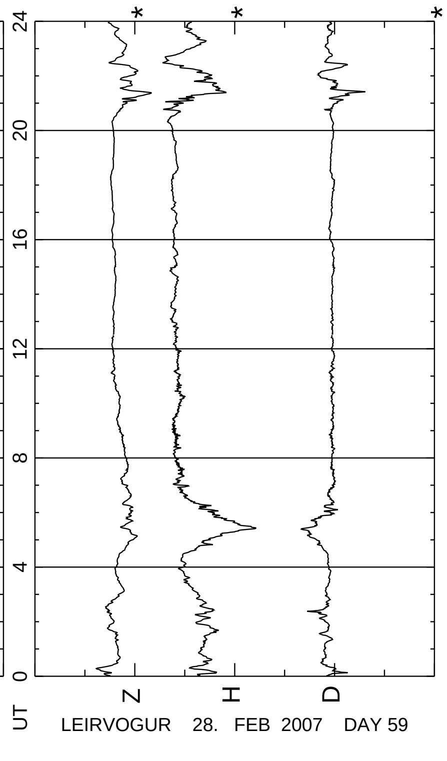
LEIRVOGUR 27. FEB 2007 DAY 58



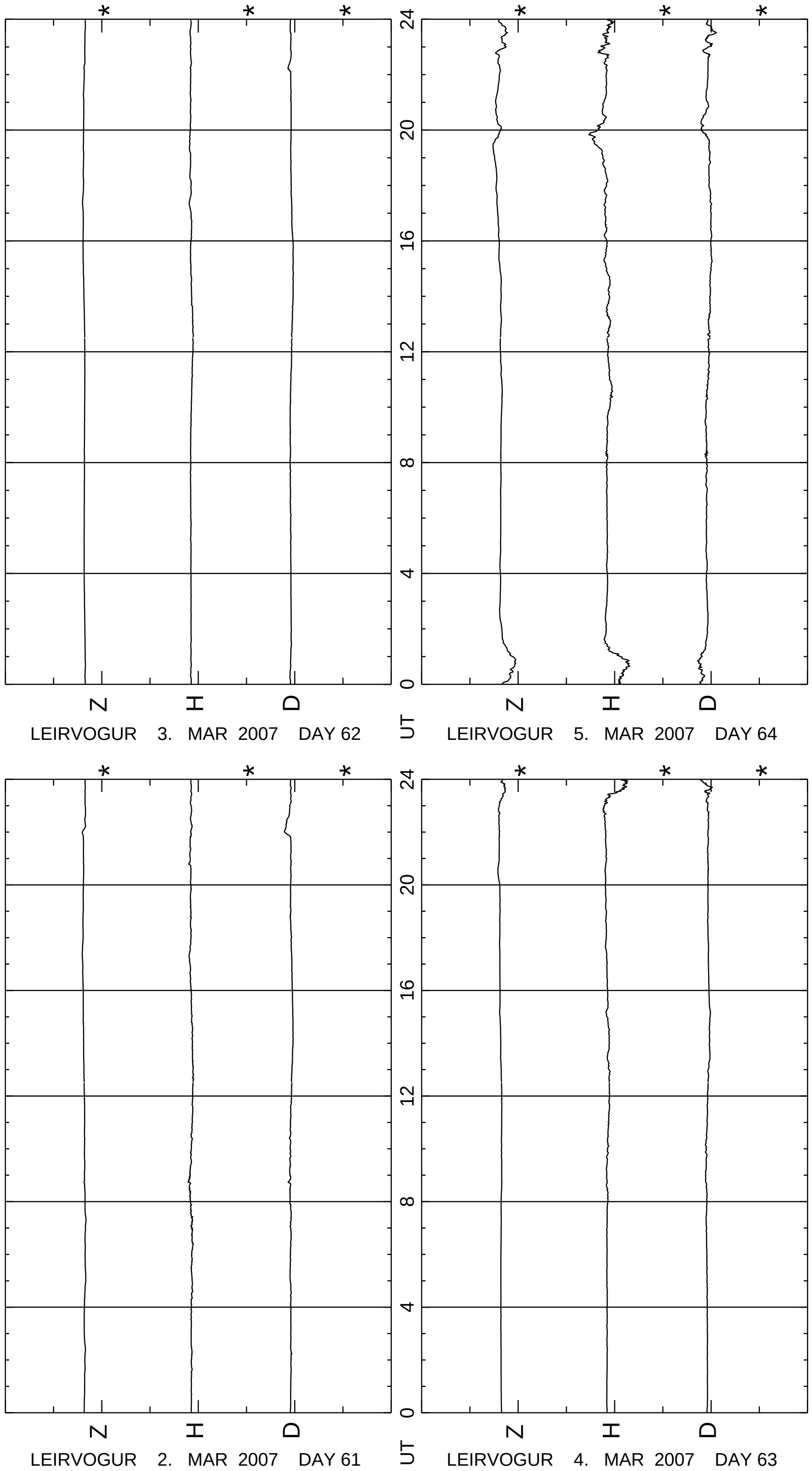
LEIRVOGUR 1. MAR 2007 DAY 60



LEIRVOGUR 26. FEB 2007 DAY 57



LEIRVOGUR 28. FEB 2007 DAY 59



LEIRVOGUR 3. MAR 2007 DAY 62
LEIRVOGUR 5. MAR 2007 DAY 64
LEIRVOGUR 2. MAR 2007 DAY 61
LEIRVOGUR 4. MAR 2007 DAY 63
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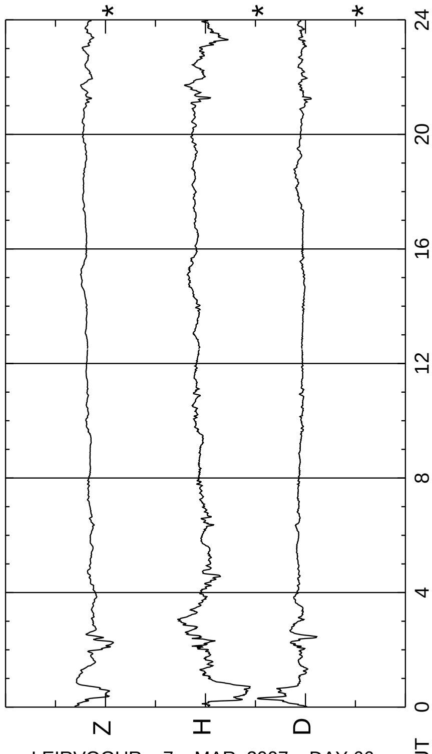
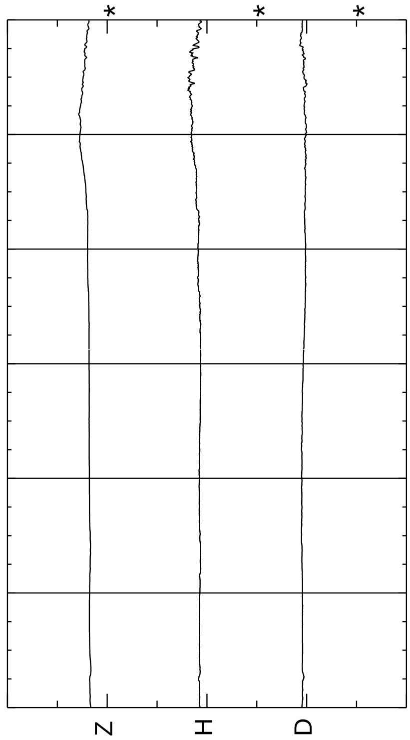
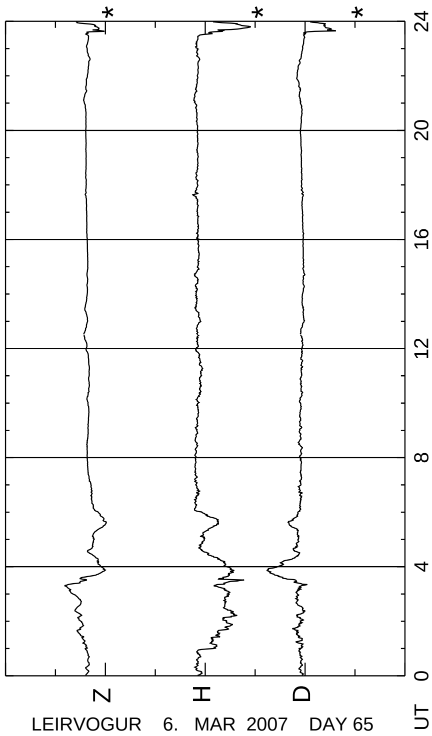


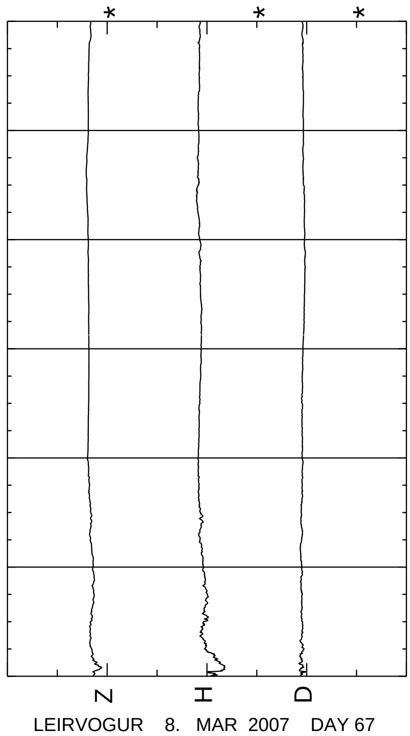
LEIRVOGUR 7. MAR 2007 DAY 66



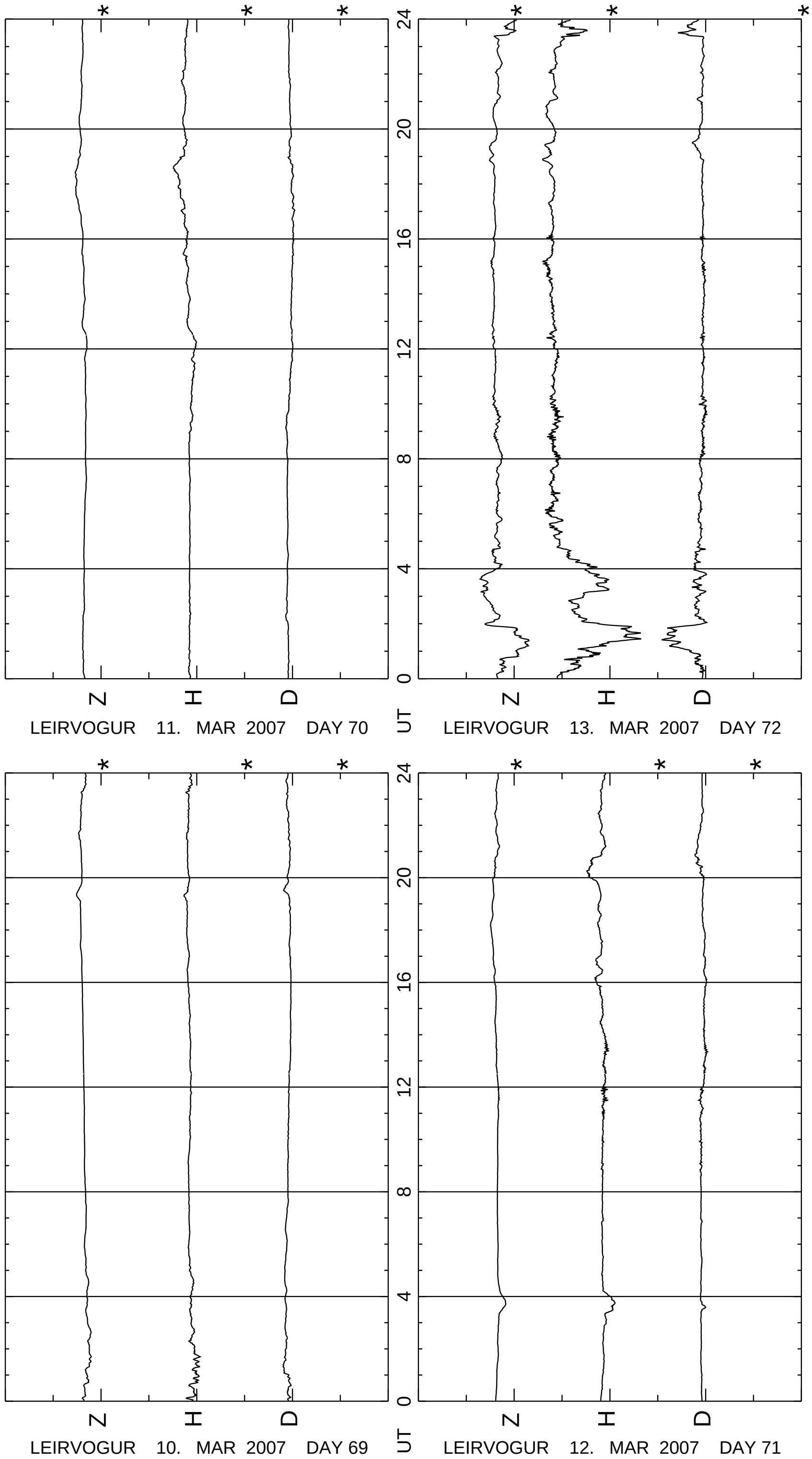
LEIRVOGUR 9. MAR 2007 DAY 68



LEIRVOGUR 6. MAR 2007 DAY 65



LEIRVOGUR 8. MAR 2007 DAY 67


LEIRVOGUR 11. MAR 2007 DAY 70
LEIRVOGUR 13. MAR 2007 DAY 72
LEIRVOGUR 10. MAR 2007 DAY 69
LEIRVOGUR 12. MAR 2007 DAY 71
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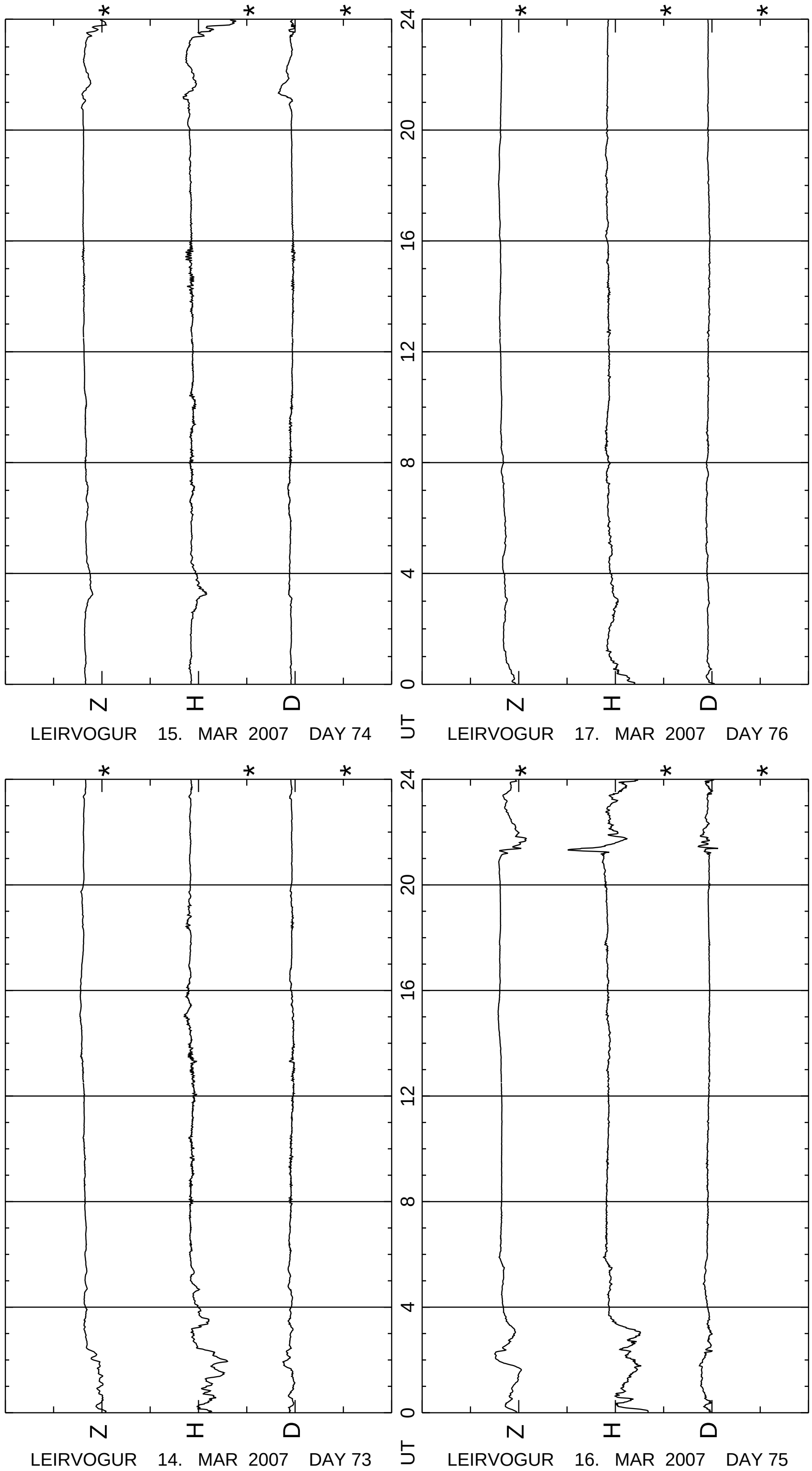
Z H D
LEIRVOGUR 15. MAR 2007 DAY 74
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LEIRVOGUR 17. MAR 2007 DAY 76
Z H D
LEIRVOGUR 14. MAR 2007 DAY 73
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LEIRVOGUR 16. MAR 2007 DAY 75
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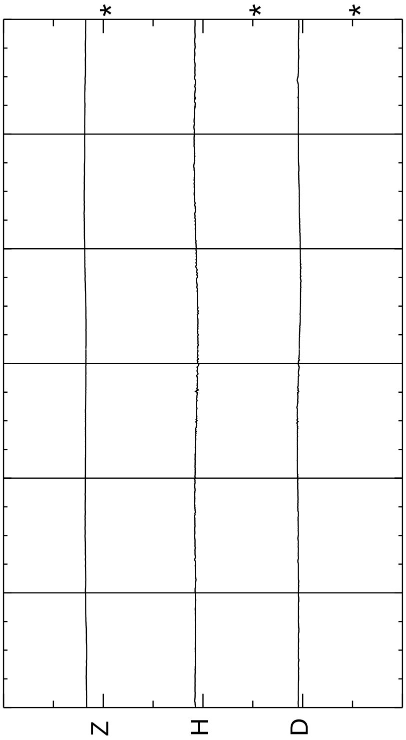
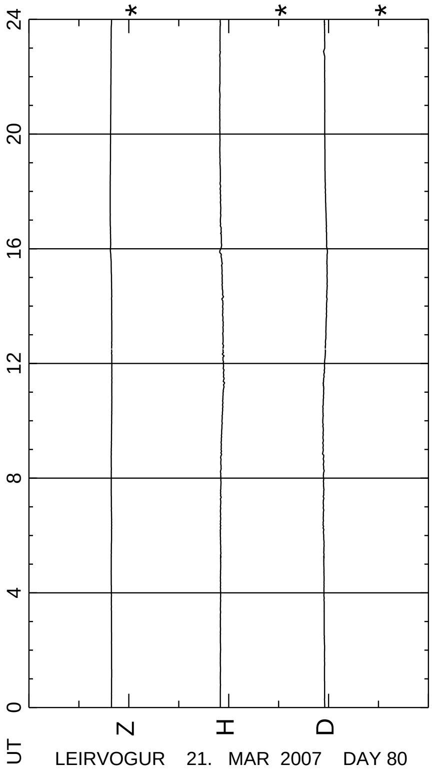
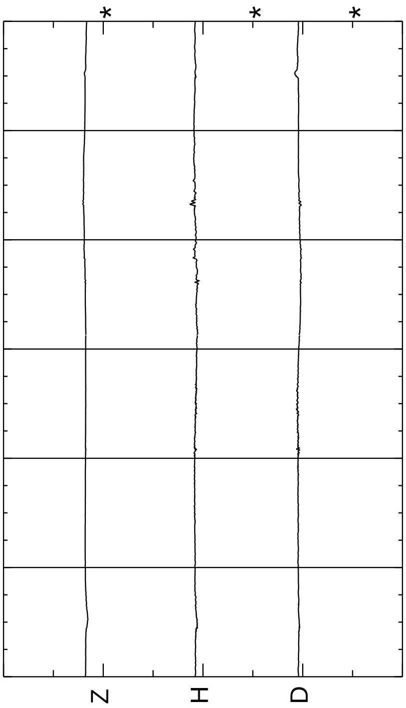


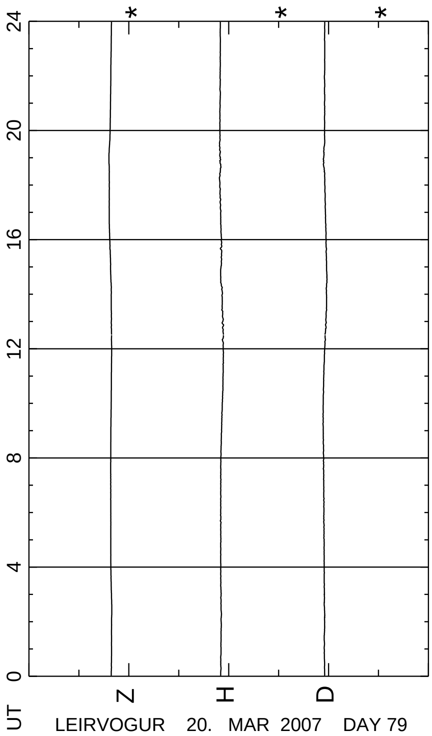
LEIRVOGUR 19. MAR 2007 DAY 78



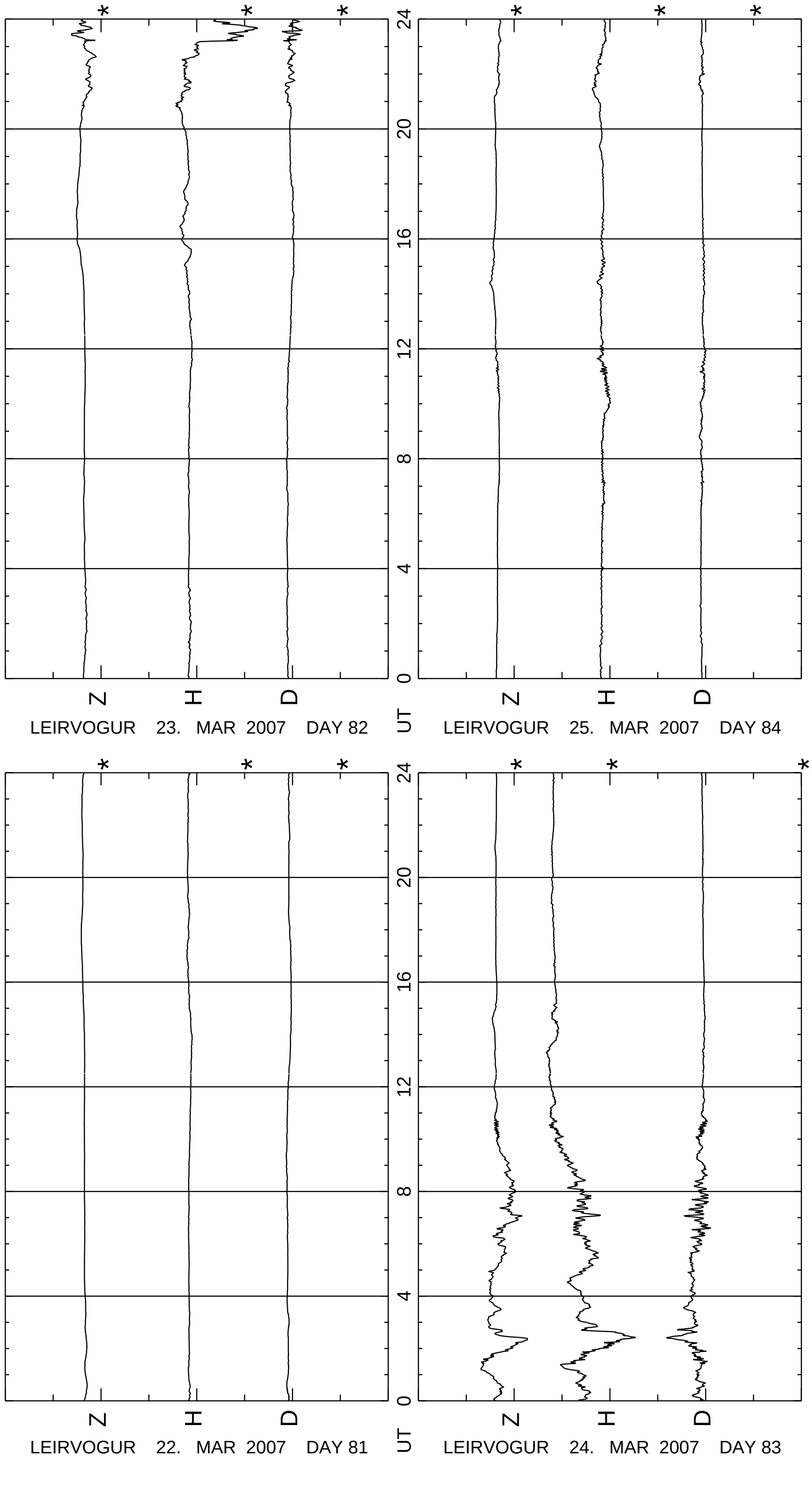
LEIRVOGUR 21. MAR 2007 DAY 80



LEIRVOGUR 18. MAR 2007 DAY 77



LEIRVOGUR 20. MAR 2007 DAY 79



LEIRVOGUR 23. MAR 2007 DAY 82
LEIRVOGUR 25. MAR 2007 DAY 84
LEIRVOGUR 22. MAR 2007 DAY 81
LEIRVOGUR 24. MAR 2007 DAY 83
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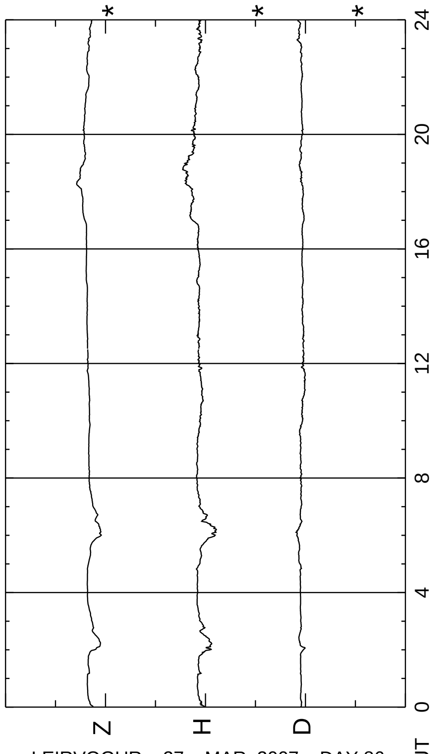
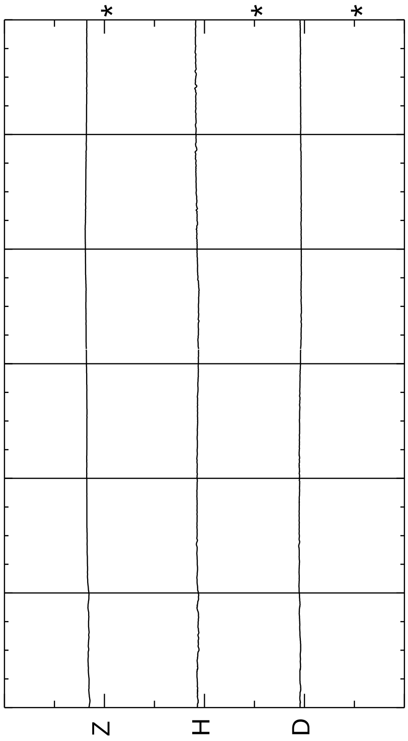
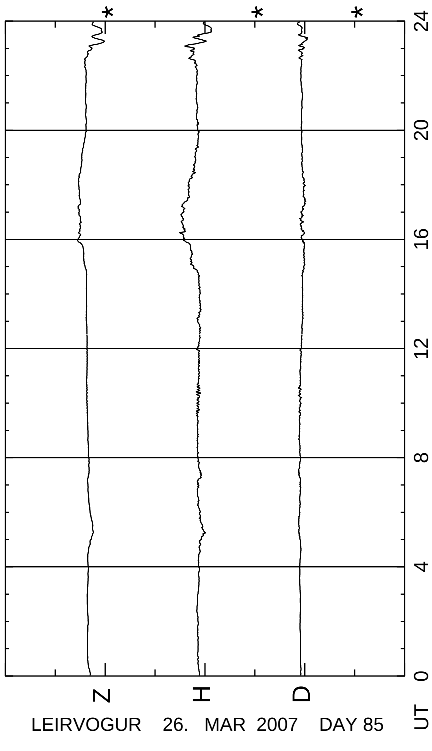


