Space weather events analysis according to the observations of northeastern Russia

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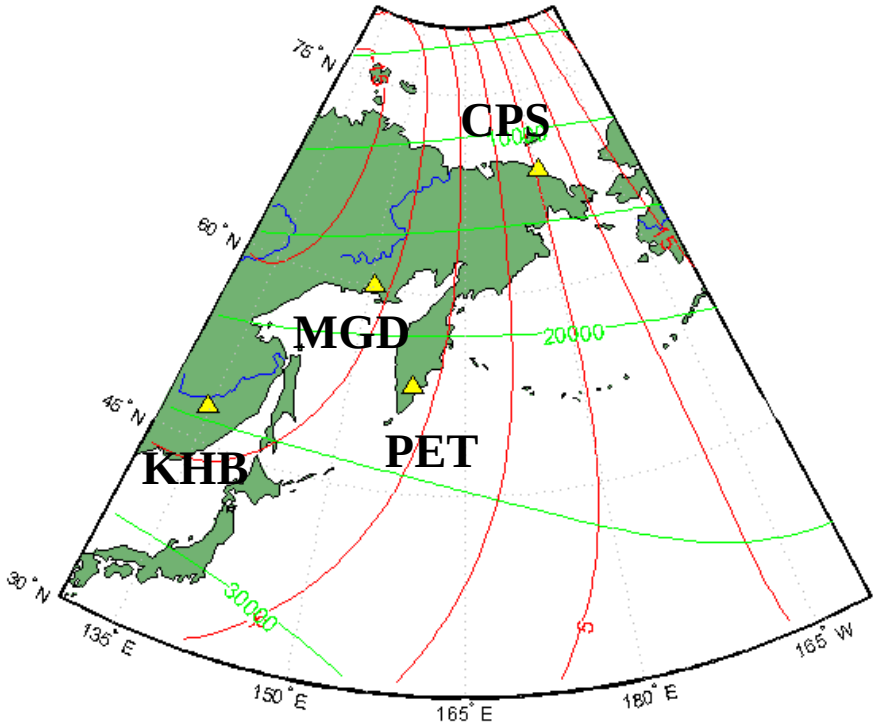
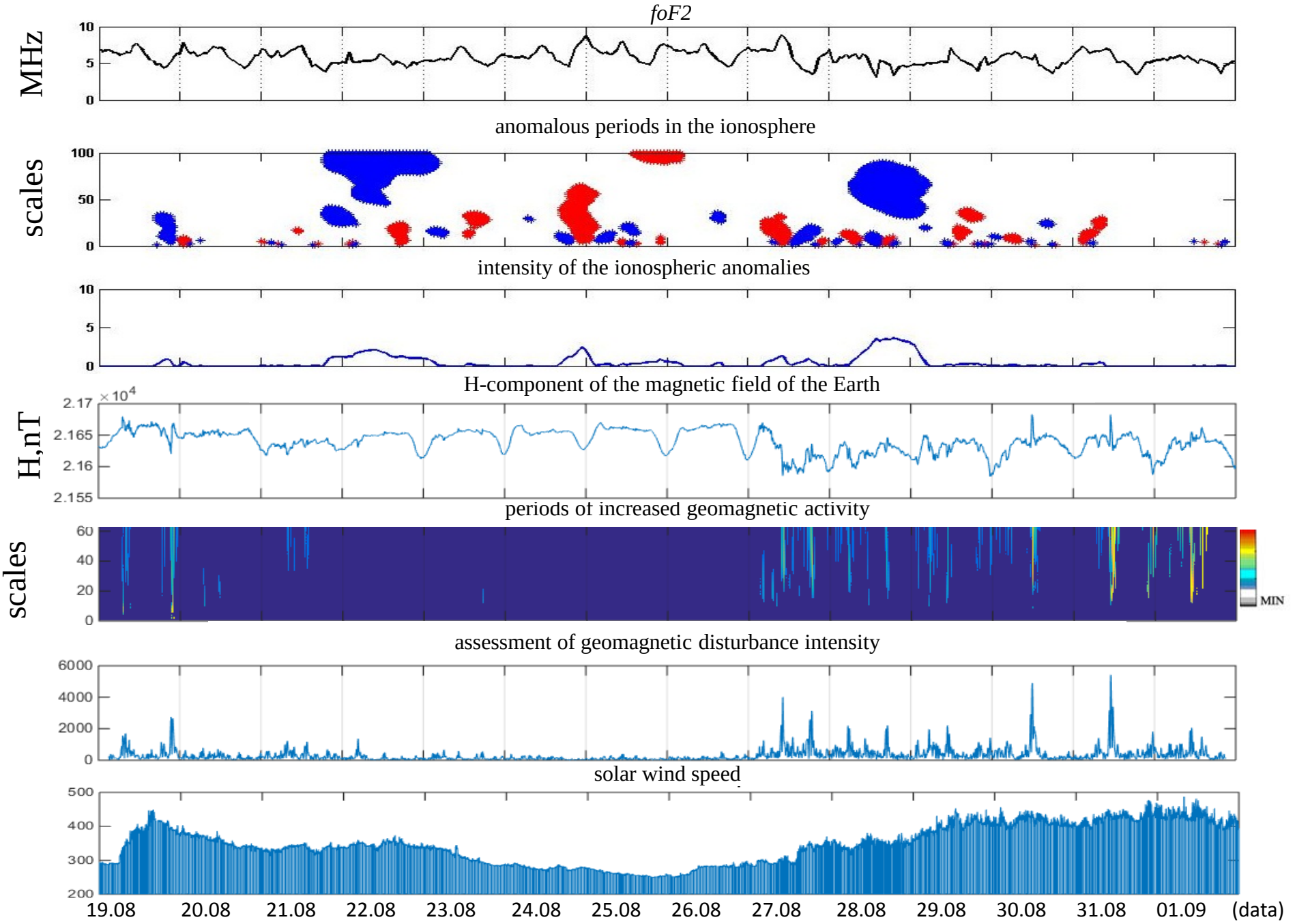
Magnetic observatories of IKIR FEB RAS



