



# **KIRUNA GEOPHYSICAL DATA**

DATA SUMMARY 01/10-12  
OCTOBER-DECEMBER 2001

Collected at  
SWEDISH INSTITUTE OF SPACE PHYSICS  
KIRUNA, SWEDEN





# **Kiruna Geophysical Data**

Data Summary 01/10-12  
October - December 2001

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### Reproductions for October - December 2001

Magnetogram plots: <http://www.irf.se/mag>

Riometer recordings: <http://www.irf.se/~rio>



## INTRODUCTION

“Kiruna Geophysical Data” is a collection of results of ground-based more or less continuous measurements of upper atmosphere variables carried out at the Swedish Institute of Space Physics. Our objective with this data summary is to present current geophysical data, related to polar upper atmospheric conditions, to those who require it for their research work.

Coordinates of the Swedish Institute of Space Physics are:

Geogr.		Geomagn. Dipole		Corr. Geomagn.	
Lat.	Long.	Lat.	Long.	Lat.	Long.
67.8°N	20.4°E	65.2°N	116.0°E	64.8°N	104.2°E

The following ground-based measurements of upper atmospheric parameters have been conducted at the Swedish Institute of Space Physics in the period for which data is presented in this report.

Geomagnetism	Optical aurora	Ionospheric ionization
1. Geomagnetic digital recording	1. All-sky camera	1. Ionosonde 0.5-16.0 MHz  2. Riometer 30.0 MHz  3. Riometer 38.2 MHz

The Ionospheric Observatory at Lycksele (64.7°N, 18.8°E) is also operated by the Swedish Institute of Space Physics. Magnetometer, riometer, and ionosonde measurements are conducted there.

Universal time is used in all tables.

Ionosonde data obtained at the Swedish Institute of Space Physics in Kiruna have been published together with ionosonde data from Lycksele and Uppsala in a monthly report “Ionospheric Data Sweden” between January 1990 and March 2000. Copies are available from the Swedish Institute of Space Physics.

Scaled ionosonde parameters from 1965 – 1998 are also available from [http://www.wdc.rl.ac.uk/wdcc1/ionosondes/data\\_archive.html](http://www.wdc.rl.ac.uk/wdcc1/ionosondes/data_archive.html)

The most recent data from all instruments are accessible via internet at <http://www.irf.se/obshb/mainpage.html>.

For more information contact the editor ([sheila.kirkwood@irf.se](mailto:sheila.kirkwood@irf.se))

## GEOMAGNETIC DATA

### Magnetograms

The magnetograms reproduced here are plots of data recorded by a three component digital fluxgate magnetometer with a sampling frequency of 1 sample/second.

The scaling is indicated by the tick mark values on the plots. Note that for large disturbances the normal scaling has been reduced. The positive direction of the components are: X north, Y east and Z down, in geographic coordinates.

### K-indices

The K-indices give a measure of the amount of disturbance of the geomagnetic field.

A reading of maximum deflection has been made during each 3-hour interval (starting from 00 to 03 UT) of two components X and Y. The Sq + L variation has been compensated for. A detailed description of the determination of K-indices has been given by J. Bartels: The technique of scaling indices K and Q geomagnetic activity. IGY Annals 4, London 1957.

The following scale has been used:

K-indices	Deflection in nT
0	0 - 15
1	15 - 30
2	30 - 60
3	60 - 120
4	120 - 210
5	210 - 360
6	360 - 600
7	600 - 990
8	990 - 1500
9	1500 and more



## ALL-SKY CAMERA DATA

Information about available records of all-sky camera films has been presented on page B4. The photographic records are made on 16 mm colour film normally at a rate of one frame per min. Data is recorded at higher frame rates (up to six per min) during selected periods. The start and stop time of camera operation and an average over the hour of auroral intensity and weather conditions is included in the tables.

