

СТАТИСТИКА НАБЛЮДЕНИЯ ПОЛЯРНЫХ СИЯНИЙ СИСТЕМОЙ КАМЕР MAIN ЗА 2011-2014 ГОДЫ

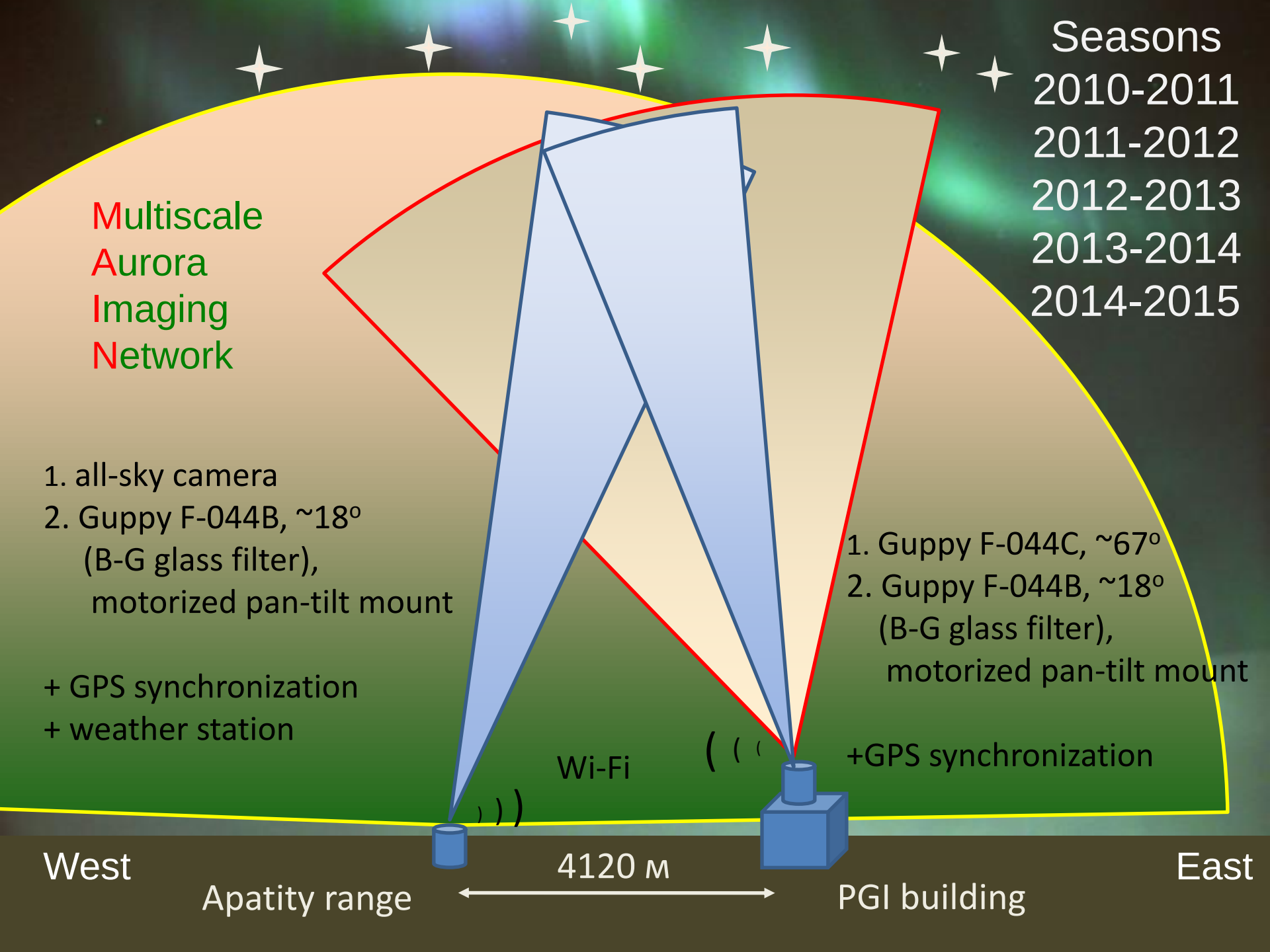
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Апатиты, Мурманская область

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Multiscale
Aurora
Imaging
Network



#	Camera	Interface	Lens	Field of view	Position	Resolution
1	LCL-902H2 (WAT-902K) or L-811K	Analog video with frame grabber	Fujinon YV2.2x1.4A- SA2	180°	67°34' N, 33°18' E	232x232 (290x288), 12 bits, 1s, (sum of 24 frames)
2	AVT Guppy F-044B NIR	IEEE 1394a	Fujinon HF25HA-1B + BG filter	15°x10° 18° diag.	67°34' N, 33°18' E	376x288 8(12) bits, 1s
3	AVT Guppy F-044B NIR	IEEE 1394a	Fujinon HF25HA-1B + BG filter	15°x10° 18° diag.	67°34' N, 33°24' E	376x288 8(12) bits, 1s
4	AVT Guppy F-044C NIR	IEEE 1394a	Fujinon DF6HA-1B	56°x44° 67° diag.	67°34' N, 33°24' E	376x290 4 colors CMY+G, 8(12) bits, 1s

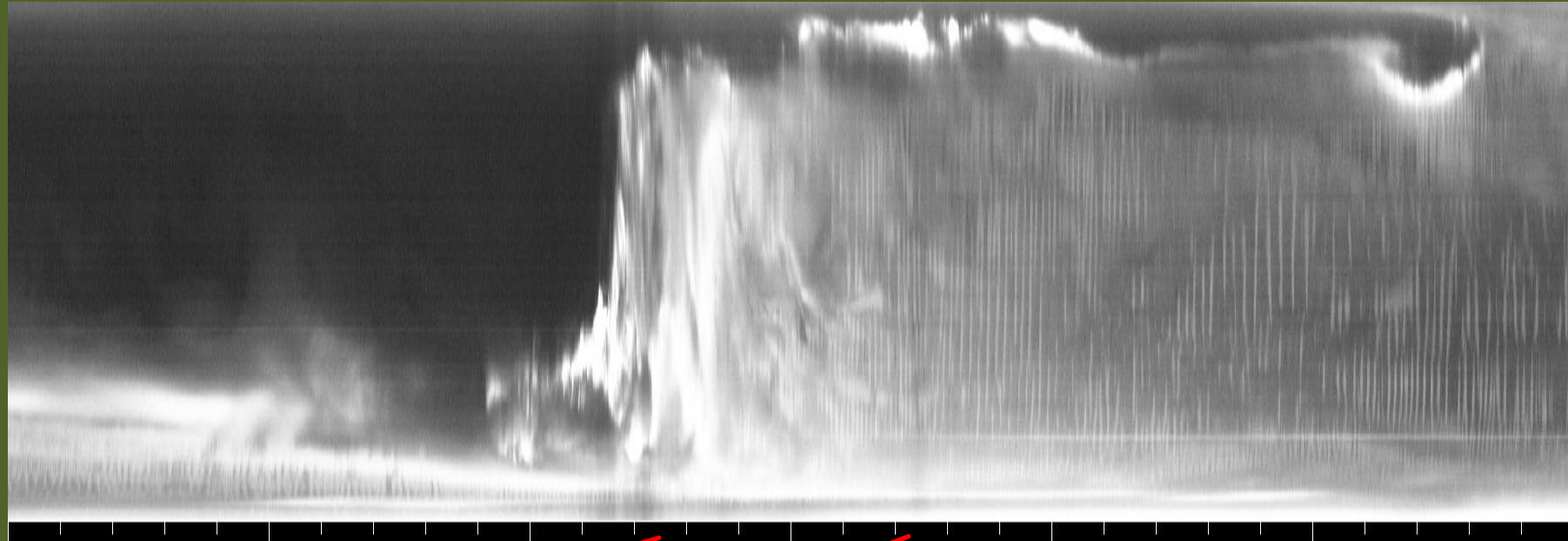
Keograms (N-S cross sections) – latitudinal dynamics