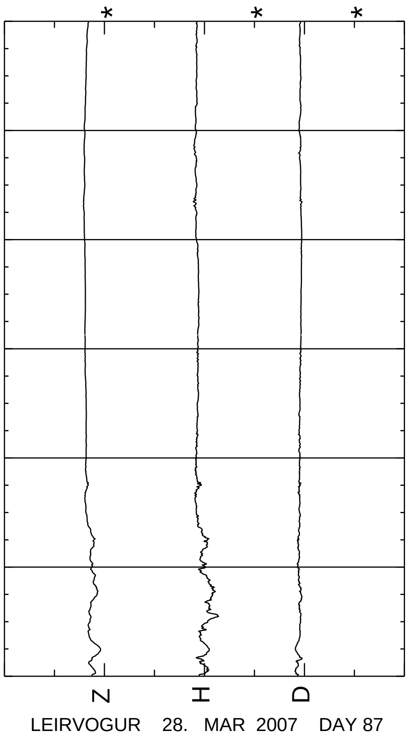
LEIRVOGUR 27. MAR 2007 DAY 86



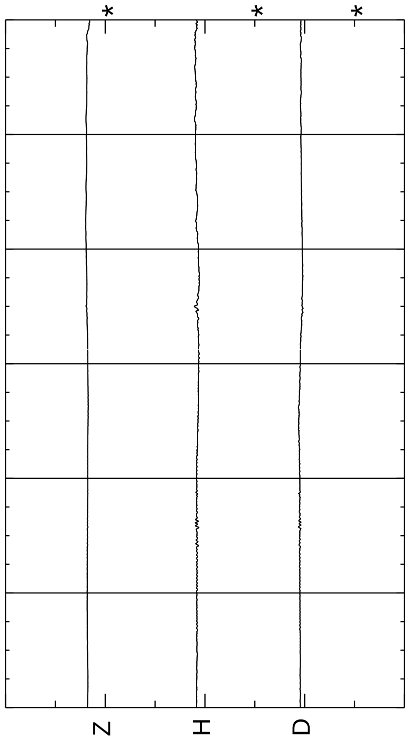
LEIRVOGUR 29. MAR 2007 DAY 88



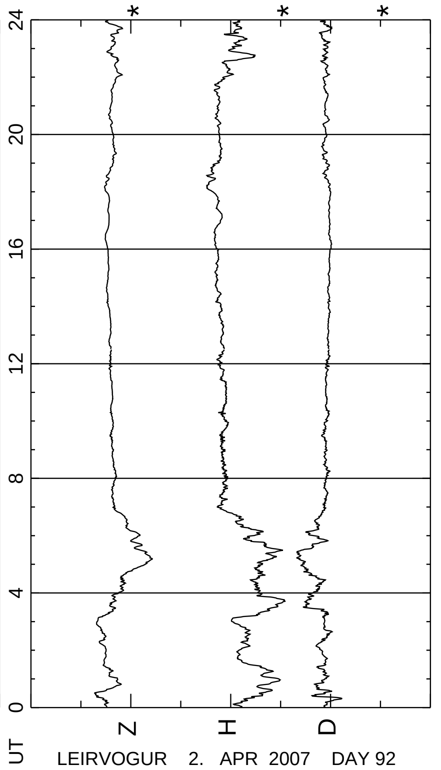
LEIRVOGUR 26. MAR 2007 DAY 85



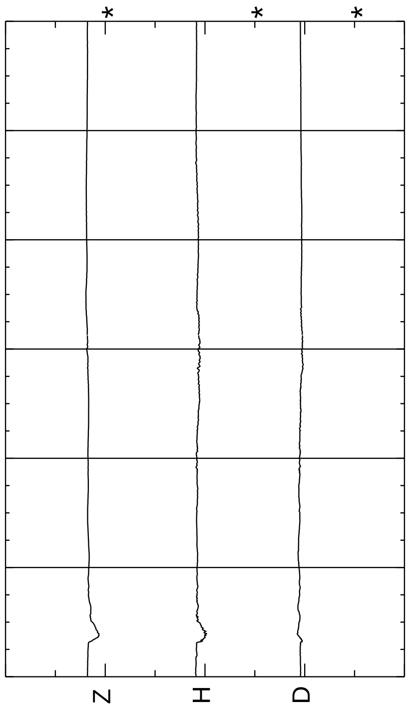
LEIRVOGUR 28. MAR 2007 DAY 87



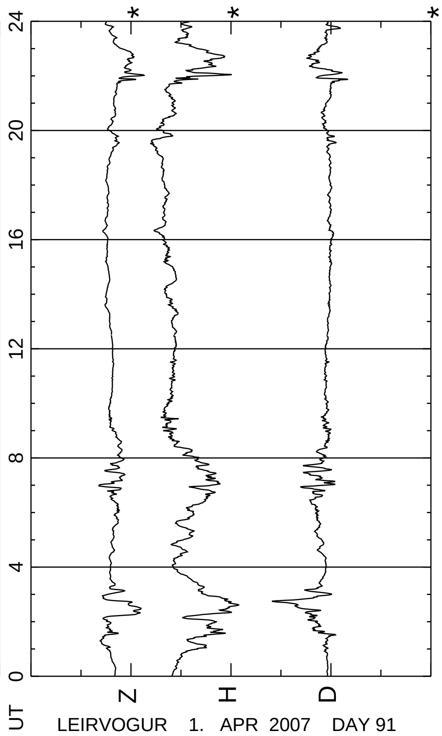
LEIRVOGUR 31. MAR 2007 DAY 90



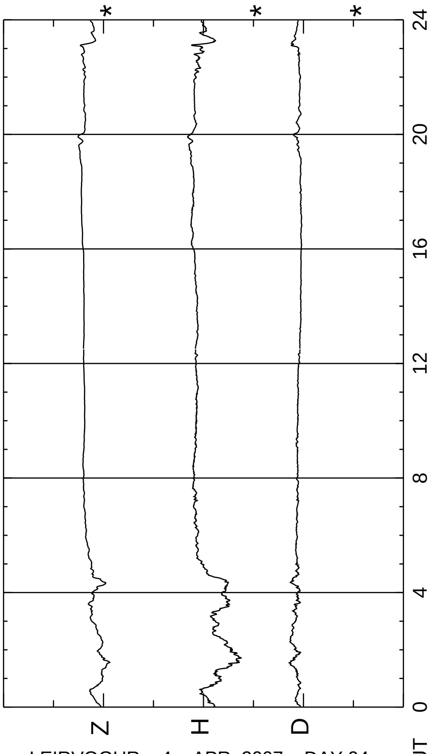
LEIRVOGUR 2. APR 2007 DAY 92



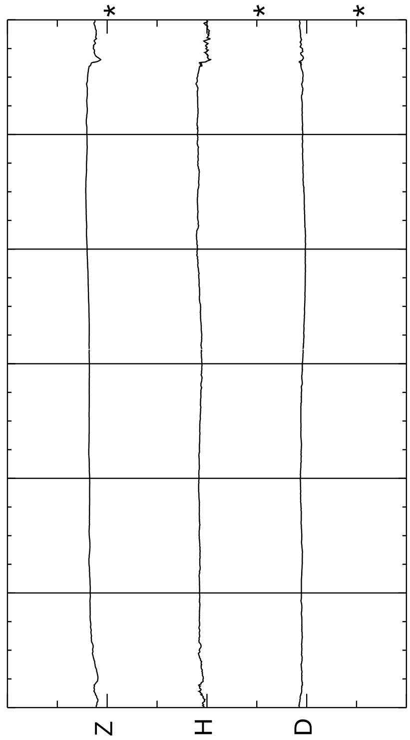
LEIRVOGUR 30. MAR 2007 DAY 89



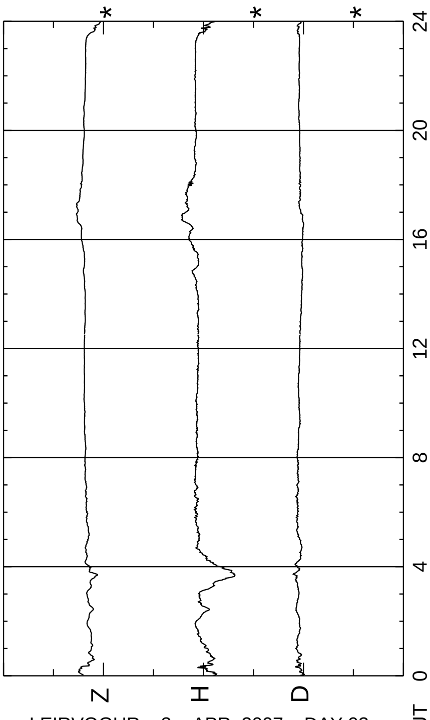
LEIRVOGUR 1. APR 2007 DAY 91



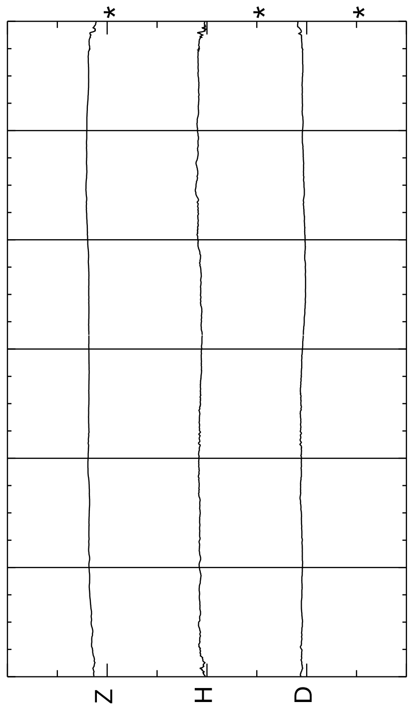
LEIRVOGUR 4. APR 2007 DAY 94



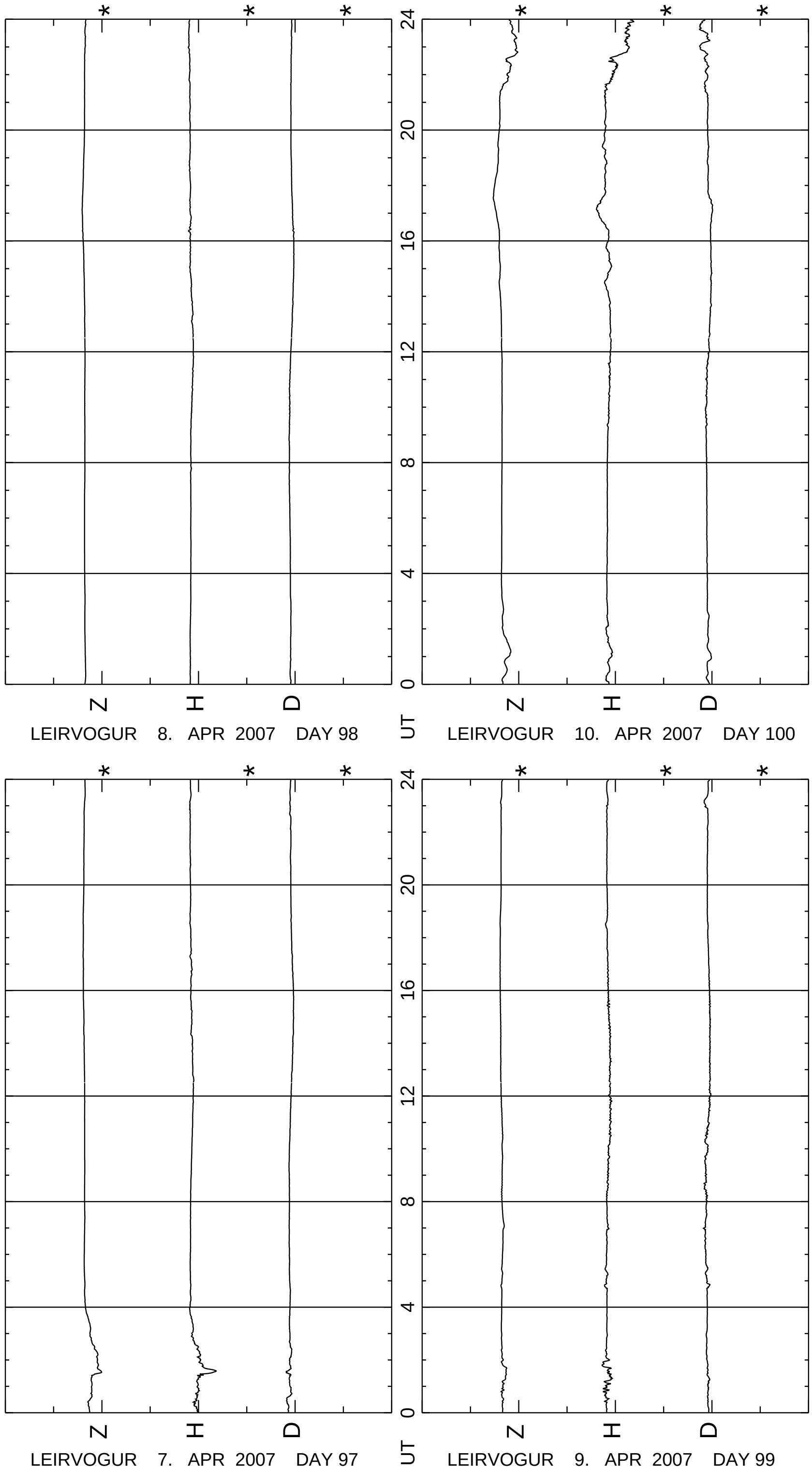
LEIRVOGUR 6. APR 2007 DAY 96



LEIRVOGUR 3. APR 2007 DAY 93



LEIRVOGUR 5. APR 2007 DAY 95


LEIRVOGUR 8. APR 2007 DAY 98
LEIRVOGUR 10. APR 2007 DAY 100
LEIRVOGUR 7. APR 2007 DAY 97
LEIRVOGUR 9. APR 2007 DAY 99
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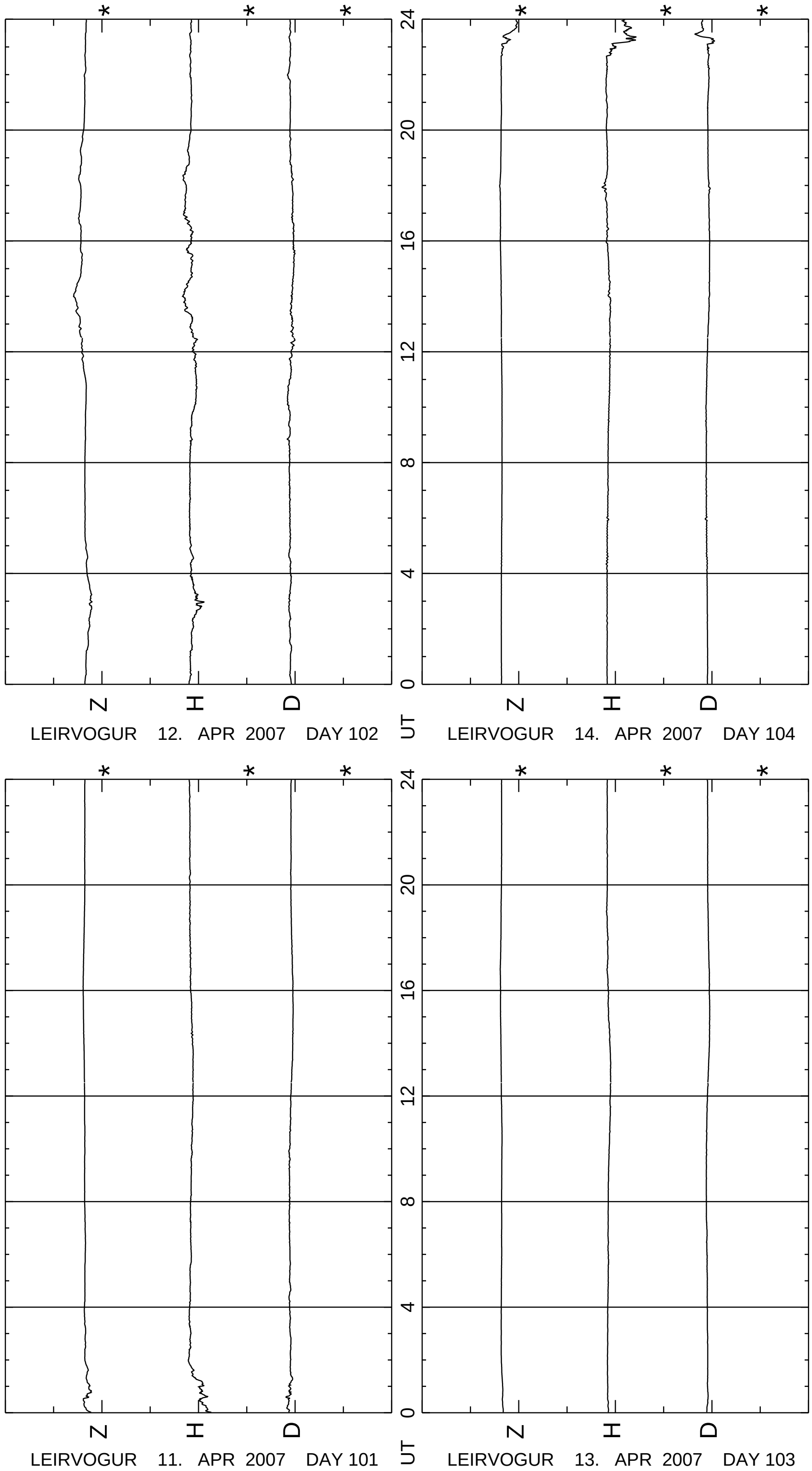
LEIRVOGUR 12. APR 2007 DAY 102
LEIRVOGUR 14. APR 2007 DAY 104
LEIRVOGUR 11. APR 2007 DAY 101
LEIRVOGUR 13. APR 2007 DAY 103
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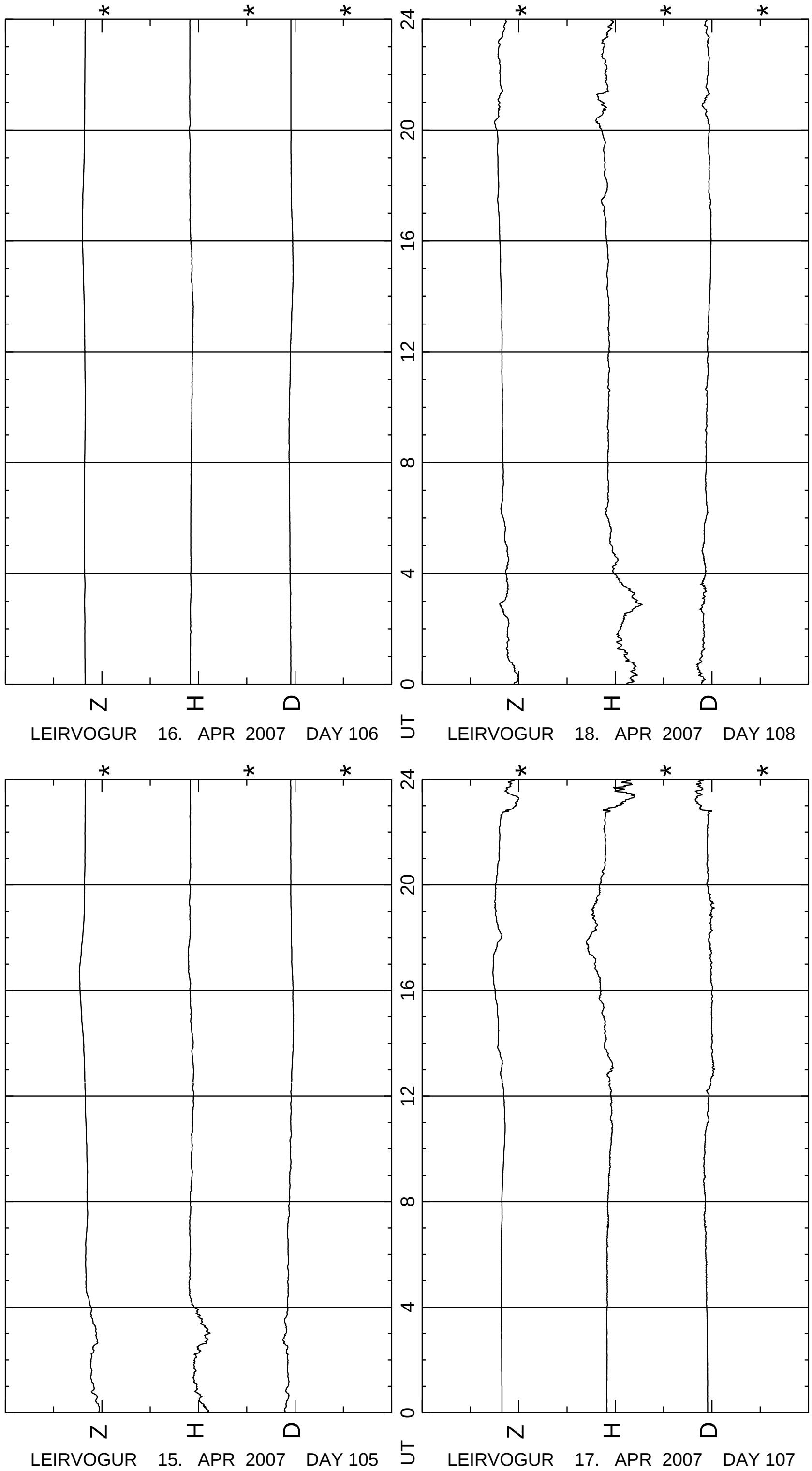
LEIRVOGUR 16. APR 2007 DAY 106
LEIRVOGUR 18. APR 2007 DAY 108
LEIRVOGUR 15. APR 2007 DAY 105
LEIRVOGUR 17. APR 2007 DAY 107
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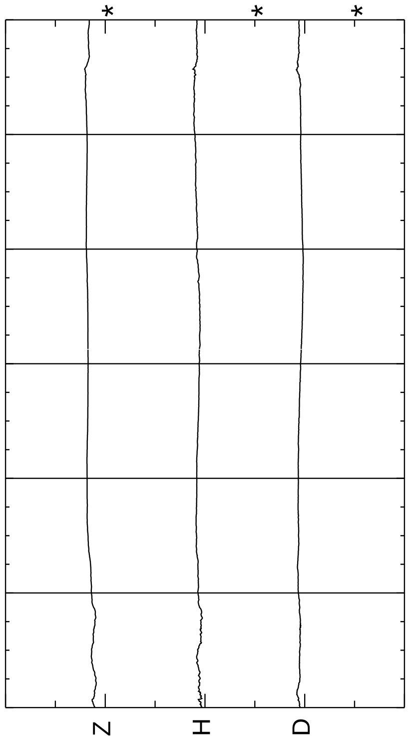
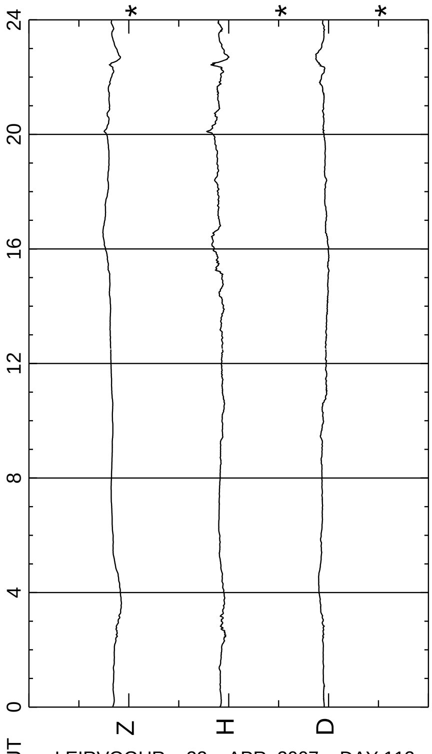
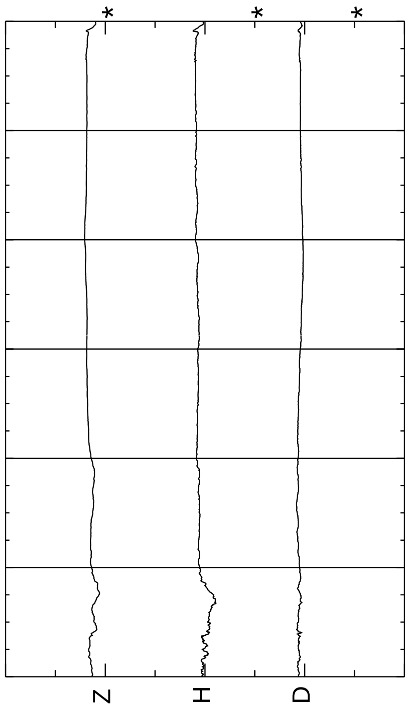


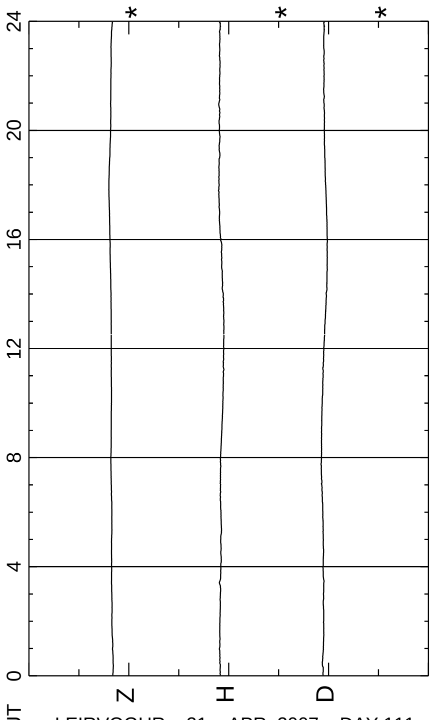
LEIRVOGUR 20. APR 2007 DAY 110



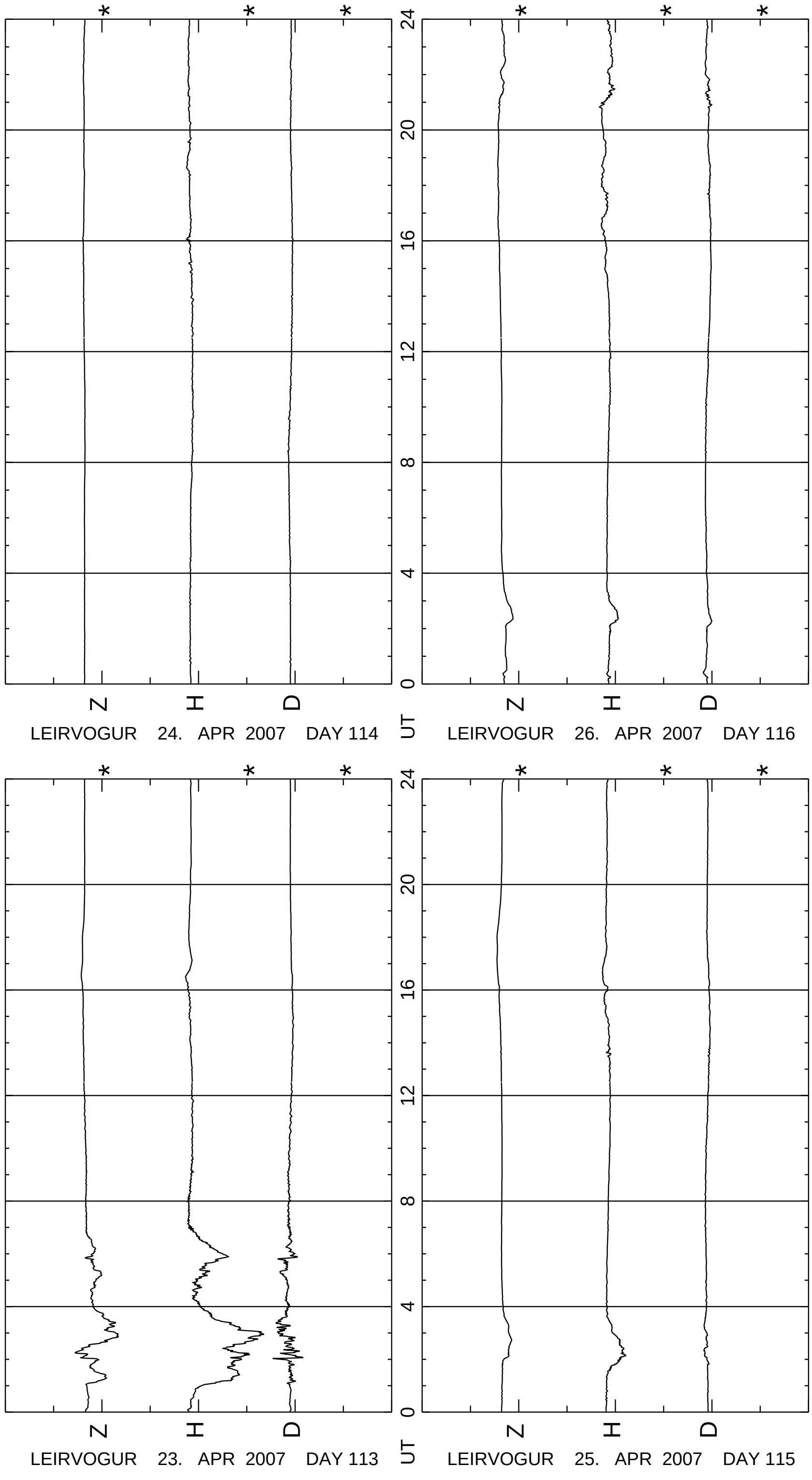
LEIRVOGUR 22. APR 2007 DAY 112



LEIRVOGUR 19. APR 2007 DAY 109



LEIRVOGUR 21. APR 2007 DAY 111



LEIRVOGUR 24. APR 2007 DAY 114
LEIRVOGUR 26. APR 2007 DAY 116
LEIRVOGUR 23. APR 2007 DAY 113
LEIRVOGUR 25. APR 2007 DAY 115
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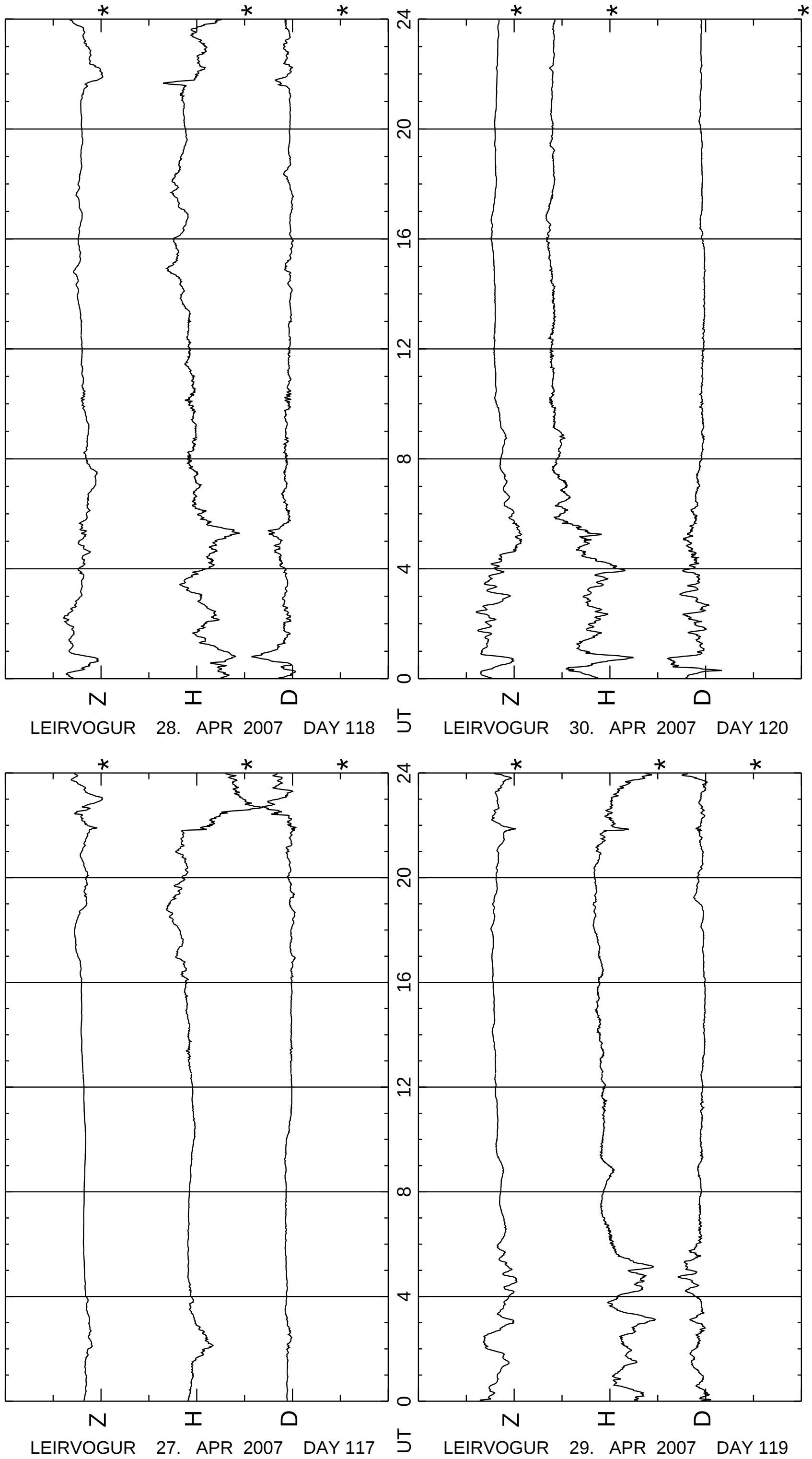
LEIRVOGUR 28. APR 2007 DAY 118
LEIRVOGUR 30. APR 2007 DAY 120
LEIRVOGUR 27. APR 2007 DAY 117
LEIRVOGUR 29. APR 2007 DAY 119
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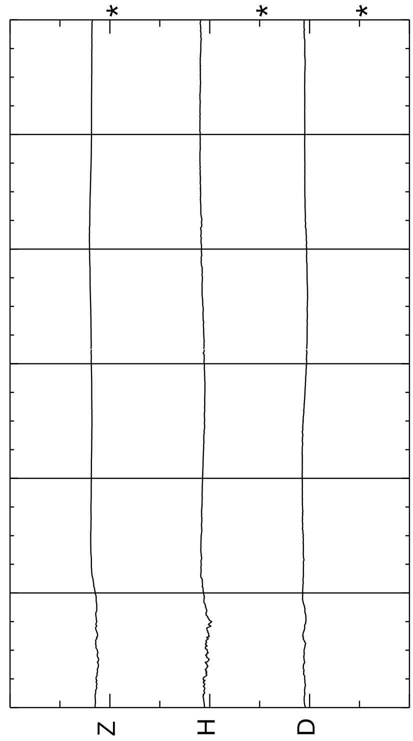
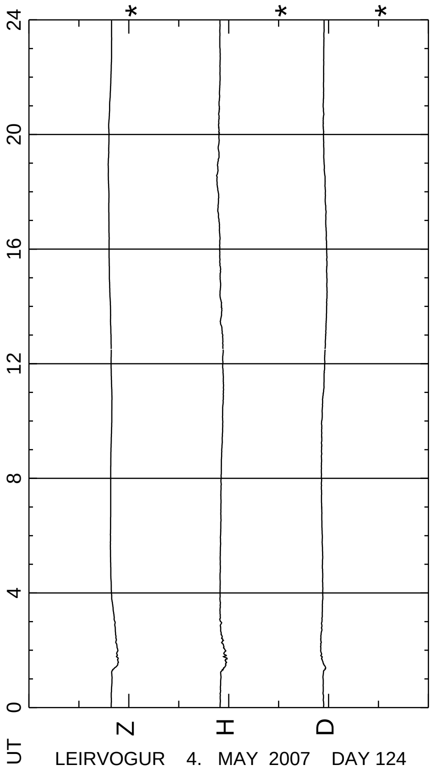
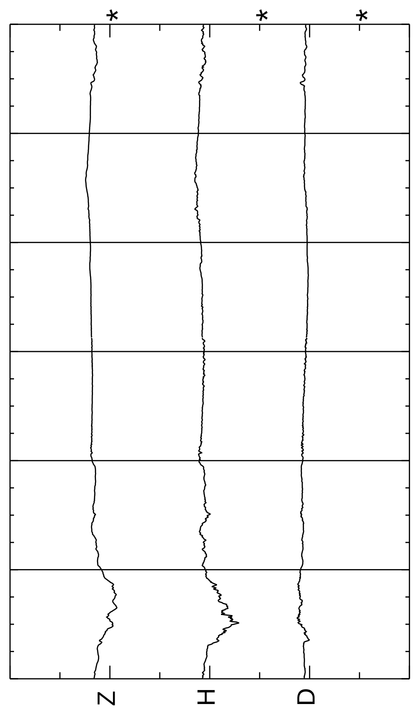


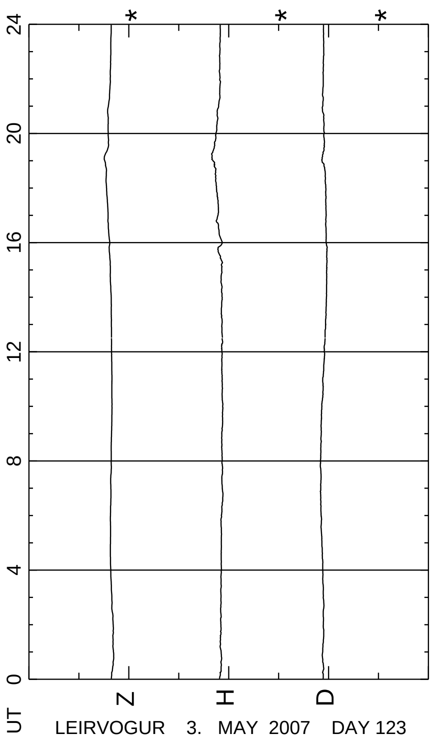
LEIRVOGUR 2. MAY 2007 DAY 122



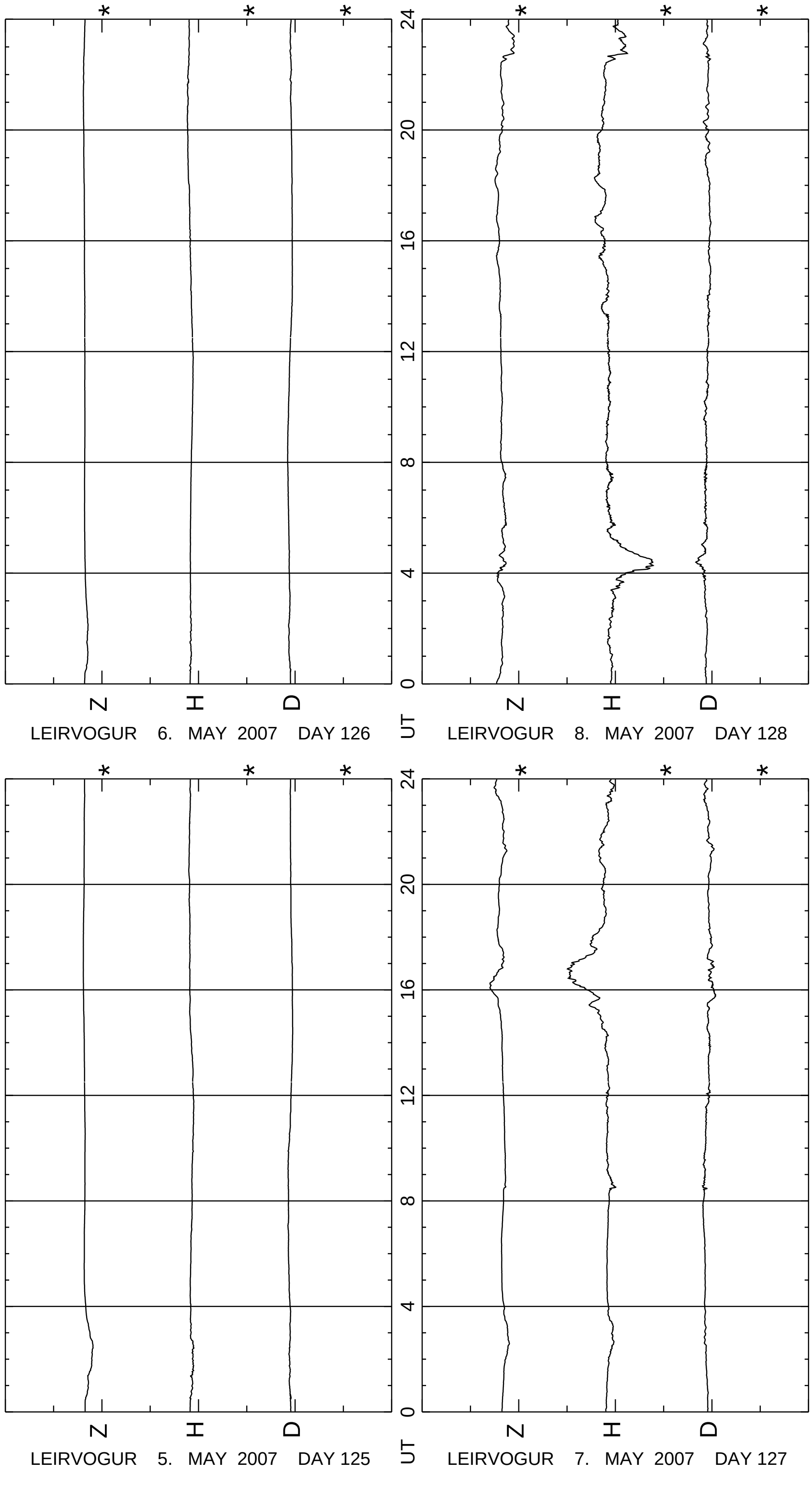
LEIRVOGUR 4. MAY 2007 DAY 124



LEIRVOGUR 1. MAY 2007 DAY 121



LEIRVOGUR 3. MAY 2007 DAY 123


LEIRVOGUR 6. MAY 2007 DAY 126
LEIRVOGUR 8. MAY 2007 DAY 128
LEIRVOGUR 5. MAY 2007 DAY 125
LEIRVOGUR 7. MAY 2007 DAY 127
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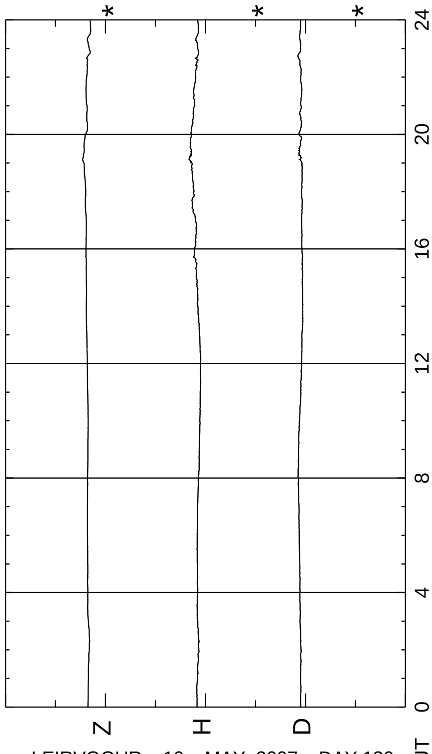
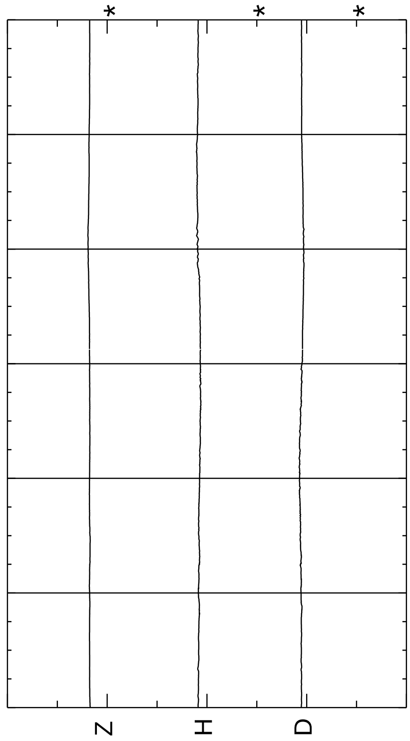
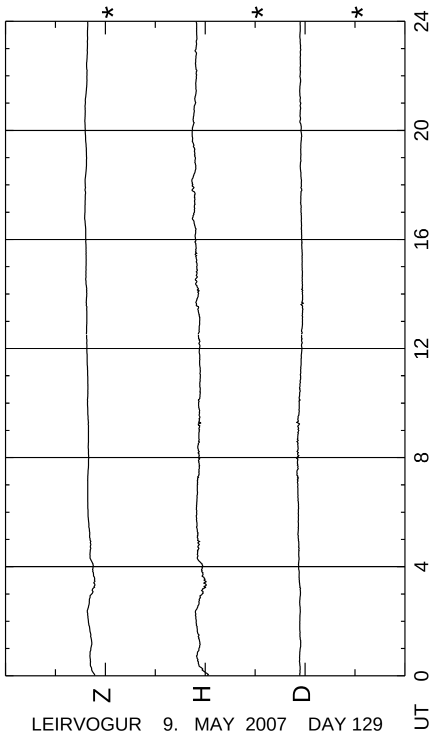