Legend:

c	Cloudy
a	Aurora
r	Red aurora
A	Strong aurora
R	Strong red aurora
ac	Aurora and partly cloudy
rc	Red aurora and partly cloudy
Ac	Strong aurora and partly cloudy
Rc	Strong red aurora and partly cloudy
I	No aurora, clear weather
Ic	No aurora, partly cloudy
+	Camera fault
—	Camera off (camera not running due to daylight, snow or rain)

## IONOSPHERIC ABSORPTION DATA

Ionospheric absorption at 30.0 MHz and 38.2 MHz is recorded by two La Jolla riometers. The riometer records of cosmic noise power are reproduced in this report. The zero power level is at bottom of each panel.

The absorption (in decibels) can be computed from the formula

$$A \text{ (dB)} = 10 \log_{10} \frac{P_0}{P}$$

where  $P$  is the received cosmic noise power,  $P_0$  the cosmic noise power expected under ionospherically quiet conditions at the same sidereal time.

## B1

## GEOMAGNETIC K-INDICES, KIRUNA

October 2001

Lower limit of K=9 is 1500 nT

Time in UT

Day	00	- 03	- 06	- 09	- 12	- 15	- 18	- 21	- 24	K-sum
1	6	6	5	4	5	5	5	6	42	
2	5	6	6	4	5	6	7	7	46	
3	7	3	5	5	7	6	4	7	44	
4	7	2	4	4	4	3	5	4	33	
5	2	1	1	3	2	3	3	0	15	
-----										
6	2	2	2	3	1	0	3	2	15	
7	0	0	1	2	1	1	0	3	8	
8	2	1	1	2	5	5	4	6	26	
9	6	4	2	4	5	5	3	2	31	
10	3	2	1	2	3	3	5	4	23	
-----										
11	5	2	2	1	3	6	5	4	28	
12	7	7	3	4	5	5	5	5	41	
13	5	5	3	3	3	2	3	1	25	
14	1	2	2	2	3	3	7	5	25	
15	4	4	3	3	3	3	1	4	25	
-----										
16	3	2	2	2	2	2	2	4	19	
17	4	3	2	1	0	1	1	1	13	
18	0	0	1	1	1	2	4	1	10	
19	0	1	1	2	4	5	4	3	20	
20	3	2	3	2	3	4	5	4	26	
-----										
21	5	4	1	2	3	7	5	7	34	
22	7	5	3	5	5	7	7	6	45	
23	5	4	4	3	2	1	2	2	23	
24	2	1	1	1	1	0	0	0	6	
25	0	1	3	2	1	1	4	4	16	
-----										
26	2	1	1	2	1	1	1	4	13	
27	3	3	1	2	2	1	1	1	14	
28	5	6	6	4	4	6	5	5	41	
29	5	3	3	2	4	4	3	4	28	
30	3	3	2	3	2	2	2	3	20	
-----										
31	2	1	1	0	2	4	7	6	23	