Observatory	start	IAGA	IMO	Geogr.	Geomag.
“Cape Schmidt"	1967	CPS	-	68.9 180.6	64.0 231.5
“Magadan"	1965	MGD	2009	60.1 150.7	52.0 213.1
“Paratunka"	1968	PET	2013	53.0 158.3	45.8 221.5
“Khabarovsk"	1968	KHB	2013	47.7 134.7	38.4 202.5

Analysis of geomagnetic storm registered 27 august 2014 (st. «Paratunka»)

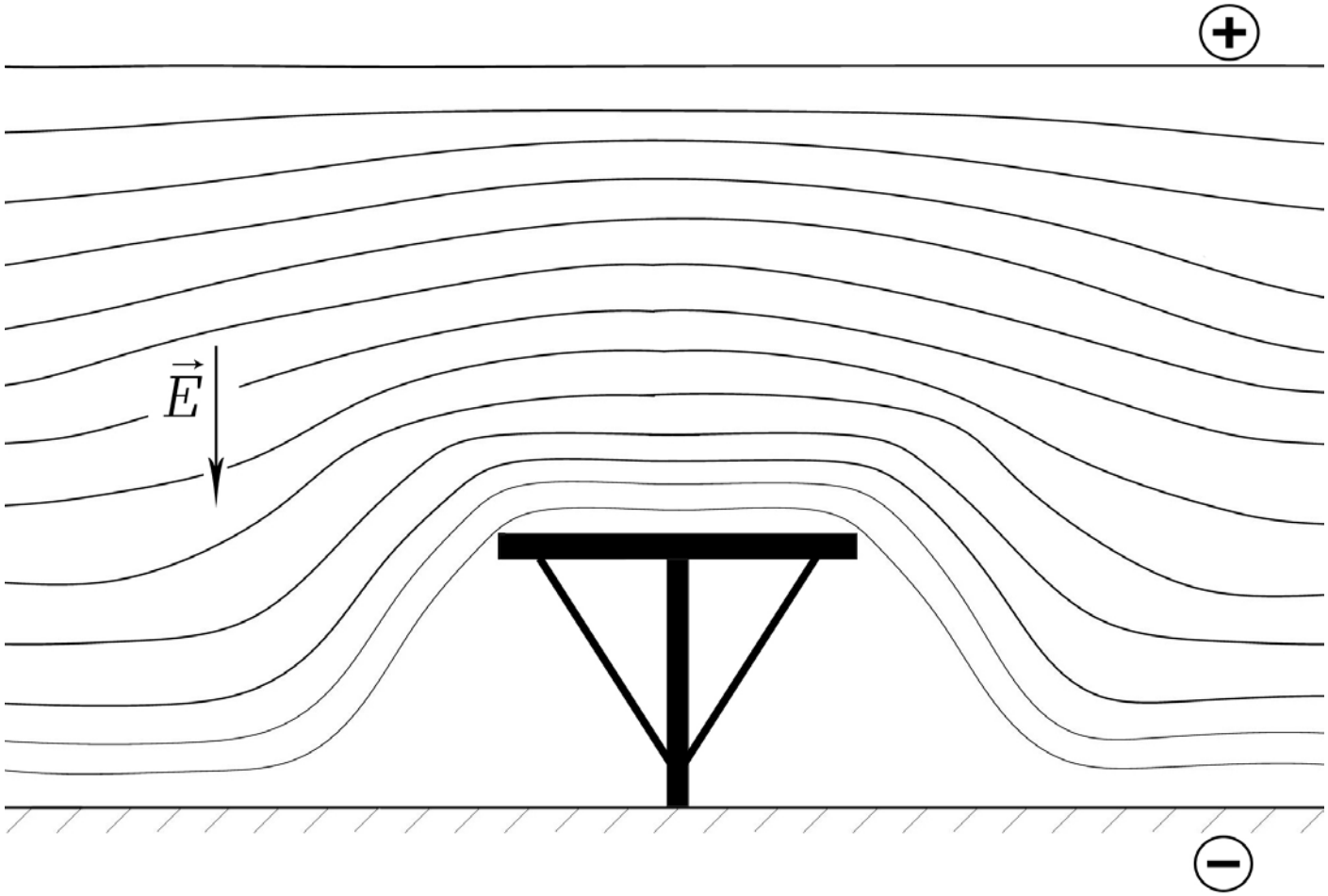


Atmospheric electrical field

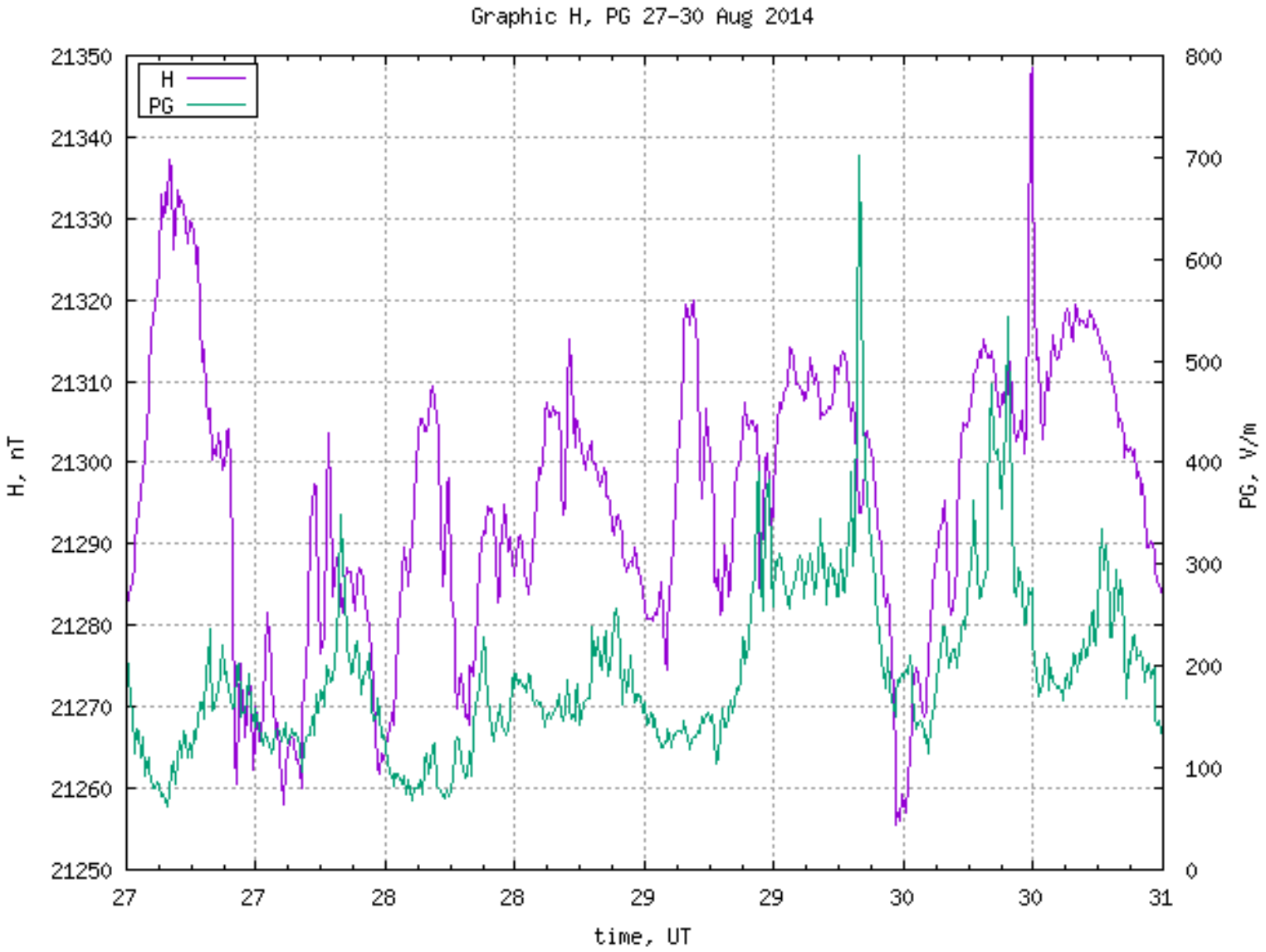


Sensor of vertical gradient of electric field potential “Pole-2” at GFO “Paratunka” (spring, early winter, late winter)

Earth's atmospheric electricity
'Pole-2'

