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LEIRVOGUR

MAGNETIC RESULTS

2013

REYKJAVÍK 2014

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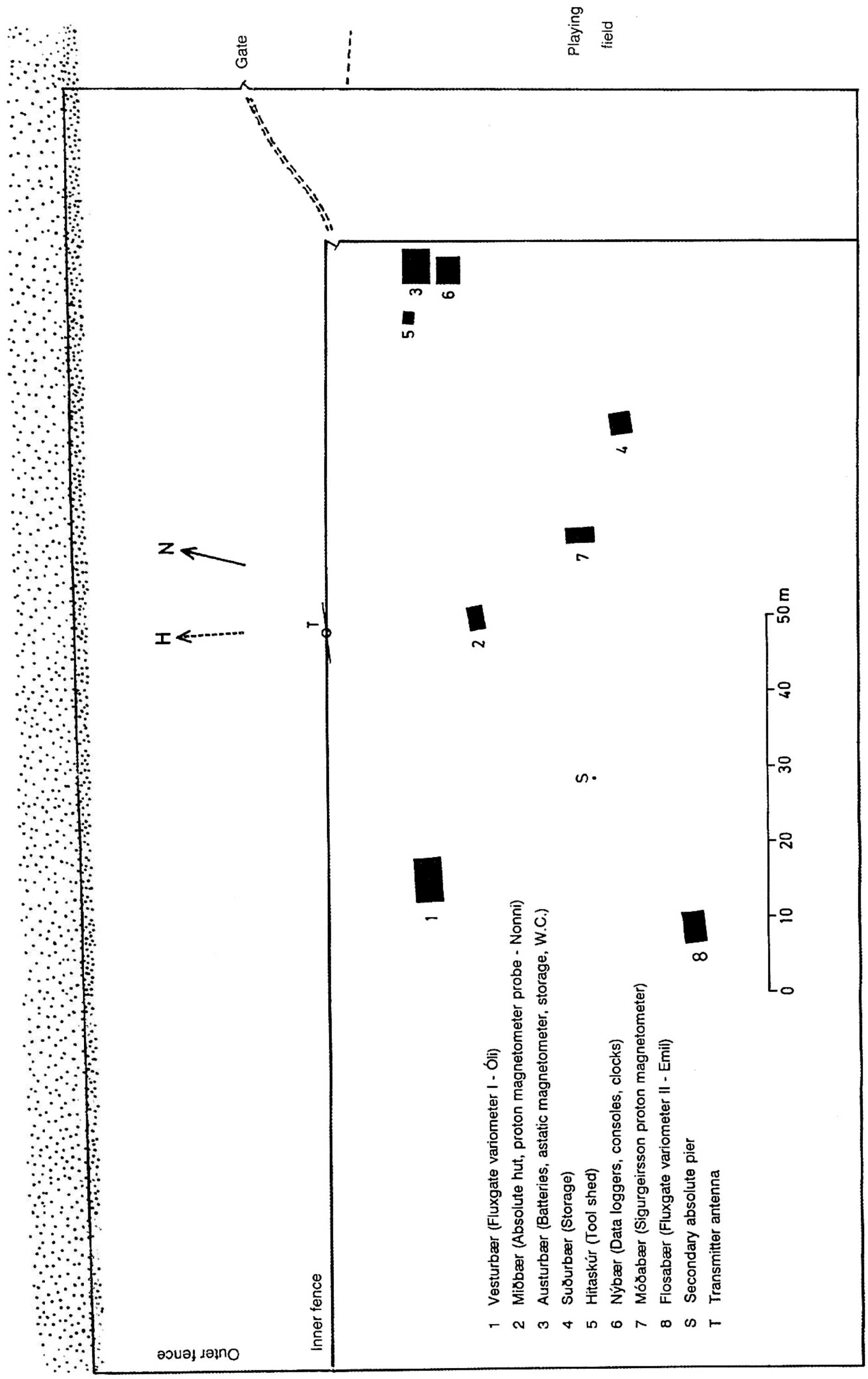
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INTRODUCTION

This volume contains the results of geomagnetic measurements carried out at the Leirvogur Magnetic Observatory in Iceland during the year 2013. 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

$$64^\circ 10\overset{\prime}{.}986\ \mathrm{N},\quad 21^\circ 41\overset{\prime}{.}920\ \mathrm{W}\ \ (\mathrm{WGS84}).$$

The geomagnetic coordinates relative to a pole position of $79\overset{\circ}{.}4$ N, $71\overset{\circ}{.}7$ W are $69\overset{\circ}{.}4$ N, $71\overset{\circ}{.}8$ E. The McIlwain L-parameter of the observatory in 2013 was approximately 5.4 earth-radii, the corresponding corrected geomagnetic latitude being $64\overset{\circ}{.}5$. The geomagnetic conjugate point at 100 km altitude was at $68\overset{\circ}{.}9$ S, $27\overset{\circ}{.}9$ E geographic, about 470 km from the Japanese Antarctic station Syowa.

PERSONNEL

In 2013, the Upper Atmosphere Section had a staff of two: Gunnlaugur Björnsson, director and Pálmi Ingólfsson, research assistant in a part-time position. Former director Þorsteinn Sæmundsson continued to serve in an advisory capacity. He and Edda Lína Gunnarsdóttir, physicist, made absolute measurements on occasions when Gunnlaugur was away.

Kristján Jónsson, an electrical engineer from the Science Institute, helped diagnose and repair battery problems with one of the DI-flux electronics and to diagnose problems with one of the Omega-clocks. Runólfur Valdimarsson, a retired technician of the Science Institute, fixed a problem with the lock on Flosabær.

Jóhannes Gunnarsson and Pétur B. Kristjánsson, visited on January 23. On March 27, Ásbjörn Þorvarðarson, planning officer from the local community advised on the location of a new septic tank that needed to be installed.

DEVELOPMENTS

The staff made 74 trips to the observatory in 2013, somewhat more than in a regular year. Most of the additional trips were due to preparations for a Nordic Comparison meeting in May. 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 minimal snowfalls that did not cause any major problems. The lowest temperature was $-14°$C in December, and the highest was $+24°$C in July.

Construction work at the nearby housing project continued at a modest pace. It is unclear when the project will be completed. So far, no major problems have been caused by the new neighbours that have already moved in.

The electrical supply was uninterrupted during the year.

On March 6, a sudden blizzard caused severe traffic problems in Reykjavík and prevented a visit to the site. The following day it was discovered that someone had smashed both front door windows of the Fabia that was parked outside the Institute. No absolute measurement was done during that week.

In April, a new septic tank was installed at the observatory, replacing a very old one of ancient 'design' and construction.

On July 31, the phone and network connections were lost due to a line failure. This was promptly fixed by the phone company and connection restored in a couple of days.

Digital fluxgate systems I and II

Both dataloggers ran perfectly and without a hitch during the entire year. They have now been running uninterrupted for almost two years (system I) and for over six years (system II), without failure and without a need of a reboot.

On June 13, 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 6.

The thermostat in Vesturbær which houses System I (Óli) was adjusted from winter level ($13°$C) to summer level ($20°$C) on June 3. Readjustment took place on November 13.

Móði

The proton magnetometer Móði worked without problems during the entire year.

Saxi

The Overhauser magnetometer Saxi (GSM90) worked reliably most of the year. On several occasions, however, errors occurred in the time-stamp of individual mesurements. The cause of these were not immediately clear. The errors were few and far between and were easily corrected. Saxi is now used as the main source of the total field, F, with Móði as a reserve.

Geó II

The conventional proton magnetometer Geó (G856-AX) was used in the absolute measurements. The setup has worked very well although on several occasions the signal from the probe in Miðbær was too weak to give reliable readings. In those cases Geó was moved to Miðbær and a shorter cable used.

Backup computers

A new Linux-computer “Tesla”, was set up early in the year. It is solely used for handling the LRV data, for storage and final processing for both systems I and II. It is regularily backed up to an external hard disk.

The Linux-computer “Cygnus” is used at the Science Institute for receiving and storing data from Leirvogur and worked without problems throughout the year. Data from both systems I and II are transferred regularly to the Institute.

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

The Network Time Protocol service (*NTP*) is used for timing the data. It is checked regularily against GPS signals. A quartz clock of the type Omegaface that was used earlier for timing the data is kept operating as a reserve. 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 internal battery in the main Omega-clock was replaced early in the year.

ADSL connection

The ADSL-connection worked without major problems most of the year, except for the period when the phone line failed at the end of July. Backup data are transferred to the Science Institute from systems I and II every 10 minutes.

Software development

Work continued on improving the various data handling routines and procedures. Most of the programs in use are now written in *Python*. The improved procedures for analysis and correction of the raw measurements to provide absolute data are now routinely applied. Both systems are on-line with one second time resolution and semi-automatic data handling.

General maintenance and modifications

Trees and hedges were pruned and fertilizer applied in the spring. Because of the warm weather, tree growth was almost as vigorous as in previous years. During the summer and autumn, the grass around the observatory was cut from time to time with a lawnmower and a brush cutter.

The fence at the north-side of the observatory was in need of rather extensive repair that was carried out in the early summer months.

Nordic comparison meeting

On May 6 and 7, the observatory hosted the 47th Nordic meeting for comparison of instruments. The meeting was attended by Patrik Johansson and Anders Gustafsson from Uppsala, Jürgen Matzka, Lars W. Pedersen, and Anna N. Willer from DTU Space, Lars-Göran Vanhainen and Daria Mikhaylova from Kiruna, Truls L. Hansen and Magnar G. Johnsen from Tromsø, Tero Raita from Sodankylä and Kari Pajunpää, from Nurmijärvi.

The observatory buildings are too small for a group of this size. A nearby house serving the football field next to the observatory was therefore borrowed and used for discussions and work during the meeting.

All measurements were carried out on the main pier in the absolut hut Miðbær. In total, 27 sets of measurements were obtained during the two days. The results are discussed on page 20.

Participants of the 47th Nordic Comparison Meeting: From left, Patrik Johansson, Gunnlaugur Björnsson, Anders Gustafsson, Anna N. Willer, Lars-Göran Vanhainen, Tero Raita, Jürgen Matzka, Truls L. Hansen, Lars W. Pedersen, Kari Pajunpää, Magnar G. Johnsen, Daria Mikhaylova.

MAGNETOMETERS

The observatory possesses the following instruments:

1. A triaxial fluxgate variometer, "Óli" (Óli II, System I), of the type FGE, version E, from the Danish Meteorological Institute, with suspended sensors. The data logger is an industrial A/D converter connected to a laptop computer running Linux. 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) and a measurement of each component is recorded at 1-second intervals. Data delivery from the logger to the Institute is automatic every 10 minutes and every morning at 03:15.

2. A triaxial fluxgate variometer "Emil" (Emil II, System II), of the type FGE, version K, from the Danish Meteorological Institute, with suspended sensors. The data logger is identical to System I. This system serves as a backup for Óli. All the 1-minute data from this instrument are fully processed. Data delivery to the Institute is automatic every 10 minutes and every morning at 02:15.

3. A triaxial fluxgate variometer, Emil I, of the type FG84C. This instrument was replaced by Emil II on December 18, 2006, but is 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 logger serving the fluxgate variometer Emil. The 10-second averages are also recorded.

6. A Gemsys GSM90 Overhauser magnetometer (“Saxi”). This provides a recording of the total force F every three seconds. Data delivery to the Institute is automatic every 10 minutes and every morning at 02:05.

7. A Geometrics G856-AX proton magnetometer (“Geó II”).

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

9. A second, identical DI-flux instrument, “Stefnir-II”, also with electronics from Tromsø.

10. 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 *NTP* network service is used to correct the time on the laptop computers. It is typically accurate to within 10 milliseconds. It is checked regularily against a signal from the Global Positioning System (GPS). The older digital fluxgate loggers were controlled by a quartz crystal clock which is adjusted using GPS.

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 Saxi 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 2013 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, using data from Saxi. As the probe of Saxi is situated some 15 meters from the absolute pier, a site correction must be applied. Its value is checked by comparison measurements once a week. In 2013, the correction varied between -9.9 nT and -10.4 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. By combining the values of inclination and 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 21. 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 47804 nT for Z, 10166 nT for H and 2199 nT for D (see yearbooks 2002, p. 14 and 2012, p. 12). 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

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

where Z_0, H_0, and D_0 are the base-line values. The adopted base-line values for 2013 were as follows:

Vertical intensity (Z_0):

		nT
Jan 1	– Apr 28	-1.5
Apr 29	– May 25	-2.0
May 26	– Jun 3 (13:20)	-1.5
Jun 3	– Jun 3 (18:20)	-1.0
Jun 3	– Jun 15	-0.5
Jun 16	– Jun 30	-1.0
Jul 1	– Oct 3	-0.5
Oct 4	– Nov 13 (15:00)	0.0
Nov 13	– Nov 13 (18:00)	-0.5
Nov 13	– Nov 13 (19:30)	-1.0
Nov 13	– Nov 13 (21:00)	-1.5
Nov 13	– Dec 15	-2.0
Dec 16	– Dec 31	-1.5

Horizontal intensity (H_0):

		nT
Jan 1	– Apr 6	-8.0
Apr 7	– Jun 3 (13:20)	-7.5
Jun 3	– Jun 3 (15:00)	-7.0
Jun 3	– Jun 3 (16:40)	-6.5
Jun 3	– Jun 3 (18:20)	-6.0
Jun 3	– Jun 3 (20:00)	-5.5
Jun 3	– Jul 20	-5.0
Jul 21	– Aug 11	-5.5
Aug 12	– Sep 30	-5.0
Oct 1	– Oct 27	-5.5
Oct 28	– Nov 13 (15:00)	-5.0
Nov 13	– Nov 13 (16:30)	-5.5
Nov 13	– Nov 13 (18:00)	-6.0
Nov 13	– Nov 13 (19:30)	-6.5
Nov 13	– Nov 13 (21:00)	-7.0
Nov 13	– Dec 15	-7.5
Dec 16	– Dec 31	-8.0

Declination (D_0):

Jan 1	– Jan 5	$346° \; 24.'0$
Jan 6	– Feb 3	$346° \; 24.'1$
Feb 4	– Mar 6	$346° \; 24.'2$
Mar 7	– Apr 6	$346° \; 24.'1$
Apr 7	– May 19	$346° \; 24.'2$
May 18	– Jun 3 (13:20)	$346° \; 24.'1$
Jun 3	– Jun 3 (18:20)	$346° \; 24.'0$
Jun 3	– Jun 3 (20:00)	$346° \; 23.'9$
Jun 3	– Jun 23	$346° \; 23.'8$
Jun 24	– Jul 6	$346° \; 23.'7$
Jul 7	– Aug 24	$346° \; 23.'8$
Aug 25	– Oct 27	$346° \; 23.'7$
Oct 28	– Nov 13 (15:00)	$346° \; 23.'6$
Nov 13	– Nov 13 (16:30)	$346° \; 23.'7$
Nov 13	– Nov 13 (18:00)	$346° \; 23.'8$
Nov 13	– Nov 13 (19:30)	$346° \; 23.'9$
Nov 13	– Nov 13 (21:00)	$346° \; 24.'0$
Nov 13	– Nov 13 (22:30)	$346° \; 24.'1$
Nov 13	– Nov 20	$346° \; 24.'2$
Dec 1	– Dec 19	$346° \; 24.'0$
Dec 20	– Dec 31	$346° \; 24.'2$

The changes in base lines on June 3 and November 13 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 22. 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 2013 were as follows:

Vertical intensity (Z_0):

		nT
Jan 1	– Apr 13	0.0
Apr 14	– Jun 13 (13:20)	-0.5
Jun 13	– Jun 13 (15:00)	-1.0
Jun 13	– Jun 13 (16:40)	-1.5
Jun 13	– Jul 6	-2.0
Jul 7	– Jul 20	-1.5
Jul 21	– Aug 3	-2.0
Aug 4	– Oct 31	-1.5
Nov 1	– Nov 6 (15:00)	-1.0
Nov 6	– Dec 31	-0.5

Horizontal intensity (H_0):

		nT
Jan 1	– Jun 13 (11:40)	-10.0
Jun 13	– Jun 13 (13:20)	-10.5
Jun 13	– Jun 13 (15:00)	-11.0
Jun 13	– Jun 13 (16:40)	-11.5
Jun 13	– Jun 13 (18:20)	-12.0
Jun 13	– Jun 30	-12.5
Jul 1	– Jul 20	-12.0
Jul 21	– Aug 11	-12.5
Aug 12	– Oct 12	-12.0
Oct 13	– Nov 6 (15:00)	-12.5
Nov 6	– Nov 6 (18:00)	-12.0

		nT
Nov 6	– Nov 6 (19:30)	-11.5
Nov 6	– Nov 6 (21:00)	-11.0
Nov 6	– Nov 6 (22:30)	-10.5
Nov 6	– Nov 30	-10.0
Dec 1	– Dec 15	-9.5
Dec 16	– Dec 31	-10.0

Declination (D_0):

Jan 1	– Feb 10	$346° 20.'3$
Feb 11	– Mar 6	$346° 20.'4$
Mar 7	– Apr 6	$346° 20.'3$
Apr 7	– May 31	$346° 20.'4$
Jun 1	– Jun 13 (11:40)	$346° 20.'5$
Jun 1	– Jun 13 (15:00)	$346° 20.'4$
Jun 1	– Jun 13 (16:40)	$346° 20.'3$
Jun 13	– Jul 6	$346° 20.'2$
Jul 7	– Jul 20	$346° 20.'1$
Jul 21	– Aug 24	$346° 20.'2$
Aug 25	– Oct 12	$346° 20.'1$
Oct 13	– Nov 16	$346° 20.'2$
Nov 17	– Dec 23	$346° 20.'3$
Dec 23	– Dec 31	$346° 20.'4$

The steps in the base lines on June 13 and November 6 were caused by adjustments of the thermostat in the variometer house. The temperature coefficients are approximately 0.1 nT/°C for Z, 0.2 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.

The 1-minute means of F are calculated from the 3-second readings of Saxi, giving 20 measurements each minute. A site reduction is needed because the probe of Saxi is some distance away from the observatory reference pier as mentioned earlier. The value of δF is found by comparing the signal from Saxi 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 2013 were as follows:

		δF (nT)
Jan 1	– Jan 20	-10.3
Jan 21	– Feb 10	-10.2
Feb 11	– Feb 16	-10.1
Feb 17	– Feb 28	-10.2
Mar 1	– Mar 24	-10.0
Mar 25	– Apr 6	-10.1
Apr 7	– Apr 21	-9.9
Apr 22	– Apr 28	-10.0
Apr 29	– May 19	-10.1
May 20	– Jun 23	-10.2
Jun 24	– Jul 6	-10.3
Jul 7	– Jul 20	-10.1
Jul 21	– Aug 3	-10.2
Aug 4	– Aug 31	-10.3
Sep 1	– Sep 14	-10.2
Sep 15	– Sep 21	-10.0
Sep 22	– Oct 12	-10.2
Oct 13	– Oct 27	-10.1
Oct 28	– Nov 23	-10.2
Nov 24	– Nov 30	-10.4
Dec 1	– Dec 23	-10.3
Dec 24	– Dec 31	-10.2

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 0.13 nT. Most of the values (99.72%) were in the range -1 to $+1$ nT, 0.20% reached ± 2 nT, and there were 403 cases of a higher value.

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. All these factors can cause M to depart from zero, especially during magnetic storms.

In 2013, the 1-minute data for Z, H and D were complete. The gaps in the Saxi data were 10311 or 1.96% of the total time. Most of these were due to testing and occasional problems with the logging computer.

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 Overhauser magnetometer Saxi.

The hourly means of Z and H were checked by comparing them with the hourly means of F and tabulating the difference M (see above). In 2013, individual rounded 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 2013 was among the lowest on record at Leirvogur and there were no highly disturbed days. The most significant disturbances occurred on the following days:

Date	*K-sum*	*C9*	*L9*
Mar 17	(46)	(7)	(7)
May 25-26	(45,38)	(6,5)	(7,6)
Jun 1	(44)	(7)	(7)
Jun 7	(22)	(6)	(5)
Jun 29	(44)	(7)	(6)
Jul 6	(50)	(6)	(7)
Oct 2	(59)	(7)	(7)

These and other disturbances are displayed in the graphical records on pages 32–123. The index L9 was explained in the yearbook for 1998.

The index K reached the extreme value 9 only once in 2013, and the value 8 ten times. The year was one of the quietest at Leirvogur as is evident from the tables on pages 29 and 30.

COMPUTER PROGRAMS

Approximately 40 programs are used for data handling and processing. Most are in Python, one in C and ten in GNU-awk and Linux command scripts.

DATA DISTRIBUTION

Magnetic results from Leirvogur are sent to two data centres: 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://wdc.kugi.kyoto-u.ac.jp/

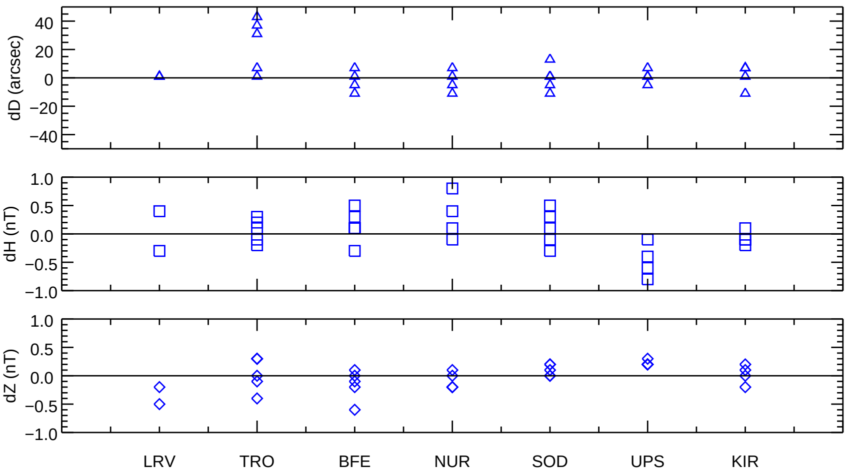
Preliminary values of Z, H and D are sent every hour to Kyoto, to be displayed graphically on the World Wide Web, and also made available at the above address. The same preliminary data are also placed in graphical form on the Leirvogur website: *http://www.raunvis.hi.is/∼halo/leirvogur.html*. The data 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.

NORDIC COMPARISON MEETING

As mentioned earlier a comparison was made at LRV of the DI-flux instruments from Nordic observatories. The meeting took place on May 6-7, 2013, while the LRV measurements used in the comparison were taken on May 2 and May 8. Instruments from six observatories were brought to LRV. These are: Tromsø, Norway (TRO), Nurmijärvi, Finland (NUR), Uppsala, Sweden (UPS), Kiruna, Sweden (KIR), Sodankylä, Finland (SOD), and Brorfelde, Denmark (BFE). The main DI-instrument at LRV was used in the comparison.

The results are shown in the figure below. Apart from 3 TRO measurements the deviation is less than 10" for D. For H and Z, the agreement is in most cases within 0.5 nT. No problems were uncovered with any of the instruments.



The deviation from the mean of the individual measurements during the Nordic Comparison meeting 2013. Overall there is good agreement between all instruments and observers.

November 2014

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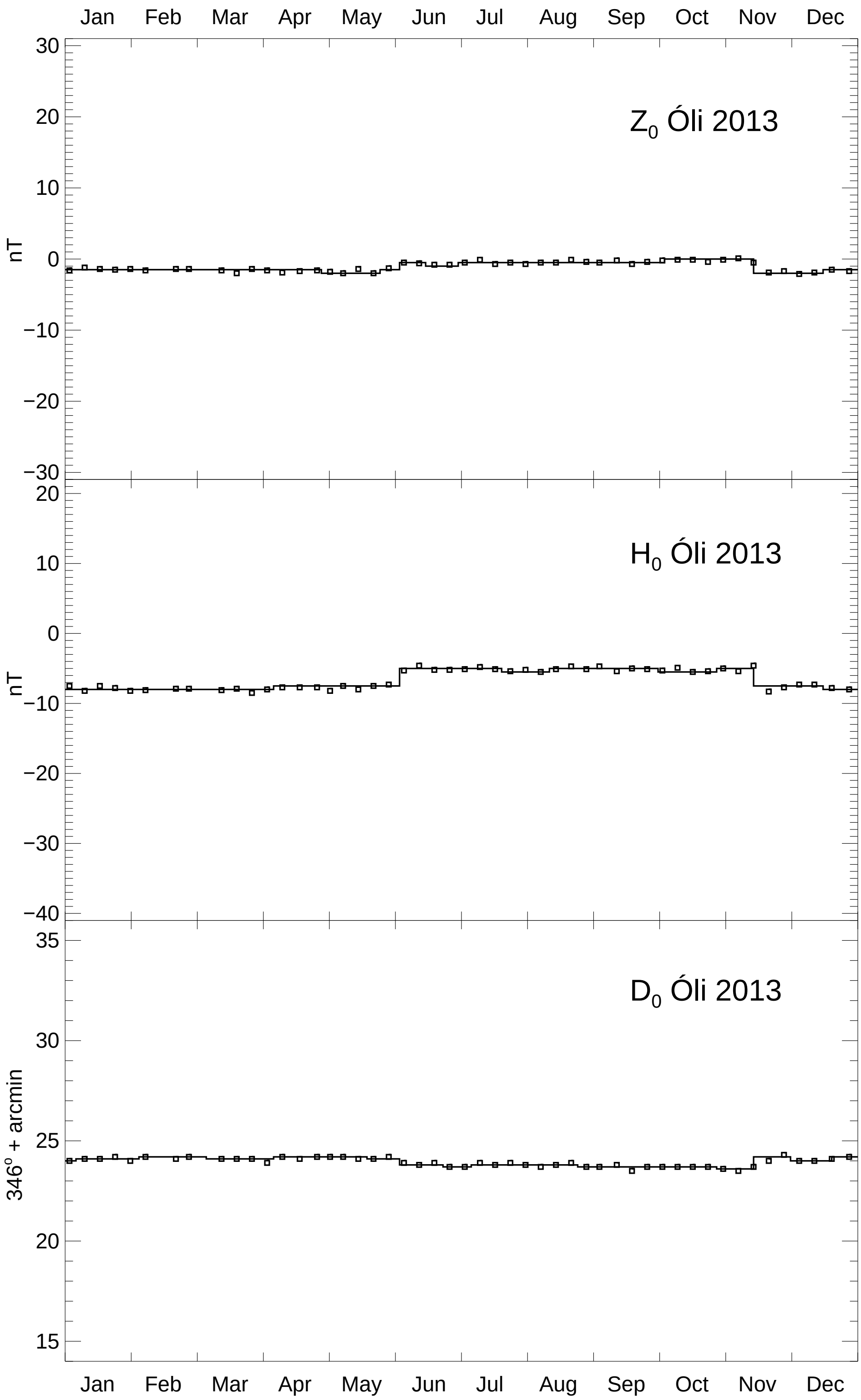
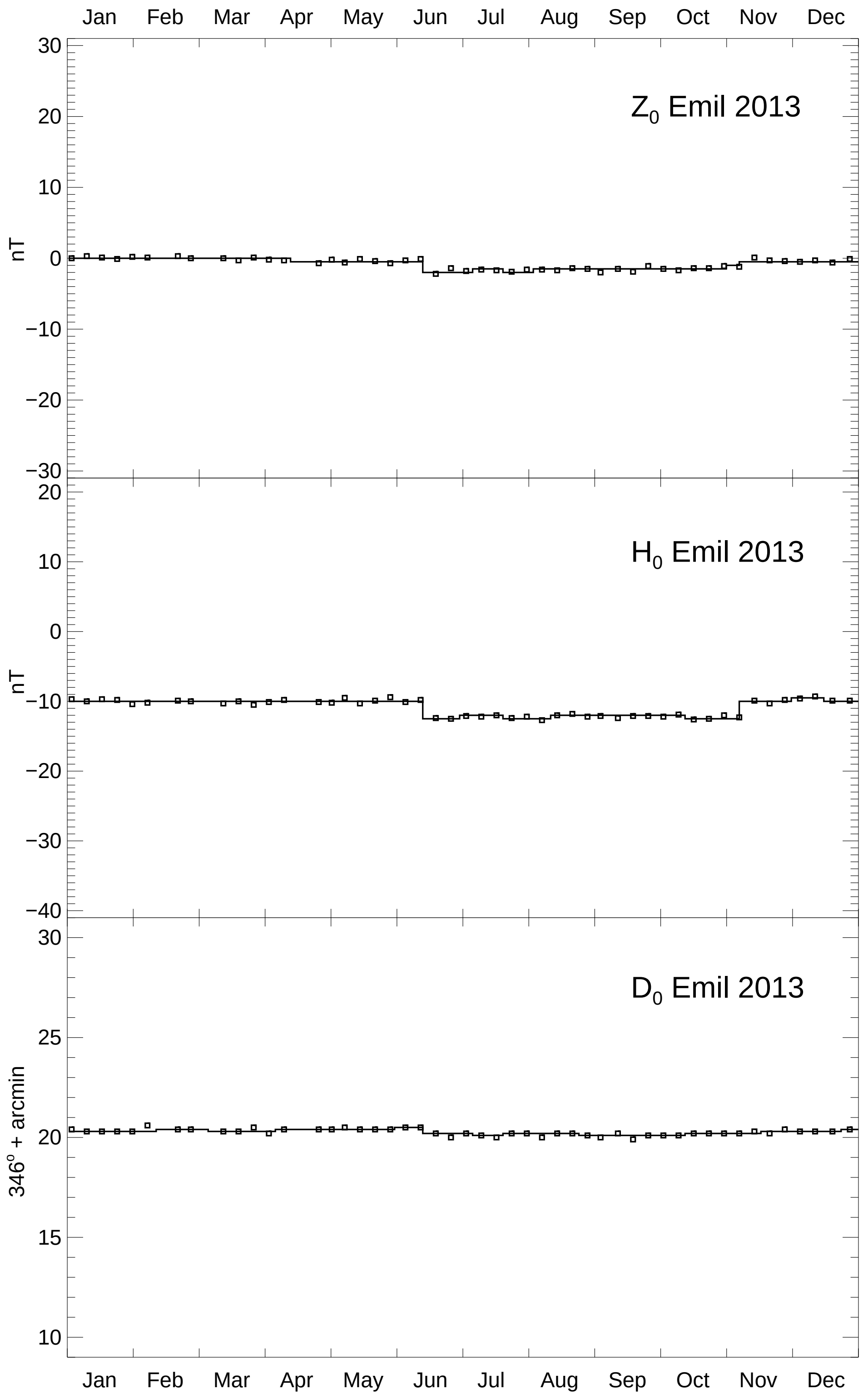

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Z0 Óli 2013
nT
H0 Óli 2013
nT
D0 Óli 2013
346° + arcmin
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Z0 Emil 2013
H0 Emil 2013
D0 Emil 2013
nT
nT
346° + arcmin
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

EXPLANATION OF TABLES

Monthly and annual means

In the table of monthly means on the following page, the declination is reckoned towards the east from 0 to 360 degrees. Thus 347° corresponds to 13° 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 124-126.

Diurnal variations

The tables on pages 25-26 show the mean diurnal inequalities of the magnetic elements Z, H, D and F at Leirvogur in 2013. 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 form on page 27. The daily K-sums are shown on page 28 in runs of 27 days. The table on page 29 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 page 30.

LEIRVOGUR 2013
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 347 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	205	207	200	659	658	664	160	162	151	776	777	772
FEB	206	204	201	660	659	656	176	177	186	777	775	772
MAR	202	206	174	645	659	616	192	187	186	770	777	736
APR	205	206	199	660	663	654	213	213	221	777	778	769
MAY	208	207	209	656	664	635	228	227	243	779	780	775
JUN	216	206	260	650	670	598	242	238	250	785	780	815
JUL	210	217	206	657	672	611	256	248	271	781	791	766
AUG	214	212	220	652	666	626	270	267	283	783	785	783
SEP	208	210	208	663	664	657	280	283	281	780	782	779
OCT	212	216	207	653	663	606	298	293	315	782	787	766
NOV	212	212	210	662	670	635	311	314	323	784	786	775
DEC	211	212	204	669	670	659	323	324	327	785	786	776
MEAN	209	210	208	657	665	635	246	244	253	780	782	774

LEIRVOGUR 2013

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		-11	-15	-15	-14	-16	-17	-17	-12	-9	-7	-5	-1	3	9	15	21	25	25	22	16	10	4	-1	-6	99.	18.	42
ZW		-8	-14	-13	-10	-9	-9	-10	-10	-7	-5	-2	-1	0	4	8	11	15	16	14	13	12	8	5	-1	2.	18.	29
ZE		-12	-15	-18	-18	-13	-16	-17	-12	-8	-5	-4	-1	3	9	15	21	22	24	22	16	13	6	-3	-7	4.	18.	41
ZS		-13	-15	-14	-14	-26	-26	-24	-16	-12	-12	-8	-2	5	14	23	33	37	37	30	18	5	-2	-6	-11	99.	17.	62
ZQ		-8	-11	-12	-7	-5	-3	-3	-3	-3	-3	-4	-3	-2	0	4	8	11	12	11	9	6	3	1	-2	3.	18.	24
ZQW		-1	-5	-6	-4	-2	-1	-1	-2	-2	-2	-2	-2	-2	1	2	4	5	5	5	4	3	3	2	0	3.	99.	11
ZQE		-7	-11	-12	-6	-3	-2	-2	-3	-3	-3	-4	-4	-3	0	4	9	12	11	9	6	3	1	-1	-1	3.	17.	24
ZQS		-16	-17	-17	-11	-9	-7	-5	-5	-4	-5	-5	-4	-2	1	6	11	17	21	21	18	13	6	2	-5	2.	18.	37
ZD		-1	-4	-2	-3	-19	-33	-54	-38	-24	-17	-7	6	16	31	38	47	41	34	18	3	-2	-9	-14	-8	7.	16.	100
ZDW		-8	-20	-27	-27	-28	-32	-34	-32	-17	-4	8	11	12	17	24	29	40	37	17	14	12	5	4	-4	7.	17.	73
ZDE		-5	-8	-16	-26	-17	-39	-63	-42	-26	-11	-9	6	18	35	45	58	39	38	35	10	14	-2	-25	-7	7.	16.	120
ZDS		9	16	38	45	-12	-28	-65	-42	-30	-37	-19	1	19	41	46	55	44	26	3	-16	-32	-28	-20	-12	7.	16.	119
H		-30	-41	-48	-48	-39	-24	-13	-4	-1	-4	-7	-9	-7	1	11	25	39	46	48	45	37	26	8	-13	3.	19.	96
HW		-9	-19	-17	-16	-12	-9	-5	2	3	3	-1	-5	-8	-6	-2	3	9	14	17	18	18	14	9	-5	2.	99.	36
HE		-25	-27	-33	-32	-21	-12	-3	3	4	-3	-8	-13	-13	-7	2	15	29	34	35	32	29	21	3	-10	3.	19.	67
HS		-58	-76	-94	-95	-83	-53	-32	-17	-9	-12	-12	-9	0	15	33	57	80	89	93	84	66	43	13	-24	4.	19.	187
HQ		0	-3	-4	-2	-1	0	1	1	-2	-8	-15	-20	-20	-15	-8	0	6	12	17	18	16	14	11	8	12.	20.	37
HQW		0	-6	-5	-2	0	2	3	4	4	2	-2	-6	-8	-8	-5	-1	2	4	5	5	6	5	5	3	13.	21.	13
HQE		5	3	3	6	6	6	6	5	1	-6	-15	-23	-25	-23	-16	-7	0	7	11	13	13	13	11	11	13.	99.	38
HQS		-6	-7	-9	-9	-10	-7	-5	-7	-13	-21	-28	-31	-26	-15	-5	7	16	24	34	35	30	25	18	10	12.	20.	65
HD		-70	-97	-133	-154	-144	-111	-85	-41	-7	1	9	18	28	48	70	99	136	141	127	105	71	44	-12	-43	4.	18.	294
HDW		-32	-66	-52	-72	-57	-44	-34	-5	6	10	9	9	6	8	19	21	36	48	55	55	40	34	24	-16	4.	19.	127
HDE		-73	-94	-129	-132	-83	-75	-41	-9	6	-1	6	9	16	42	53	87	132	131	112	82	57	20	-63	-55	4.	17.	263
HDS		-107	-133	-218	-257	-292	-214	-180	-110	-34	-7	13	37	64	93	138	188	240	245	214	178	117	79	5	-59	5.	18.	537

LEIRVOGUR 2013

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		14	24	32	45	52	54	53	47	44	37	22	0	-23	-47	-61	-64	-57	-49	-39	-33	-27	-17	-11	2	16.	6.	118
DW		21	23	24	25	26	27	26	19	11	9	5	-7	-21	-32	-39	-41	-35	-27	-20	-14	-6	4	8	17	16.	6.	67
DE		19	28	30	42	46	48	47	36	36	37	25	4	-24	-51	-69	-73	-61	-47	-32	-21	-19	-13	-4	8	16.	6.	120
DS		2	21	42	67	84	87	84	86	85	65	38	4	-26	-57	-75	-80	-77	-72	-64	-63	-55	-41	-38	-20	16.	6.	166
DQ		1	8	10	14	20	28	35	40	43	41	30	9	-14	-37	-49	-50	-41	-30	-21	-15	-9	-9	-5	-3	16.	9.	93
DQW		8	13	13	12	8	10	11	11	13	13	10	2	-10	-20	-26	-27	-22	-16	-11	-7	-5	-3	4	10	16.	9.	39
DQE		9	13	13	13	17	21	26	31	38	44	35	14	-9	-39	-56	-58	-44	-30	-19	-12	-7	-5	1	0	16.	10.	101
DQS		-13	-4	3	16	36	52	68	79	78	66	44	11	-23	-51	-65	-67	-58	-45	-34	-26	-16	-18	-20	-18	16.	8.	145
DD		29	39	67	121	142	127	94	60	46	30	4	-19	-33	-61	-74	-84	-86	-86	-79	-86	-71	-48	-28	-4	20.	5.	228
DDW		37	42	49	70	73	73	56	25	-3	-5	-12	-22	-36	-50	-62	-71	-65	-46	-33	-27	-12	3	1	17	16.	6.	144
DDE		36	47	60	109	116	129	114	39	31	28	-1	-20	-43	-75	-92	-103	-92	-83	-67	-55	-50	-38	9	3	16.	6.	232
DDS		16	29	91	183	240	179	114	116	110	68	25	-15	-19	-58	-69	-77	-101	-129	-137	-178	-153	-109	-93	-30	20.	5.	417
F		-18	-24	-26	-25	-24	-22	-20	-13	-9	-8	-7	-4	1	8	17	27	33	36	33	26	19	10	0	-10	3.	18.	62
FW		-10	-18	-17	-14	-11	-11	-11	-9	-6	-4	-3	-3	-2	2	7	11	16	19	17	17	16	11	7	-3	2.	18.	36
FE		-18	-22	-26	-26	-18	-18	-17	-11	-7	-6	-6	-4	-1	6	14	24	28	31	29	23	19	11	-2	-10	99.	18.	56
FS		-27	-34	-37	-37	-45	-38	-32	-20	-14	-15	-11	-4	5	17	30	46	56	58	52	38	21	9	-3	-17	5.	18.	102
FQ		-7	-12	-12	-7	-5	-3	-3	-3	-4	-5	-7	-8	-7	-4	2	8	13	15	15	13	10	7	4	0	3.	99.	27
FQW		0	-6	-7	-4	-2	-1	0	-1	-1	-2	-3	-4	-4	-2	1	4	6	6	6	5	4	4	3	1	3.	18.	12
FQE		-5	-10	-11	-4	-1	0	-1	-1	-2	-5	-7	-9	-9	-6	0	7	12	13	12	9	7	5	3	2	3.	18.	24
FQS		-17	-19	-19	-13	-12	-9	-7	-7	-8	-10	-12	-12	-9	-4	4	13	20	26	28	26	20	11	6	-2	2.	19.	46
FD		-19	-27	-34	-40	-53	-59	-73	-48	-25	-17	-5	10	22	41	54	70	73	67	48	28	15	2	-16	-18	7.	17.	146
FDW		-15	-34	-39	-44	-41	-42	-41	-32	-15	-2	10	12	13	19	28	33	47	48	30	28	22	13	10	-8	4.	18.	91
FDE		-23	-31	-47	-57	-37	-56	-71	-43	-24	-12	-8	8	21	44	56	77	71	69	61	30	27	3	-40	-21	7.	16.	147
FDS		-18	-17	-16	-19	-82	-79	-106	-68	-38	-38	-16	9	34	62	79	100	102	85	55	28	-3	-9	-19	-27	7.	17.	208

LEIRVOGUR MAGNETIC OBSERVATORY 2013
K-INDICES FOR THREE HOUR INTERVALS IN U.T.
LOWER LIMIT FOR K-9 = 1500 NANOTESLAS IN H

DAYS	K-INDICES						
1- 7	00000000	00011112	10000001	20000001	00000000	00000110	10000001
8- 14	01011003	21010002	11000000	00011003	31011000	51112246	54222221
15- 21	22111020	11010113	22111455	45123234	62002235	65422110	31011111
22- 28	00000000	00010001	21000000	00011215	63332465	53111210	01111123
29- 35	20011000	00000001	10000102	50000113	34422232	40112101	20011220
36- 42	00101100	00000002	31322121	33322212	42120011	22311132	23011123
43- 49	20011115	55111247	64633323	01111122	00012551	22212544	10011014
50- 56	02112222	31132210	53311145	55223335	52022134	32111102	00011213
57- 63	21111222	31211101	33111126	55564567	64432346	64322343	42122111
64- 70	50012122	34010000	00021100	00111111	42122221	00111114	43111100
71- 77	22013114	31011111	00022210	03321101	66322222	41866678	32122121
78- 84	31112225	43313336	67522210	01111233	10212246	60122220	00012211
85- 91	20021100	13333546	52122335	55433655	77322345	21121234	22212212
92- 98	32012123	21012202	23122111	01022221	22122213	22222210	00111210
99-105	11121211	01121223	00121323	31122210	33121203	24232322	01111132
106-112	00011323	21112100	10011110	00012201	00112100	00011210	21112211
113-119	11122225	56334465	64233444	68433337	43222332	10123333	61112212
120-126	31222234	66646465	65322353	33222332	31222433	44423320	21323333
127-133	65222332	63212322	12122210	12122111	02122121	33222211	01112321
134-140	11323233	01223320	66223445	45322435	67433354	55434532	41223334
141-147	43221235	62233435	35232335	54334466	67644666	67623563	46324554
148-154	56333211	01122100	11112111	01222445	78854345	56534335	54222335
155-161	64322336	43222223	25334457	68633321	36333112	12223442	66433321
162-168	01123433	21222212	42112112	21022112	33222202	10112111	32121212
169-175	23222322	33122224	54222344	66433345	65333555	67633545	65335565
176-182	54323323	11122123	21123335	54225576	58754555	44223445	64211220
183-189	01212232	11123221	11123222	24422333	68766557	64121111	14321322
190-196	01223335	67653566	46445454	45423234	45222334	66545565	56544443
197-203	12122342	01222213	21234453	55433453	62221212	11222223	11212335
204-210	33222222	41112222	13223444	56323334	53233354	66222223	33122211
211-217	13222332	43222221	23112310	11112211	01122223	11322665	66343436
218-224	54222123	22222220	11122222	02232232	21122122	11232212	11121225
225-231	21132434	55322346	75343524	67534546	53323223	21222343	33222311
232-238	21122212	26433346	76222346	65433334	52222321	23323324	42122133
239-245	53123666	55323312	10111210	00132437	54323316	54323345	15523330
246-252	10222234	20122122	01122211	21122243	12221110	14121220	01011111
253-259	00022335	30122333	42212235	62212442	21221210	21011211	31121202
260-266	33212233	34022325	55332335	23222123	33112323	33122210	12221233
267-273	42035422	52212111	00011110	00111111	00011100	00111113	31011101
274-280	00113235	89843477	61011220	00011100	00021100	00022212	14111212
281-287	12022156	66633324	55422111	33121112	01011133	31011101	12334566
288-294	77532225	54223323	54222331	10111110	00022100	00011111	11012100
295-301	00121114	12211100	00011100	00011202	00011101	00022110	00021100
302-308	00022143	12233455	41022224	54112121	31010102	43311142	01222322
309-315	22021101	10111113	24534234	41111000	46744223	54223346	56634322
316-322	21011000	01211110	00011102	33112356	66323112	42222112	20011000
323-329	00011221	32111100	00011101	10001001	02332210	00010000	00000000
330-336	00000000	00000100	00000001	11111342	20221234	64313100	00000000
337-343	22023232	41110122	12111101	01010012	41210013	67433342	10011212
344-350	24221100	10011002	10000000	00002100	55212564	31110302	13211112
351-357	20000120	01111012	21001332	22011132	21010000	00010000	10001001
358-364	00000003	30123320	01000000	00000010	00000001	20111110	00110001
365-365	21212111						

LEIRVOGUR MAGNETIC OBSERVATORY 2013

K-SUMS IN 27-DAY RUNS

DAYS	K-SUMS																										
1- 27	0	6	2	3	0	2	2	6	6	2	5	6	22	20	9	8	21	24	20	21	9	0	2	3	10	32	14
28- 54	10	4	1	4	10	22	10	8	3	2	15	18	11	15	13	11	26	30	9	14	22	8	12	13	23	28	19
55- 81	11	8	12	10	18	43	32	27	14	13	8	4	6	16	9	11	14	9	7	11	25	46	14	17	26	25	12
82-108	18	15	7	6	28	23	36	33	16	14	14	10	13	10	15	13	6	10	12	12	12	15	20	10	10	8	5
109-135	6	5	5	11	16	36	30	37	21	16	16	19	43	29	20	20	22	20	25	21	11	11	11	16	11	18	13
136-162	32	28	35	31	22	22	28	26	35	45	38	33	24	7	9	20	44	34	26	29	20	33	32	22	20	28	17
163-189	14	14	11	16	8	14	18	19	26	34	35	39	38	25	13	20	36	44	28	18	13	13	14	23	50	17	18
190-216	19	44	36	27	25	42	35	17	13	24	32	18	15	18	18	15	23	29	28	25	15	18	18	13	10	13	26
217-243	35	21	14	13	16	13	14	15	20	30	33	40	23	19	17	13	31	32	31	19	22	18	32	24	7	20	27
244-270	29	22	16	12	10	17	10	13	6	15	17	21	23	11	9	12	19	21	29	17	18	14	16	22	15	4	6
271-297	3	8	8	15	50	13	3	4	9	13	19	33	21	14	10	8	30	33	24	22	6	5	5	6	10	8	3
298-324	6	4	6	4	12	25	17	17	8	19	14	9	9	27	8	32	29	31	5	7	5	24	24	16	4	7	9
325-351	4	3	13	1	0	0	1	1	14	16	18	0	16	12	8	5	12	32	8	12	5	1	3	30	11	12	5
352-365	7	12	12	4	1	3	3	14	1	1	1	7	3	11													

LEIRVOGUR MAGNETIC OBSERVATORY 2013

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	116	67	30	13	7	10	5	0	0	0	0	1.1	7
FEB	41	72	54	29	11	13	3	1	0	0	0	1.8	10
MAR	38	65	56	32	19	15	16	5	2	0	0	2.3	19
APR	36	74	77	33	10	3	5	1	1	0	0	1.8	10
MAY	10	38	66	58	28	21	24	3	0	0	0	2.9	22
JUN	4	32	66	54	27	32	16	5	4	0	0	3.2	27
JUL	4	40	81	46	32	23	18	3	1	0	0	2.9	22
AUG	8	47	84	52	20	16	17	4	0	0	0	2.7	19
SEP	33	72	72	39	11	12	1	0	0	0	0	1.8	9
OCT	65	76	47	22	13	11	7	4	2	1	0	1.8	15
NOV	79	67	43	22	16	5	7	1	0	0	0	1.5	9
DEC	106	72	38	18	7	3	3	1	0	0	0	1.1	6
YEAR	540	722	714	418	201	164	122	28	10	1	0	2.1	15
%	18.5	24.7	24.5	14.3	6.9	5.6	4.2	1.0	0.3	0.0			

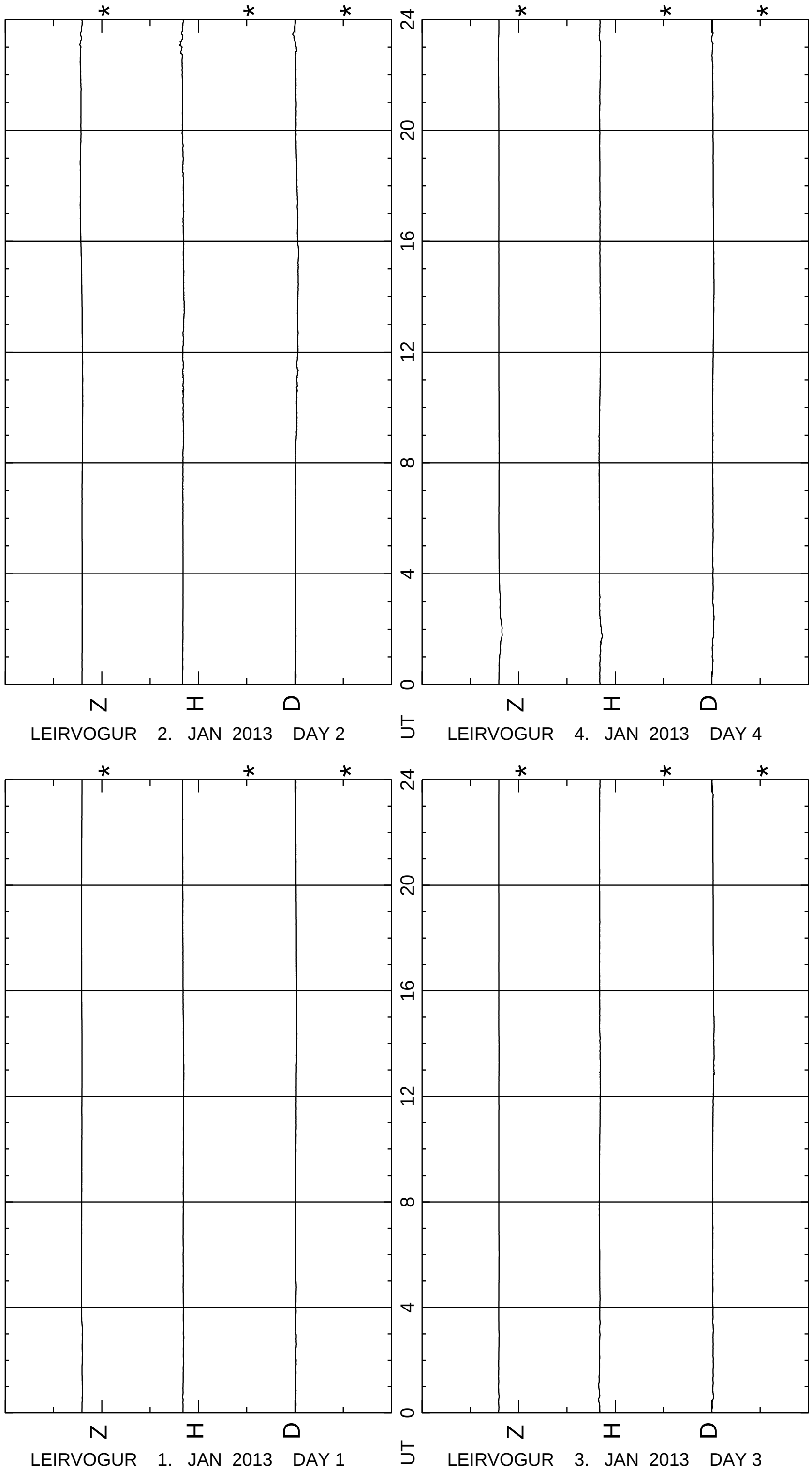
	K=0	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	-	$\bar{K}$	$\overline{Ak}$
1958	76	267	459	591	510	488	328	87	12	2	100	3.6	33
1959	46	260	360	567	562	547	388	138	33	8	11	3.9	39
1960	75	275	399	539	468	492	304	165	32	4	175	3.7	38
1961	224	477	475	518	482	351	222	87	19	1	64	3.1	27
1962	17	346	592	569	444	412	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
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
2008	524	734	713	463	223	154	84	29	4	0	0	2.0	13
2009	836	1036	663	222	77	57	25	4	0	0	0	1.3	6
2010	576	856	763	341	184	100	75	23	2	0	0	1.8	11
2011	433	757	783	443	231	147	87	32	7	0	0	2.1	14
2012	376	640	771	458	264	203	168	39	7	2	0	2.4	18
2013	540	722	714	418	201	164	122	28	10	1	0	2.1	15

EXPLANATION OF DAILY GRAPHS

The graphs on pages 32–123 show the 1-minute means of the magnetic elements Z, H, and D at Leirvogur in 2013. Vertical divisions are spaced at intervals of 500 nT in Z and H and $2.^{\circ}31$ in D. The last figure is equivalent to 500 nT in the direction of magnetic east for average values of H at Leirvogur.