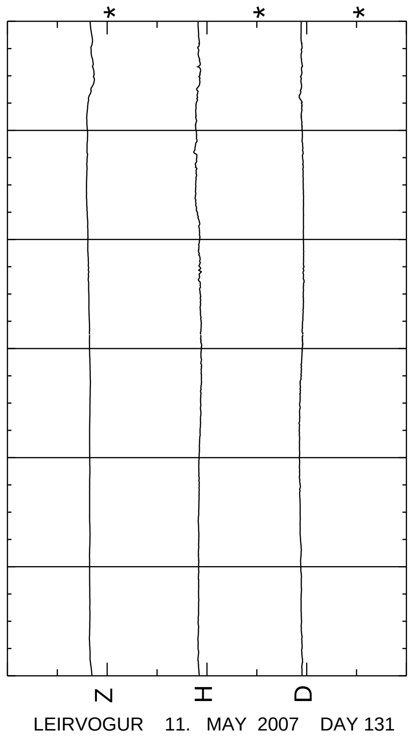
LEIRVOGUR 10. MAY 2007 DAY 130



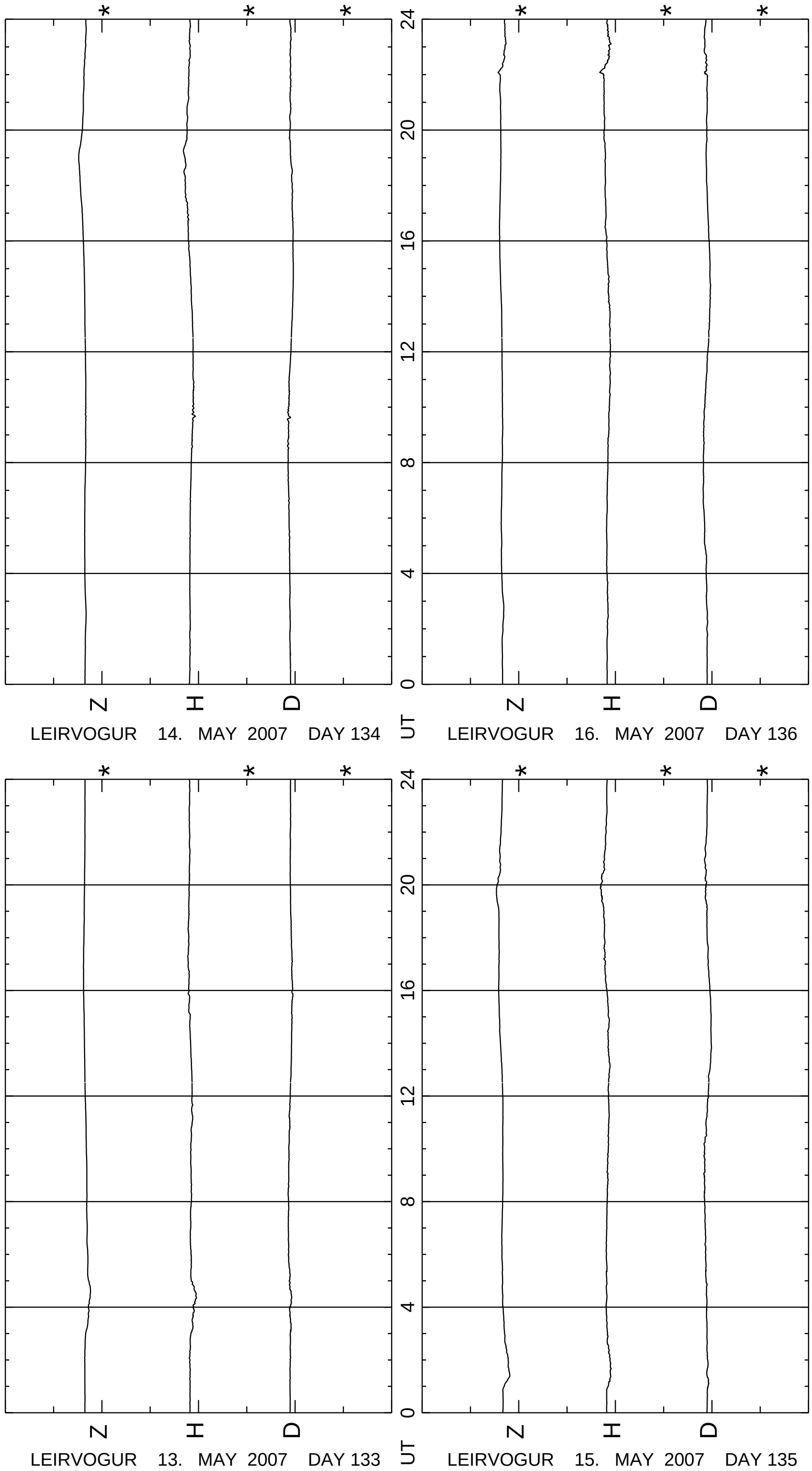
LEIRVOGUR 12. MAY 2007 DAY 132



LEIRVOGUR 9. MAY 2007 DAY 129



LEIRVOGUR 11. MAY 2007 DAY 131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LEIRVOGUR 14. MAY 2007 DAY 134
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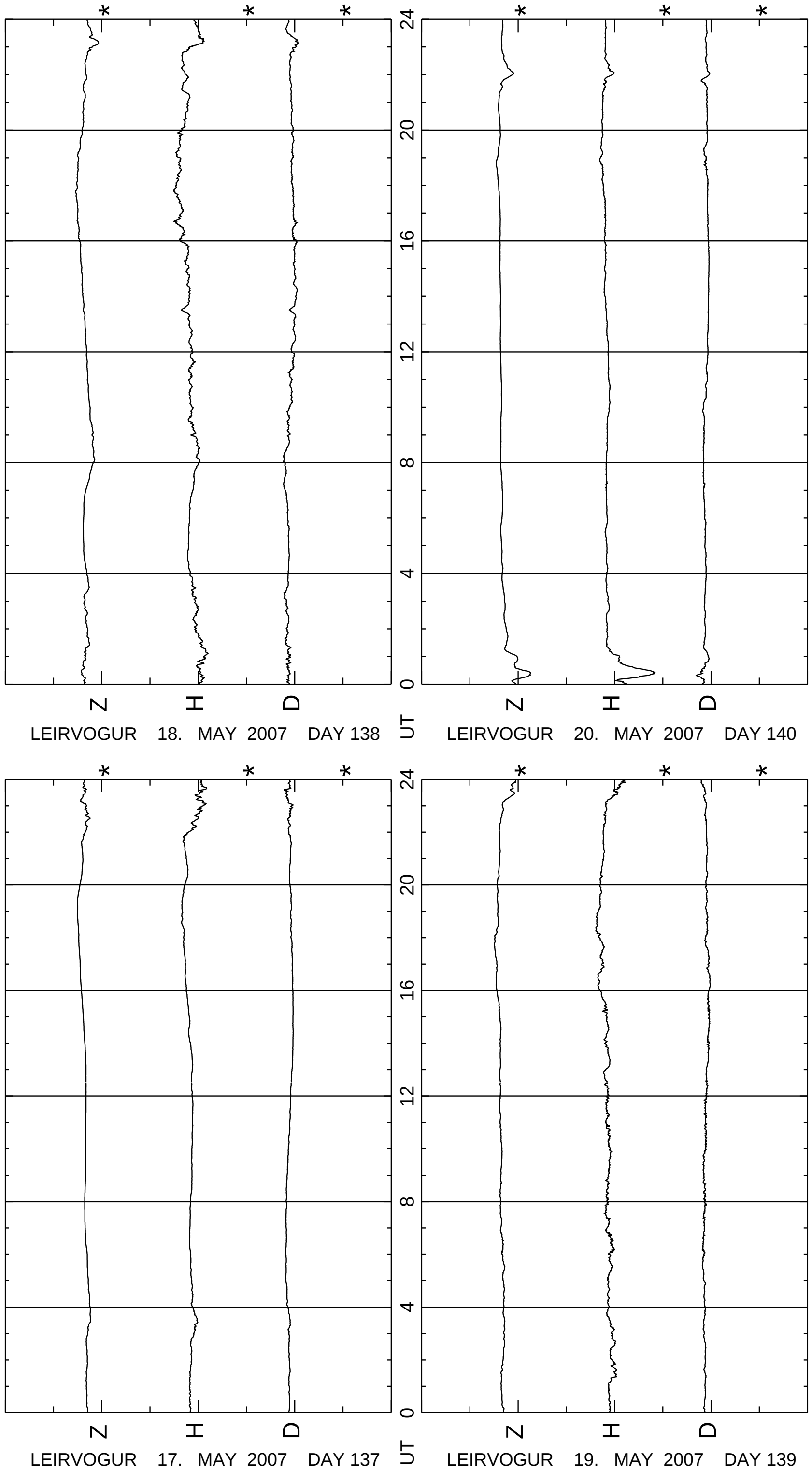
LEIRVOGUR 15. MAY 2007 DAY 135



LEIRVOGUR 18. MAY 2007 DAY 138
LEIRVOGUR 20. MAY 2007 DAY 140
LEIRVOGUR 17. MAY 2007 DAY 137
LEIRVOGUR 19. MAY 2007 DAY 139
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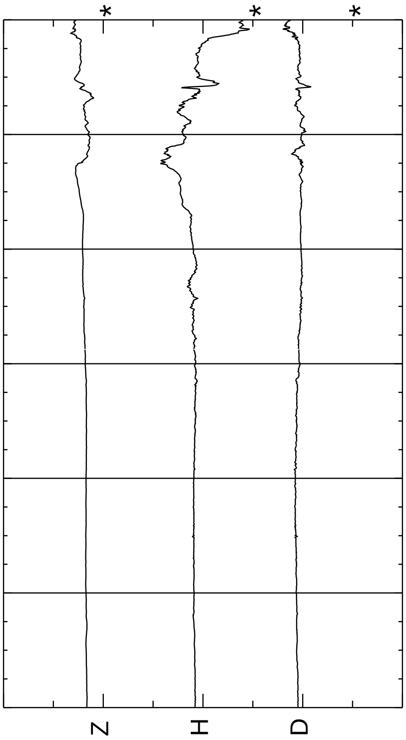
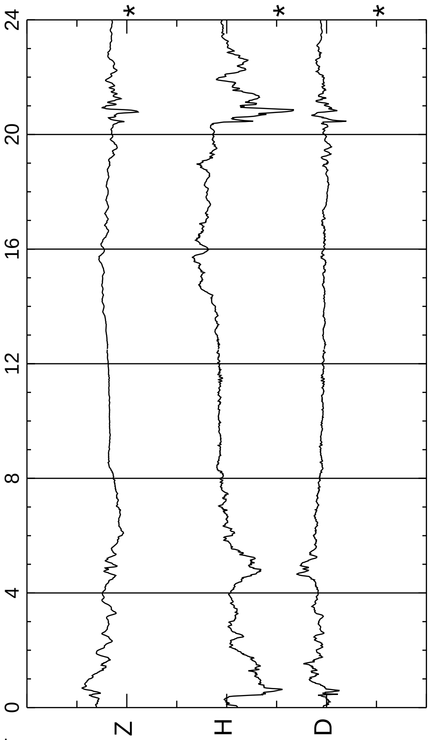
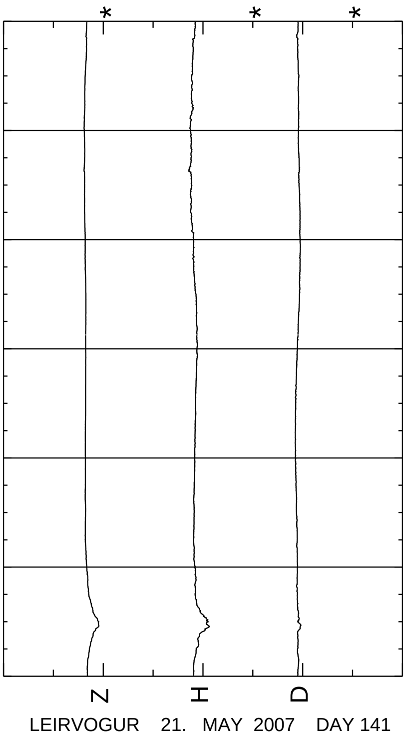


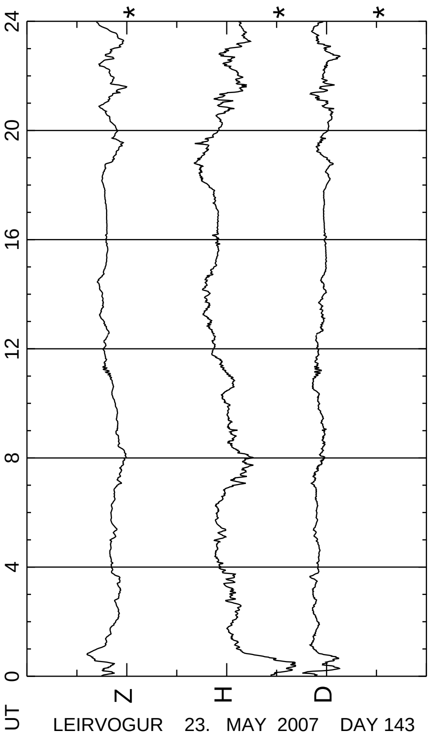
LEIRVOGUR 22. MAY 2007 DAY 142



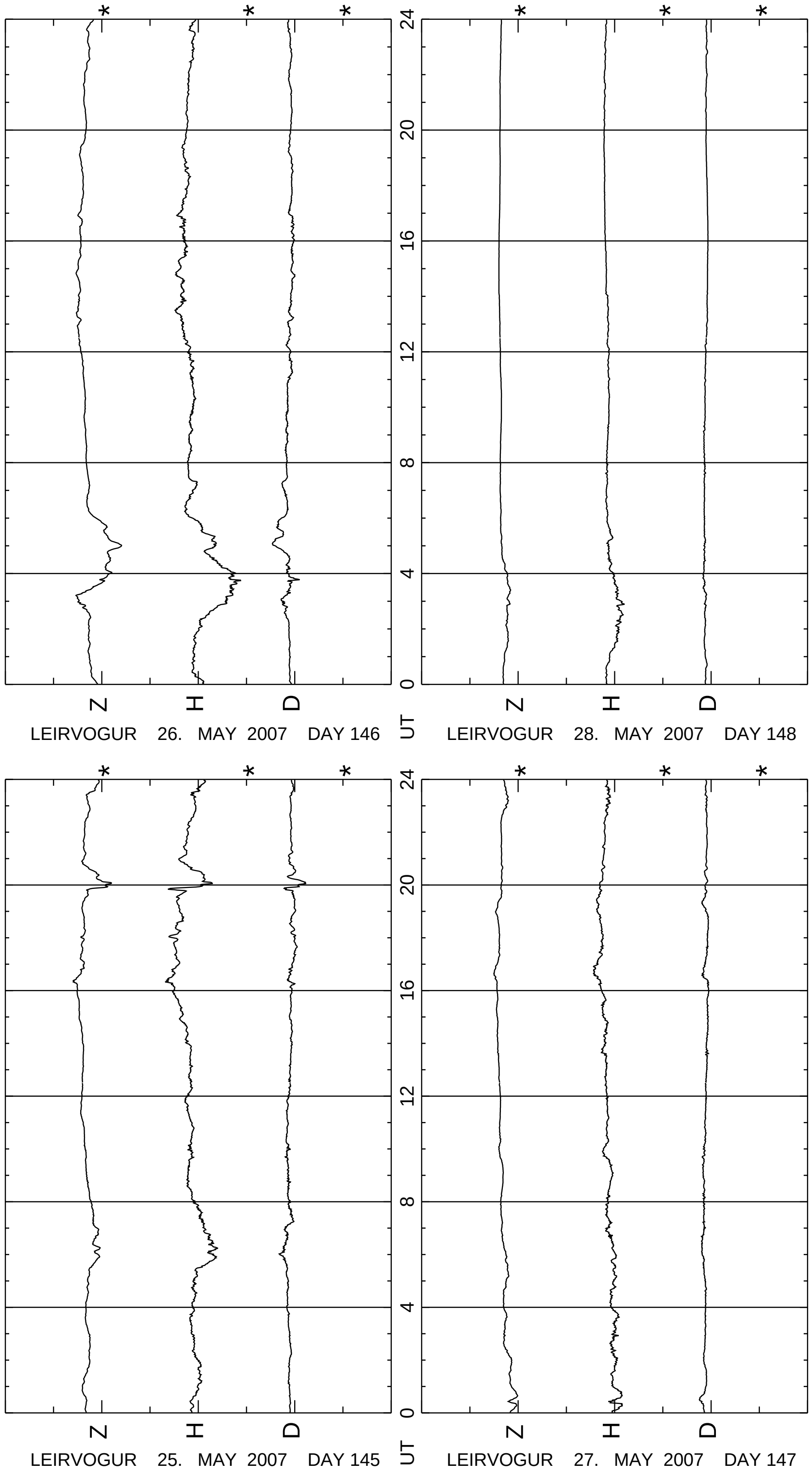
LEIRVOGUR 24. MAY 2007 DAY 144



LEIRVOGUR 21. MAY 2007 DAY 141



LEIRVOGUR 23. MAY 2007 DAY 143



LEIRVOGUR 26. MAY 2007 DAY 146
LEIRVOGUR 28. MAY 2007 DAY 148
LEIRVOGUR 25. MAY 2007 DAY 145
LEIRVOGUR 27. MAY 2007 DAY 147
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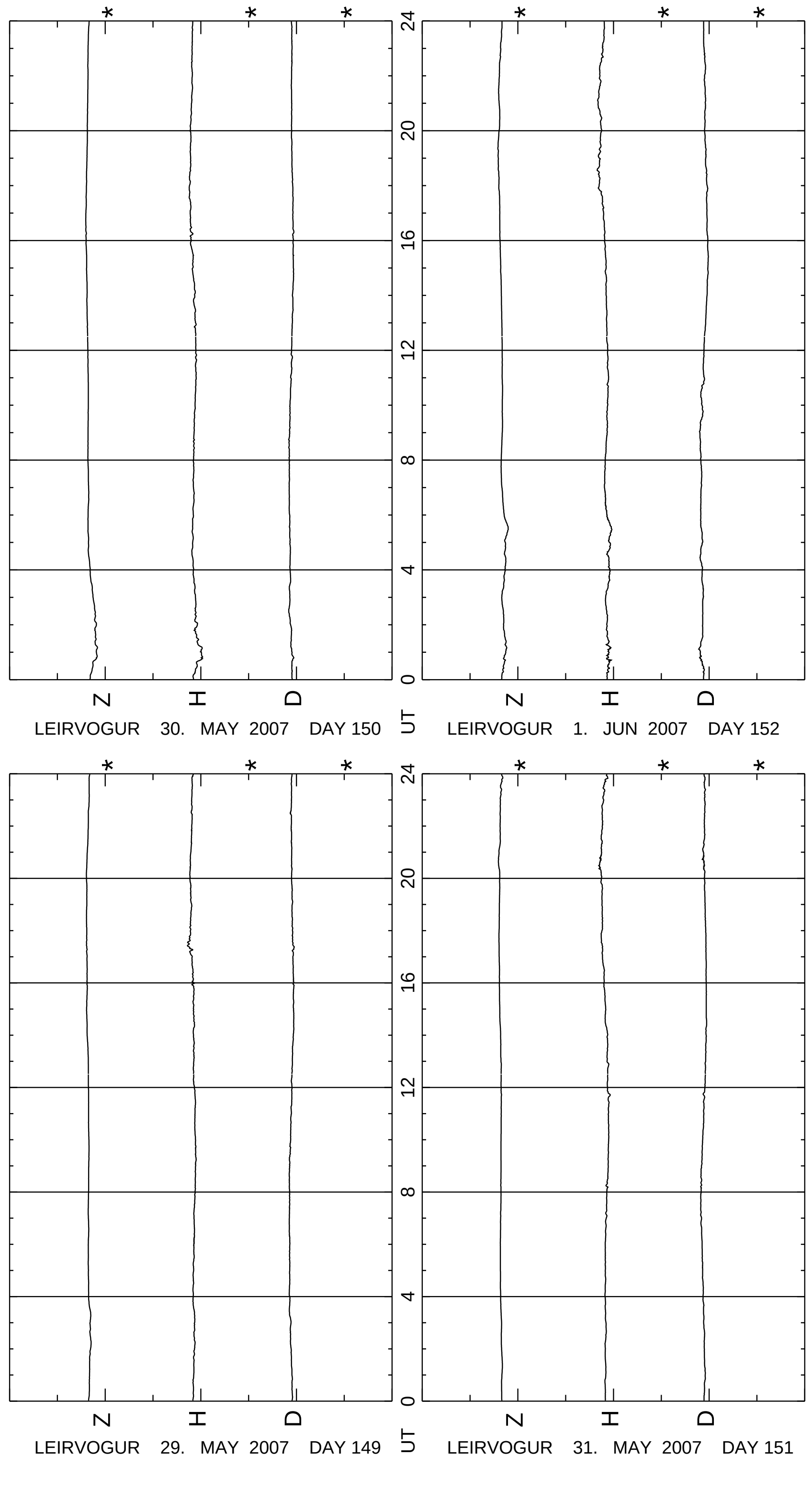
Z H D
LEIRVOGUR 30. MAY 2007 DAY 150
Z H D
LEIRVOGUR 1. JUN 2007 DAY 152
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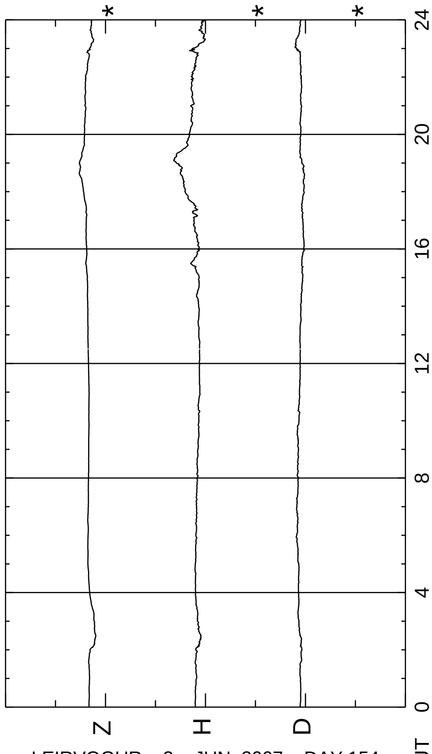
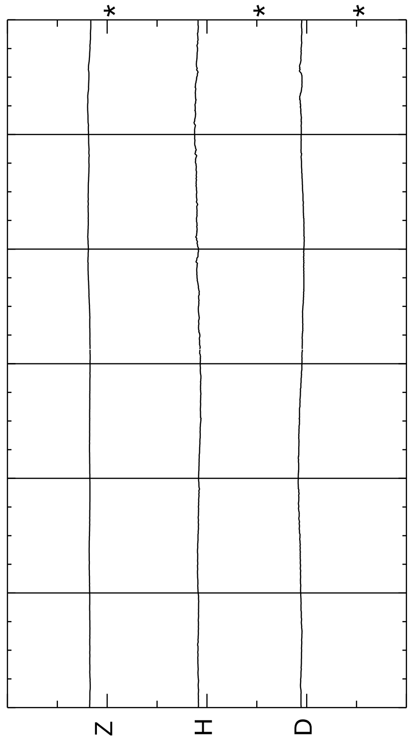
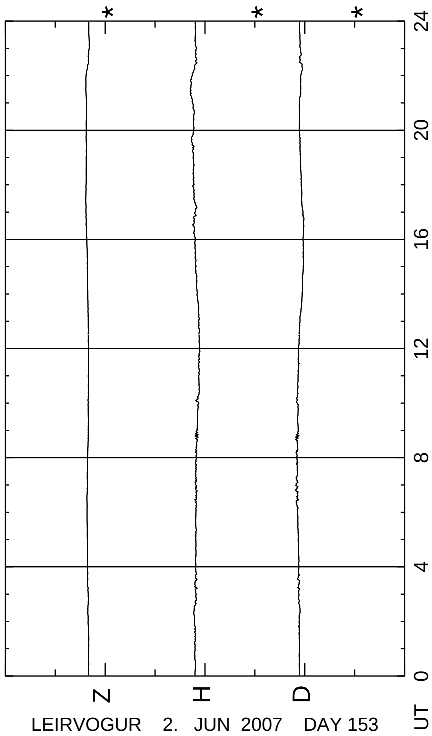
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 29. MAY 2007 DAY 149
Z H D
LEIRVOGUR 31. MAY 2007 DAY 151



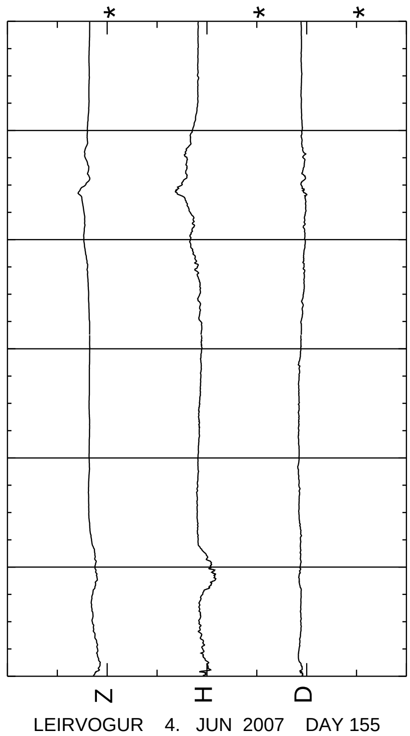
LEIRVOGUR 3. JUN 2007 DAY 154



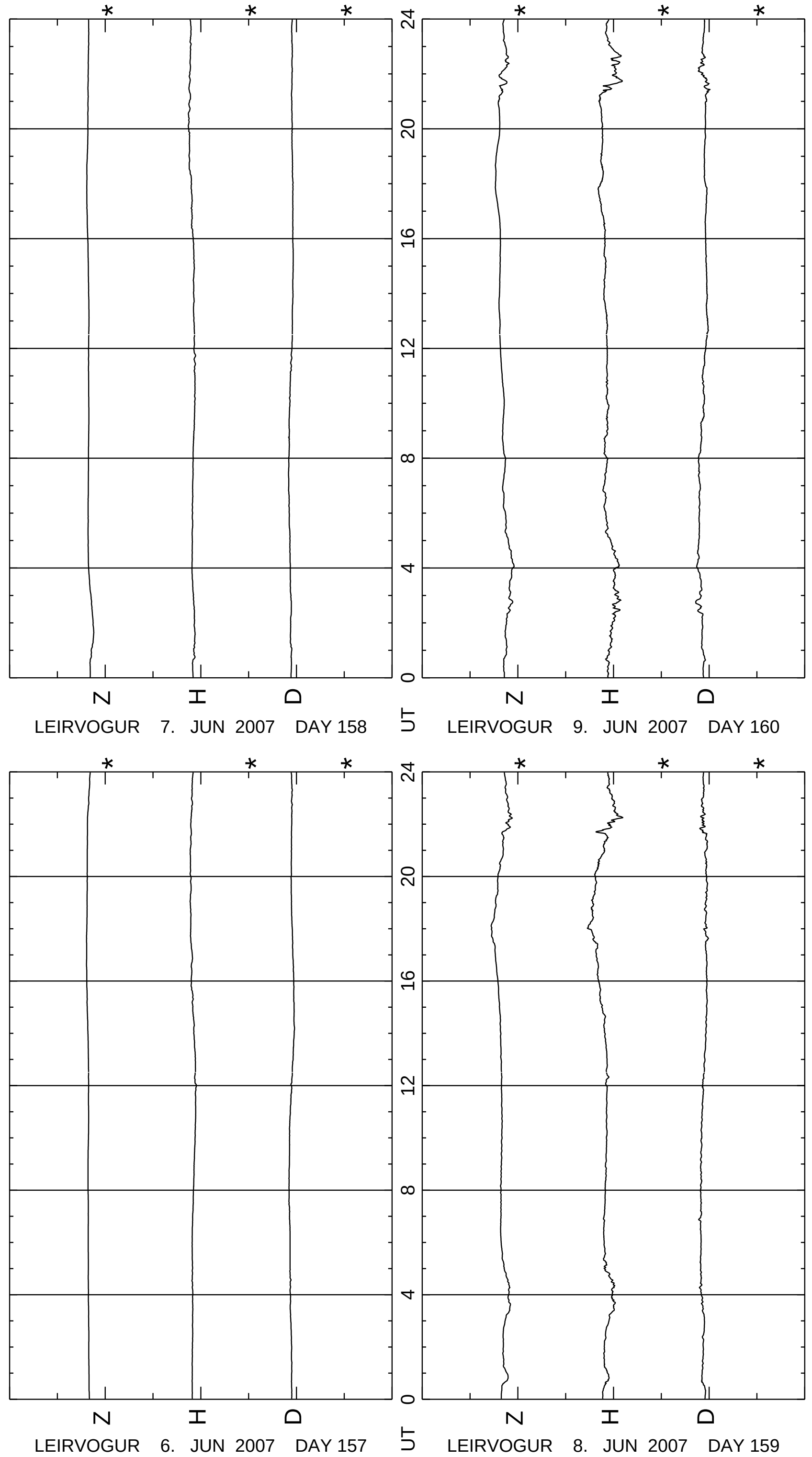
LEIRVOGUR 5. JUN 2007 DAY 156



LEIRVOGUR 2. JUN 2007 DAY 153



LEIRVOGUR 4. JUN 2007 DAY 155


LEIRVOGUR 7. JUN 2007 DAY 158
LEIRVOGUR 9. JUN 2007 DAY 160
LEIRVOGUR 6. JUN 2007 DAY 157
LEIRVOGUR 8. JUN 2007 DAY 159
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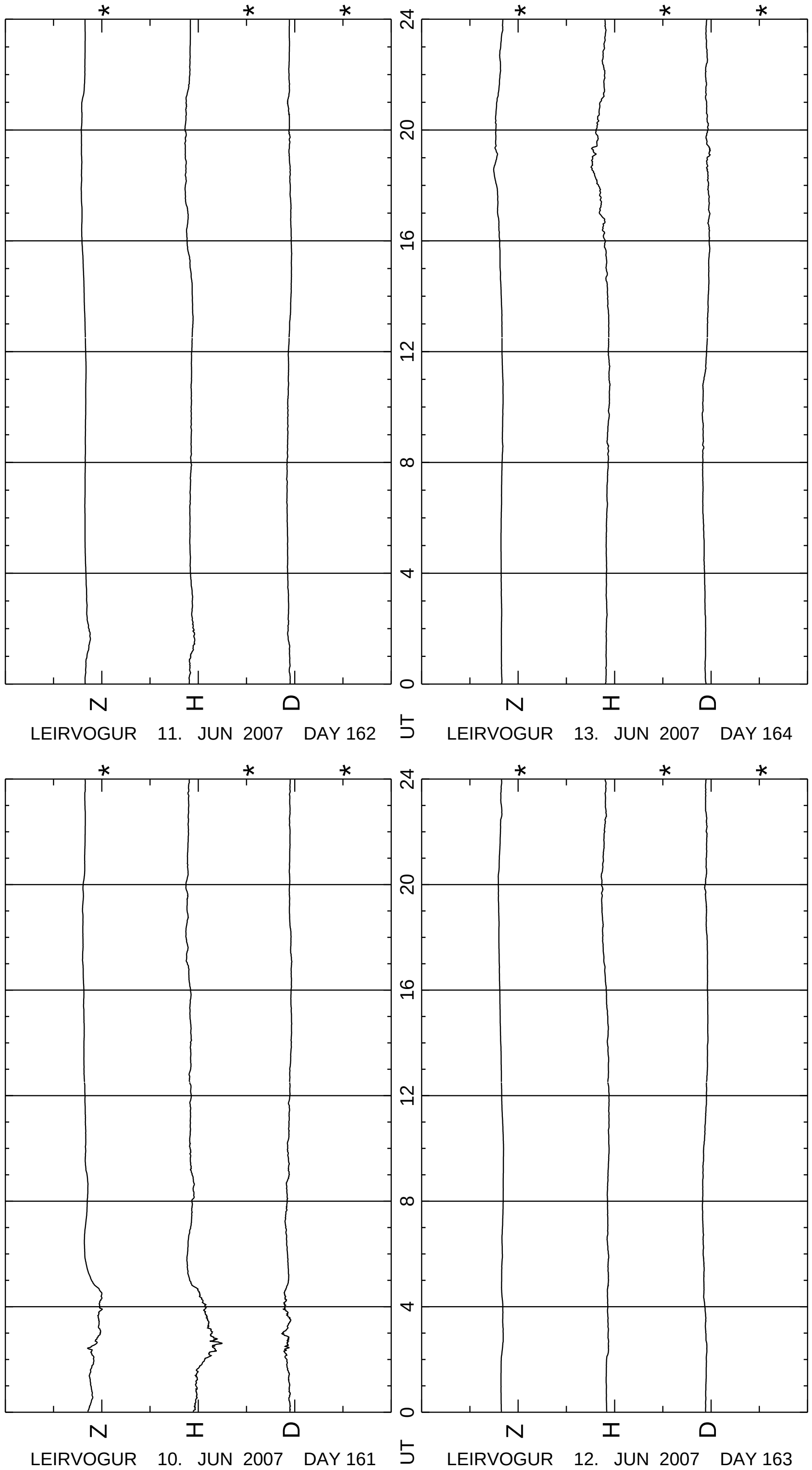
LEIRVOGUR 11. JUN 2007 DAY 162
LEIRVOGUR 13. JUN 2007 DAY 164
LEIRVOGUR 10. JUN 2007 DAY 161
LEIRVOGUR 12. JUN 2007 DAY 163
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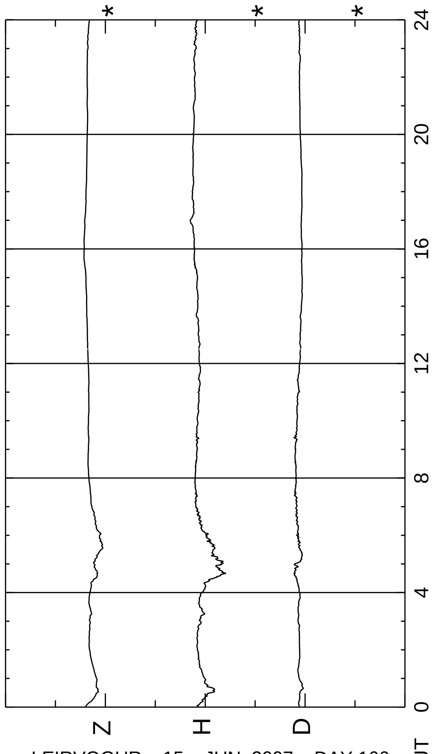
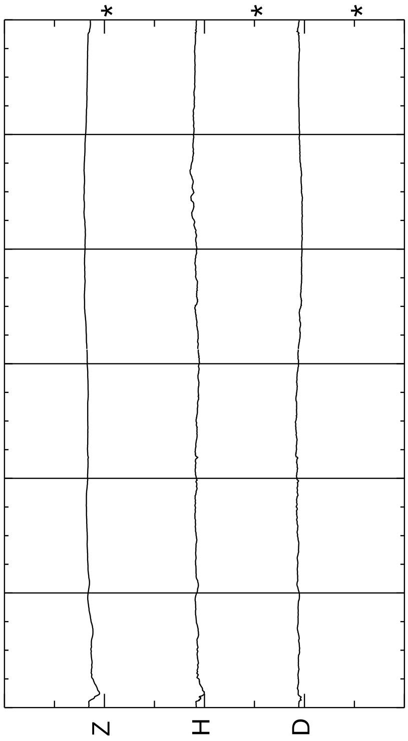
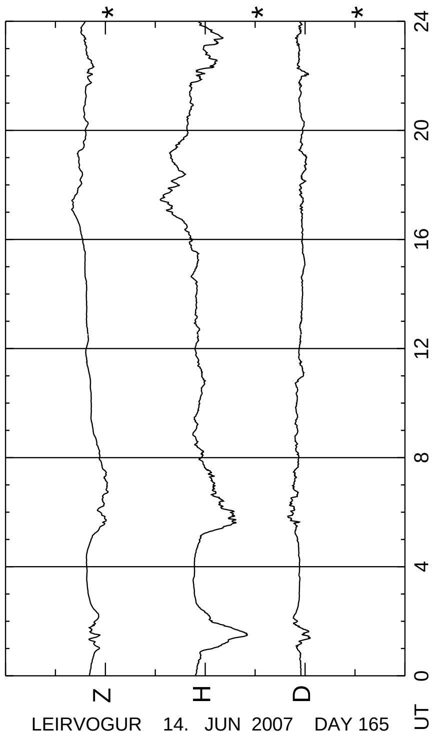