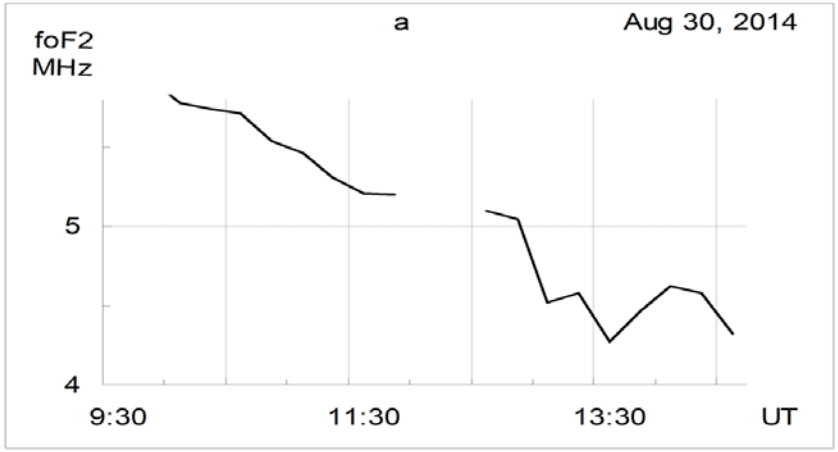


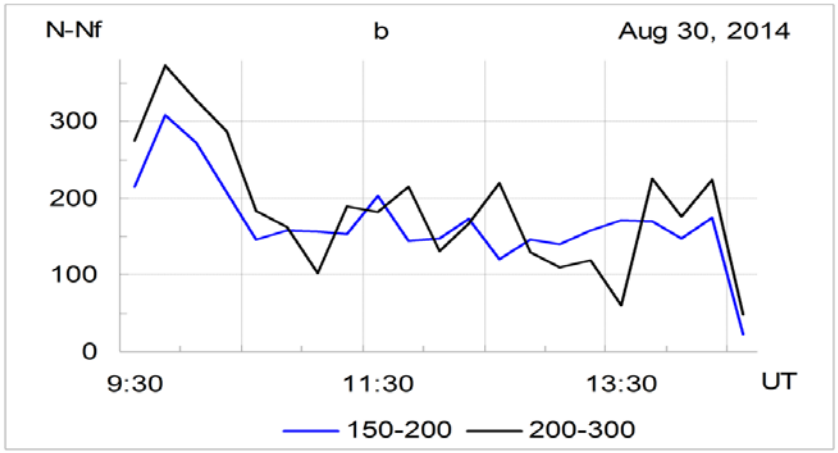
Earth's atmospheric electricity

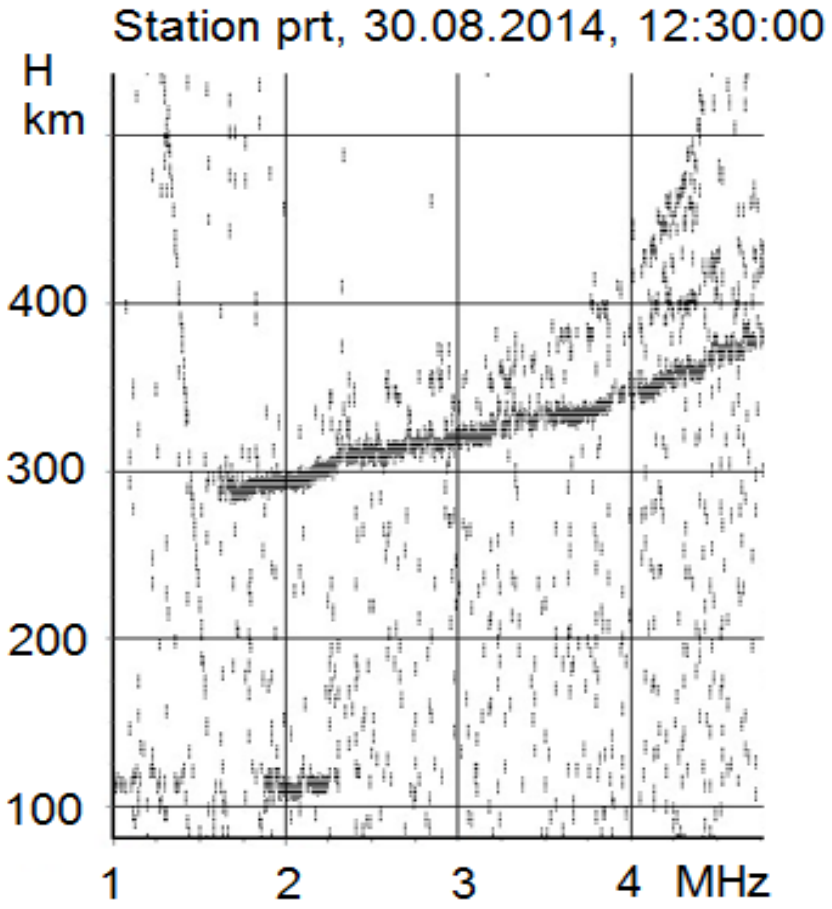


06.0