## B2

## GEOMAGNETIC K-INDICES, KIRUNA

November 2001

Lower limit of K=9 is 1500 nT

Time in UT

Day	00	- 03	- 06	- 09	- 12	- 15	- 18	- 21	- 24	K-sum
1	6	6	4	4	4	3	4	1	32	
2	1	1	1	1	3	0	0	1	8	
3	1	1	1	1	1	0	0	0	5	
4	0	1	2	2	4	4	2	0	15	
5	0	0	1	2	3	4	6	7	23	
-----										
6	8	9	7	4	6	7	7	7	55	
7	5	6	3	3	3	2	4	4	30	
8	4	2	2	2	2	1	1	3	17	
9	1	1	1	1	1	1	3	2	11	
10	1	1	1	1	2	1	2	7	16	
-----										
11	4	3	1	2	1	0	2	1	14	
12	2	0	1	1	1	0	0	0	5	
13	0	1	1	1	1	3	3	4	14	
14	0	1	1	1	1	1	2	1	8	
15	0	1	1	1	1	4	6	2	16	
-----										
16	3	3	1	2	2	3	1	3	18	
17	4	4	1	2	5	3	4	5	28	
18	3	3	1	2	2	3	4	6	24	
19	6	3	3	2	4	5	7	4	34	
20	6	3	3	1	0	0	0	0	13	
-----										
21	2	1	1	1	1	3	2	0	11	
22	2	1	2	2	2	2	4	5	20	
23	5	3	3	4	4	5	5	5	34	
24	6	6	9	9	8	7	3	4	52	
25	3	3	3	2	2	2	1	1	17	
-----										
26	2	3	2	2	1	0	0	1	11	
27	1	1	0	0	1	1	0	0	4	
28	1	0	0	0	1	1	0	2	5	
29	1	0	0	1	0	0	0	0	2	
30	0	1	0	0	0	0	0	0	1	

## B3

## GEOMAGNETIC K-INDICES, KIRUNA

December 2001

Lower limit of K=9 is 1500 nT

Time in UT

Day	00	- 03	- 06	- 09	- 12	- 15	- 18	- 21	- 24	K-sum
1	0	1	1	2	2	2	0	0	8	
2	0	0	1	1	1	1	2	2	8	
3	0	1	0	1	1	4	4	4	15	
4	3	2	1	2	1	1	4	4	18	
5	5	3	2	1	1	2	4	3	21	
-----										
6	4	1	1	2	2	3	3	3	19	
7	4	1	1	1	2	5	1	3	18	
8	3	1	1	1	2	2	0	1	11	
9	1	0	0	1	0	0	1	2	5	
10	0	0	1	0	1	1	1	3	7	
-----										
11	1	0	0	1	1	2	2	4	11	
12	3	1	2	2	2	4	6	6	26	
13	4	3	3	2	2	2	2	2	20	
14	2	2	2	2	2	3	3	3	19	
15	3	2	3	2	2	2	2	3	19	
-----										
16	2	3	3	2	2	3	3	3	21	
17	3	3	3	2	3	5	4	4	27	
18	4	3	3	2	2	3	2	3	22	
19	3	2	2	2	2	2	3	4	20	
20	2	2	2	2	2	2	2	3	17	
-----										
21	2	3	2	2	3	4	5	4	25	
22	4	3	2	1	3	2	2	2	19	
23	3	2	2	2	3	2	2	3	19	
24	3	2	3	3	4	4	5	4	28	
25	2	3	2	2	2	2	2	4	19	
-----										
26	2	3	2	2	2	1	3	3	18	
27	3	2	2	2	2	1	3	3	18	
28	2	2	2	2	2	2	2	2	16	
29	2	2	2	2	2	2	2	4	18	
30	3	3	2	2	2	2	2	4	20	
-----										
31	3	2	2	2	2	3	5	3	22	

ALL-SKY CAMERA, KIRUNA  
October 2001

	13	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05	UT
1-2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2-3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3-4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4-5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5-6	-	-	-	-	c	c	c	c	c	c	c	c	-	-	-	-	-	-
6-7	-	-	-	-	c	c	c	c	c	c	c	c	-	-	-	-	-	-
7-8	-	-	-	-	c	c	c	c	c	c	c	c	-	-	-	-	-	-
8-9	-	-	-	-	c	c	c	+	+	+	+	+	-	-	-	-	-	-
9-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-12	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12-13	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13-14	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14-15	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15-16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
16-17	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
17-18	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
18-19	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
19-20	-	-	-	-	a	a	ac	ac	ac	c	ac	ac	ac	a	a	-	-	-
20-21	-	-	-	-	c	ac	Ac	ac	c	ac	ac	c	c	c	c	-	-	-
21-22	-	-	-	-	R	r	r	R	r	rc	R	R	r	rc	c	-	-	-
22-23	-	-	-	-	R	R	r	r	r	Rc	ac	ac	ac	ac	ac	-	-	-
23-24	-	-	-	-	c	c	ac	a	ac	c	Ic	Ic	Ic	+	+	-	-	-
24-25	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-
25-26	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-
26-27	-	-	-	-	+	+	c	c	c	c	c	ac	ac	ac	ac	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	ac	c	c	c	c	c	c	c	c	c	c	-	-	-
30-31	-	-	-	-	c	c	c	c	c	c	c	c	c	c	c	-	-	-
31-1/11	-	-	-	-	c	c	c	c	c	c	ac	ac	ac	r	a	-	-	-