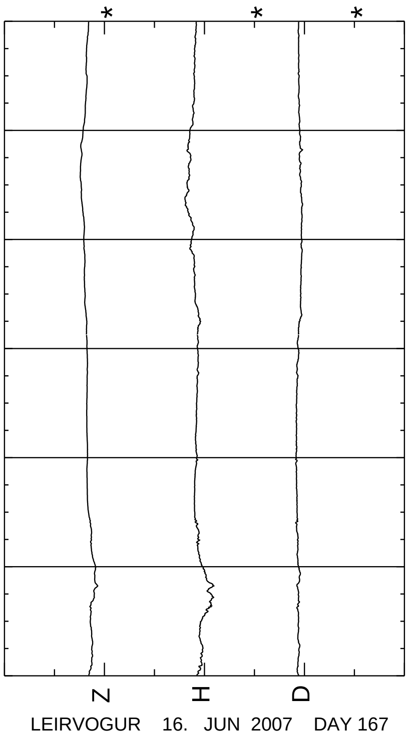
LEIRVOGUR 15. JUN 2007 DAY 166



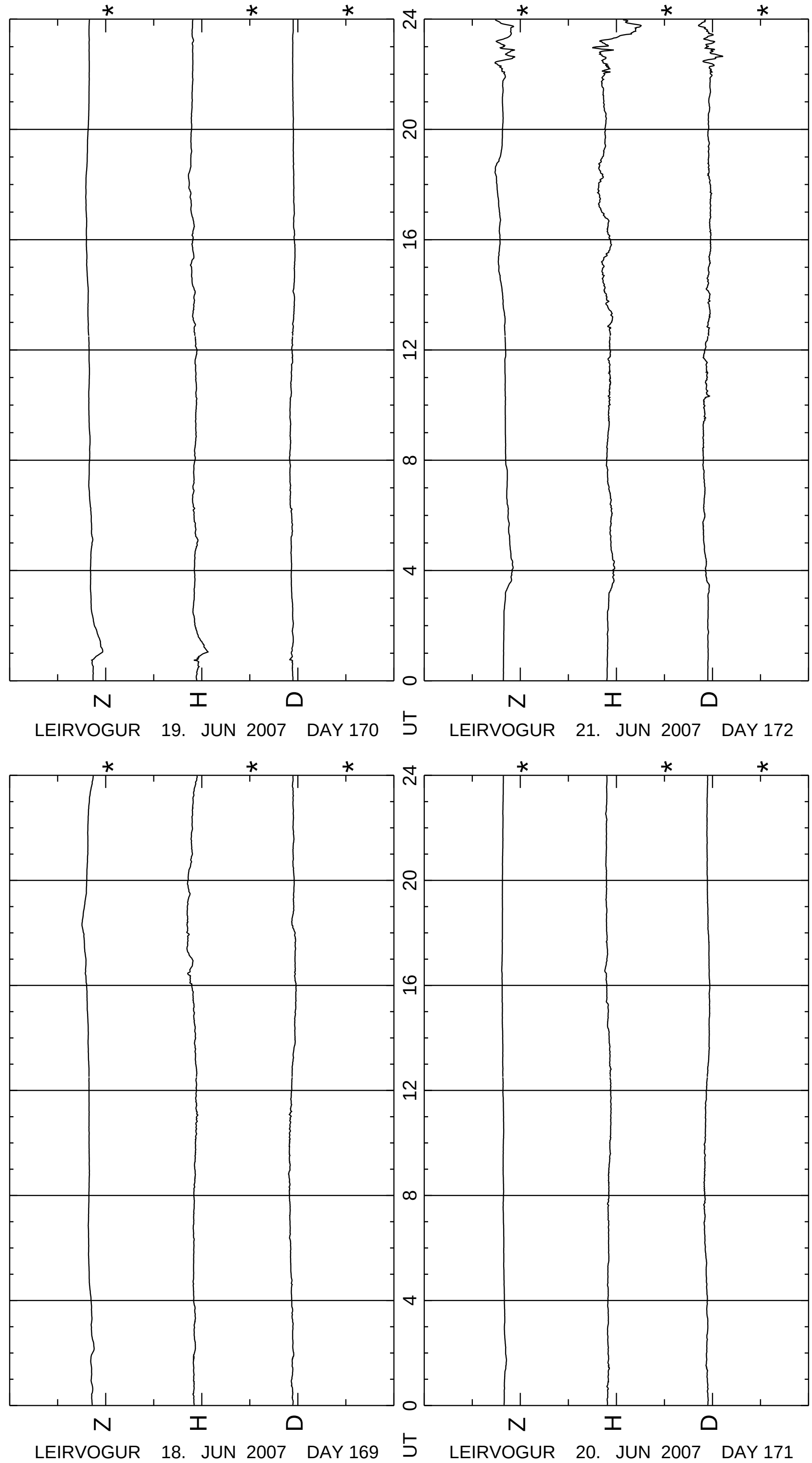
LEIRVOGUR 17. JUN 2007 DAY 168



LEIRVOGUR 14. JUN 2007 DAY 165



LEIRVOGUR 16. JUN 2007 DAY 167


LEIRVOGUR 19. JUN 2007 DAY 170
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LEIRVOGUR 20. JUN 2007 DAY 171
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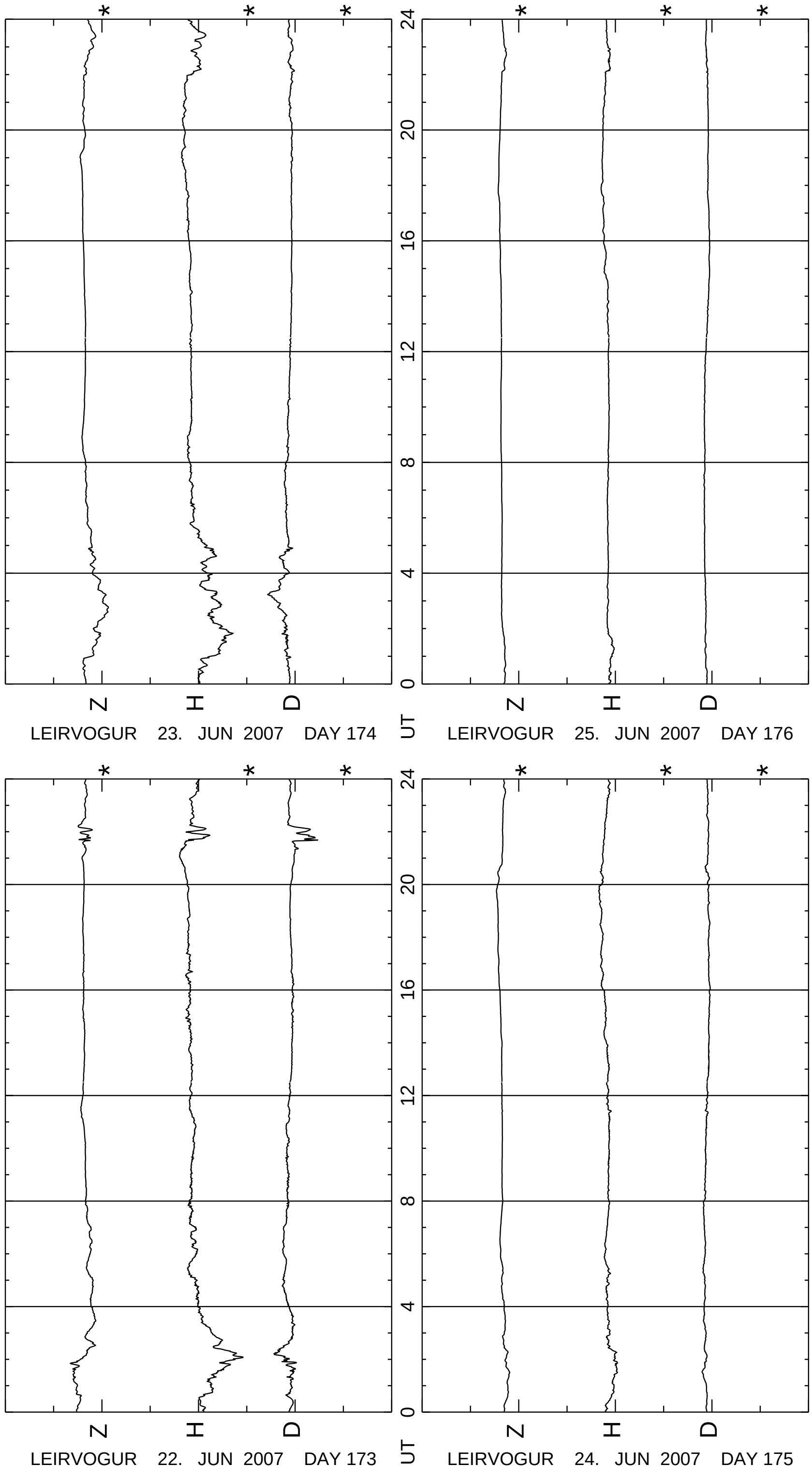
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LEIRVOGUR 23. JUN 2007 DAY 174
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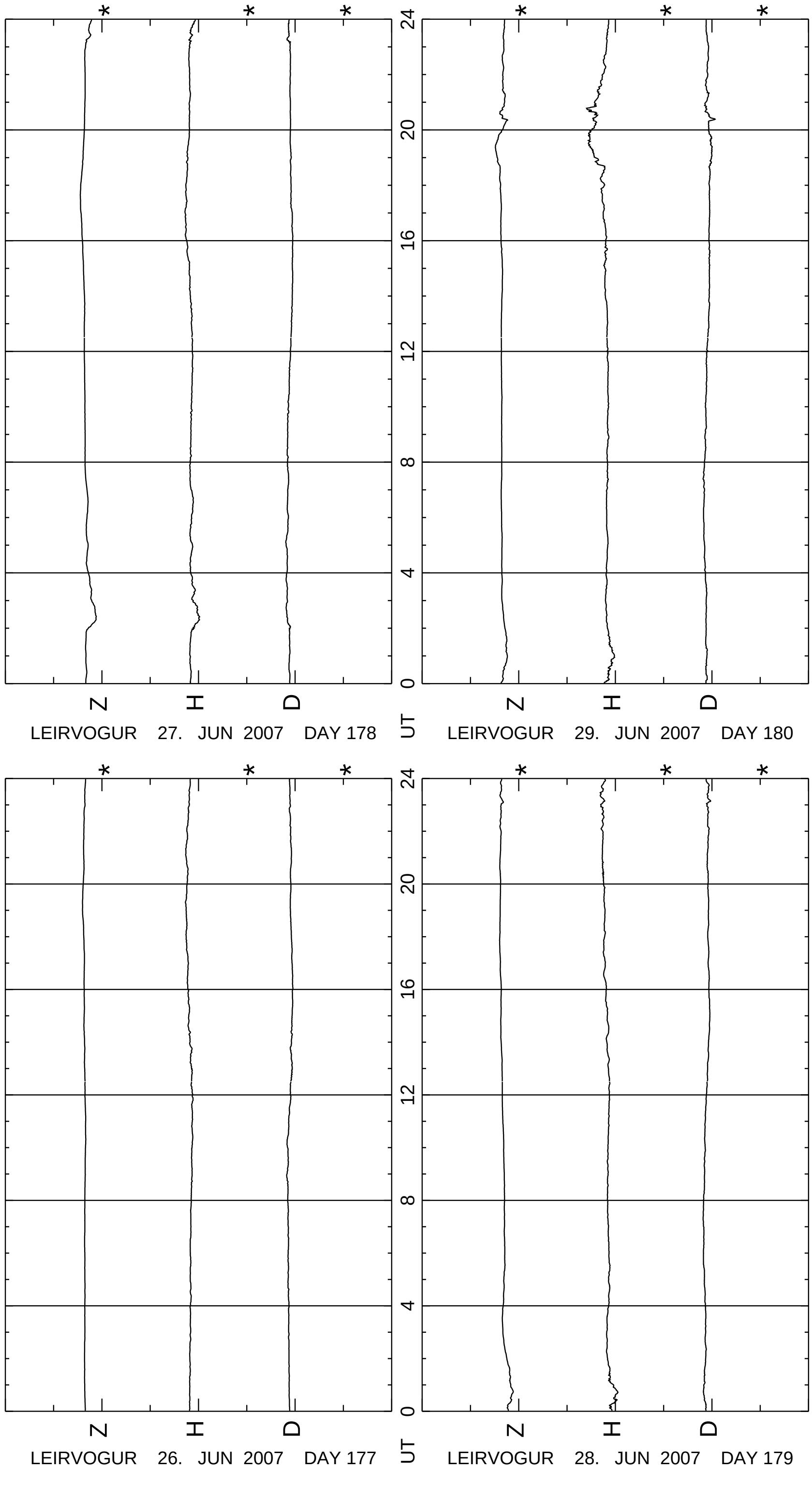
LEIRVOGUR 25. JUN 2007 DAY 176
LEIRVOGUR 22. JUN 2007 DAY 173
LEIRVOGUR 24. JUN 2007 DAY 175


LEIRVOGUR 27. JUN 2007 DAY 178
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LEIRVOGUR 26. JUN 2007 DAY 177
LEIRVOGUR 28. JUN 2007 DAY 179
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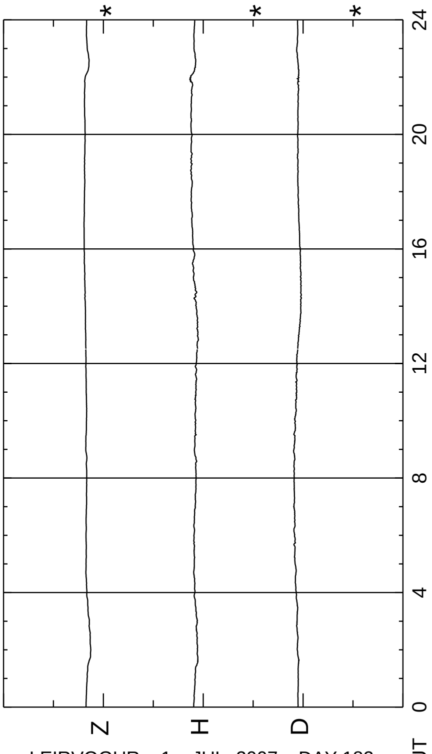
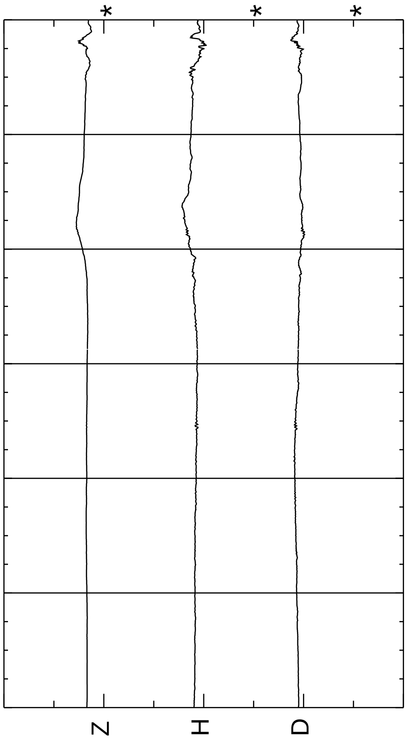
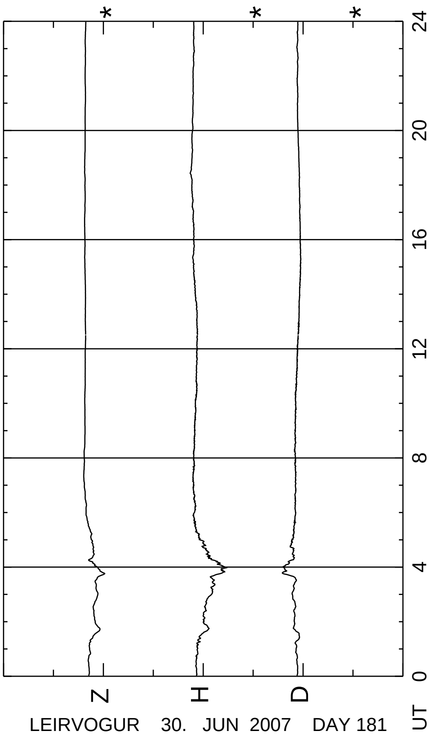


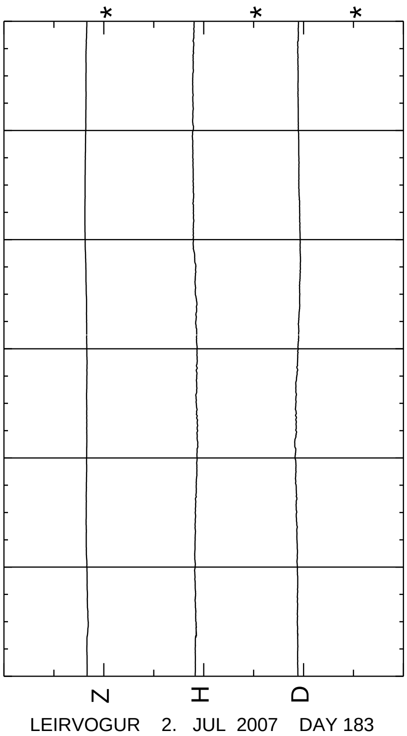
LEIRVOGUR 1. JUL 2007 DAY 182



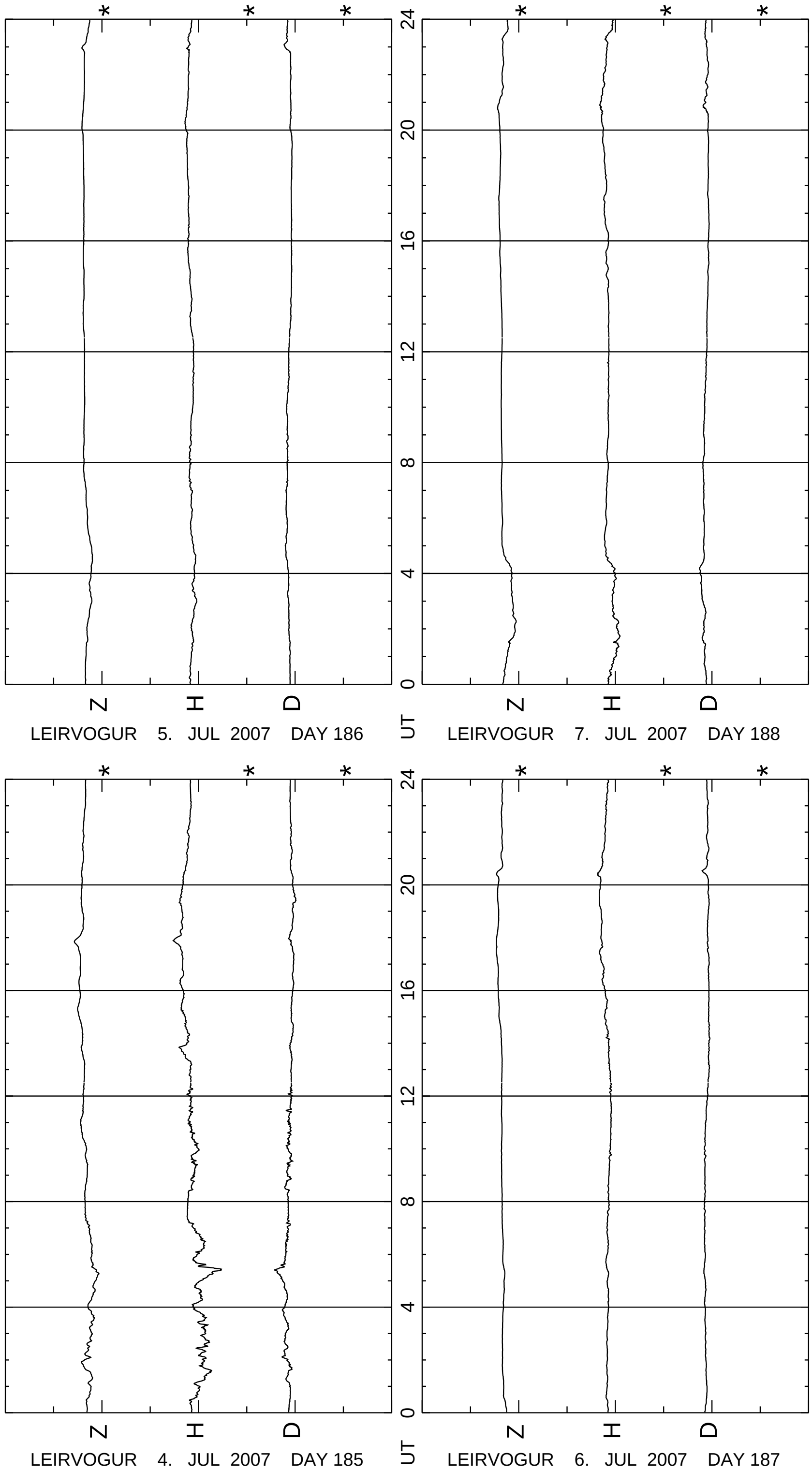
LEIRVOGUR 3. JUL 2007 DAY 184



UT LEIRVOGUR 30. JUN 2007 DAY 181



LEIRVOGUR 2. JUL 2007 DAY 183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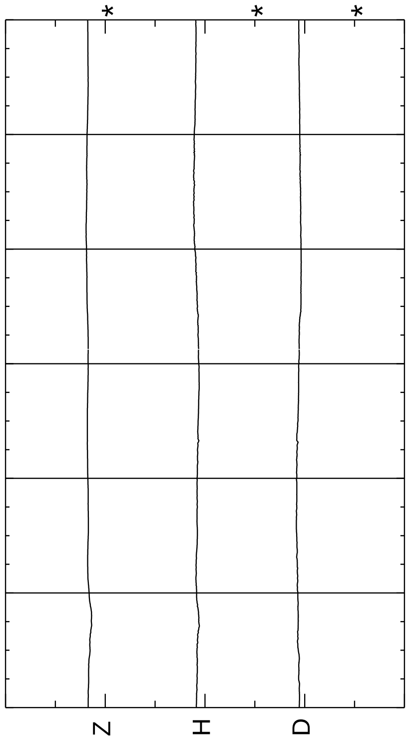
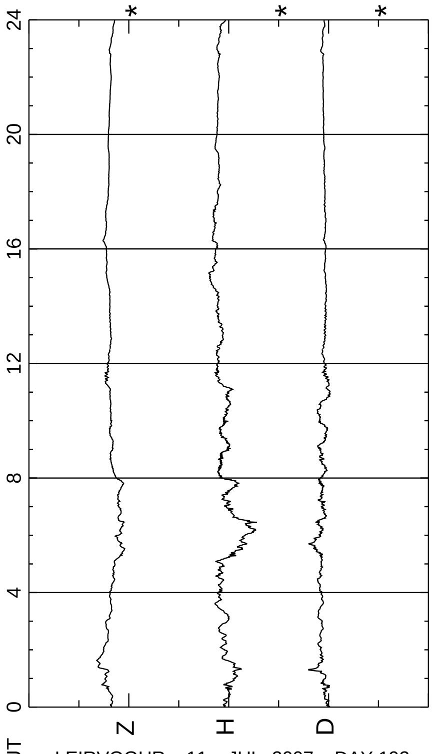
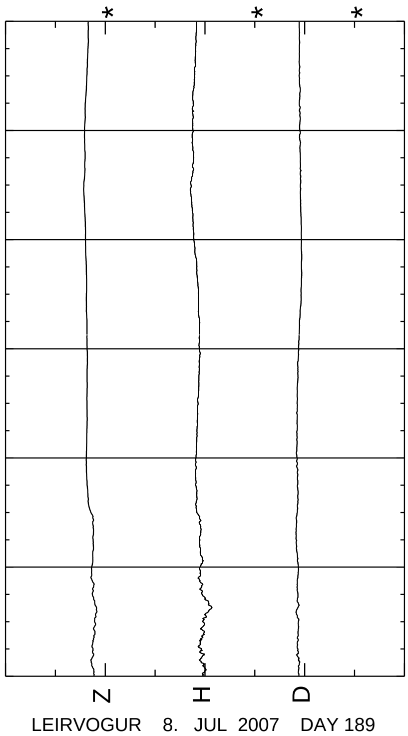
LEIRVOGUR 5. JUL 2007 DAY 186
LEIRVOGUR 7. JUL 2007 DAY 188
LEIRVOGUR 4. JUL 2007 DAY 185
LEIRVOGUR 6. JUL 2007 DAY 187



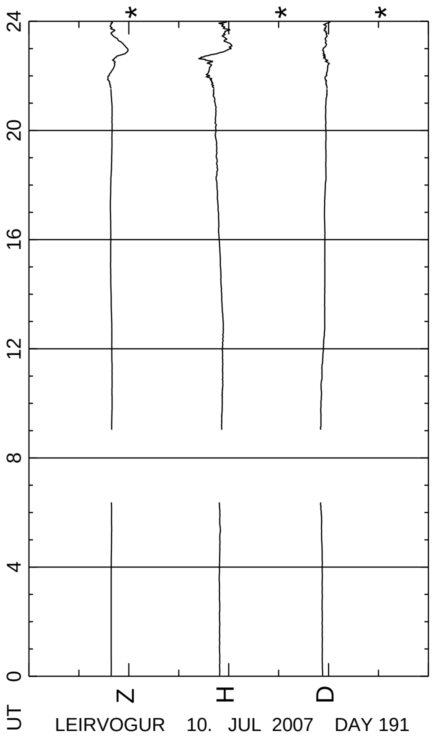
LEIRVOGUR 9. JUL 2007 DAY 190



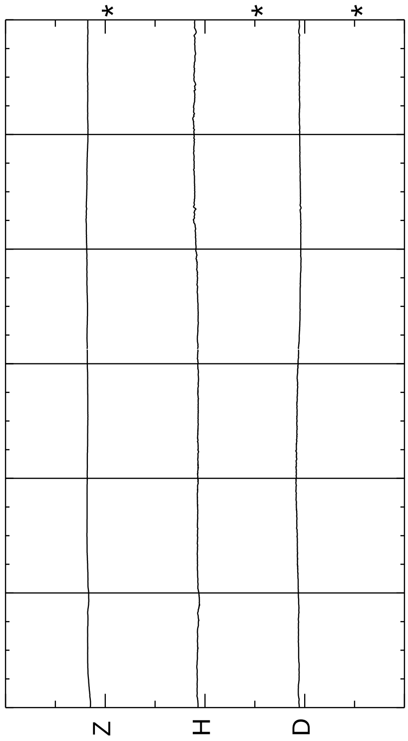
LEIRVOGUR 11. JUL 2007 DAY 192



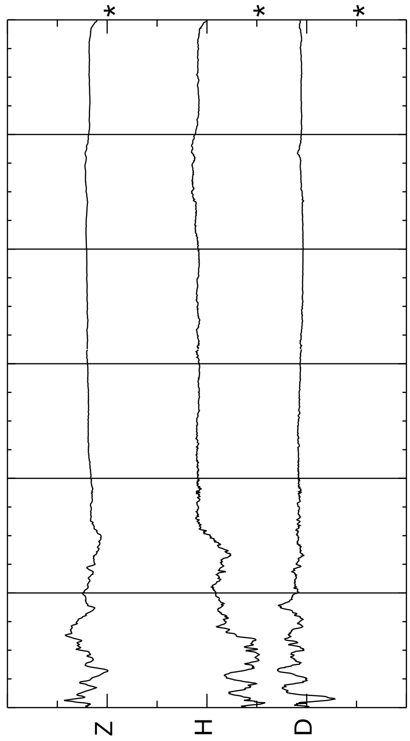
LEIRVOGUR 8. JUL 2007 DAY 189



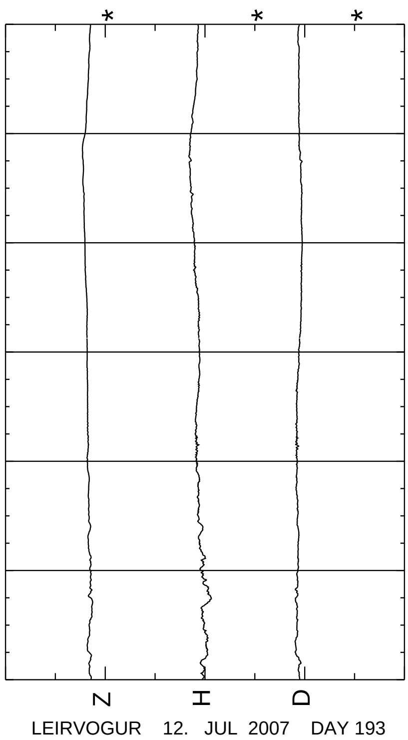
LEIRVOGUR 10. JUL 2007 DAY 191



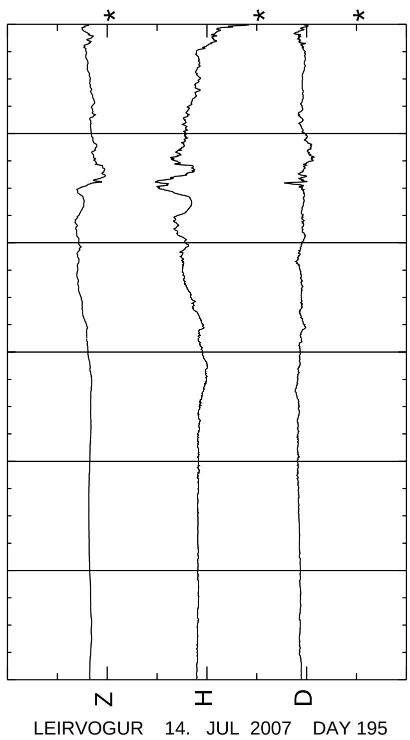
LEIRVOGUR 13. JUL 2007 DAY 194



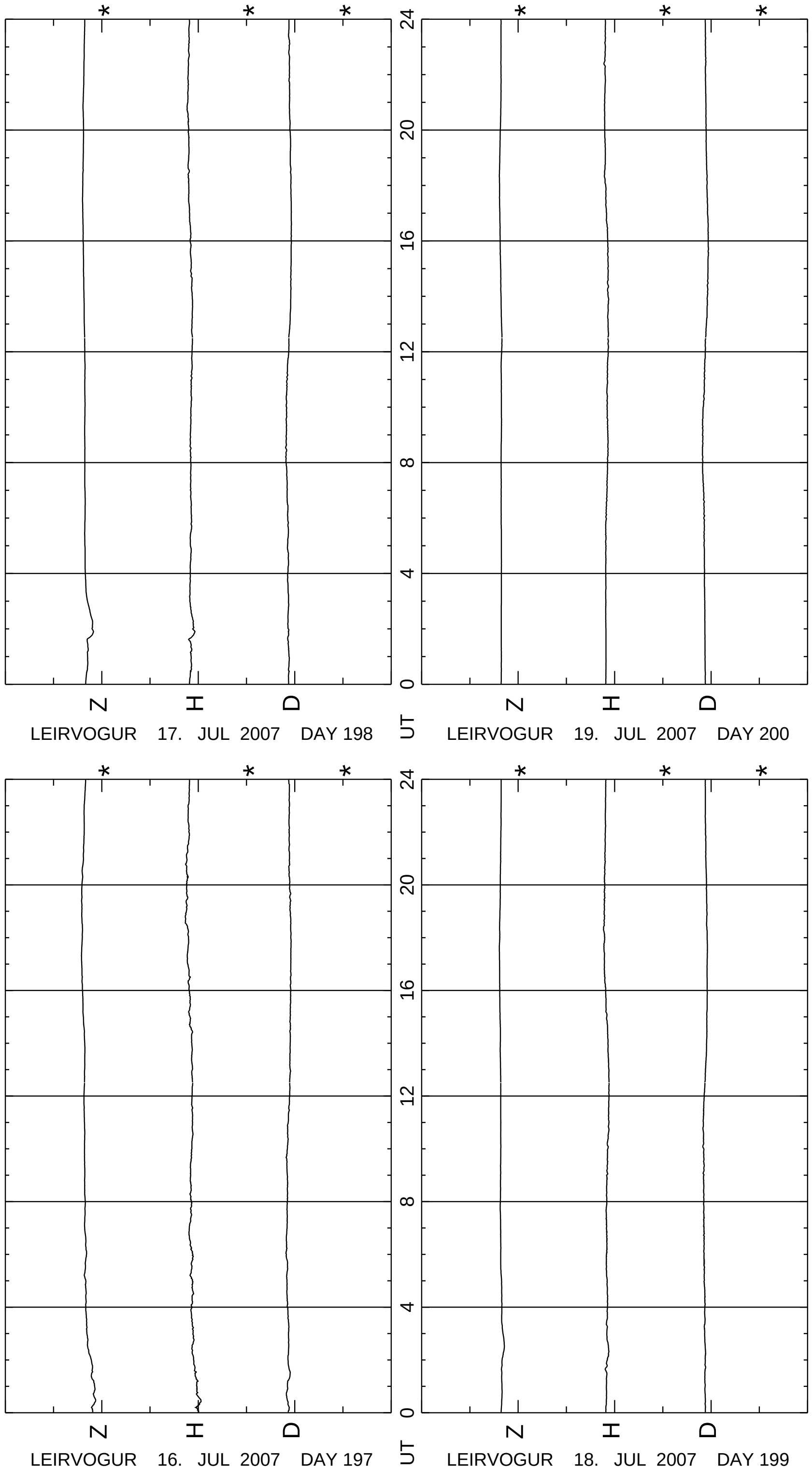
LEIRVOGUR 15. JUL 2007 DAY 196



LEIRVOGUR 12. JUL 2007 DAY 193



LEIRVOGUR 14. JUL 2007 DAY 195


LEIRVOGUR 17. JUL 2007 DAY 198
LEIRVOGUR 19. JUL 2007 DAY 200
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LEIRVOGUR 18. JUL 2007 DAY 199
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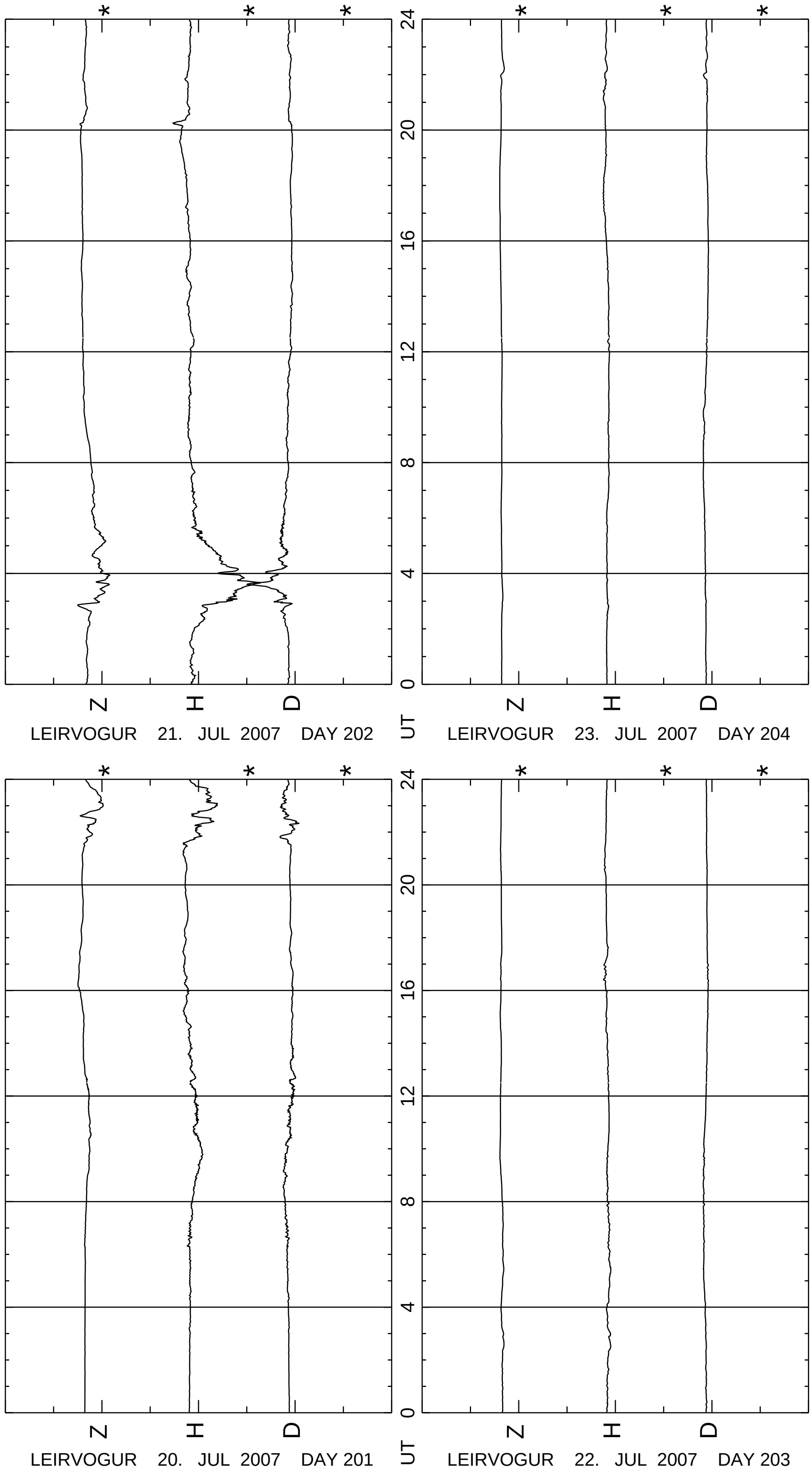
LEIRVOGUR 21. JUL 2007 DAY 202
LEIRVOGUR 23. JUL 2007 DAY 204
LEIRVOGUR 20. JUL 2007 DAY 201
LEIRVOGUR 22. JUL 2007 DAY 203
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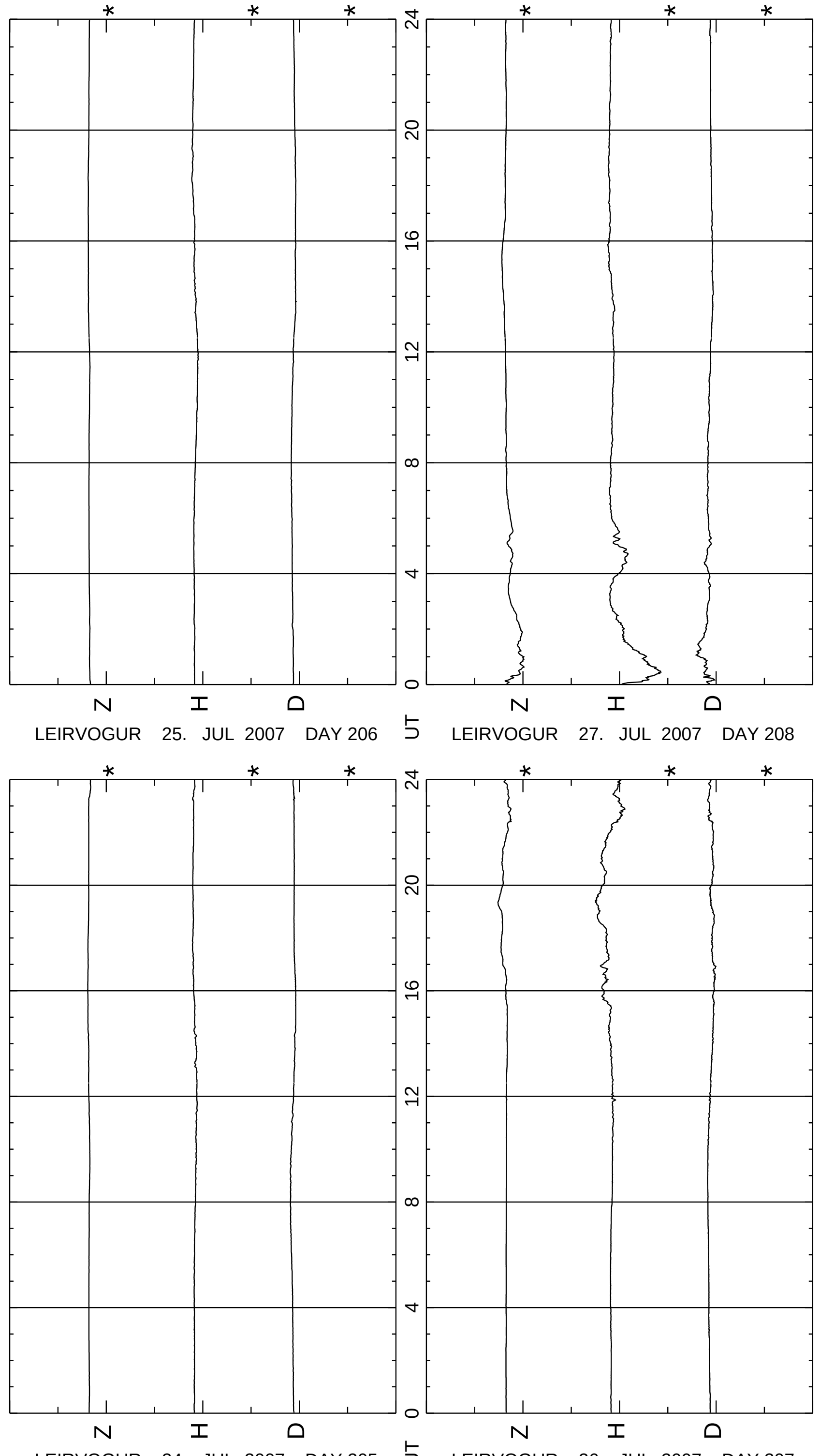
LEIRVOGUR 25. JUL 2007 DAY 206
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LEIRVOGUR 26. JUL 2007 DAY 207
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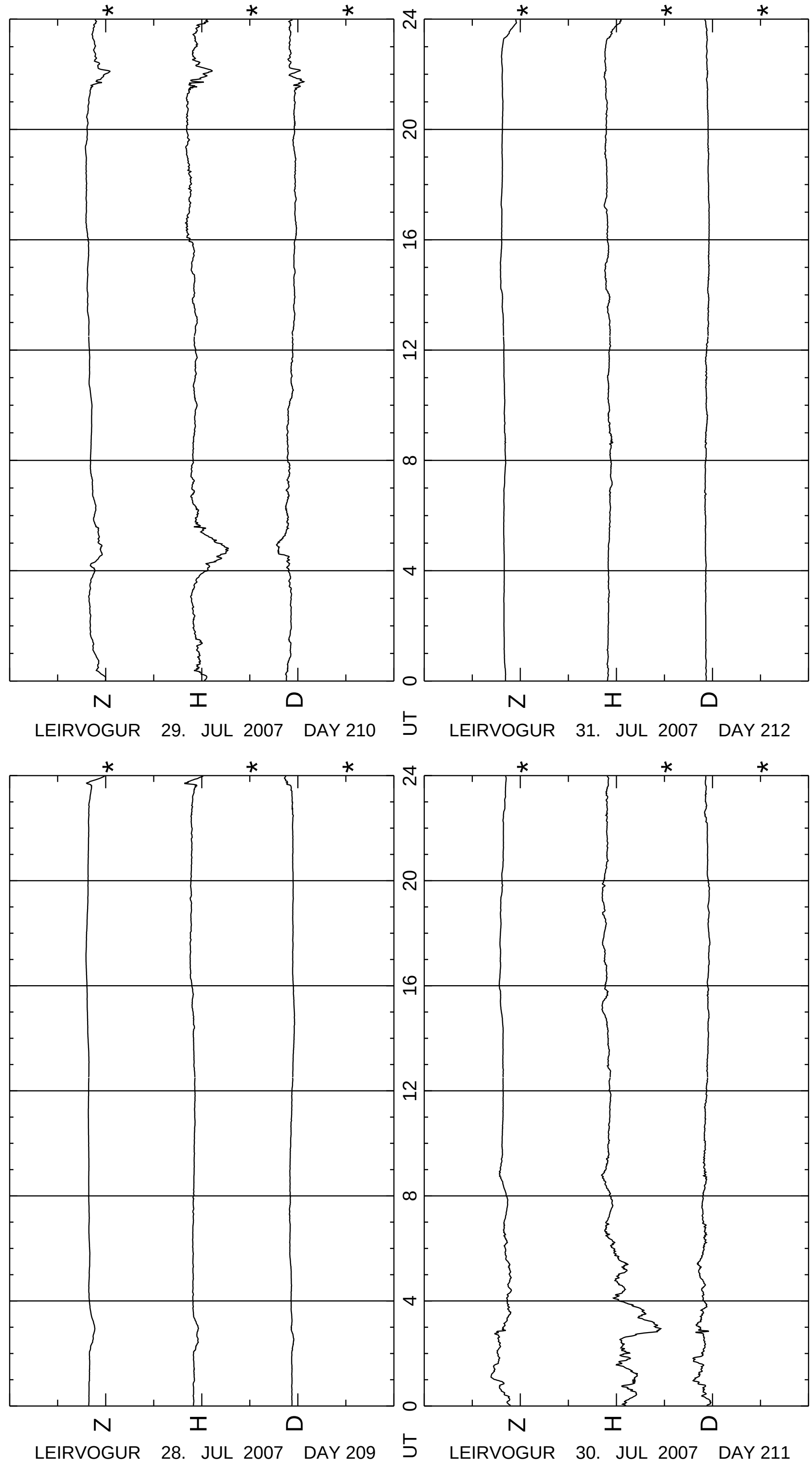
LEIRVOGUR 29. JUL 2007 DAY 210
LEIRVOGUR 31. JUL 2007 DAY 212
LEIRVOGUR 28. JUL 2007 DAY 209
LEIRVOGUR 30. JUL 2007 DAY 211
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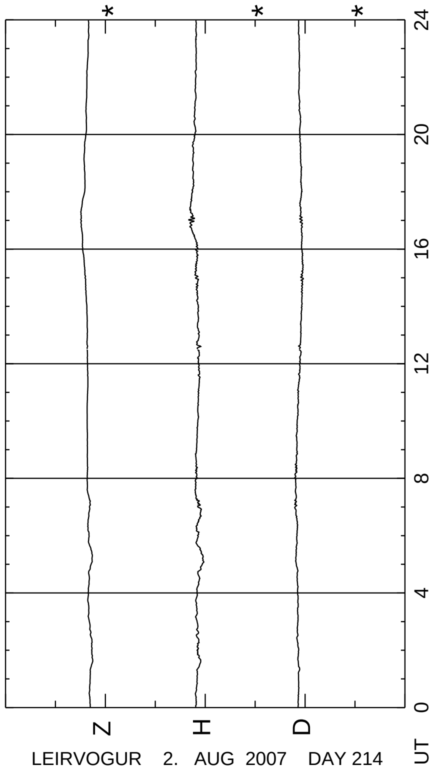
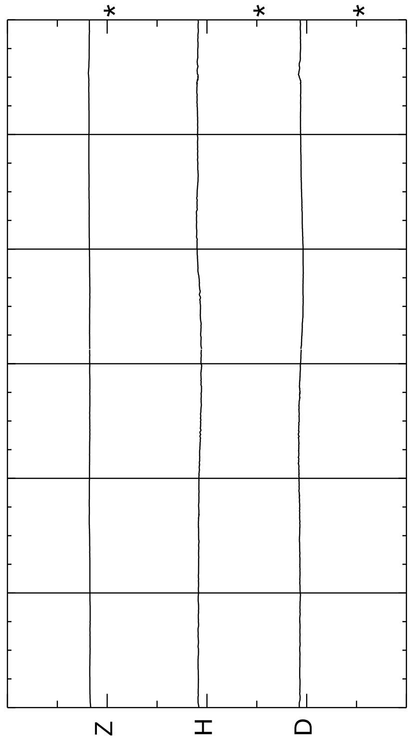
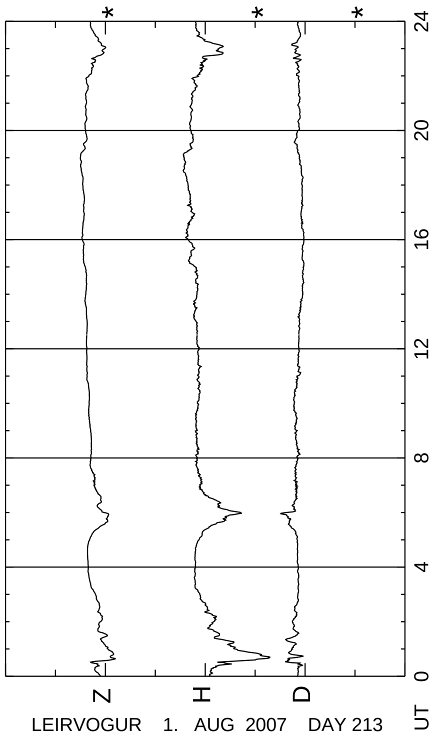