Lidar measurement and ionosphere







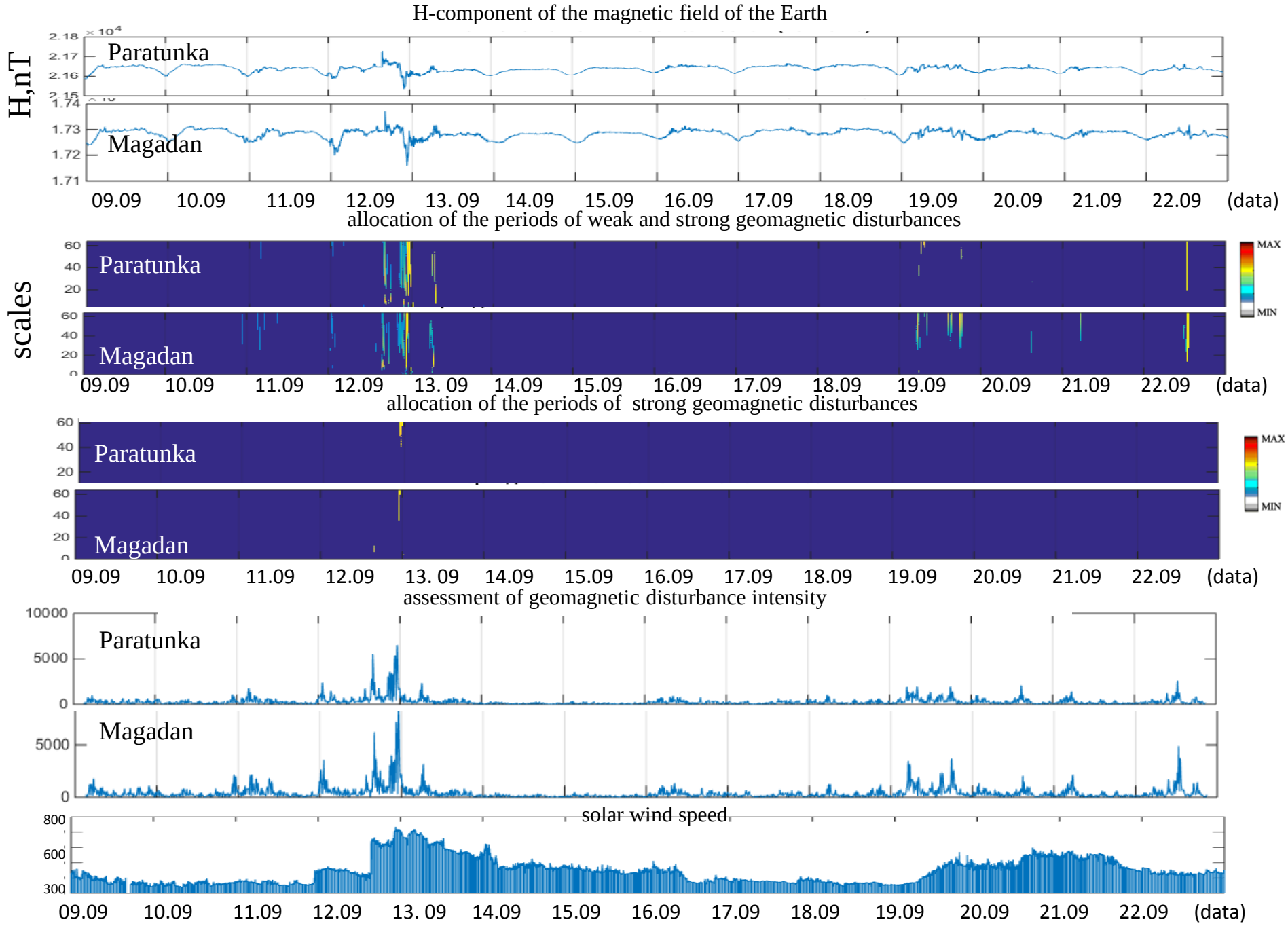
30.08.2014

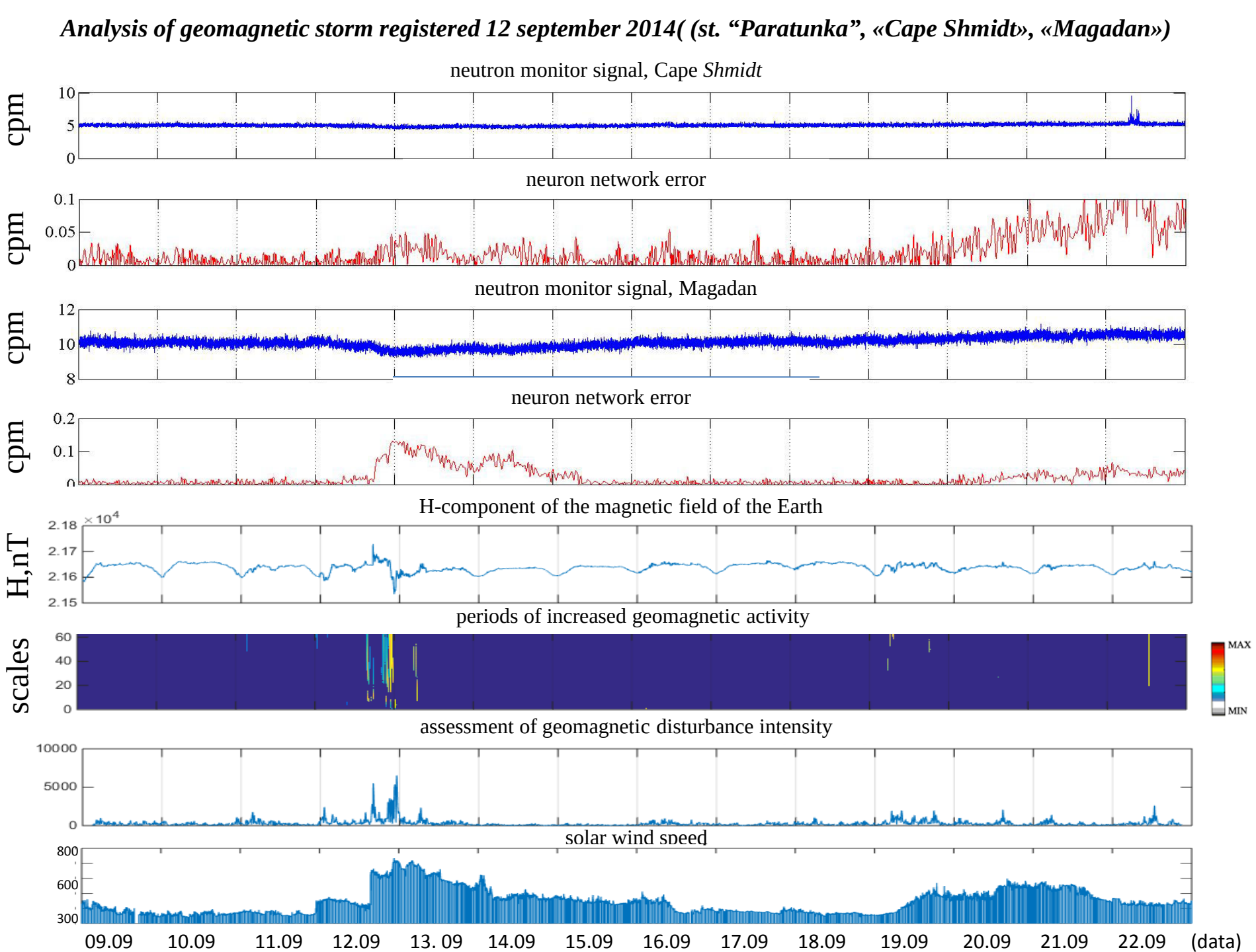
Increase in night foF2 values in the ranges 11:15 - 13:15 UT and 13:45 - 14:15 UT.