Apatity

March 29, 2013

N

S



23:00

23:05

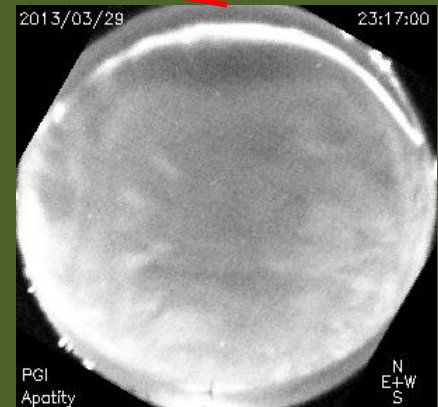
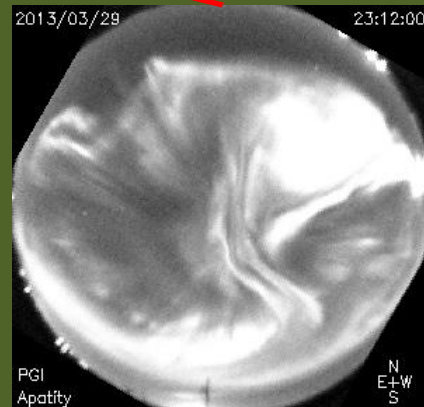
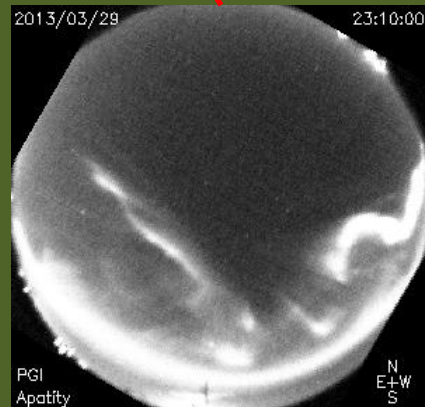
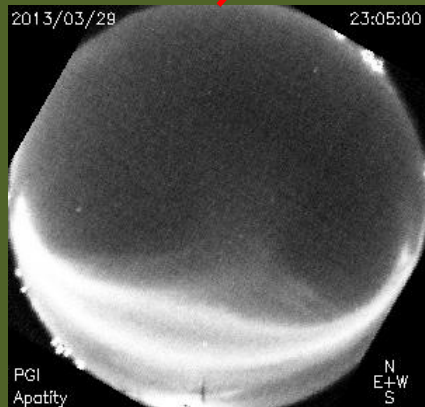
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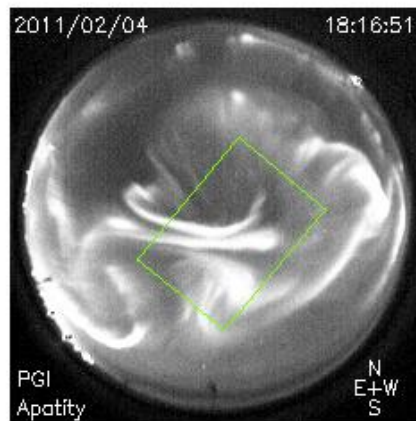
23:15

23:20

23:25

UT





a

b

c

d

- a – all-sky
- b – Guppy-C
- c – Guppy-1
- d – Guppy-2

Возможности системы:

- ☐ одновременные наблюдения на 3 масштабах (поля зрения – 180° , 68° и 18°),
- ☐ GPS синхронизация и патрульный режим работы всех камер,
- ☐ в реальном времени – на web-сайте,
- ☐ 2 пары для триангуляции: с базой 4 км в Апатитах и с базой 86 км Апатиты-Ловозеро.

<http://aurora.pgia.ru/>

<http://www.geosci-instrum-method-data-syst-discuss.net/1/31/2011/gid-1-31-2011.pdf>

Scientific problems:

1. Scaling in small-scale structures of aurora.
(Features of the M-I plasma turbulence).
2. Spatial and temporal structure of pulsing aurora. (Wave-particle interactions in M-I system).
3. Vertical distribution in rayed structures.
(Structure of electric field and particle sources in acceleration region)

Data products and access

Level 0: raw data, 1 frame/s – available by request.

Estimated size: G1, G2 ~370 Mb/hour

GC ~ 1.5 Gb/hour

AS ~ 740 Mb/hour

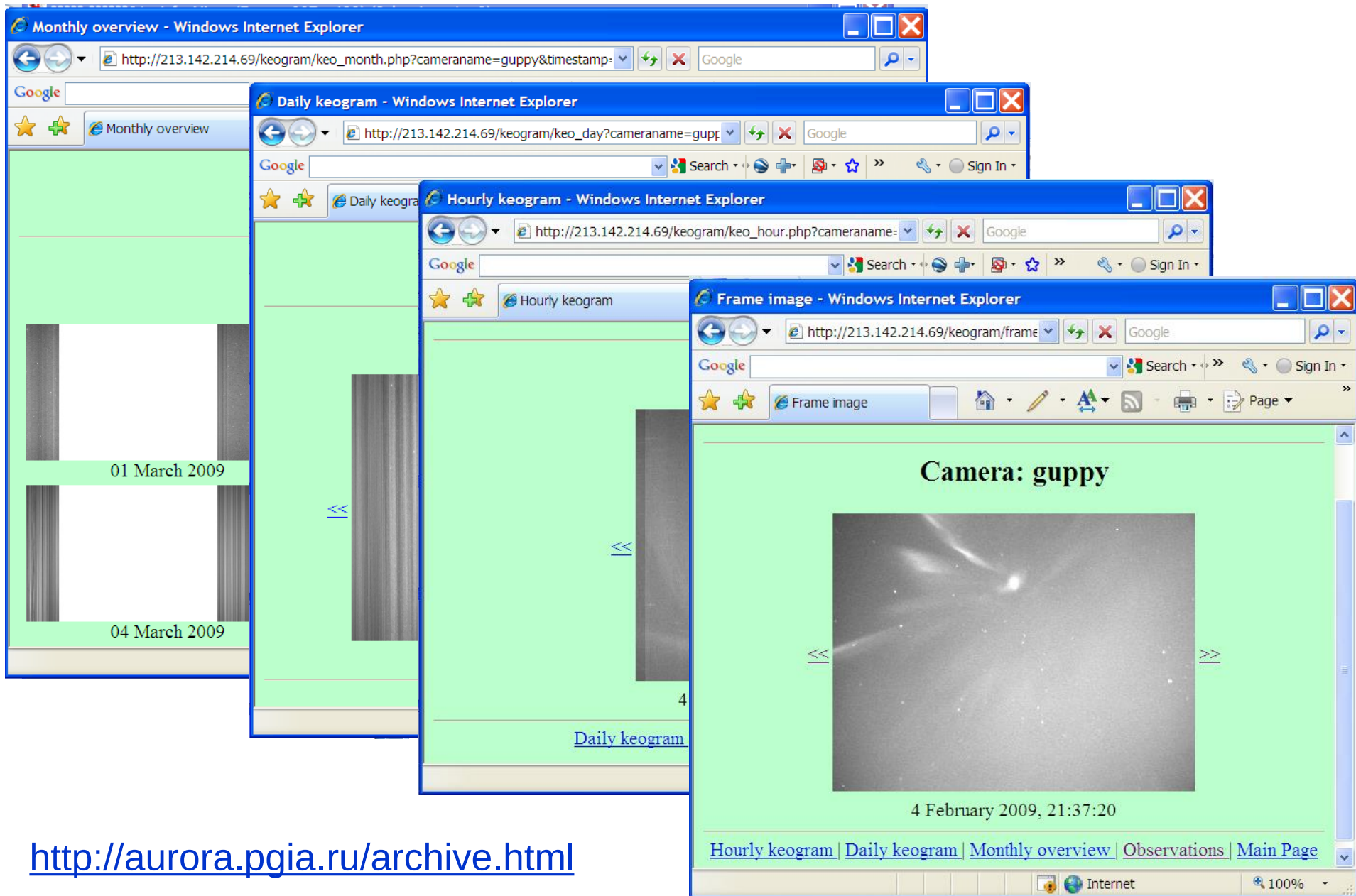
Level 1: keograms and frames with 10 s interval, –
free access, available here

<http://aurora.pgia.ru/archive.html>

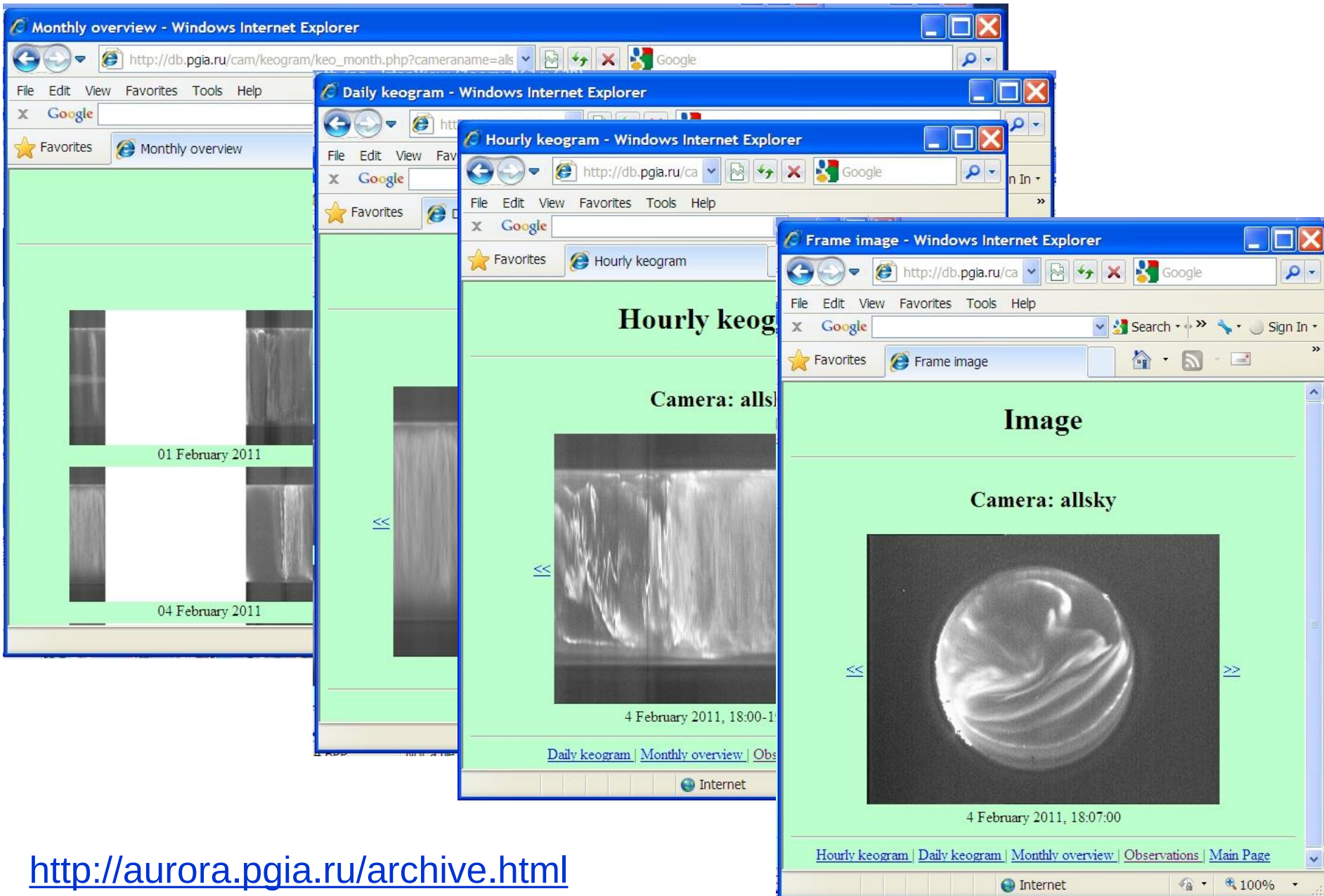
Level 2: visually selected hourly intervals with aurora in field of view,
avi-movi, keograms, (+ Dst, AE, AL, links to magnetograms)