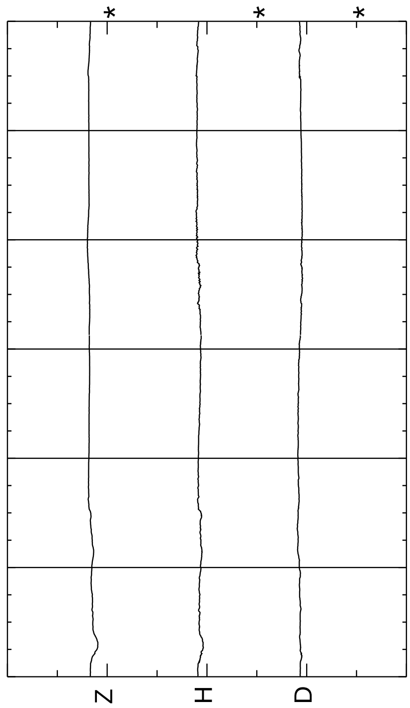
LEIRVOGUR 2. AUG 2007 DAY 214



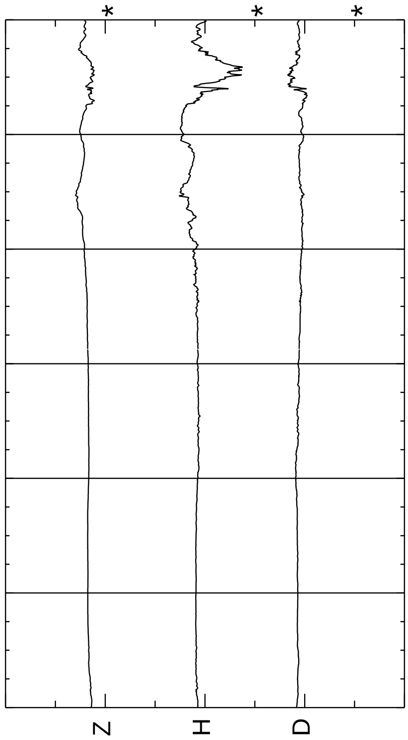
LEIRVOGUR 4. AUG 2007 DAY 216



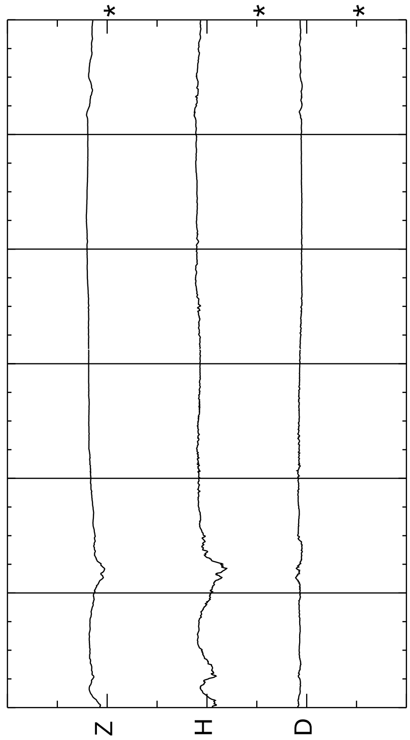
LEIRVOGUR 1. AUG 2007 DAY 213



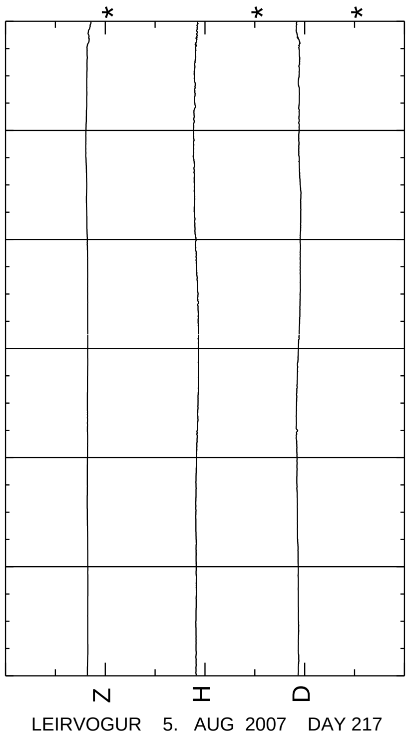
LEIRVOGUR 3. AUG 2007 DAY 215



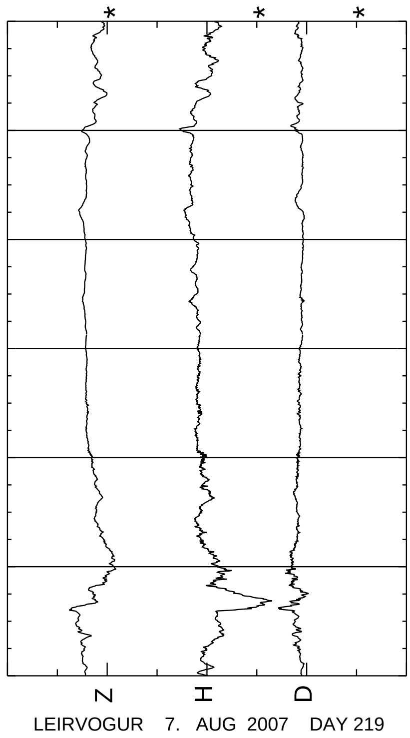
LEIRVOGUR 6. AUG 2007 DAY 218



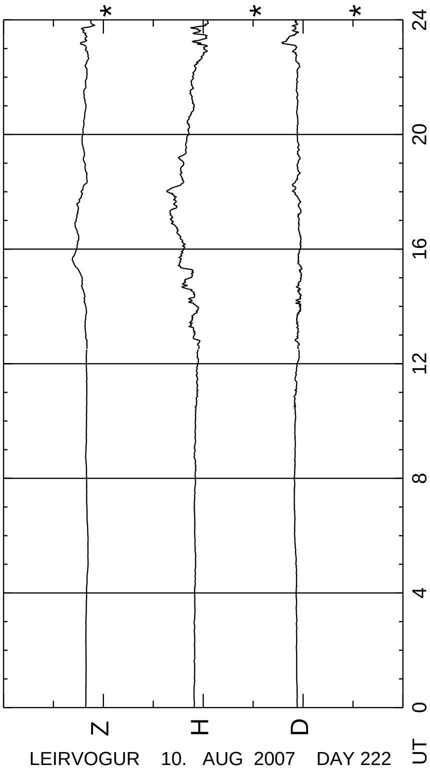
LEIRVOGUR 8. AUG 2007 DAY 220



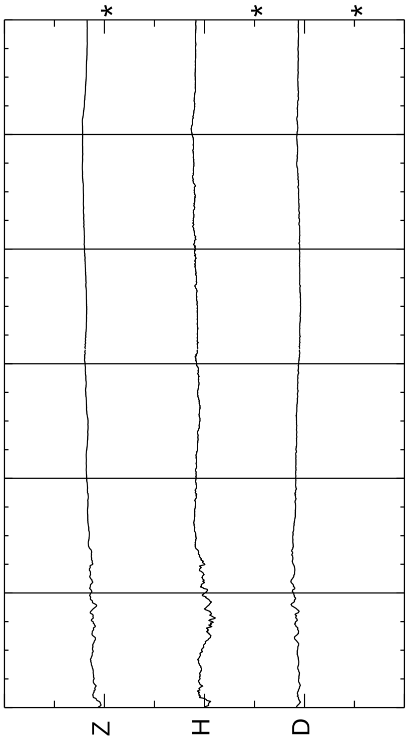
LEIRVOGUR 5. AUG 2007 DAY 217



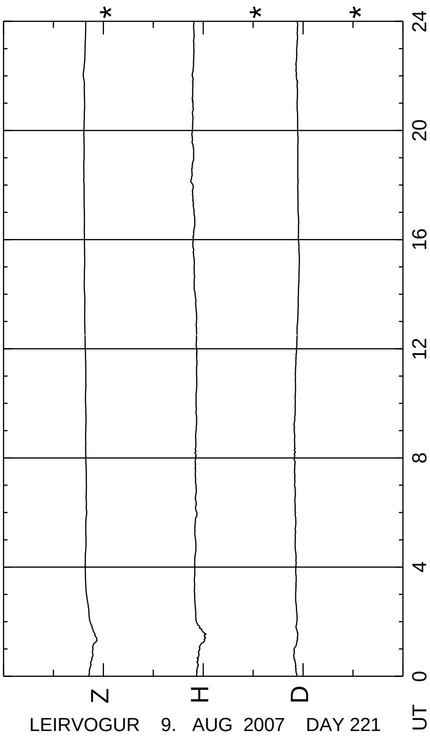
LEIRVOGUR 7. AUG 2007 DAY 219



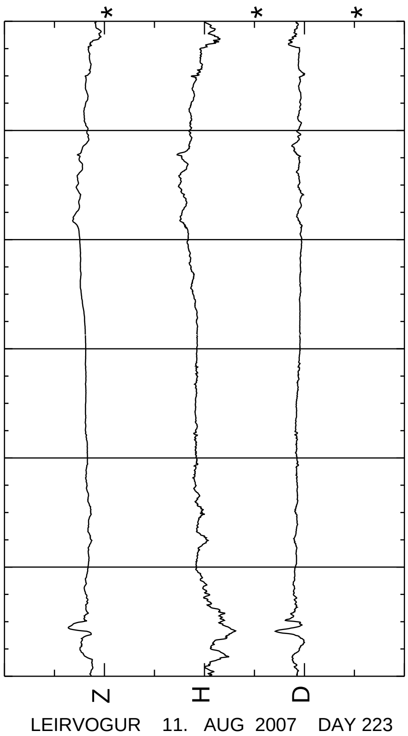
LEIRVOGUR 10. AUG 2007 DAY 222



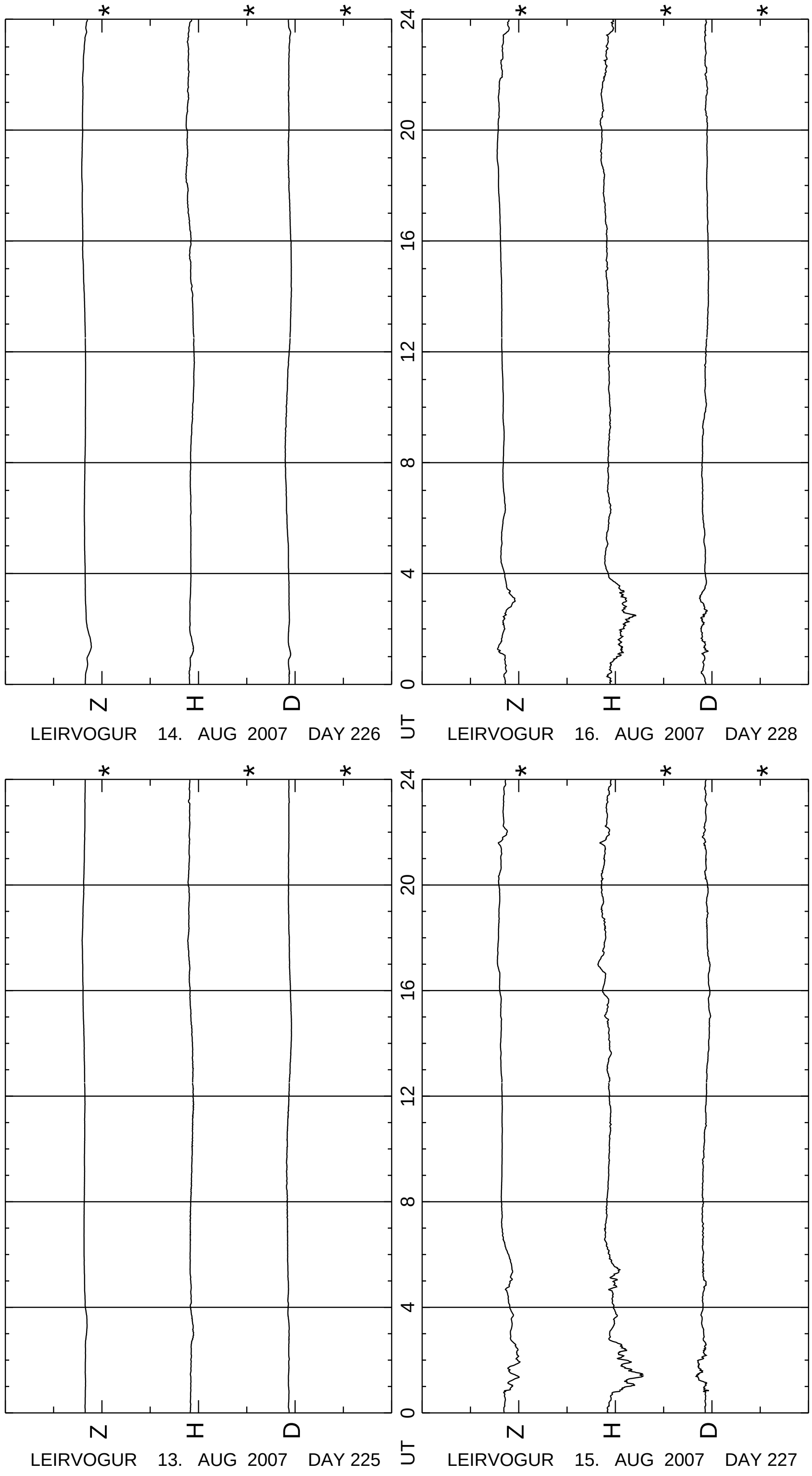
LEIRVOGUR 12. AUG 2007 DAY 224



LEIRVOGUR 9. AUG 2007 DAY 221



LEIRVOGUR 11. AUG 2007 DAY 223



LEIRVOGUR 14. AUG 2007 DAY 226
LEIRVOGUR 16. AUG 2007 DAY 228
LEIRVOGUR 13. AUG 2007 DAY 225
LEIRVOGUR 15. AUG 2007 DAY 227
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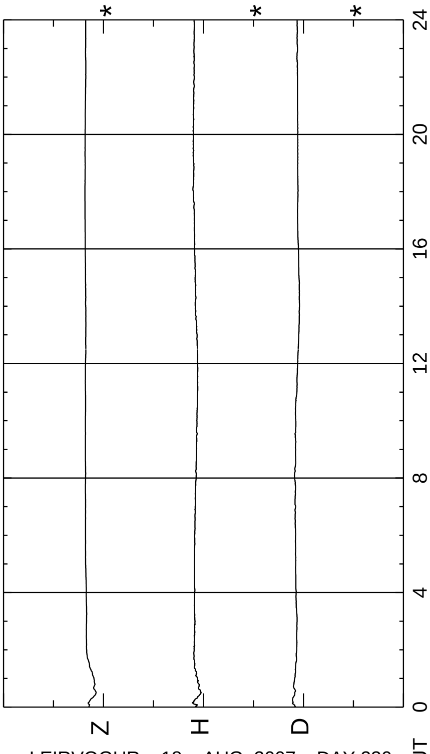
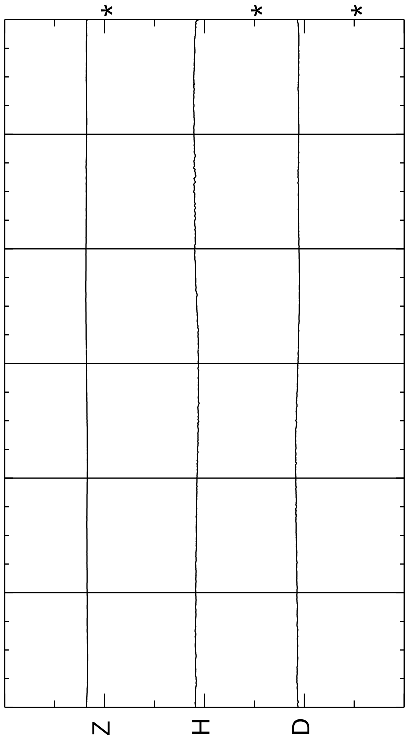
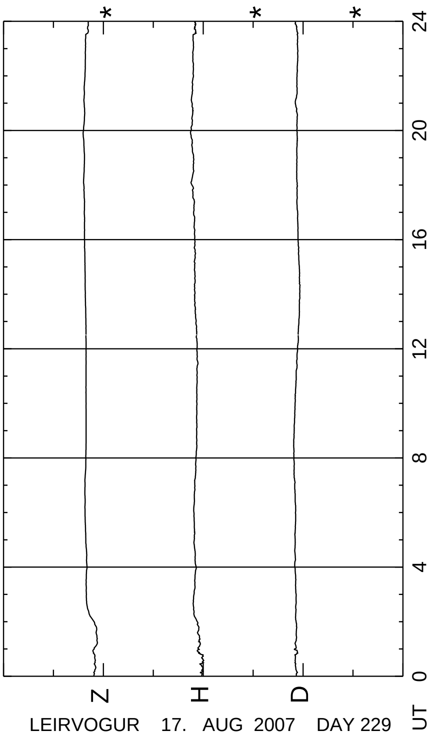


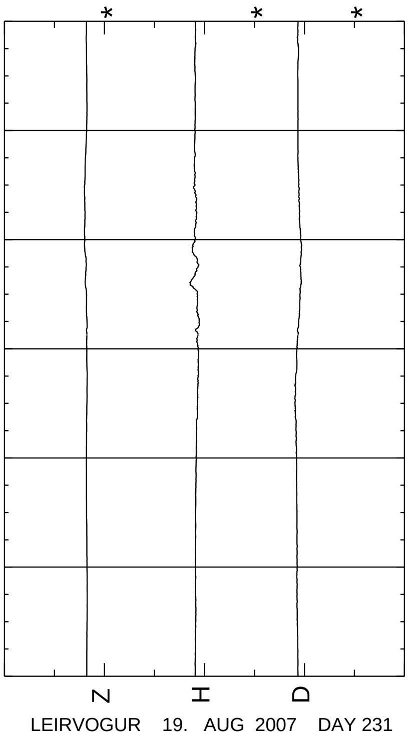
LEIRVOGUR 18. AUG 2007 DAY 230



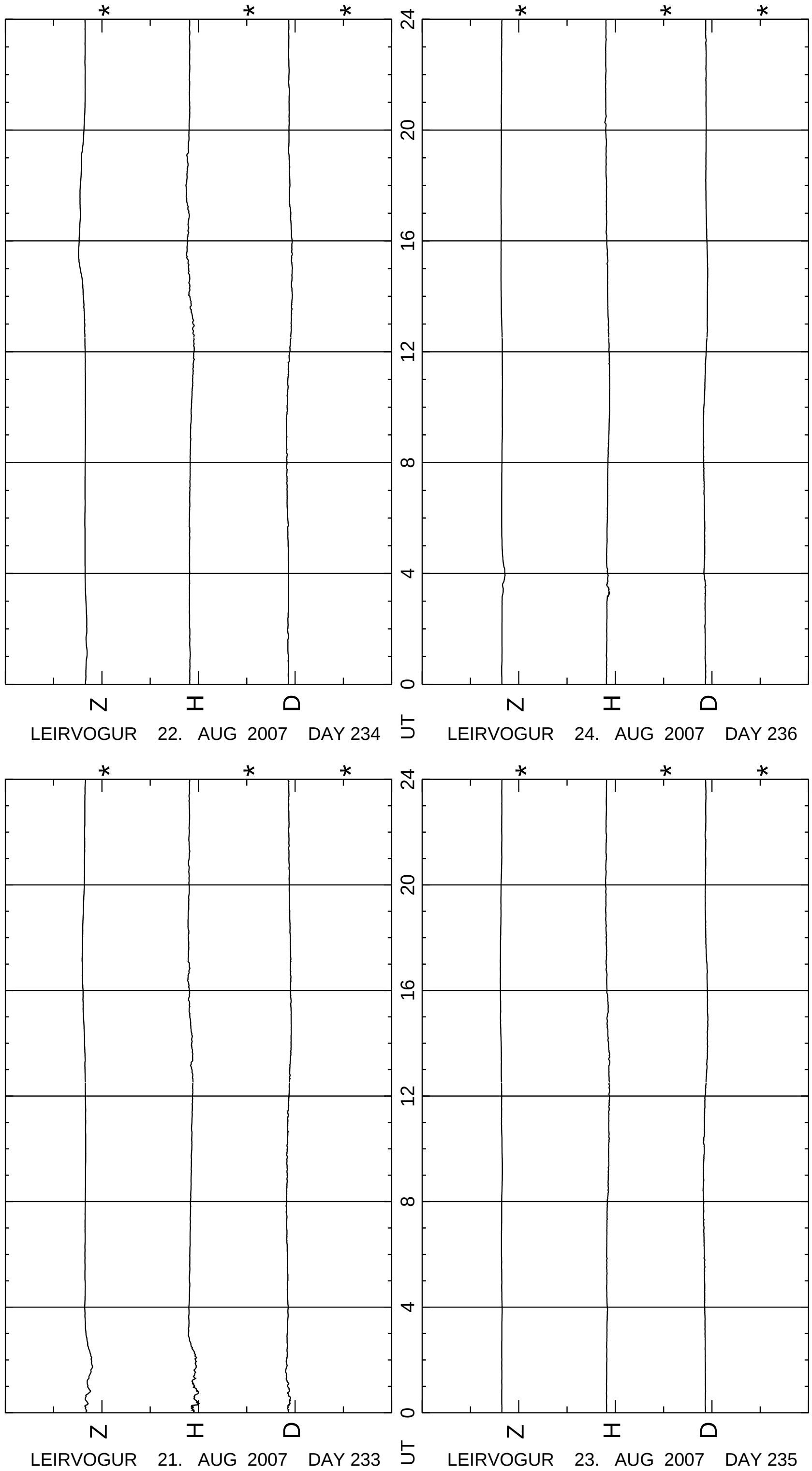
LEIRVOGUR 20. AUG 2007 DAY 232



LEIRVOGUR 17. AUG 2007 DAY 229



LEIRVOGUR 19. AUG 2007 DAY 231



LEIRVOGUR 22. AUG 2007 DAY 234
LEIRVOGUR 24. AUG 2007 DAY 236
LEIRVOGUR 21. AUG 2007 DAY 233
LEIRVOGUR 23. AUG 2007 DAY 235
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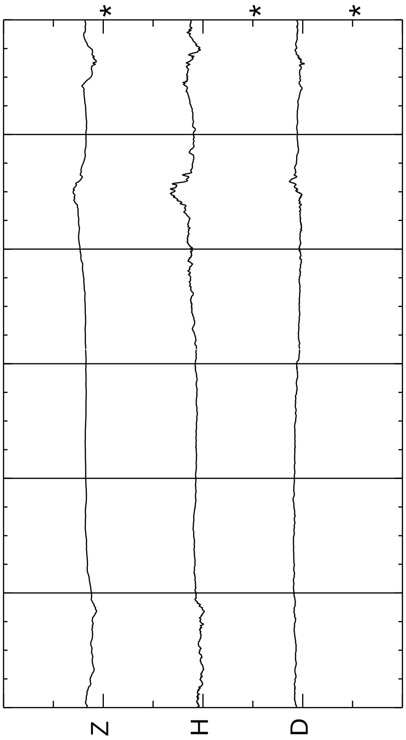
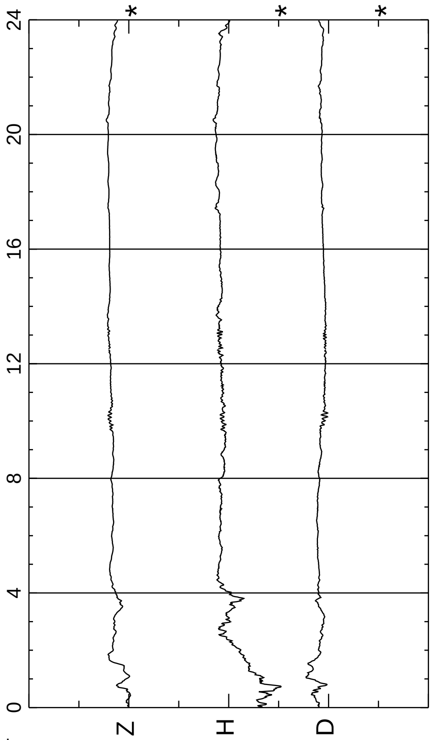
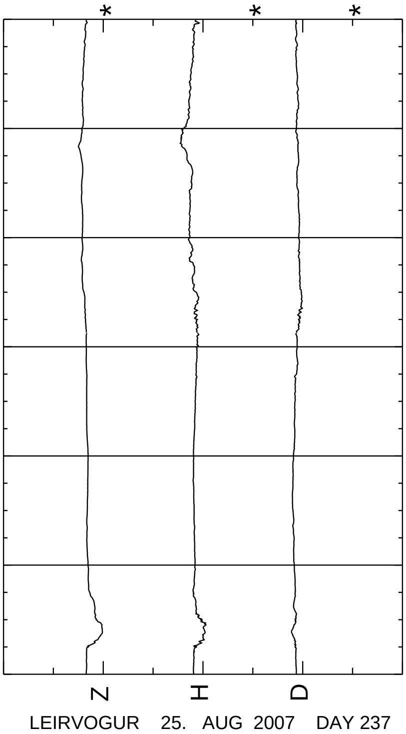


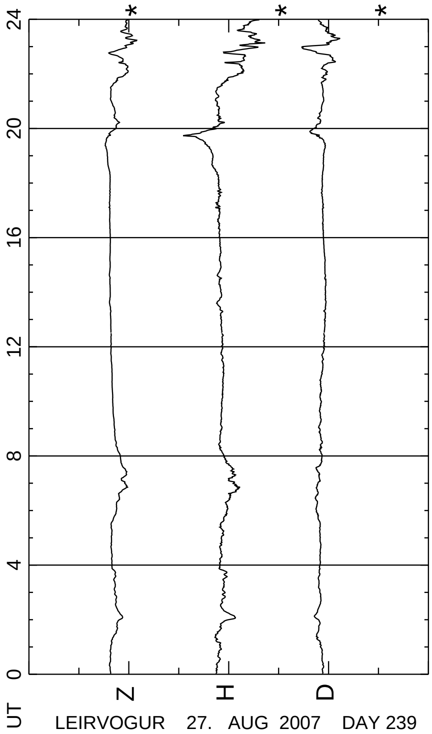
LEIRVOGUR 26. AUG 2007 DAY 238



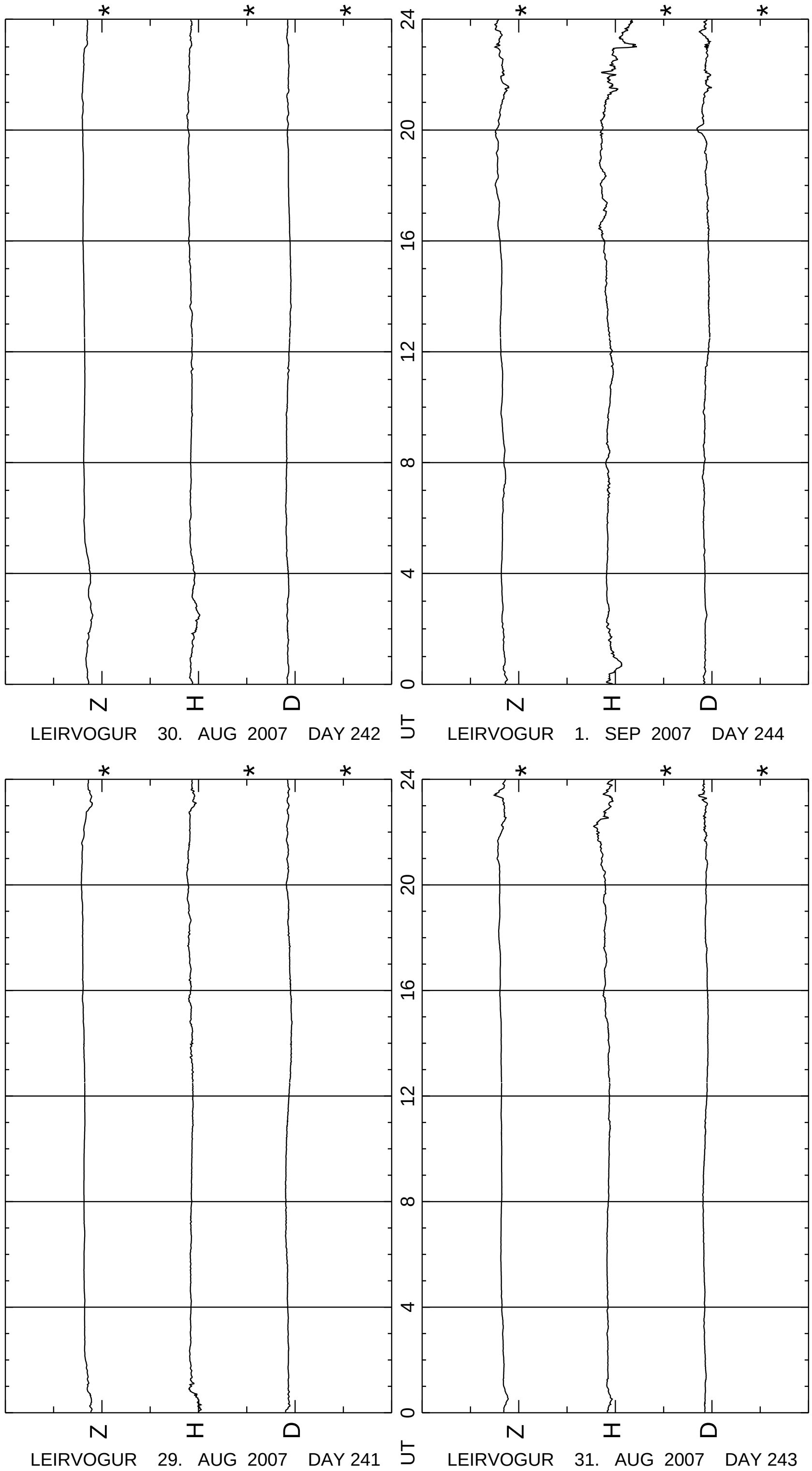
LEIRVOGUR 28. AUG 2007 DAY 240



LEIRVOGUR 25. AUG 2007 DAY 237



LEIRVOGUR 27. AUG 2007 DAY 239


LEIRVOGUR 30. AUG 2007 DAY 242
LEIRVOGUR 1. SEP 2007 DAY 244
LEIRVOGUR 29. AUG 2007 DAY 241
LEIRVOGUR 31. AUG 2007 DAY 243
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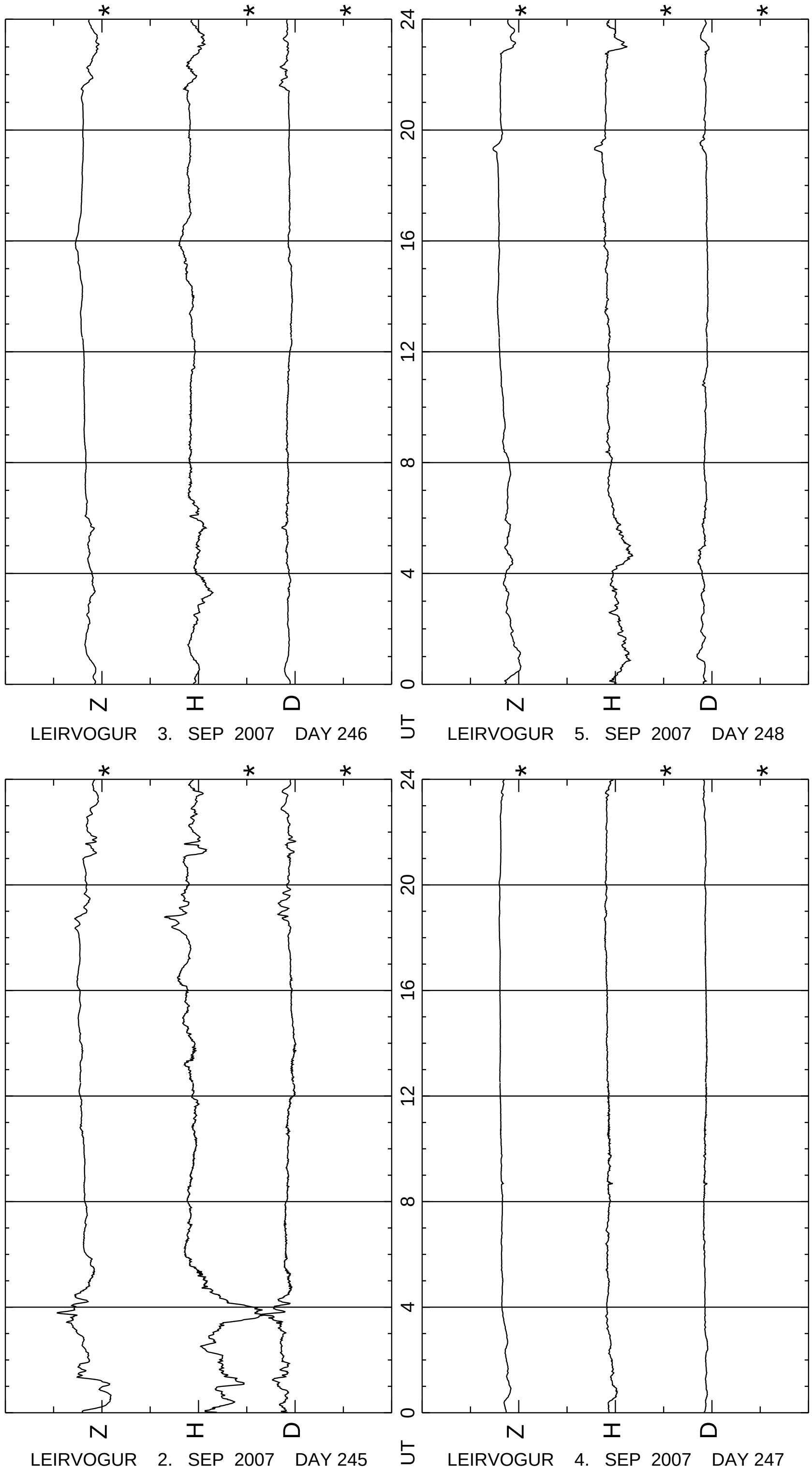
LEIRVOGUR 3. SEP 2007 DAY 246
LEIRVOGUR 5. SEP 2007 DAY 248
LEIRVOGUR 2. SEP 2007 DAY 245
LEIRVOGUR 4. SEP 2007 DAY 247
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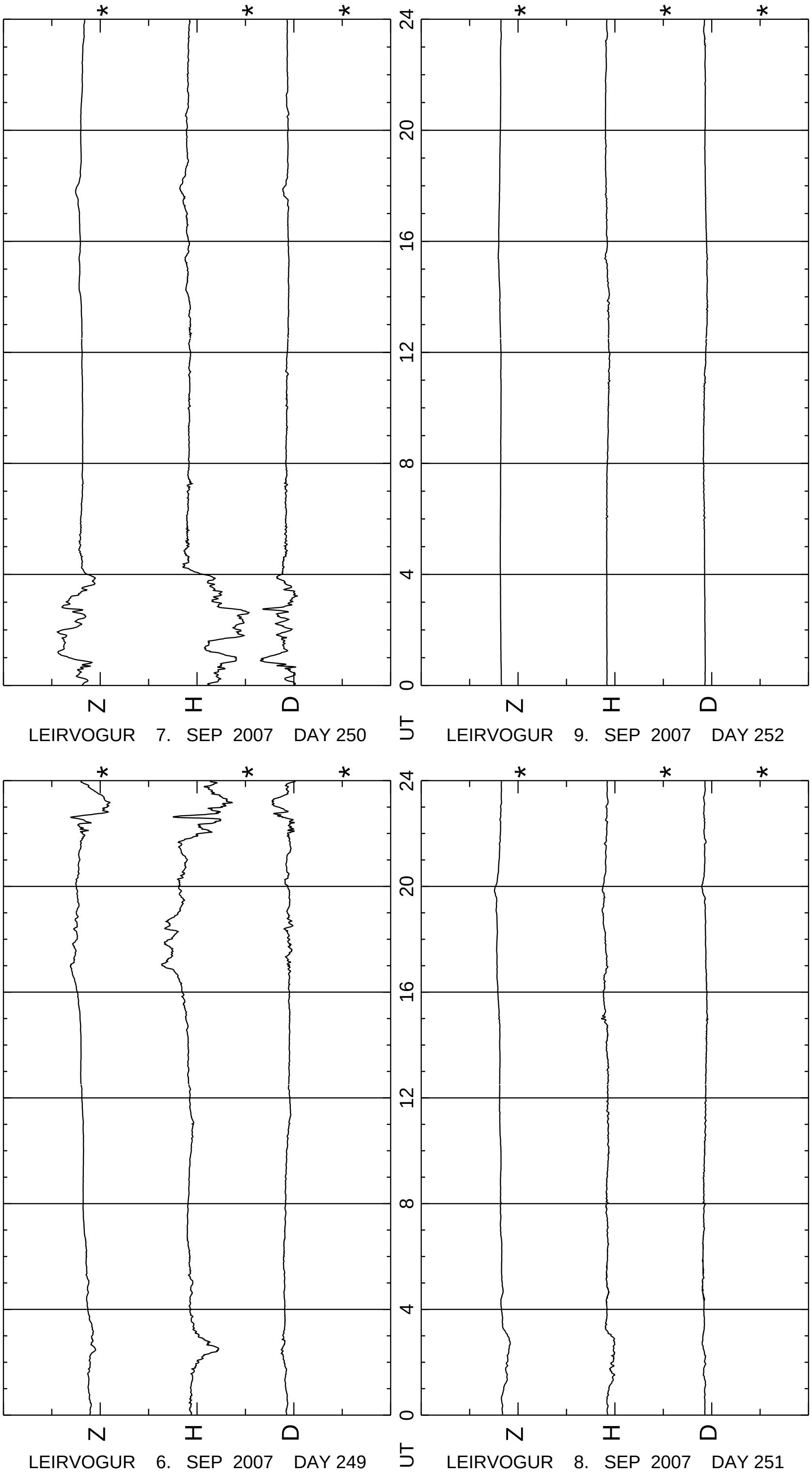
LEIRVOGUR 7. SEP 2007 DAY 250
LEIRVOGUR 9. SEP 2007 DAY 252
LEIRVOGUR 6. SEP 2007 DAY 249
LEIRVOGUR 8. SEP 2007 DAY 251
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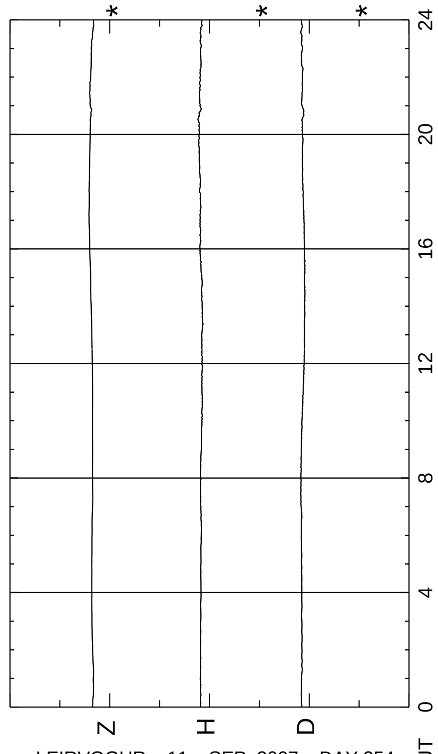
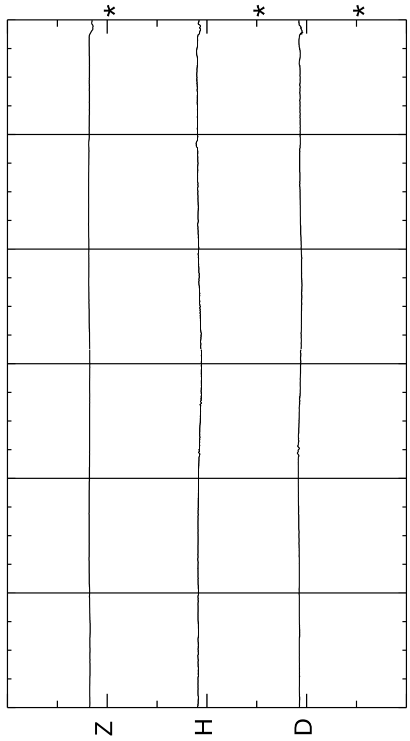
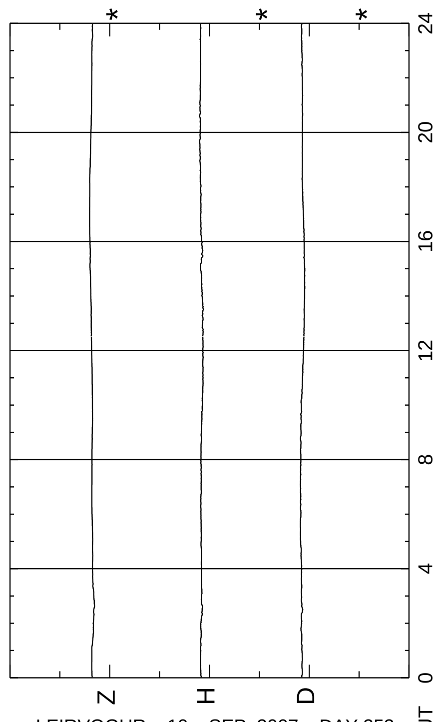