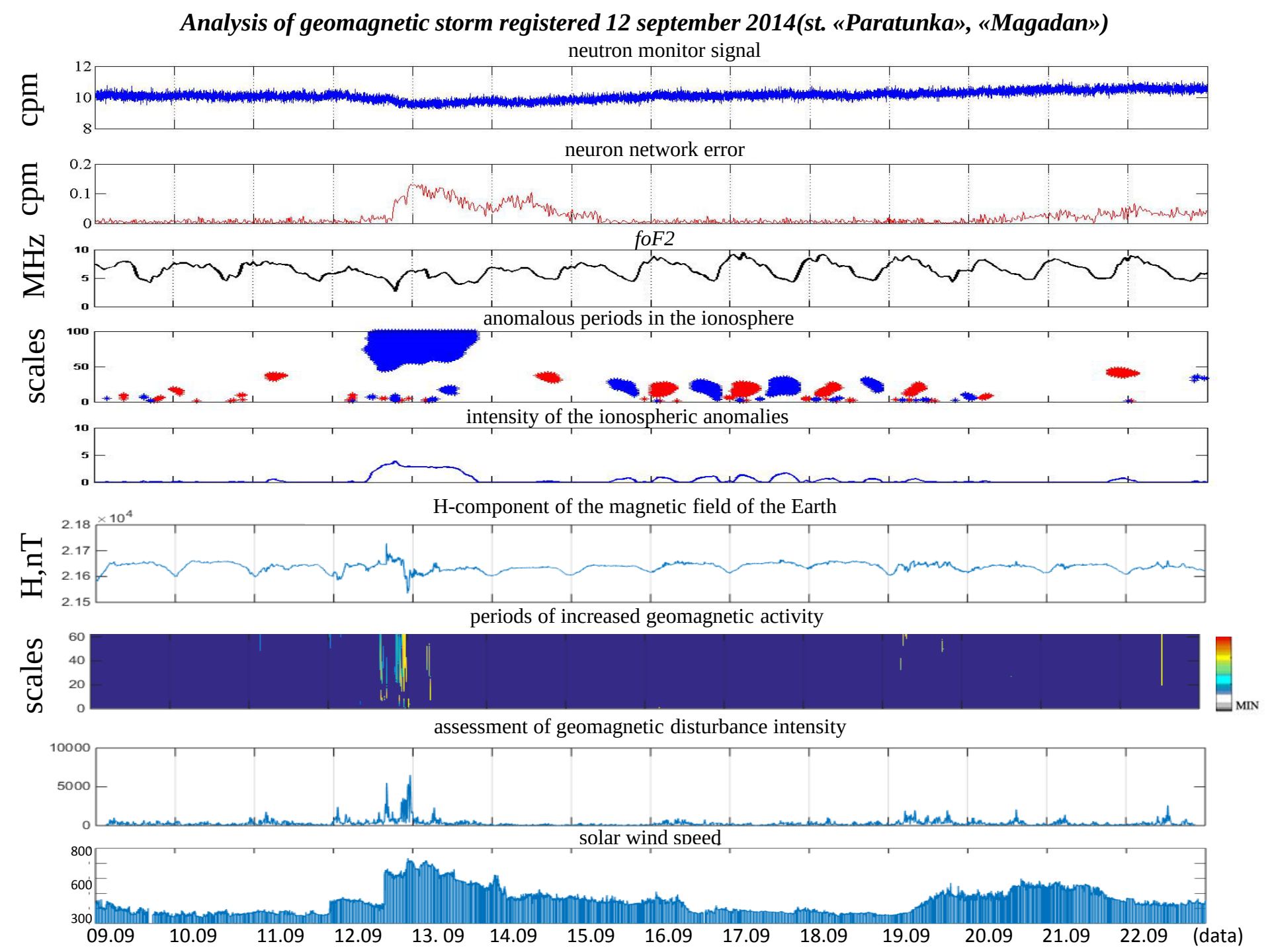
Increase in the total value of the lidar signal from regions 150-200 and 200-300 km in the same period of time.