<http://aurora.pgia.ru/events/>

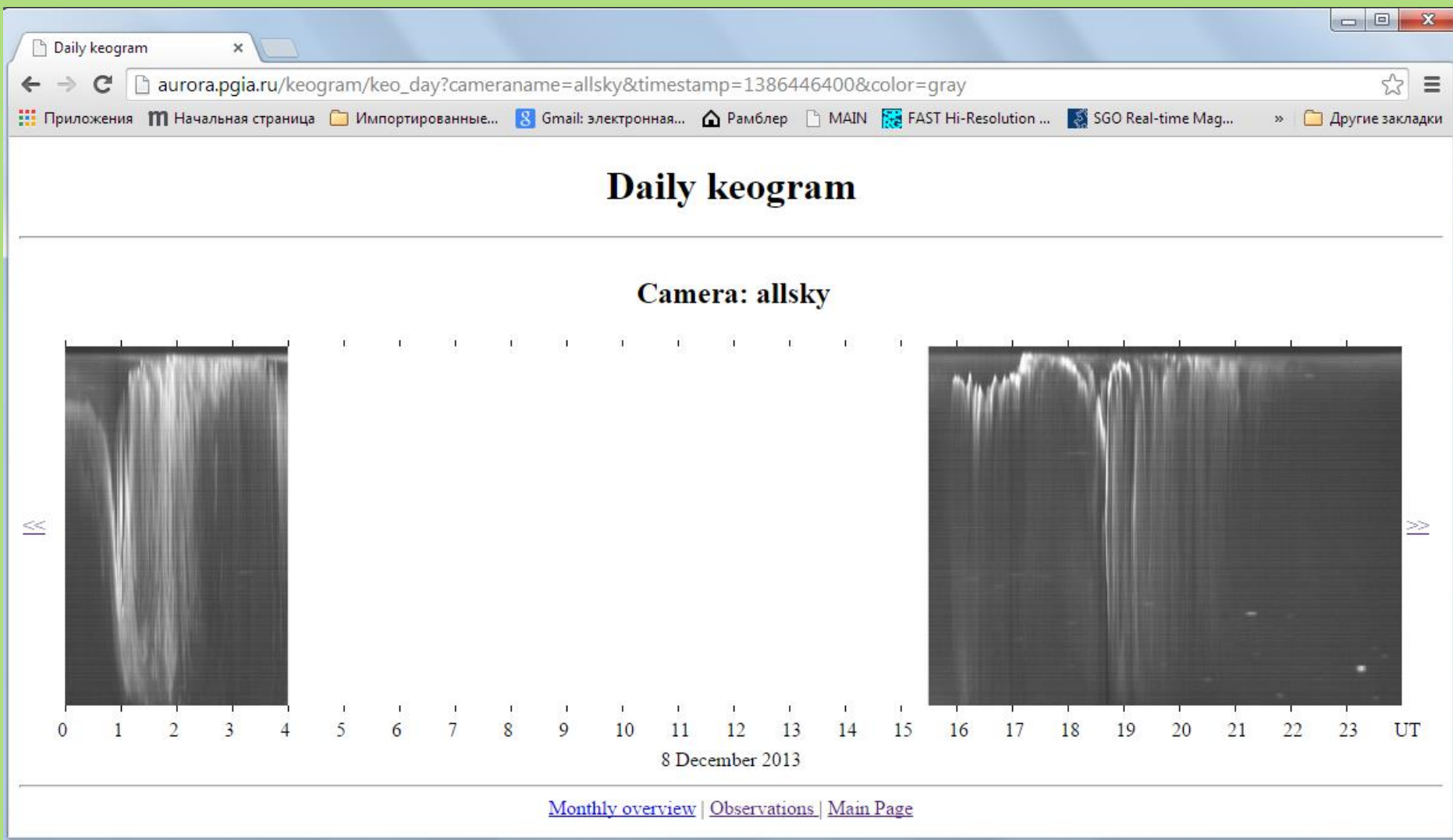
MAIN cameras: keograms and frames

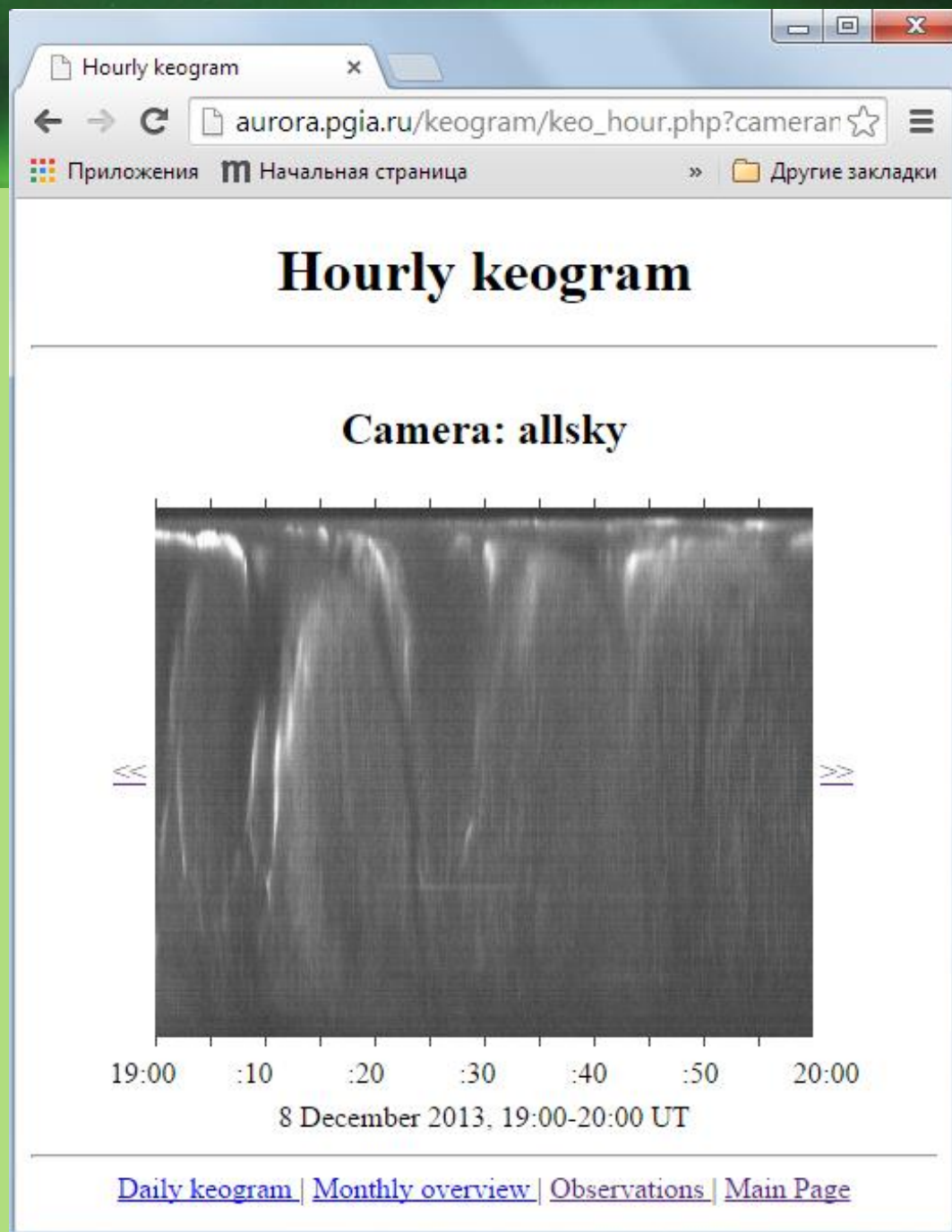


Apatity all-sky camera



<http://aurora.pgja.ru/archive.html>







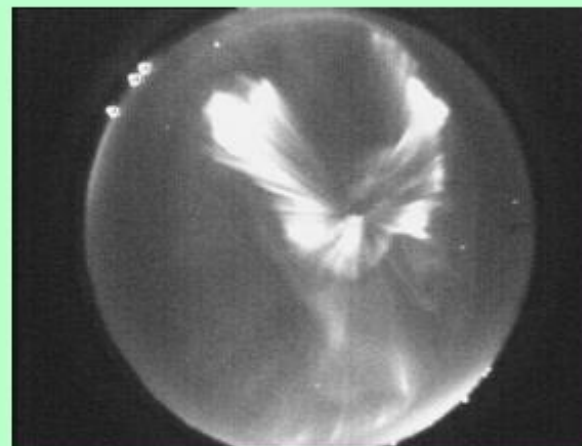
25 March 2014, 23:05:20



G044C_APB



allsky



guppy



guppy2





25 March 2014, 22:56:50



G044C_APB



allsky



guppy



guppy2



Observed Aurora Events, winter 2013-2014

Here presented a list of hour intervals when aurora was observed by MAIN cameras in winter season 2013-2014, and some related information about other simultaneous observations.