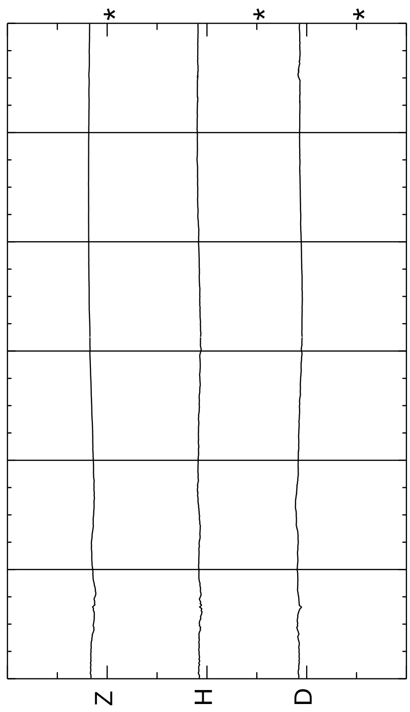
LEIRVOGUR 11. SEP 2007 DAY 254



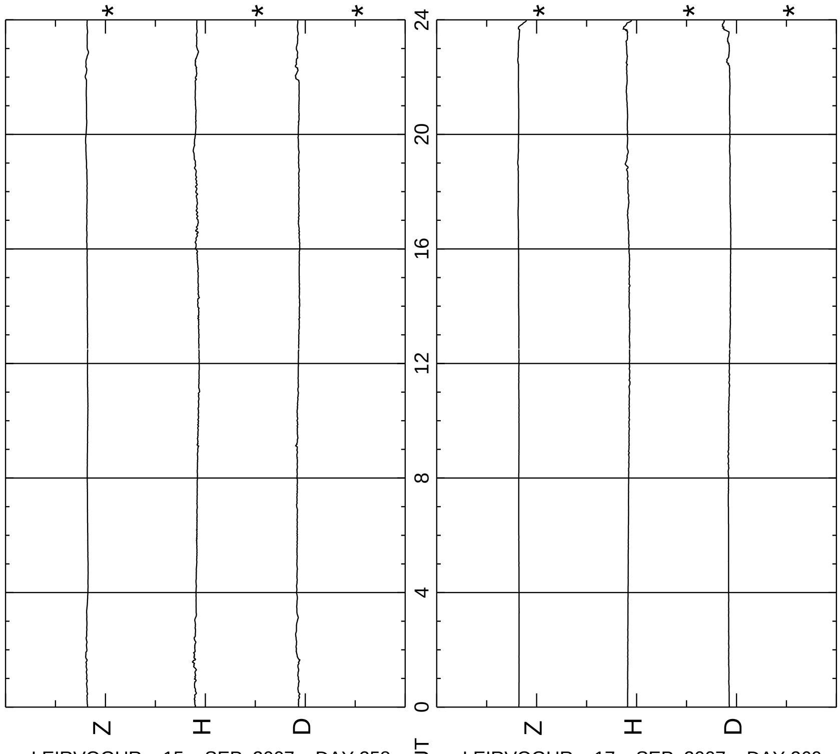
LEIRVOGUR 13. SEP 2007 DAY 256



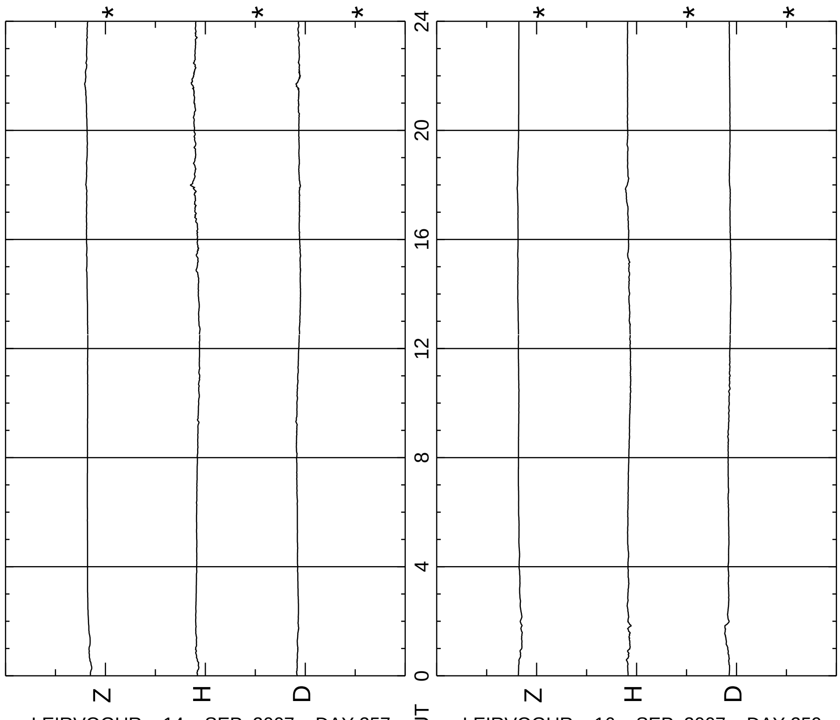
LEIRVOGUR 10. SEP 2007 DAY 253



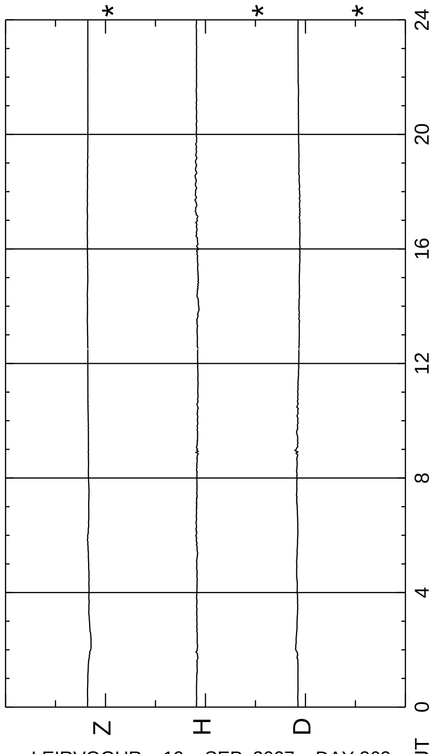
LEIRVOGUR 12. SEP 2007 DAY 255



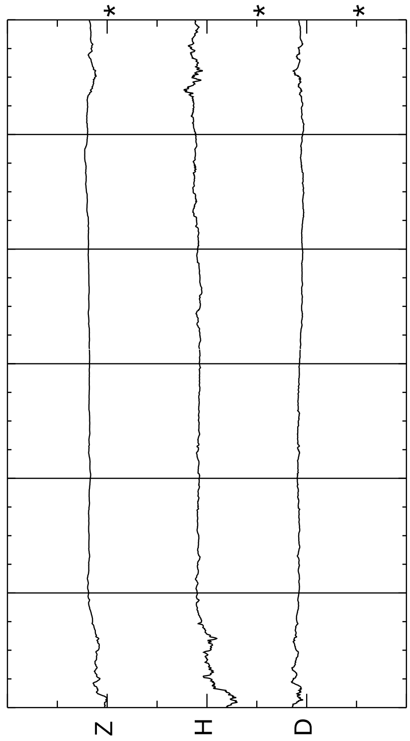
LEIRVOGUR 15. SEP 2007 DAY 258 LEIRVOGUR 17. SEP 2007 DAY 260



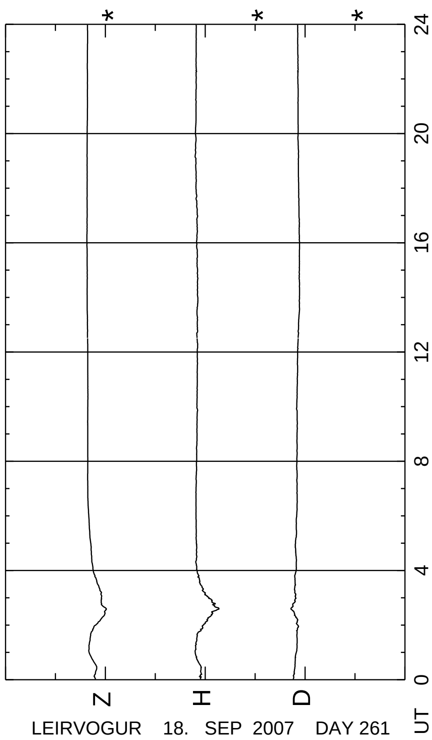
LEIRVOGUR 14. SEP 2007 DAY 257 LEIRVOGUR 16. SEP 2007 DAY 259



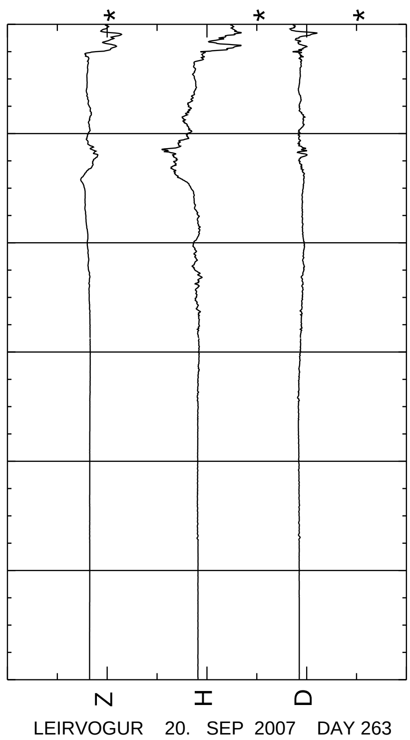
LEIRVOGUR 19. SEP 2007 DAY 262



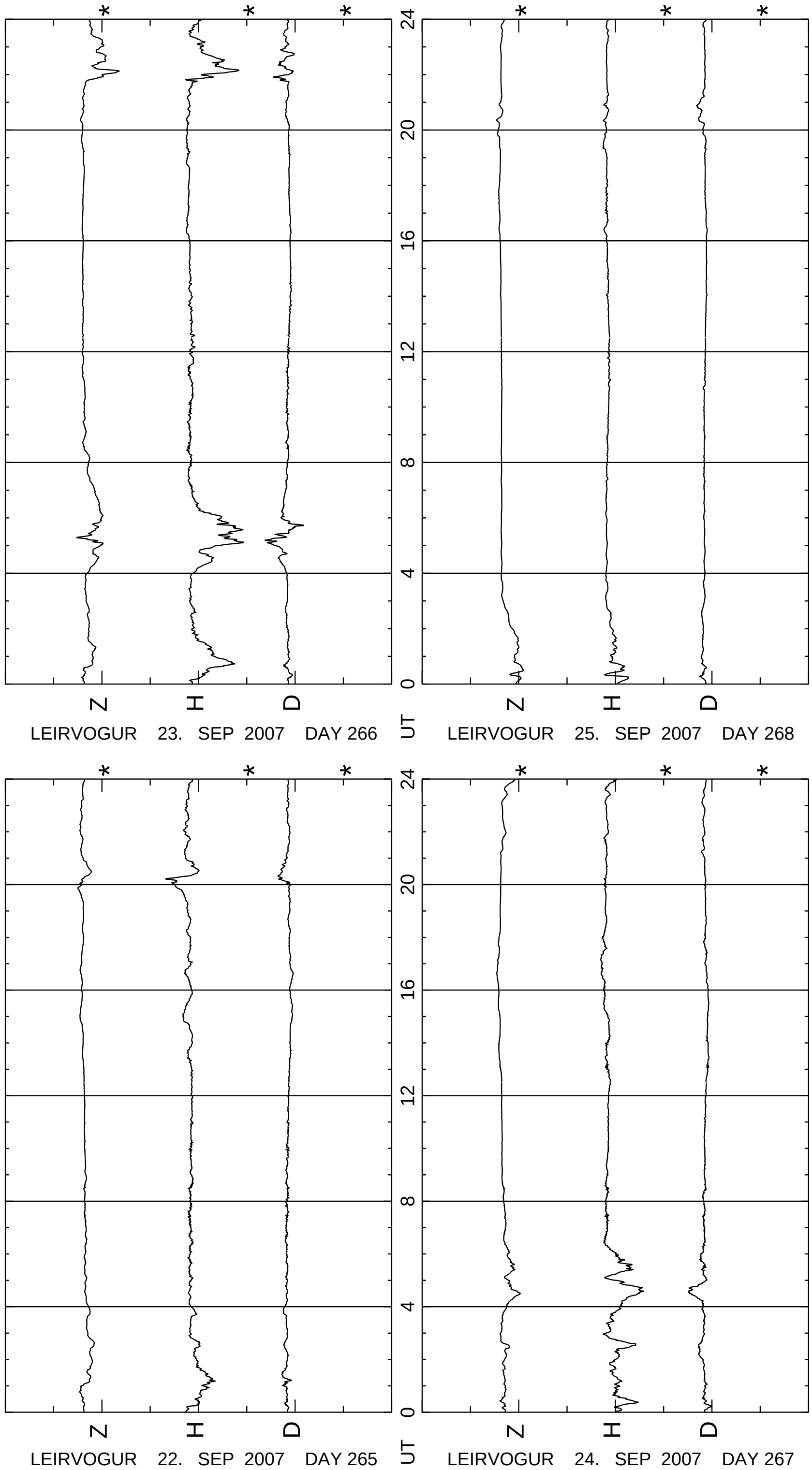
LEIRVOGUR 21. SEP 2007 DAY 264



LEIRVOGUR 18. SEP 2007 DAY 261



LEIRVOGUR 20. SEP 2007 DAY 263


LEIRVOGUR 23. SEP 2007 DAY 266
LEIRVOGUR 25. SEP 2007 DAY 268
LEIRVOGUR 22. SEP 2007 DAY 265
LEIRVOGUR 24. SEP 2007 DAY 267
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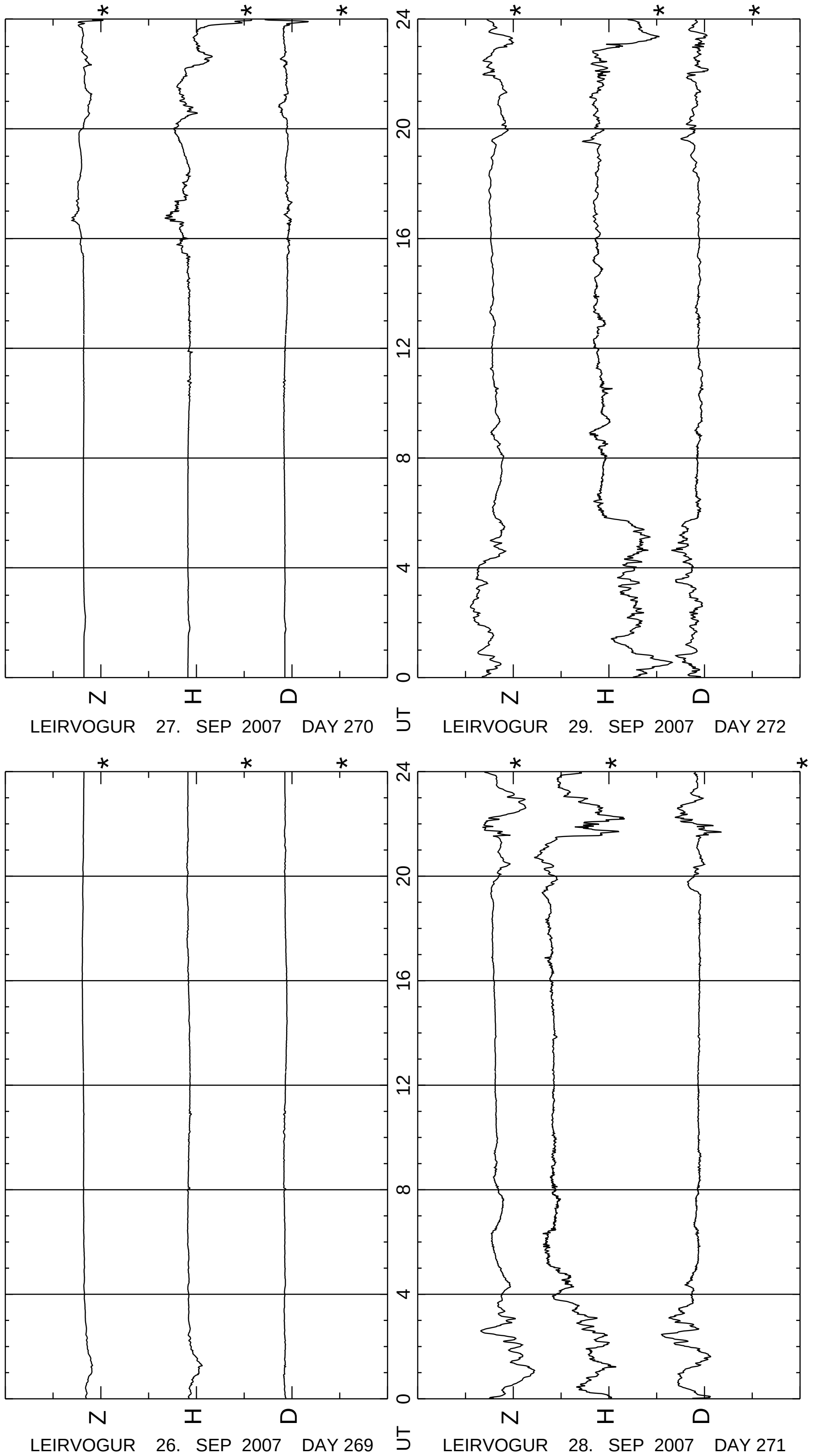
LEIRVOGUR 27. SEP 2007 DAY 270
LEIRVOGUR 29. SEP 2007 DAY 272
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LEIRVOGUR 28. SEP 2007 DAY 271
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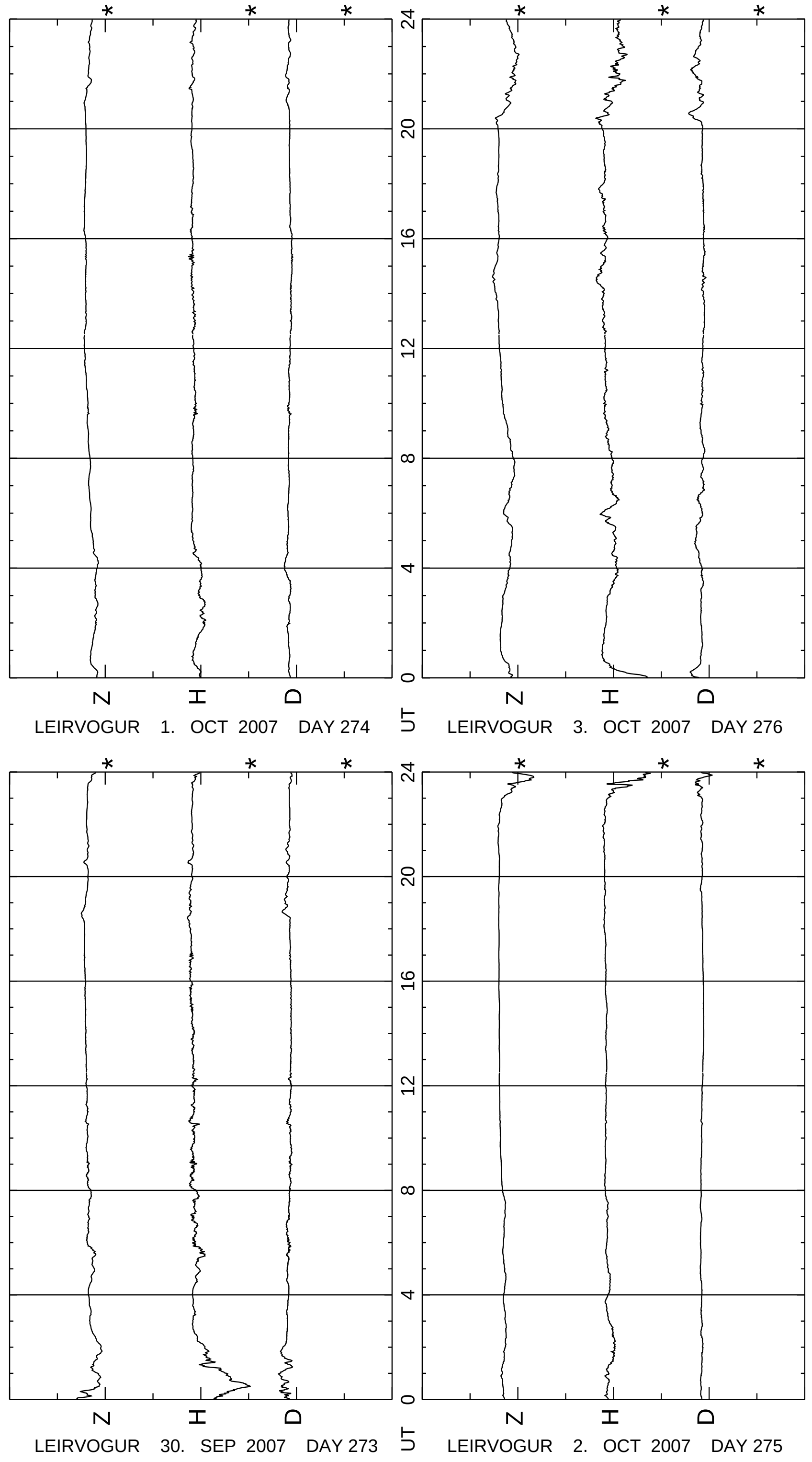
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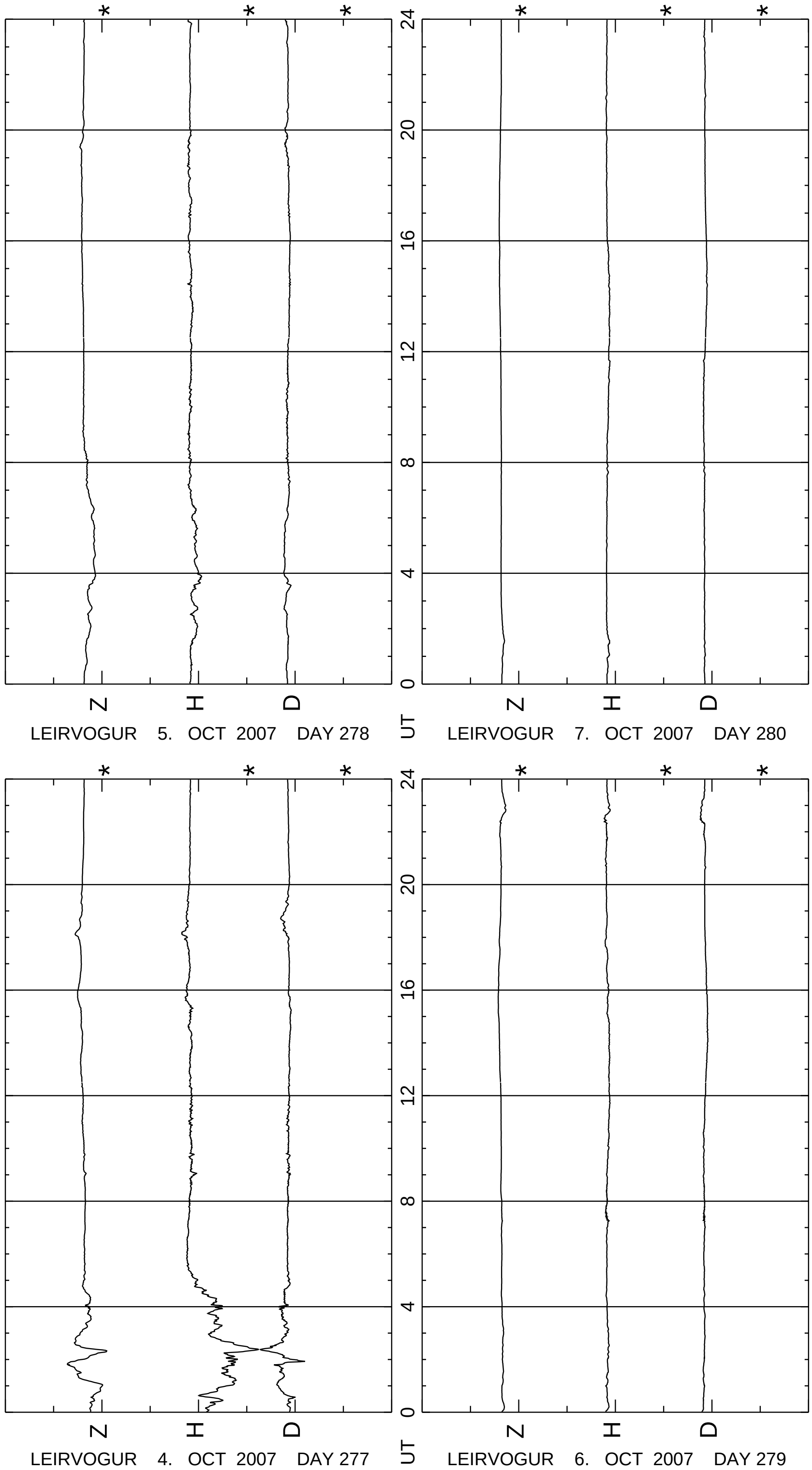
LEIRVOGUR 1. OCT 2007 DAY 274
LEIRVOGUR 3. OCT 2007 DAY 276
LEIRVOGUR 30. SEP 2007 DAY 273
LEIRVOGUR 2. OCT 2007 DAY 275


LEIRVOGUR 5. OCT 2007 DAY 278
LEIRVOGUR 7. OCT 2007 DAY 280
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LEIRVOGUR 6. OCT 2007 DAY 279
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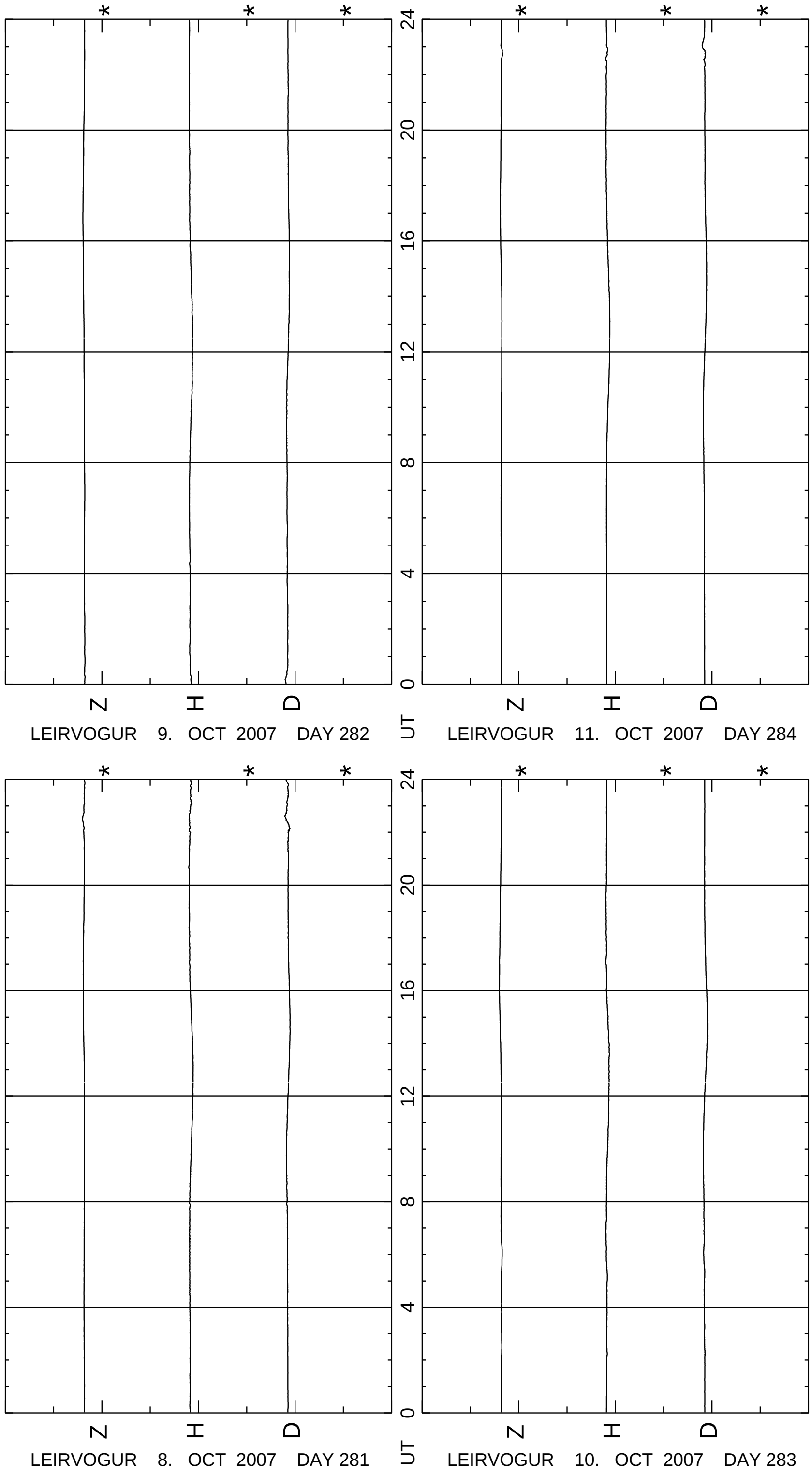
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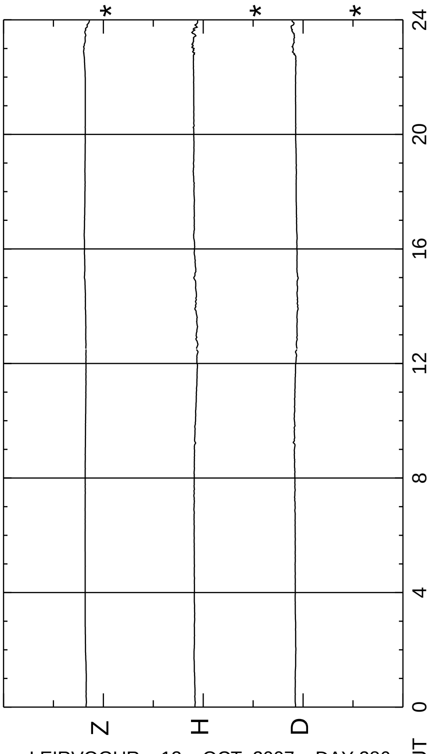
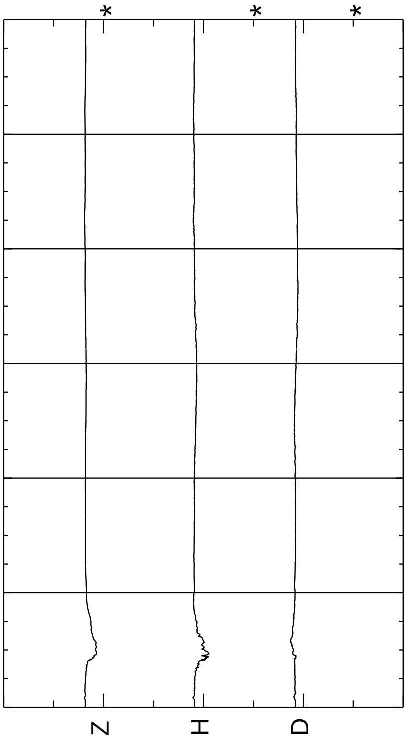
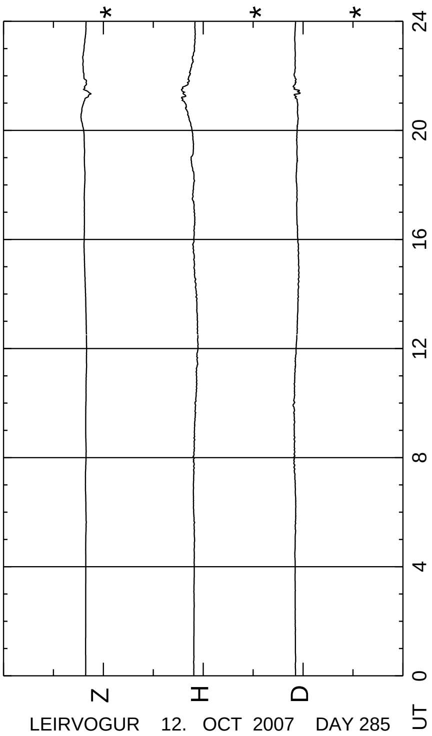
LEIRVOGUR 11. OCT 2007 DAY 284
LEIRVOGUR 8. OCT 2007 DAY 281
LEIRVOGUR 10. OCT 2007 DAY 283