Es corpuscular type in 12:30 UT. (Vasily V Bychkov, Yuri A Nepomnyashchiy, Andrey S Perezhogin and Boris M Shevtsov Lidar returns from the upper atmosphere of Kamchatka for 2008 to 2014 observations // Earth, Planets and Space.2014, 66: 150 DOI: 10.1186 / s40623-014- 0150-6)

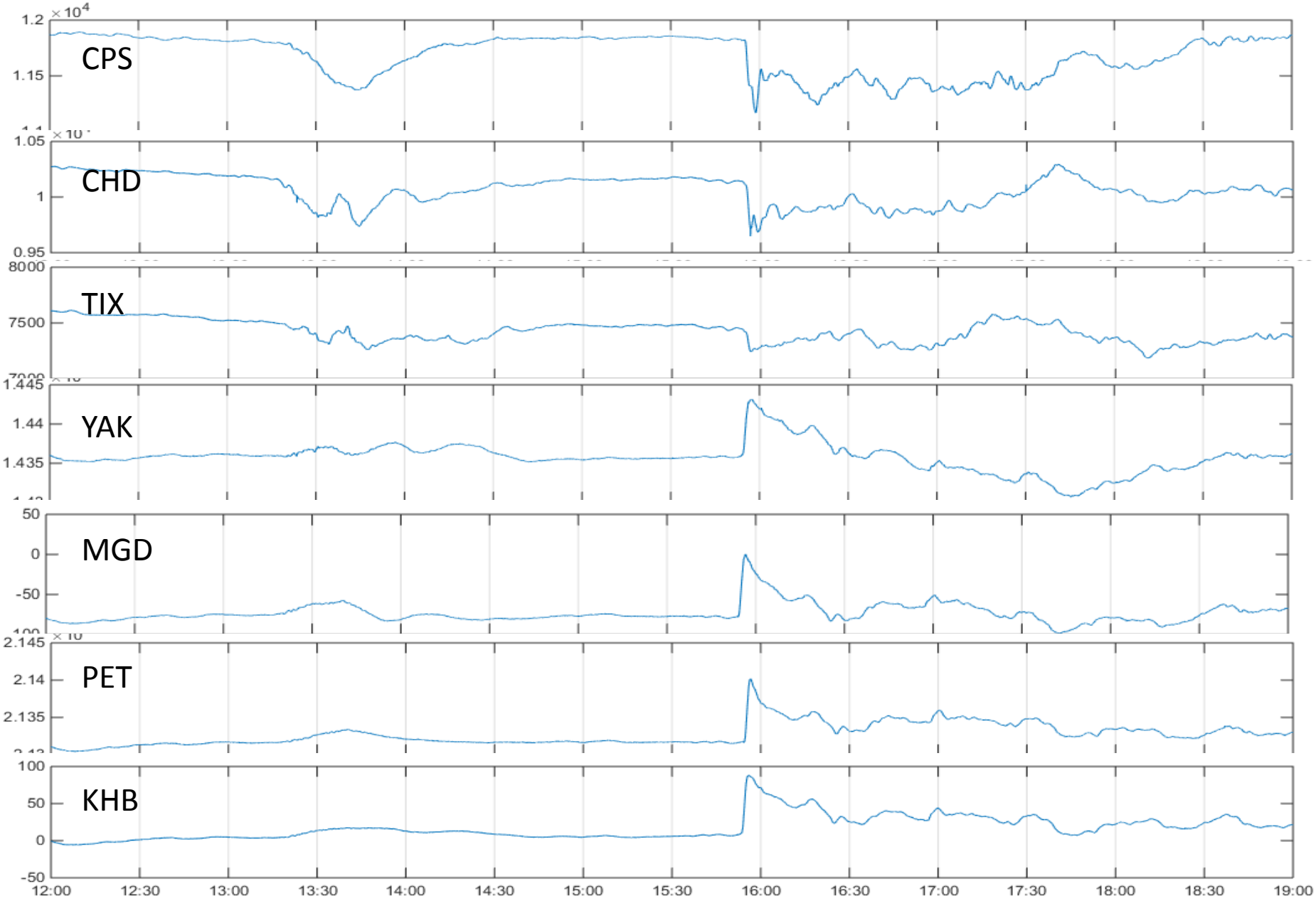
Analysis of geomagnetic storm registered 12 september 2014(st. «Paratunka», «Magadan»)