Levels marked with asterisk (*) are as follows:
Z: 50000 nT
H: 12000 nT
D: 345° 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 2013 DAY 2
LEIRVOGUR 4. JAN 2013 DAY 4
LEIRVOGUR 1. JAN 2013 DAY 1
LEIRVOGUR 3. JAN 2013 DAY 3
Z
H
D
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16
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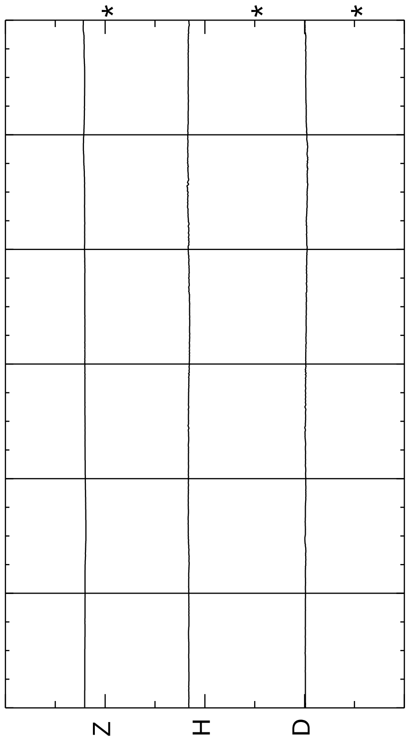
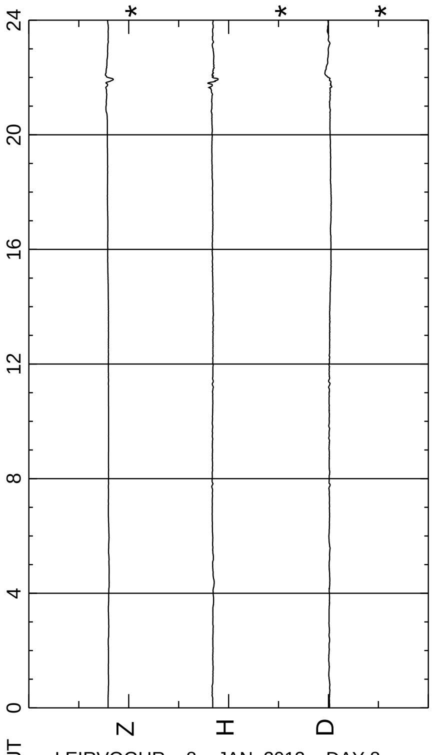
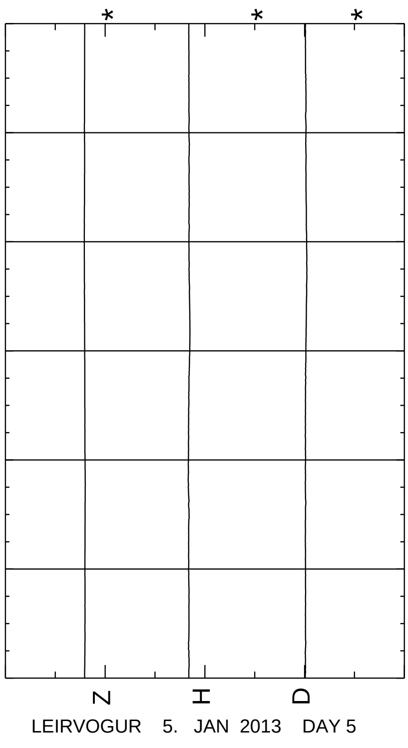
24



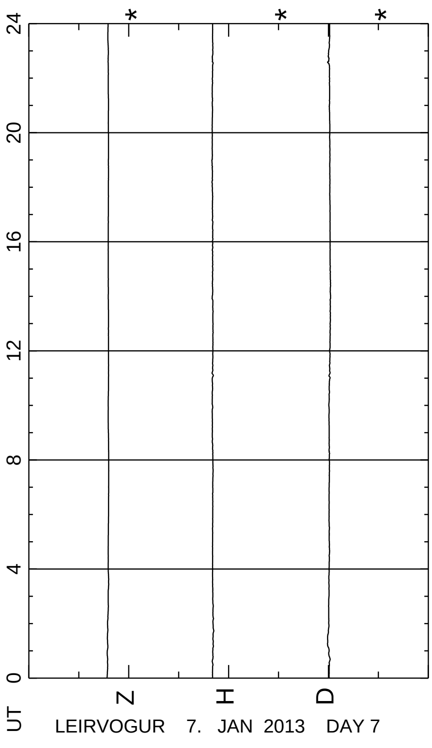
LEIRVOGUR 6. JAN 2013 DAY 6



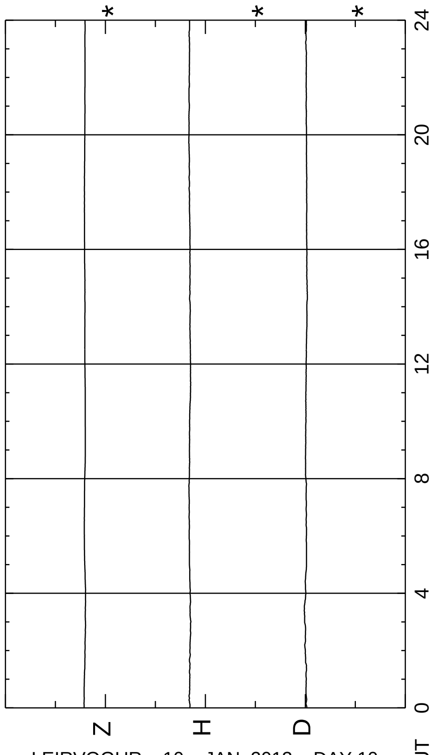
LEIRVOGUR 8. JAN 2013 DAY 8



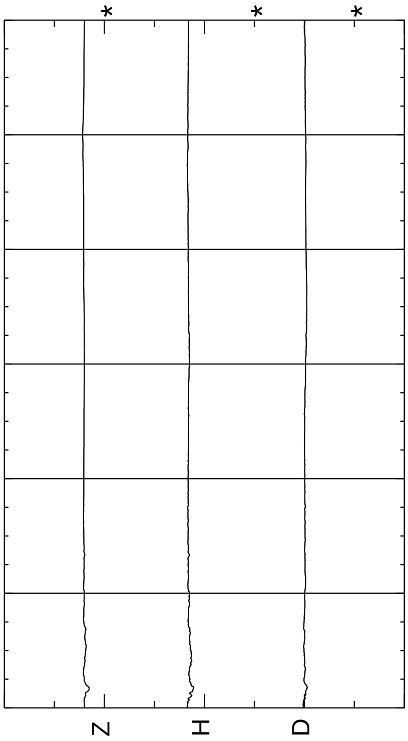
LEIRVOGUR 5. JAN 2013 DAY 5



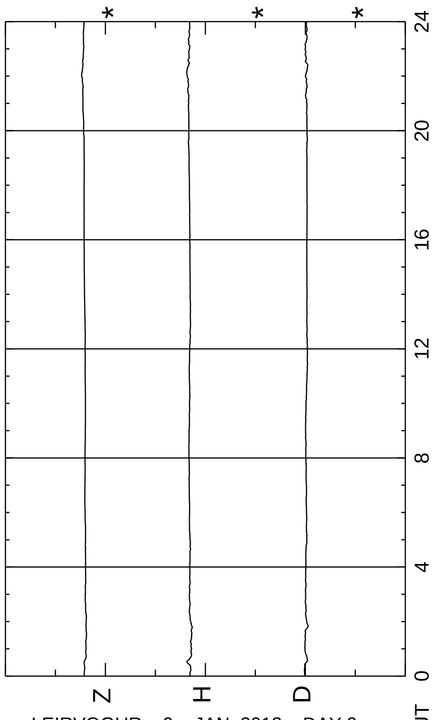
LEIRVOGUR 7. JAN 2013 DAY 7



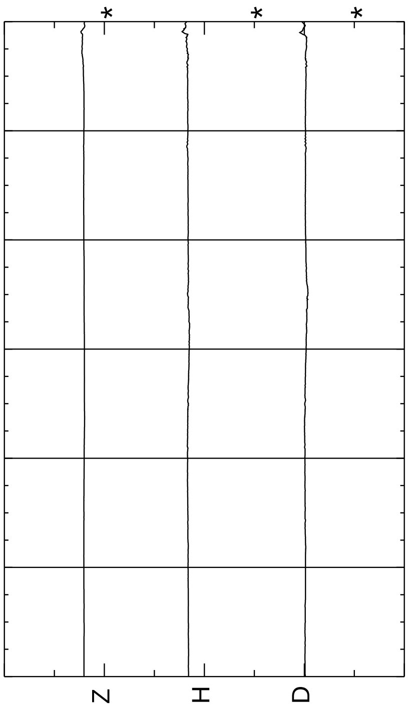
LEIRVOGUR 10. JAN 2013 DAY 10



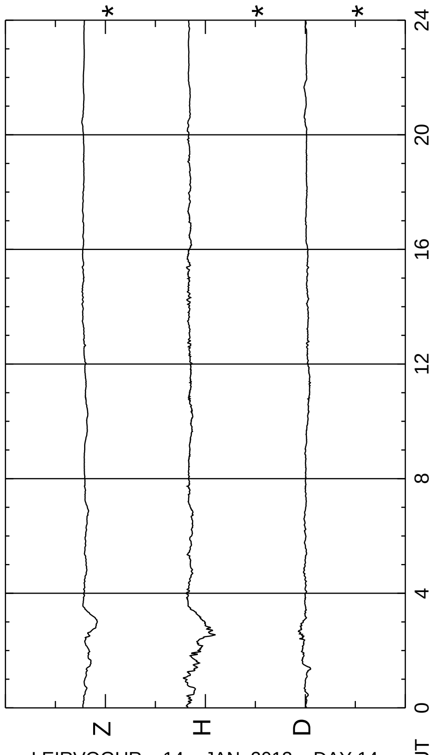
LEIRVOGUR 12. JAN 2013 DAY 12



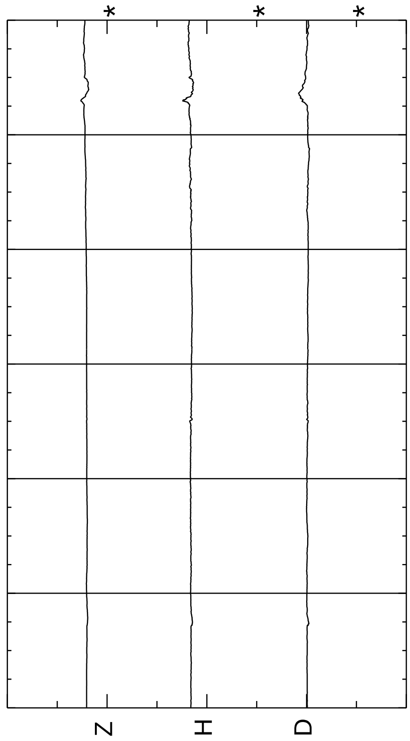
LEIRVOGUR 9. JAN 2013 DAY 9



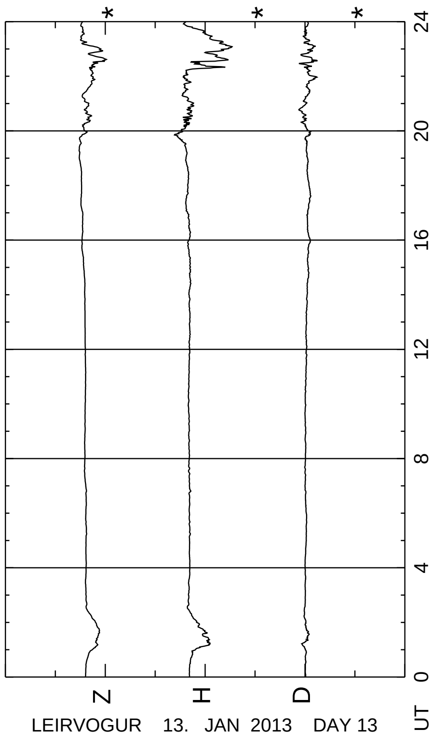
LEIRVOGUR 11. JAN 2013 DAY 11



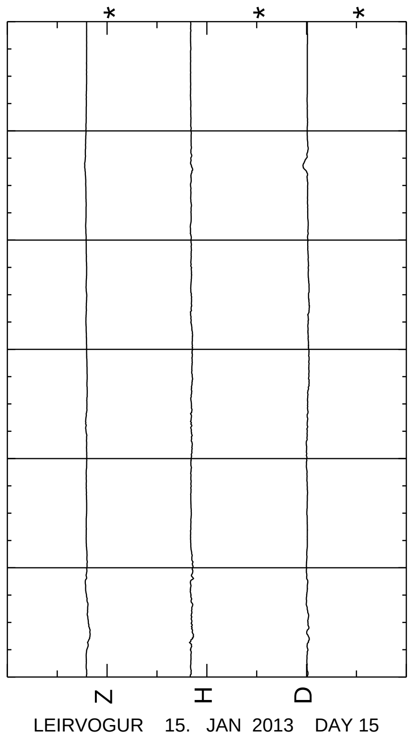
LEIRVOGUR 14. JAN 2013 DAY 14



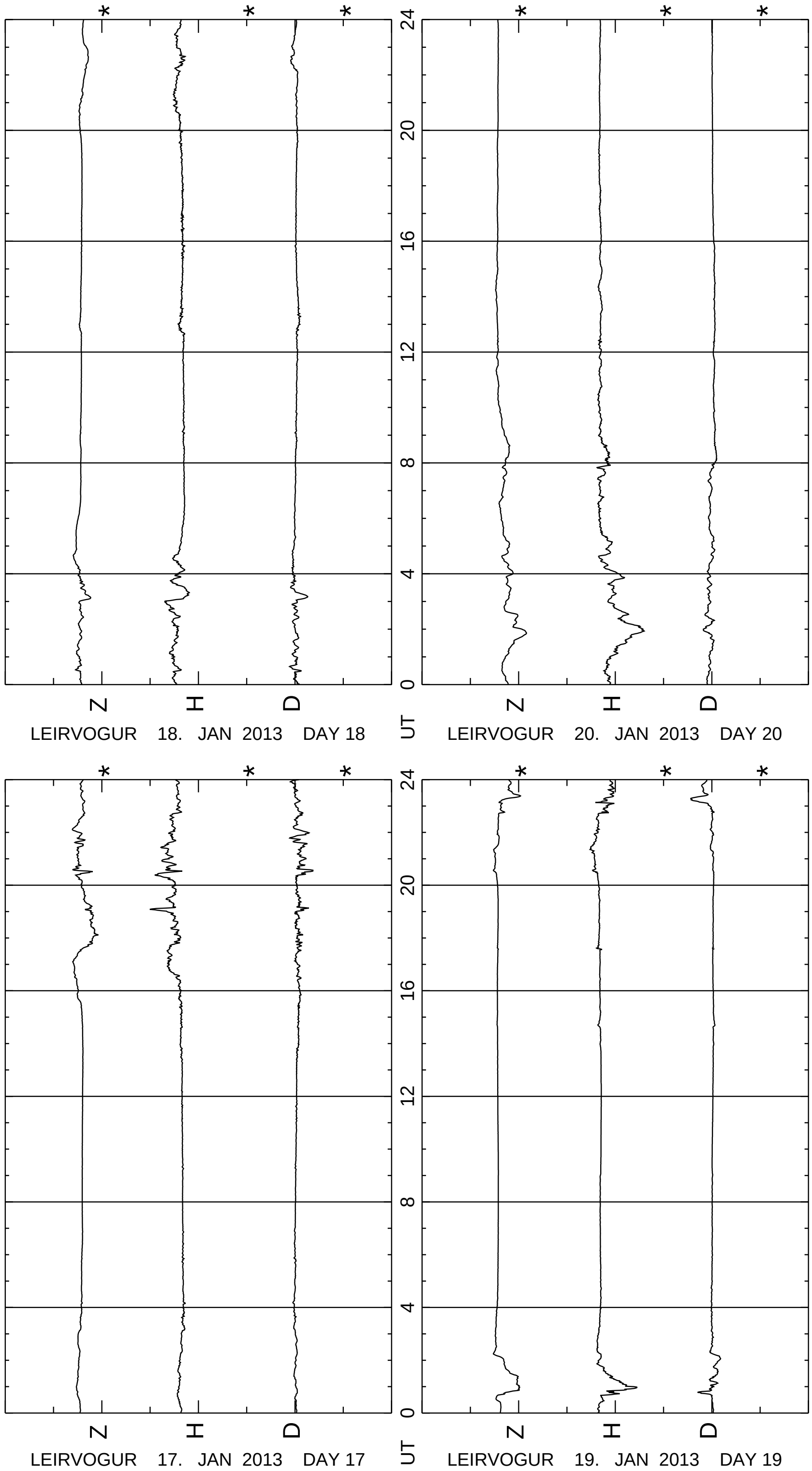
LEIRVOGUR 16. JAN 2013 DAY 16

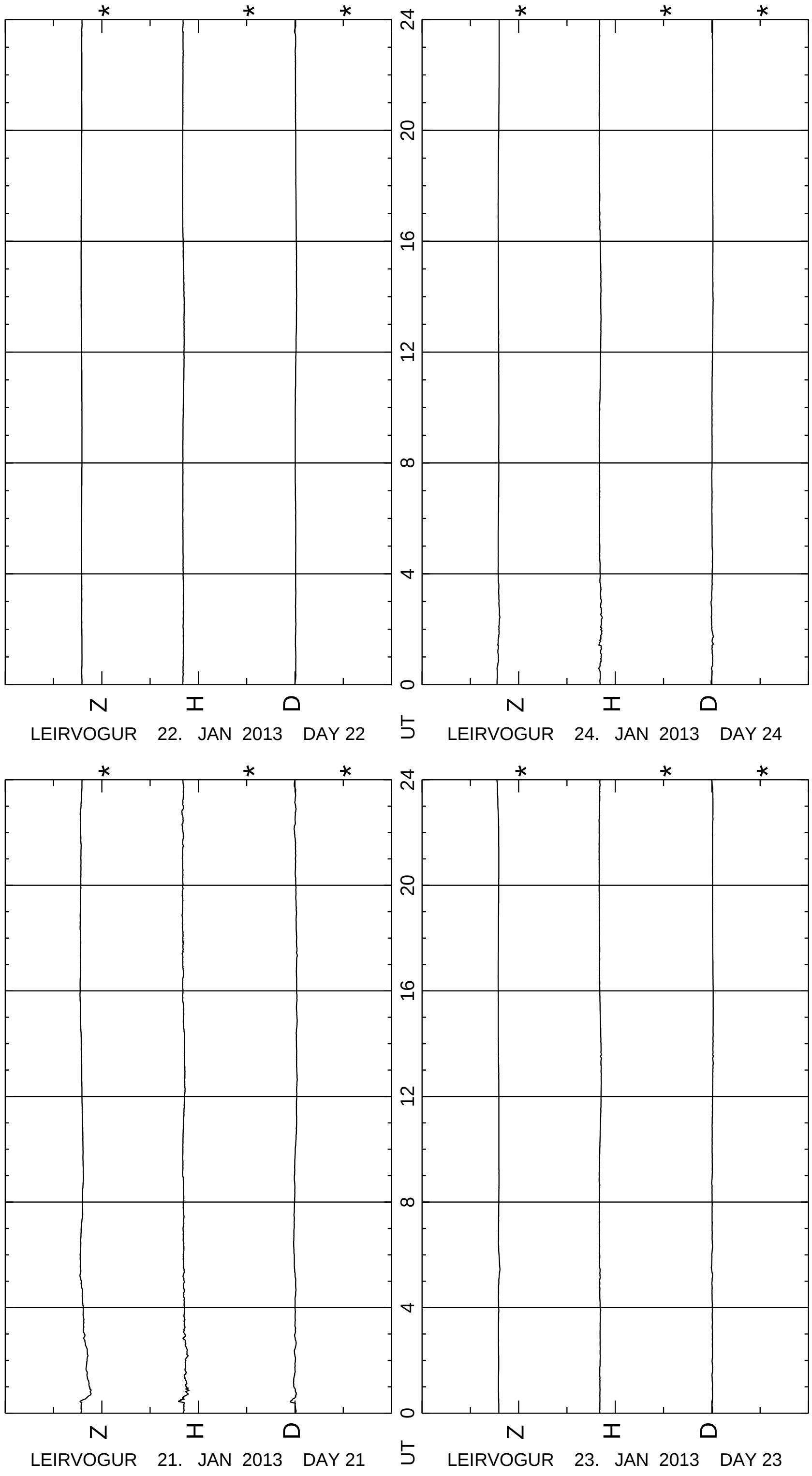


LEIRVOGUR 13. JAN 2013 DAY 13



LEIRVOGUR 15. JAN 2013 DAY 15


LEIRVOGUR 18. JAN 2013 DAY 18
LEIRVOGUR 20. JAN 2013 DAY 20
LEIRVOGUR 17. JAN 2013 DAY 17
LEIRVOGUR 19. JAN 2013 DAY 19
Z H D
UT
0 4 8 12 16 20 24


LEIRVOGUR 22. JAN 2013 DAY 22
LEIRVOGUR 24. JAN 2013 DAY 24
LEIRVOGUR 21. JAN 2013 DAY 21
LEIRVOGUR 23. JAN 2013 DAY 23
Z
H
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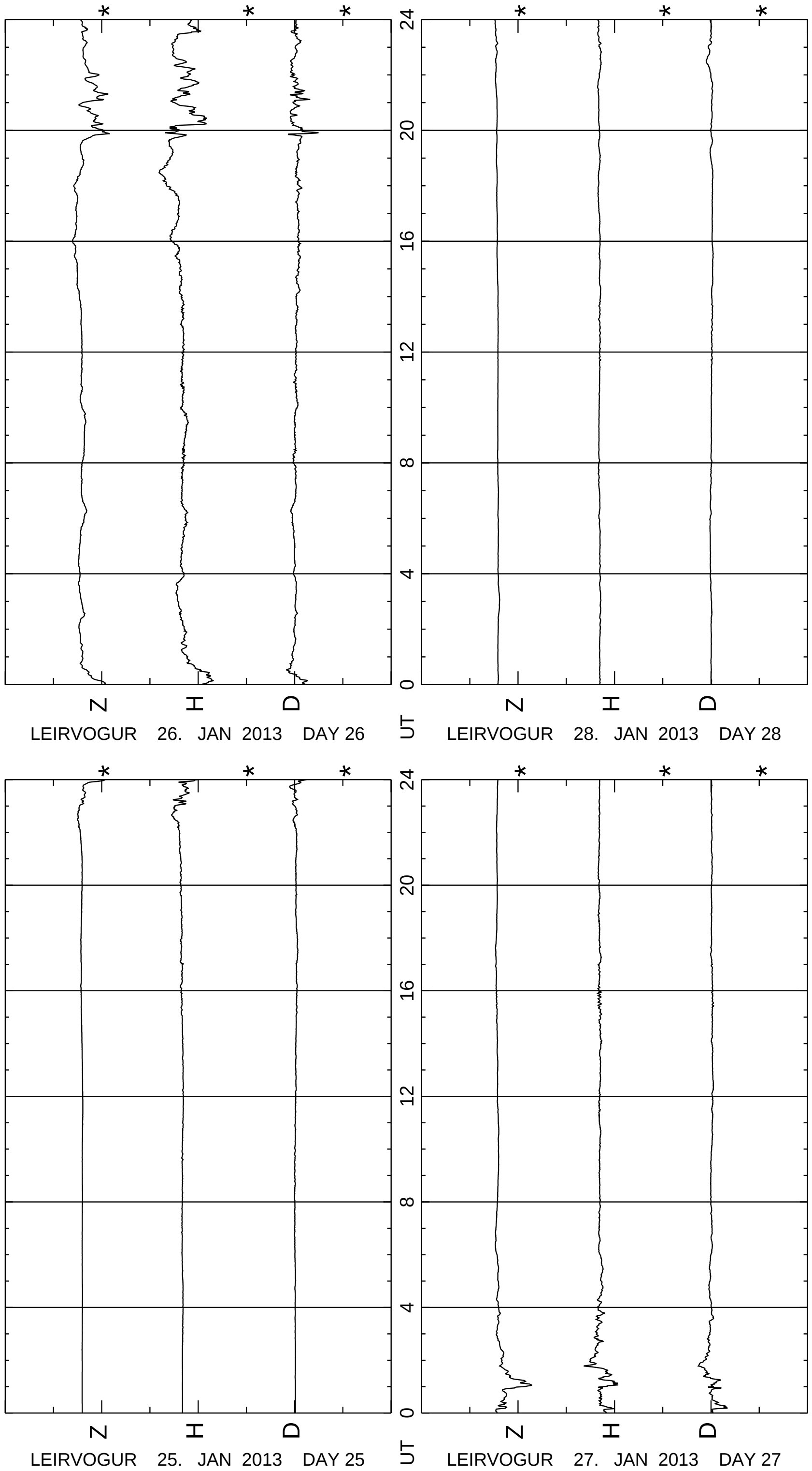
24



LEIRVOGUR 26. JAN 2013 DAY 26
LEIRVOGUR 28. JAN 2013 DAY 28
LEIRVOGUR 25. JAN 2013 DAY 25
LEIRVOGUR 27. JAN 2013 DAY 27
Z
H
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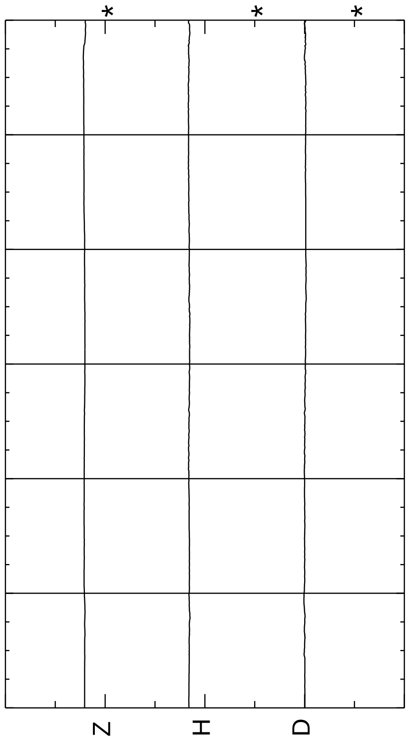
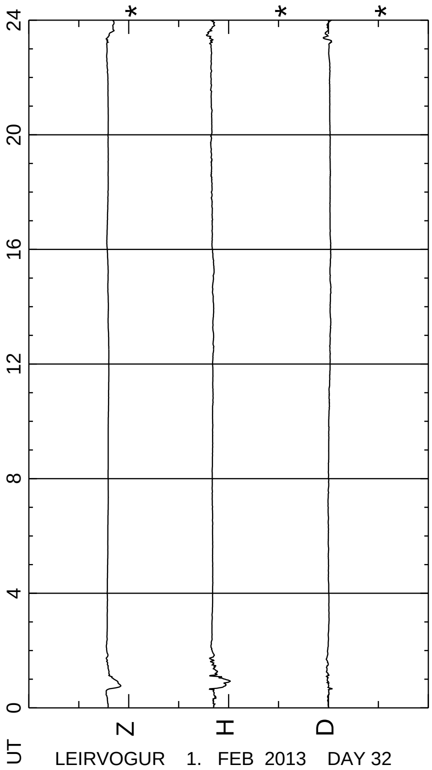
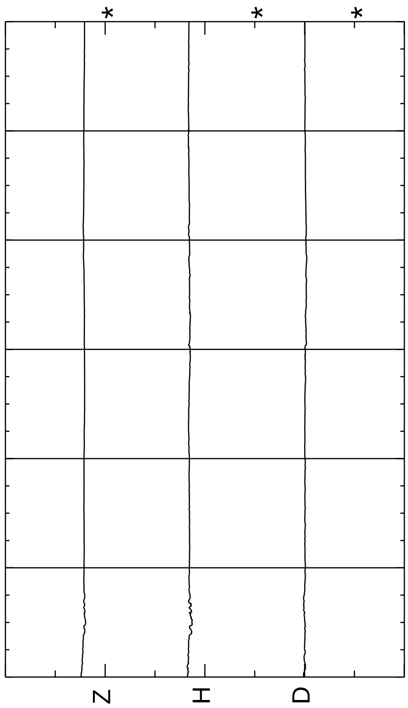


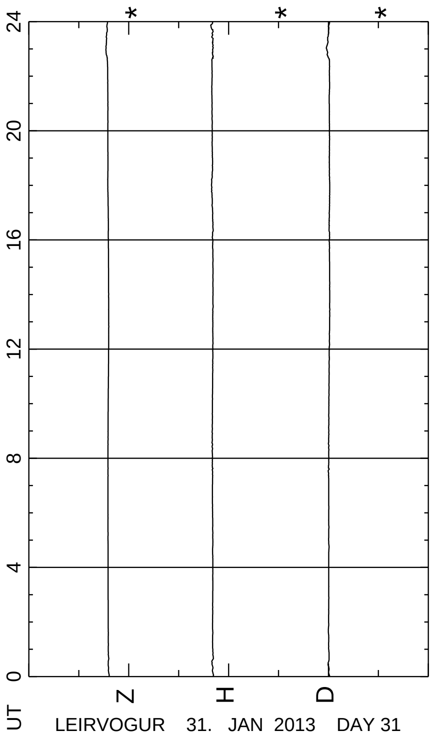
LEIRVOGUR 30. JAN 2013 DAY 30



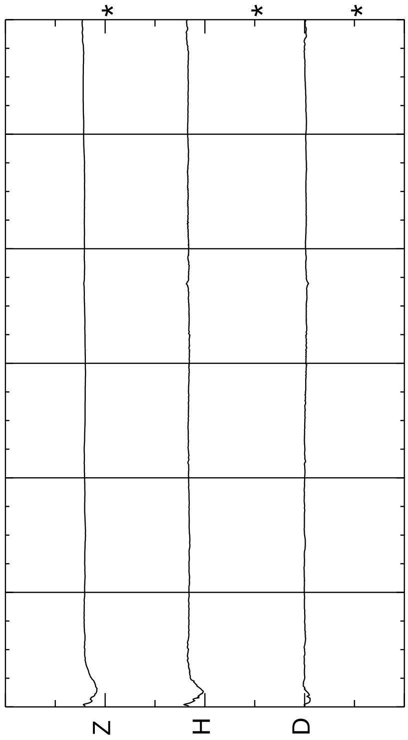
LEIRVOGUR 1. FEB 2013 DAY 32



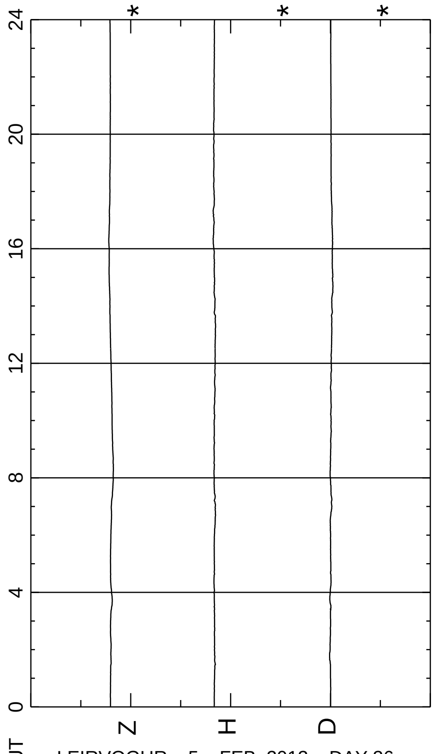
LEIRVOGUR 29. JAN 2013 DAY 29



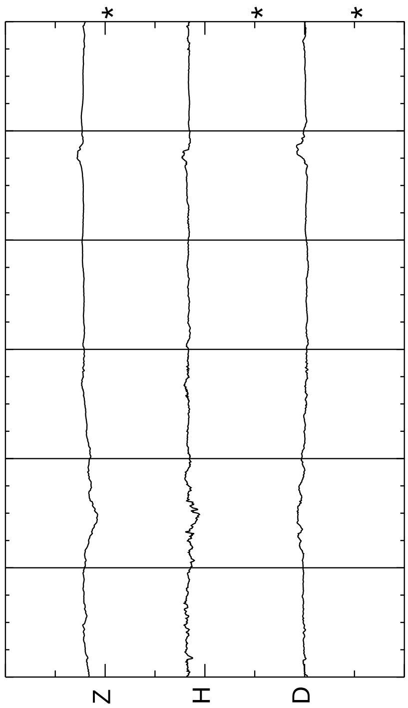
LEIRVOGUR 31. JAN 2013 DAY 31



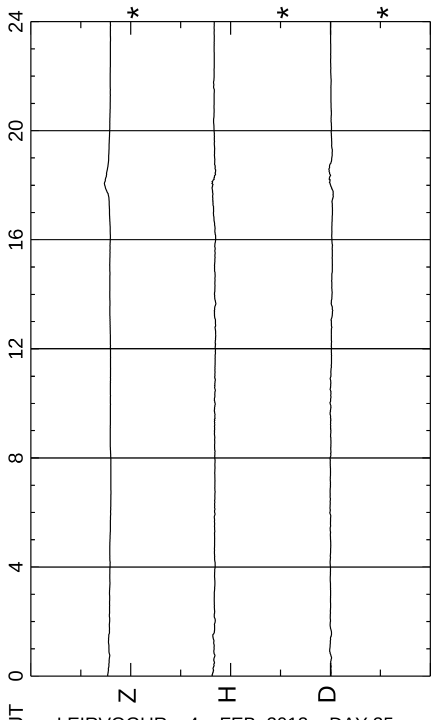
LEIRVOGUR 3. FEB 2013 DAY 34



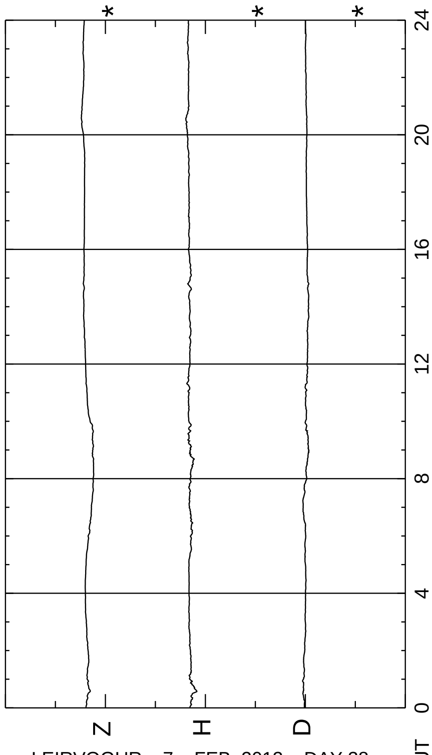
LEIRVOGUR 5. FEB 2013 DAY 36



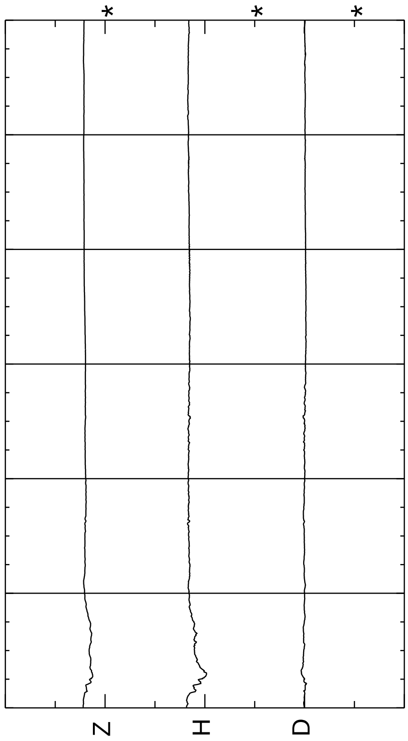
LEIRVOGUR 2. FEB 2013 DAY 33



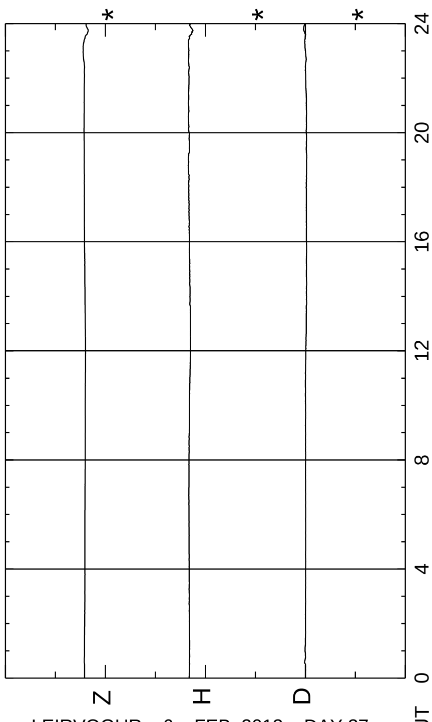
LEIRVOGUR 4. FEB 2013 DAY 35



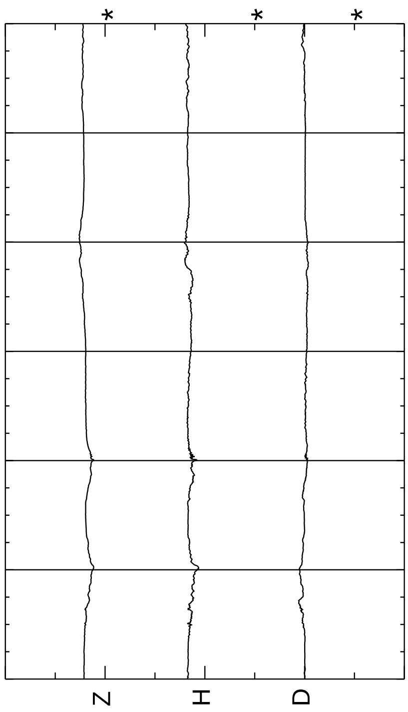
LEIRVOGUR 7. FEB 2013 DAY 38



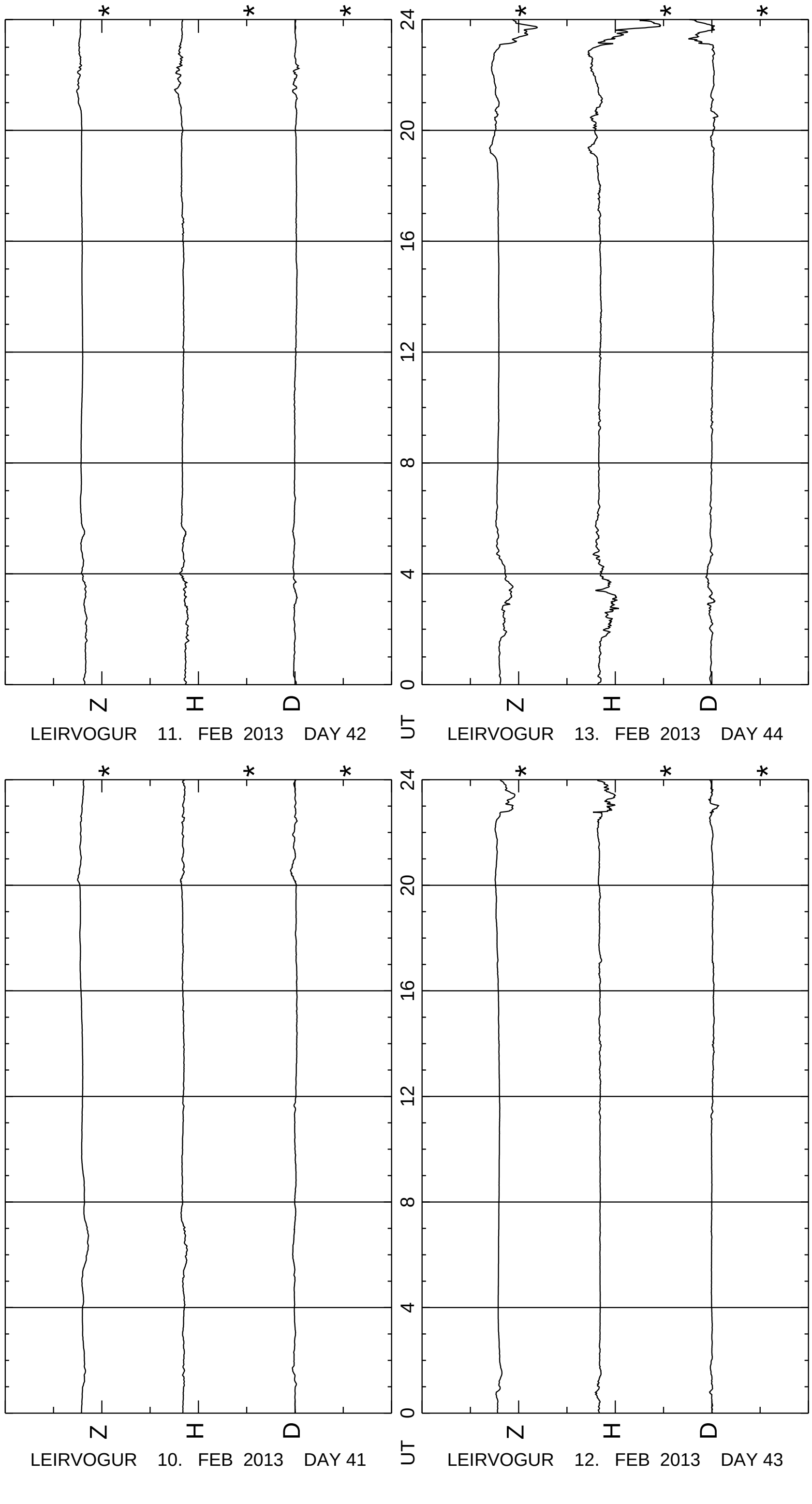
LEIRVOGUR 9. FEB 2013 DAY 40

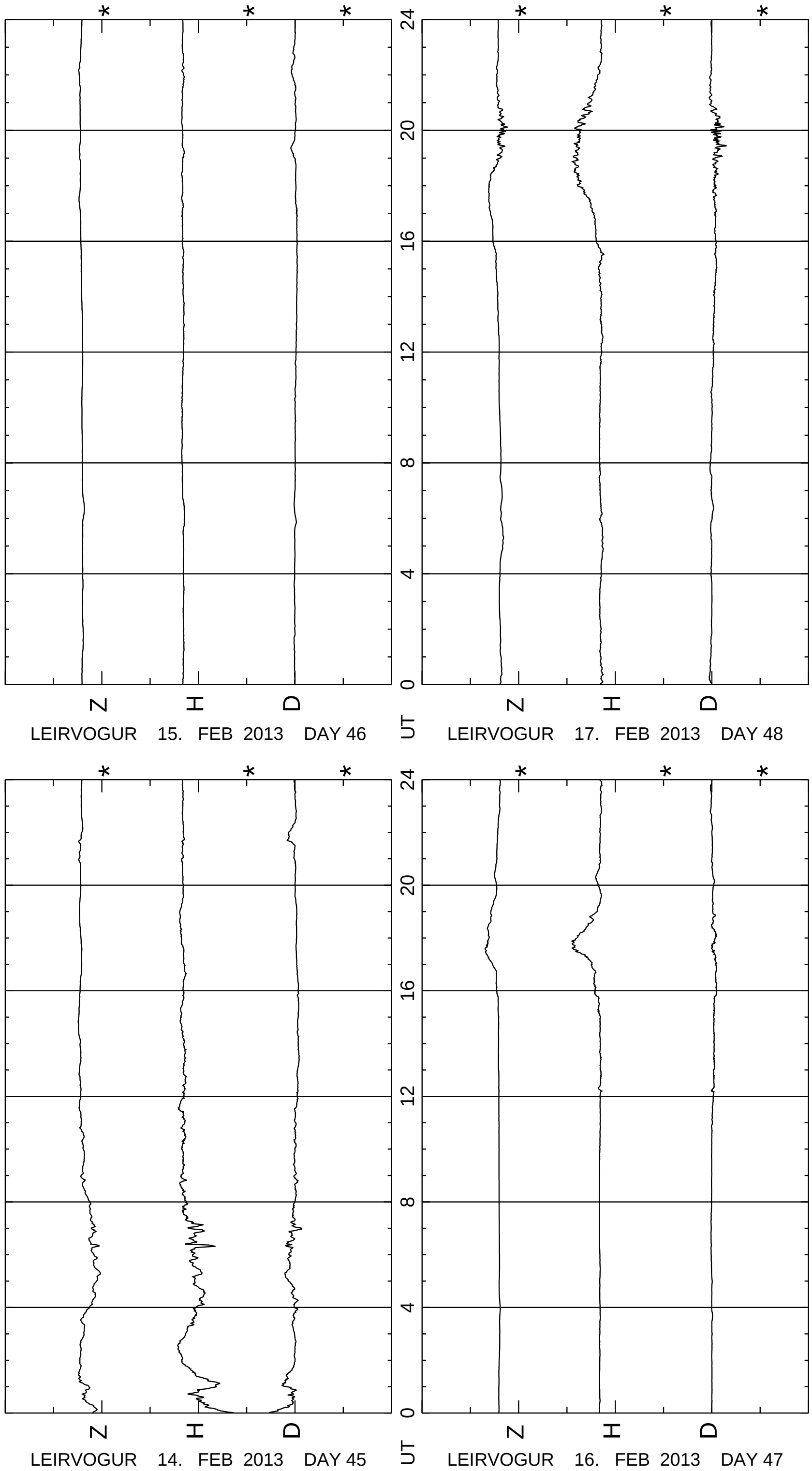


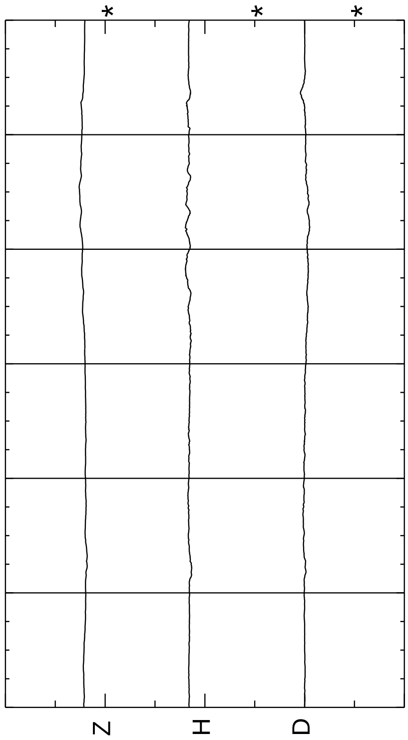
LEIRVOGUR 6. FEB 2013 DAY 37



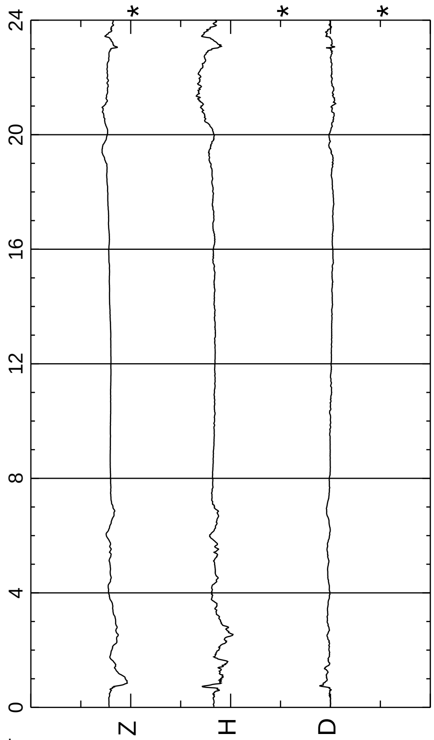
LEIRVOGUR 8. FEB 2013 DAY 39


Z H D
LEIRVOGUR 11. FEB 2013 DAY 42
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 13. FEB 2013 DAY 44
Z H D
LEIRVOGUR 10. FEB 2013 DAY 41
UT
0 4 8 12 16 20 24
Z H D
LEIRVOGUR 12. FEB 2013 DAY 43

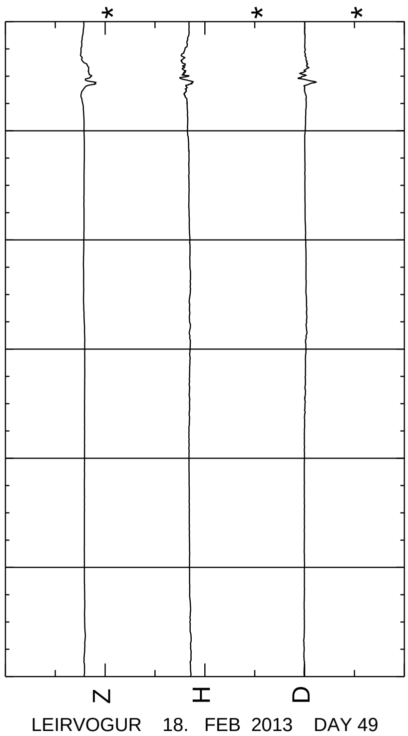

LEIRVOGUR 15. FEB 2013 DAY 46
LEIRVOGUR 17. FEB 2013 DAY 48
LEIRVOGUR 14. FEB 2013 DAY 45
LEIRVOGUR 16. FEB 2013 DAY 47
Z
H
D
UT