Legend:

AS - Apatity all-sky camera (Apatity range)

G1 - Guppy-1 camera (PGI building, Apatity)

G2 - Guppy-2 camera (Apatity range)

GC - Guppy-C camera (PGI building, Apatity)

AS-Loz - Lovozero all-sky camera (Lovozero observatory)

W - observations near horizon in North-West sector

B - Barentsburg all-sky camera (Barentsburg observatory, Svalbard)

E - NORUSCA hyperspectral all-sky camera (Barentsburg observatory, Svalbard)

SOD_magn - link to daily magnetogram by Sodankylä Geophysical observatory

Dst, AE, AL - provisional values by Kyoto University

date	UThour	AS	G1	G2	GC	AS-Loz	Other	Dst	AE	AL	comments
2013-09-07	22:00:00	avi keo	0	0	0			-1.00	49.00	-26.00	North SOD_magn
2013-09-07	23:00:00	avi keo	0	0	0			0.00	38.00	-12.00	North SOD_magn
2013-09-09	20:00:00	avi keo	0	0	0		W	3.00	39.00	-19.00	North SOD_magn

2013-10-08	21:00:00	avi keo	avi keo	avi keo	avi keo			13.00	092.00	-800.00	storm SOD_magn
2013-10-08	22:00:00	avi keo	avi keo	avi keo	avi keo			-30.00	586.00	-331.00	storm SOD_magn
2013-10-08	23:00:00	avi keo	avi keo	avi keo	avi keo			-17.00	396.00	-141.00	storm SOD_magn
2013-10-09	00:00:00	avi keo	avi keo	avi keo	avi keo			-62.00	305.00	-170.00	storm SOD_magn

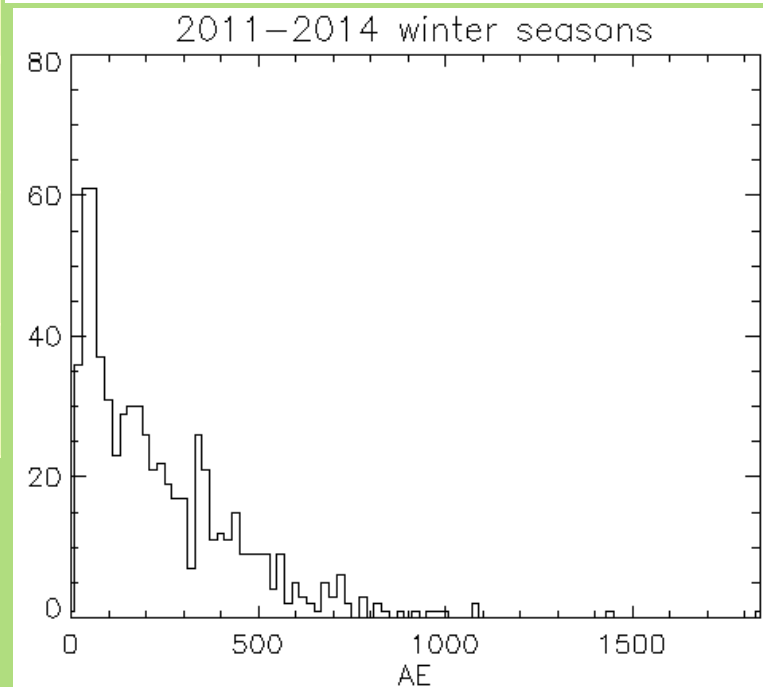
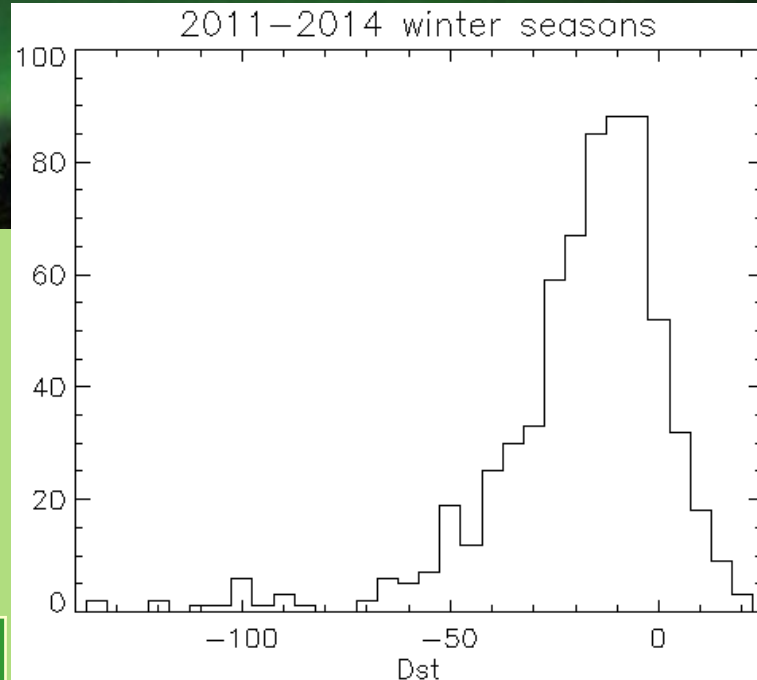
Statistics of observed events by *Dst* and *AE* indexes

Number of hour intervals when aurora was observed

Season	Total	Allsky	GC	G1	G2	G1+G2	+LOZ
2013 - 2014	222	222	58	54	34	29	110
2012 - 2013	225	225	70	82	95	78	128
2011 - 2012	210	178	110	85	86	64	95

The main limiting factors are:

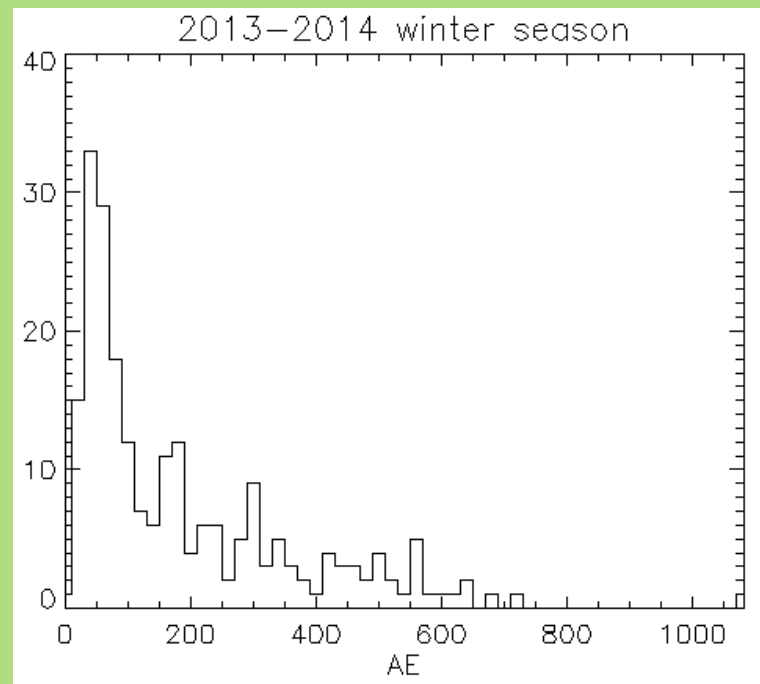
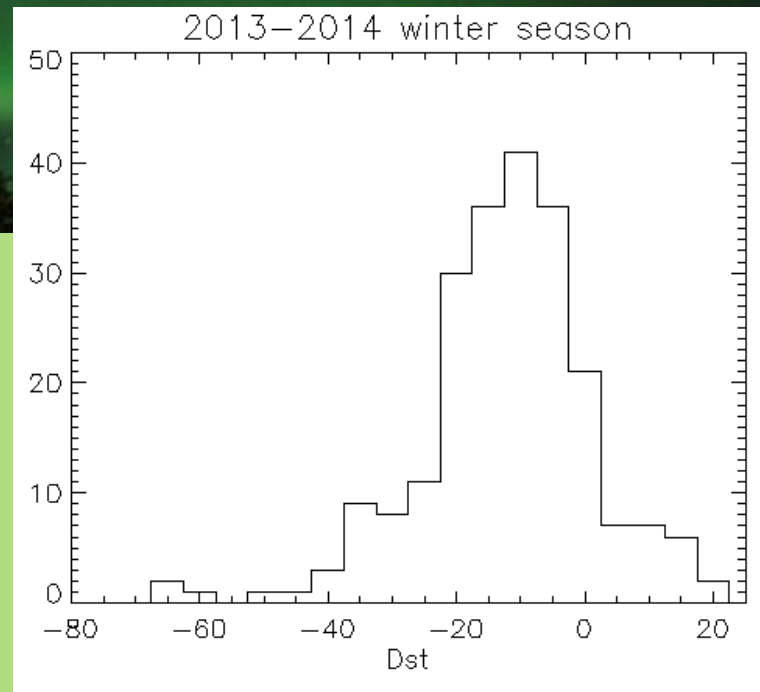
- 1) Weather (clouds)
- 2) Hardware problems
- 3) Software problems