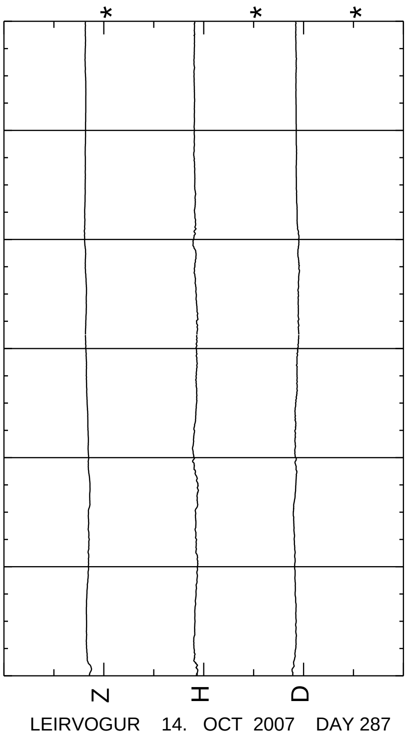
LEIRVOGUR 13. OCT 2007 DAY 286



LEIRVOGUR 15. OCT 2007 DAY 288



LEIRVOGUR 12. OCT 2007 DAY 285



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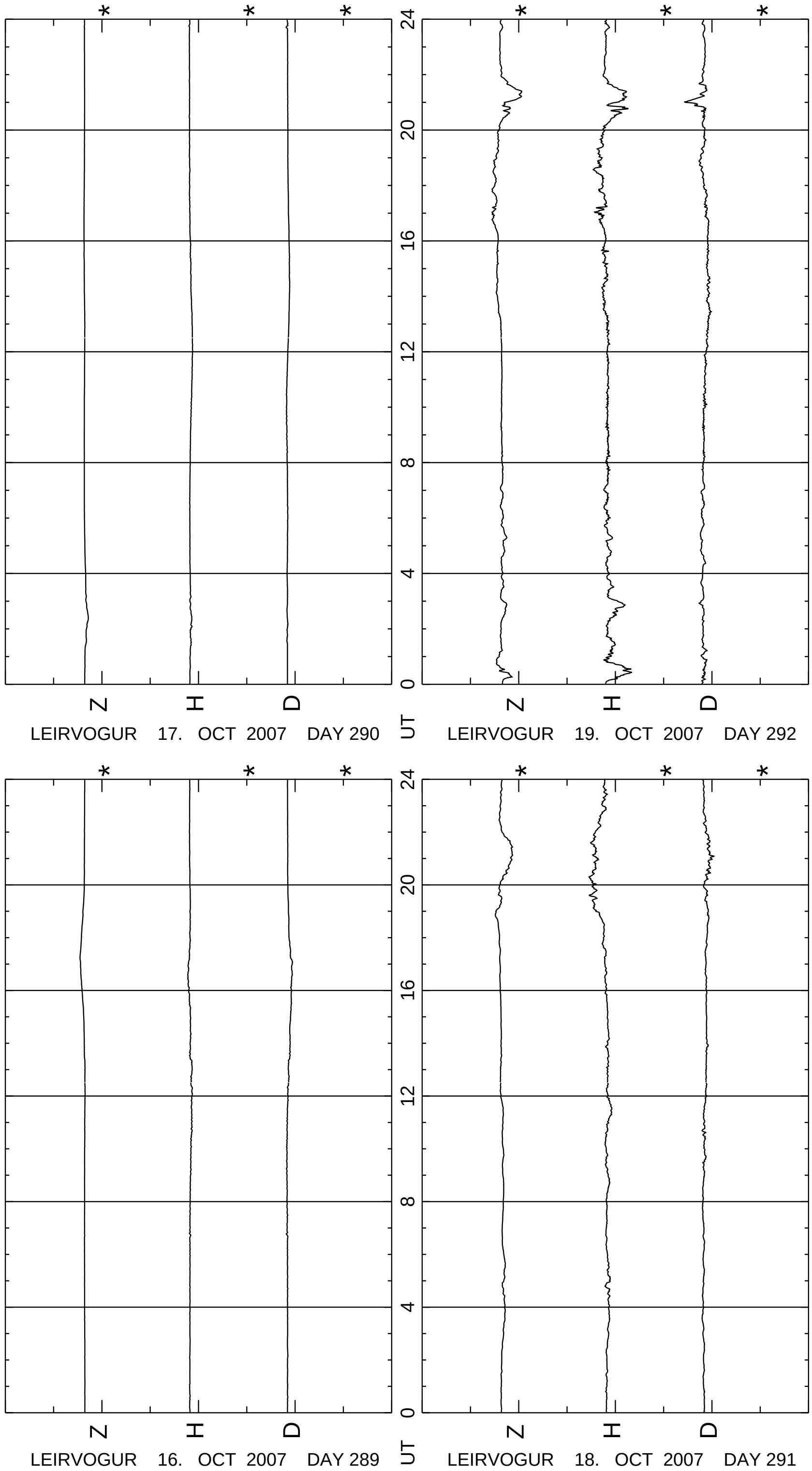
LEIRVOGUR 17. OCT 2007 DAY 290
LEIRVOGUR 19. OCT 2007 DAY 292
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LEIRVOGUR 18. OCT 2007 DAY 291
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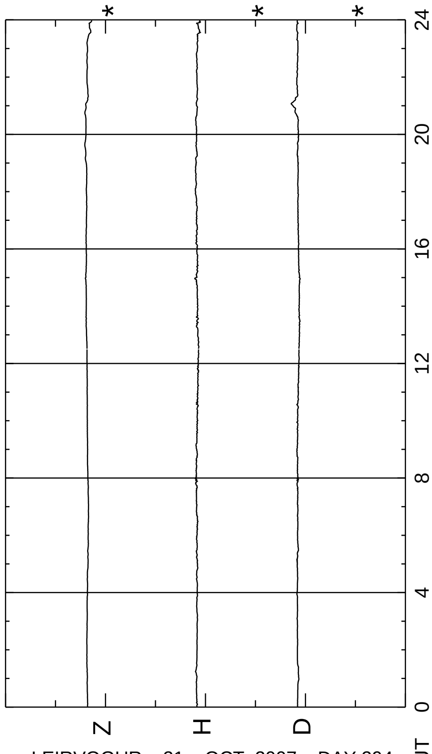
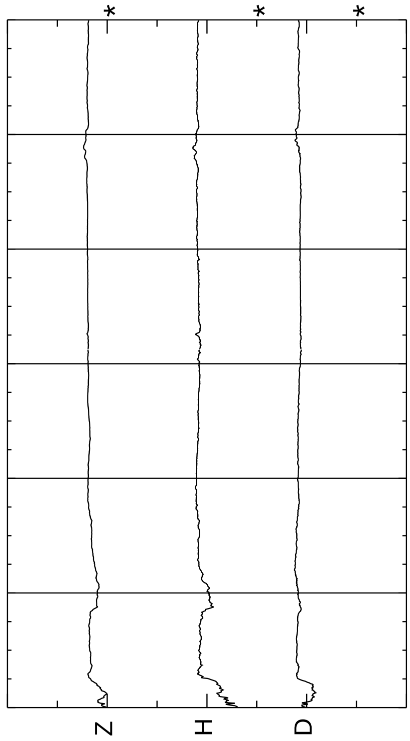
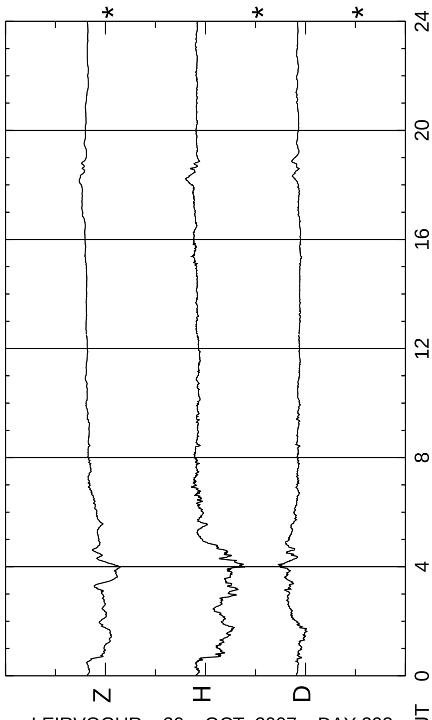


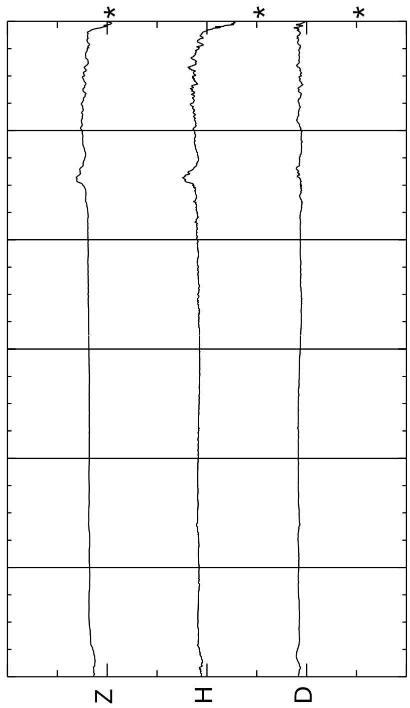
LEIRVOGUR 21. OCT 2007 DAY 294



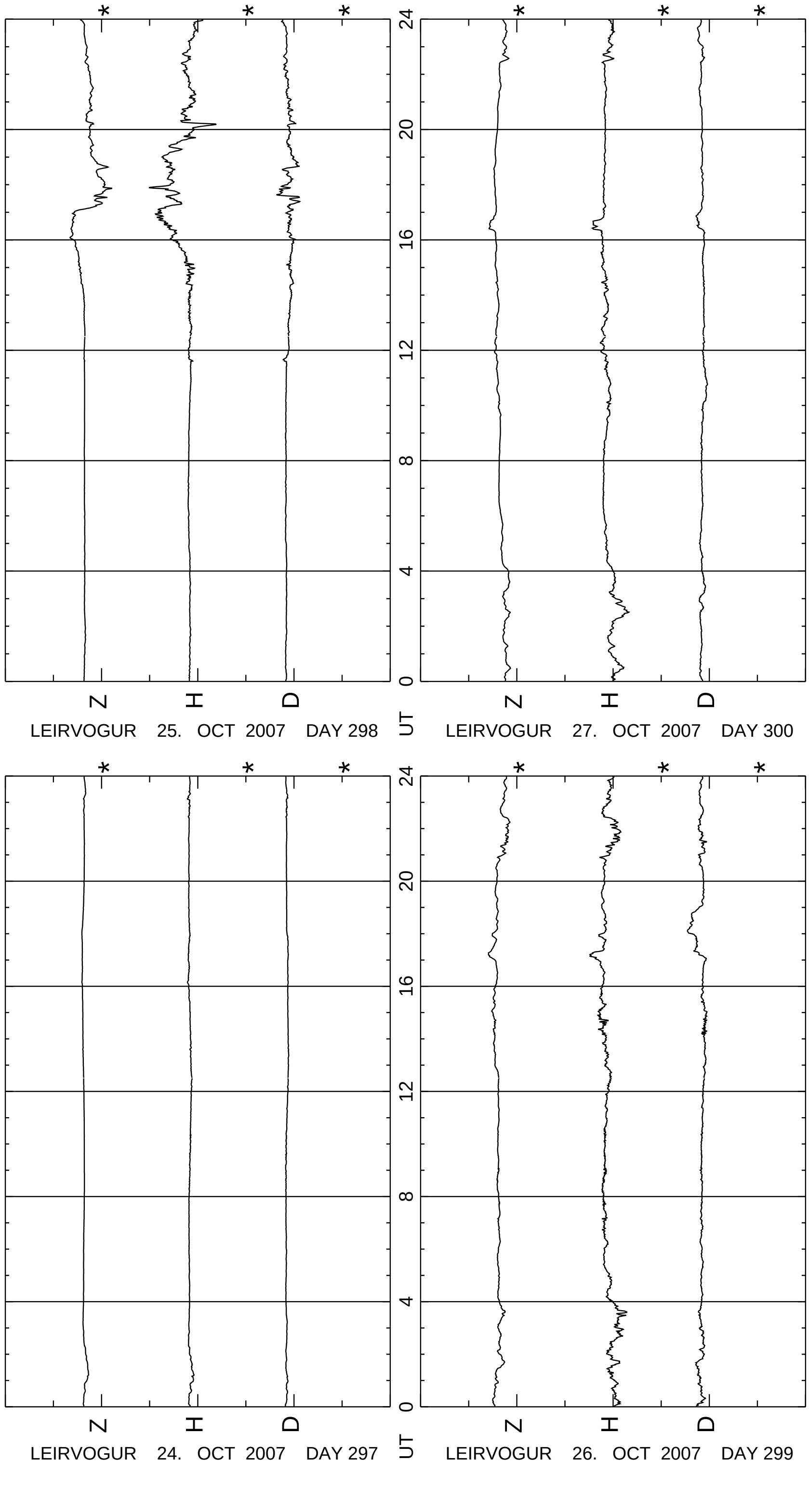
LEIRVOGUR 23. OCT 2007 DAY 296



LEIRVOGUR 20. OCT 2007 DAY 293



LEIRVOGUR 22. OCT 2007 DAY 295


Z H D
LEIRVOGUR 25. OCT 2007 DAY 298
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Z H D
LEIRVOGUR 27. OCT 2007 DAY 300
Z H D
LEIRVOGUR 24. OCT 2007 DAY 297
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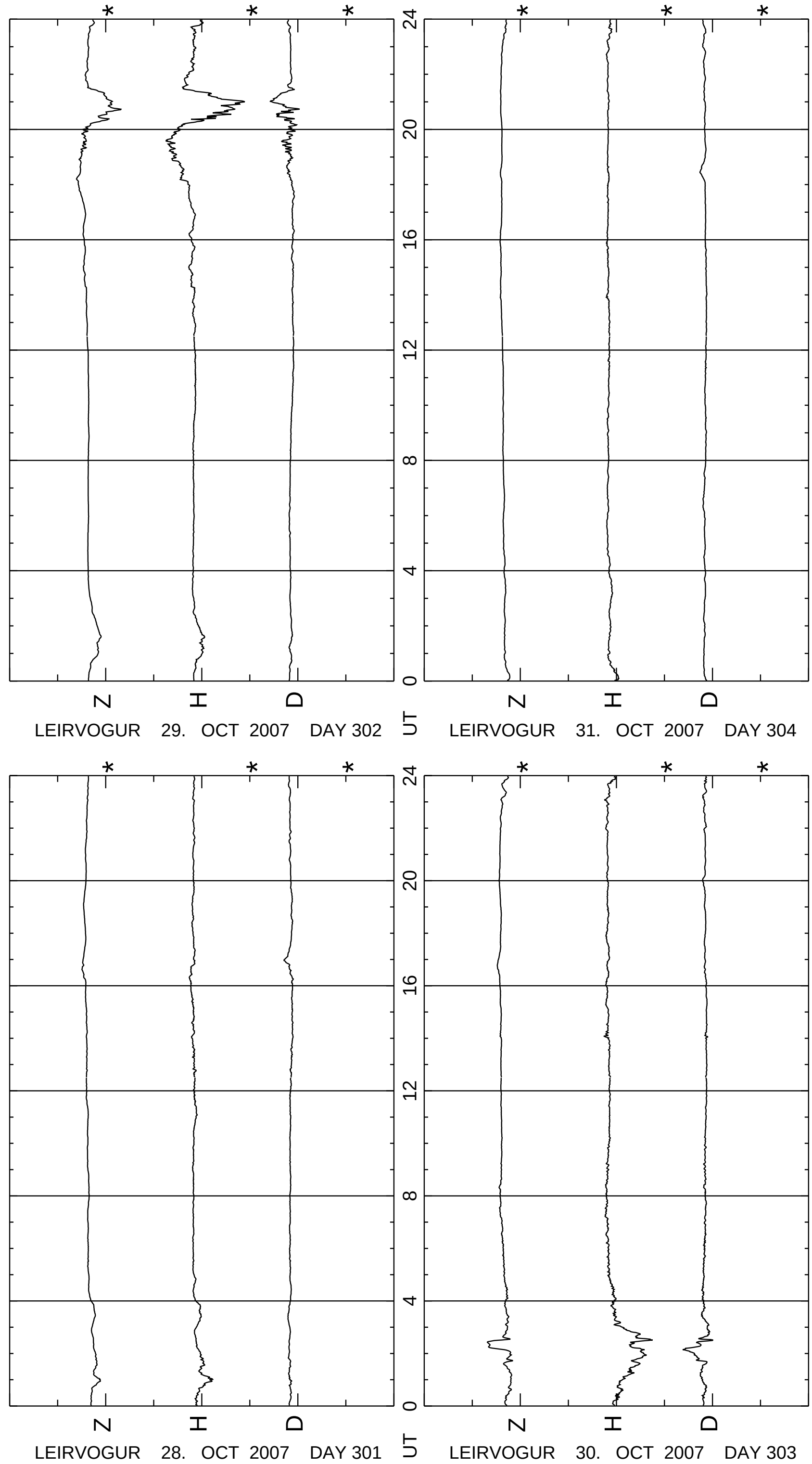
Z H D
LEIRVOGUR 26. OCT 2007 DAY 299
0 4 8 12 16 20 24


LEIRVOGUR 29. OCT 2007 DAY 302
LEIRVOGUR 31. OCT 2007 DAY 304
LEIRVOGUR 28. OCT 2007 DAY 301
LEIRVOGUR 30. OCT 2007 DAY 303
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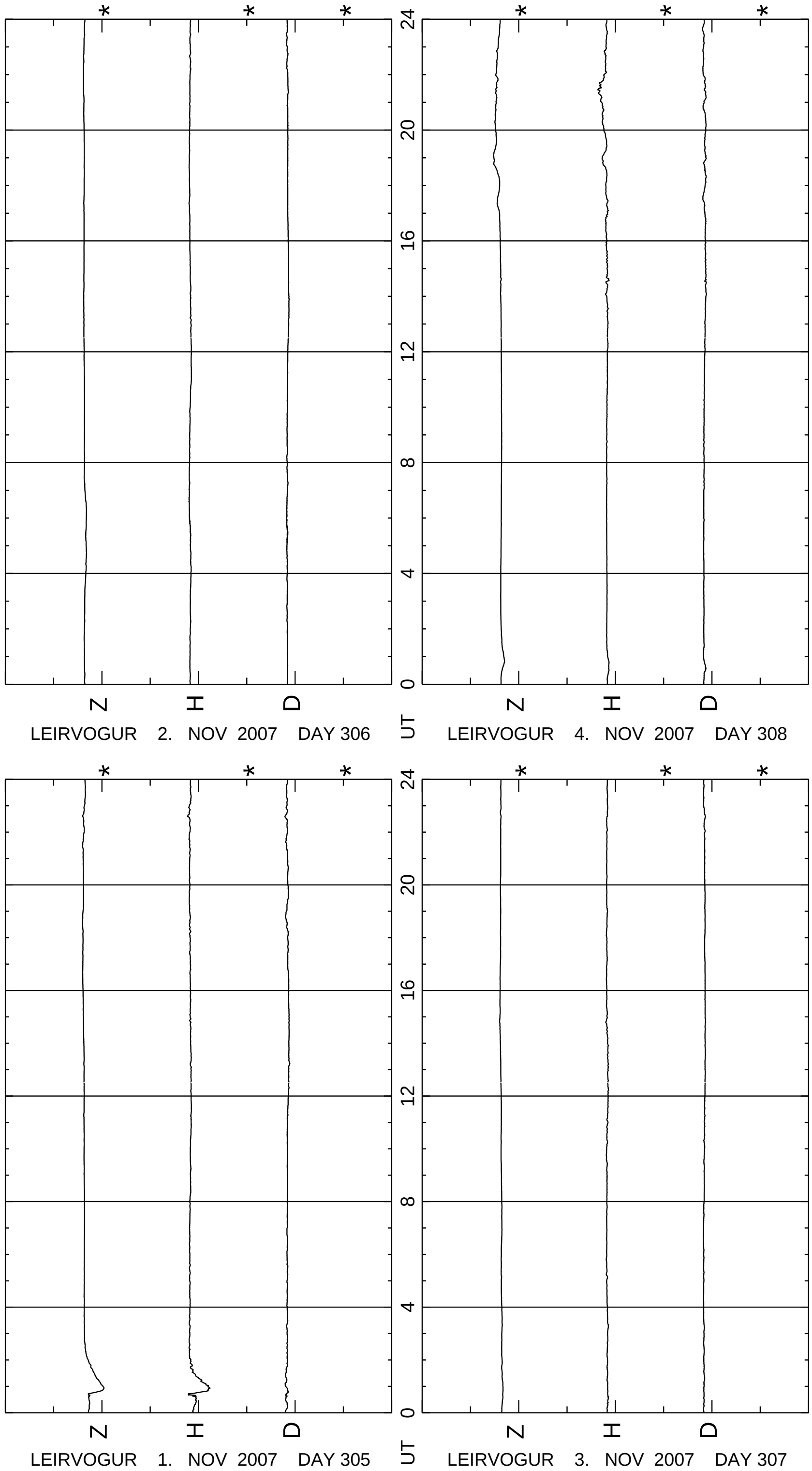
LEIRVOGUR 2. NOV 2007 DAY 306
LEIRVOGUR 4. NOV 2007 DAY 308
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LEIRVOGUR 3. NOV 2007 DAY 307
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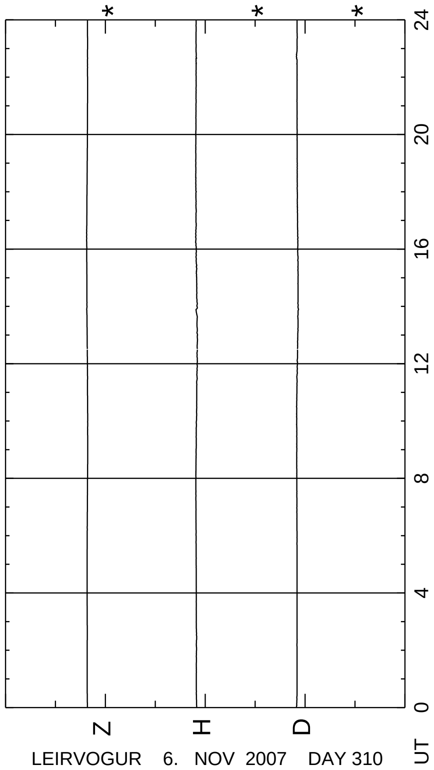
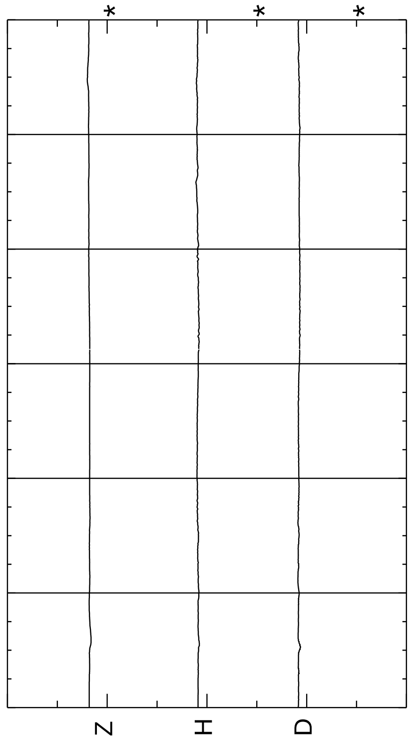
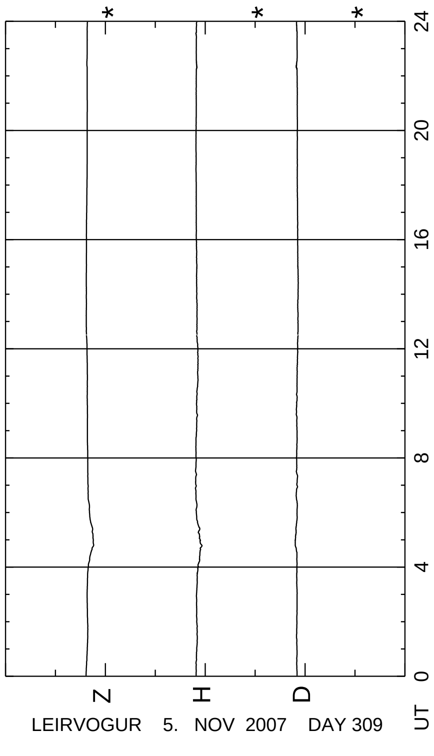


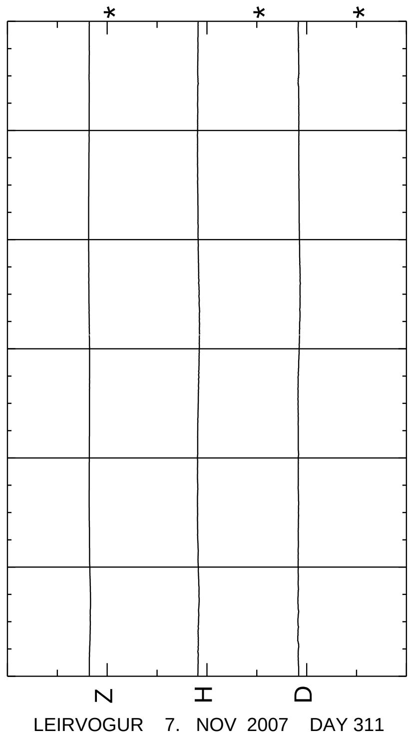
LEIRVOGUR 6. NOV 2007 DAY 310



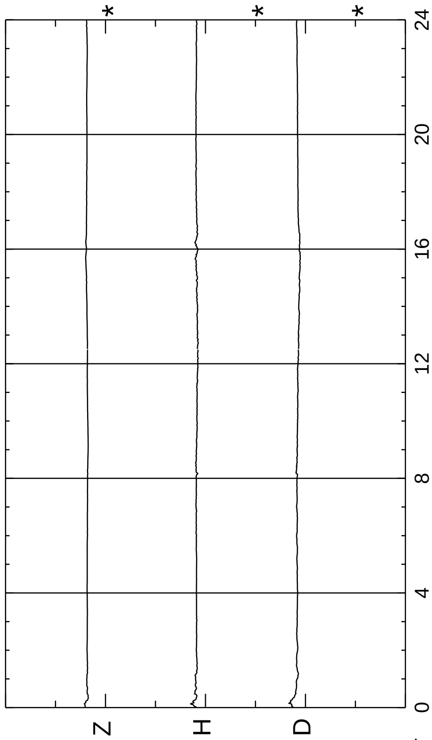
LEIRVOGUR 8. NOV 2007 DAY 312



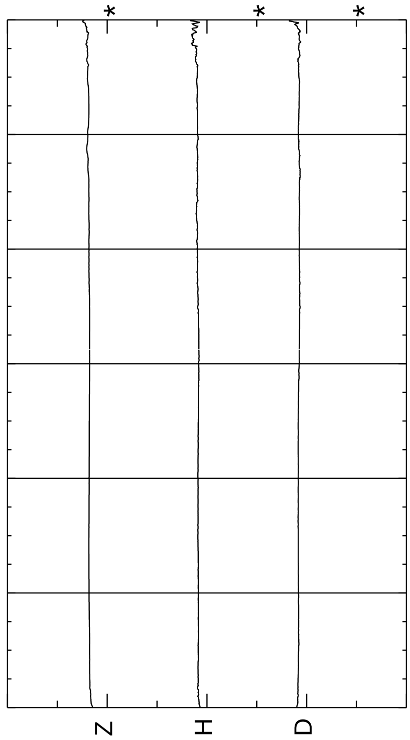
LEIRVOGUR 5. NOV 2007 DAY 309



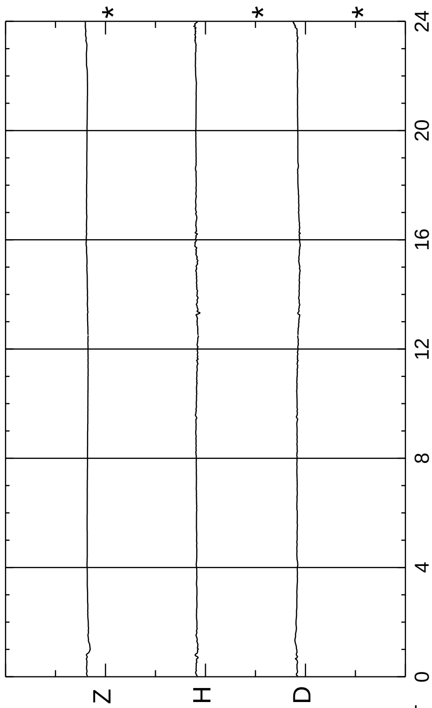
LEIRVOGUR 7. NOV 2007 DAY 311



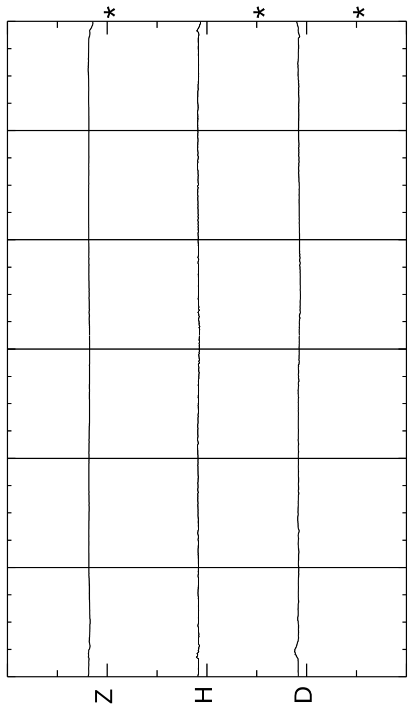
LEIRVOGUR 10. NOV 2007 DAY 314



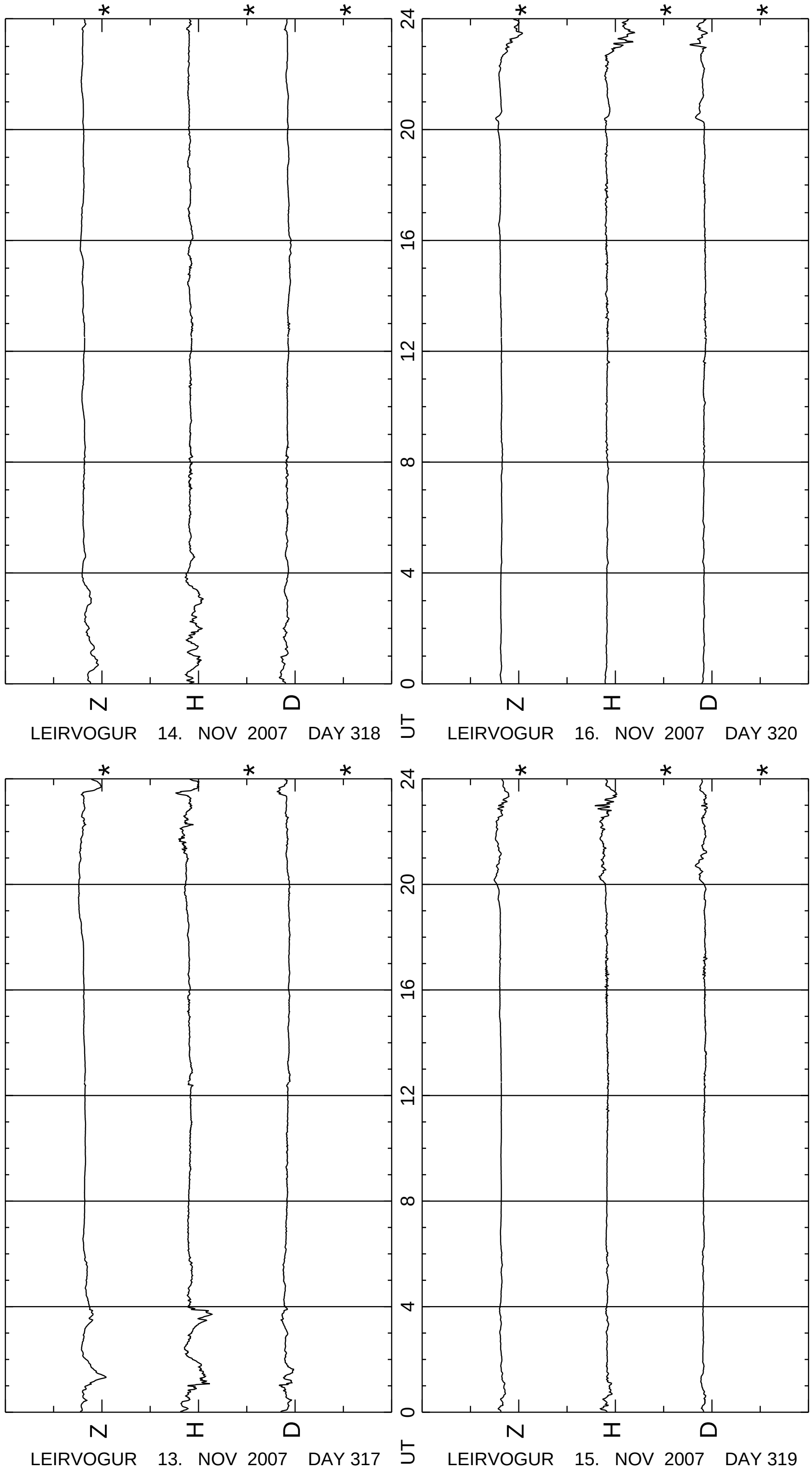
LEIRVOGUR 12. NOV 2007 DAY 316



LEIRVOGUR 9. NOV 2007 DAY 313



LEIRVOGUR 11. NOV 2007 DAY 315


LEIRVOGUR 14. NOV 2007 DAY 318
LEIRVOGUR 16. NOV 2007 DAY 320
LEIRVOGUR 13. NOV 2007 DAY 317
LEIRVOGUR 15. NOV 2007 DAY 319
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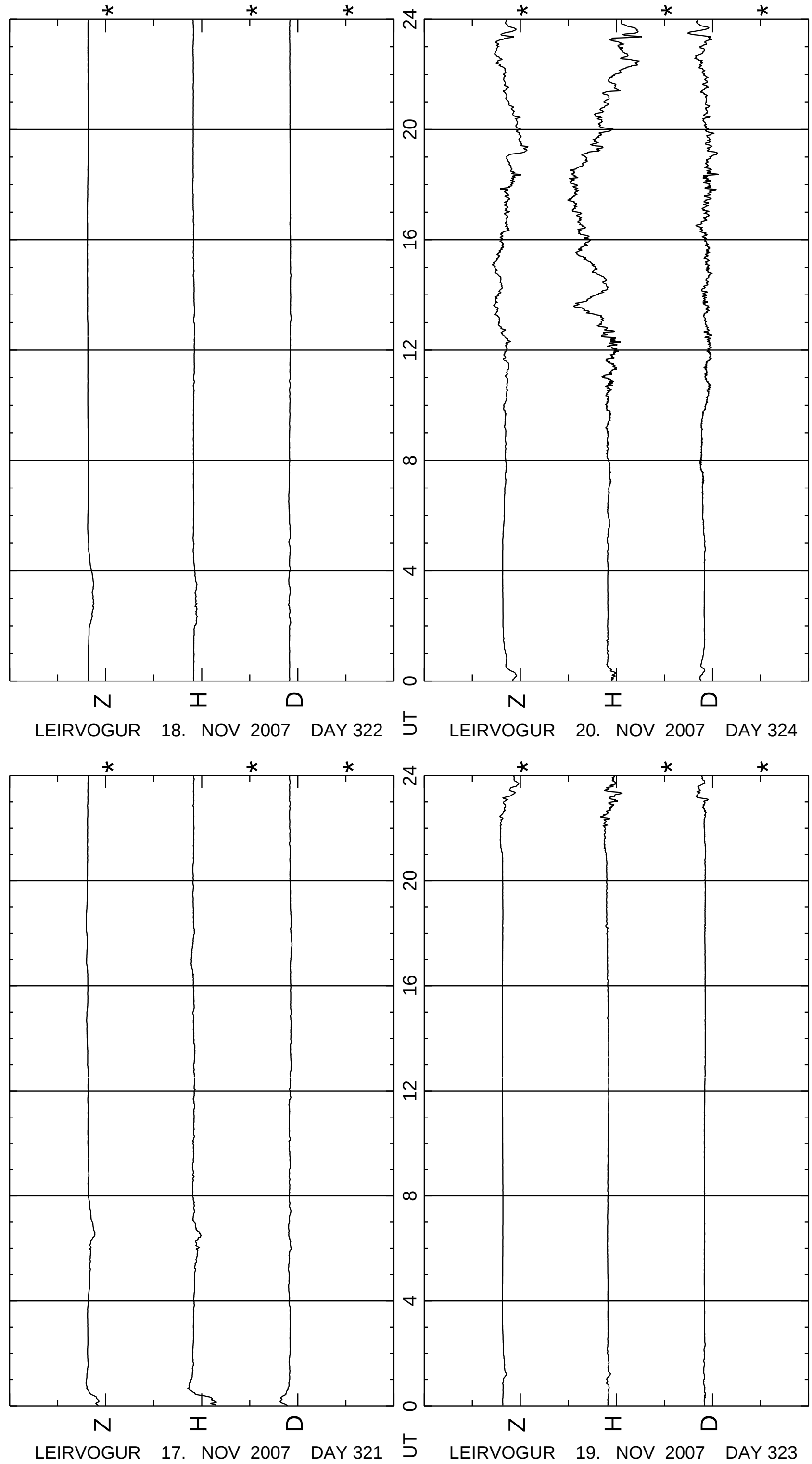
LEIRVOGUR 18. NOV 2007 DAY 322
LEIRVOGUR 20. NOV 2007 DAY 324
LEIRVOGUR 17. NOV 2007 DAY 321
LEIRVOGUR 19. NOV 2007 DAY 323
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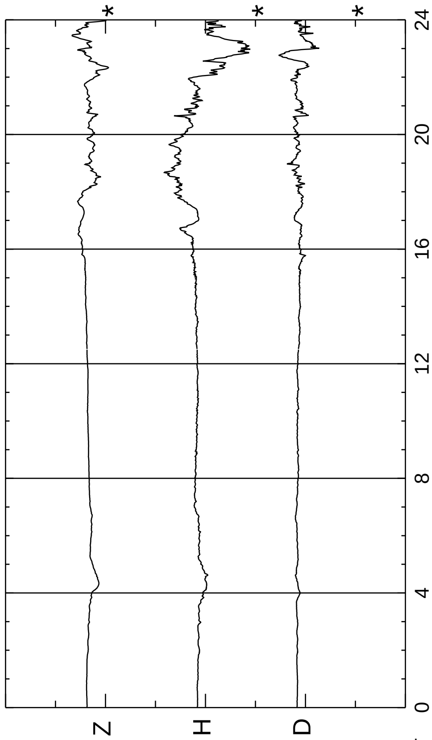
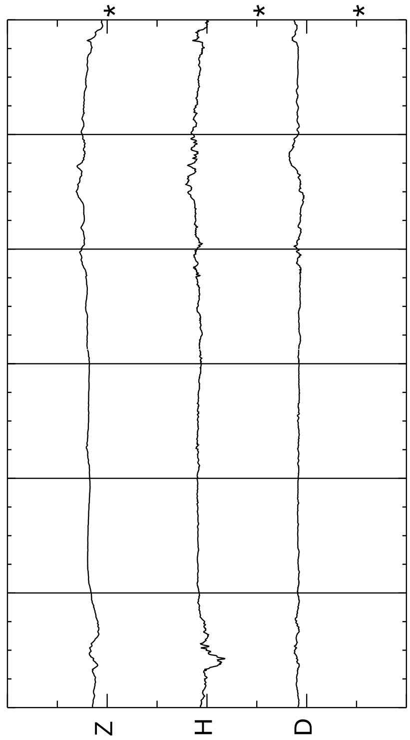
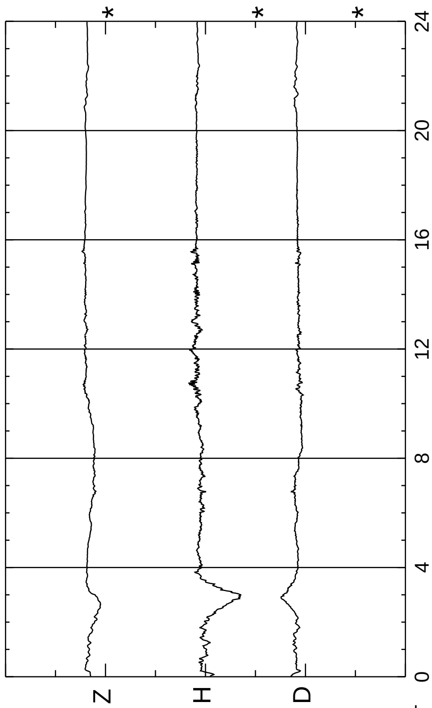