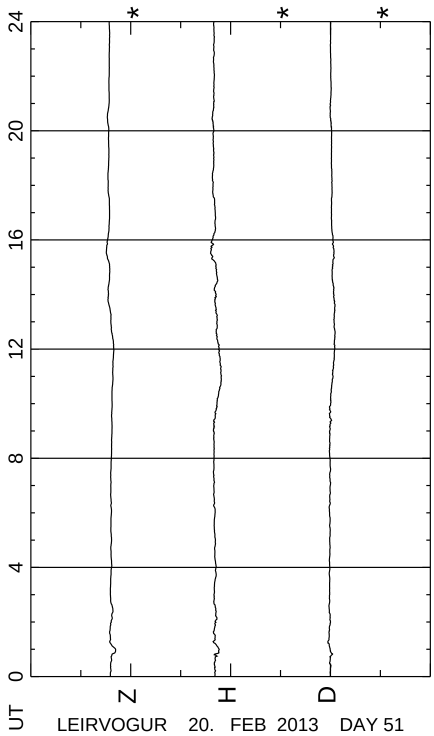
LEIRVOGUR 19. FEB 2013 DAY 50



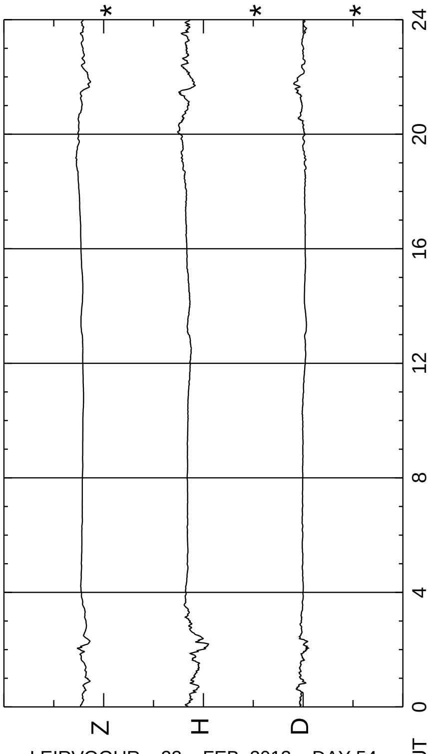
LEIRVOGUR 21. FEB 2013 DAY 52



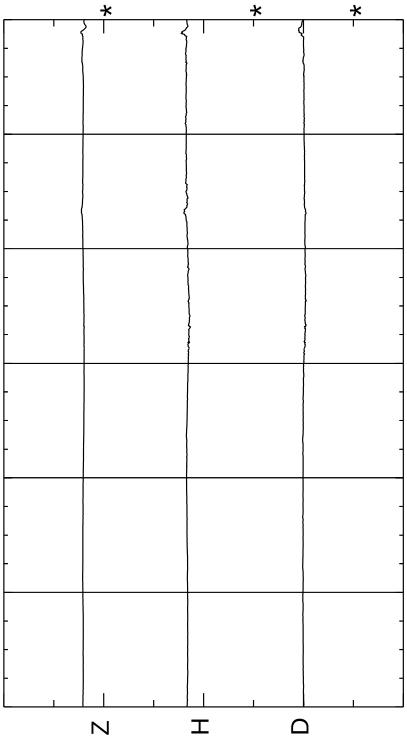
LEIRVOGUR 18. FEB 2013 DAY 49



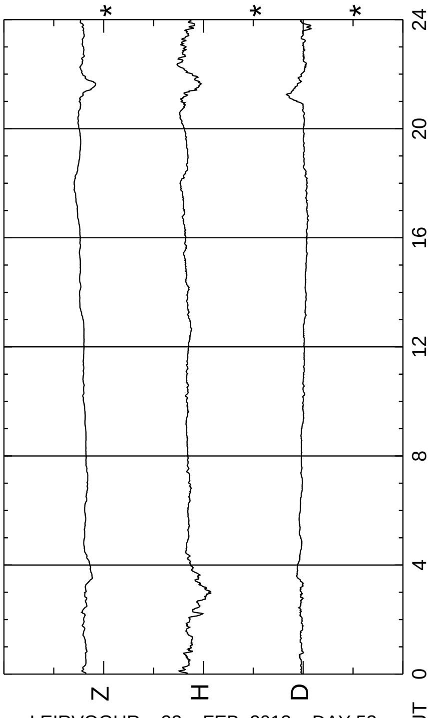
LEIRVOGUR 20. FEB 2013 DAY 51



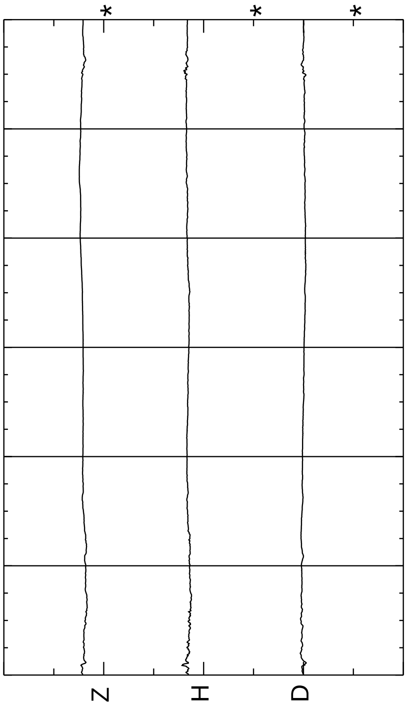
LEIRVOGUR 23. FEB 2013 DAY 54



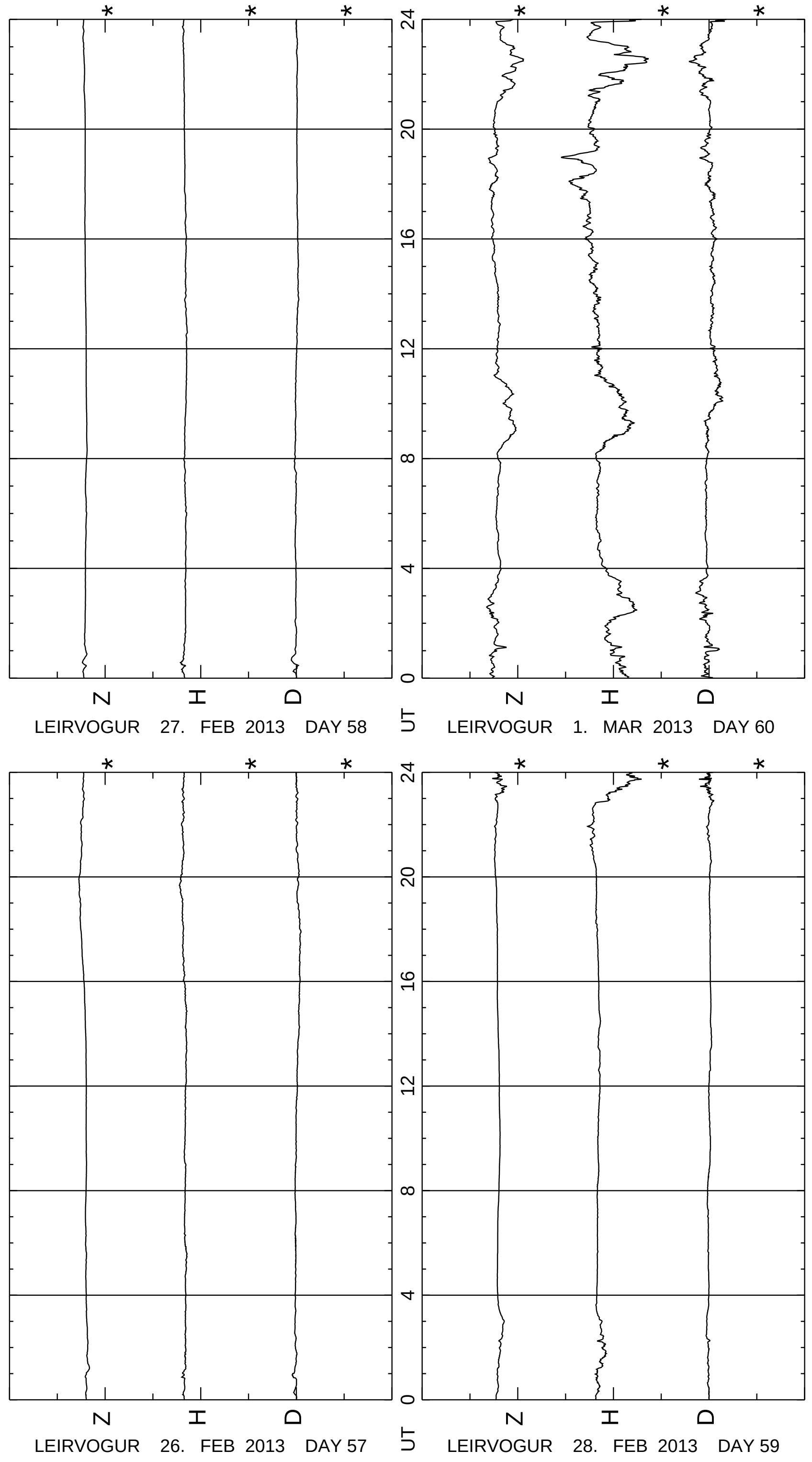
LEIRVOGUR 25. FEB 2013 DAY 56



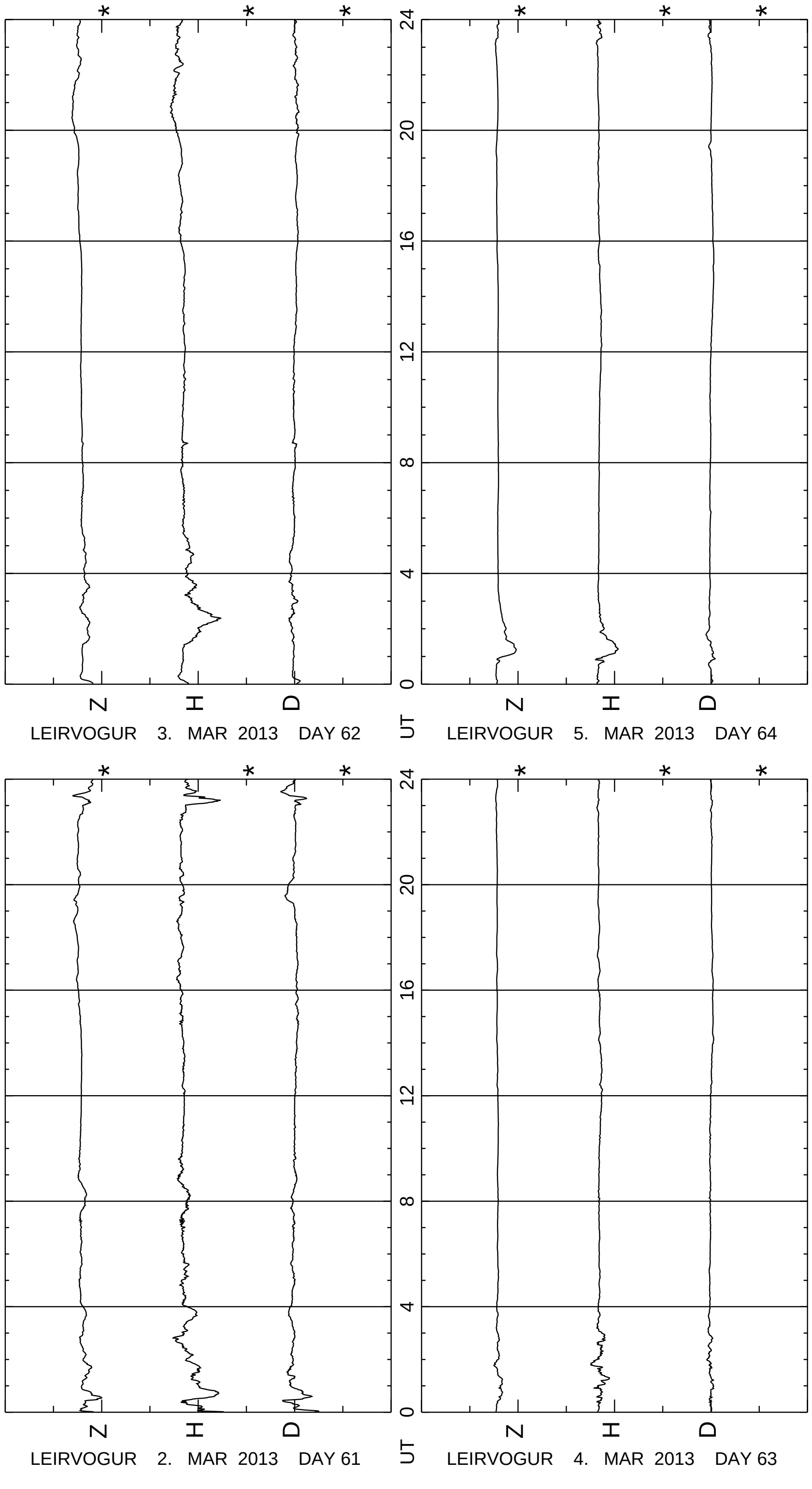
LEIRVOGUR 22. FEB 2013 DAY 53



LEIRVOGUR 24. FEB 2013 DAY 55



Z H D
UT
0 4 8 12 16 20 24
LEIRVOGUR 27. FEB 2013 DAY 58
LEIRVOGUR 1. MAR 2013 DAY 60
LEIRVOGUR 26. FEB 2013 DAY 57
LEIRVOGUR 28. FEB 2013 DAY 59



Z
H
D
UT
LEIRVOGUR 3. MAR 2013 DAY 62
LEIRVOGUR 5. MAR 2013 DAY 64
LEIRVOGUR 2. MAR 2013 DAY 61
LEIRVOGUR 4. MAR 2013 DAY 63
0
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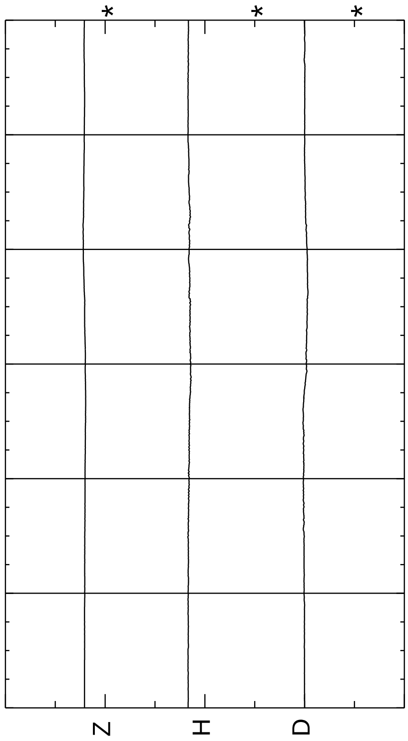
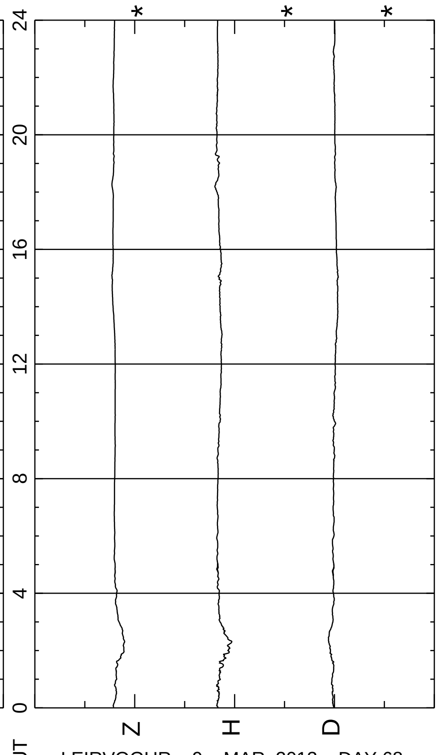
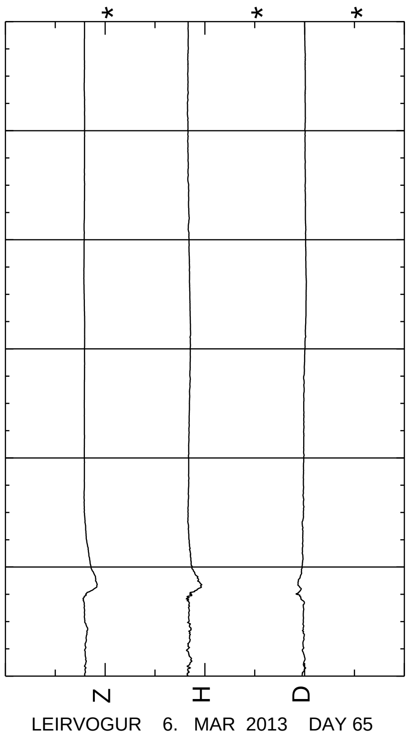
24



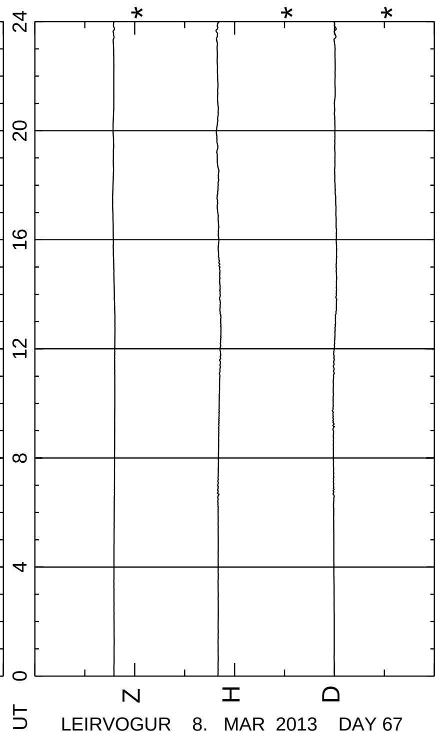
LEIRVOGUR 7. MAR 2013 DAY 66



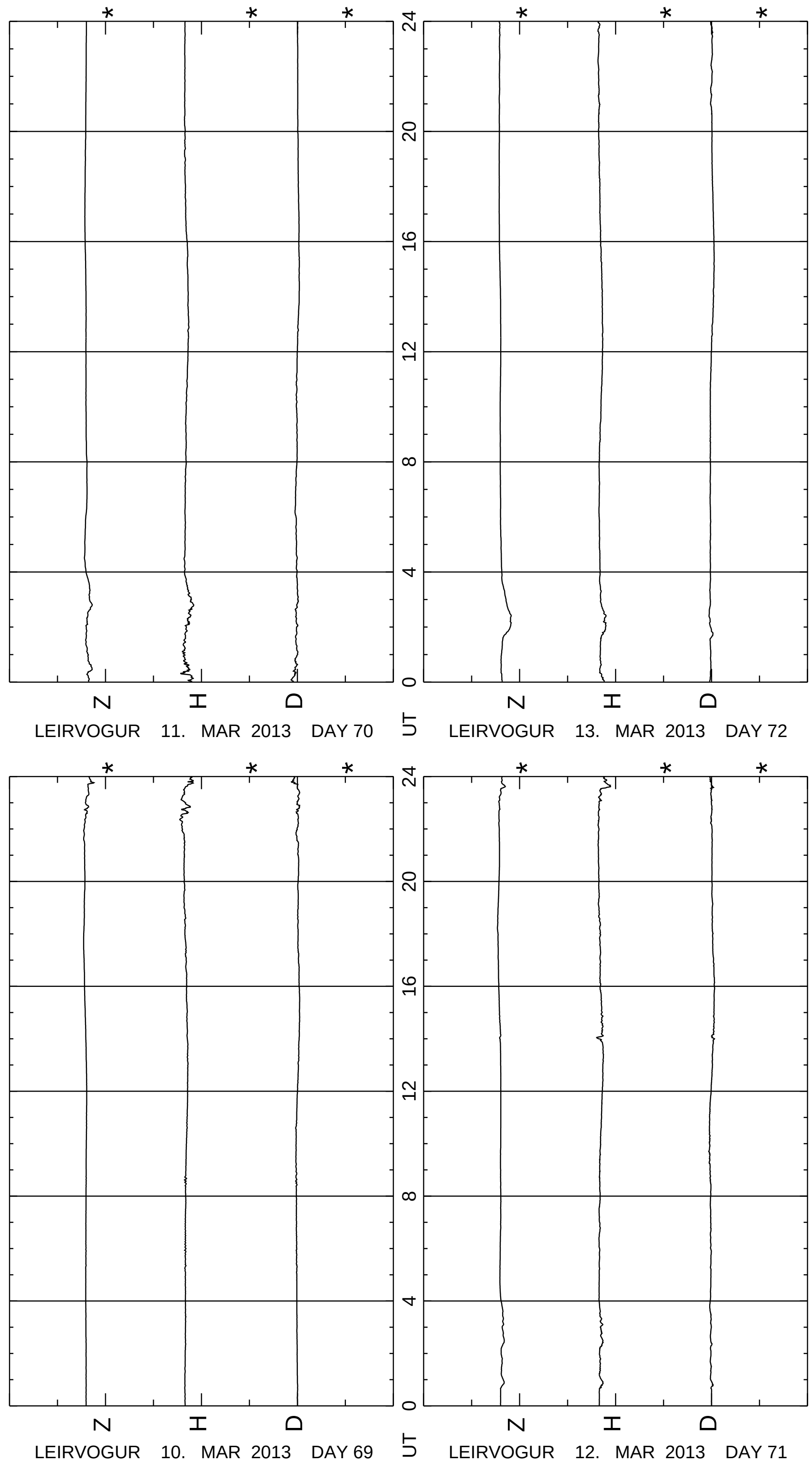
LEIRVOGUR 9. MAR 2013 DAY 68



LEIRVOGUR 6. MAR 2013 DAY 65



LEIRVOGUR 8. MAR 2013 DAY 67



LEIRVOGUR 11. MAR 2013 DAY 70
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LEIRVOGUR 12. MAR 2013 DAY 71
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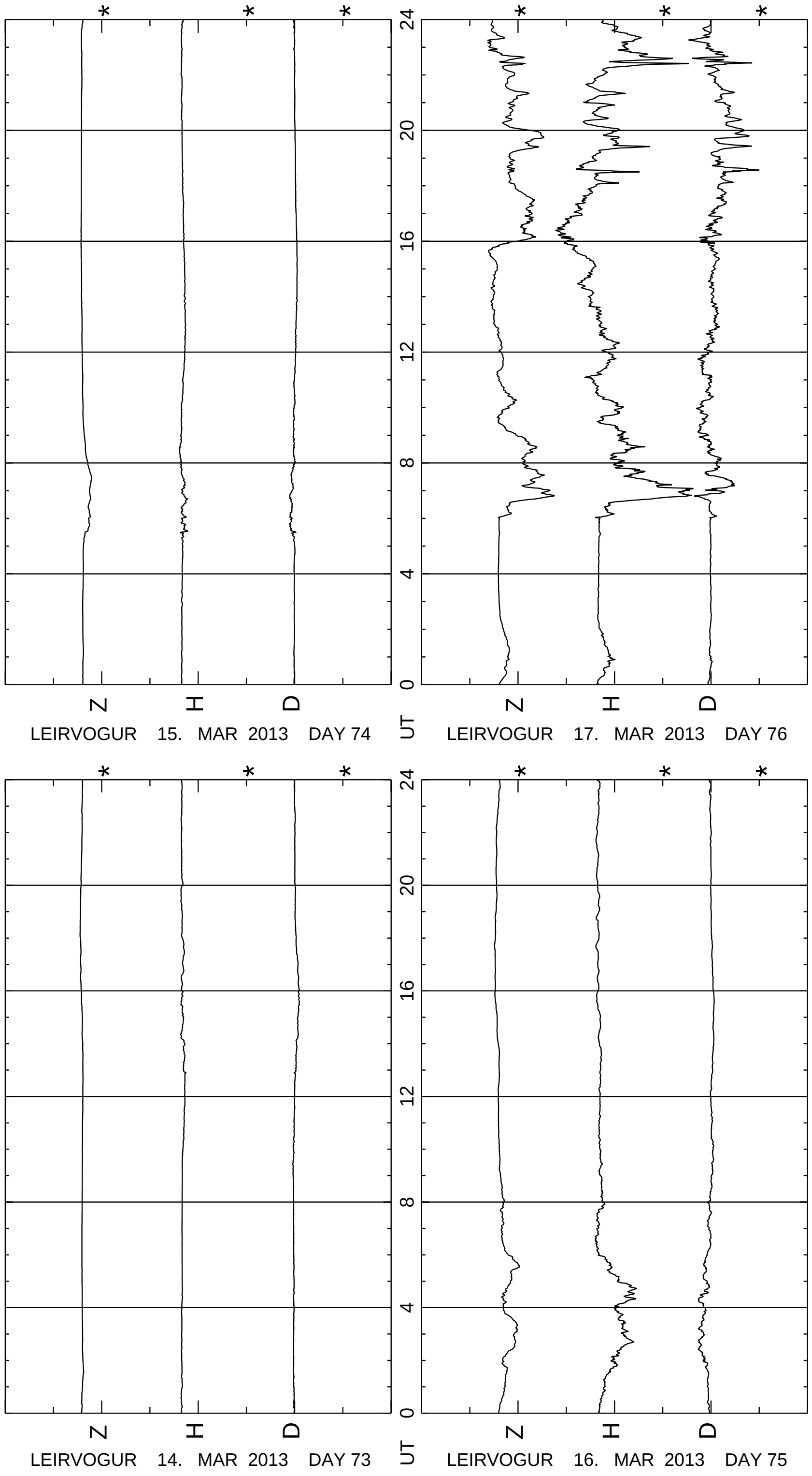
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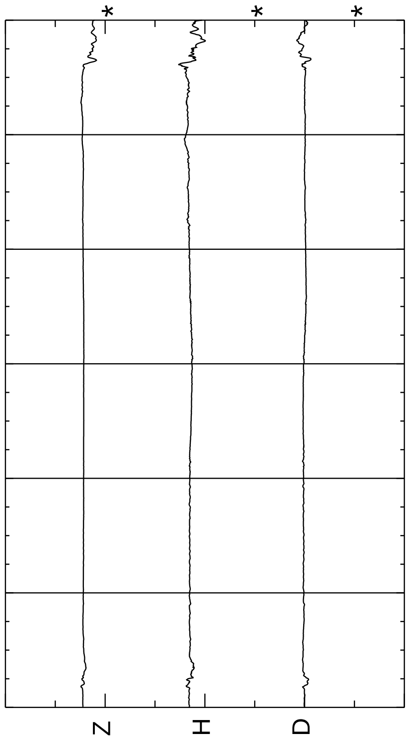

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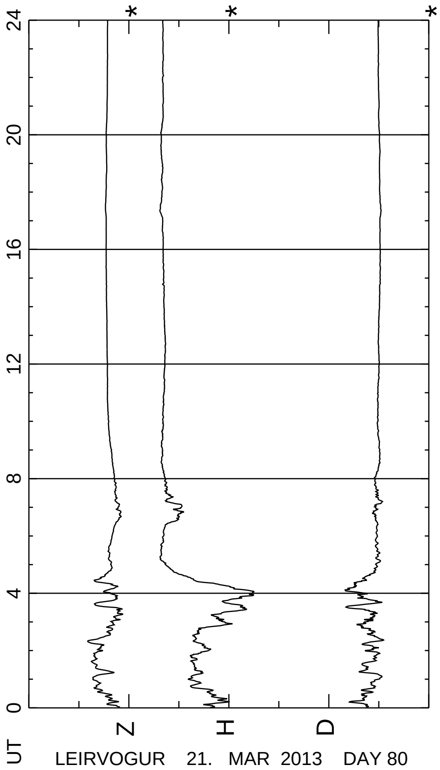

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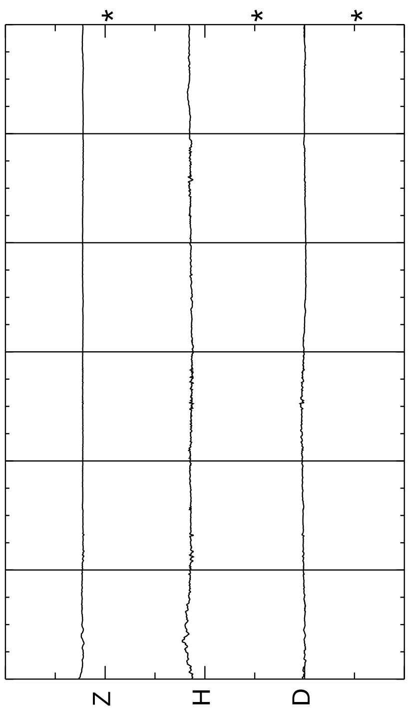

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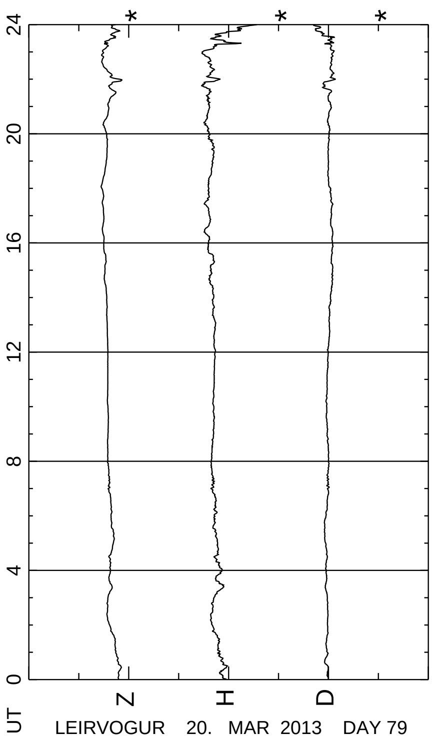

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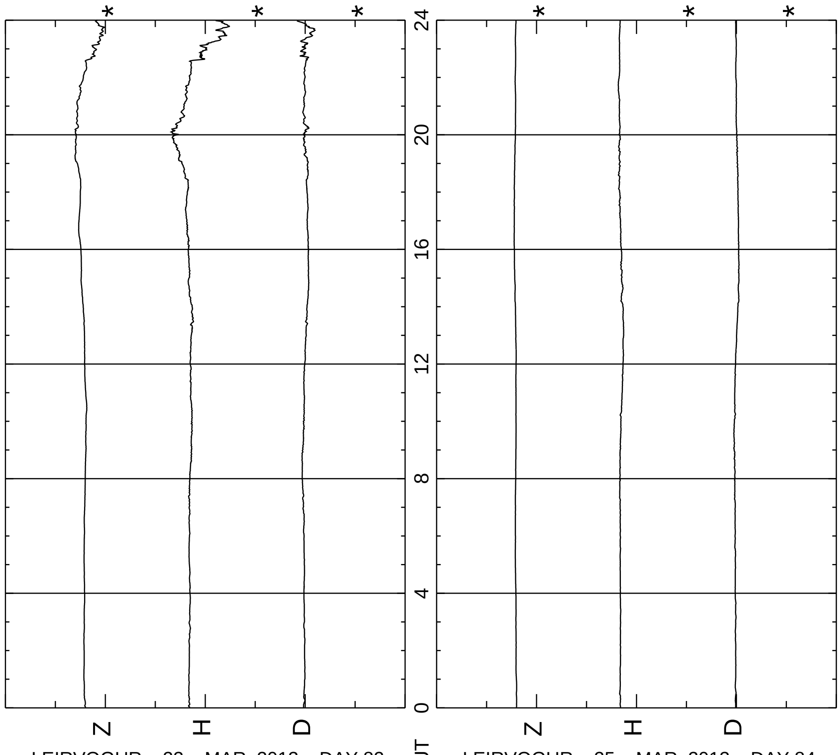

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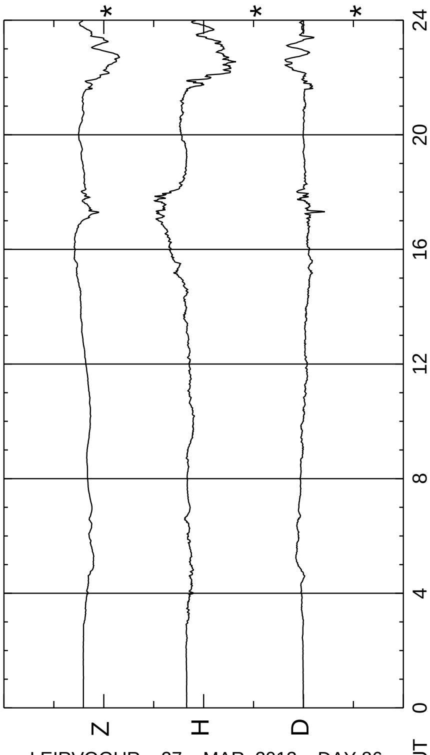
LEIRVOGUR 25. MAR 2013 DAY 84

LEIRVOGUR 22. MAR 2013 DAY 81

LEIRVOGUR 24. MAR 2013 DAY 83



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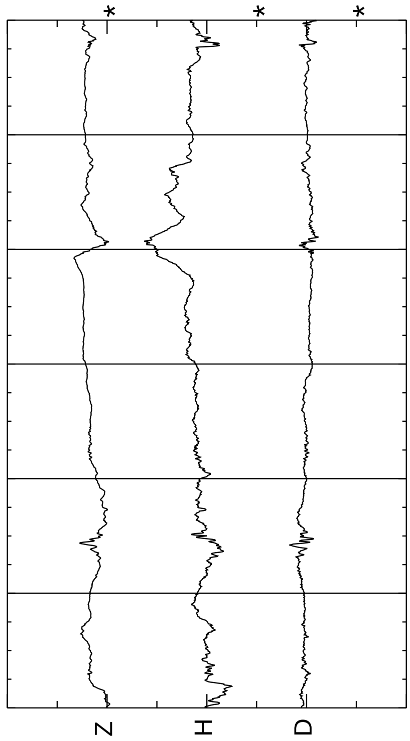

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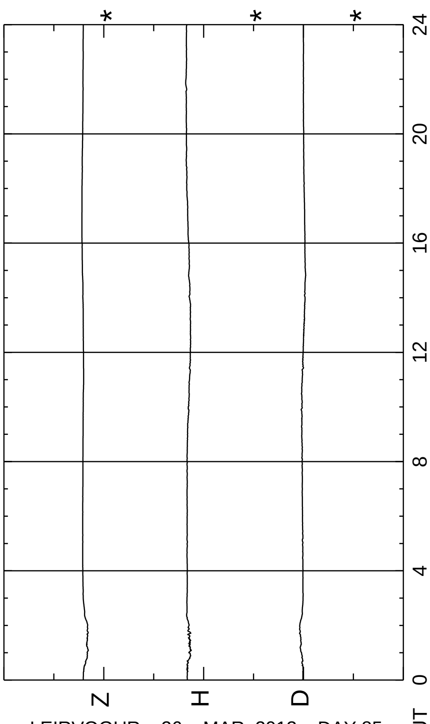

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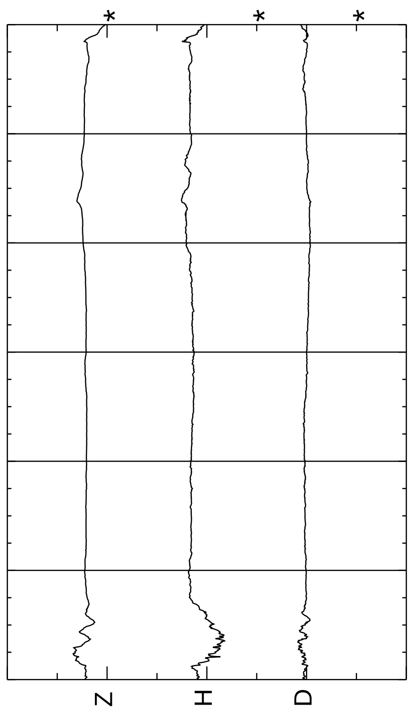

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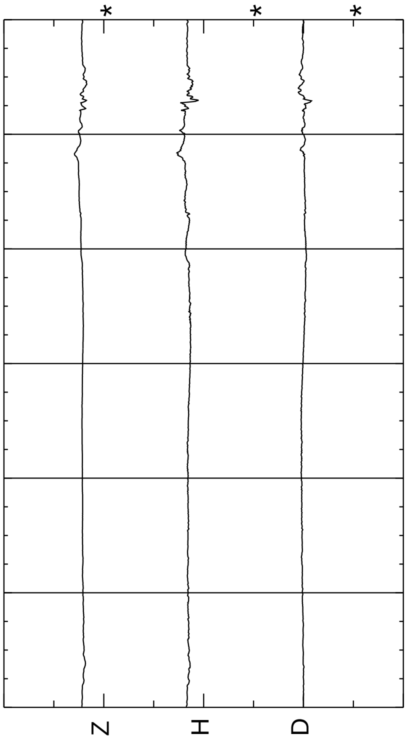

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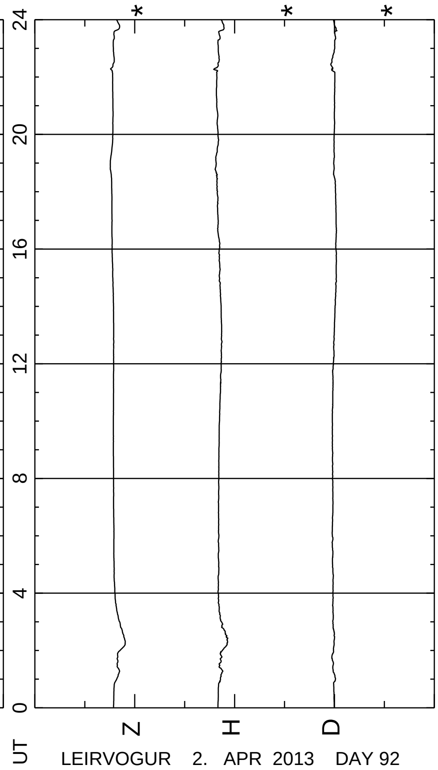

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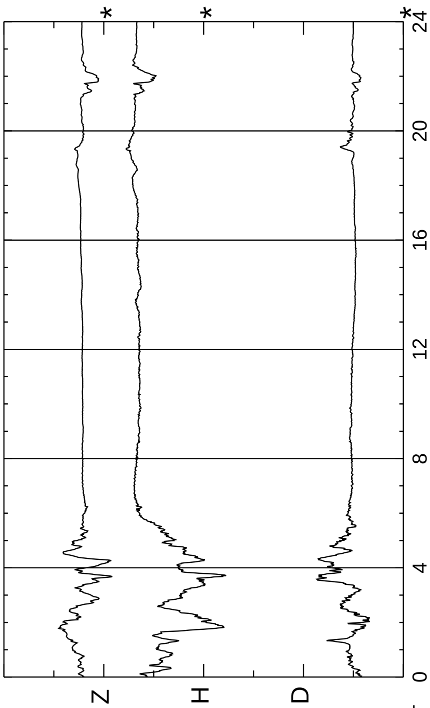
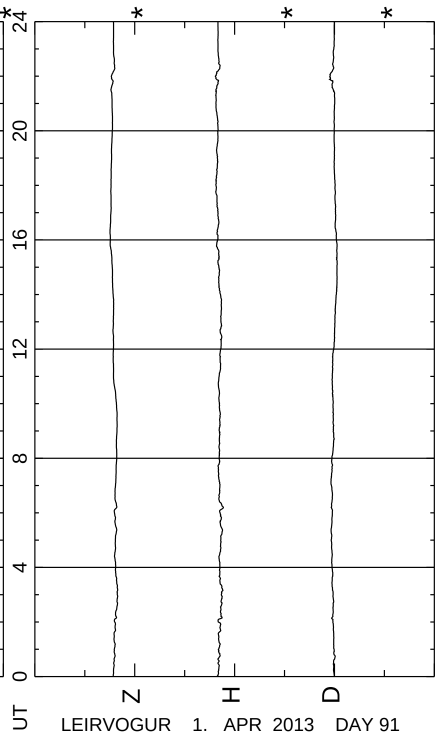


LEIRVOGUR 30. MAR 2013 DAY 89



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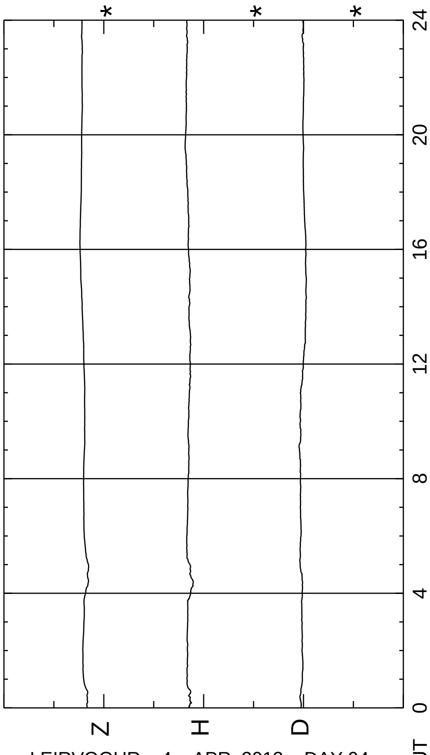

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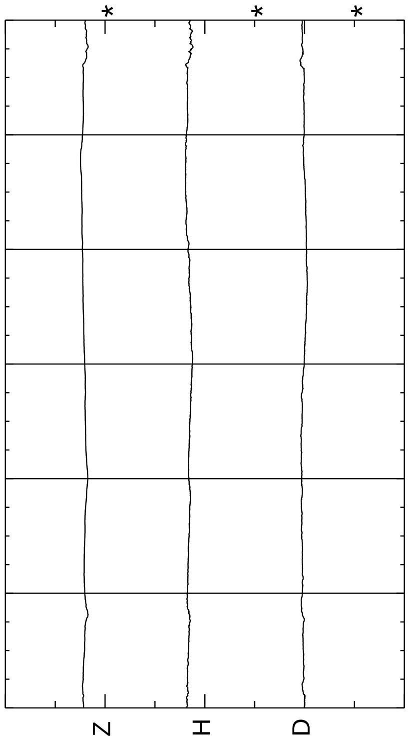
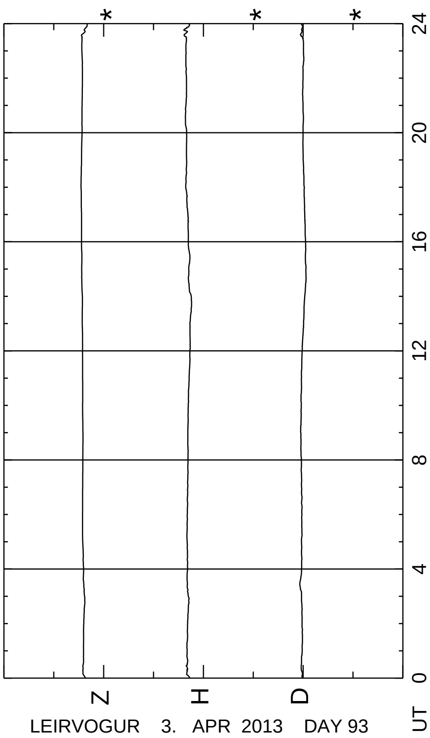
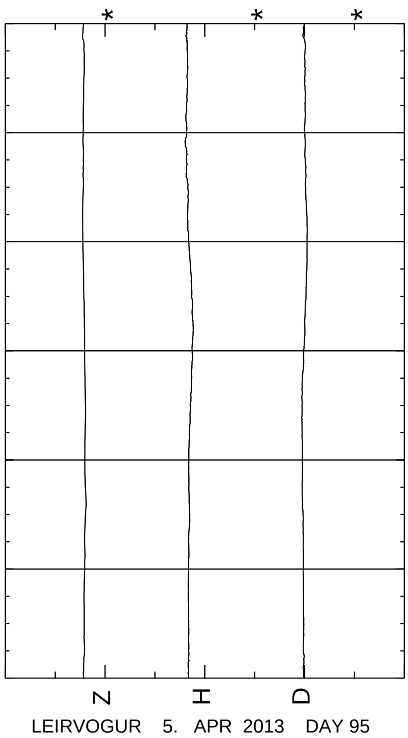


LEIRVOGUR 6. APR 2013 DAY 96



LEIRVOGUR 3. APR 2013 DAY 93



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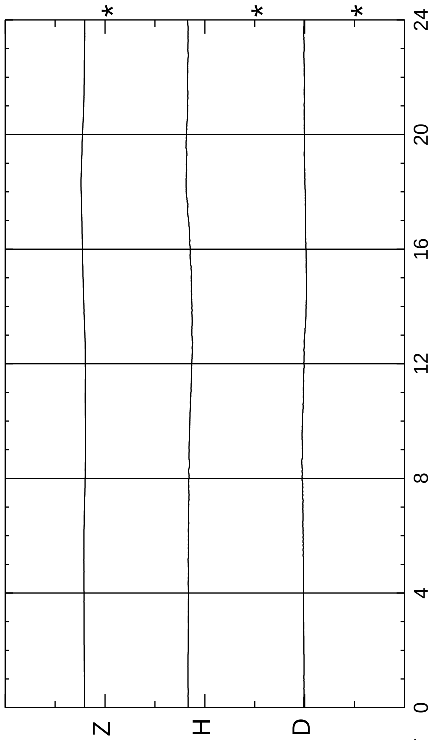
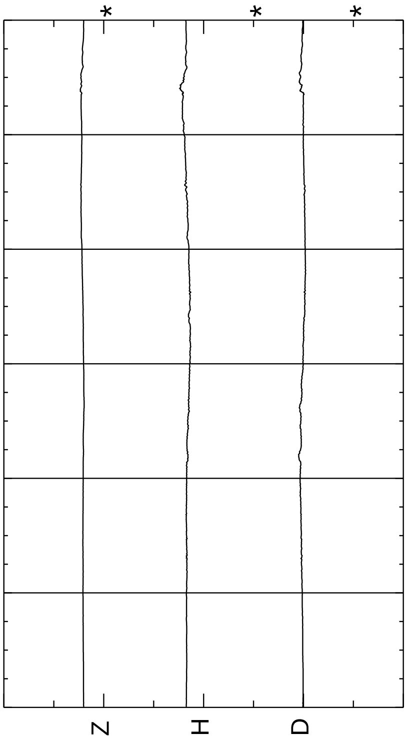


LEIRVOGUR 8. APR 2013 DAY 98



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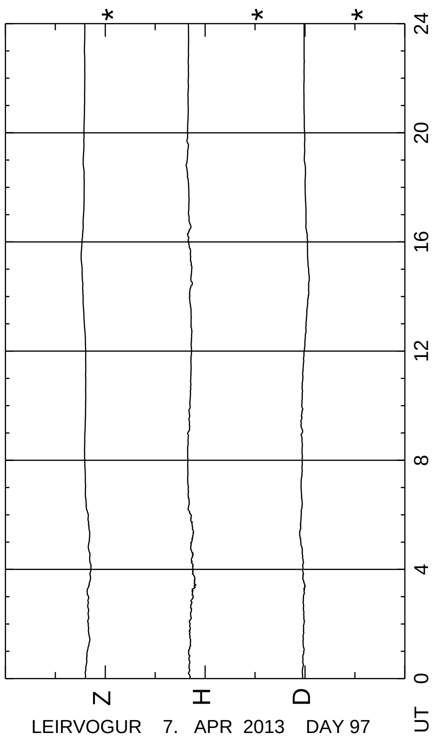
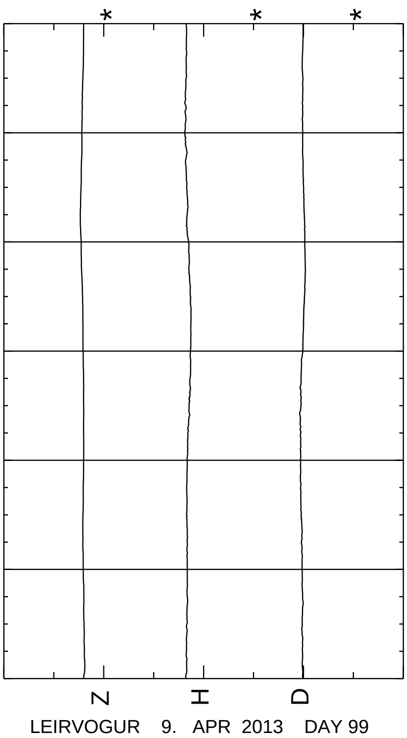
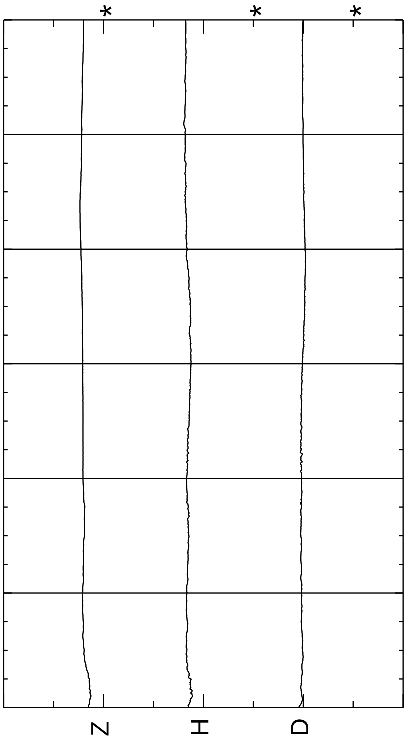


LEIRVOGUR 7. APR 2013 DAY 97



LEIRVOGUR 9. APR 2013 DAY 99



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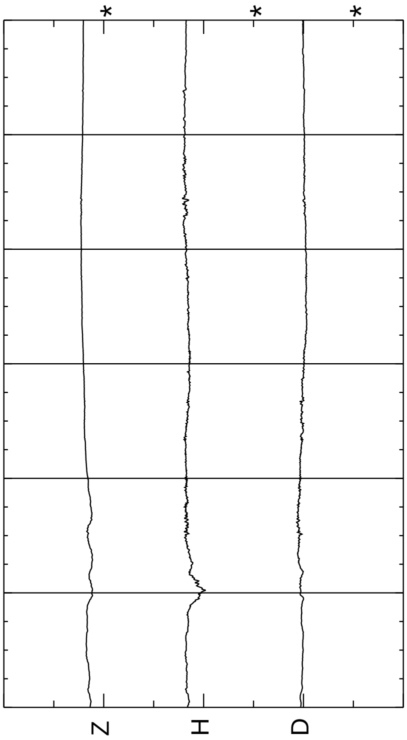

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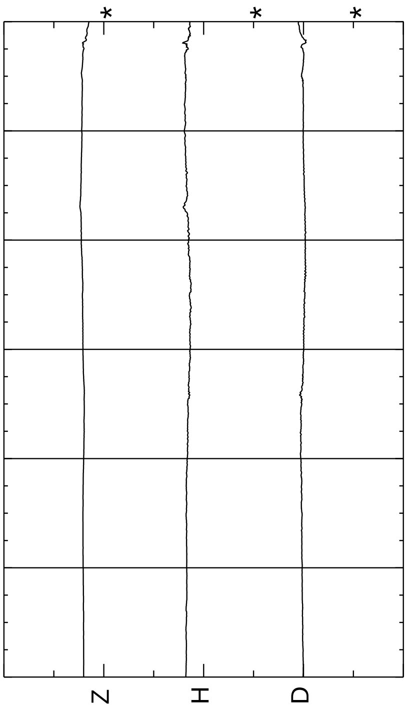

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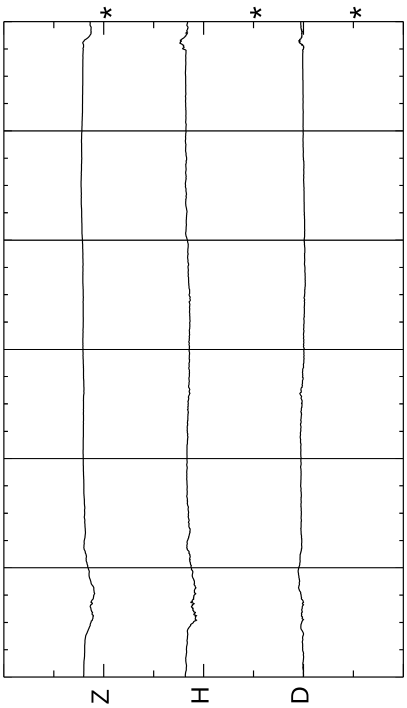

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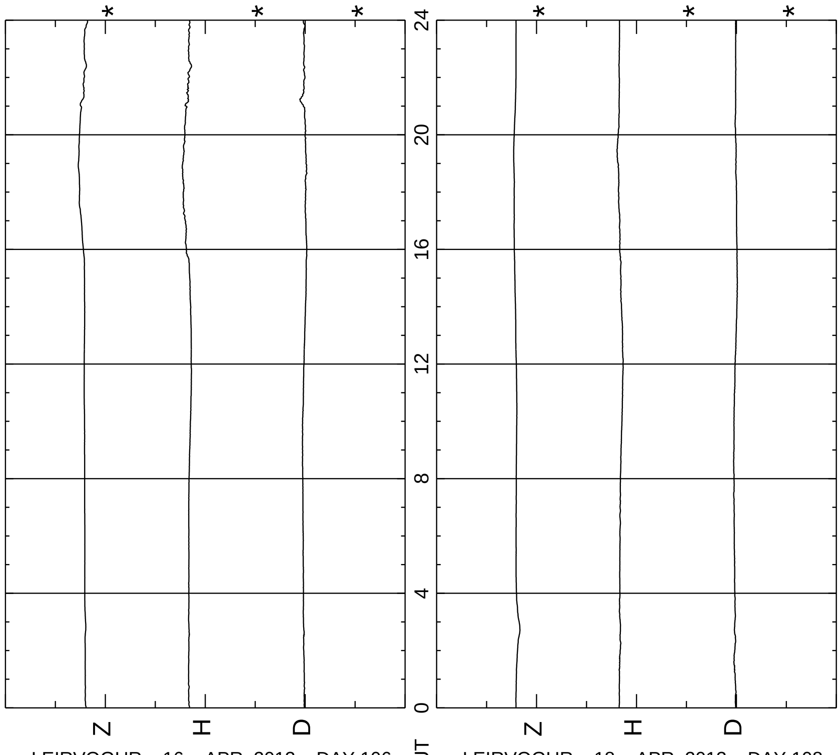

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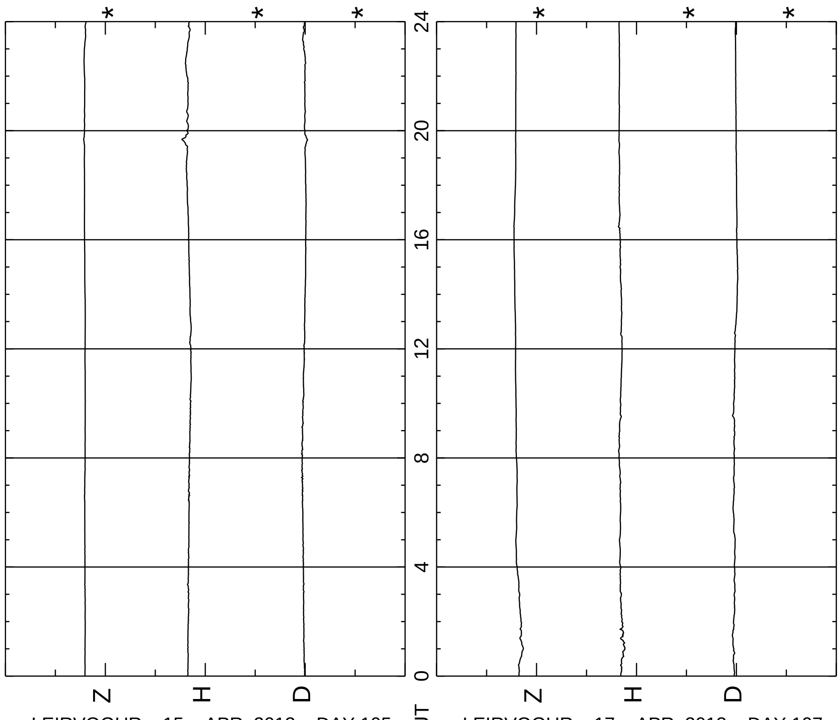