Events in 2013-2014 winter season

	Allsky	GC	G1	G2
Hours	222	58	54	34

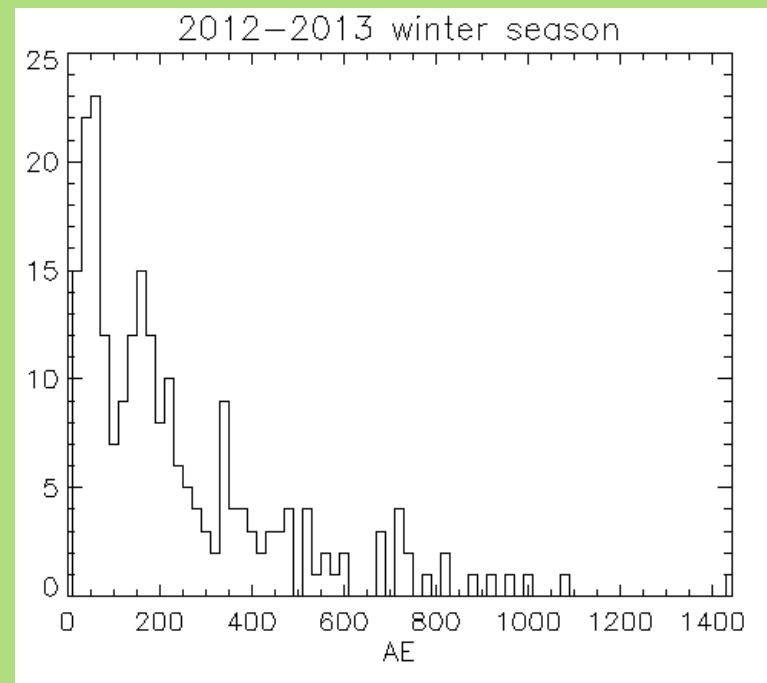
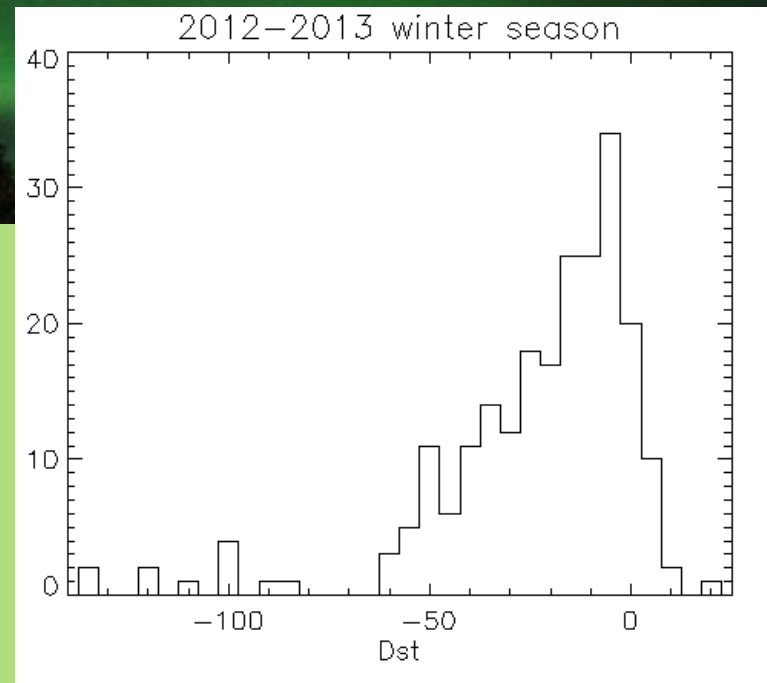
Pulsations in the North of the allsky camera	122
Arcs in zenith of GC	31
Possible triangulation G1-G2, where:	29
- rays	8
- pulsations	14
- N-S structures	8
+ Lovozero allsky	110



Events in 2012-2013 winter season

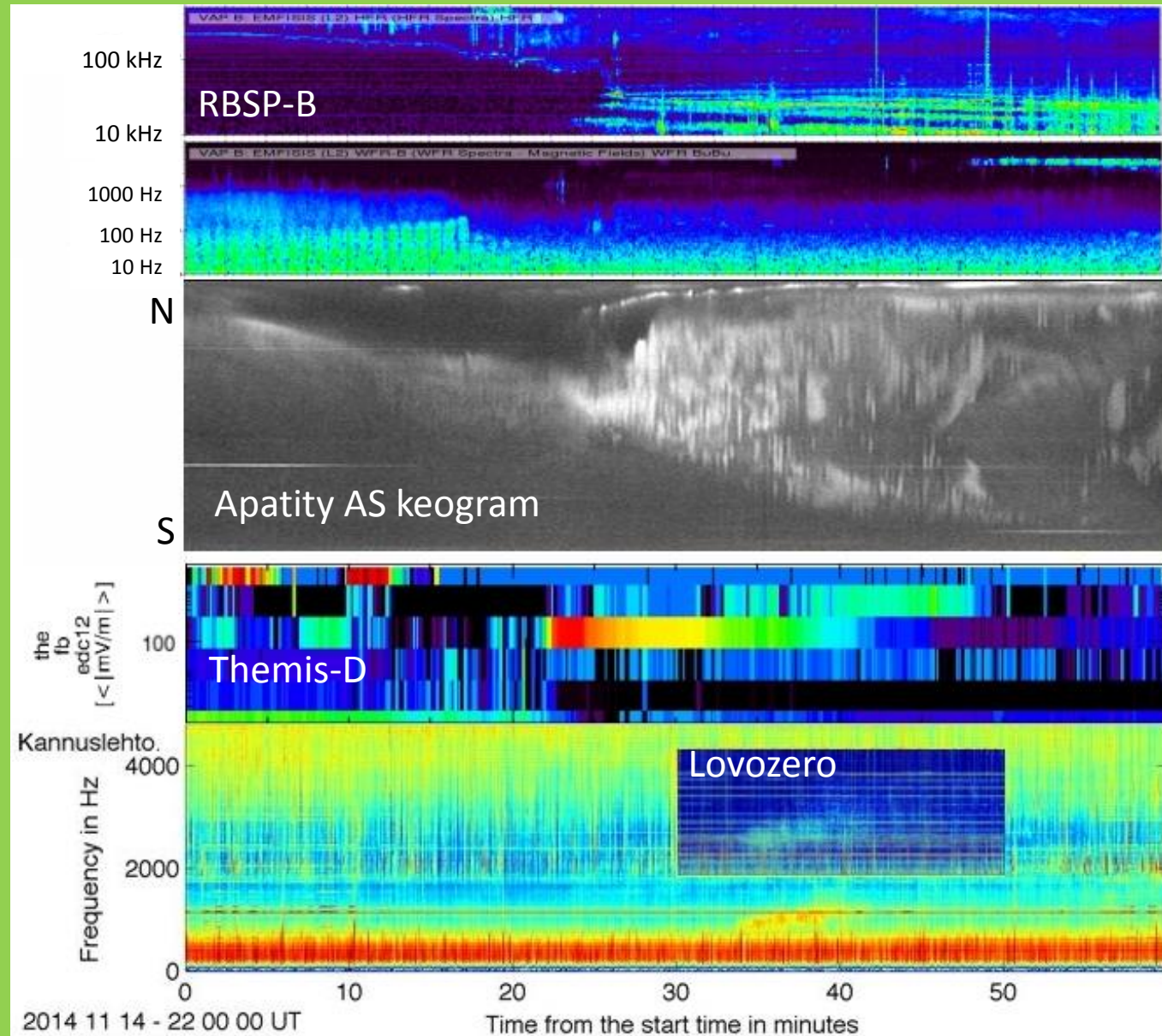
	Allsky	GC	G1	G2
Hours	225	70	82	95

Pulsations in the North of the allsky camera	120
Arcs in zenith of GC	24
Possible triangulation G1-G2, where:	78
- rays	17
- pulsations	28
- N-S structures	20
+ Lovozero allsky	128



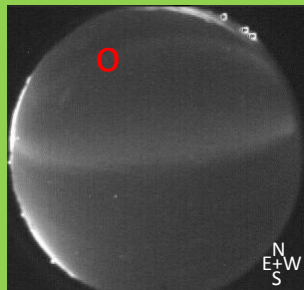
Примеры одновременных наблюдений с наземными приемниками КНЧ/ОНЧ волн, спутниками THEMIS и RBSP.

VLF 0.5-1 kHz во время активизации сияний.