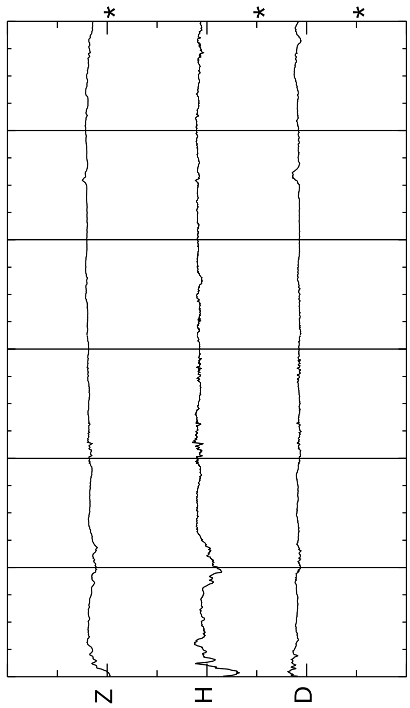
LEIRVOGUR 22. NOV 2007 DAY 326



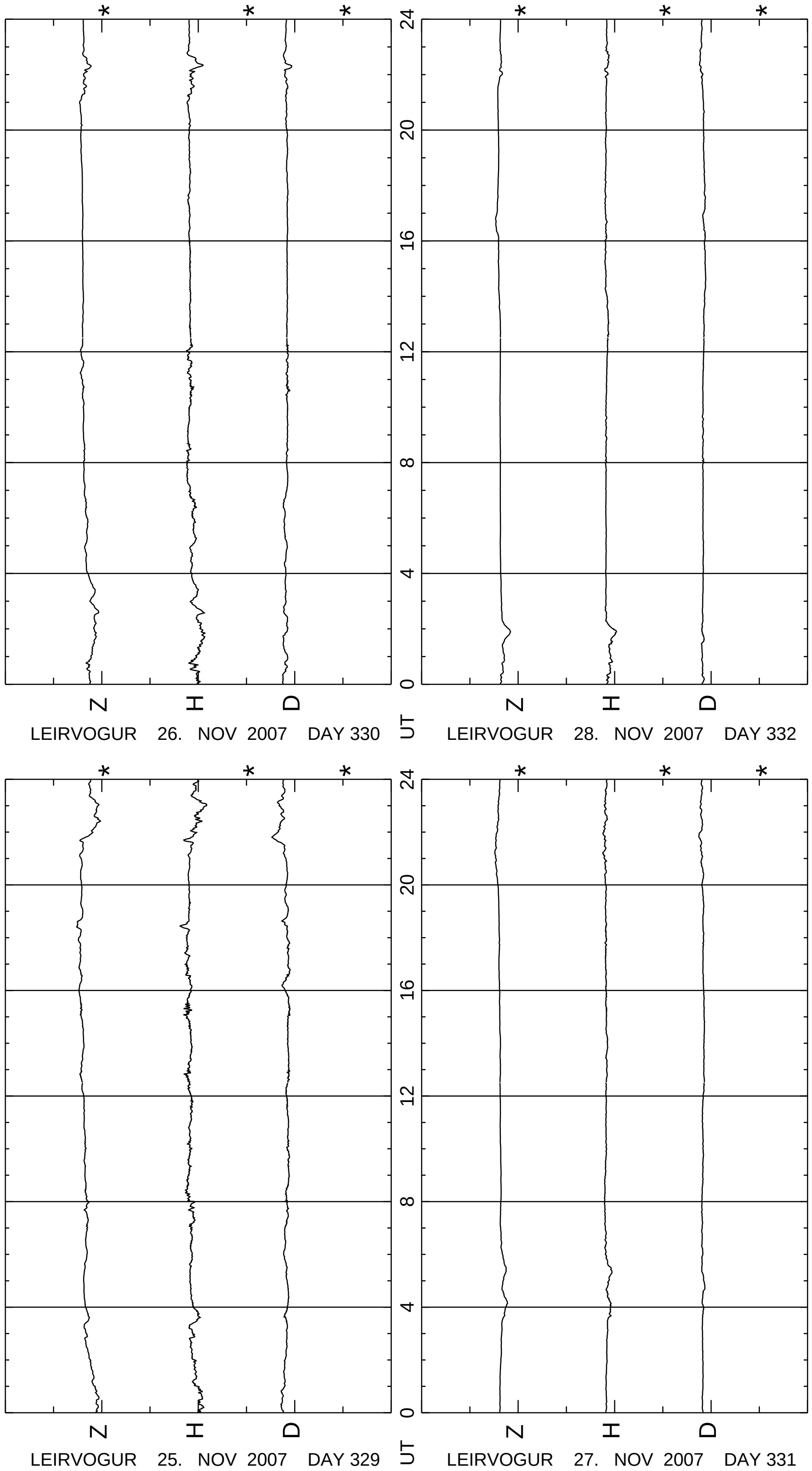
LEIRVOGUR 24. NOV 2007 DAY 328



LEIRVOGUR 21. NOV 2007 DAY 325



LEIRVOGUR 23. NOV 2007 DAY 327


LEIRVOGUR 26. NOV 2007 DAY 330
LEIRVOGUR 28. NOV 2007 DAY 332
LEIRVOGUR 25. NOV 2007 DAY 329
LEIRVOGUR 27. NOV 2007 DAY 331
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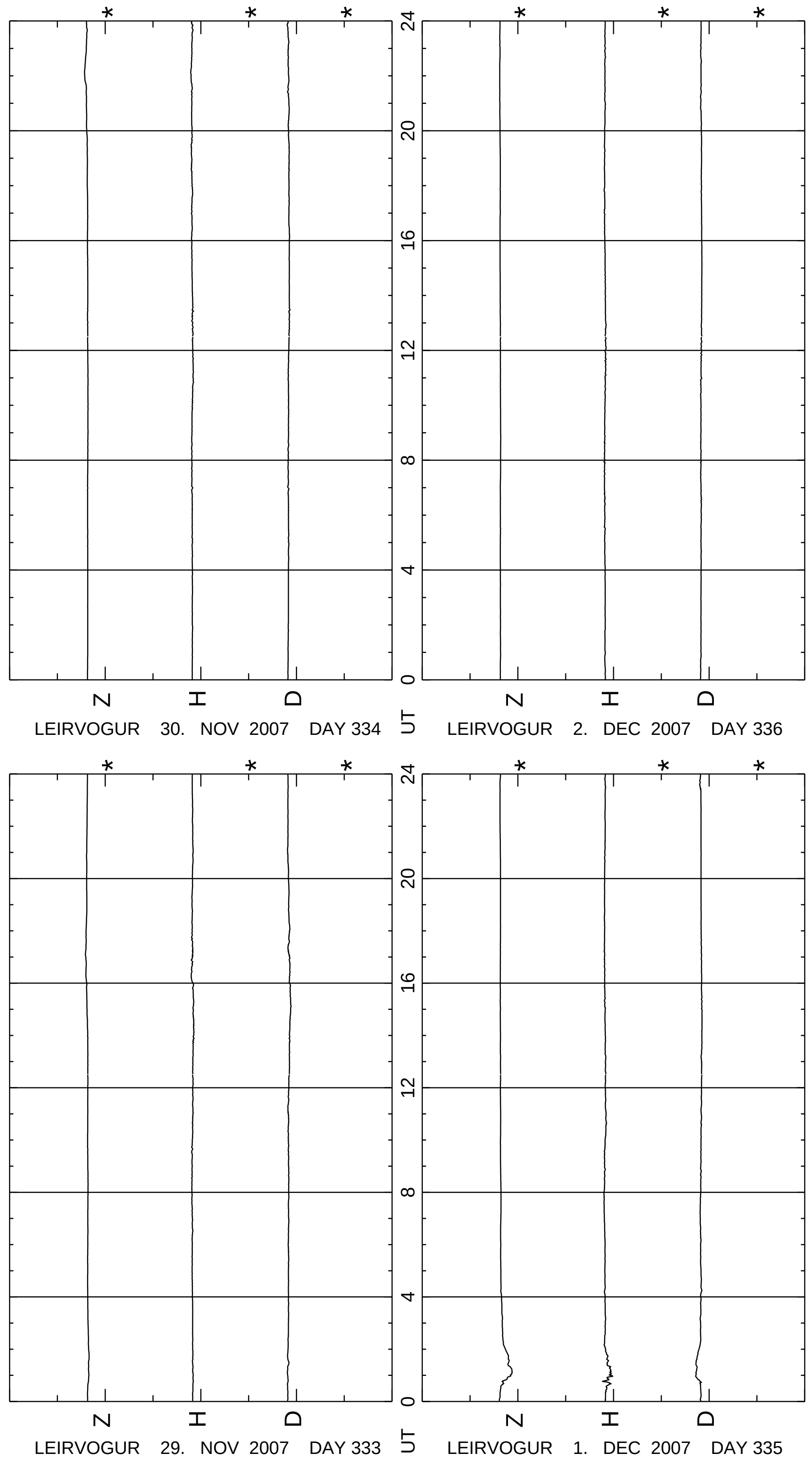
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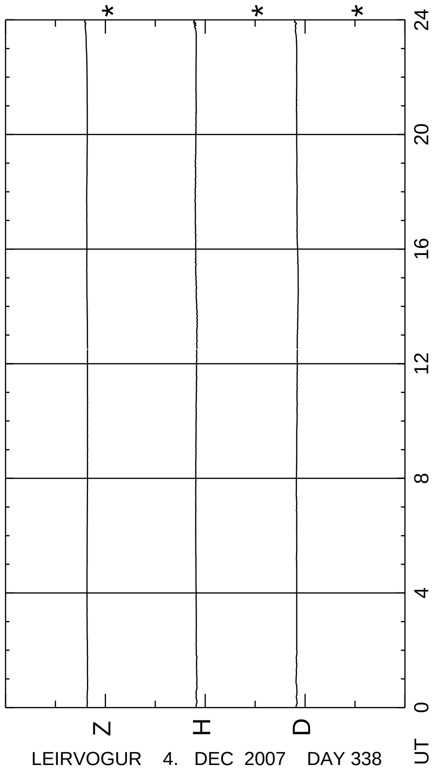
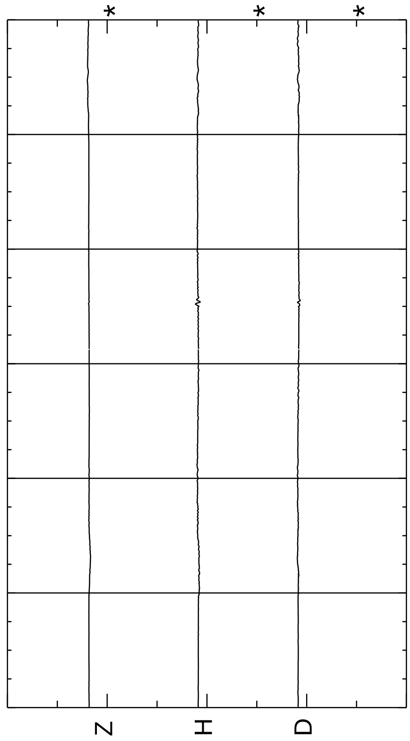
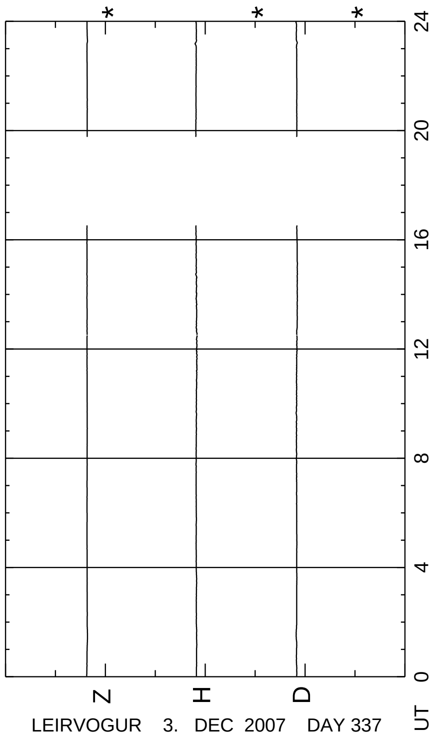
LEIRVOGUR 30. NOV 2007 DAY 334
LEIRVOGUR 2. DEC 2007 DAY 336
LEIRVOGUR 29. NOV 2007 DAY 333
LEIRVOGUR 1. DEC 2007 DAY 335



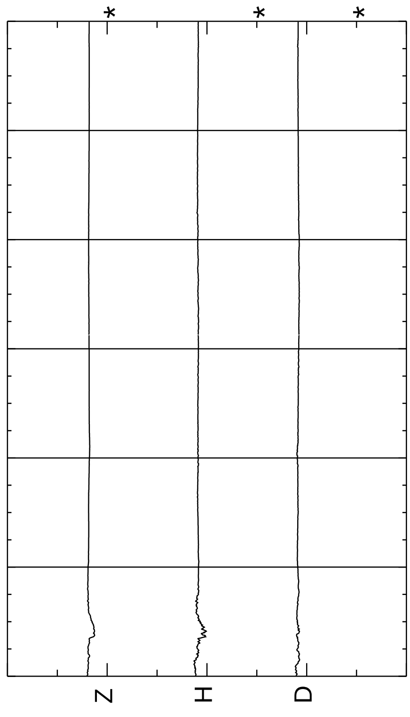
LEIRVOGUR 4. DEC 2007 DAY 338



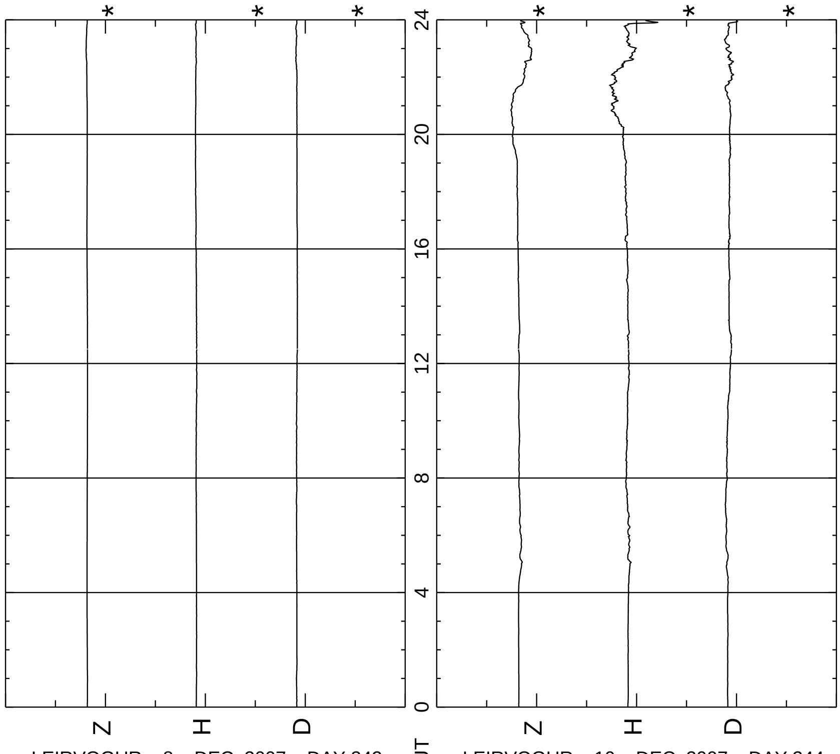
LEIRVOGUR 6. DEC 2007 DAY 340



LEIRVOGUR 3. DEC 2007 DAY 337

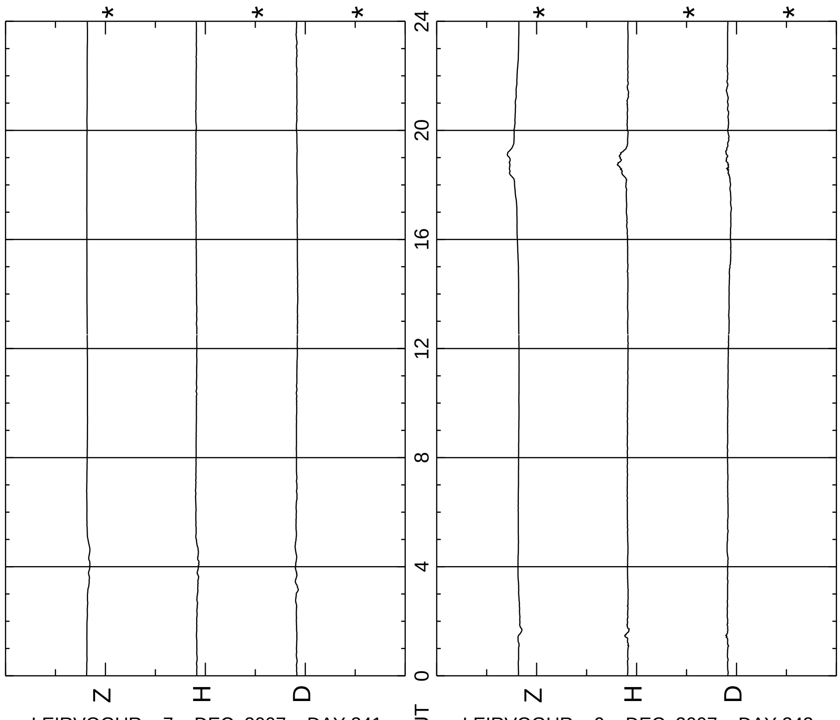


LEIRVOGUR 5. DEC 2007 DAY 339



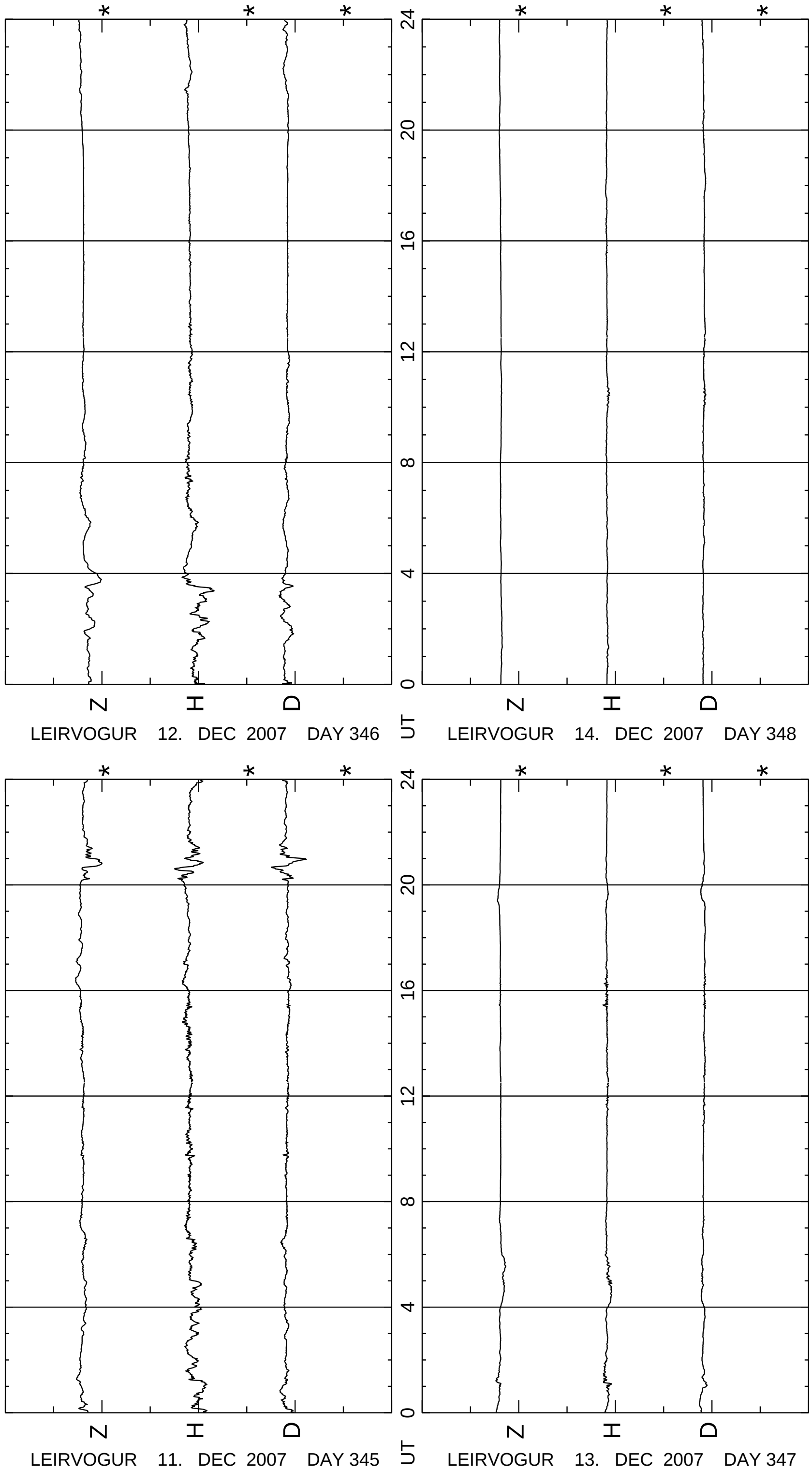
LEIRVOGUR 8. DEC 2007 DAY 342

LEIRVOGUR 10. DEC 2007 DAY 344



LEIRVOGUR 7. DEC 2007 DAY 341

LEIRVOGUR 9. DEC 2007 DAY 343



LEIRVOGUR 12. DEC 2007 DAY 346
LEIRVOGUR 14. DEC 2007 DAY 348
LEIRVOGUR 11. DEC 2007 DAY 345
LEIRVOGUR 13. DEC 2007 DAY 347
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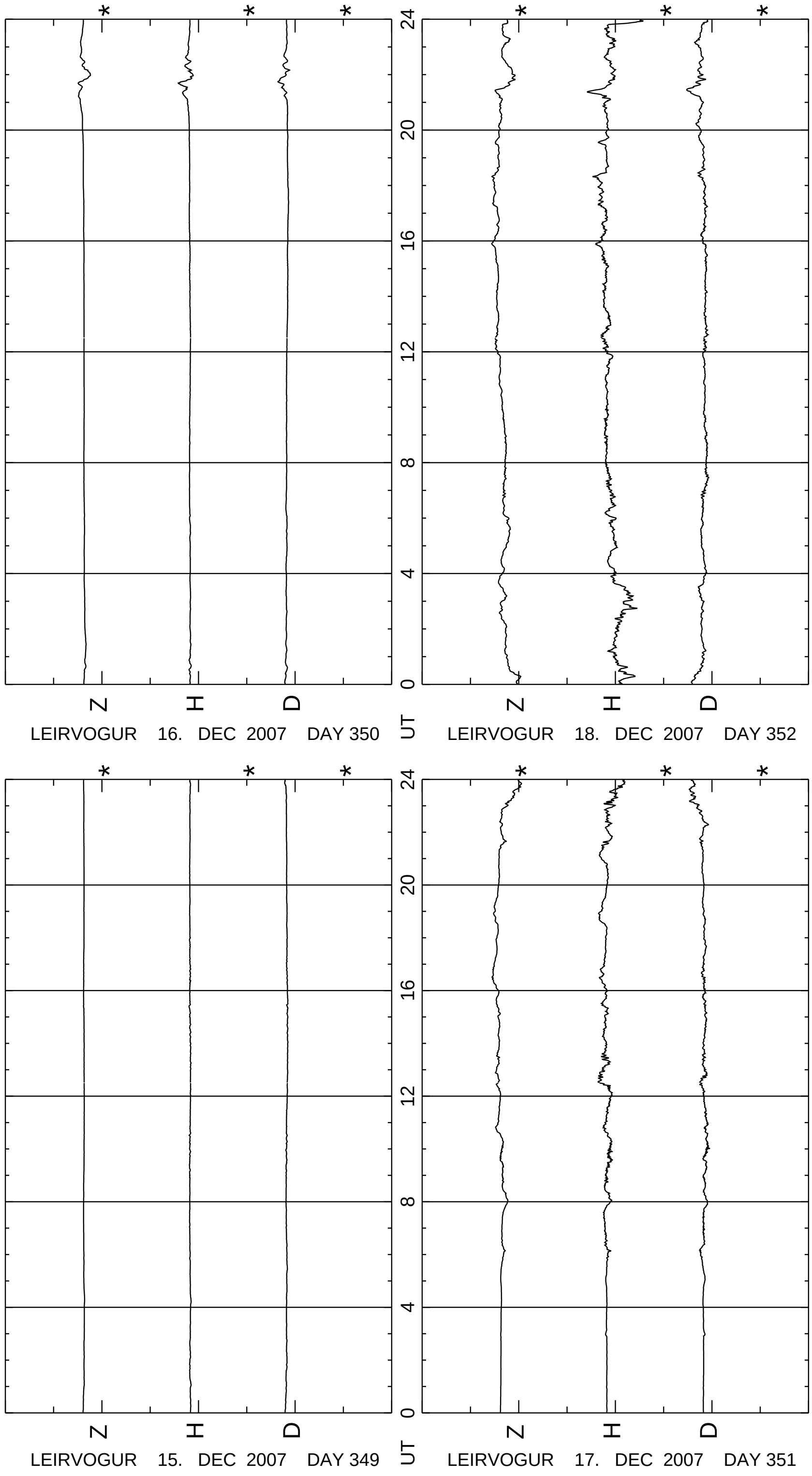
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LEIRVOGUR 18. DEC 2007 DAY 352
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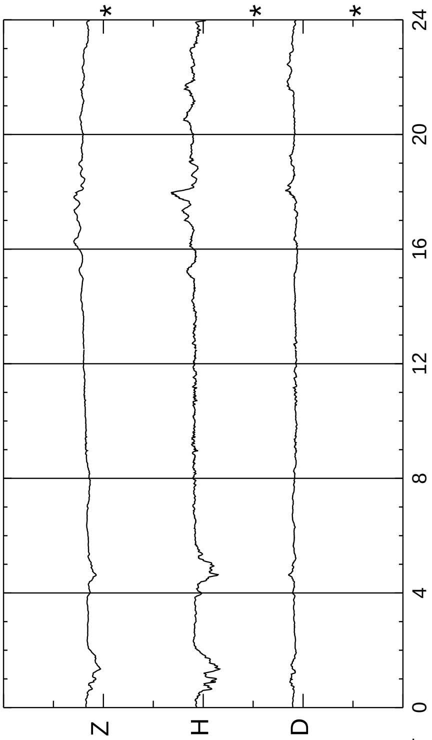
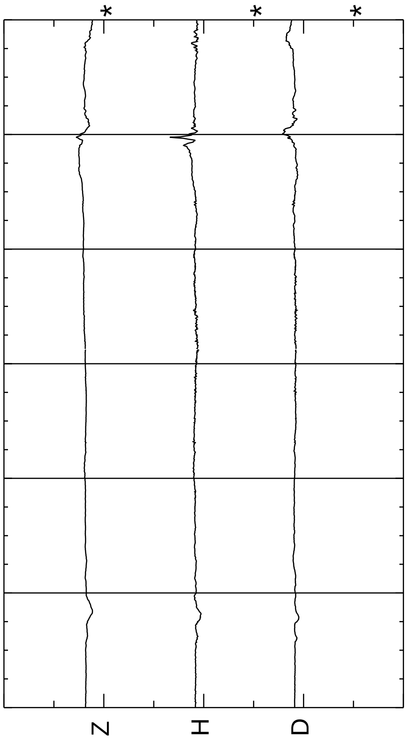
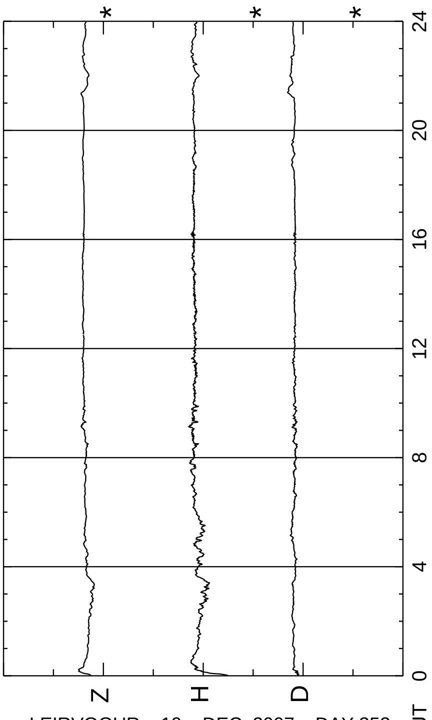


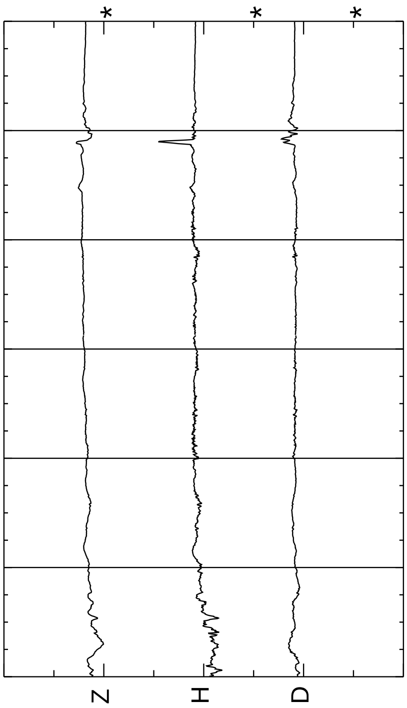
LEIRVOGUR 20. DEC 2007 DAY 354



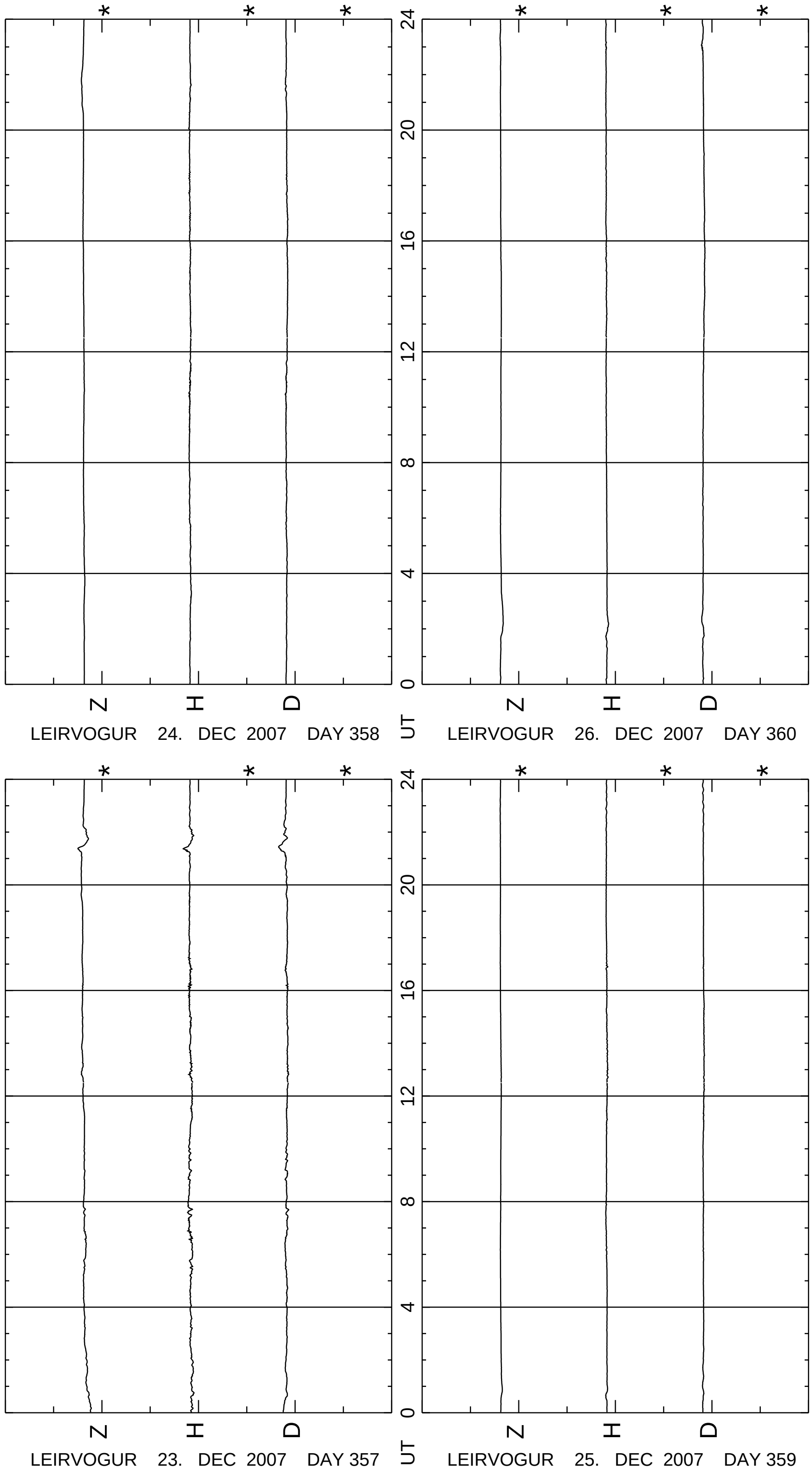
LEIRVOGUR 22. DEC 2007 DAY 356



LEIRVOGUR 19. DEC 2007 DAY 353



LEIRVOGUR 21. DEC 2007 DAY 355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LEIRVOGUR 26. DEC 2007 DAY 360
LEIRVOGUR 23. DEC 2007 DAY 357
LEIRVOGUR 25. DEC 2007 DAY 359
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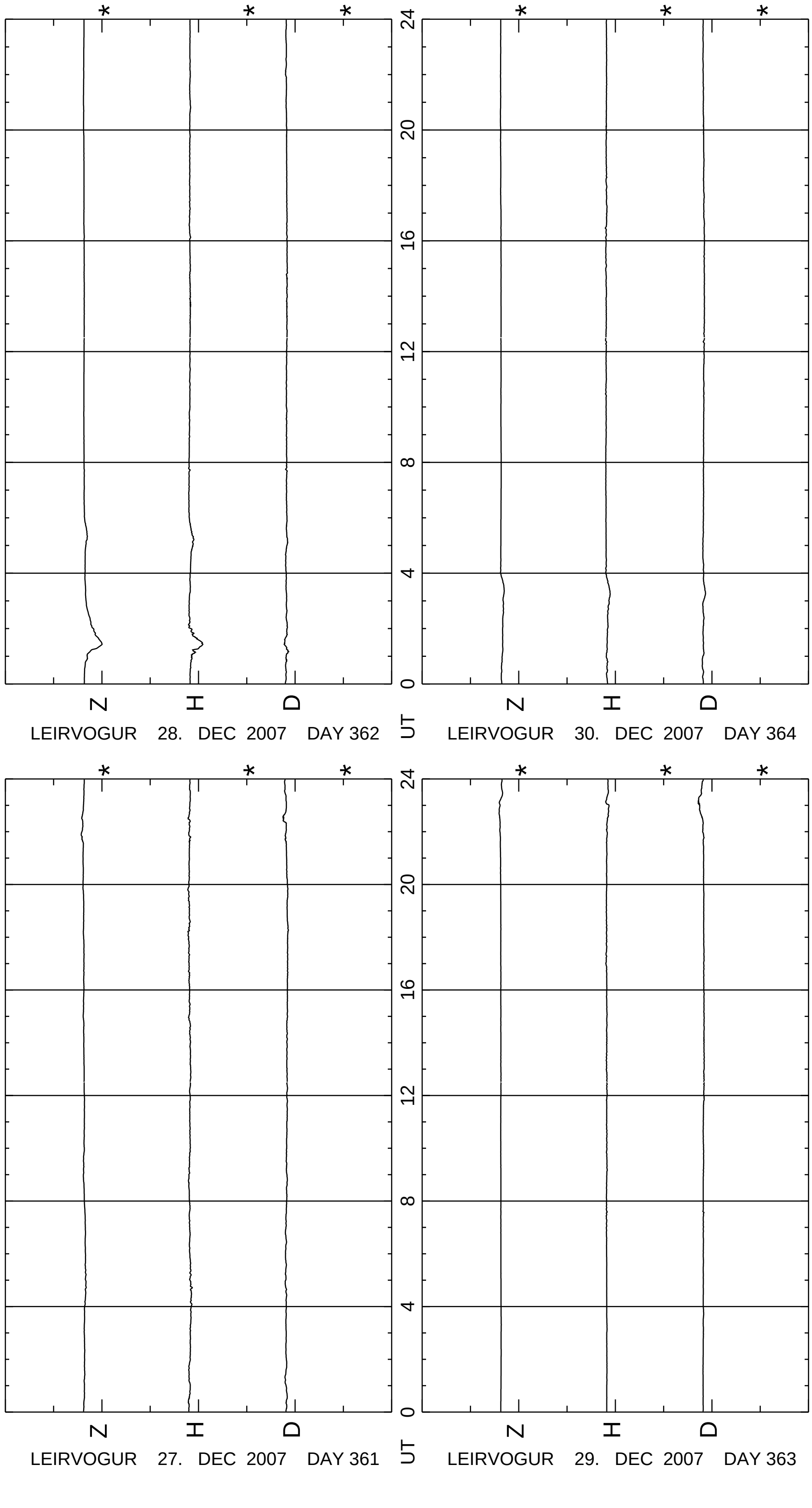
Z H D
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LEIRVOGUR 30. DEC 2007 DAY 364
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LEIRVOGUR 27. DEC 2007 DAY 361
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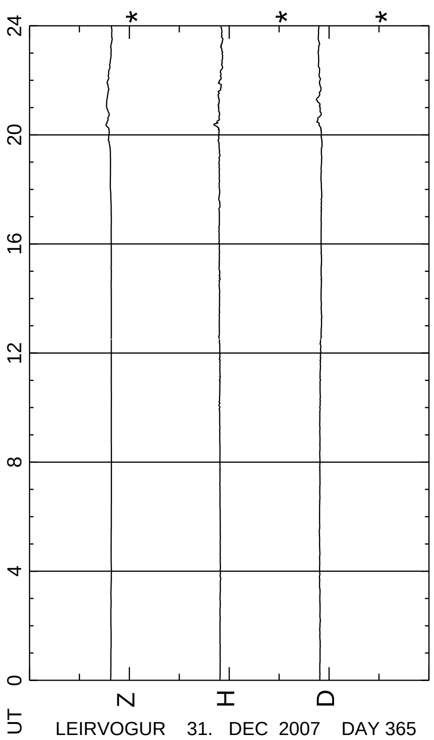
LEIRVOGUR 29. DEC 2007 DAY 363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LEIRVOGUR 31. DEC 2007 DAY 365

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
	2	-6		11.8	1	9	42		0.4
1982	50004	12399	339	25.6	51519	11608	-4357	76	4.4

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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
	14	17		16.8	17	32	55		-0.9
2007	50178	12575	345	35.0	51729	12179	-3131	75	55.8