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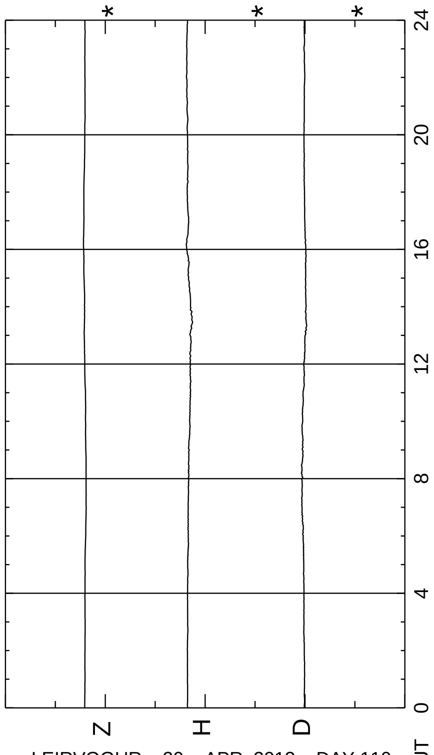
LEIRVOGUR 17. APR 2013 DAY 107



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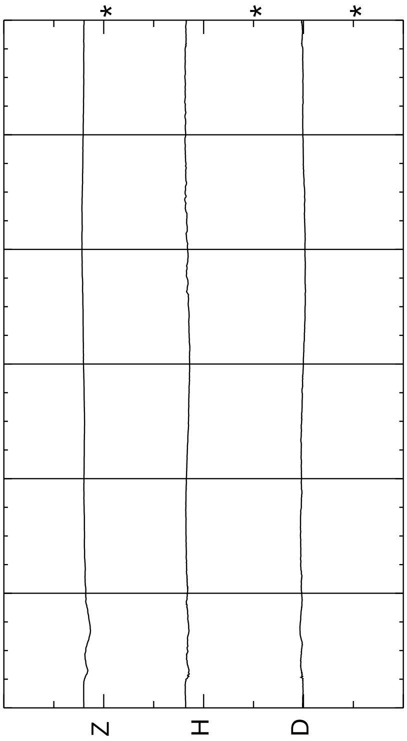

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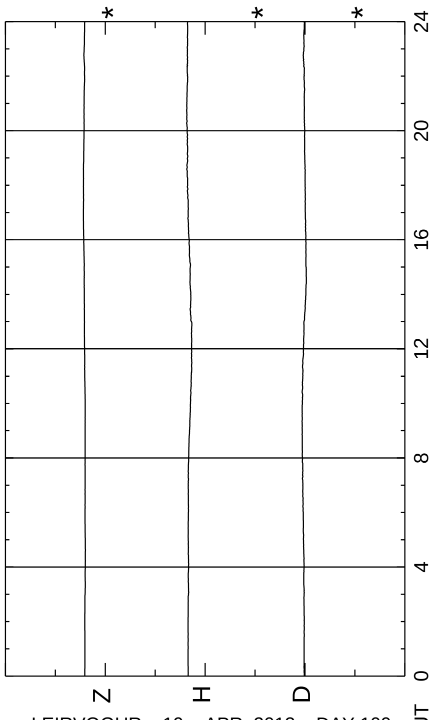

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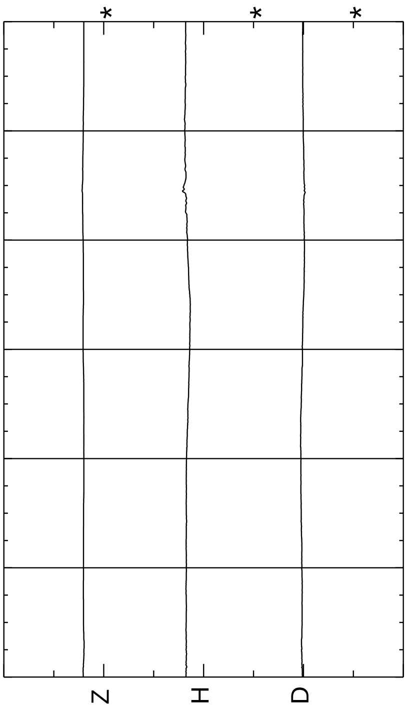

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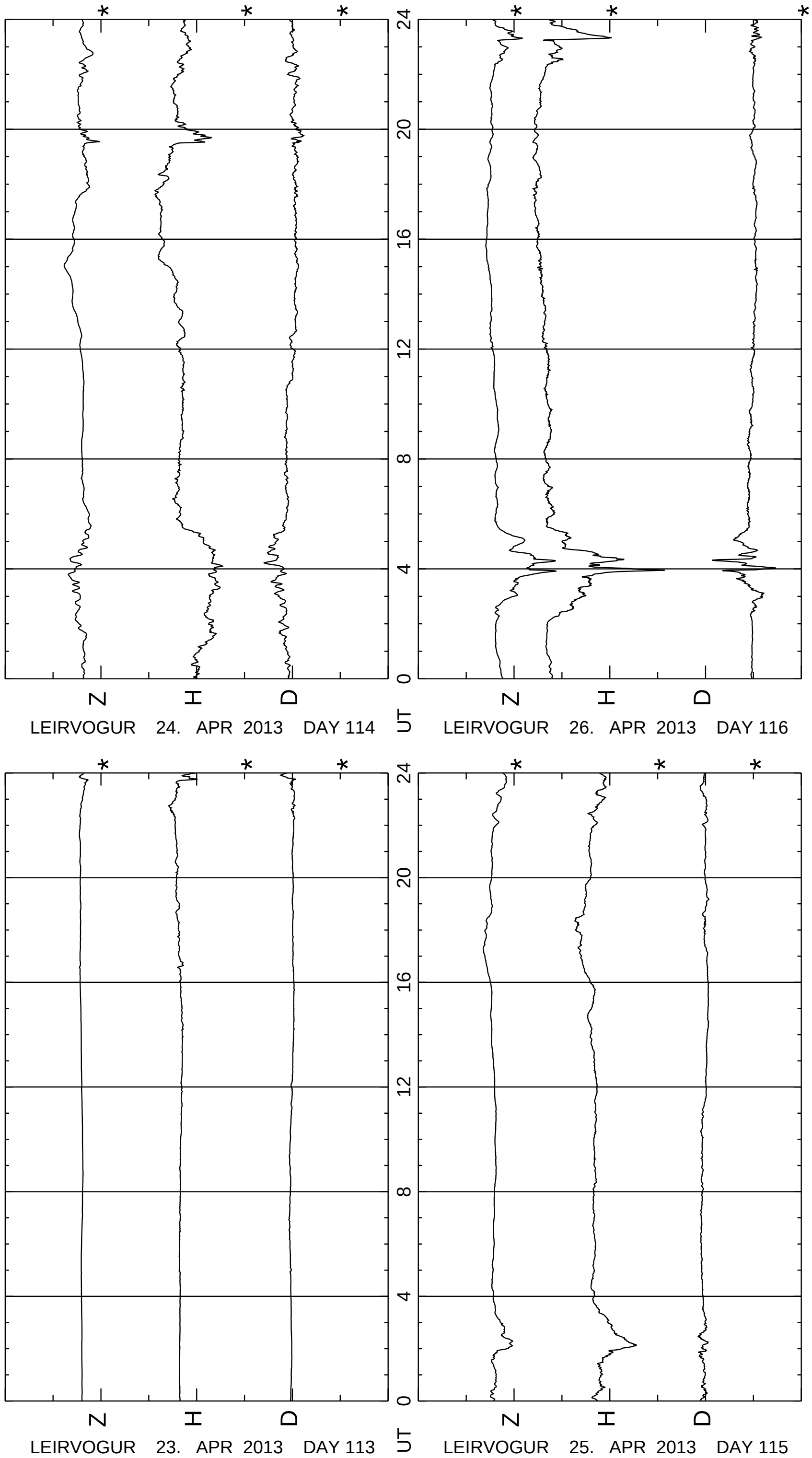
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LEIRVOGUR 26. APR 2013 DAY 116
LEIRVOGUR 23. APR 2013 DAY 113
LEIRVOGUR 25. APR 2013 DAY 115
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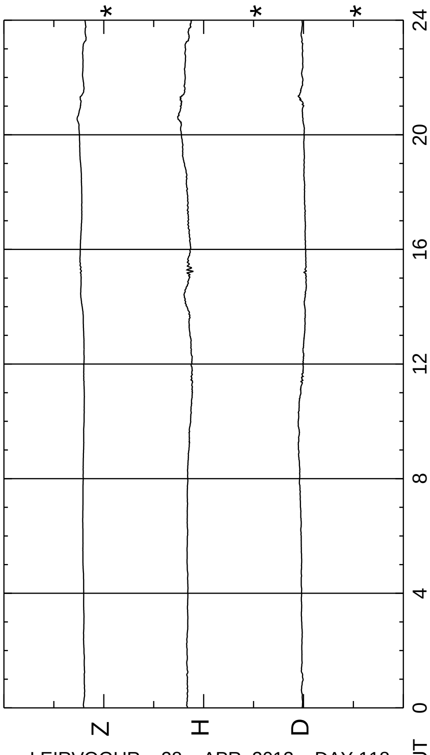

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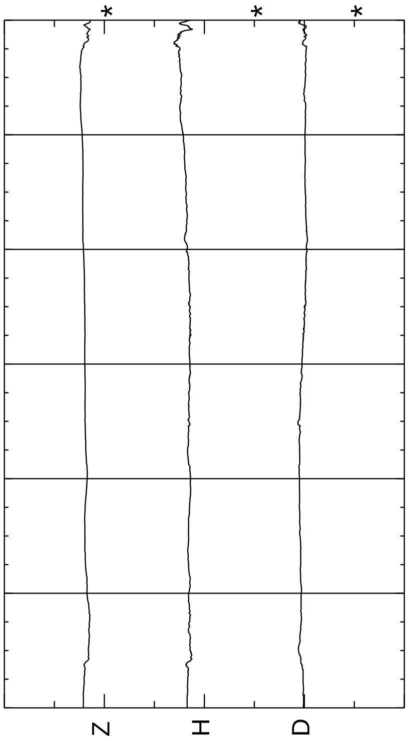

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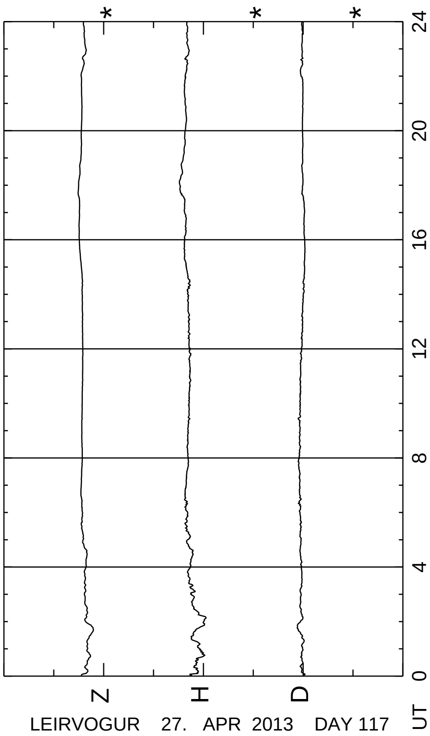

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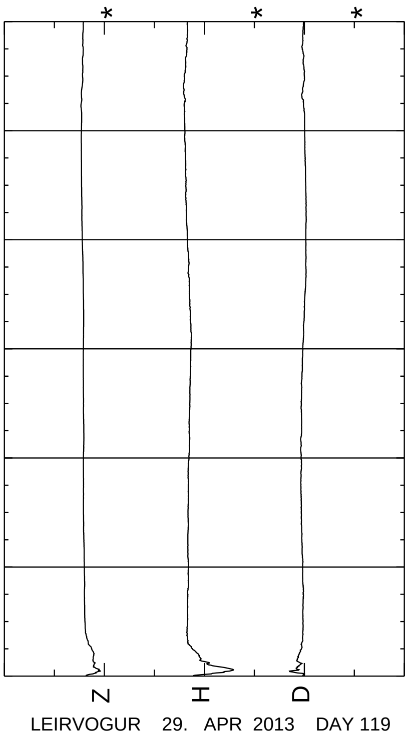

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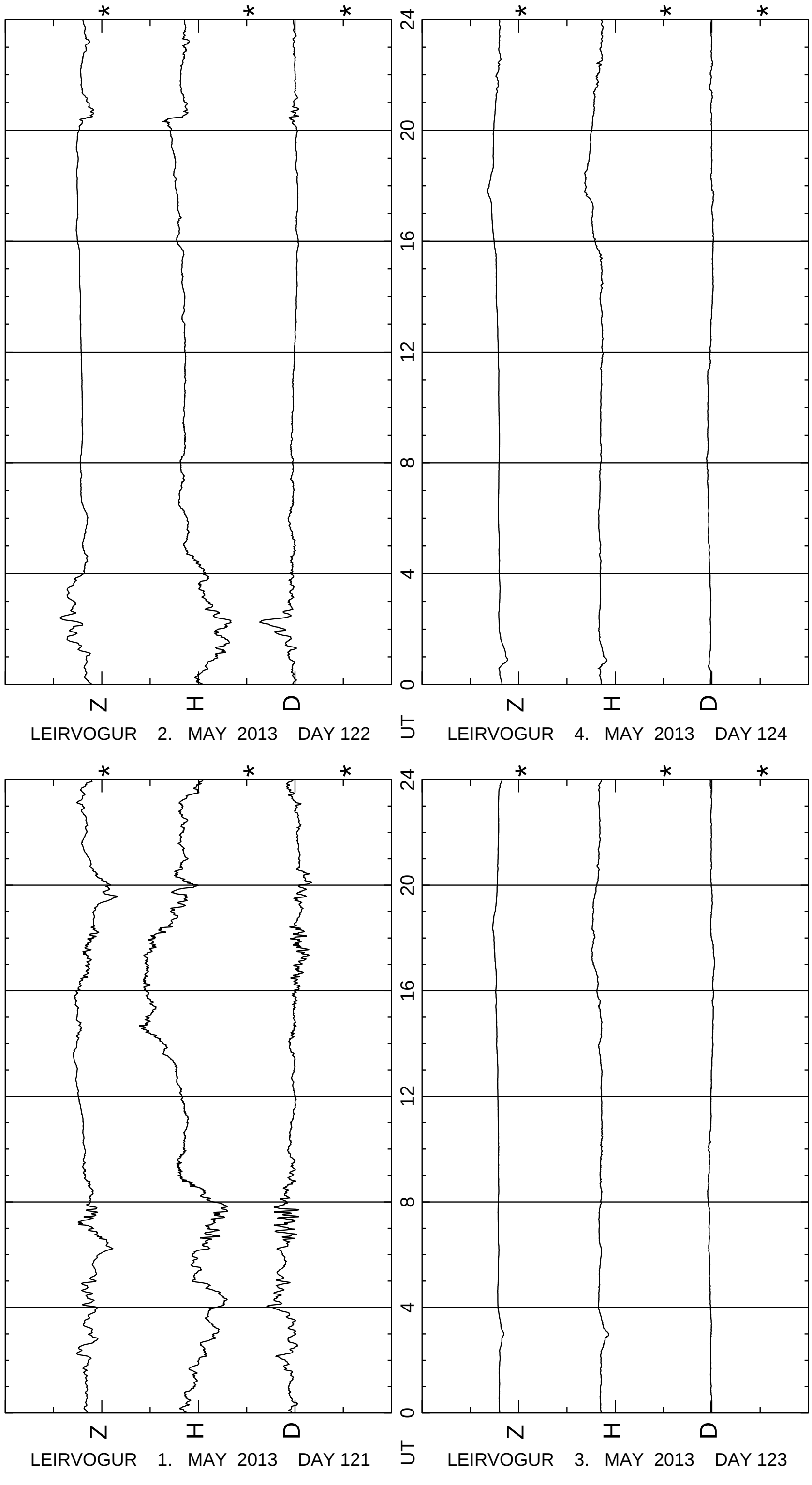
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LEIRVOGUR 4. MAY 2013 DAY 124
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LEIRVOGUR 3. MAY 2013 DAY 123
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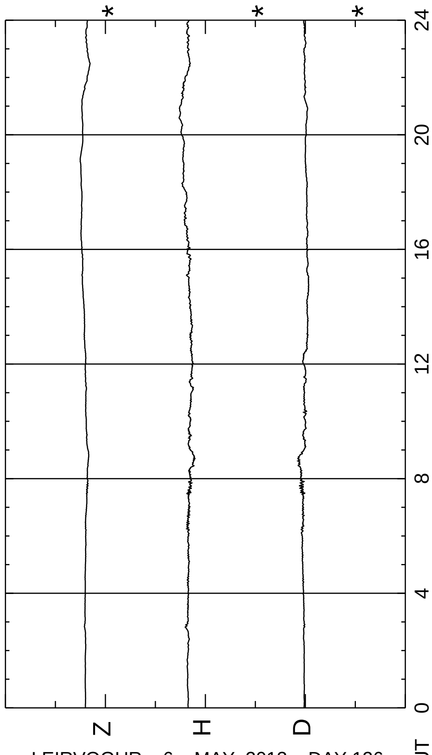

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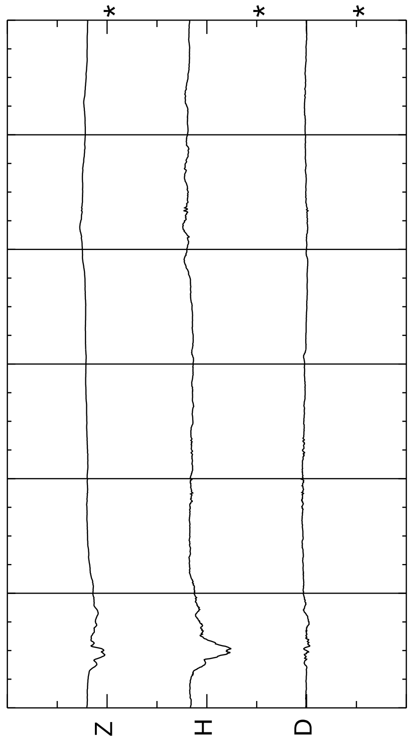

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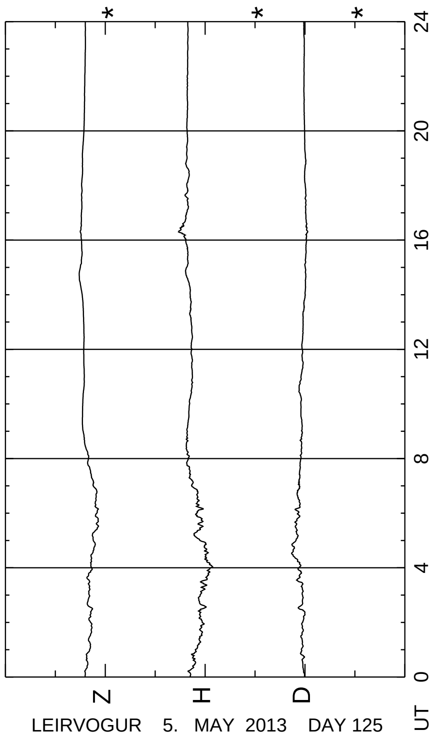

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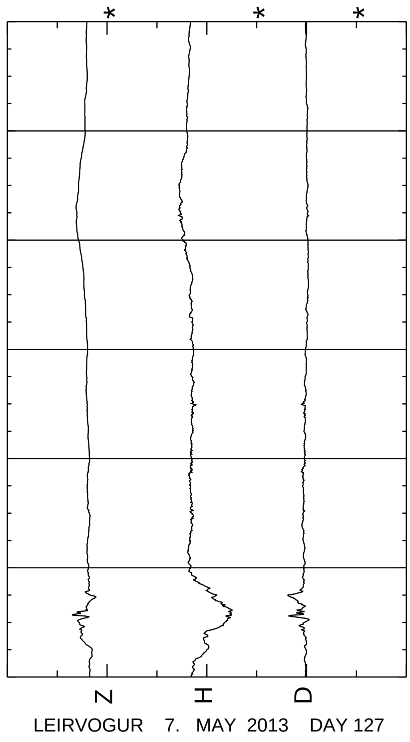
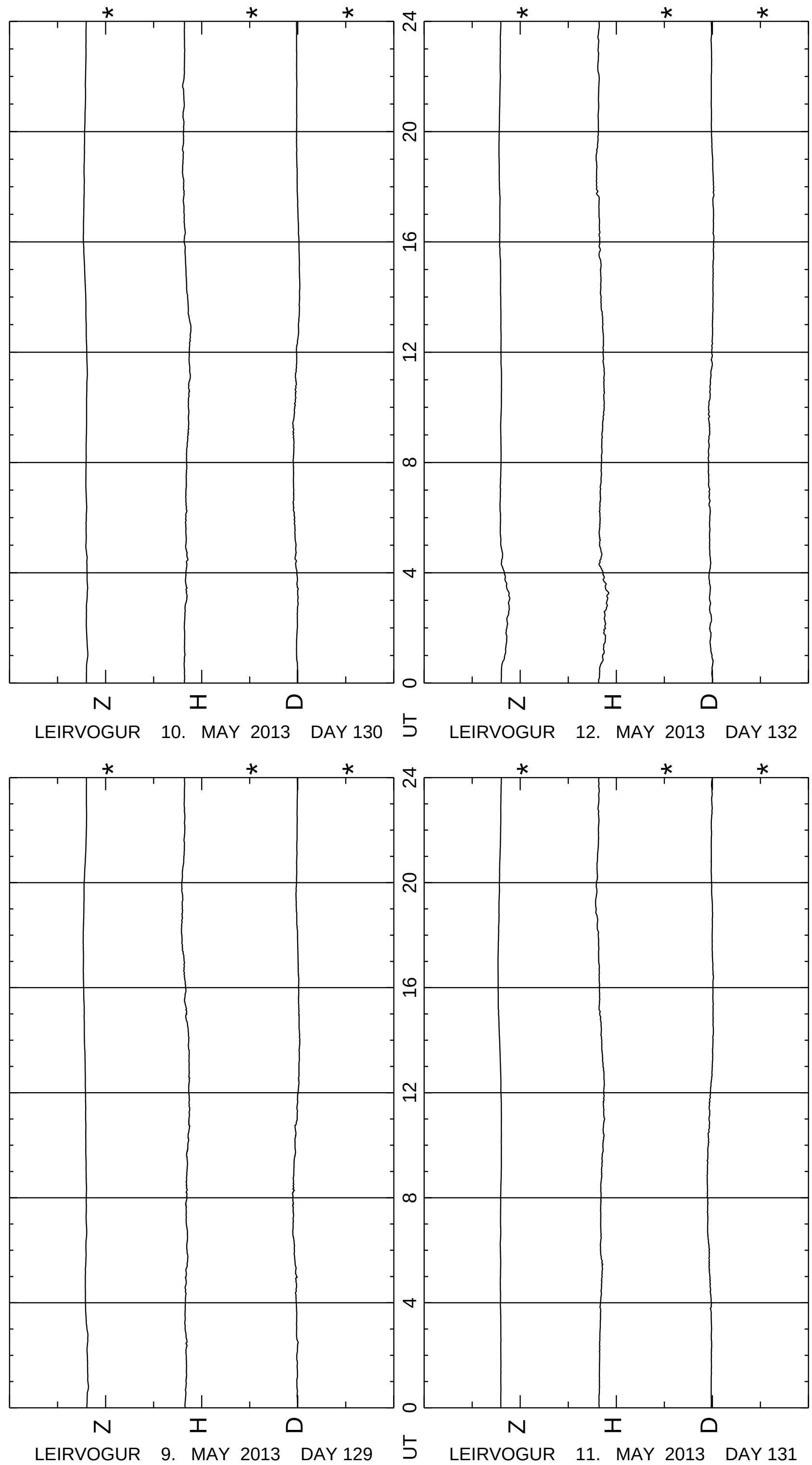


LEIRVOGUR 7. MAY 2013 DAY 127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LEIRVOGUR 12. MAY 2013 DAY 132
LEIRVOGUR 9. MAY 2013 DAY 129
LEIRVOGUR 11. MAY 2013 DAY 131
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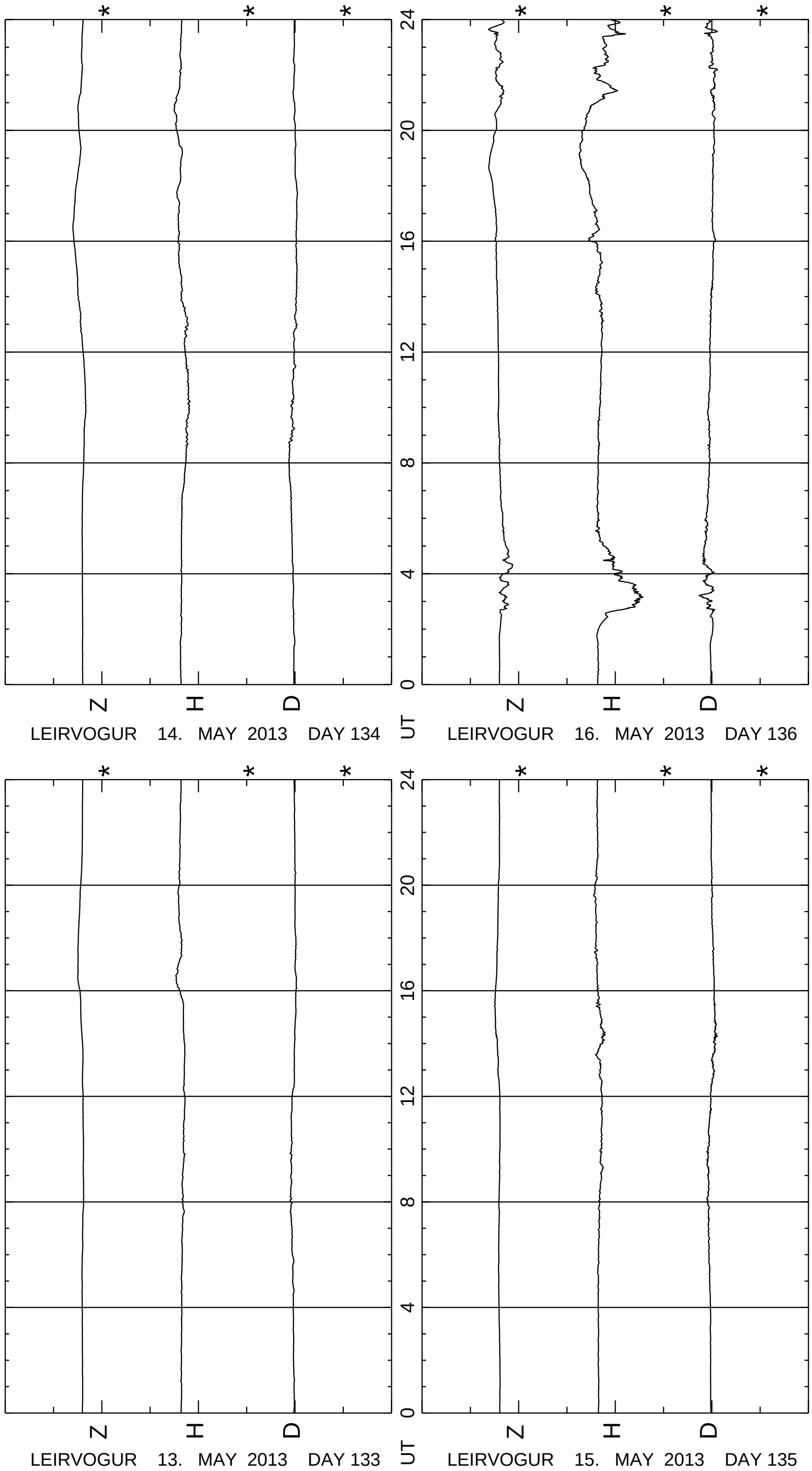
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LEIRVOGUR 16. MAY 2013 DAY 136
LEIRVOGUR 13. MAY 2013 DAY 133
LEIRVOGUR 15. MAY 2013 DAY 135
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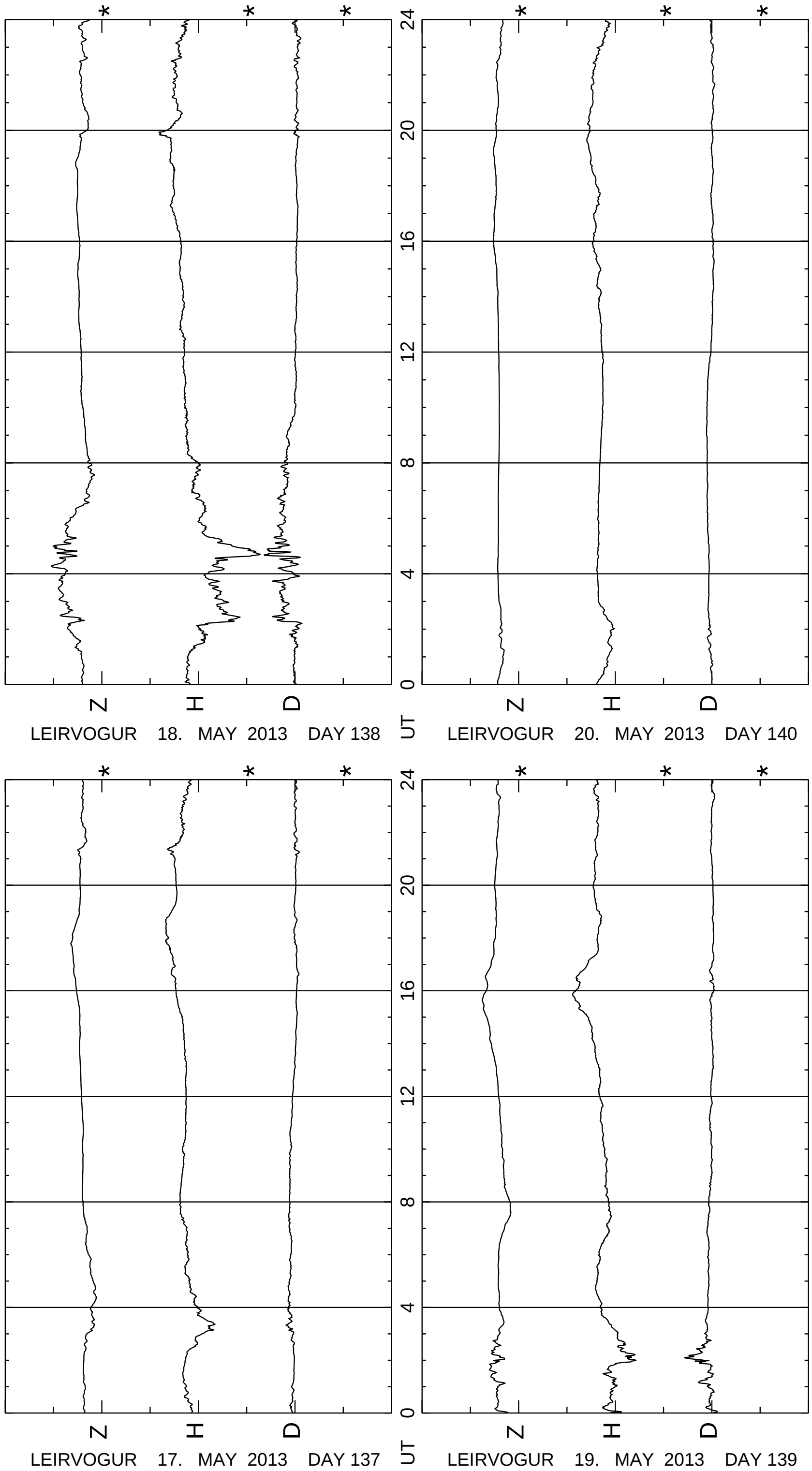
LEIRVOGUR 18. MAY 2013 DAY 138
LEIRVOGUR 20. MAY 2013 DAY 140
LEIRVOGUR 17. MAY 2013 DAY 137
LEIRVOGUR 19. MAY 2013 DAY 139
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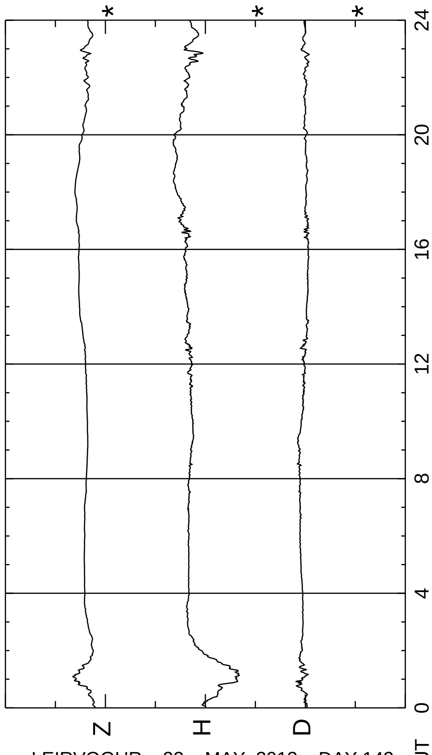

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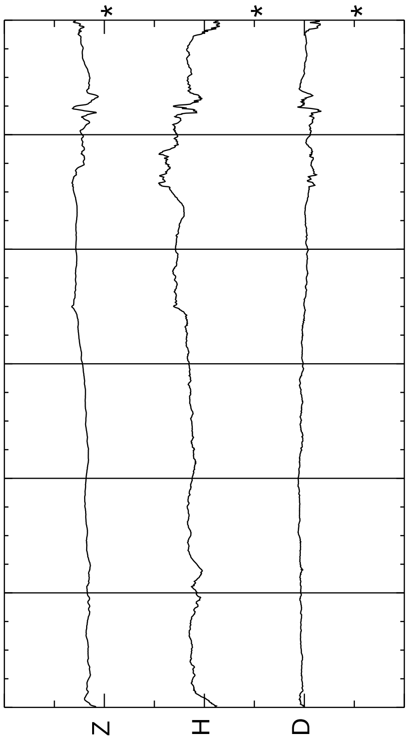

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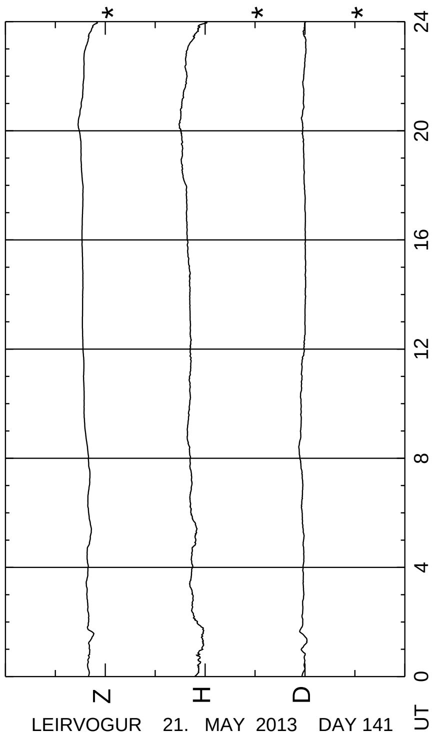

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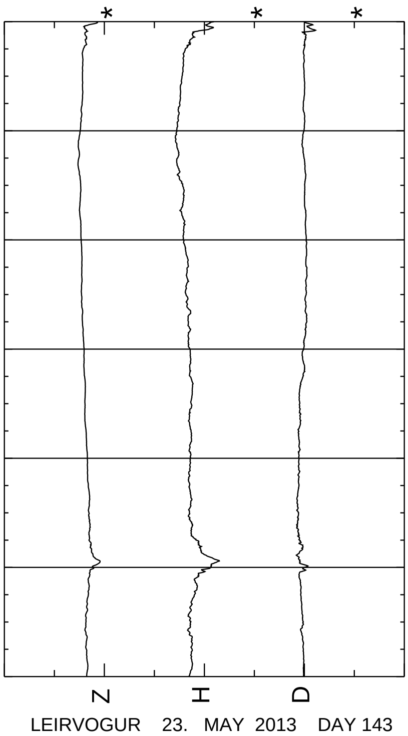

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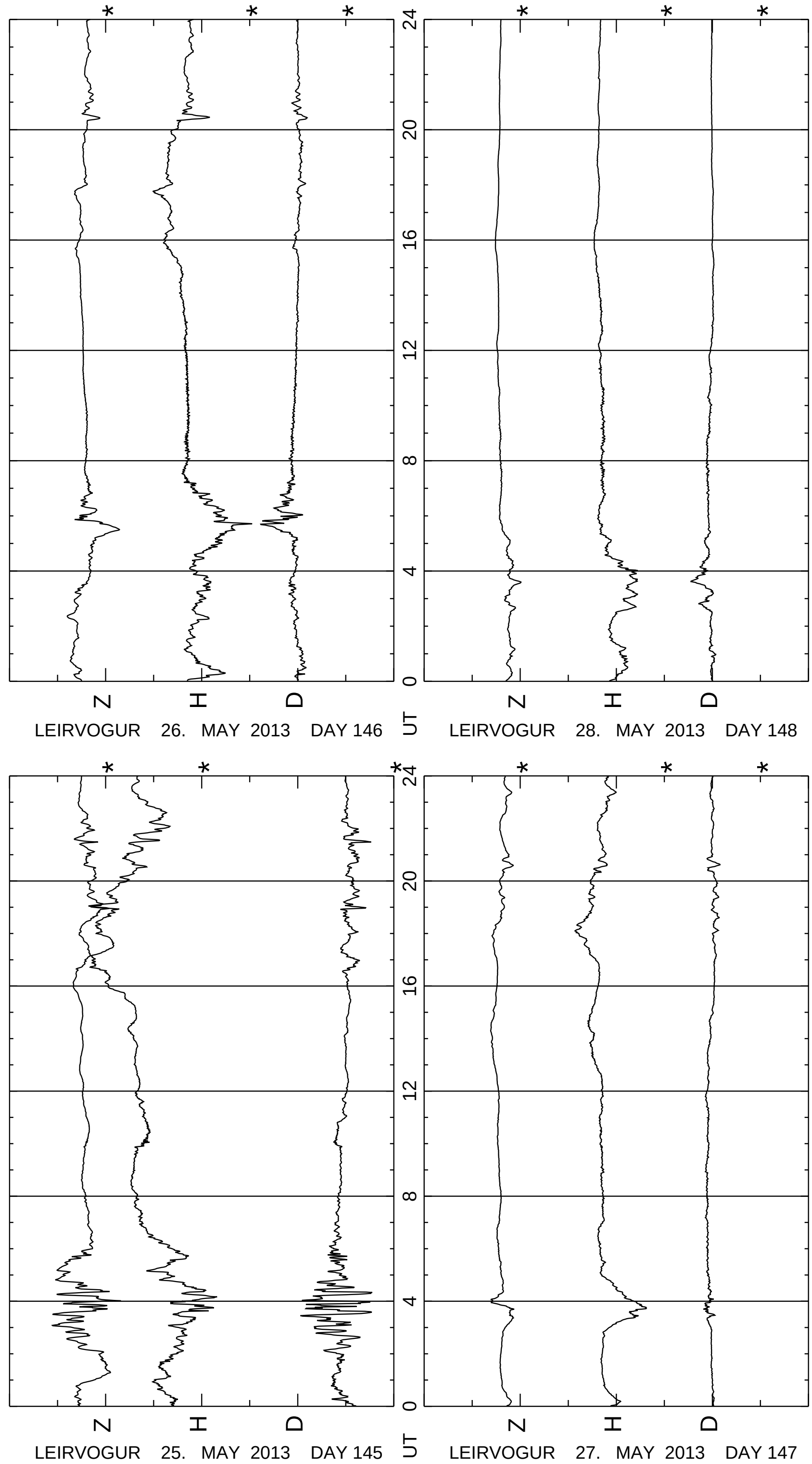
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LEIRVOGUR 26. MAY 2013 DAY 146
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LEIRVOGUR 28. MAY 2013 DAY 148
Z H D UT
LEIRVOGUR 25. MAY 2013 DAY 145
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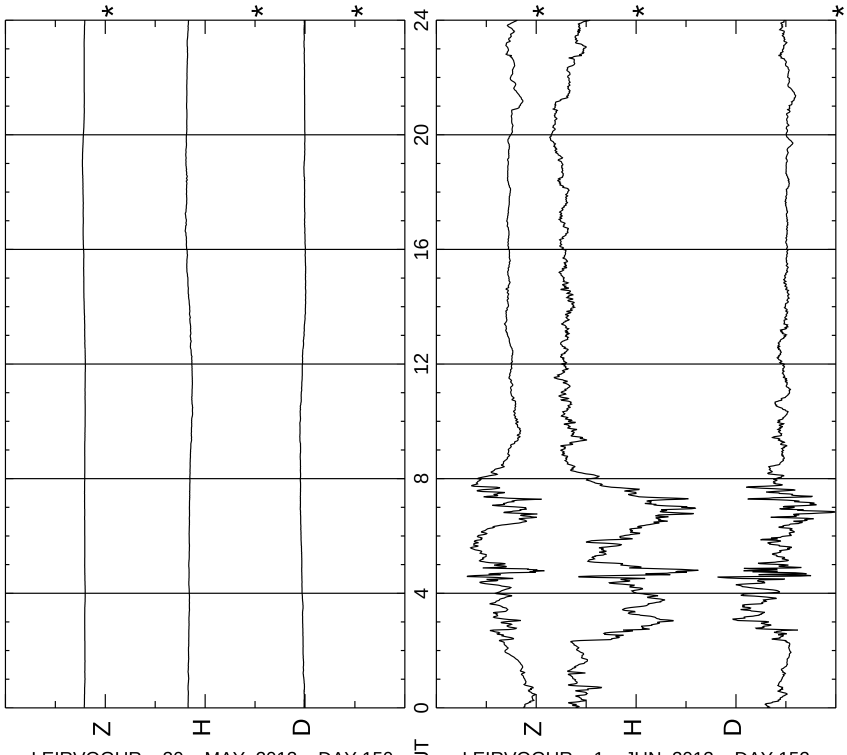
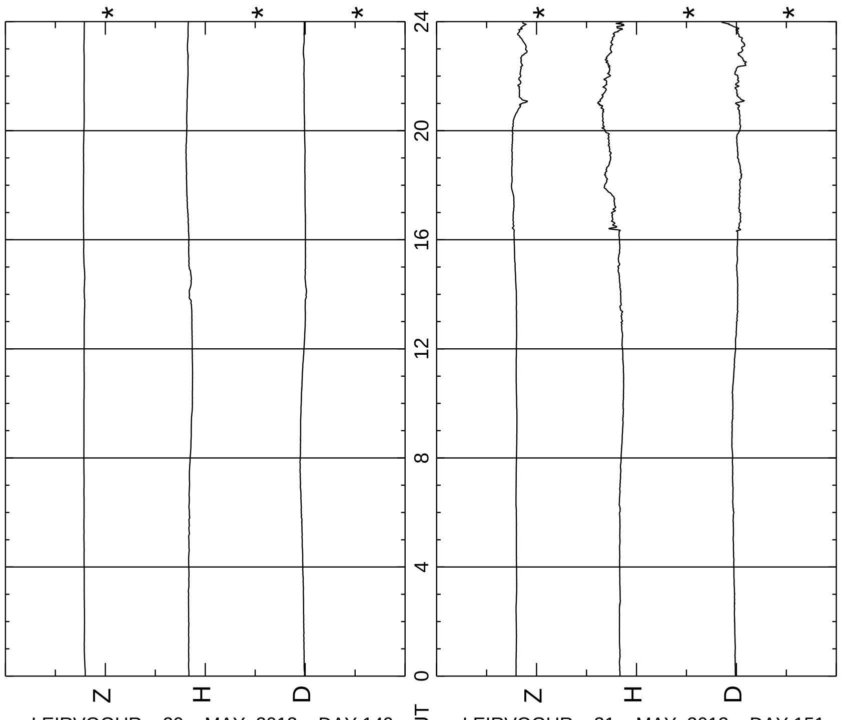
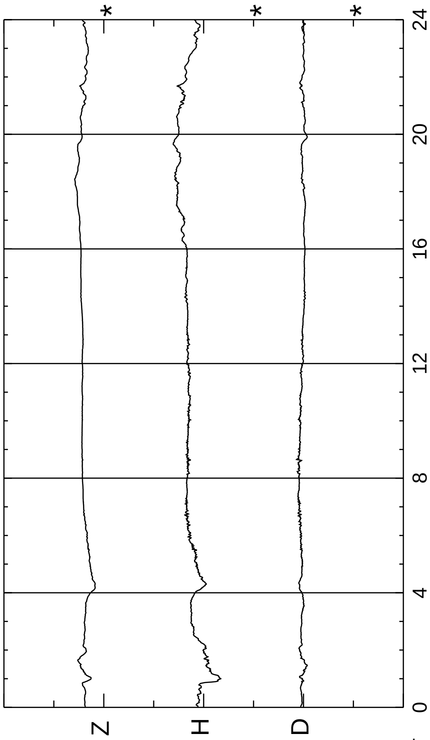
LEIRVOGUR 27. MAY 2013 DAY 147



LEIRVOGUR 30. MAY 2013 DAY 150 LEIRVOGUR 1. JUN 2013 DAY 152



LEIRVOGUR 29. MAY 2013 DAY 149 LEIRVOGUR 31. MAY 2013 DAY 151



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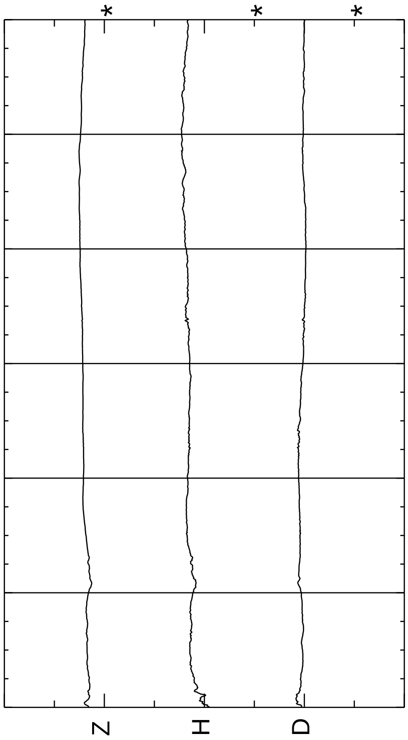

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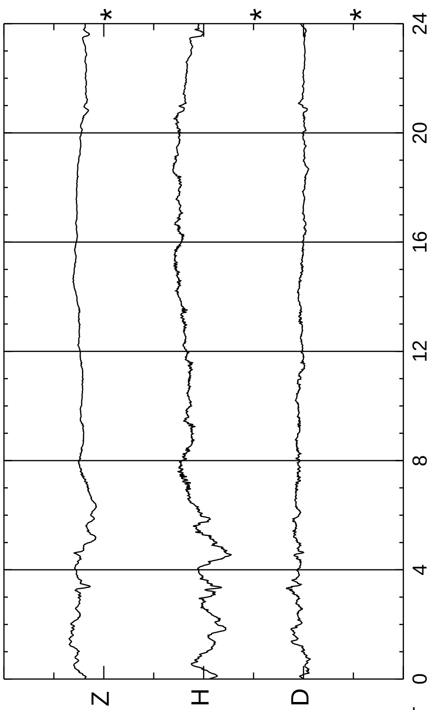

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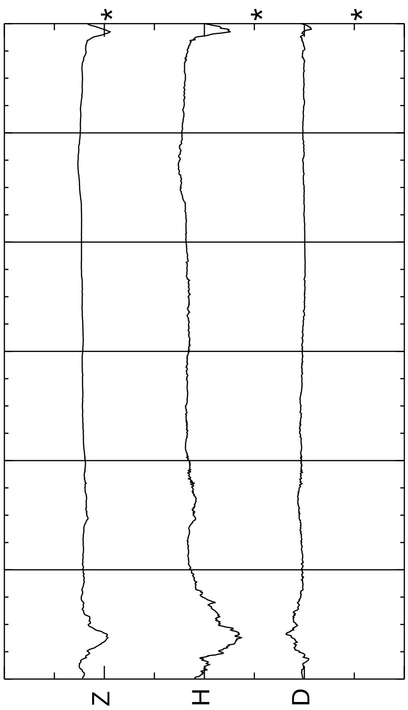

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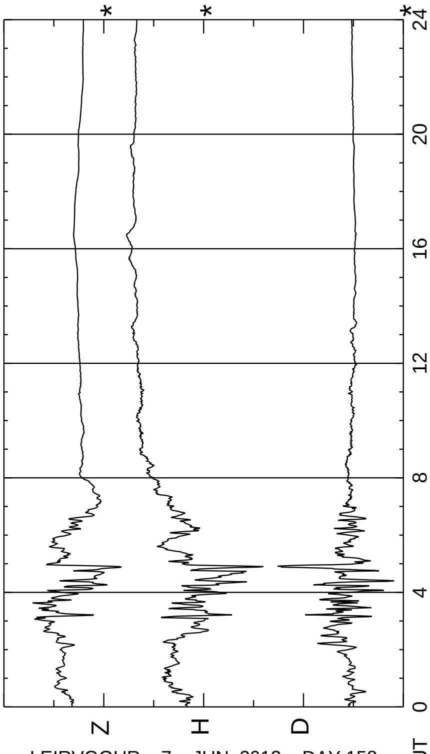
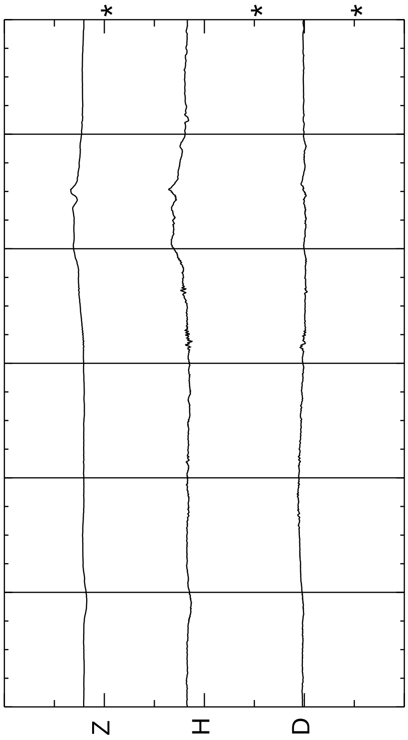
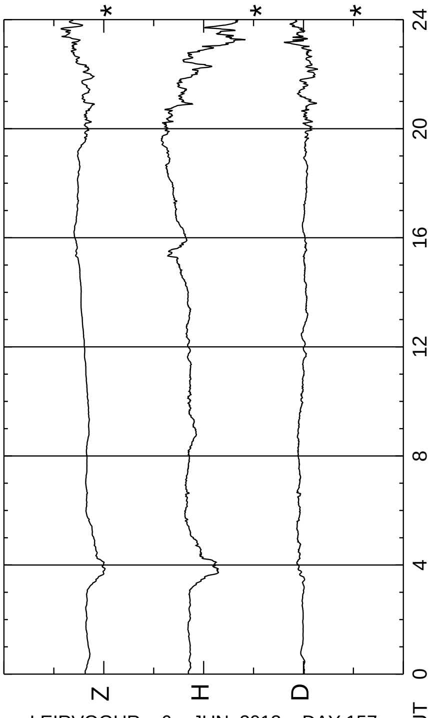