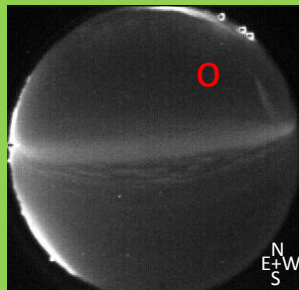


2014/11/14 21:00-22:00UT

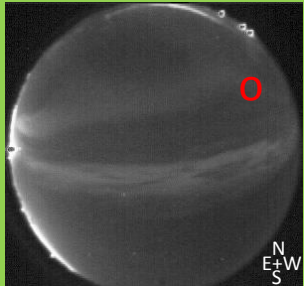
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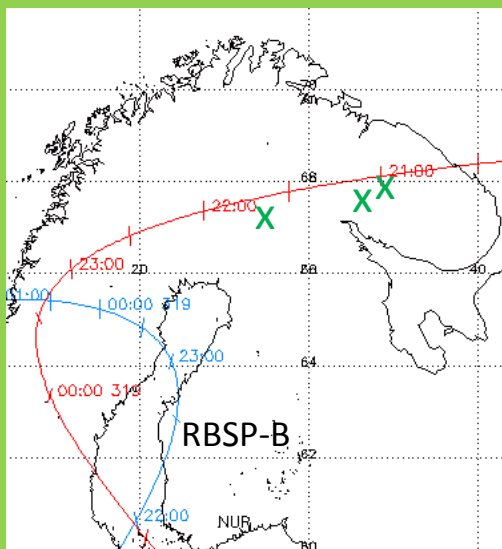
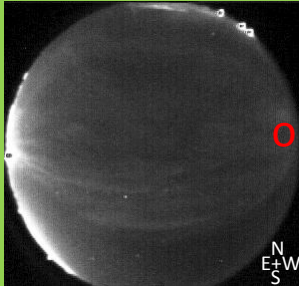
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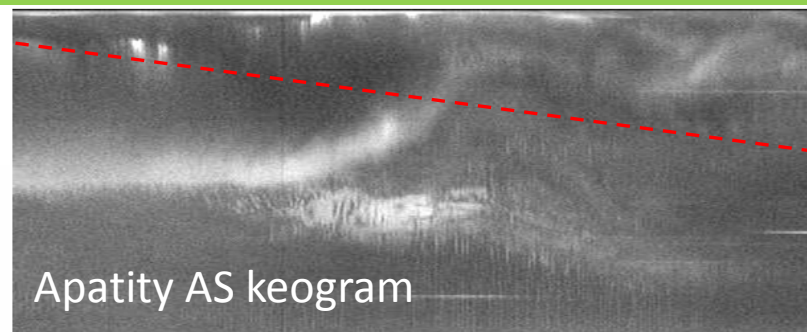
21:30



21:40



N



S

Apatity AS keogram

thd thd thd
efs efs efs
dot dot dot
gsm gsm gsm
x y z
[mV/m]

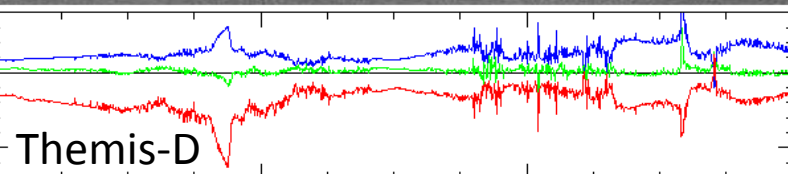
thd peer
en
eflux
pa
2-20keV/(cm²-s-sr-eV) (Allros)

thd
psef
en,
keV

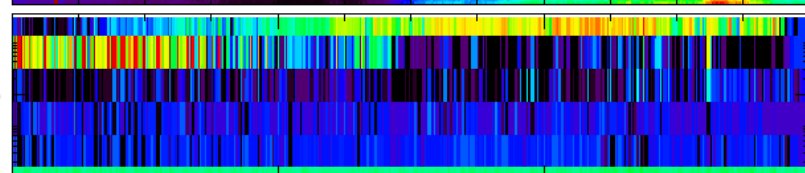
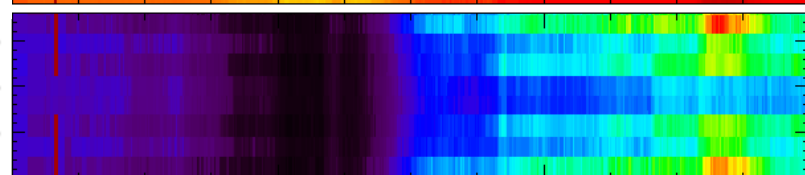
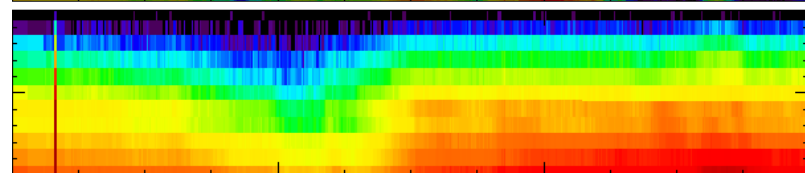
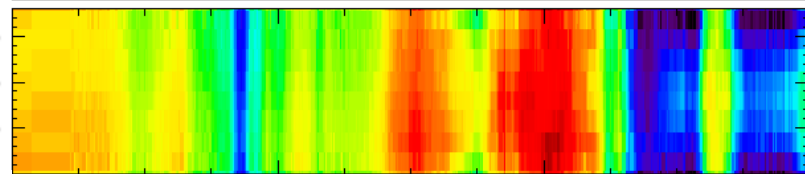
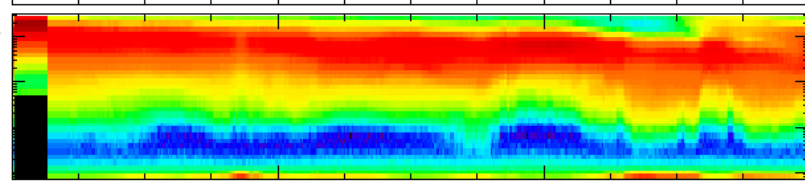
thd
psef
an
eflux
pa

the
fb
edc12
[<|mV/m|>]

2014-11-14
21:00:00



Themis-D



21:20:00

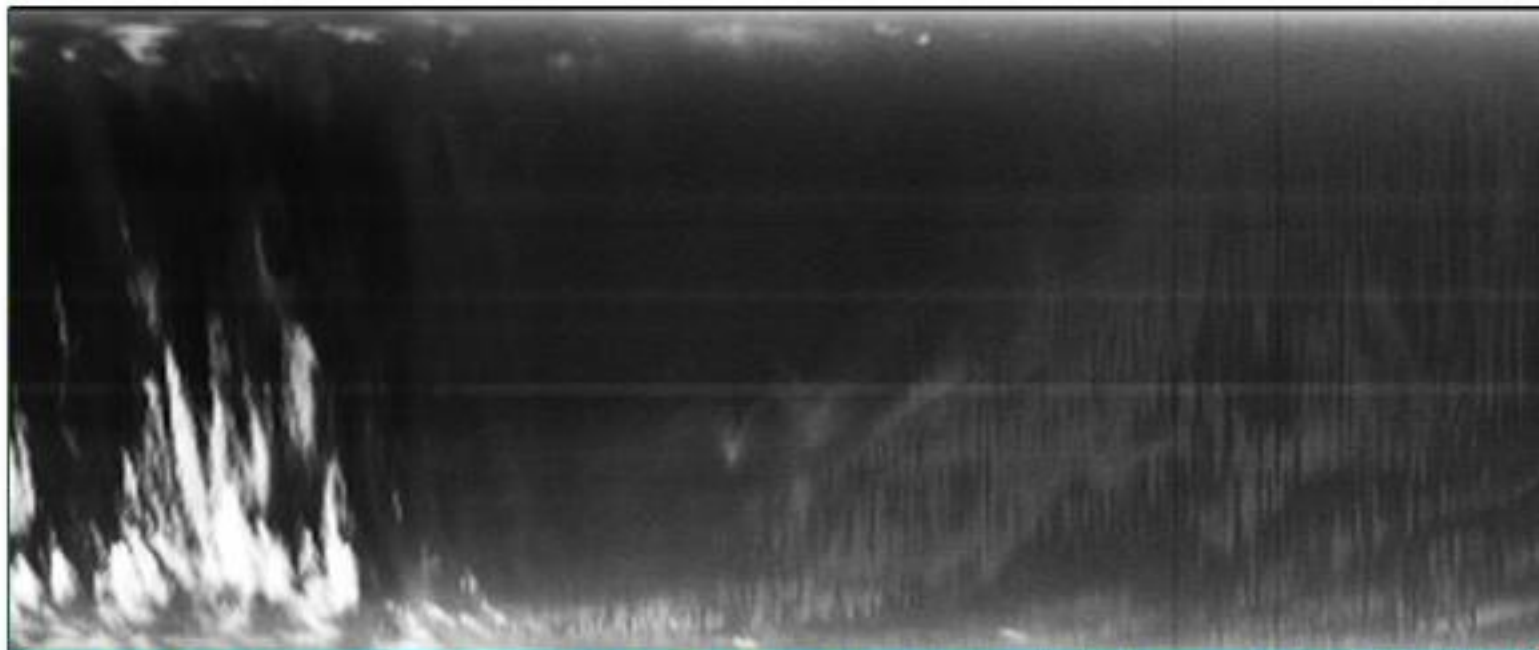
21:40:00

Eflux [eV/cm²/s/ster/eV]