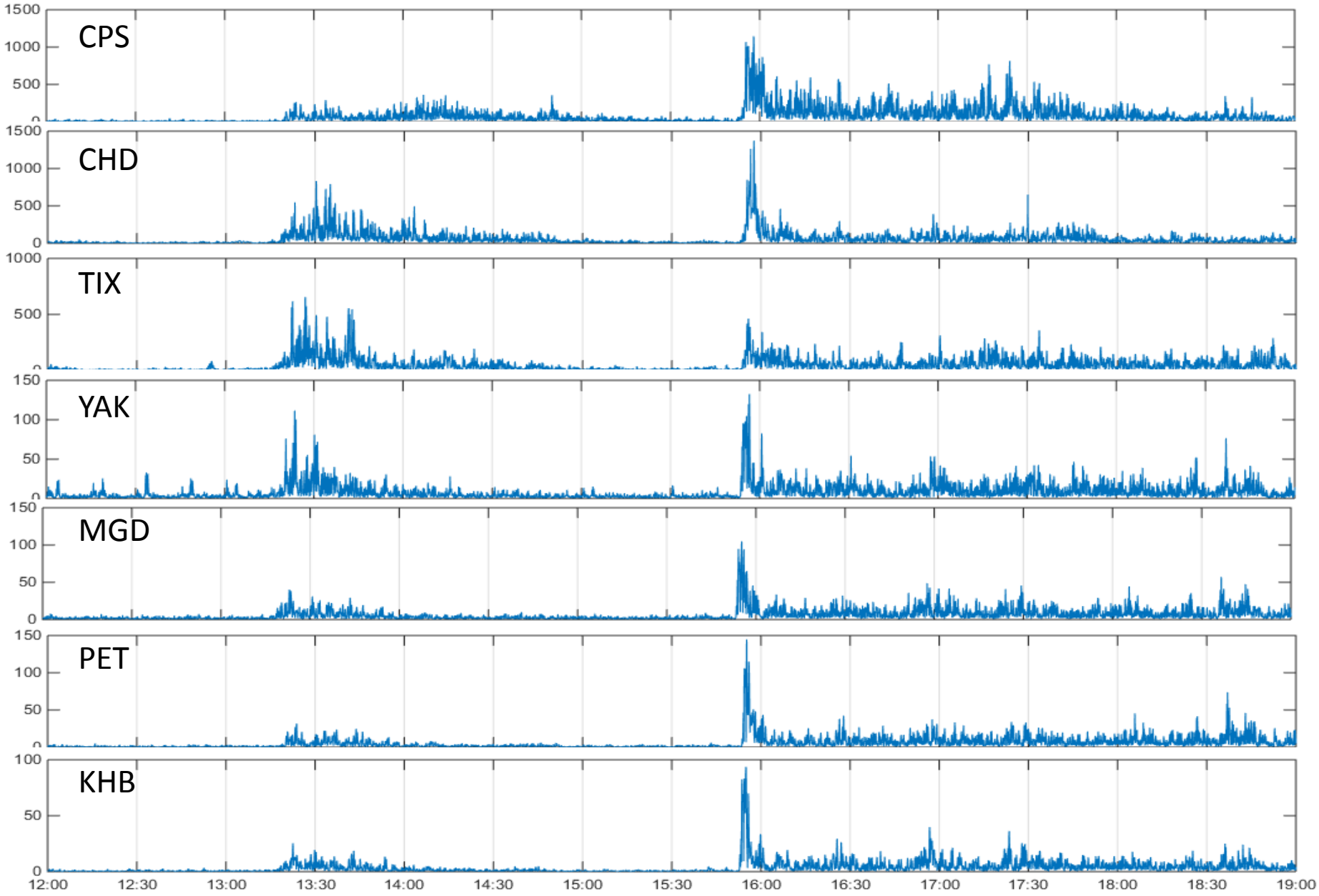

Analysis of geomagnetic storm registered 12 september 2014((st. “Paratunka”, «Cape Shmidt», «Magadan»)
neutron monitor signal, Cape Shmidt
cpm
10
5
0
neuron network error
cpm
0.1
0.05
0
neutron monitor signal, Magadan
cpm
12
10
8
neuron network error
cpm
0.2
0.1
0
H-component of the magnetic field of the Earth
H,nT
×10^4
2.18
2.17
2.16
2.15
periods of increased geomagnetic activity
scales
60
40
20
0
MAX
MIN
assessment of geomagnetic disturbance intensity
10000
5000
0
solar wind speed
800
600
300
09.09
10.09
11.09
12.09
13. 09
14.09
15.09
16.09
17.09
18.09
19.09
20.09
21.09
22.09
(data)


Analysis of geomagnetic storm registered 12 september 2014(st. «Paratunka», «Magadan»)
neutron monitor signal
cpm
12
10
8
neuron network error
cpm
0.2
0.1
0
foF2
MHz
10
5
0
anomalous periods in the ionosphere
scales
100
50
0
intensity of the ionospheric anomalies
10
5
0
H-component of the magnetic field of the Earth
H,nT
×10^4
2.18
2.17
2.16
2.15
periods of increased geomagnetic activity
scales
60
40
20
0
MIN
assessment of geomagnetic disturbance intensity
10000
5000
0
solar wind speed
800
600
300
09.09
10.09
11.09
12.09
13. 09
14.09
15.09
16.09
17.09
18.09
19.09
20.09
21.09
22.09
(data)