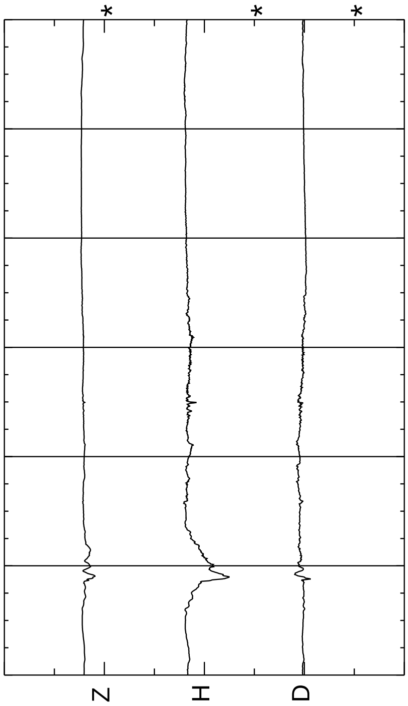
LEIRVOGUR 7. JUN 2013 DAY 158



LEIRVOGUR 9. JUN 2013 DAY 160



LEIRVOGUR 6. JUN 2013 DAY 157



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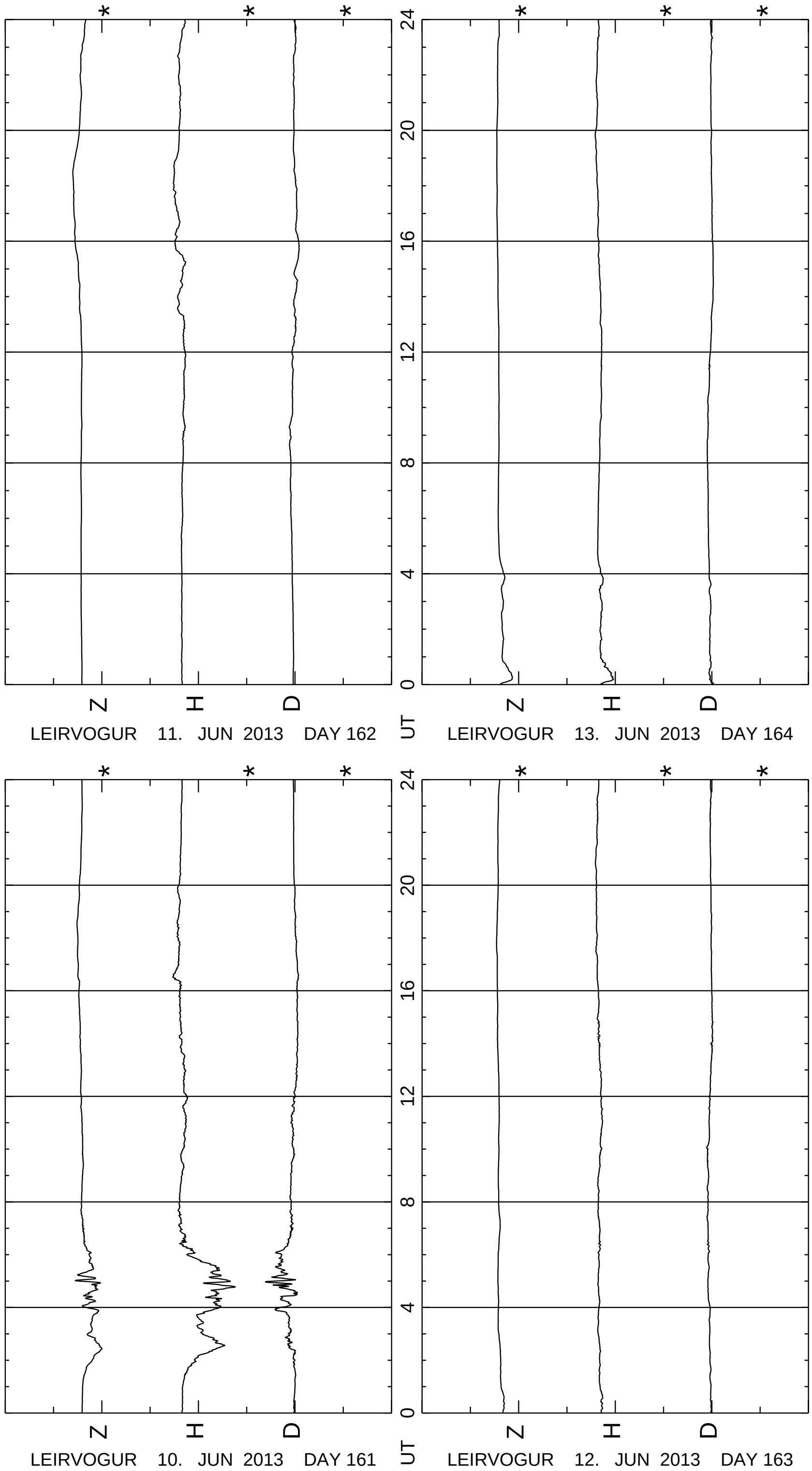
LEIRVOGUR 11. JUN 2013 DAY 162
LEIRVOGUR 13. JUN 2013 DAY 164
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LEIRVOGUR 12. JUN 2013 DAY 163
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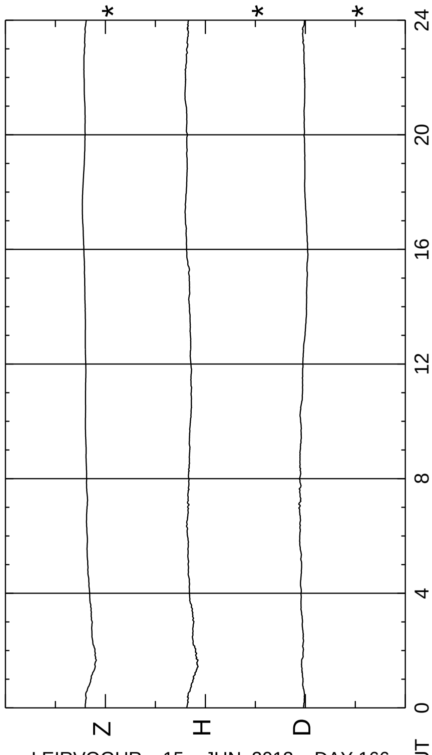
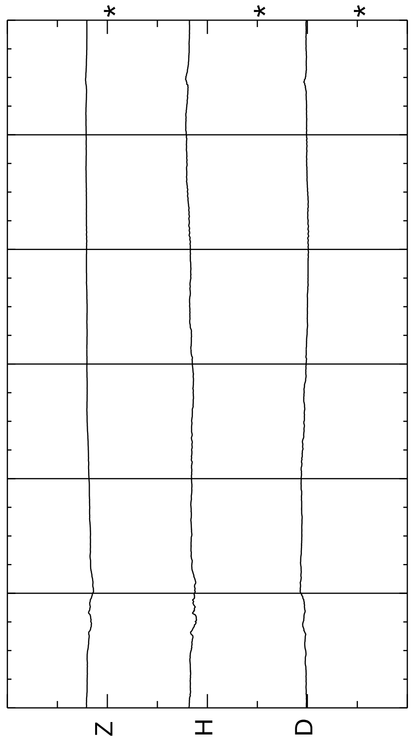
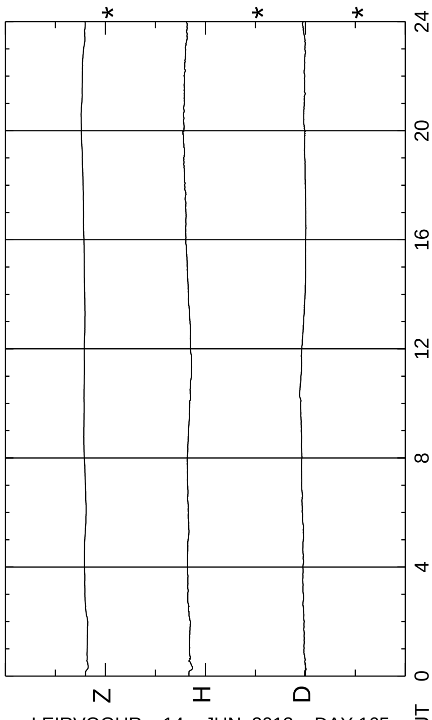


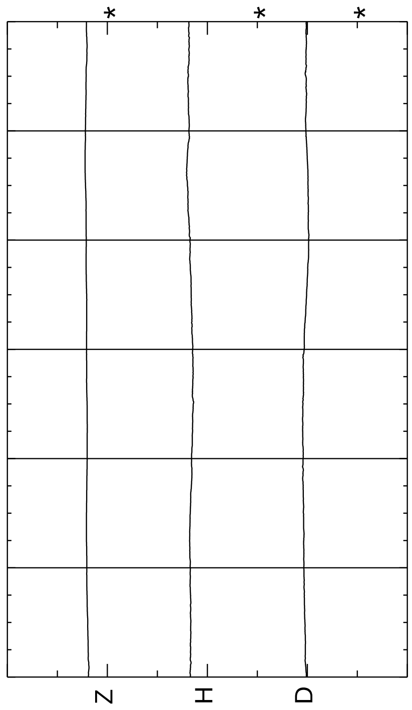
LEIRVOGUR 15. JUN 2013 DAY 166



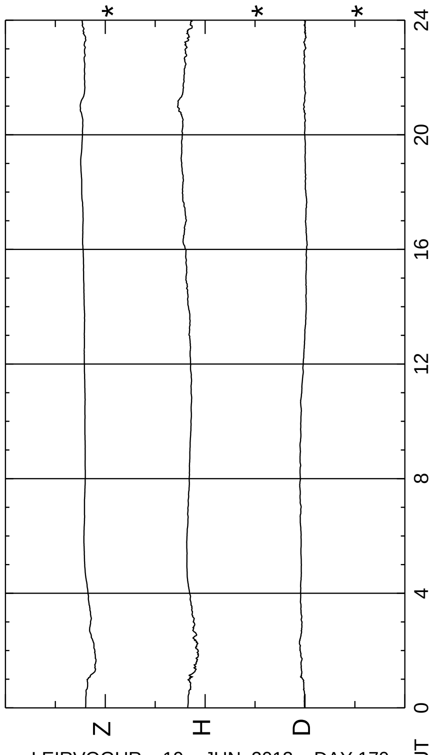
LEIRVOGUR 17. JUN 2013 DAY 168



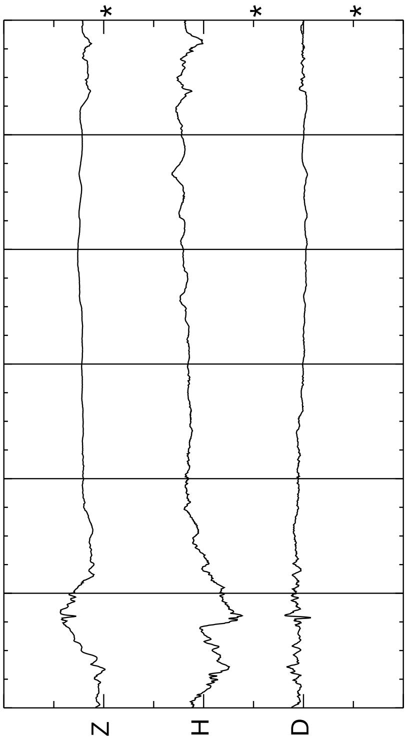
LEIRVOGUR 14. JUN 2013 DAY 165



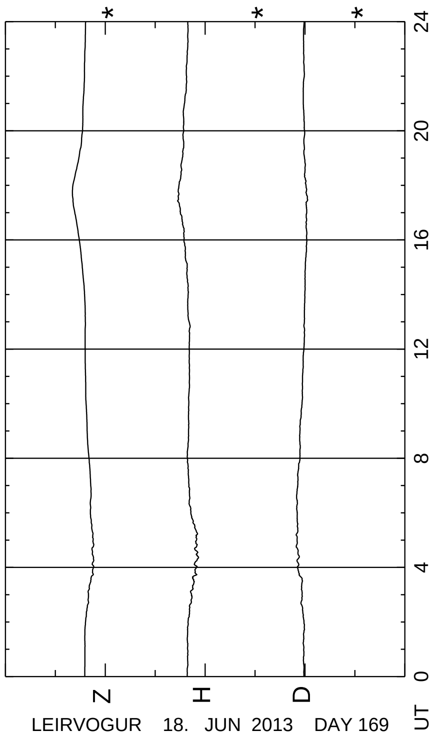
LEIRVOGUR 16. JUN 2013 DAY 167



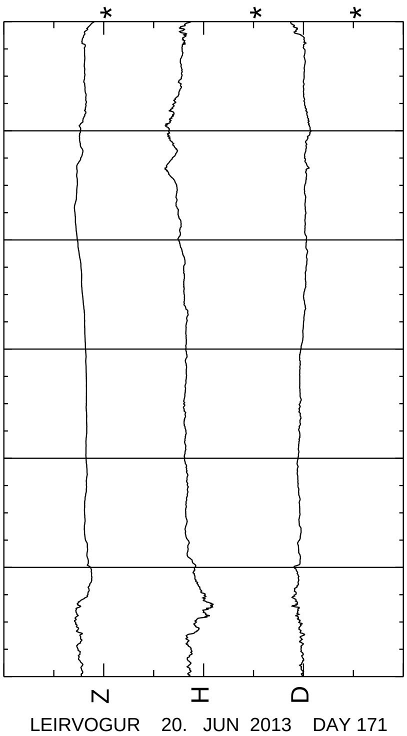
LEIRVOGUR 19. JUN 2013 DAY 170



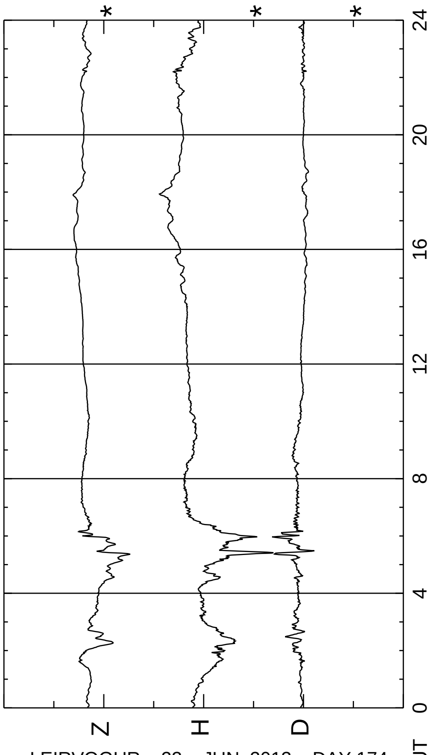
LEIRVOGUR 21. JUN 2013 DAY 172



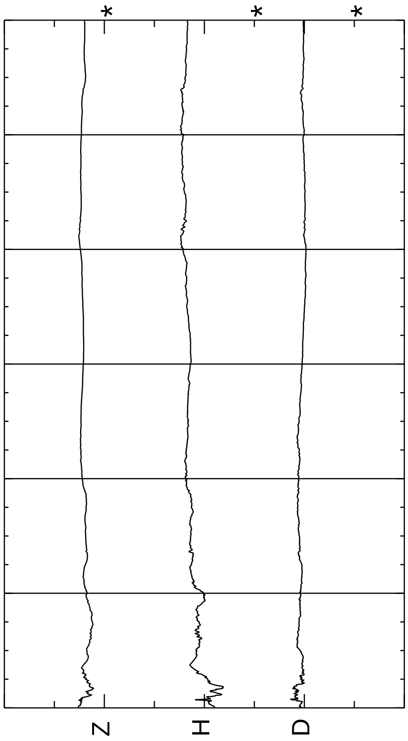
LEIRVOGUR 18. JUN 2013 DAY 169



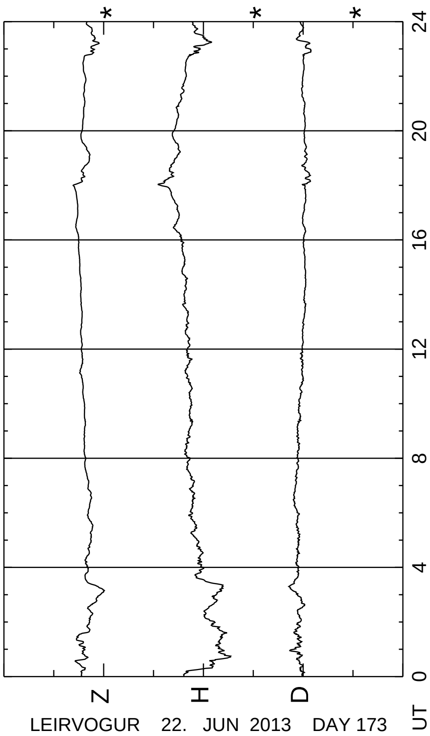
LEIRVOGUR 20. JUN 2013 DAY 171



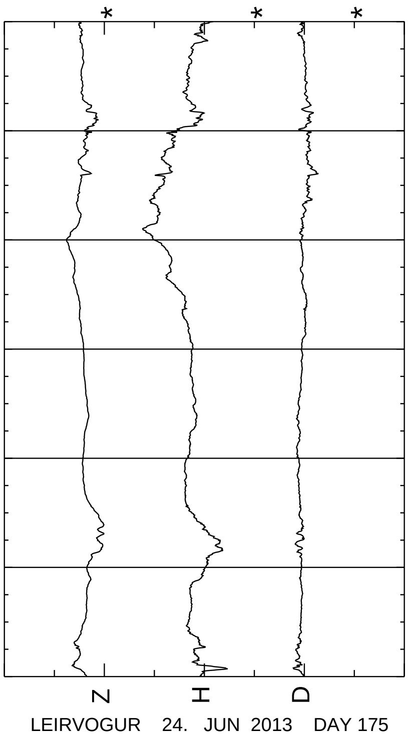
LEIRVOGUR 23. JUN 2013 DAY 174



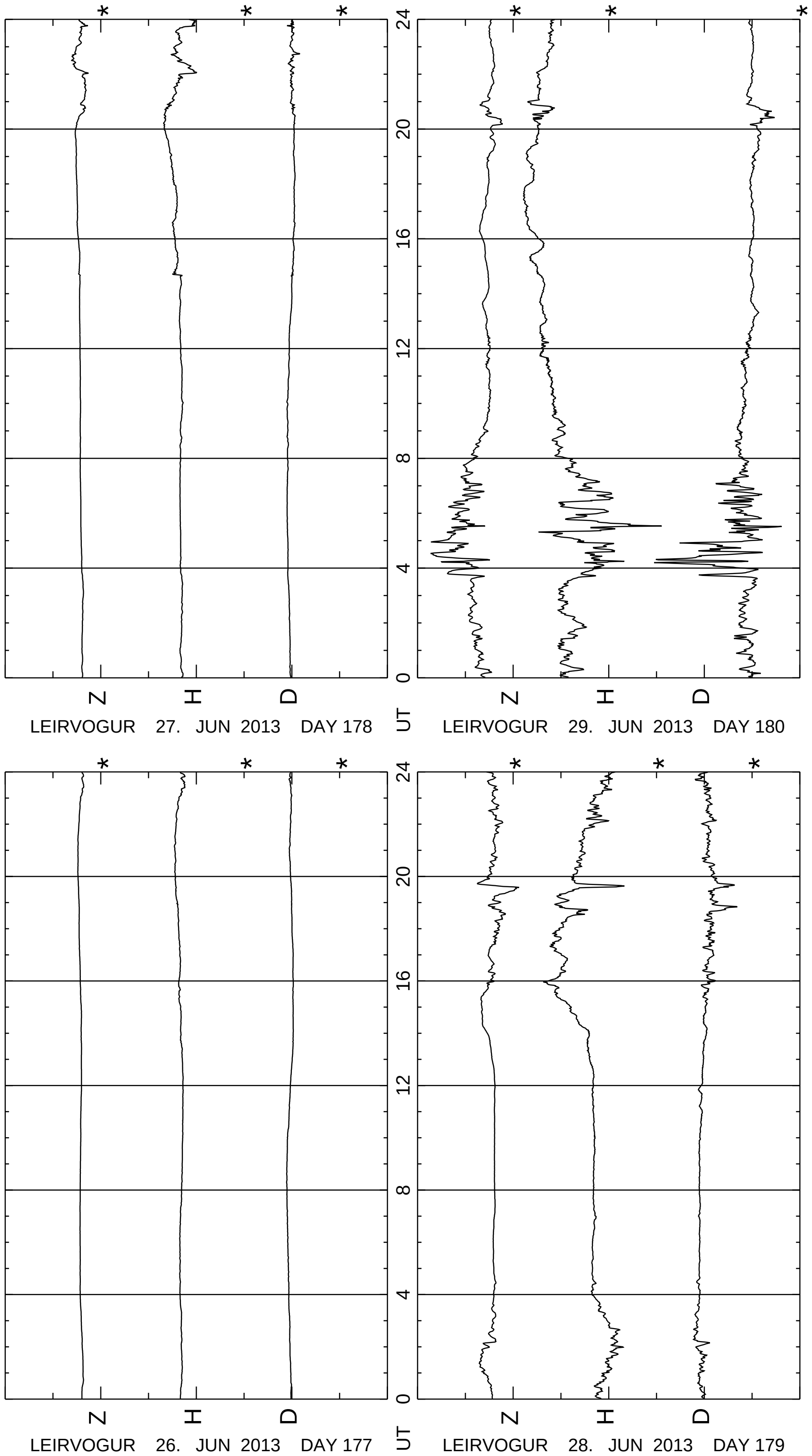
LEIRVOGUR 25. JUN 2013 DAY 176



LEIRVOGUR 22. JUN 2013 DAY 173



LEIRVOGUR 24. JUN 2013 DAY 175

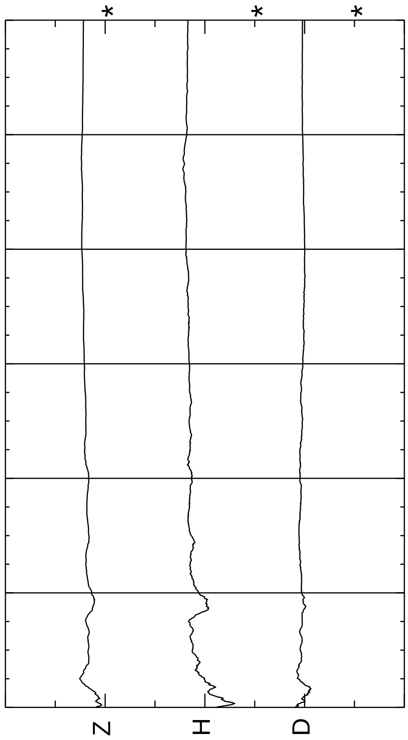


LEIRVOGUR 27. JUN 2013 DAY 178

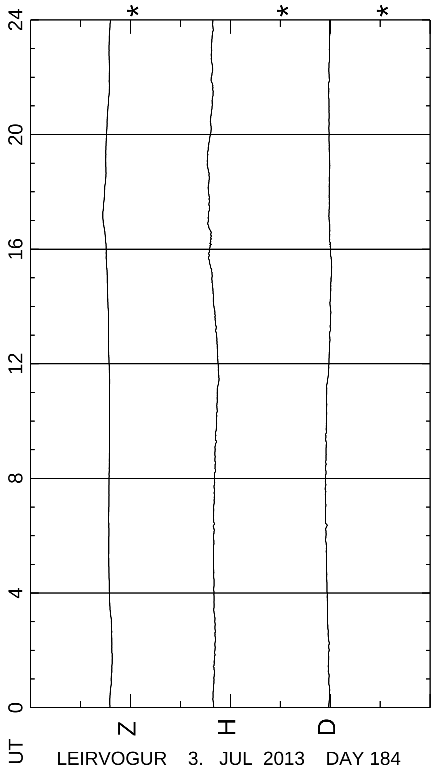
LEIRVOGUR 29. JUN 2013 DAY 180

LEIRVOGUR 26. JUN 2013 DAY 177

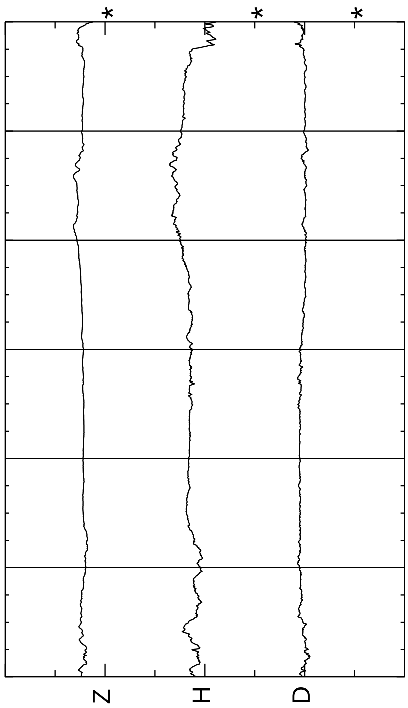
LEIRVOGUR 28. JUN 2013 DAY 179



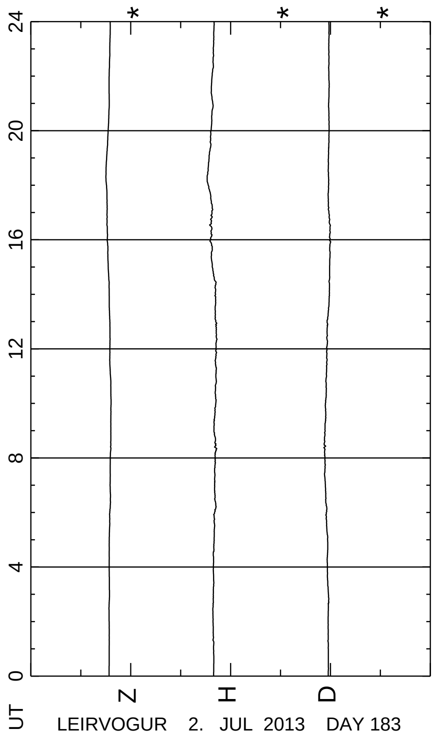
LEIRVOGUR 1. JUL 2013 DAY 182



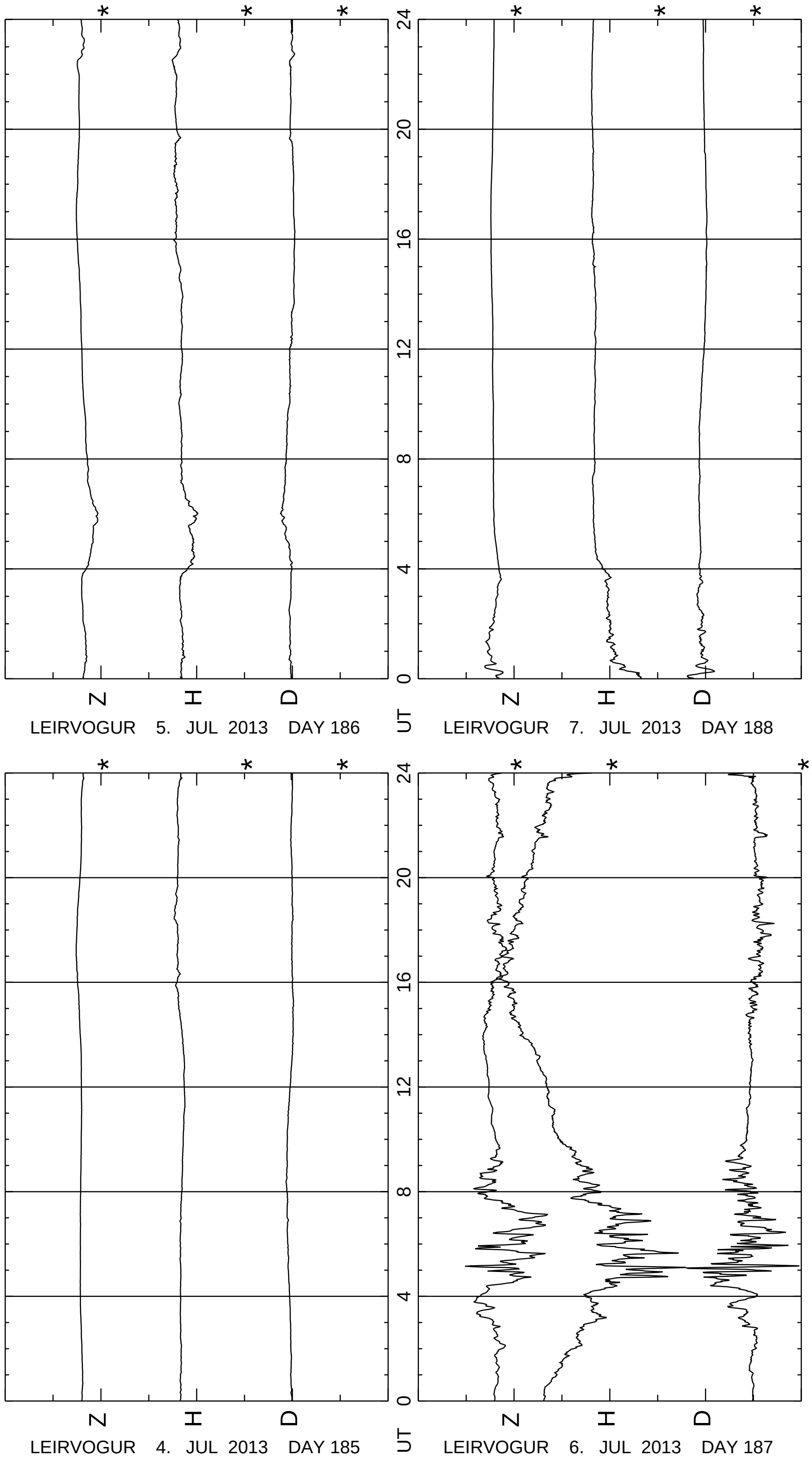
LEIRVOGUR 3. JUL 2013 DAY 184



LEIRVOGUR 30. JUN 2013 DAY 181



LEIRVOGUR 2. JUL 2013 DAY 183


LEIRVOGUR 5. JUL 2013 DAY 186
LEIRVOGUR 7. JUL 2013 DAY 188
LEIRVOGUR 4. JUL 2013 DAY 185
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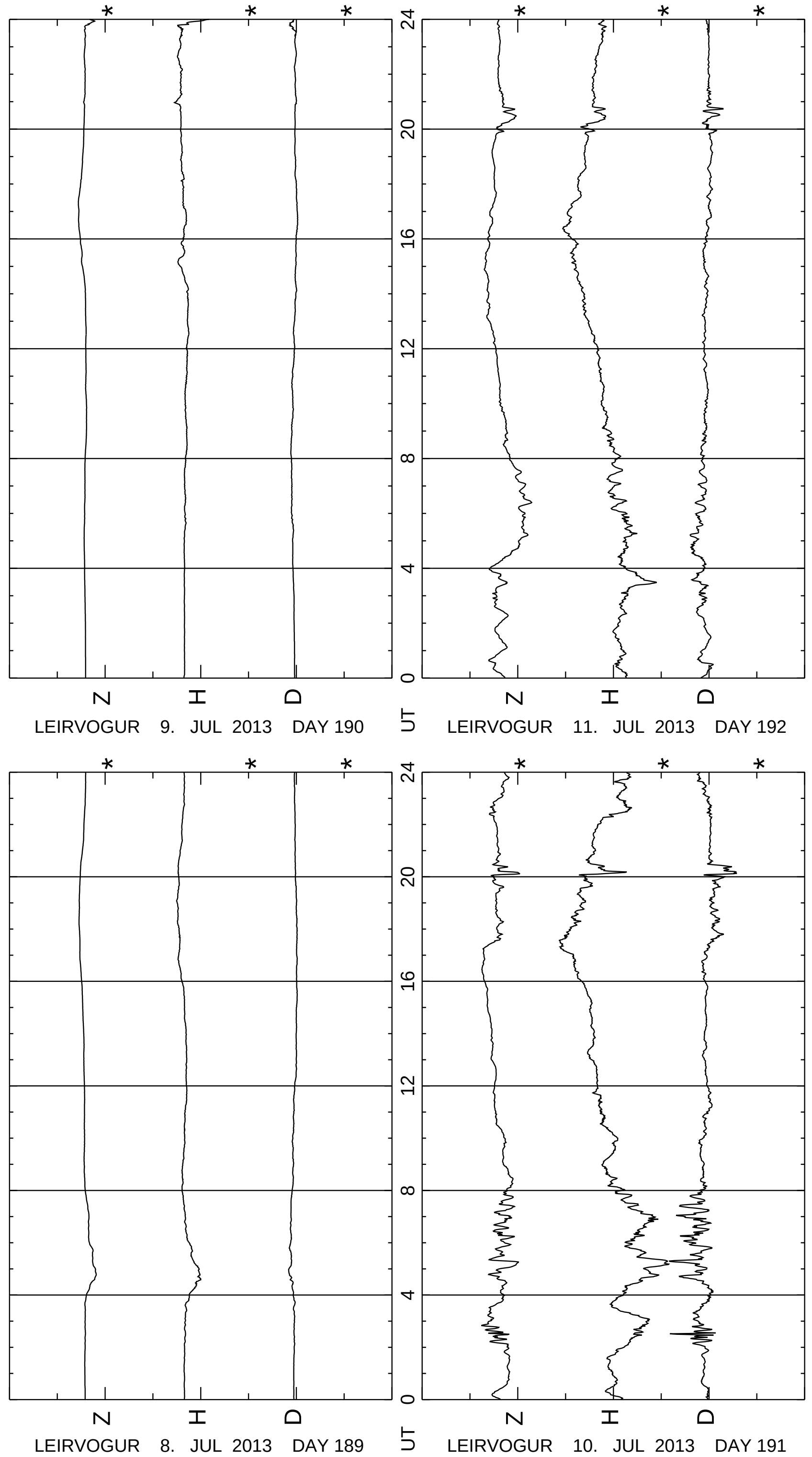
LEIRVOGUR 9. JUL 2013 DAY 190
LEIRVOGUR 11. JUL 2013 DAY 192
LEIRVOGUR 8. JUL 2013 DAY 189
LEIRVOGUR 10. JUL 2013 DAY 191
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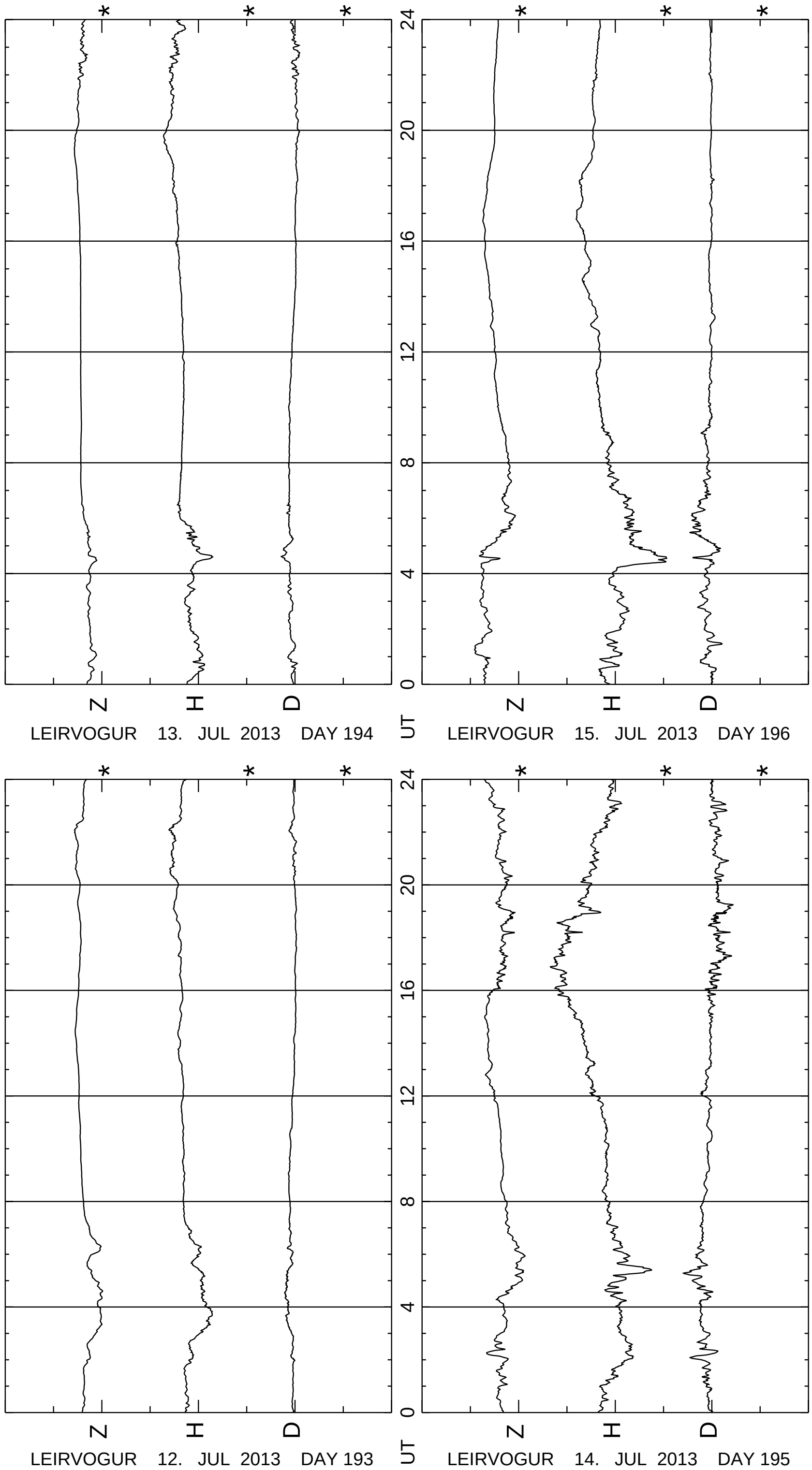
LEIRVOGUR 13. JUL 2013 DAY 194
LEIRVOGUR 15. JUL 2013 DAY 196
LEIRVOGUR 12. JUL 2013 DAY 193
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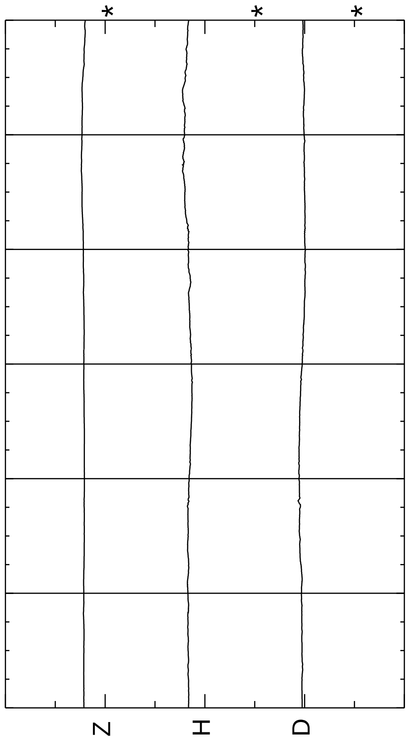
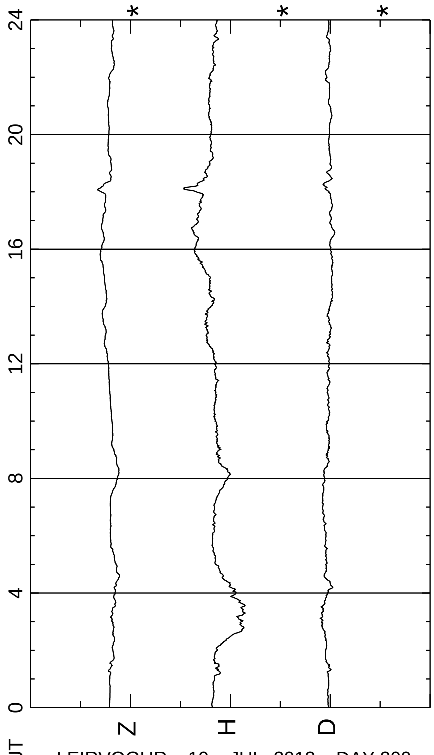
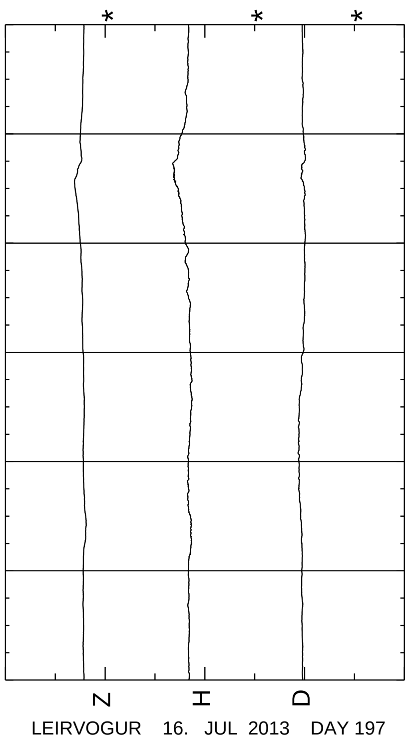


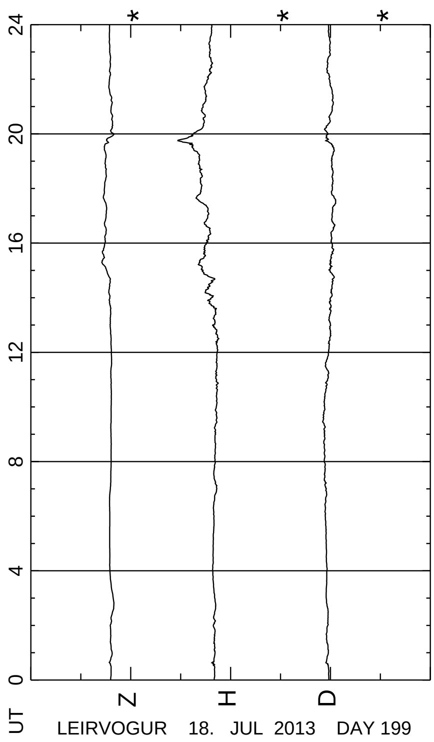
LEIRVOGUR 17. JUL 2013 DAY 198



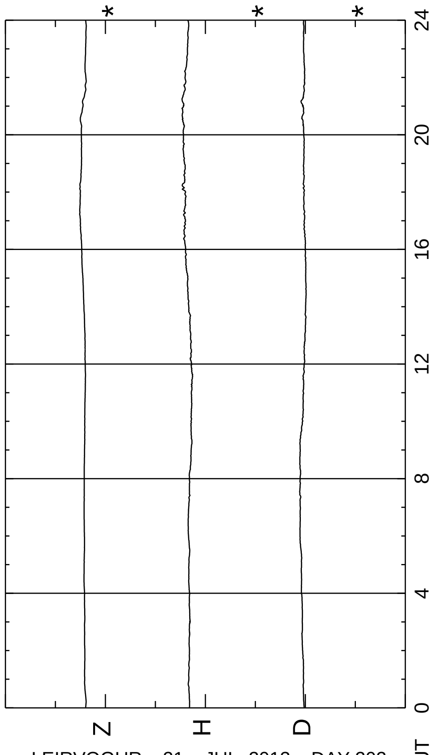
LEIRVOGUR 19. JUL 2013 DAY 200



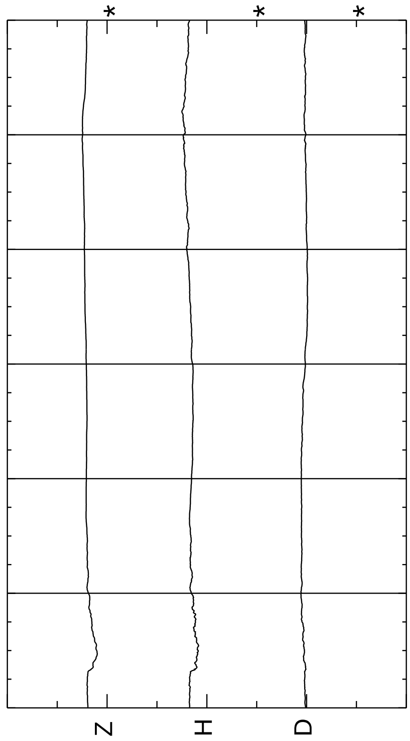
LEIRVOGUR 16. JUL 2013 DAY 197



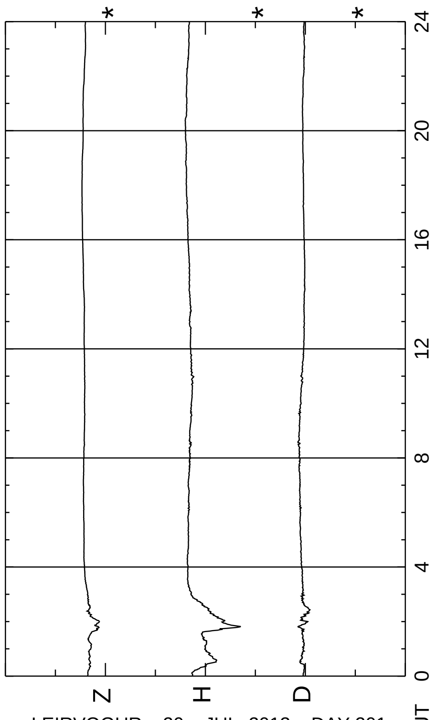
LEIRVOGUR 18. JUL 2013 DAY 199



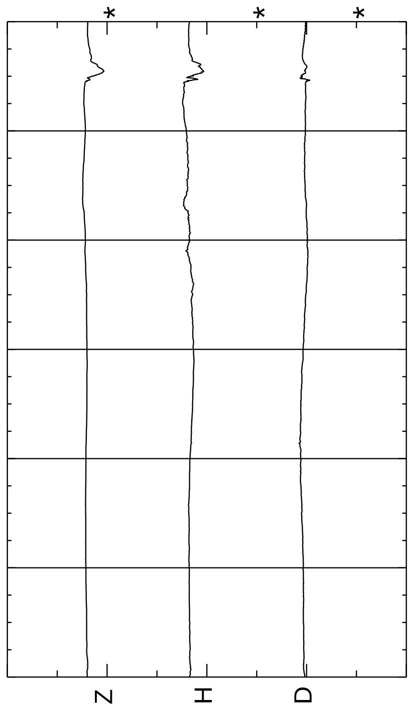
LEIRVOGUR 21. JUL 2013 DAY 202



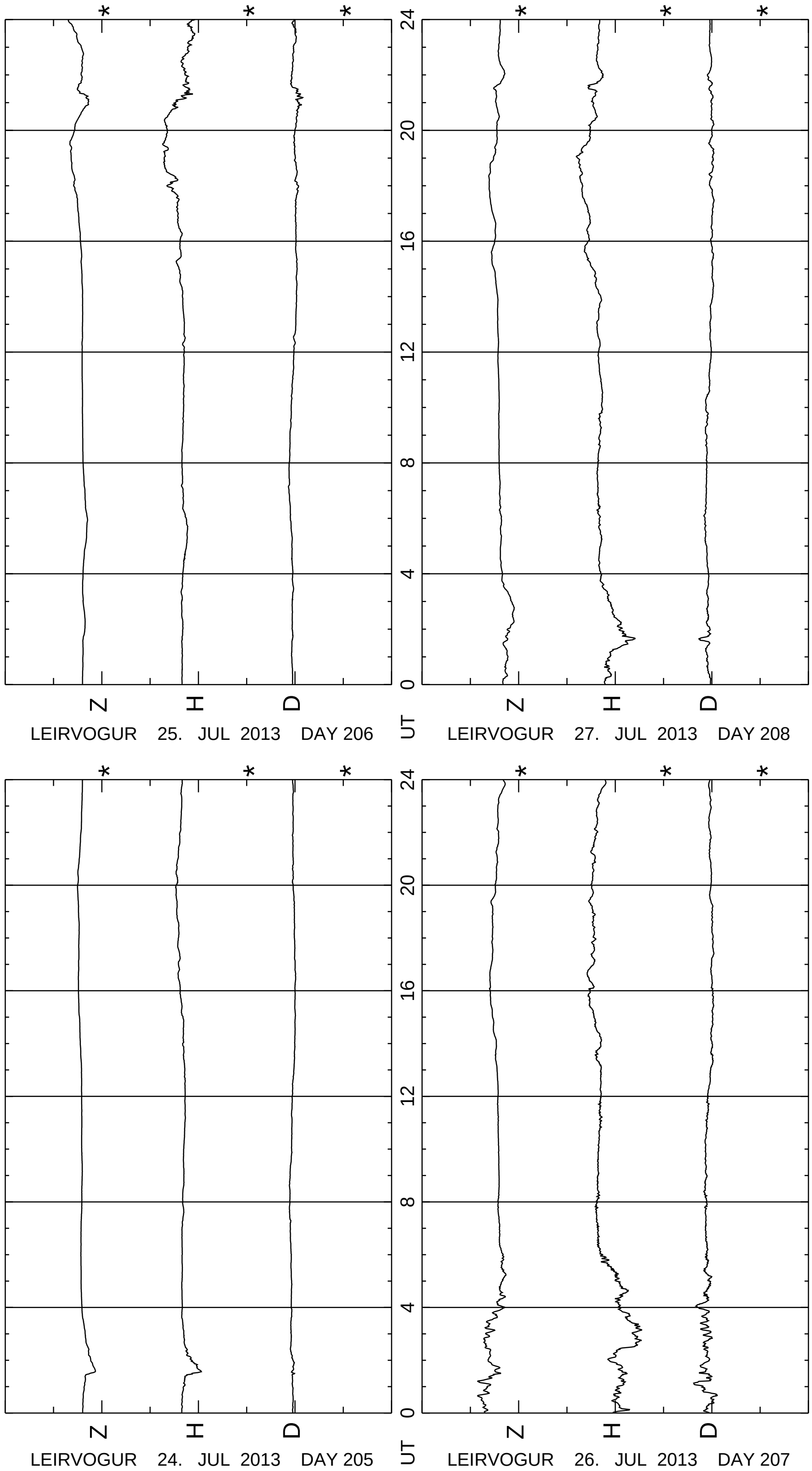
LEIRVOGUR 23. JUL 2013 DAY 204



LEIRVOGUR 20. JUL 2013 DAY 201



LEIRVOGUR 22. JUL 2013 DAY 203


LEIRVOGUR 25. JUL 2013 DAY 206
LEIRVOGUR 27. JUL 2013 DAY 208
LEIRVOGUR 24. JUL 2013 DAY 205
LEIRVOGUR 26. JUL 2013 DAY 207
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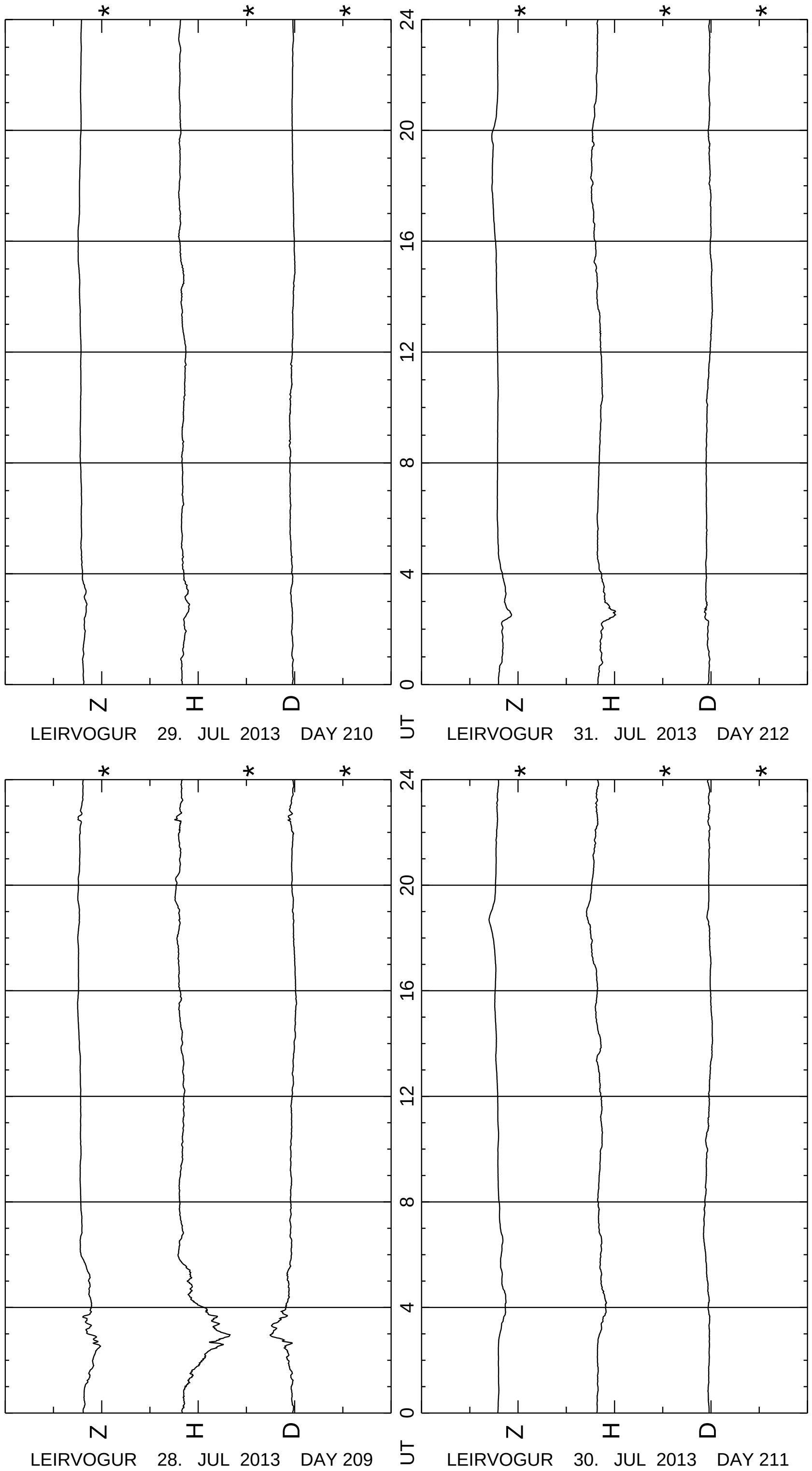
LEIRVOGUR 29. JUL 2013 DAY 210
LEIRVOGUR 31. JUL 2013 DAY 212
LEIRVOGUR 28. JUL 2013 DAY 209
LEIRVOGUR 30. JUL 2013 DAY 211
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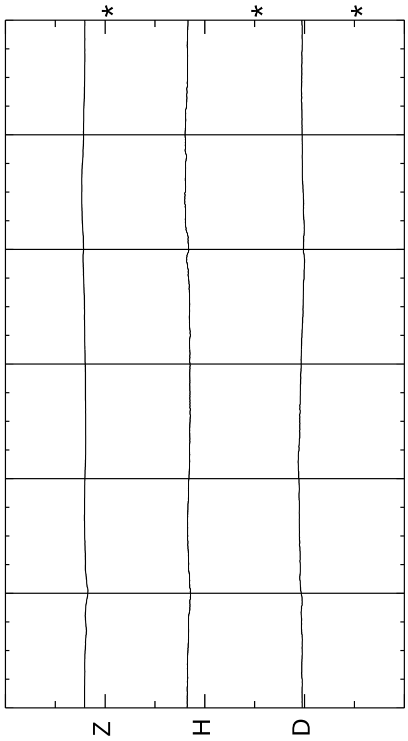
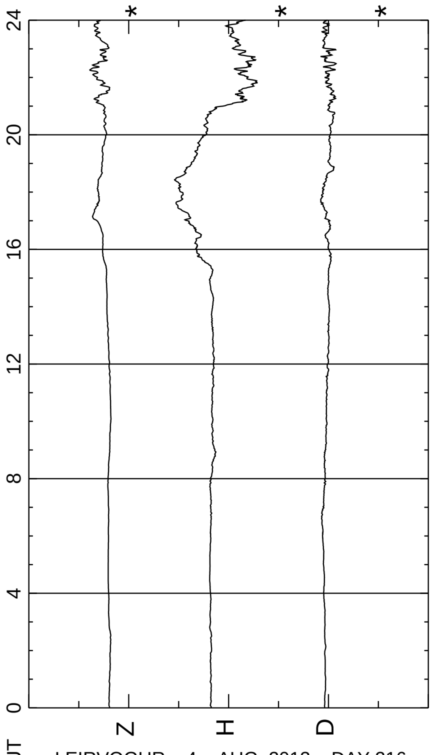
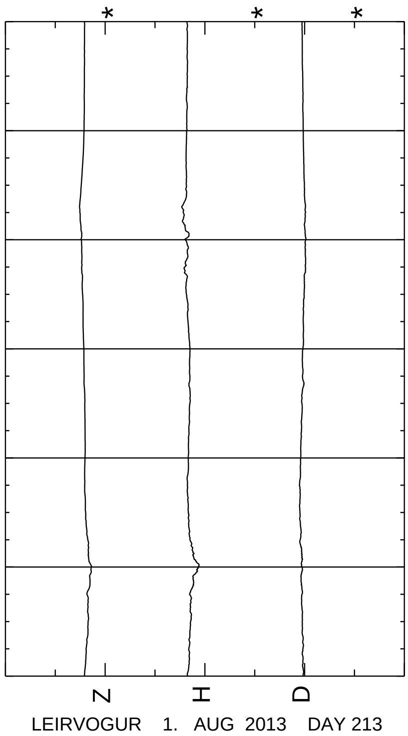