Eflux [eV/cm²/s/ster/eV]

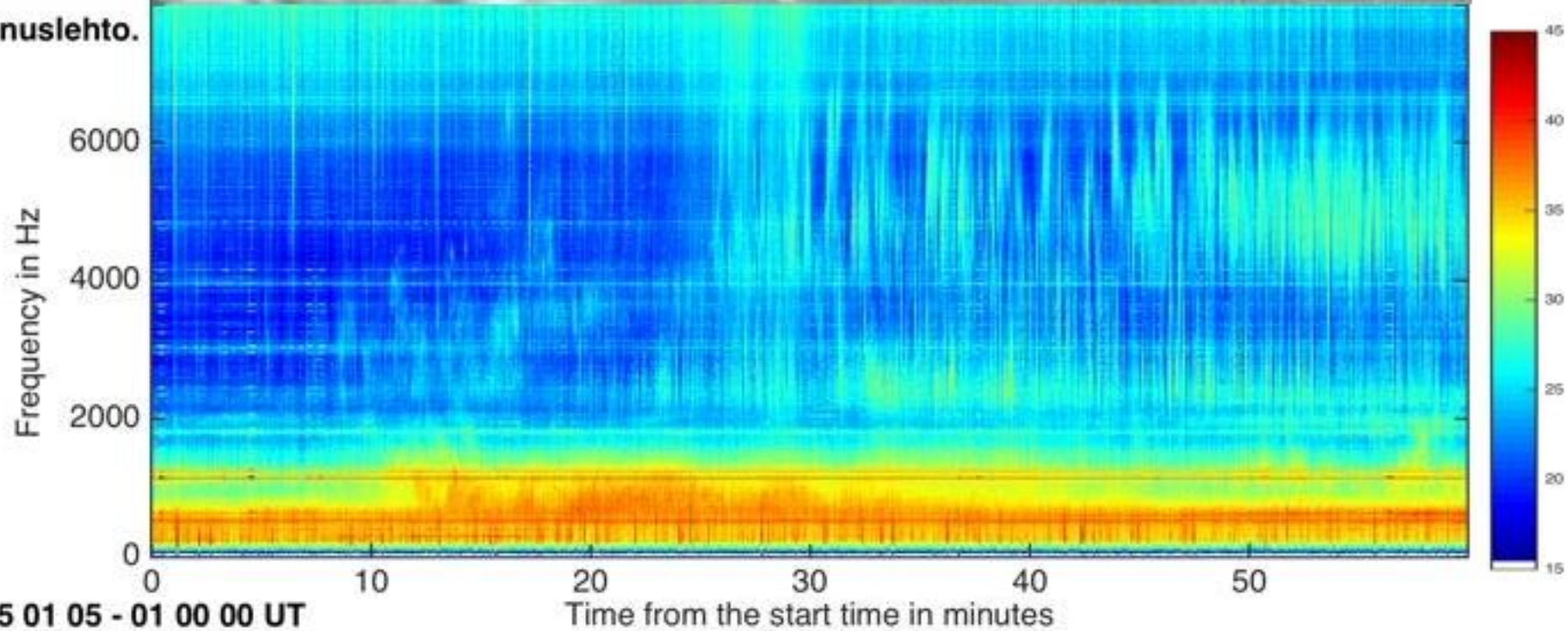
Eflux [eV/cm²/s/ster/eV]

N



S

Kannuslehto.



N

Apatity
AS keogram

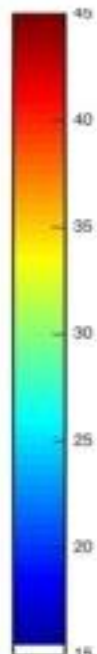
S

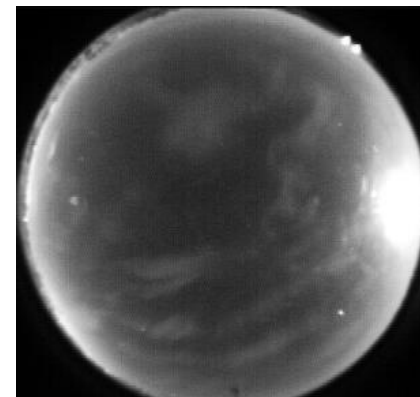
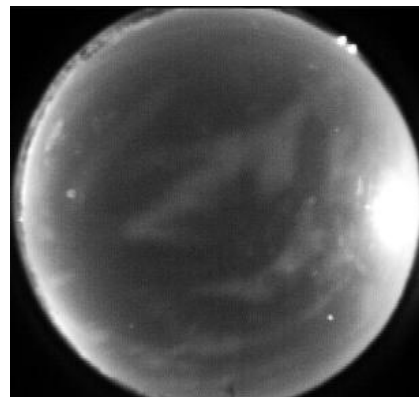
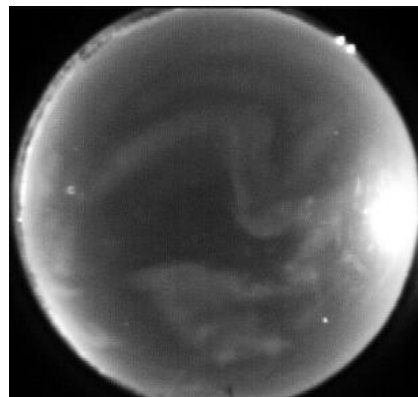
Kannuslehto.

Frequency in Hz
6000
4000
2000
0

2015 01 05 - 02 00 00 UT

Time from the start time in minutes





N

Apatity
AS keogram

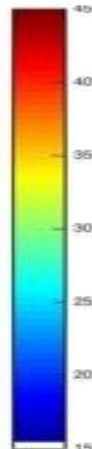
S

Kannuslehto.

Frequency in Hz
6000
4000
2000
0

2015 01 05 - 02 00 00 UT

Time from the start time in minutes



N

Apatity
AS keogram

S

Kannuslehto.

Frequency in Hz

6000

4000

2000

0

0

10

20

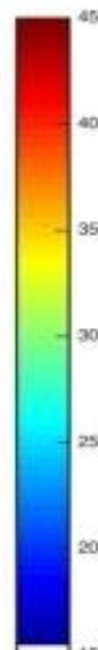
30

40

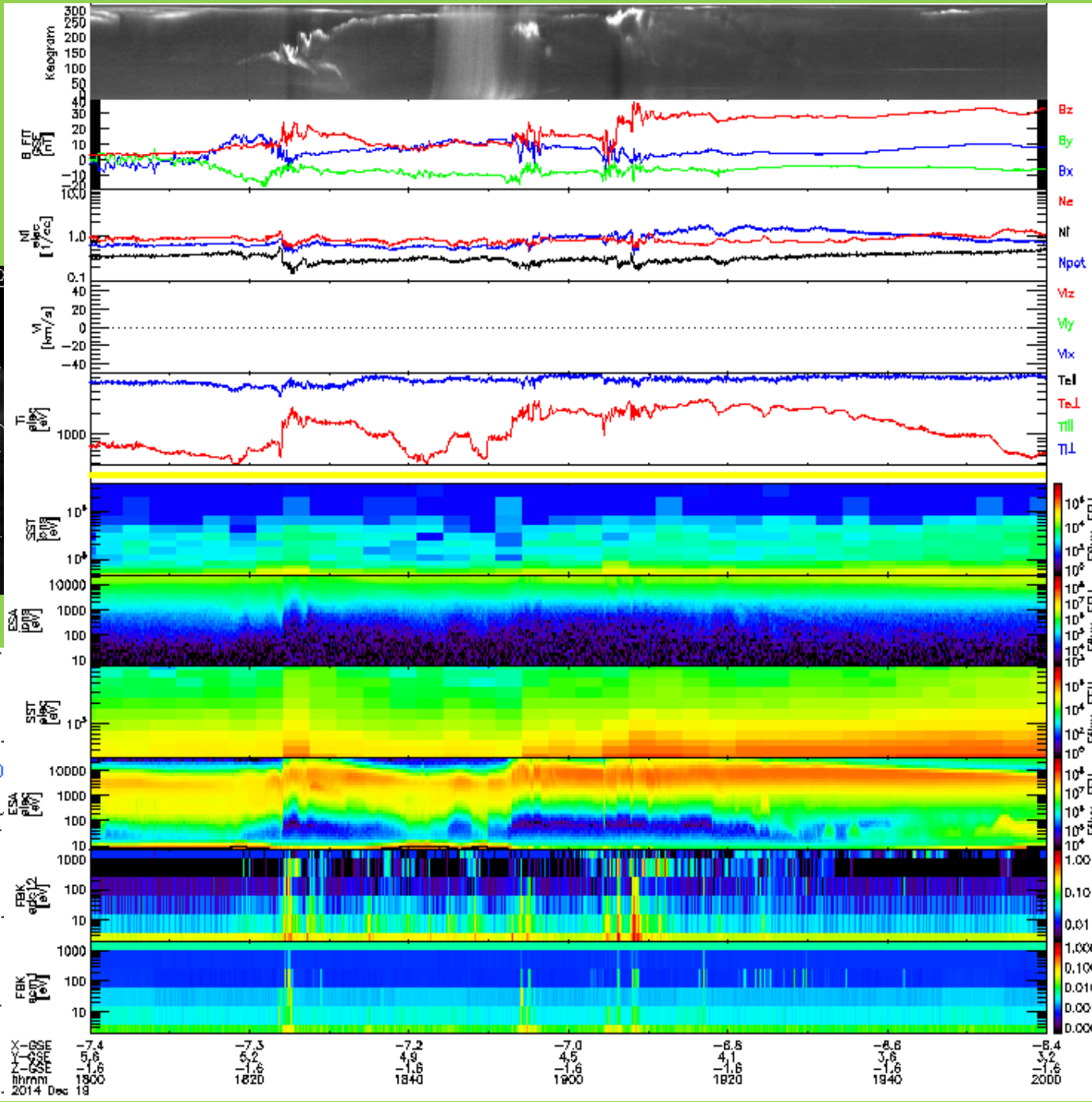
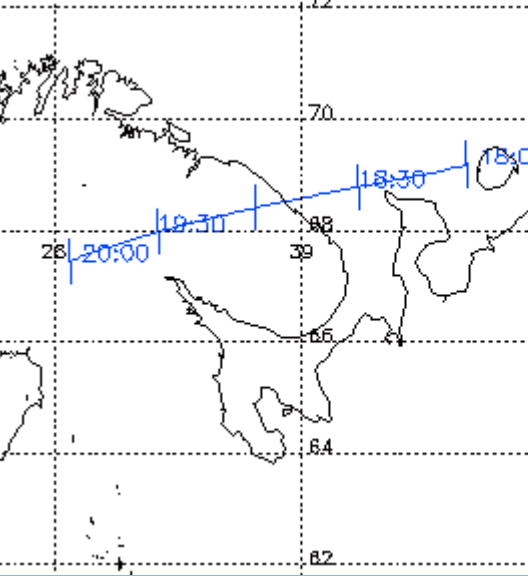
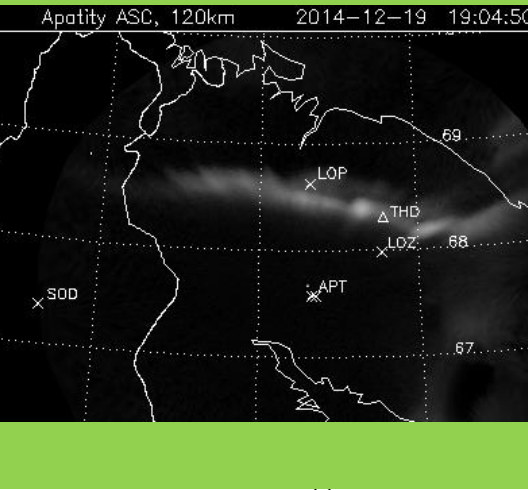
50