ALL-SKY CAMERA, KIRUNA  
December 2001

	13	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05	UT
1-2	-	c	c	c	c	c	c	c	c	c	c	c	c	Ic	Ic	c	c	
2-3	-	c	c	Ic	I	I	a	a	a	a	+	+	+	+	+	+	+	
3-4	-	c	c	c	c	c	c	c	c	c	c	Ic	Ic	c	c	c	c	
4-5	-	c	c	Ic	Ic	c	c	c	c	c	c	c	c	c	c	c	c	
5-6	-	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	
6-7	-	c	c	c	c	c	c	ac	ac	ac	ac	ac	ac	ac	c	+	+	
7-8	-	a	a	a	a	a	I	I	I	I	a	a	a	a	a	I	I	
8-9	-	I	I	I	I	I	Ic	Ic	ac	a	a	a	a	I	I	I	I	
9-10	-	Ic	I	I	I	Ic	a	a	a	a	a	a	a	ac	c	c	c	
10-11	-	c	c	c	c	c	Ic	c	ac	ac	ac	ac	ac	ac	c	c	+	
11-12	-	c	Ic	a	a	a	a	a	ac	ac	c	ac	a	a	I	I	I	
12-13	-	c	c	c	Ic	a	R	A	R	R	A	a	a	a	a	a	a	
13-14	-	Ic	c	c	c	Ic	Ic	c	ac	ac	ac	ac	Ic	Ic	Ic	Ic	Ic	
14-15	-	c	c	c	Ic	Ic	Ic	Ac	a	a	a	a	a	ac	ac	c	c	
15-16	-	c	c	c	Ic	I	I	I	Ic	Ic	Ic	Ic	c	Ic	Ic	Ic	Ic	
16-17	-	I	I	I	a	a	a	a	a	a	a	a	ac	a	ac	ac	c	
17-18	-	a	ac	ac	ac	ac	a	a	a	ac	ac	ac	ac	ac	c	c	+	
18-19	-	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	Ic	
19-20	-	Ic	I	I	I	a	a	a	a	a	a	ac	ac	ac	I	I	I	
20-21	-	I	I	I	I	Ic	Ic	Ic	ac	ac	ac	ac	ac	c	c	Ic	I	
21-22	-	I	a	a	a	a	a	a	a	a	R	ac	c	c	c	a	ac	
22-23	-	I	I	I	I	a	a	a	I	I	I	a	a	a	a	a	I	
23-24	-	Ic	Ic	Ic	I	I	I	a	a	a	a	a	a	a	a	a	a	
24-25	-	a	a	a	ac	c	c	c	c	c	c	c	c	c	c	c	c	
25-26	-	Ic	Ic	I	Ic	Ic	Ic	Ac	ac	ac	ac	ac	ac	ac	c	Ic	c	
26-27	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
27-28	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
28-29	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
29-30	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
30-31	-	+	+	I	a	a	ac	a	a	A	Rc	R	+	+	+	+	+	
31-1/1	-	+	A	a	ac	ac	A	ac	ac	rc	ac	ac	+	+	+	+	+	

# KIRUNA MAGNETOGRAM PLOTS

October - December 2001

<http://www.irf.se/mag>



# KIRUNA VERTICAL RIOMETER

October - December 2001

<http://www.irf.se/~rio>