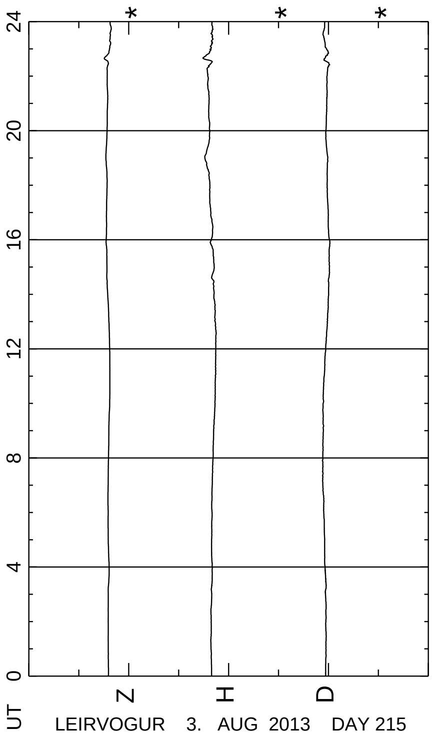
LEIRVOGUR 2. AUG 2013 DAY 214



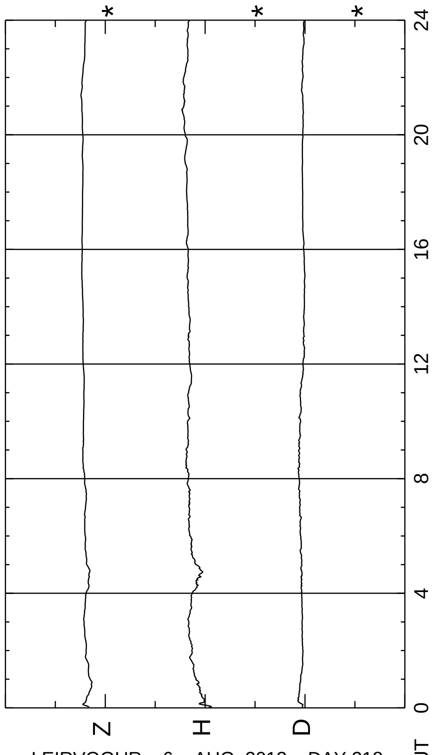
LEIRVOGUR 4. AUG 2013 DAY 216



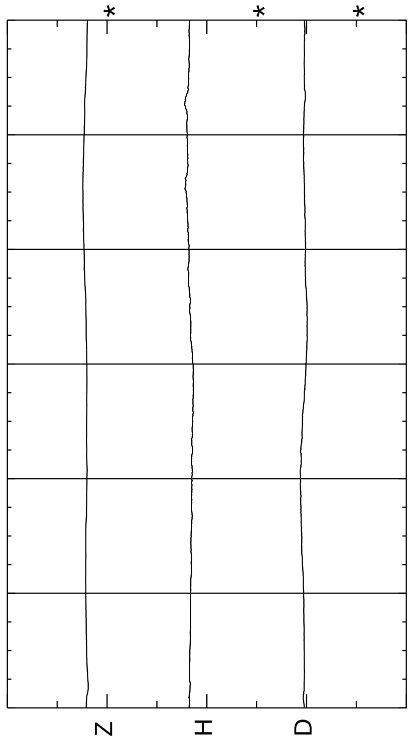
LEIRVOGUR 1. AUG 2013 DAY 213



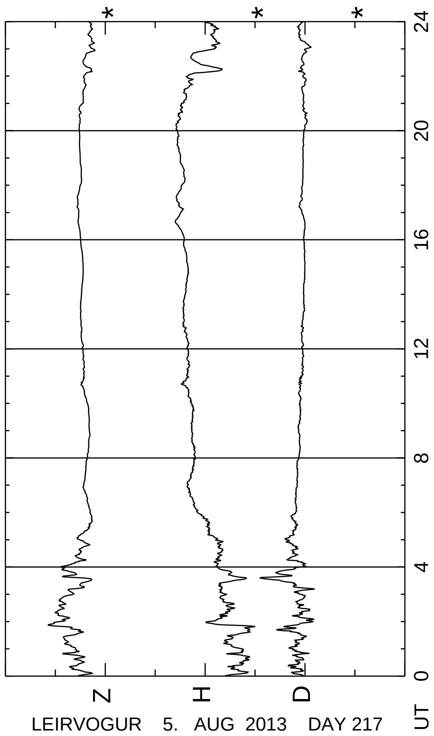
LEIRVOGUR 3. AUG 2013 DAY 215



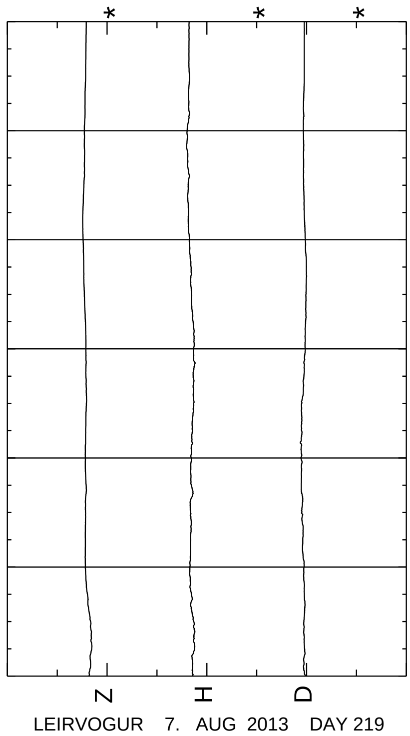
LEIRVOGUR 6. AUG 2013 DAY 218



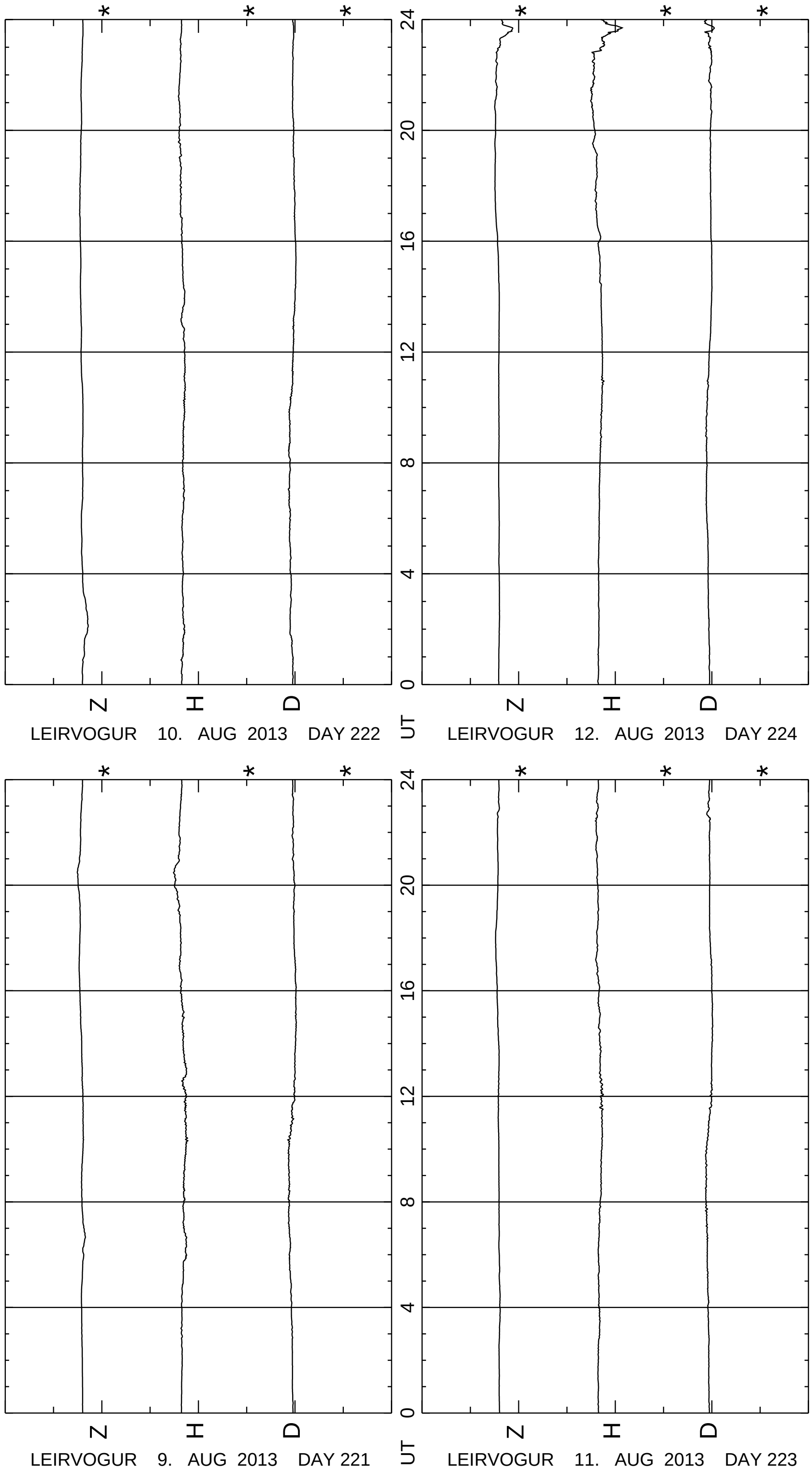
LEIRVOGUR 8. AUG 2013 DAY 220



LEIRVOGUR 5. AUG 2013 DAY 217



LEIRVOGUR 7. AUG 2013 DAY 219


LEIRVOGUR 10. AUG 2013 DAY 222
LEIRVOGUR 12. AUG 2013 DAY 224
LEIRVOGUR 9. AUG 2013 DAY 221
LEIRVOGUR 11. AUG 2013 DAY 223
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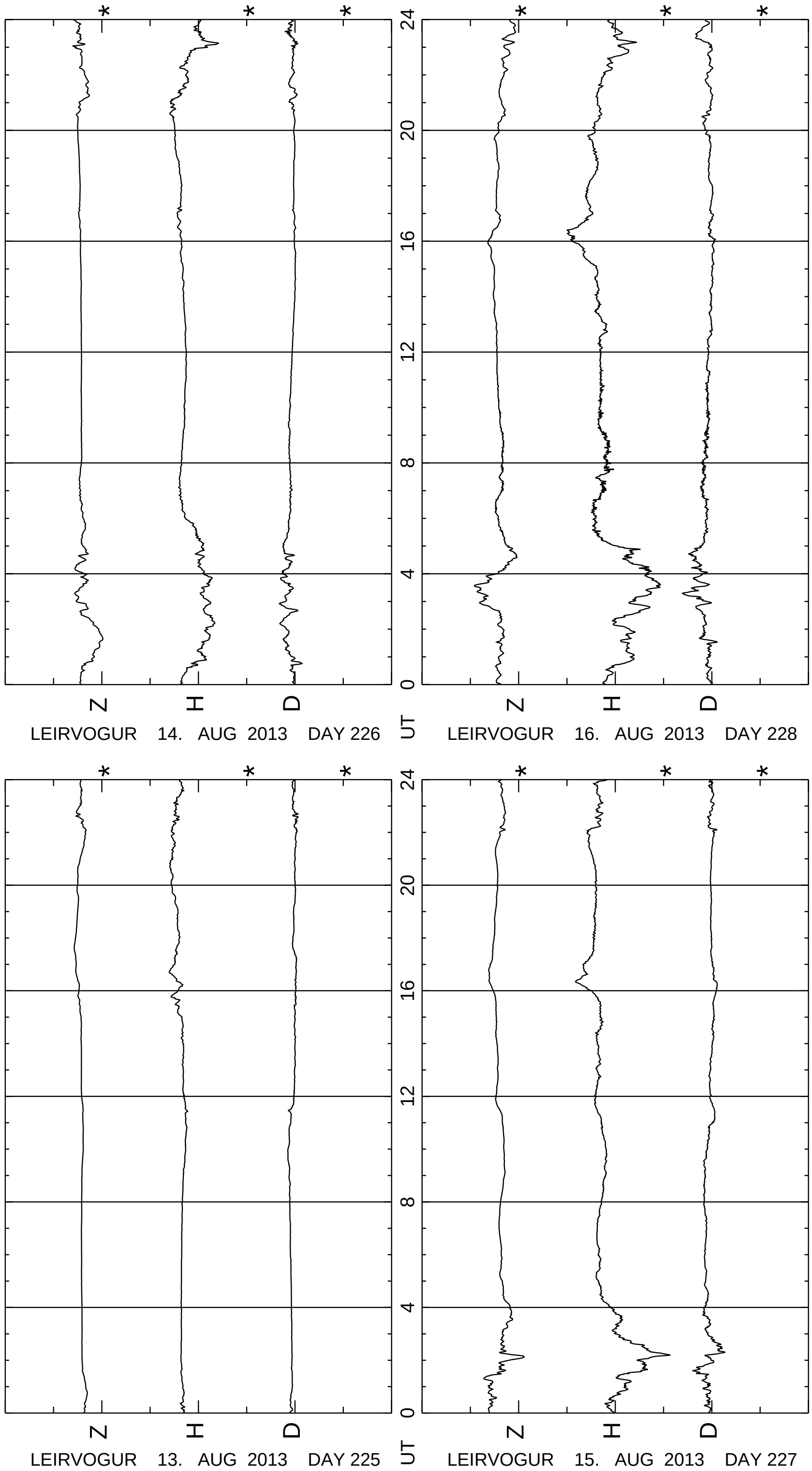
LEIRVOGUR 14. AUG 2013 DAY 226
LEIRVOGUR 16. AUG 2013 DAY 228
LEIRVOGUR 13. AUG 2013 DAY 225
LEIRVOGUR 15. AUG 2013 DAY 227
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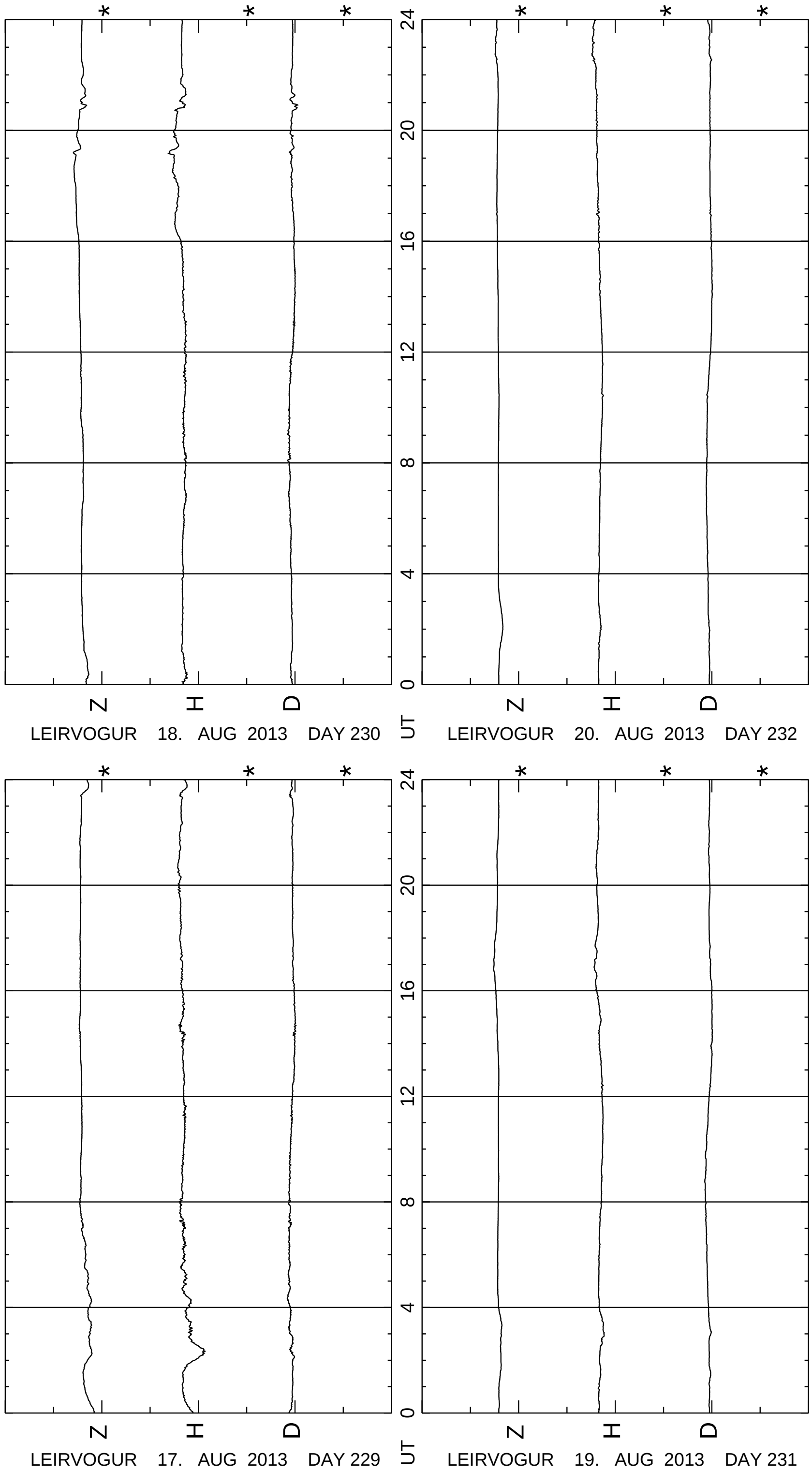

LEIRVOGUR 18. AUG 2013 DAY 230
LEIRVOGUR 20. AUG 2013 DAY 232
LEIRVOGUR 17. AUG 2013 DAY 229
LEIRVOGUR 19. AUG 2013 DAY 231
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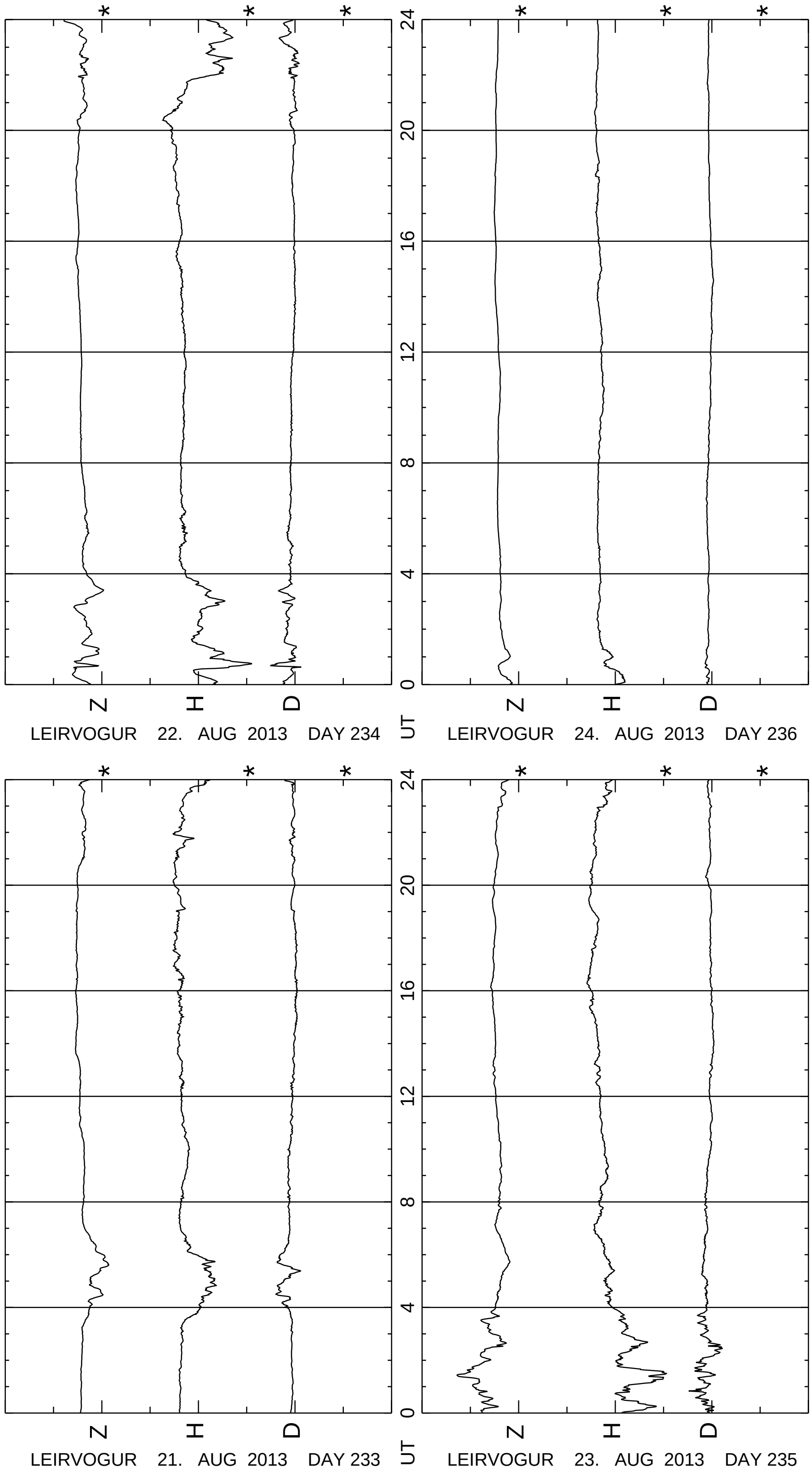
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LEIRVOGUR 22. AUG 2013 DAY 234
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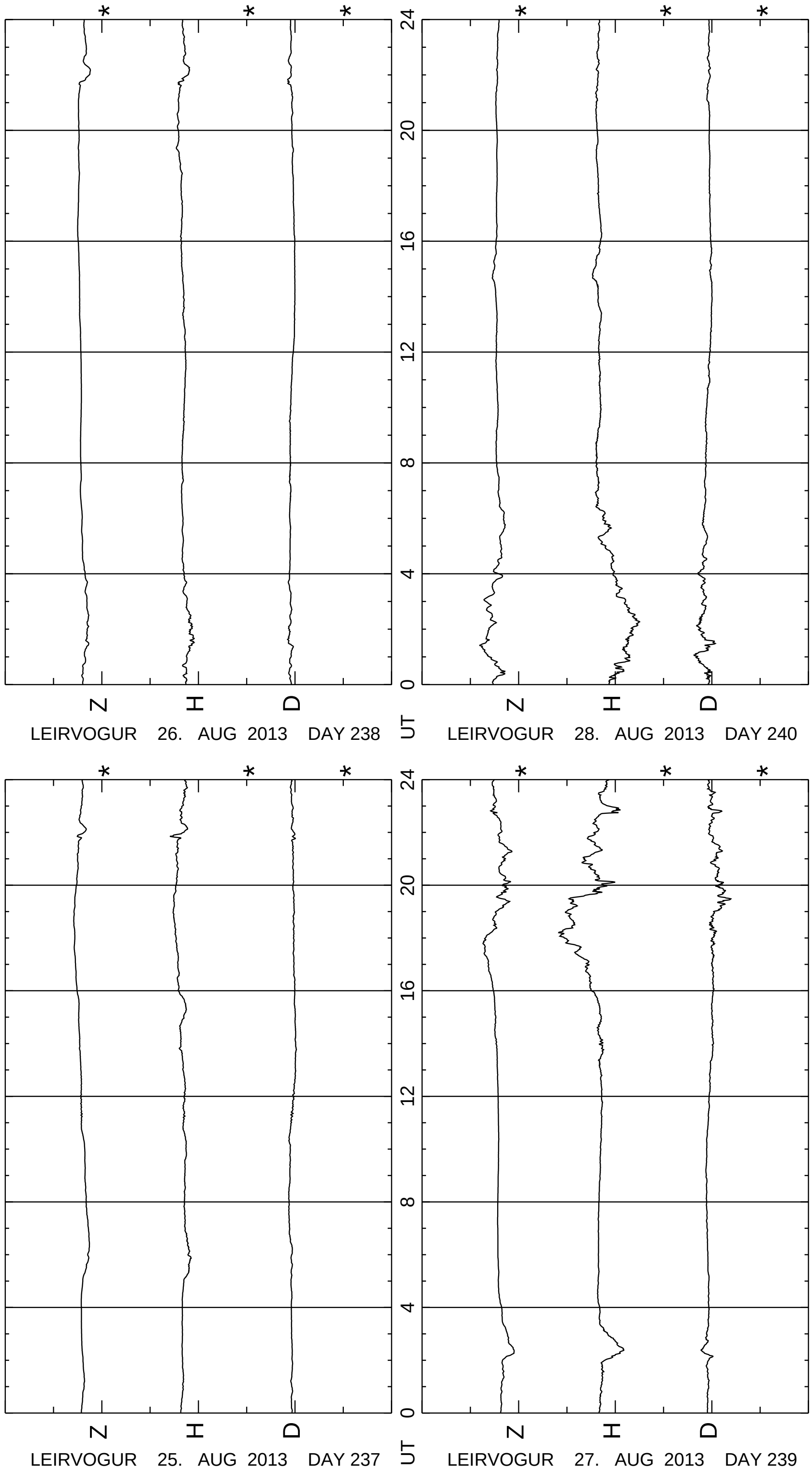
LEIRVOGUR 26. AUG 2013 DAY 238
LEIRVOGUR 28. AUG 2013 DAY 240
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LEIRVOGUR 27. AUG 2013 DAY 239
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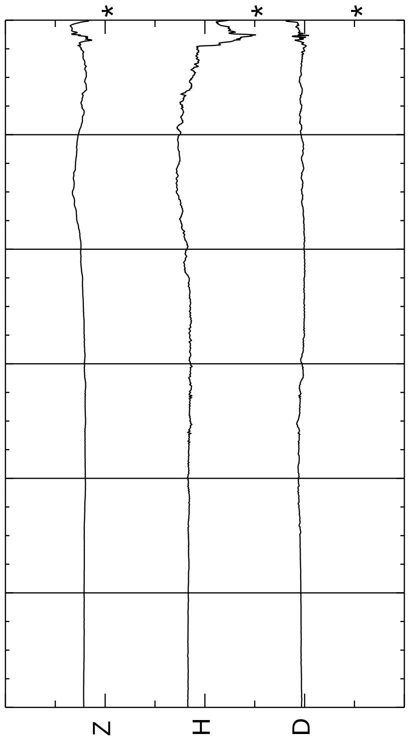
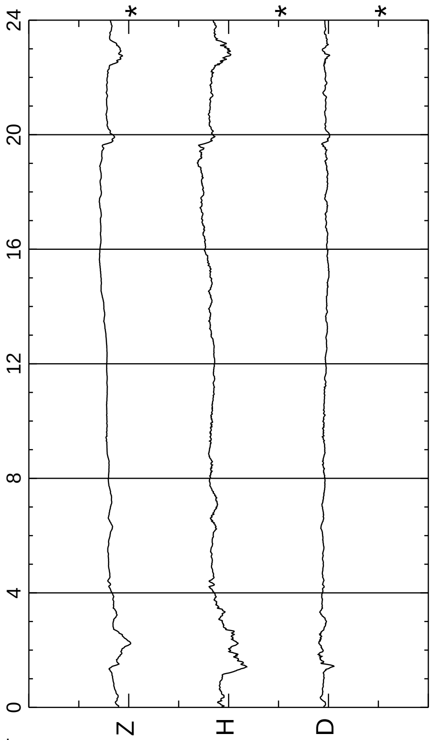
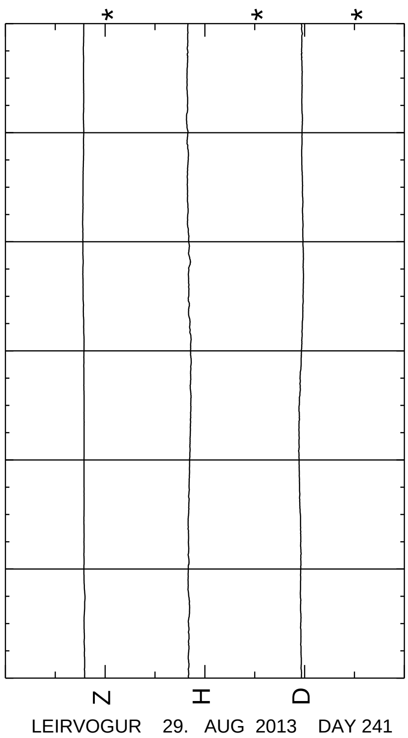


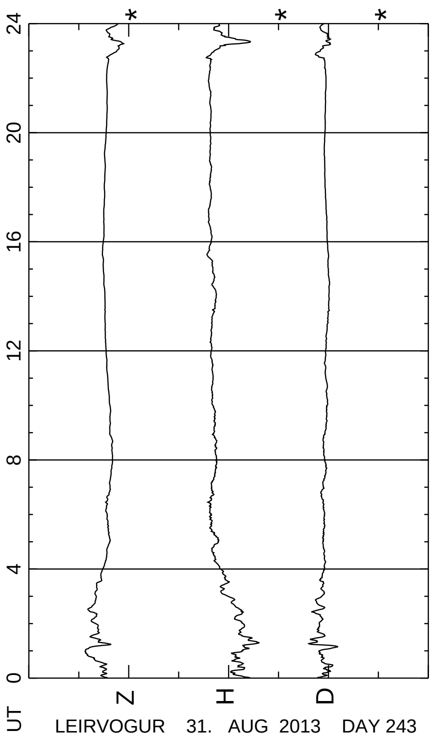
LEIRVOGUR 30. AUG 2013 DAY 242



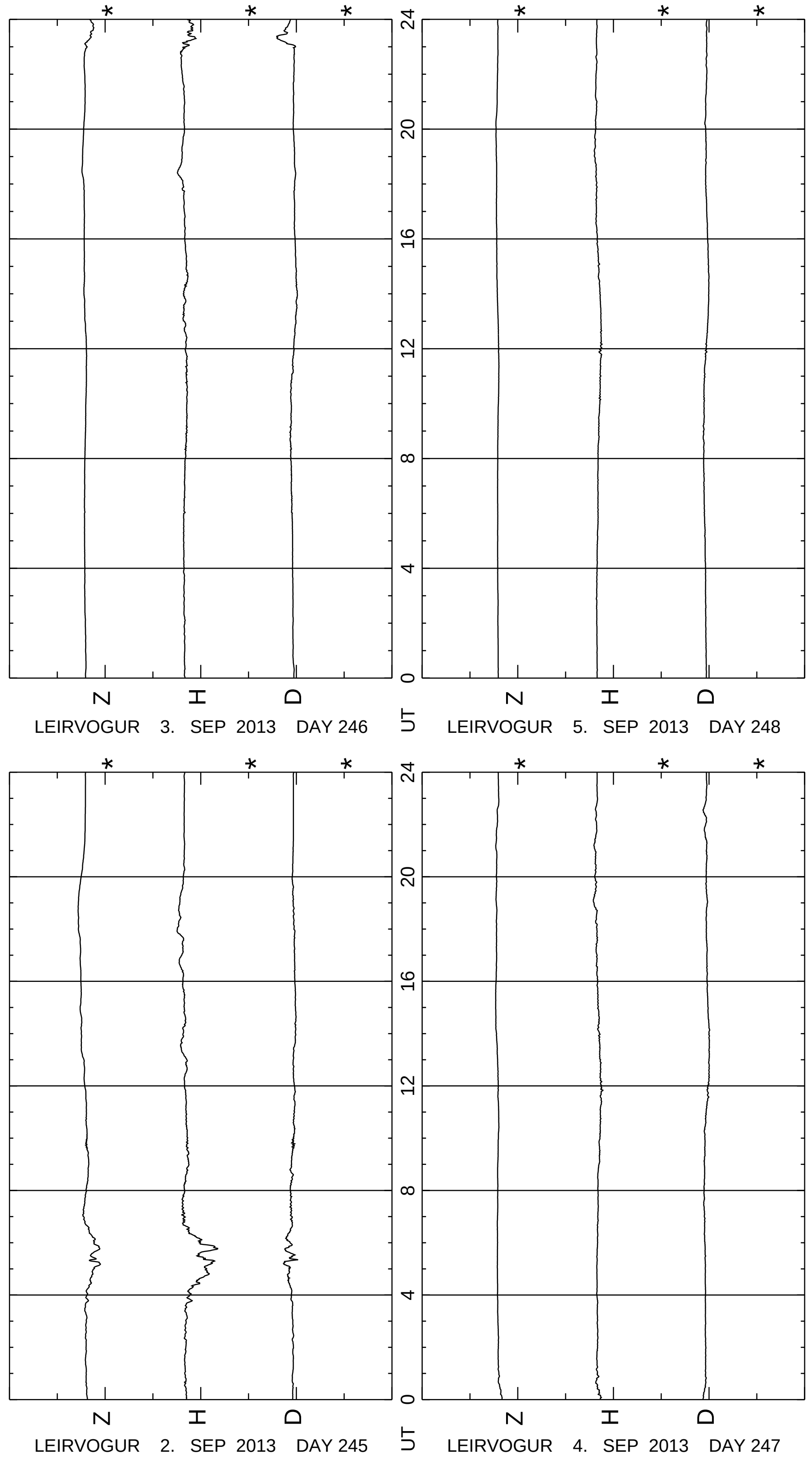
LEIRVOGUR 1. SEP 2013 DAY 244



LEIRVOGUR 29. AUG 2013 DAY 241



LEIRVOGUR 31. AUG 2013 DAY 243


LEIRVOGUR 3. SEP 2013 DAY 246
LEIRVOGUR 5. SEP 2013 DAY 248
LEIRVOGUR 2. SEP 2013 DAY 245
LEIRVOGUR 4. SEP 2013 DAY 247
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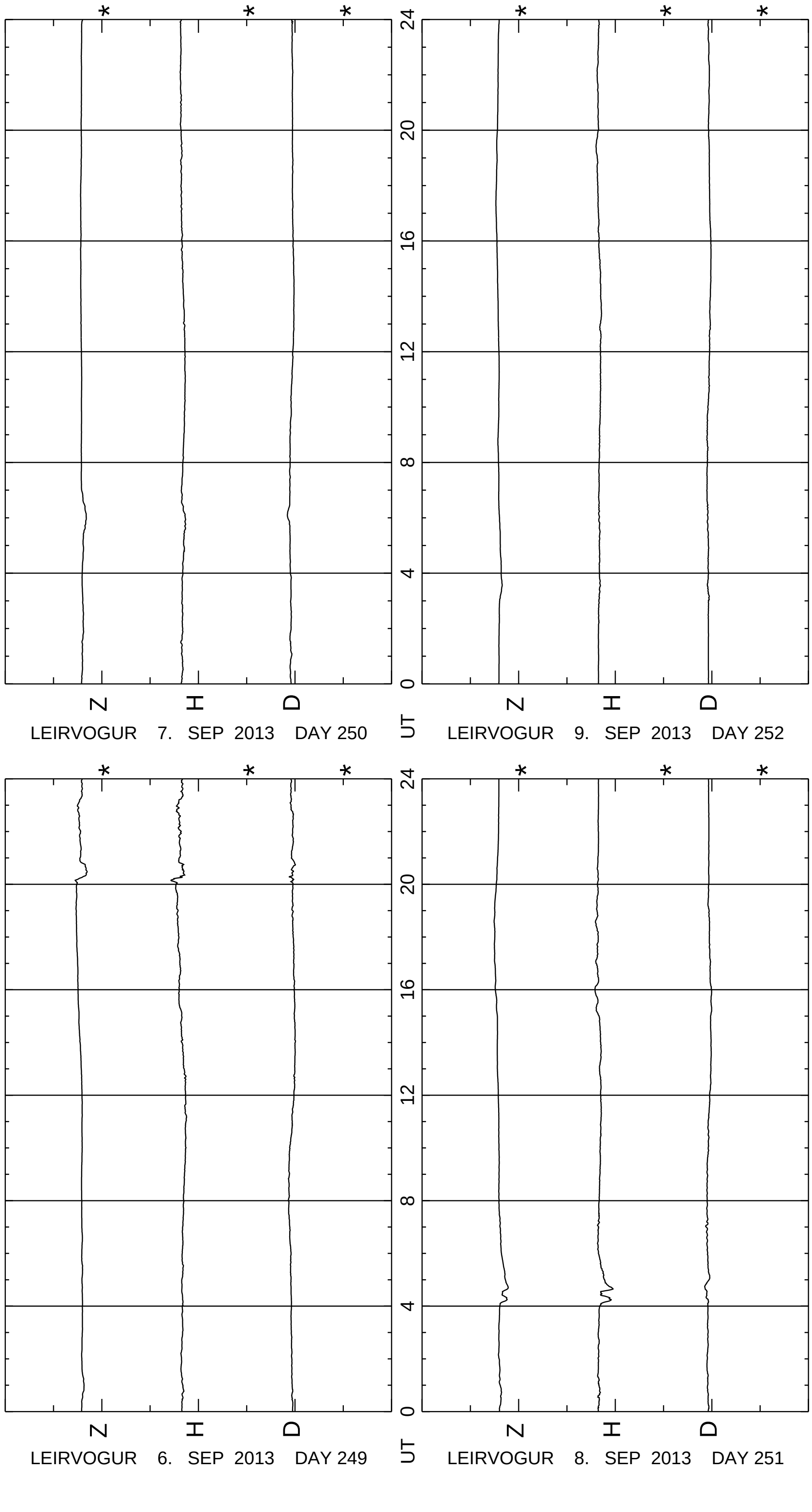
LEIRVOGUR 7. SEP 2013 DAY 250
LEIRVOGUR 9. SEP 2013 DAY 252
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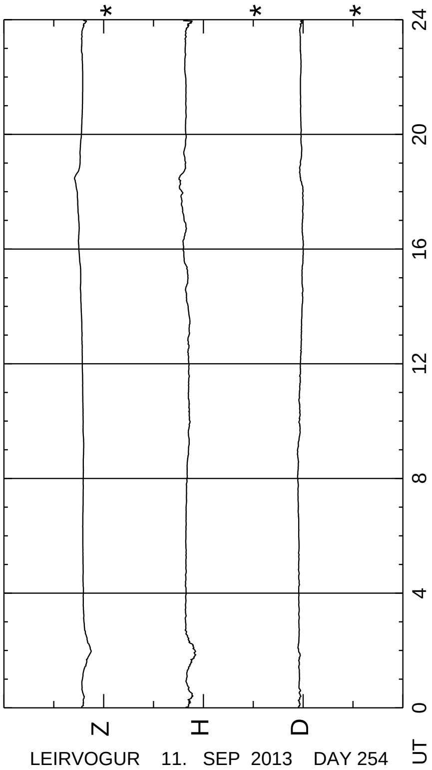
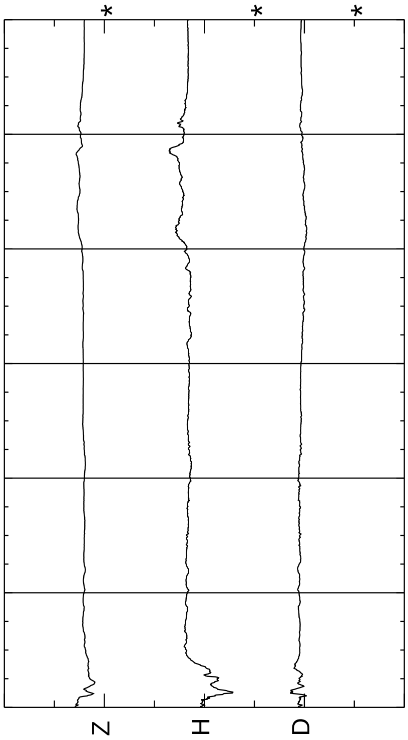
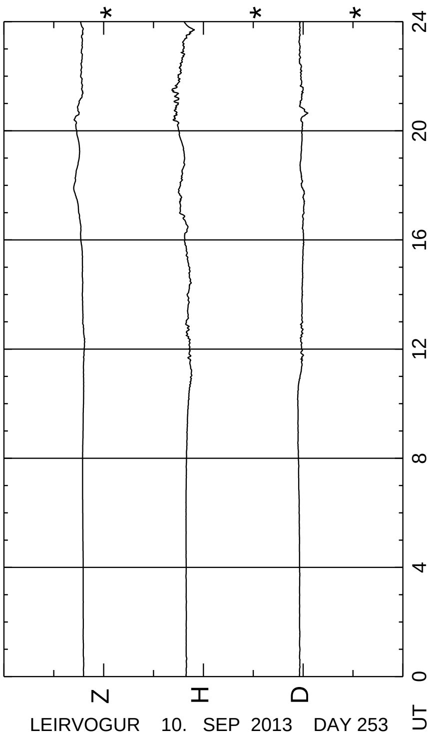


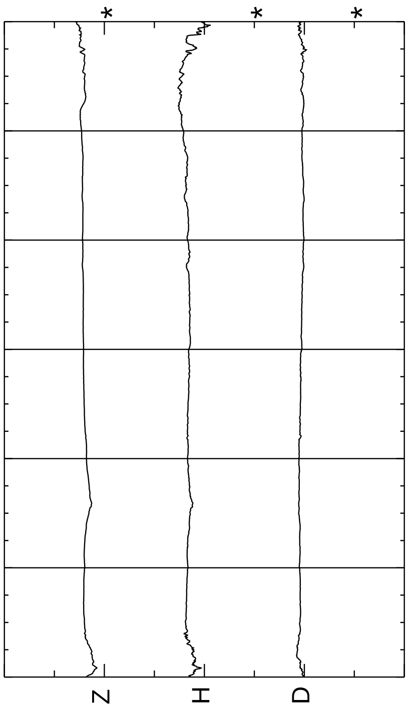
LEIRVOGUR 11. SEP 2013 DAY 254



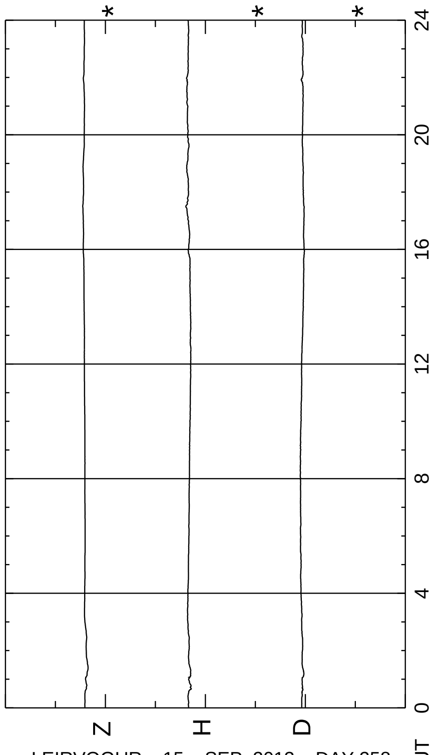
LEIRVOGUR 13. SEP 2013 DAY 256



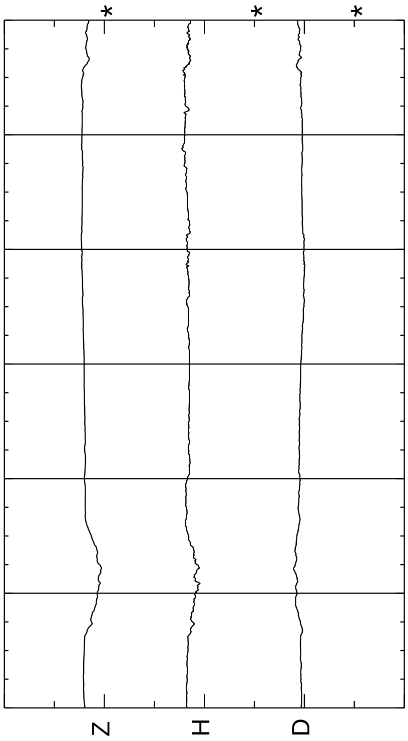
LEIRVOGUR 10. SEP 2013 DAY 253



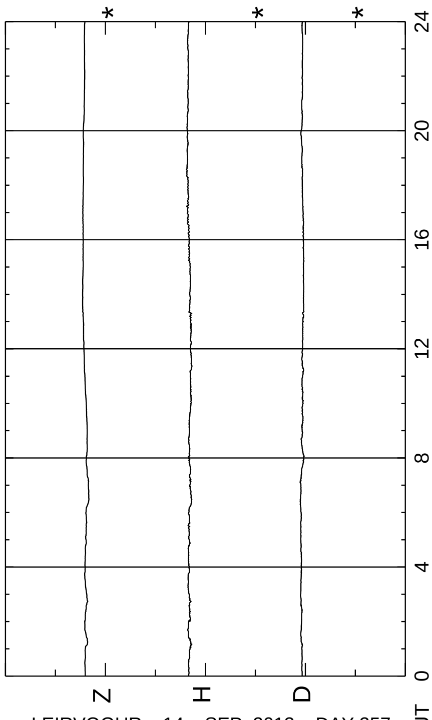
LEIRVOGUR 12. SEP 2013 DAY 255



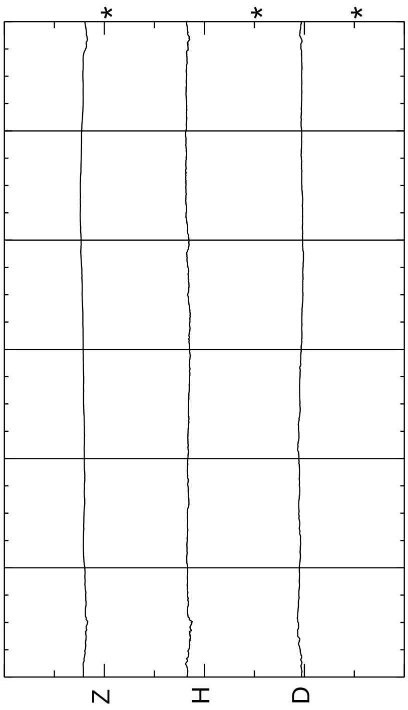
LEIRVOGUR 15. SEP 2013 DAY 258



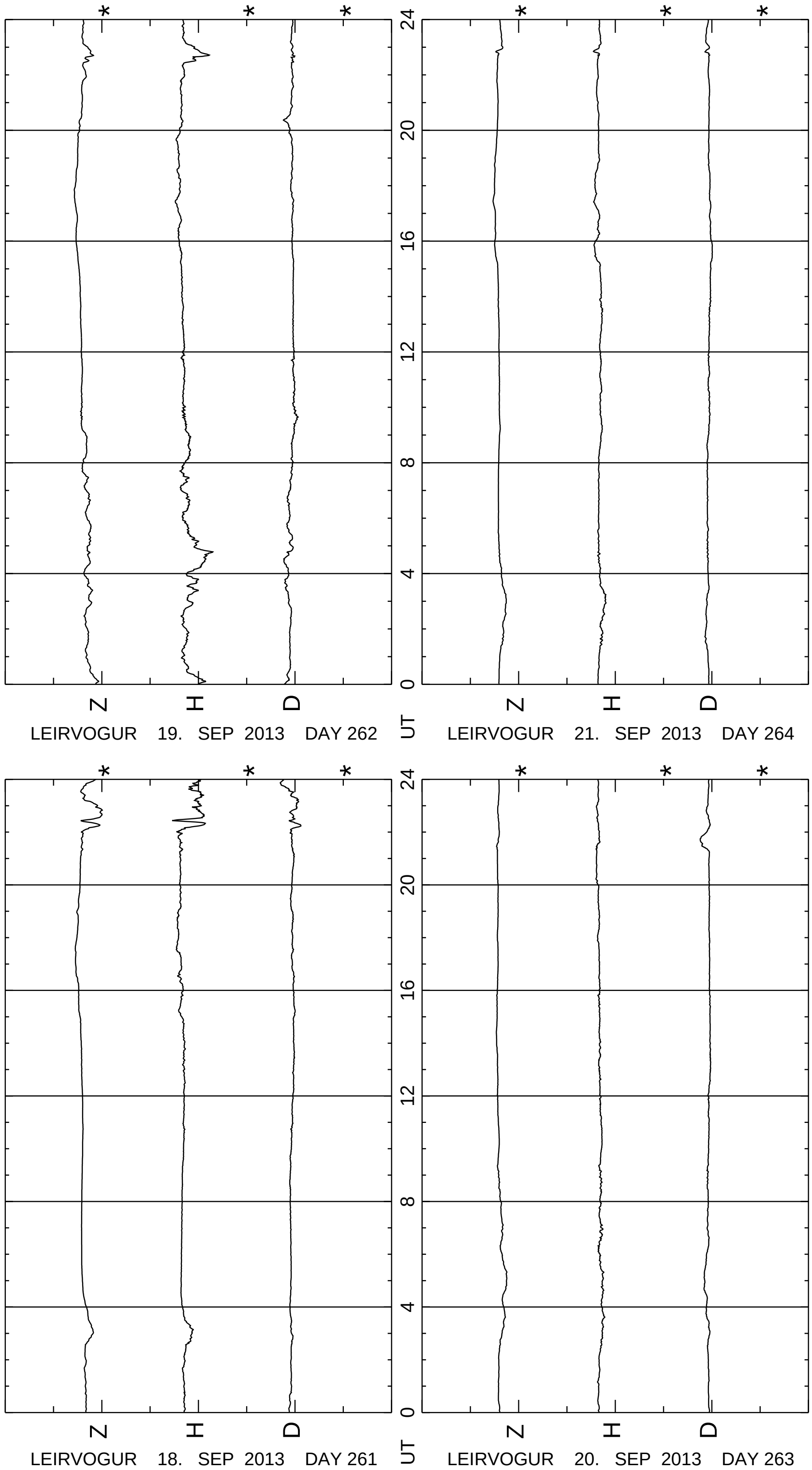
LEIRVOGUR 17. SEP 2013 DAY 260



LEIRVOGUR 14. SEP 2013 DAY 257



LEIRVOGUR 16. SEP 2013 DAY 259


LEIRVOGUR 19. SEP 2013 DAY 262
LEIRVOGUR 21. SEP 2013 DAY 264
LEIRVOGUR 18. SEP 2013 DAY 261
LEIRVOGUR 20. SEP 2013 DAY 263
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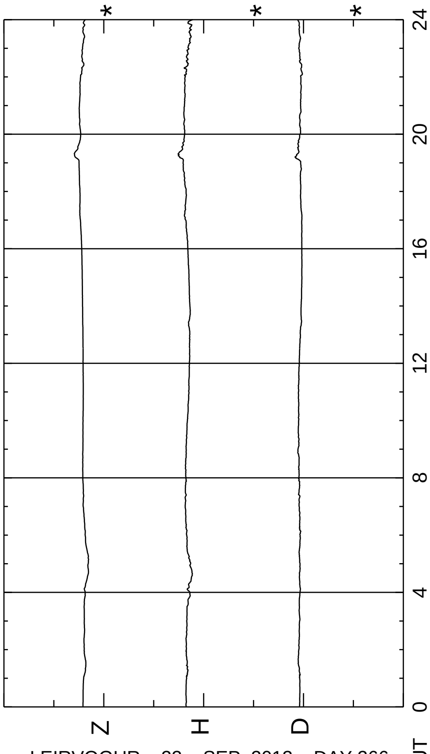
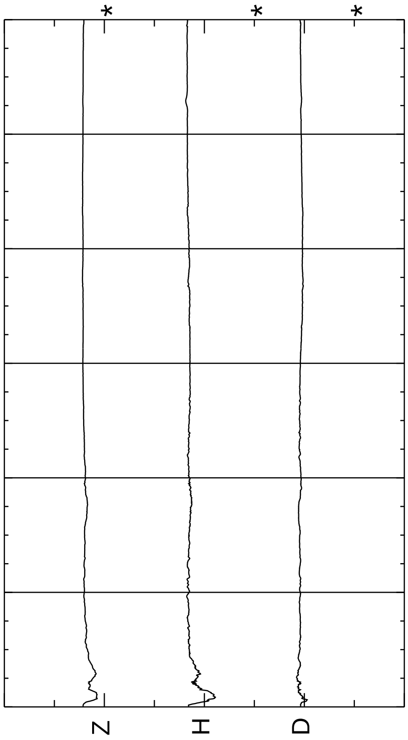
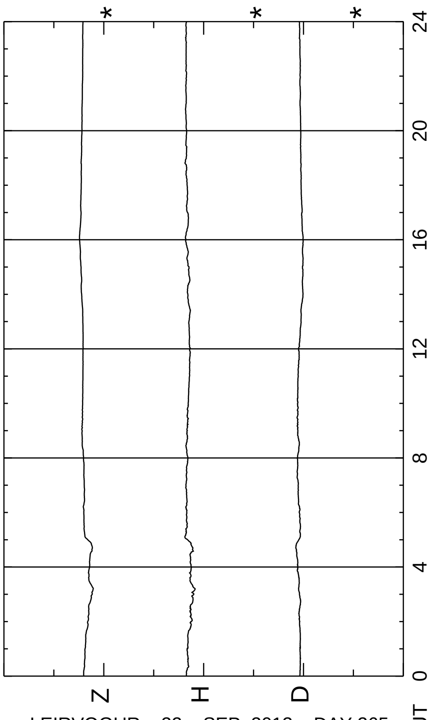