2015 01 05 - 03 00 00 UT

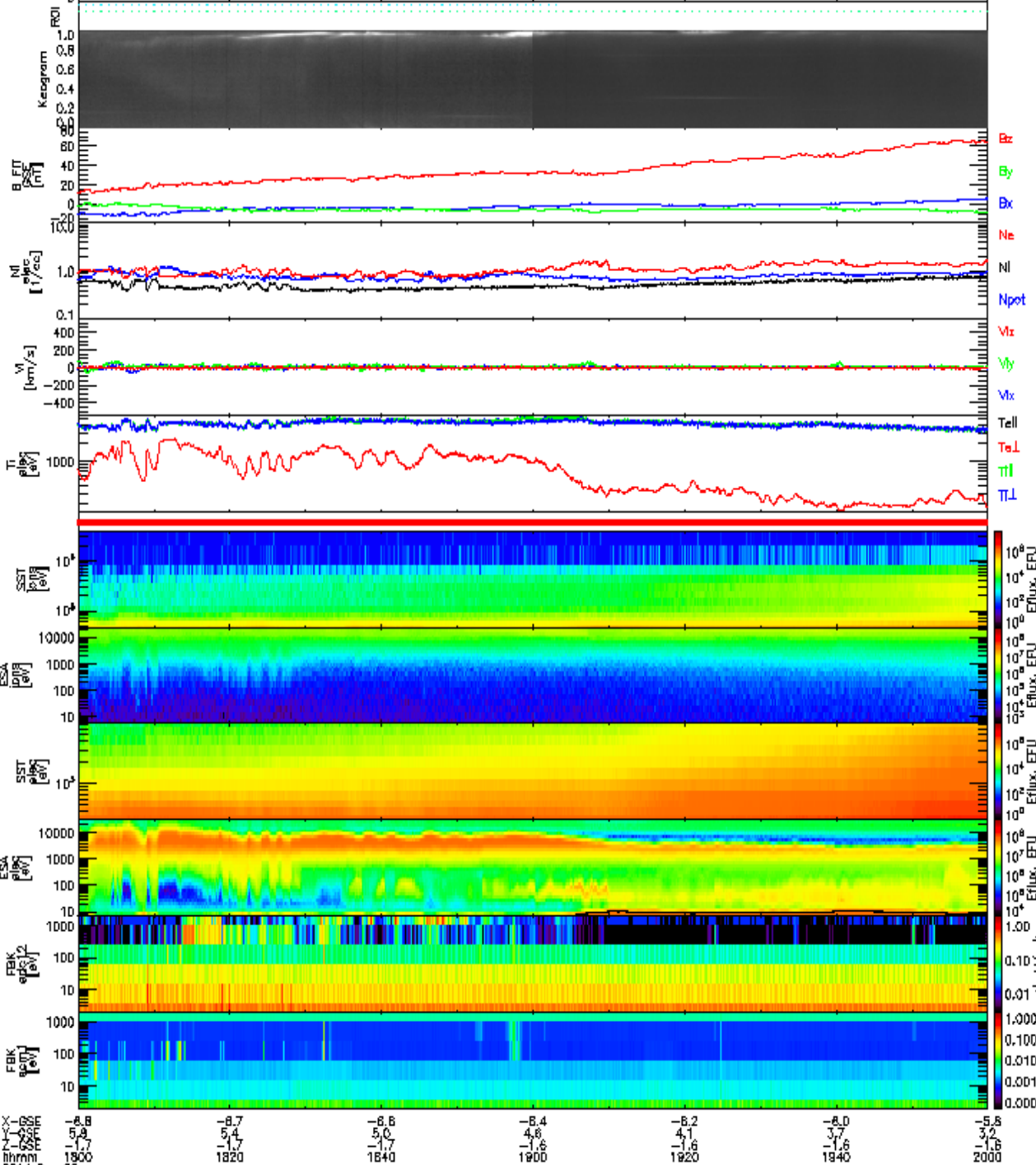
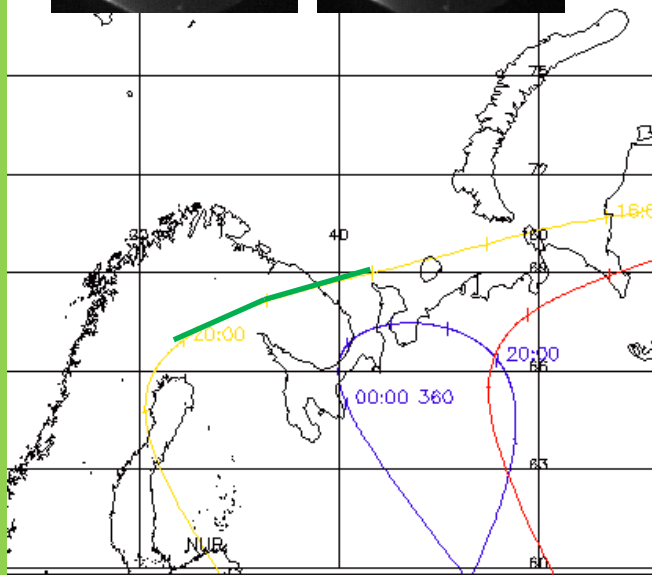
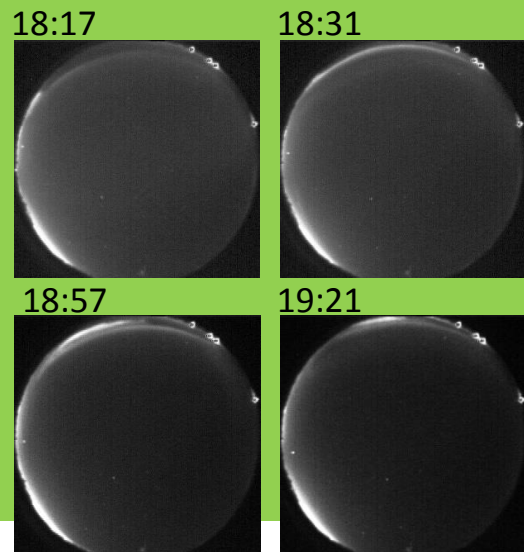
Time from the start time in minutes



2014/12/19
18:00-20:00UT



2014/12/25
18:00-20:00UT



RBSPA North B Trace in Geographic Coordinates: Time Range 12/
RBSPB North B Trace in Geographic Coordinates: Time Range 12/
THEMISA North B Trace in Geographic Coordinates: Time Range 12/
THEMISD North B Trace in Geographic Coordinates: Time Range 12/
THEMISE North B Trace in Geographic Coordinates: Time Range 12/



Thank you for attention!