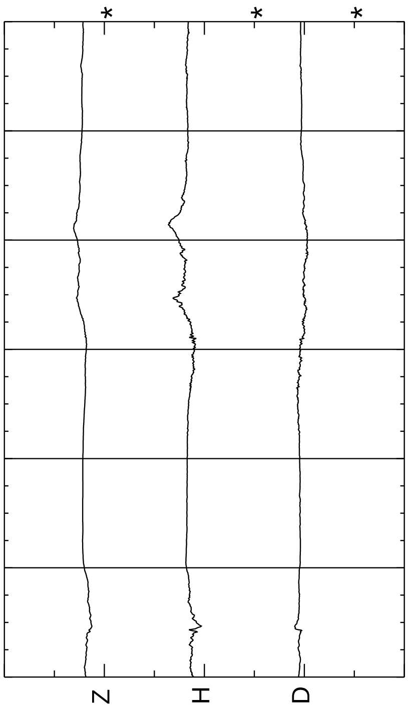
LEIRVOGUR 23. SEP 2013 DAY 266



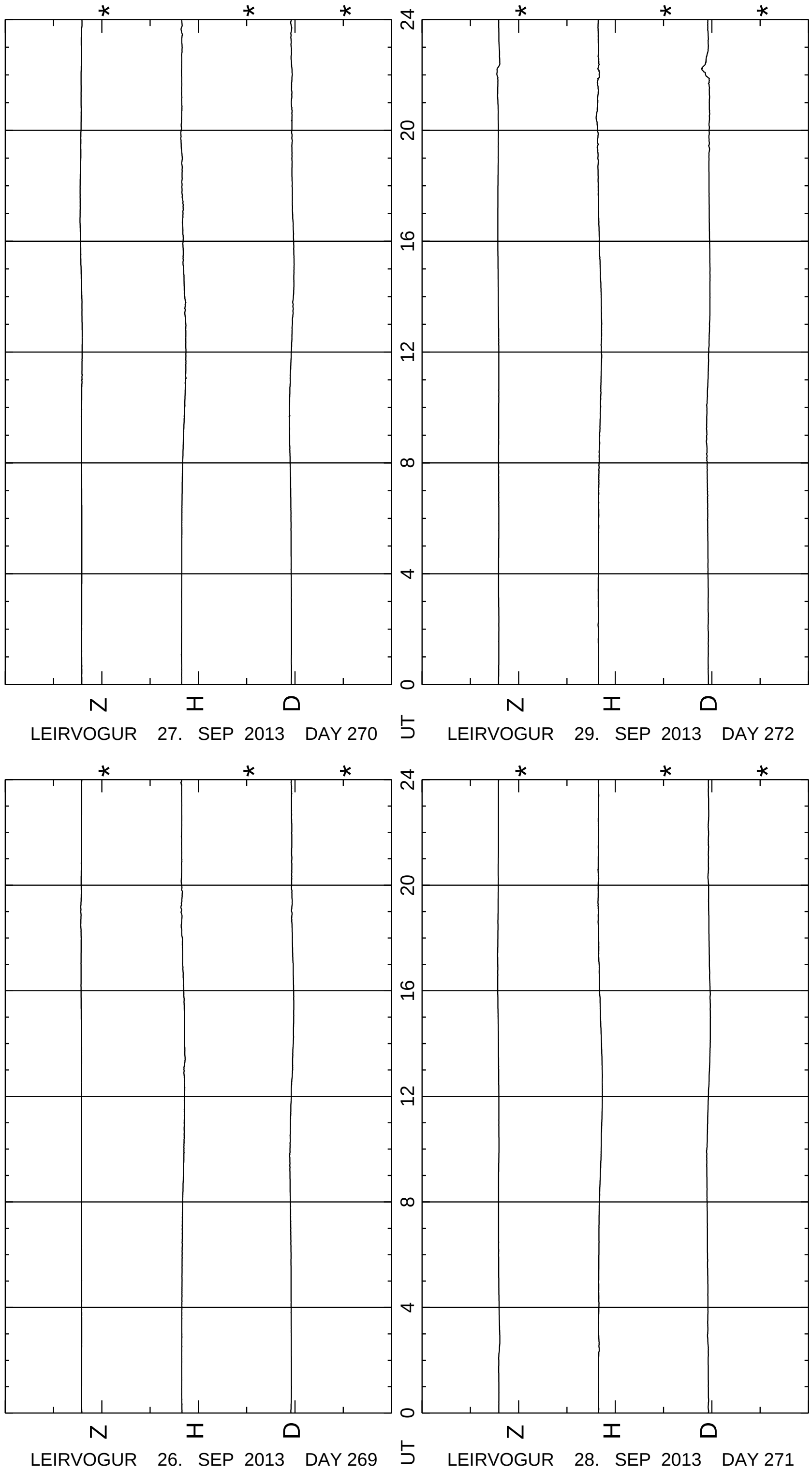
LEIRVOGUR 25. SEP 2013 DAY 268



LEIRVOGUR 22. SEP 2013 DAY 265



LEIRVOGUR 24. SEP 2013 DAY 267


LEIRVOGUR 27. SEP 2013 DAY 270
LEIRVOGUR 29. SEP 2013 DAY 272
LEIRVOGUR 26. SEP 2013 DAY 269
LEIRVOGUR 28. SEP 2013 DAY 271
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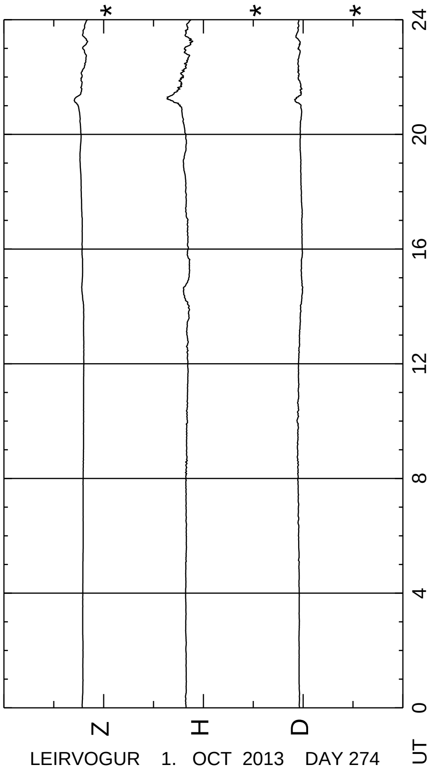
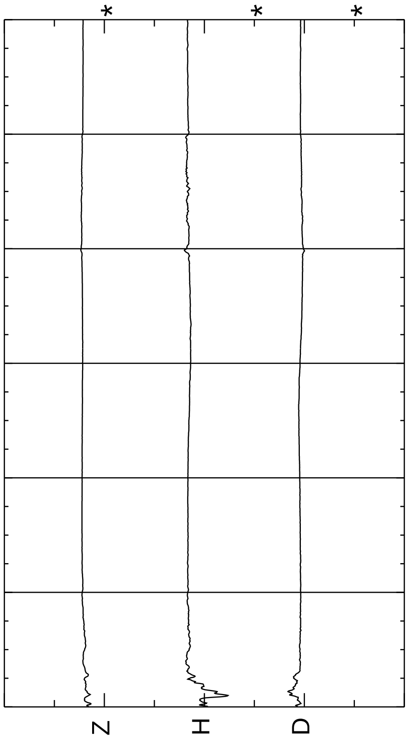
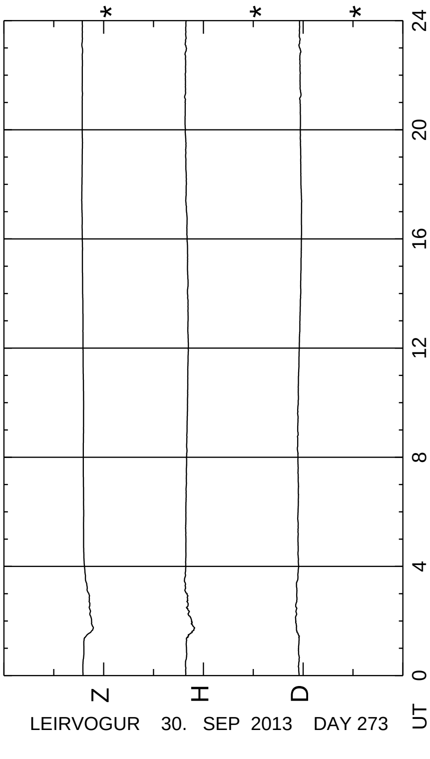


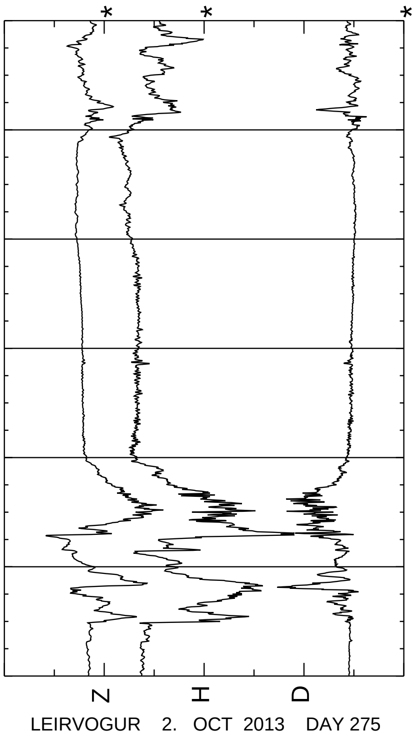
LEIRVOGUR 1. OCT 2013 DAY 274



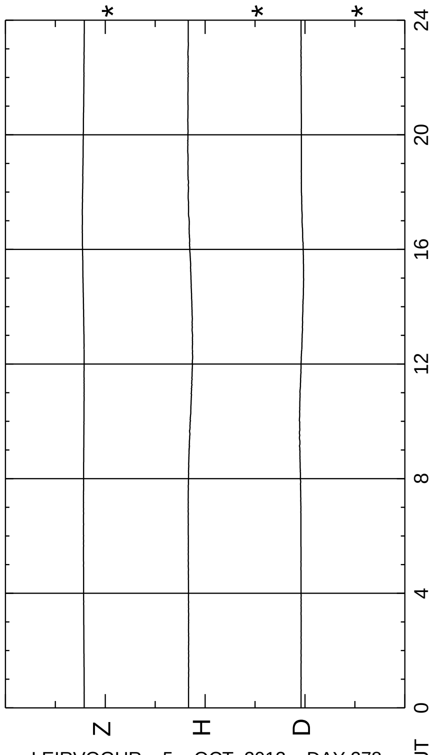
LEIRVOGUR 3. OCT 2013 DAY 276



LEIRVOGUR 30. SEP 2013 DAY 273



LEIRVOGUR 2. OCT 2013 DAY 275



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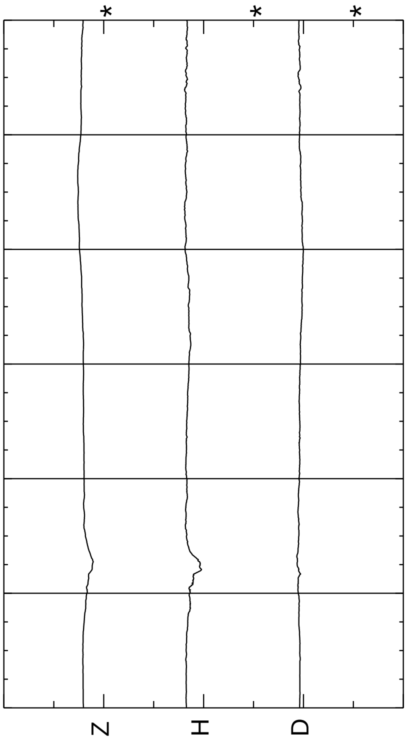
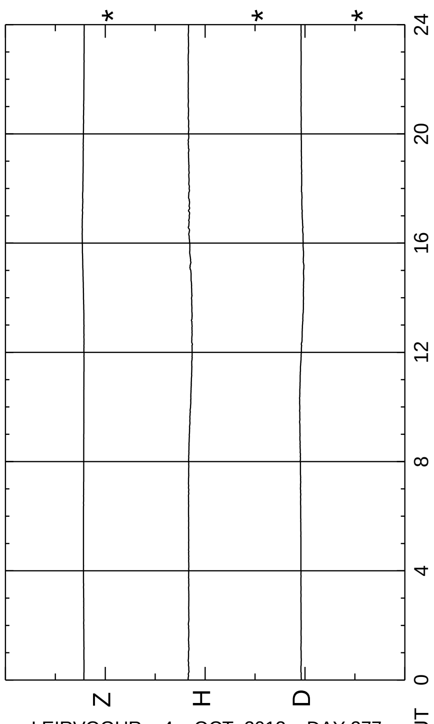


LEIRVOGUR 7. OCT 2013 DAY 280



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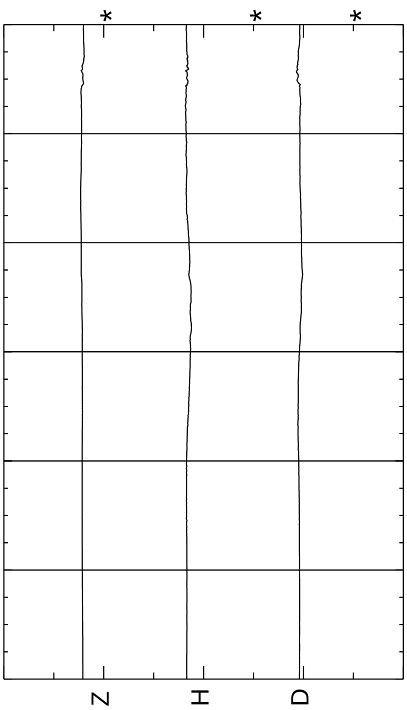
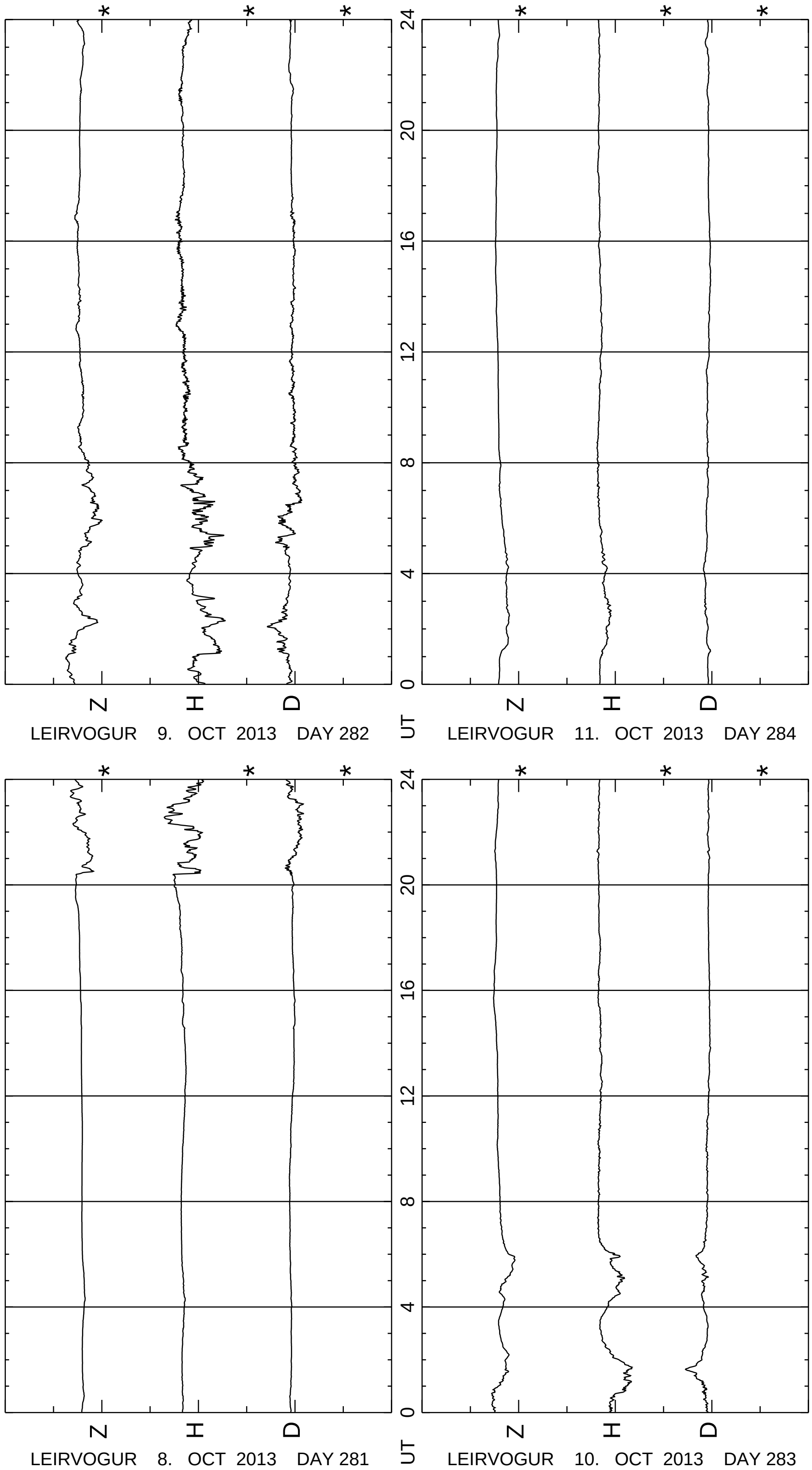


LEIRVOGUR 6. OCT 2013 DAY 279


LEIRVOGUR 9. OCT 2013 DAY 282
LEIRVOGUR 11. OCT 2013 DAY 284
LEIRVOGUR 8. OCT 2013 DAY 281
LEIRVOGUR 10. OCT 2013 DAY 283
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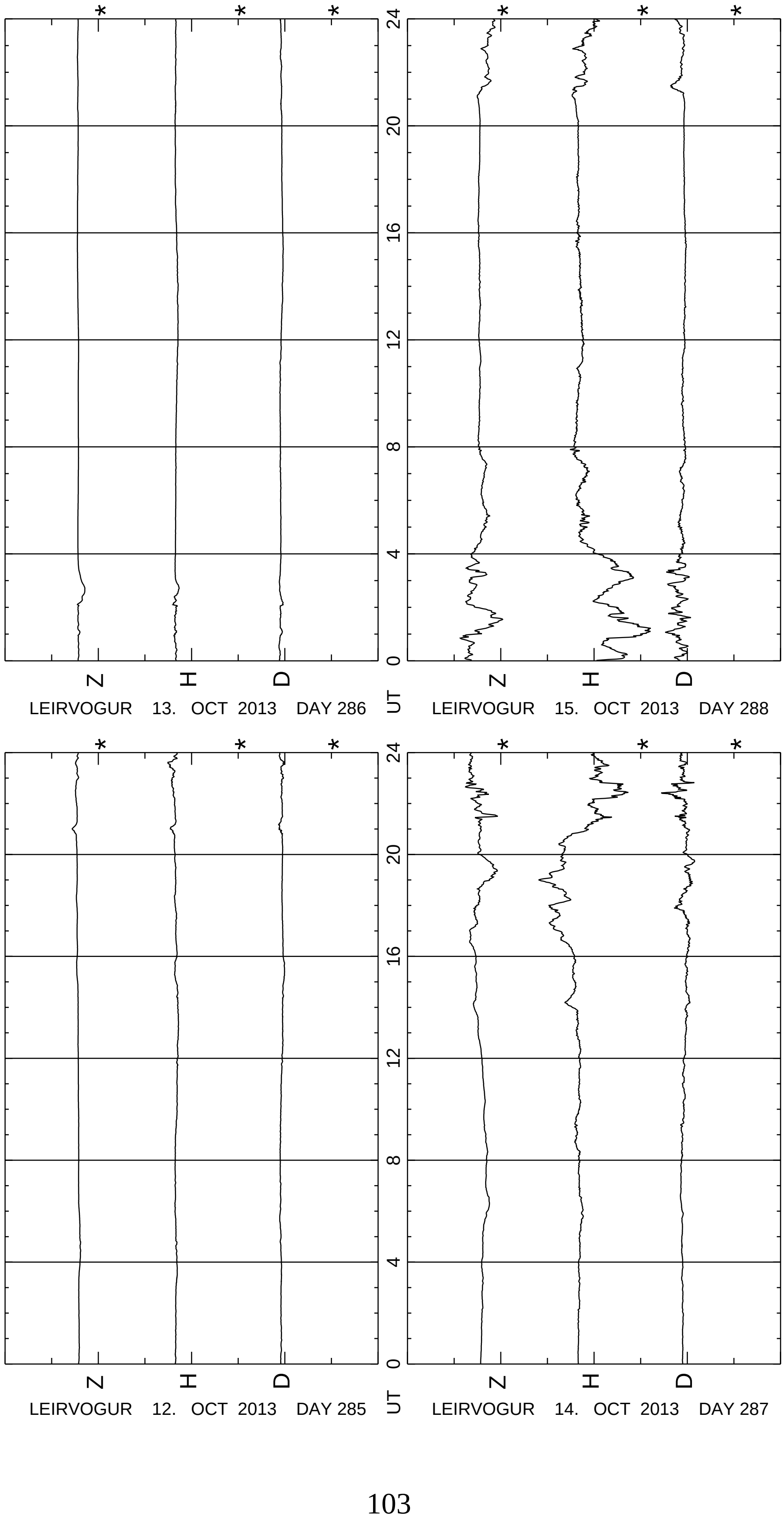
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LEIRVOGUR 14. OCT 2013 DAY 287
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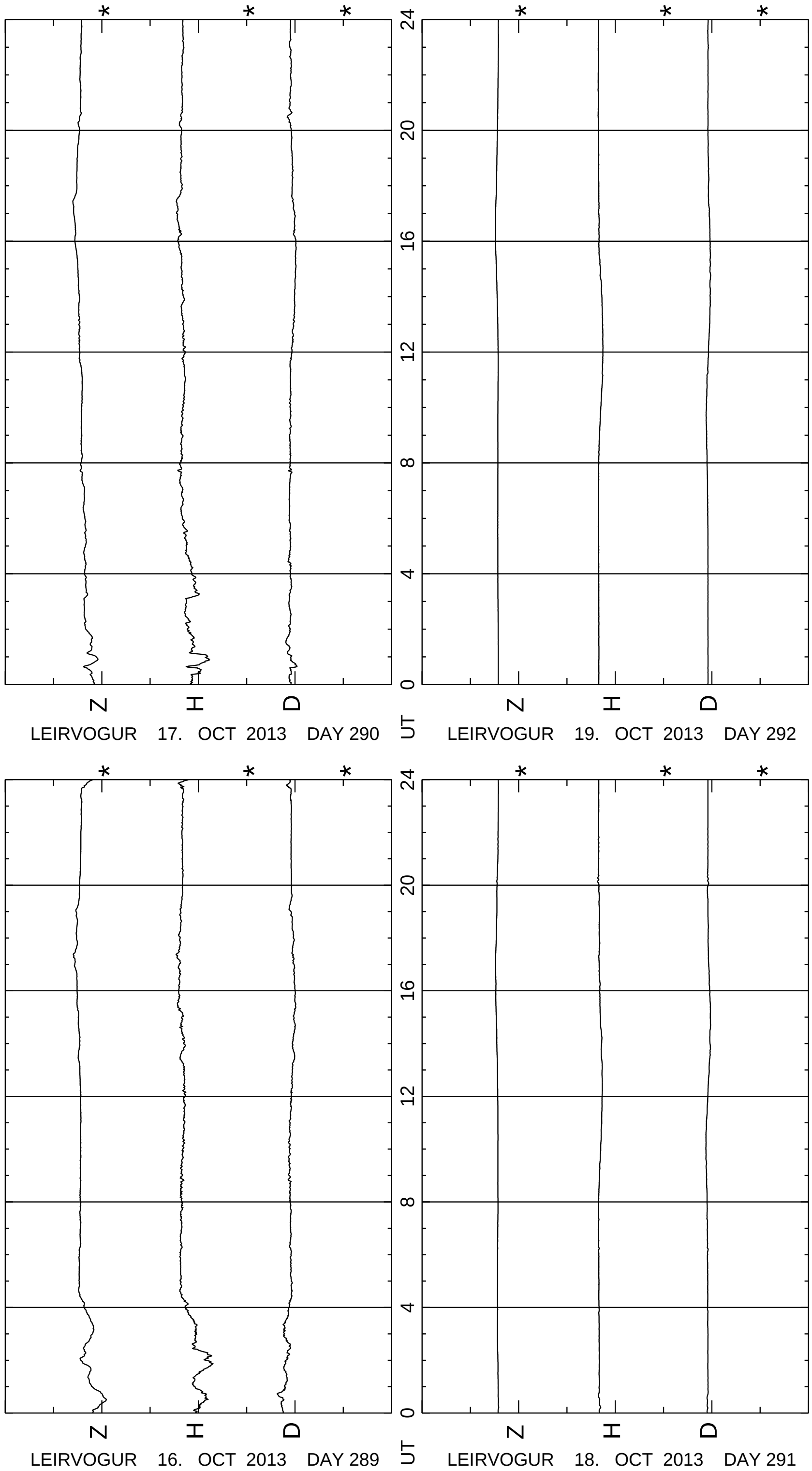
LEIRVOGUR 17. OCT 2013 DAY 290
LEIRVOGUR 19. OCT 2013 DAY 292
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LEIRVOGUR 18. OCT 2013 DAY 291
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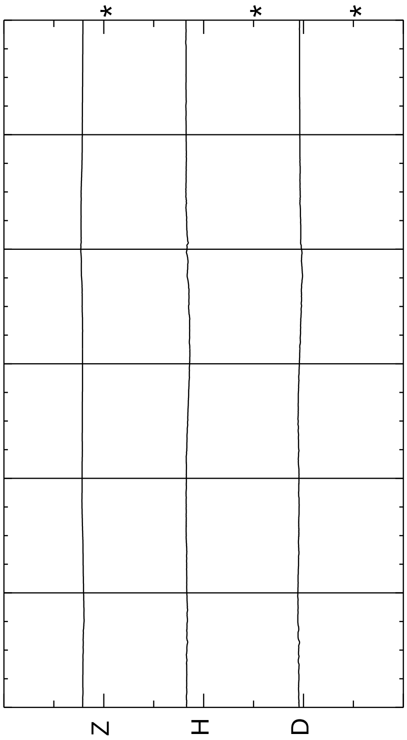

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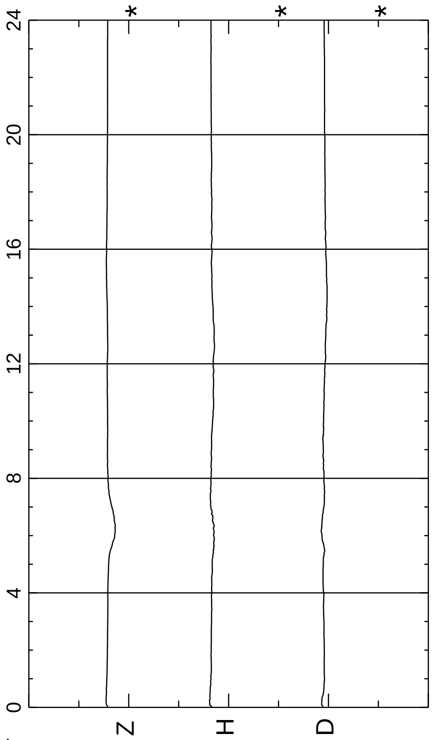

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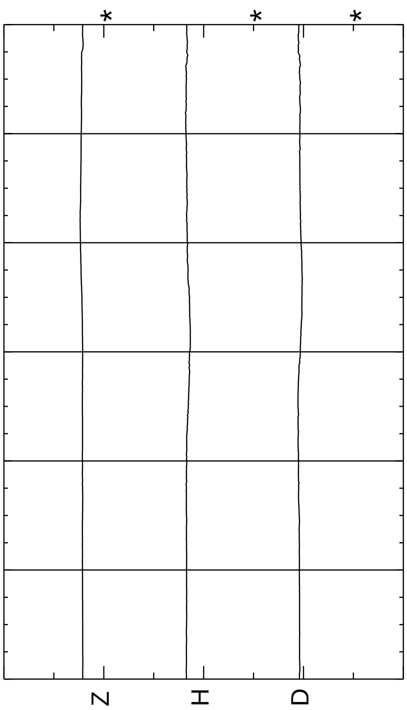
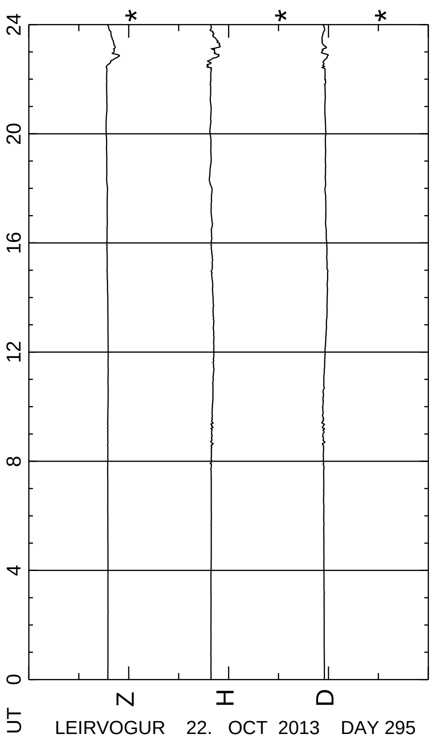
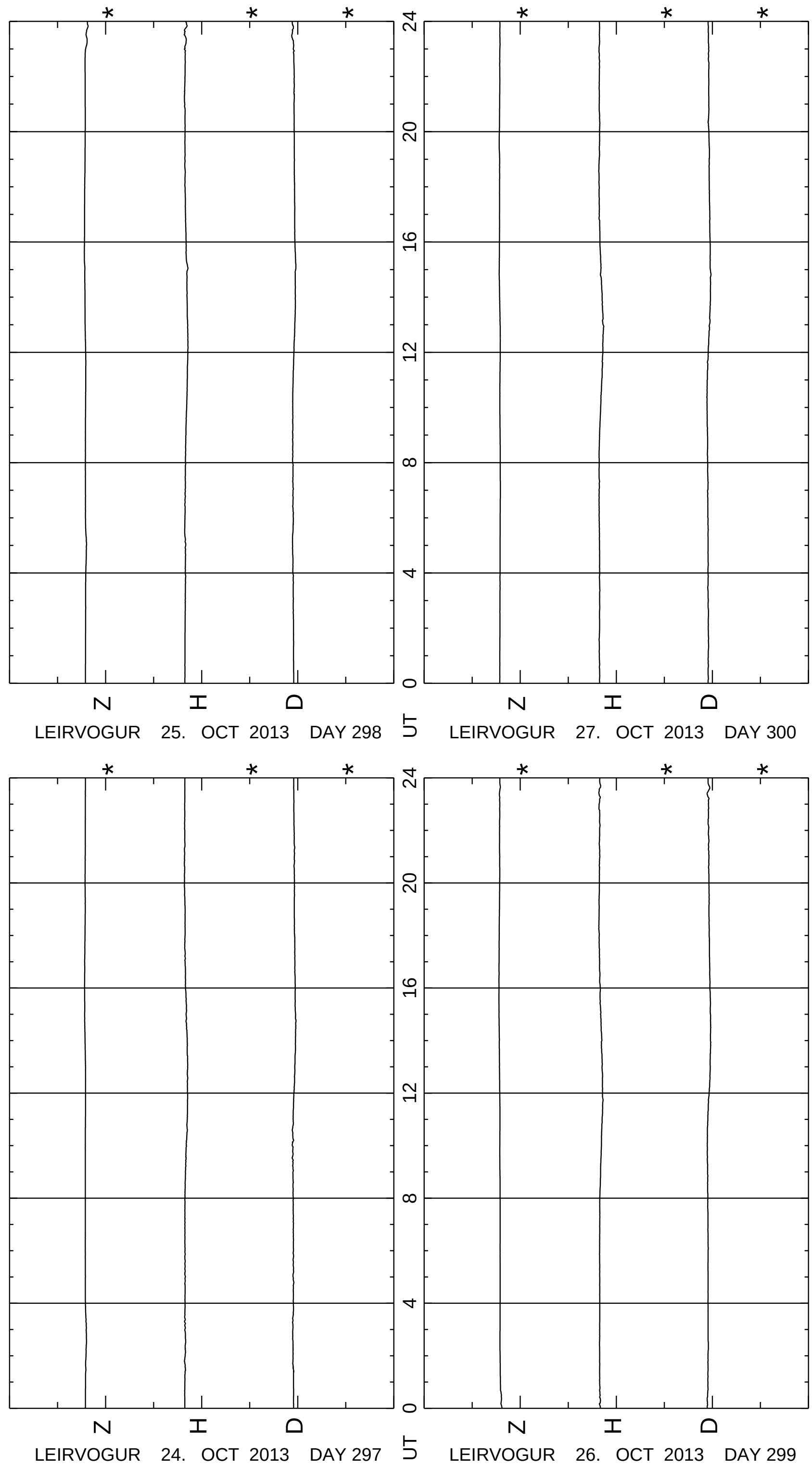


LEIRVOGUR 20. OCT 2013 DAY 293



LEIRVOGUR 22. OCT 2013 DAY 295


LEIRVOGUR 25. OCT 2013 DAY 298
LEIRVOGUR 27. OCT 2013 DAY 300
LEIRVOGUR 24. OCT 2013 DAY 297
LEIRVOGUR 26. OCT 2013 DAY 299
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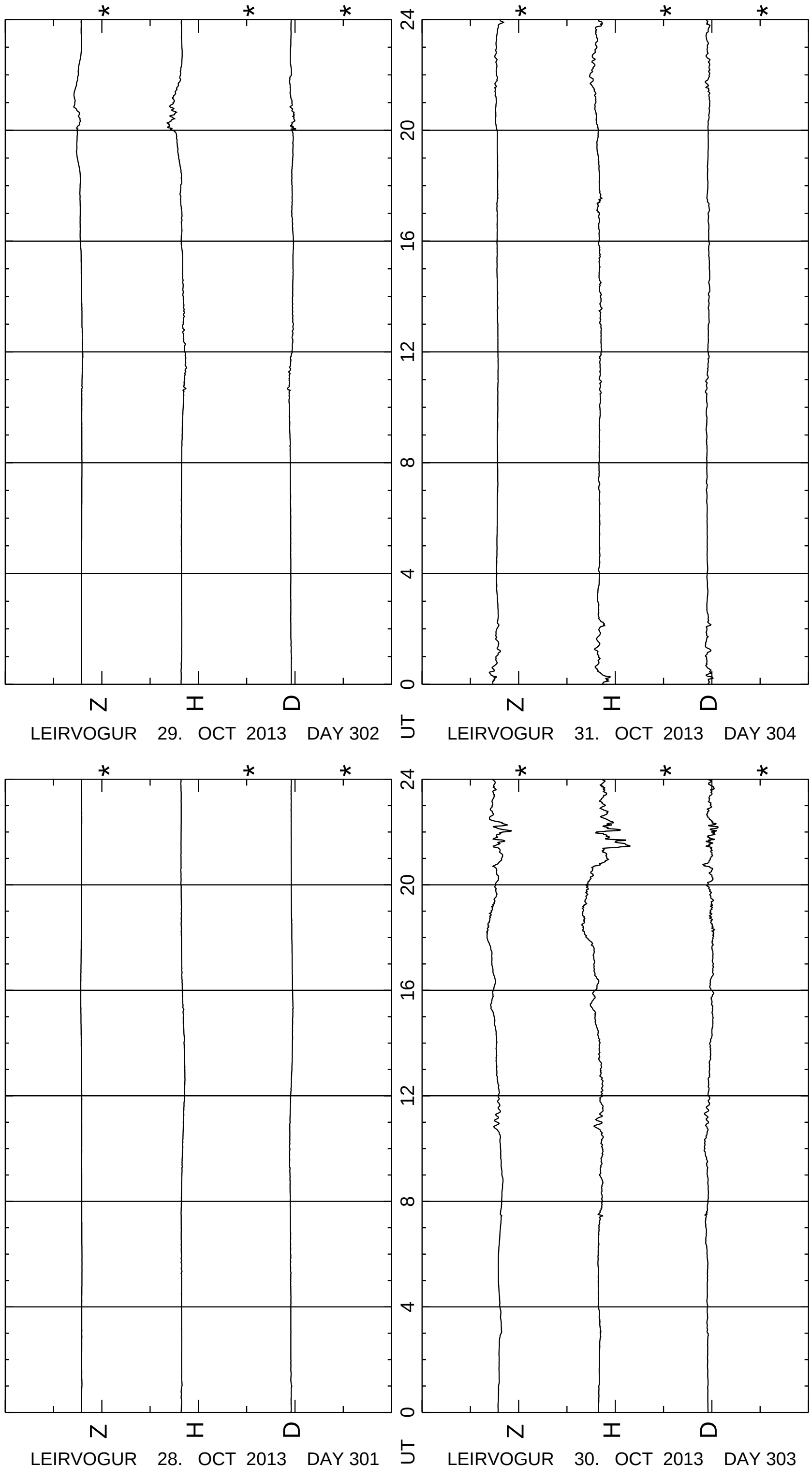
LEIRVOGUR 29. OCT 2013 DAY 302
LEIRVOGUR 31. OCT 2013 DAY 304
LEIRVOGUR 28. OCT 2013 DAY 301
LEIRVOGUR 30. OCT 2013 DAY 303
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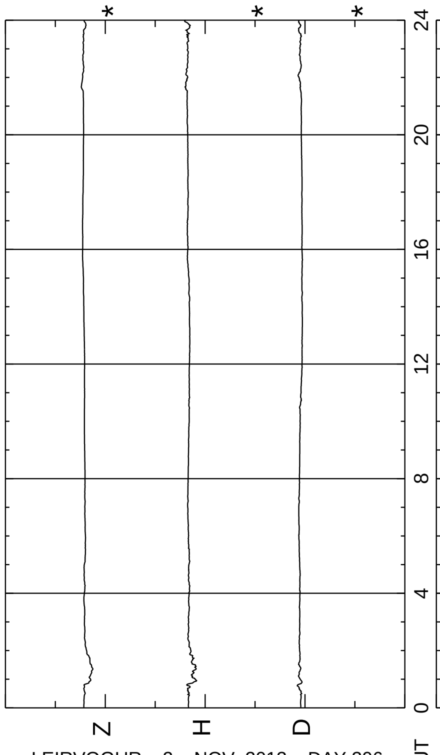

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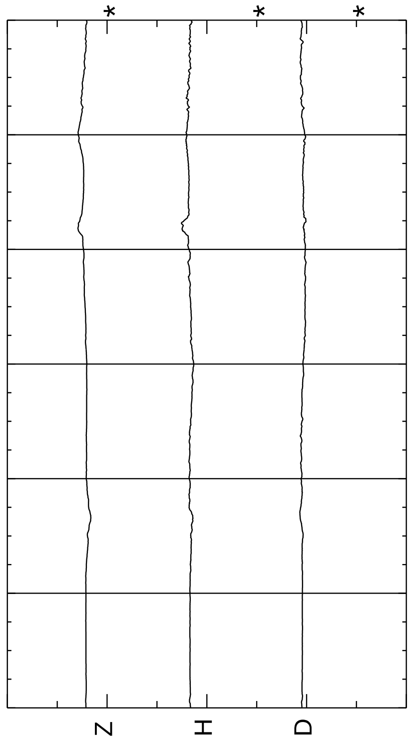
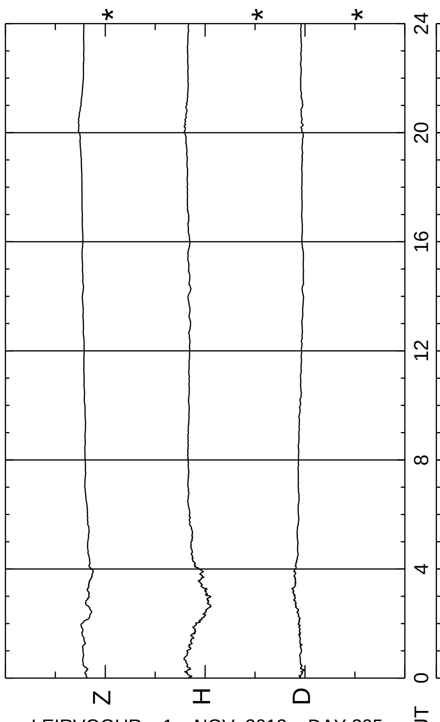
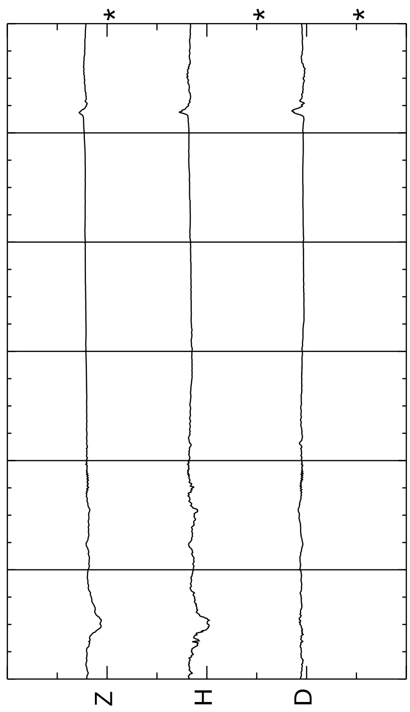


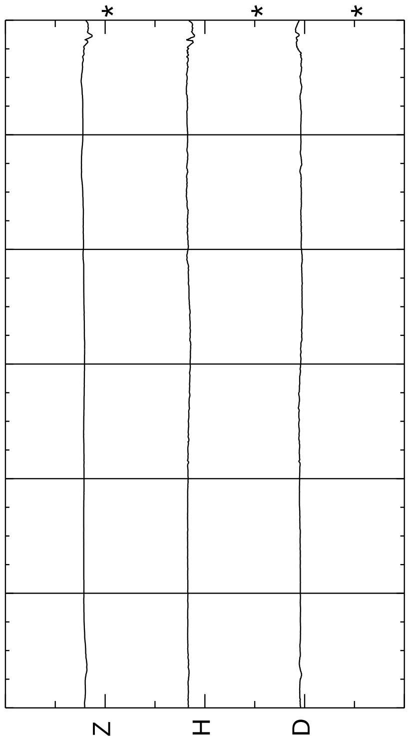
LEIRVOGUR 4. NOV 2013 DAY 308



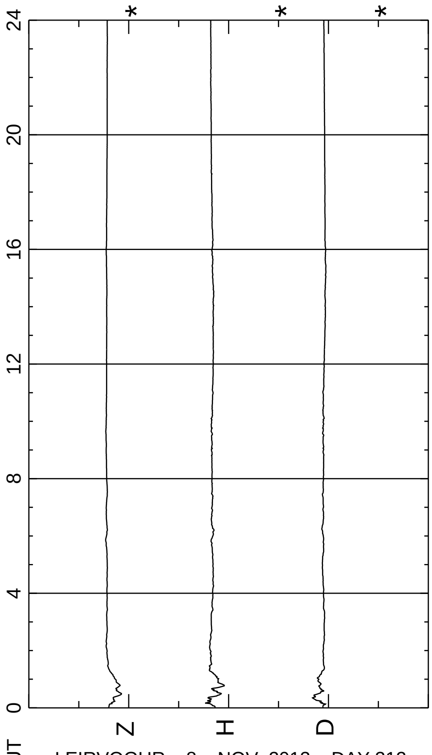
LEIRVOGUR 1. NOV 2013 DAY 305



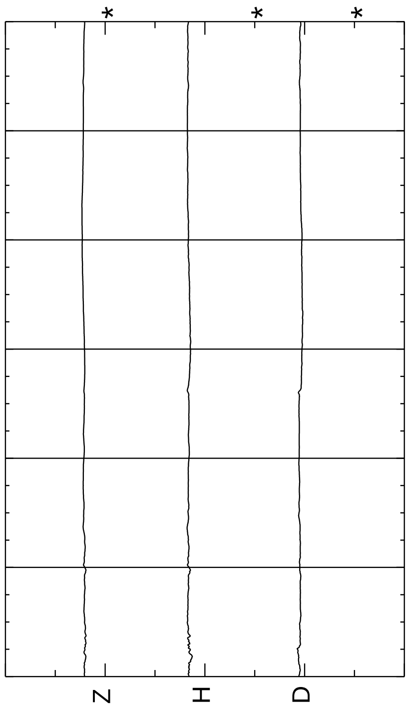
LEIRVOGUR 3. NOV 2013 DAY 307



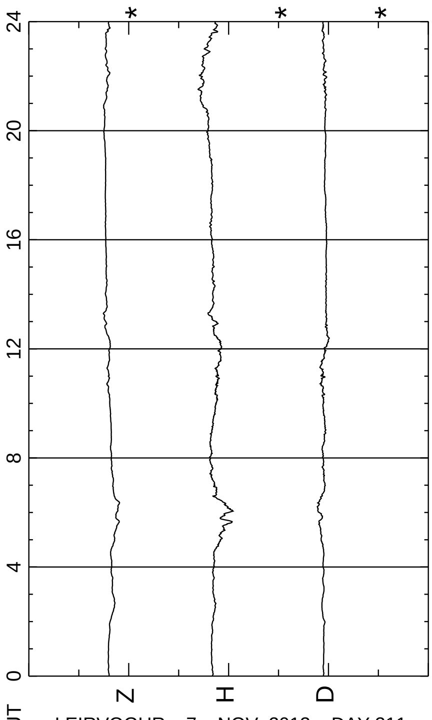
LEIRVOGUR 6. NOV 2013 DAY 310



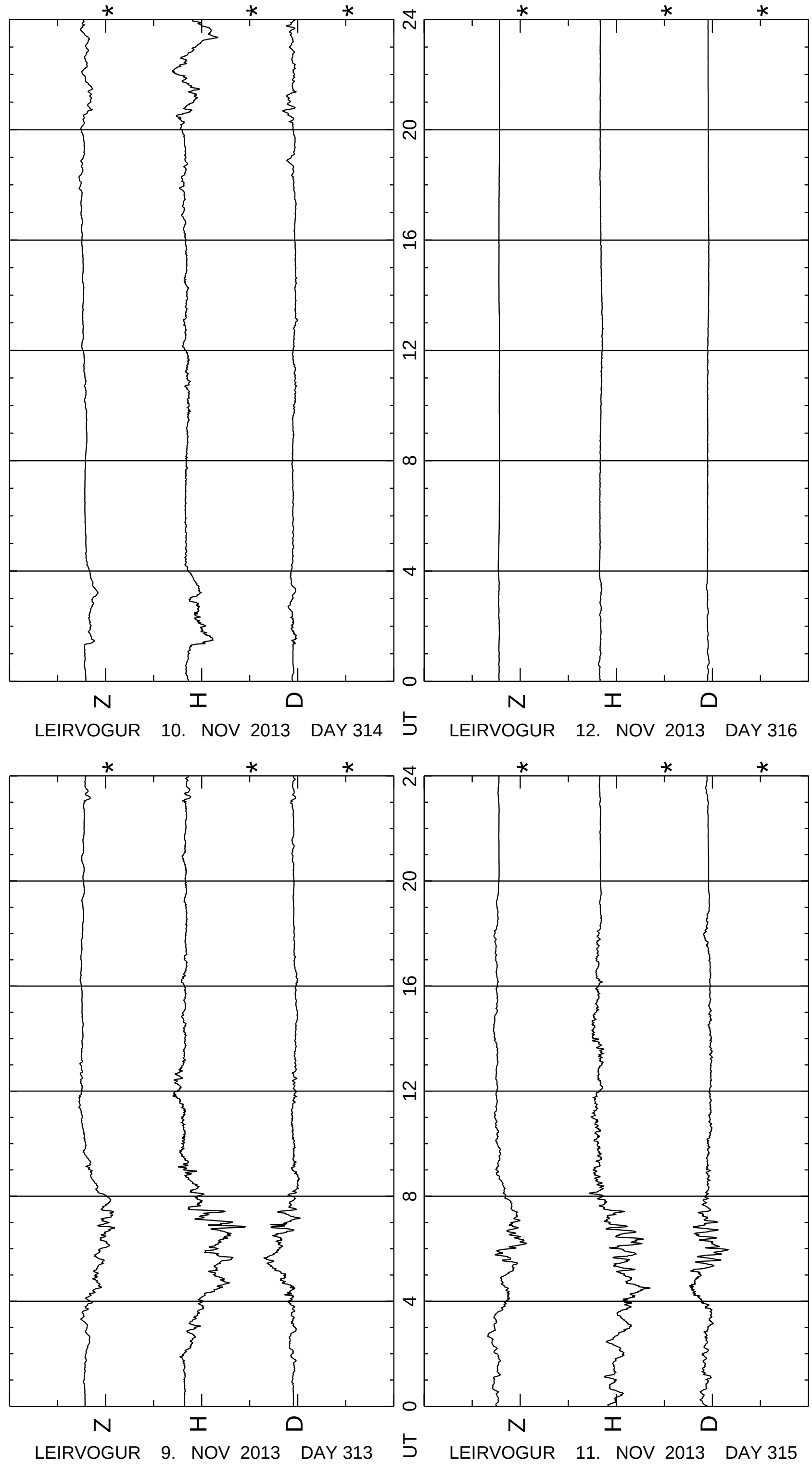
LEIRVOGUR 8. NOV 2013 DAY 312



LEIRVOGUR 5. NOV 2013 DAY 309



LEIRVOGUR 7. NOV 2013 DAY 311


LEIRVOGUR 10. NOV 2013 DAY 314
LEIRVOGUR 12. NOV 2013 DAY 316
LEIRVOGUR 9. NOV 2013 DAY 313
LEIRVOGUR 11. NOV 2013 DAY 315
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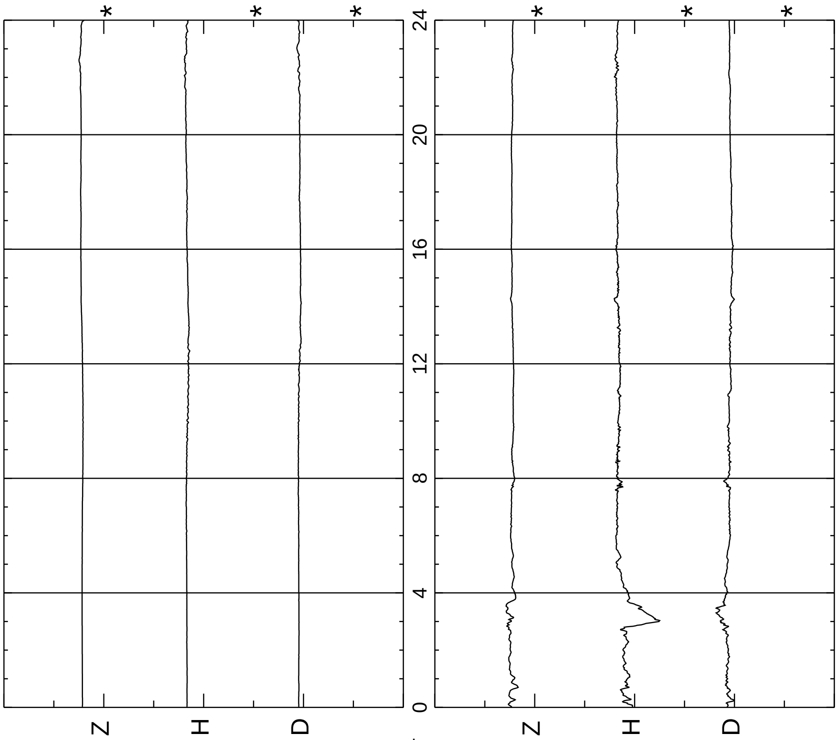
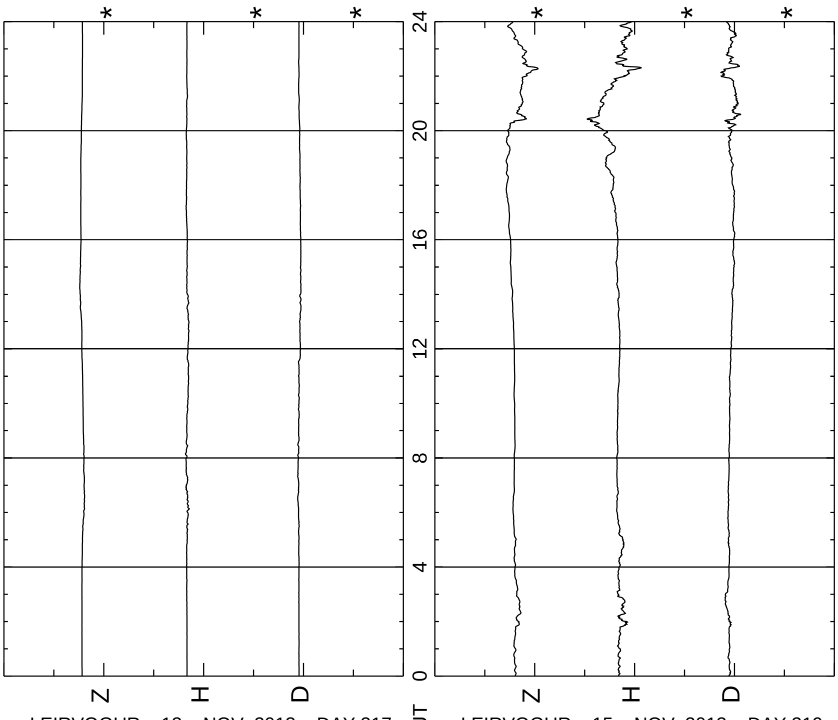


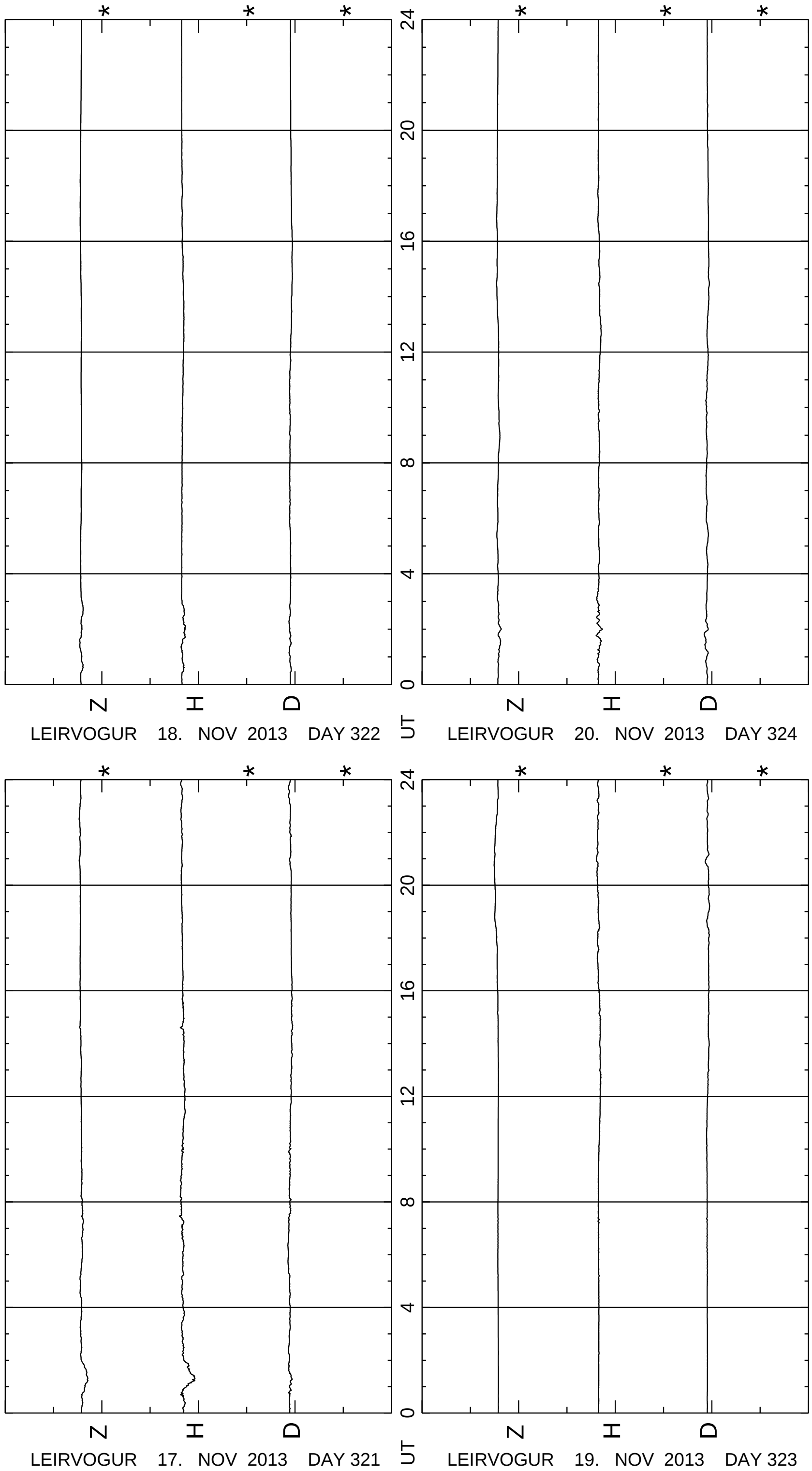
LEIRVOGUR 14. NOV 2013 DAY 318

LEIRVOGUR 16. NOV 2013 DAY 320



LEIRVOGUR 13. NOV 2013 DAY 317

LEIRVOGUR 15. NOV 2013 DAY 319


LEIRVOGUR 18. NOV 2013 DAY 322
LEIRVOGUR 20. NOV 2013 DAY 324
LEIRVOGUR 17. NOV 2013 DAY 321
LEIRVOGUR 19. NOV 2013 DAY 323
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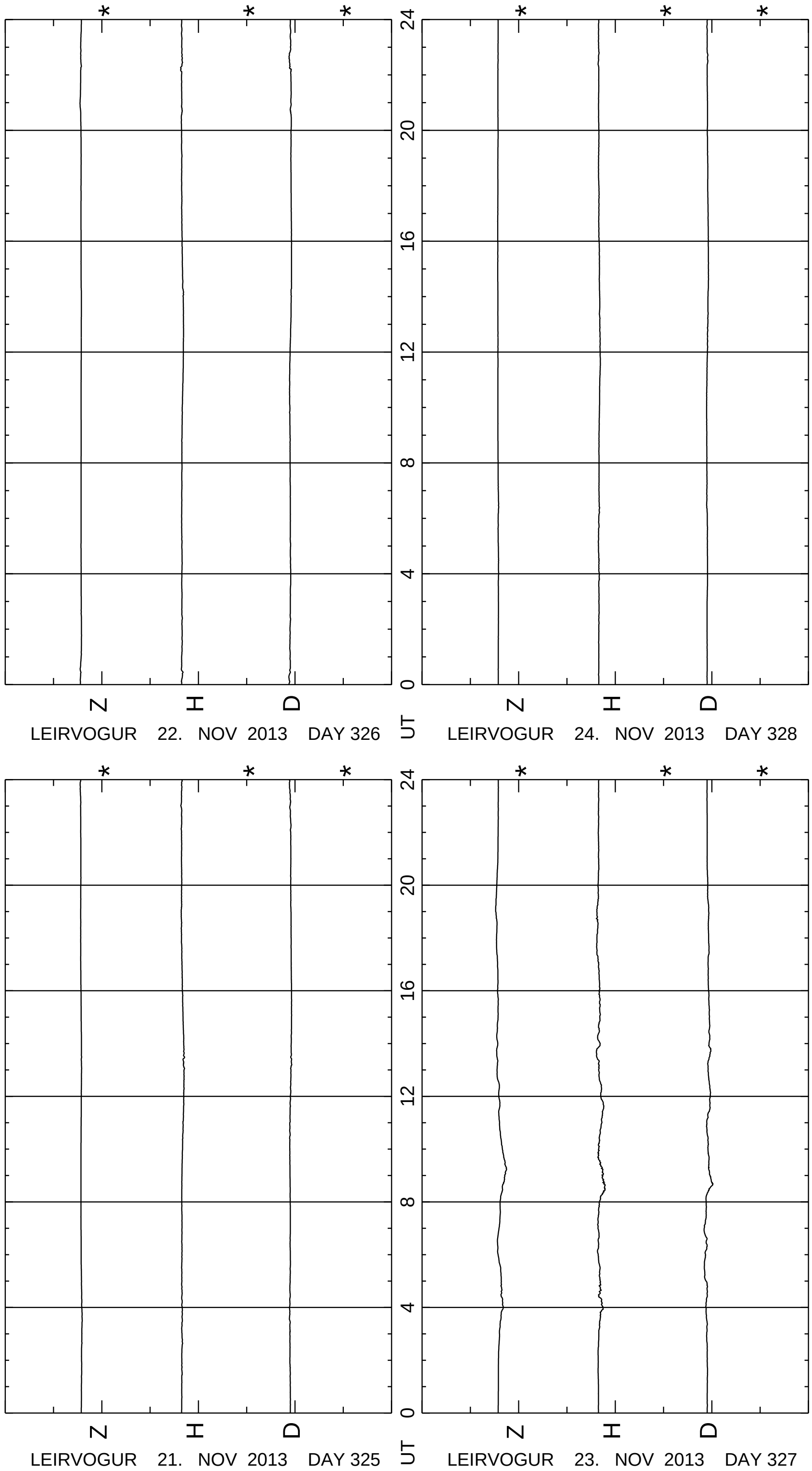
LEIRVOGUR 22. NOV 2013 DAY 326
LEIRVOGUR 24. NOV 2013 DAY 328
LEIRVOGUR 21. NOV 2013 DAY 325
LEIRVOGUR 23. NOV 2013 DAY 327
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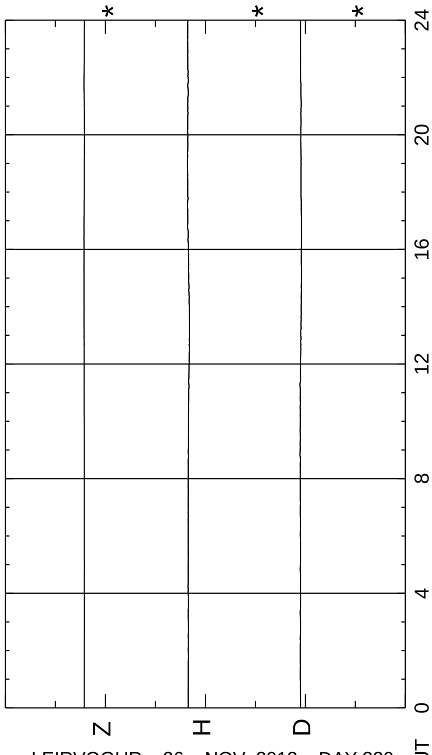
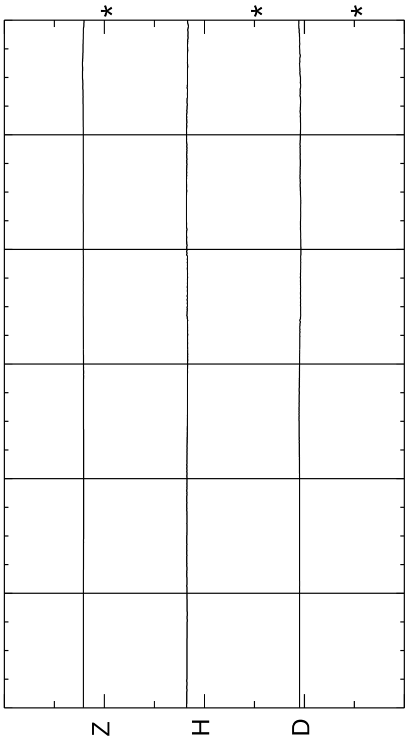
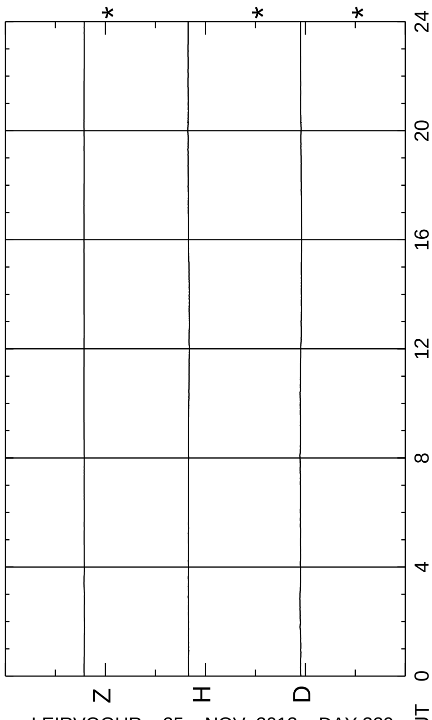


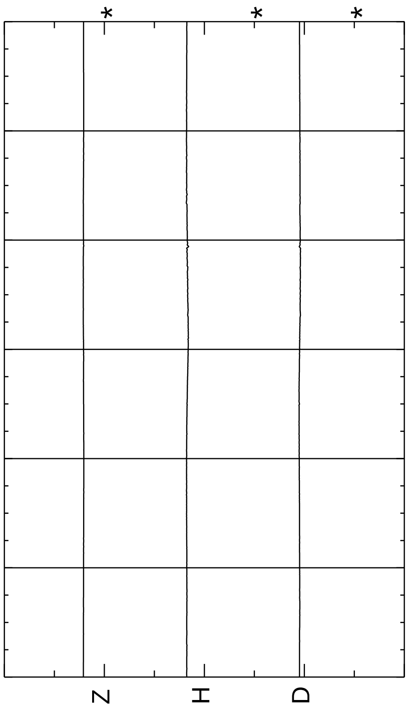
LEIRVOGUR 26. NOV 2013 DAY 330



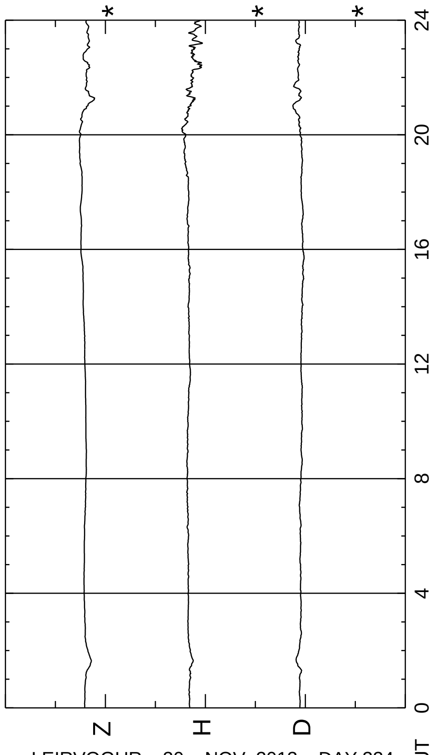
LEIRVOGUR 28. NOV 2013 DAY 332



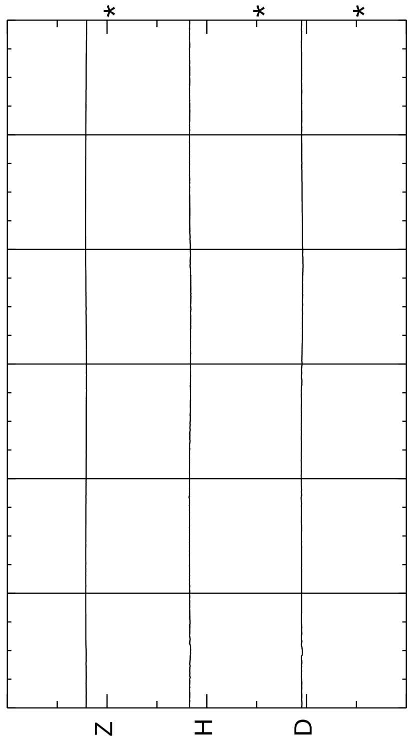
LEIRVOGUR 25. NOV 2013 DAY 329



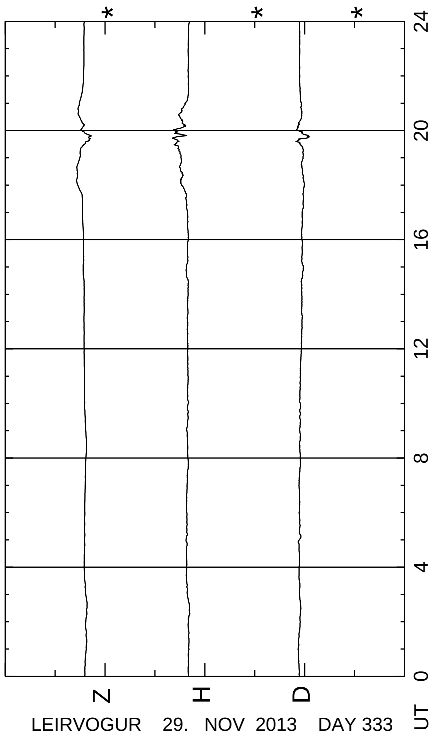
LEIRVOGUR 27. NOV 2013 DAY 331



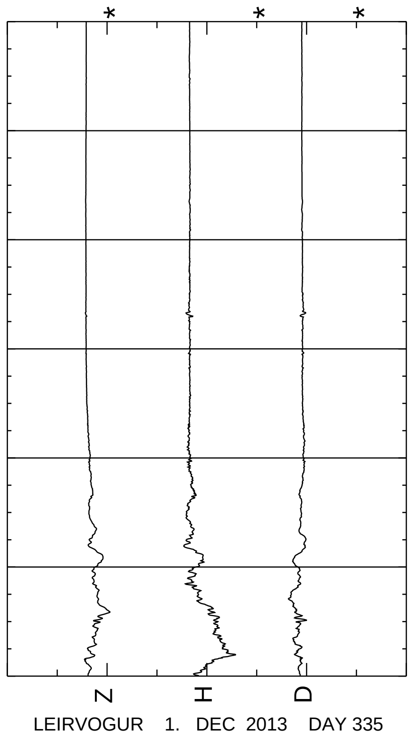
LEIRVOGUR 30. NOV 2013 DAY 334



LEIRVOGUR 2. DEC 2013 DAY 336



LEIRVOGUR 29. NOV 2013 DAY 333



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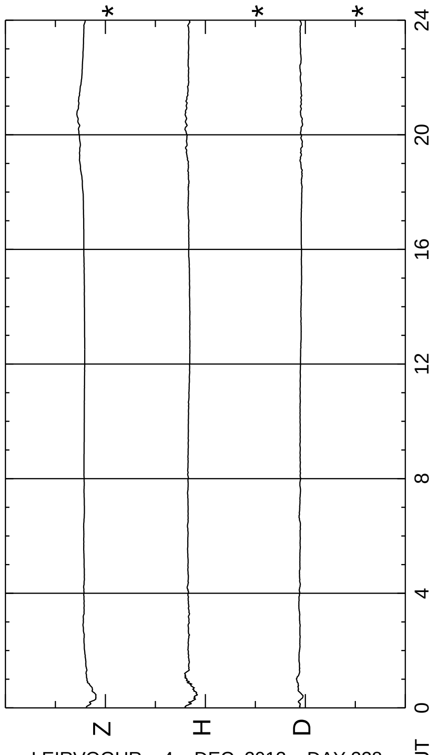
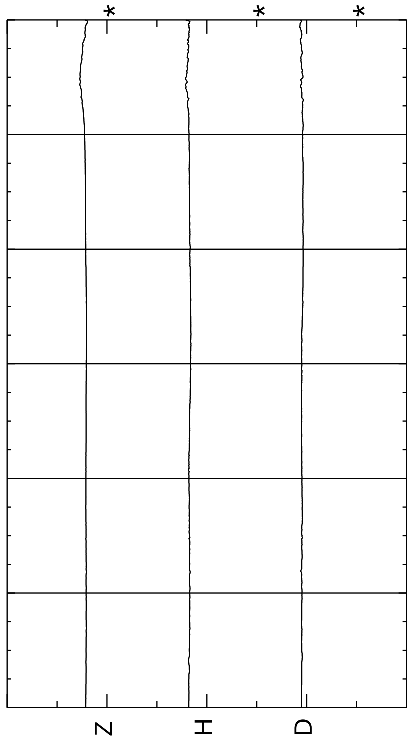


LEIRVOGUR 4. DEC 2013 DAY 338



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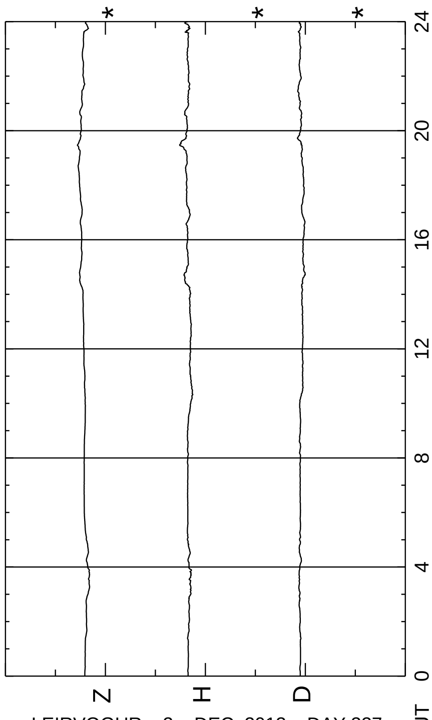
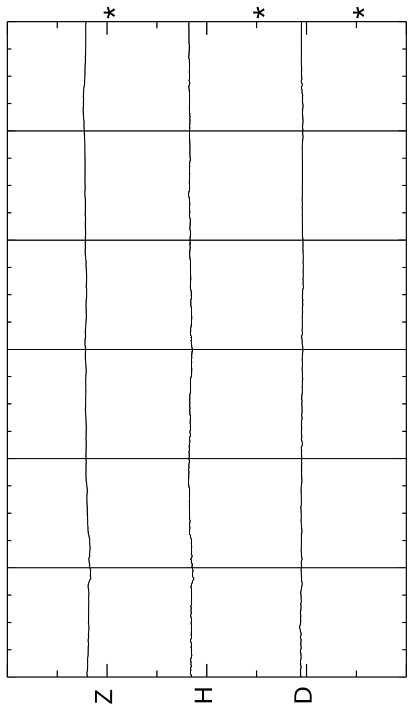
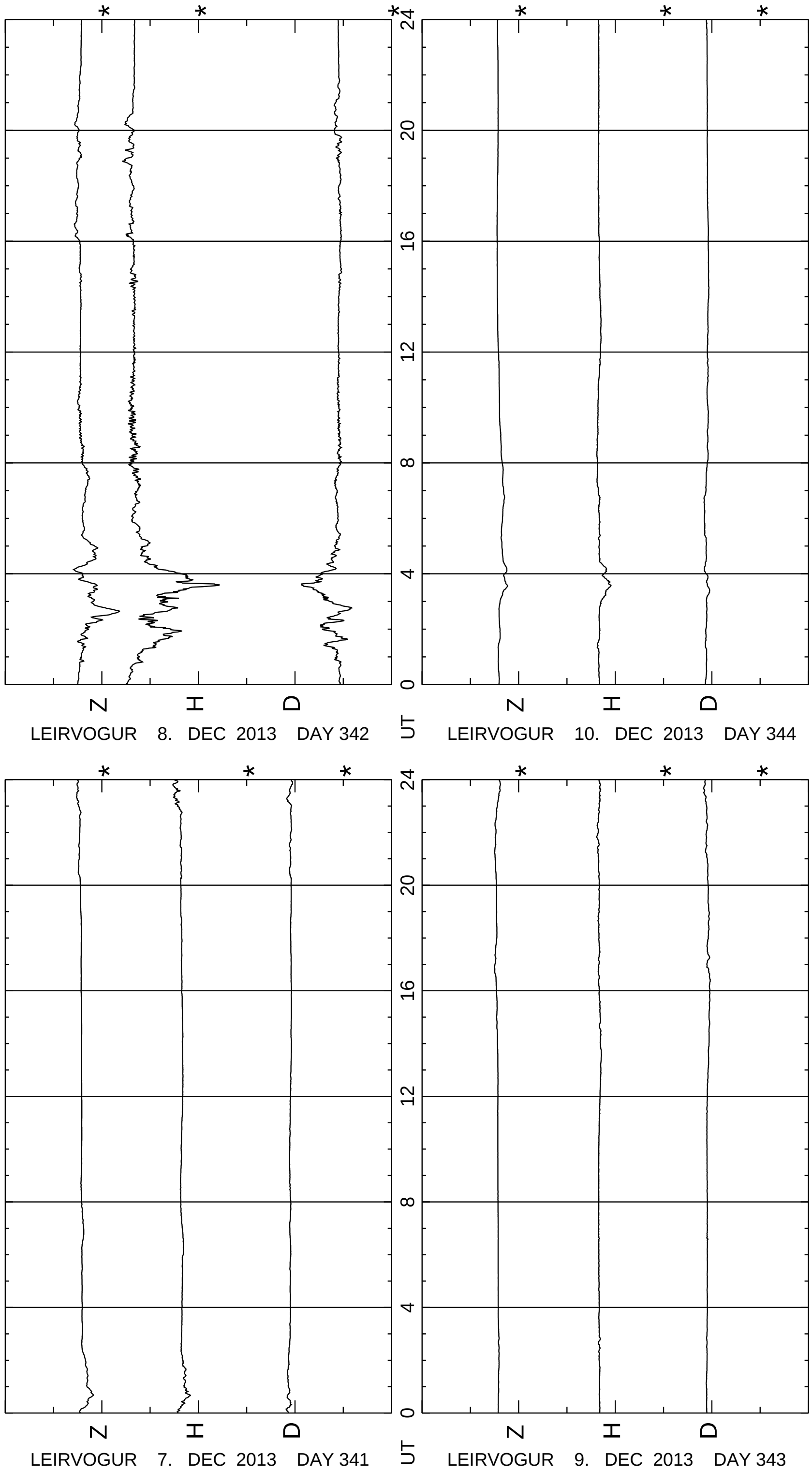


LEIRVOGUR 3. DEC 2013 DAY 337



LEIRVOGUR 5. DEC 2013 DAY 339



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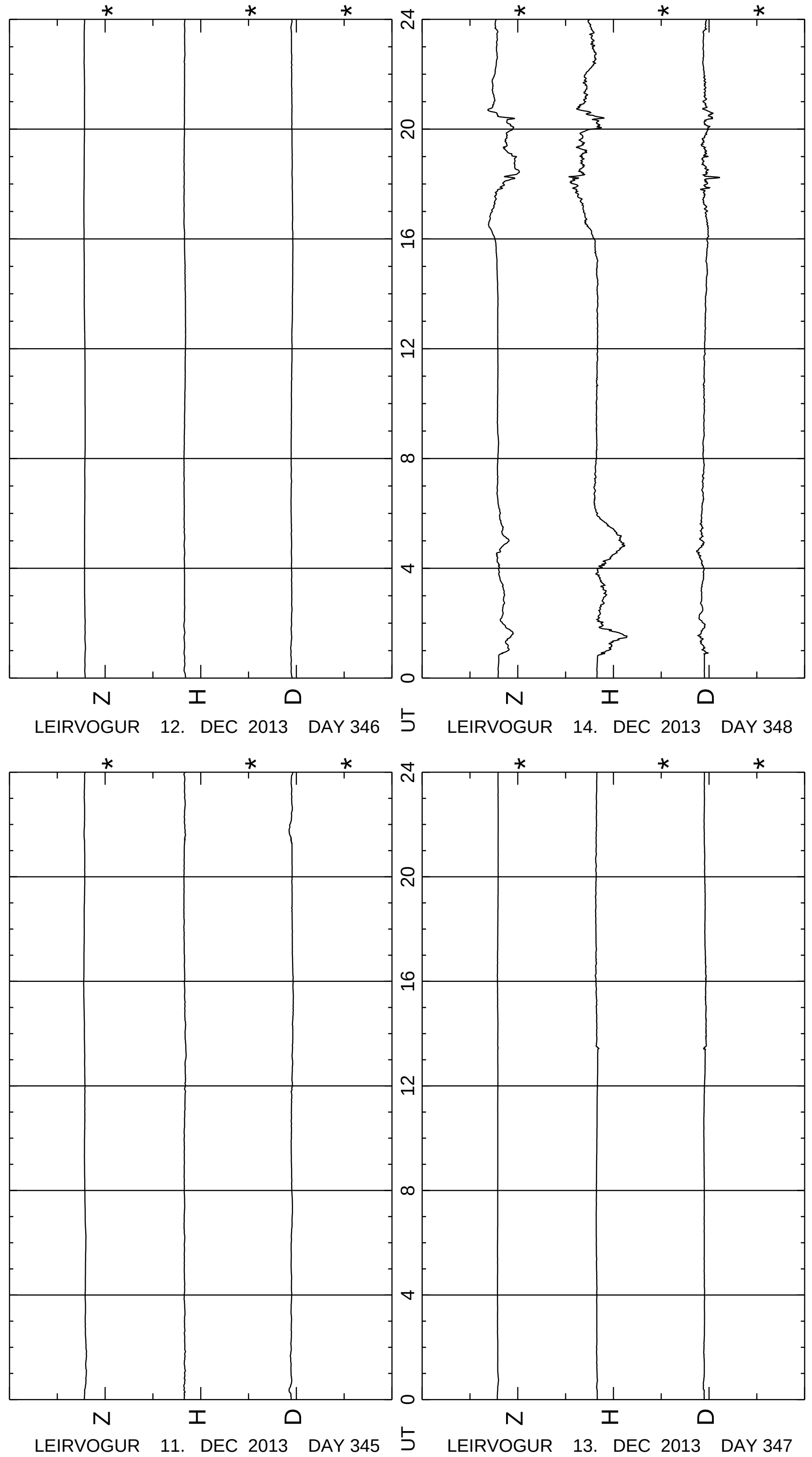
LEIRVOGUR 8. DEC 2013 DAY 342
LEIRVOGUR 10. DEC 2013 DAY 344
LEIRVOGUR 7. DEC 2013 DAY 341
LEIRVOGUR 9. DEC 2013 DAY 343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LEIRVOGUR 14. DEC 2013 DAY 348
LEIRVOGUR 11. DEC 2013 DAY 345
LEIRVOGUR 13. DEC 2013 DAY 347
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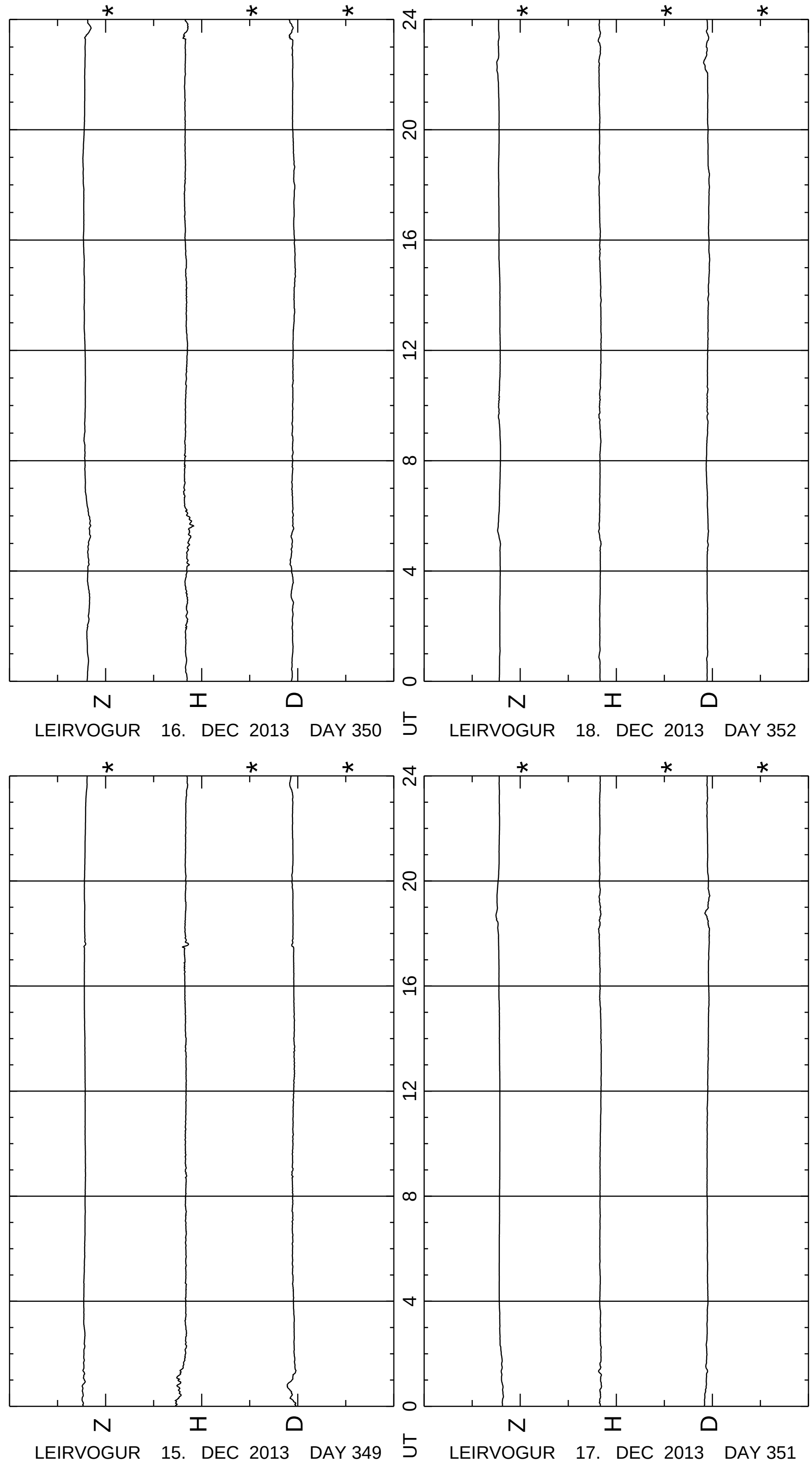
LEIRVOGUR 16. DEC 2013 DAY 350
LEIRVOGUR 18. DEC 2013 DAY 352
LEIRVOGUR 15. DEC 2013 DAY 349
LEIRVOGUR 17. DEC 2013 DAY 351
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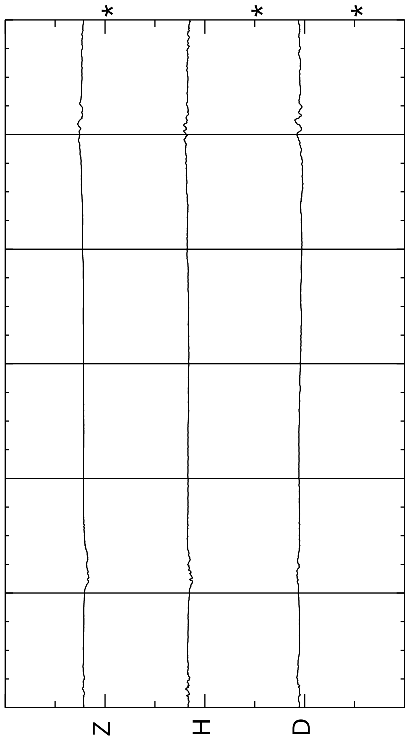

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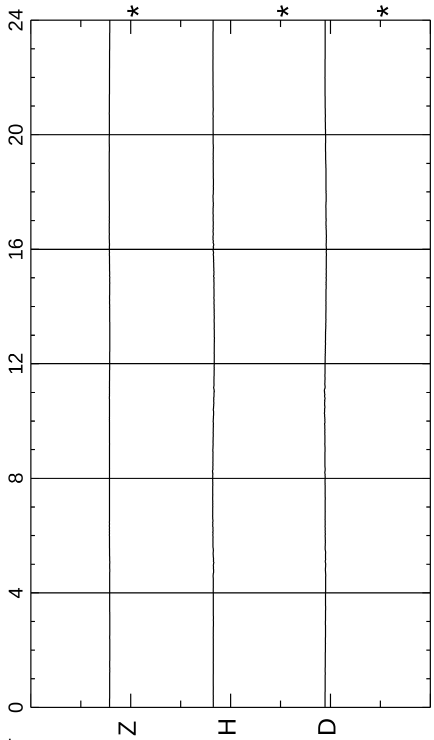
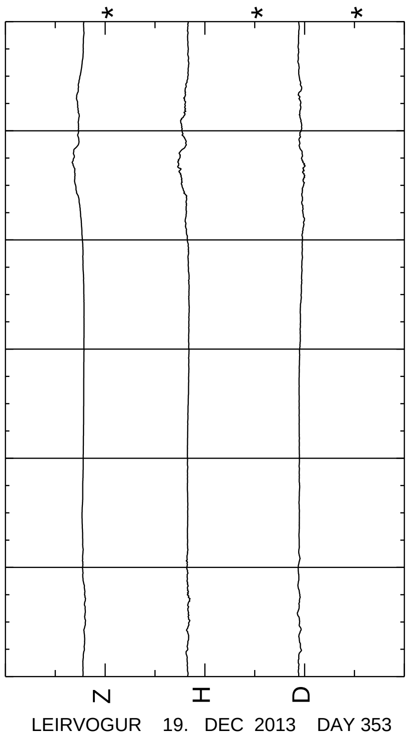


LEIRVOGUR 22. DEC 2013 DAY 356



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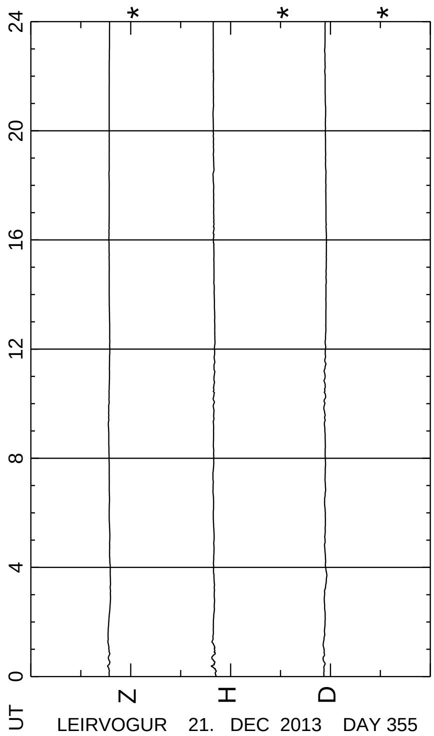

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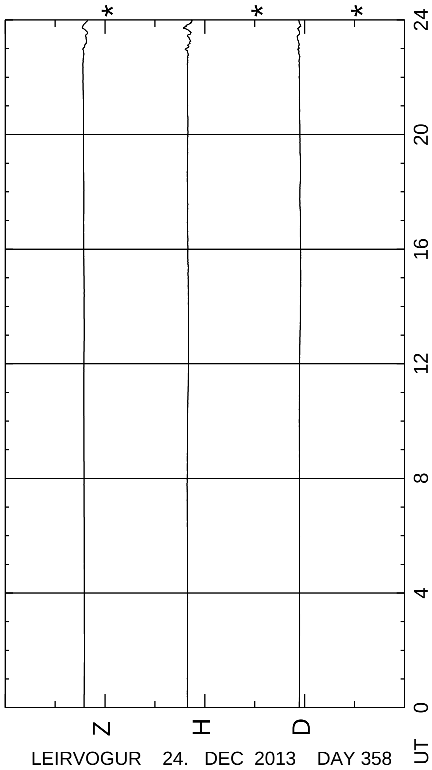
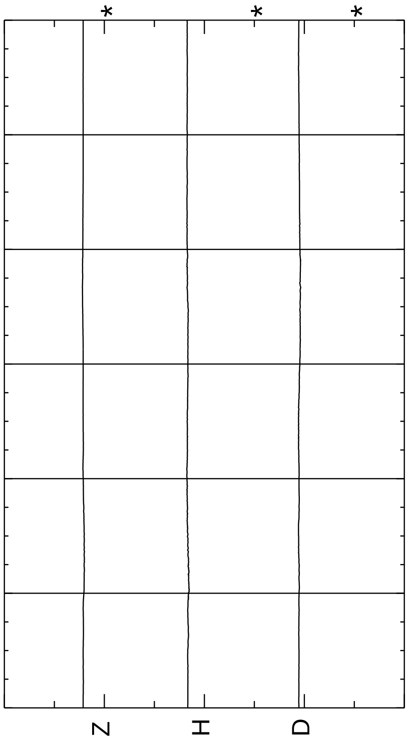
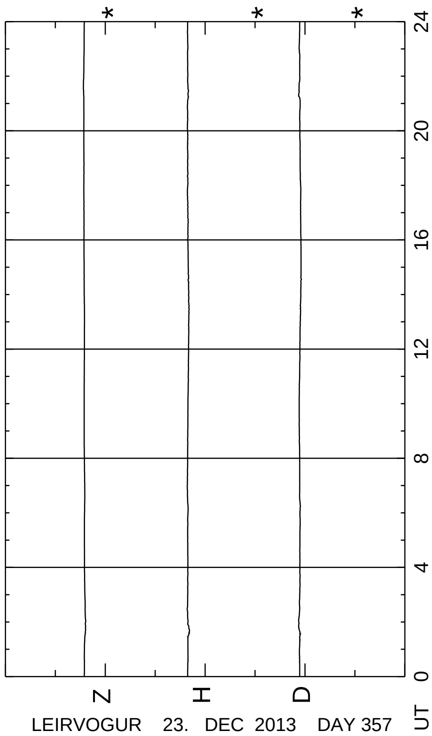


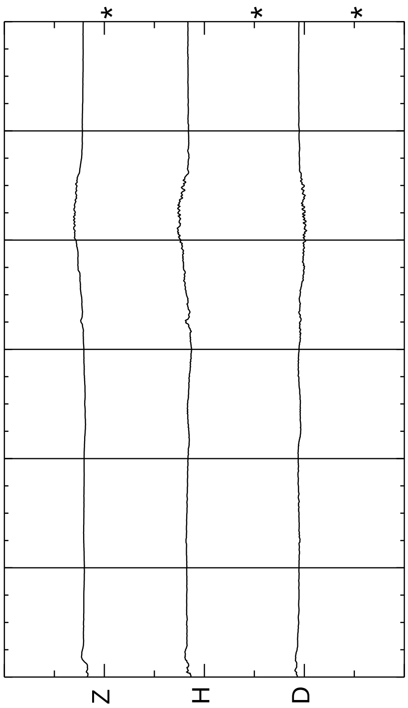
LEIRVOGUR 24. DEC 2013 DAY 358



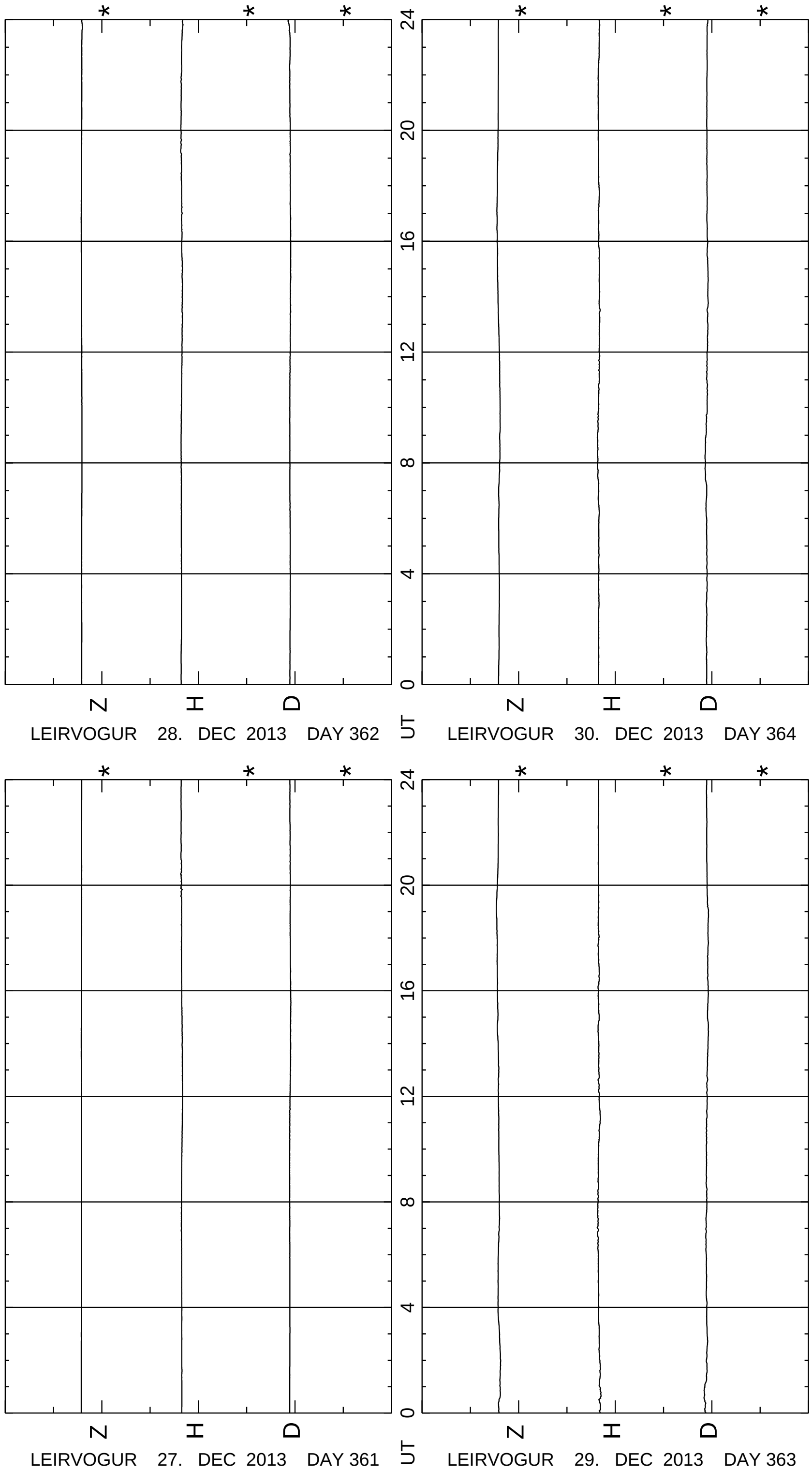
LEIRVOGUR 26. DEC 2013 DAY 360



LEIRVOGUR 23. DEC 2013 DAY 357



LEIRVOGUR 25. DEC 2013 DAY 359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LEIRVOGUR 28. DEC 2013 DAY 362
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LEIRVOGUR 30. DEC 2013 DAY 364
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LEIRVOGUR 27. DEC 2013 DAY 361
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LEIRVOGUR 29. DEC 2013 DAY 363
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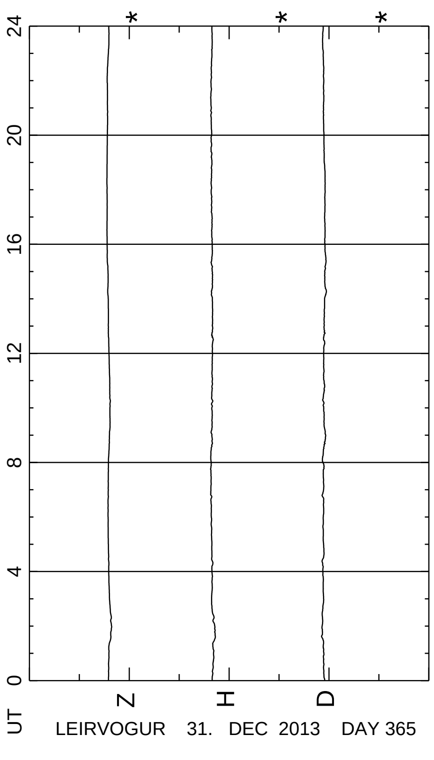

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LEIRVOGUR 31. DEC 2013 DAY 365
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ANNUAL MEANS AT LEIRVOGUR

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
	-10	8		12.7	-8	24	40		-0.6
1983	49994	12407	339	38.3	51511	11632	-4317	76	3.8

ANNUAL MEANS AT LEIRVOGUR
(Continued)

	Z	H	D		F	X	Y	I	
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
	7	15		17.1	11	30	57		-0.8
2008	50185	12590	345	52.1	51740	12209	-3074	75	55.0

ANNUAL MEANS AT LEIRVOGUR
(Continued)

	Z	H	D		F	X	Y	I	
2008	50185	12590	345	52.1	51740	12209	-3074	75	55.0
	3	22		17.6	8	37	57		-1.4
2009	50188	12612	346	9.7	51748	12246	-3017	75	53.6
	7	9		18.8	9	25	65		-0.4
2010	50195	12621	346	28.5	51757	12271	-2952	75	53.2
	7	11		18.8	10	27	65		-0.6
2011	50202	12632	346	47.3	51767	12298	-2887	75	52.6
	7	8		19.3	9	23	67		-0.4
2012	50209	12640	347	6.6	51776	12321	-2820	75	52.2
	0	17		18.0	4	31	61		-1.0
2013	50209	12657	347	24.6	51780	12353	-2758	75	51.1