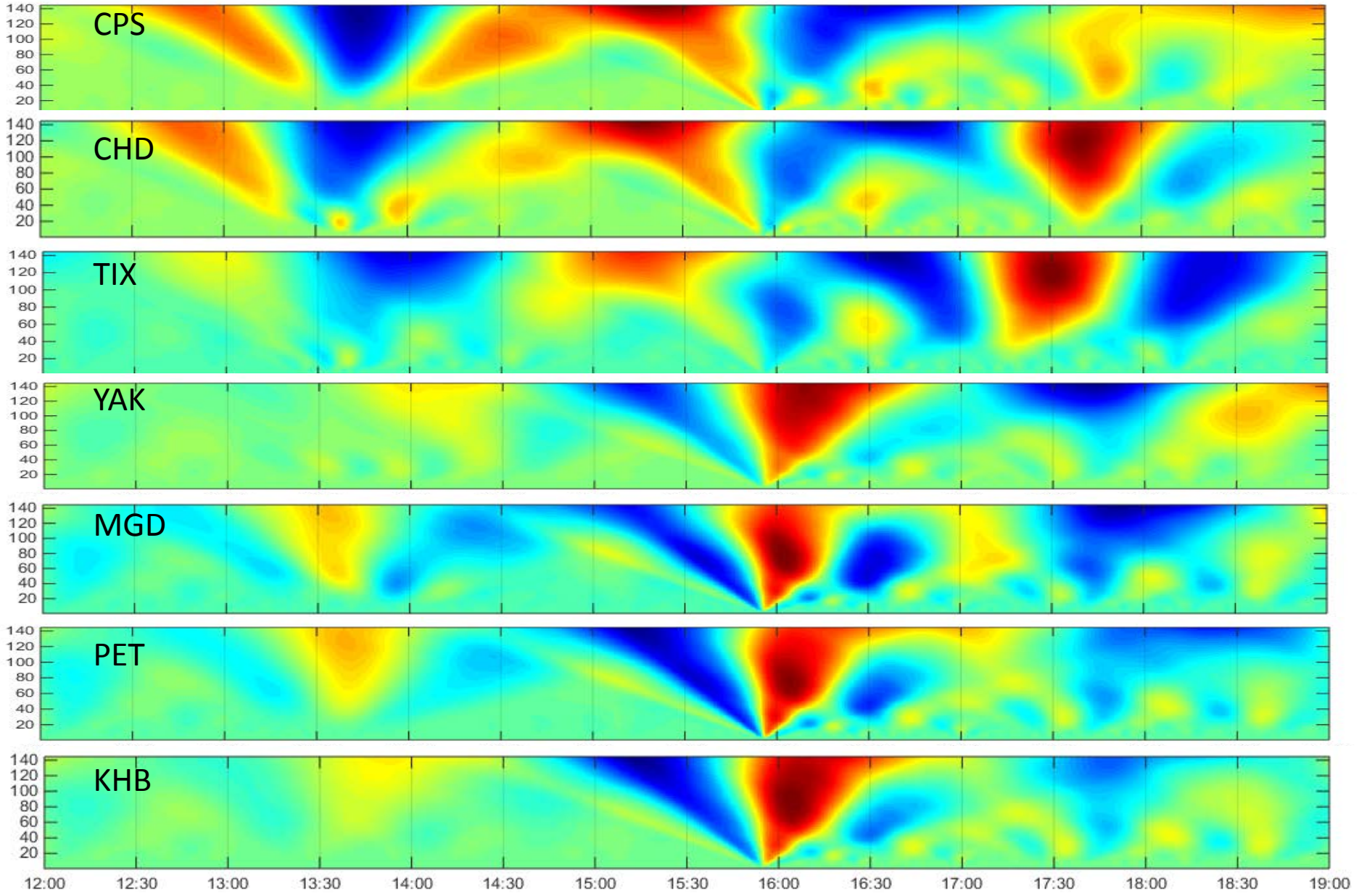
Variations of horizontal component of magnetic field of the Earth, 12 september, from 12:00 to 19:00 UT)



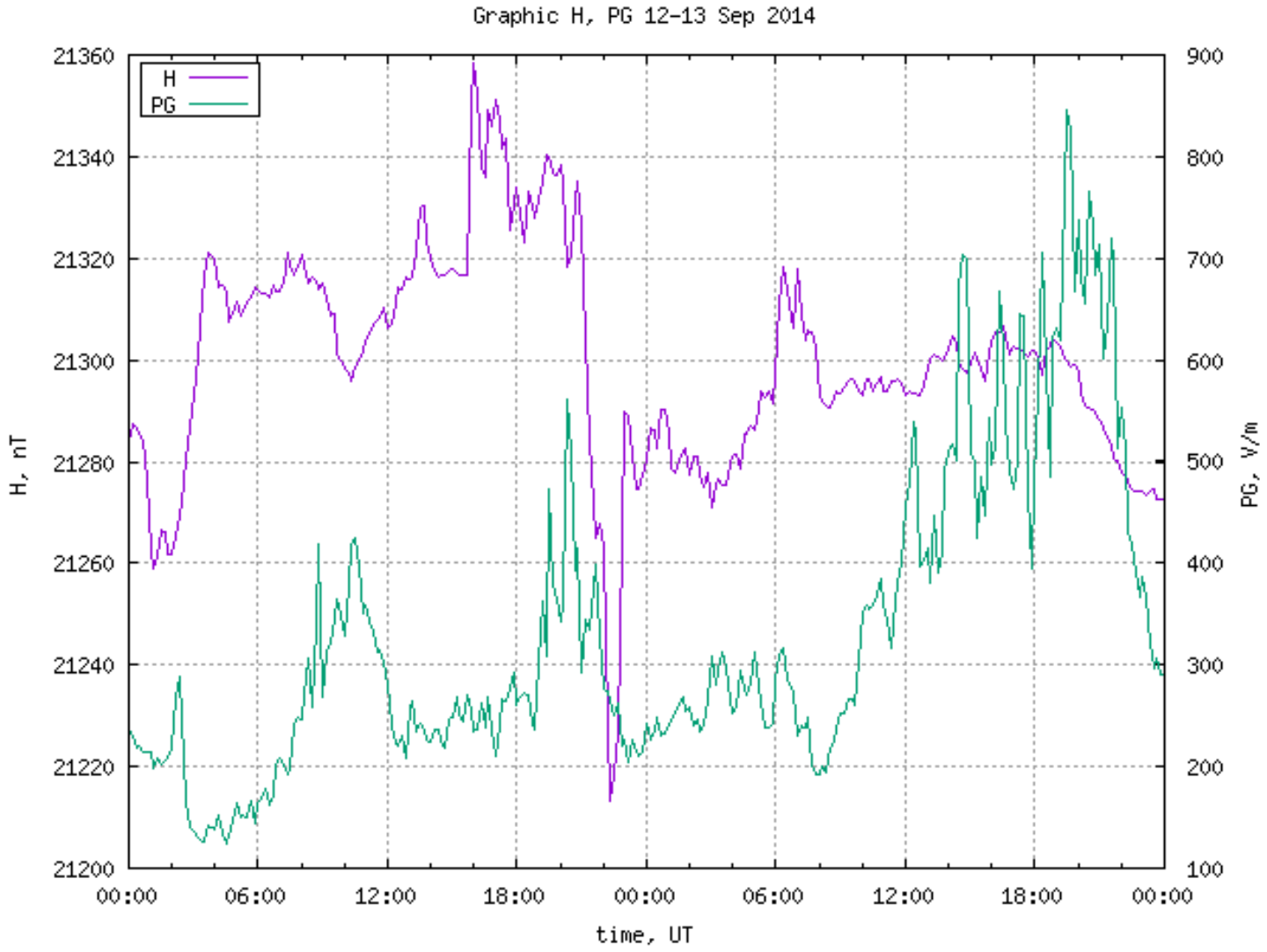
Assesment of intensity of geomagnetic disturbances in a range of Pc3 pulsations (ocillations with periods 10-45 s.) for 12 september 2014, from 12:00 to 19:00 UT



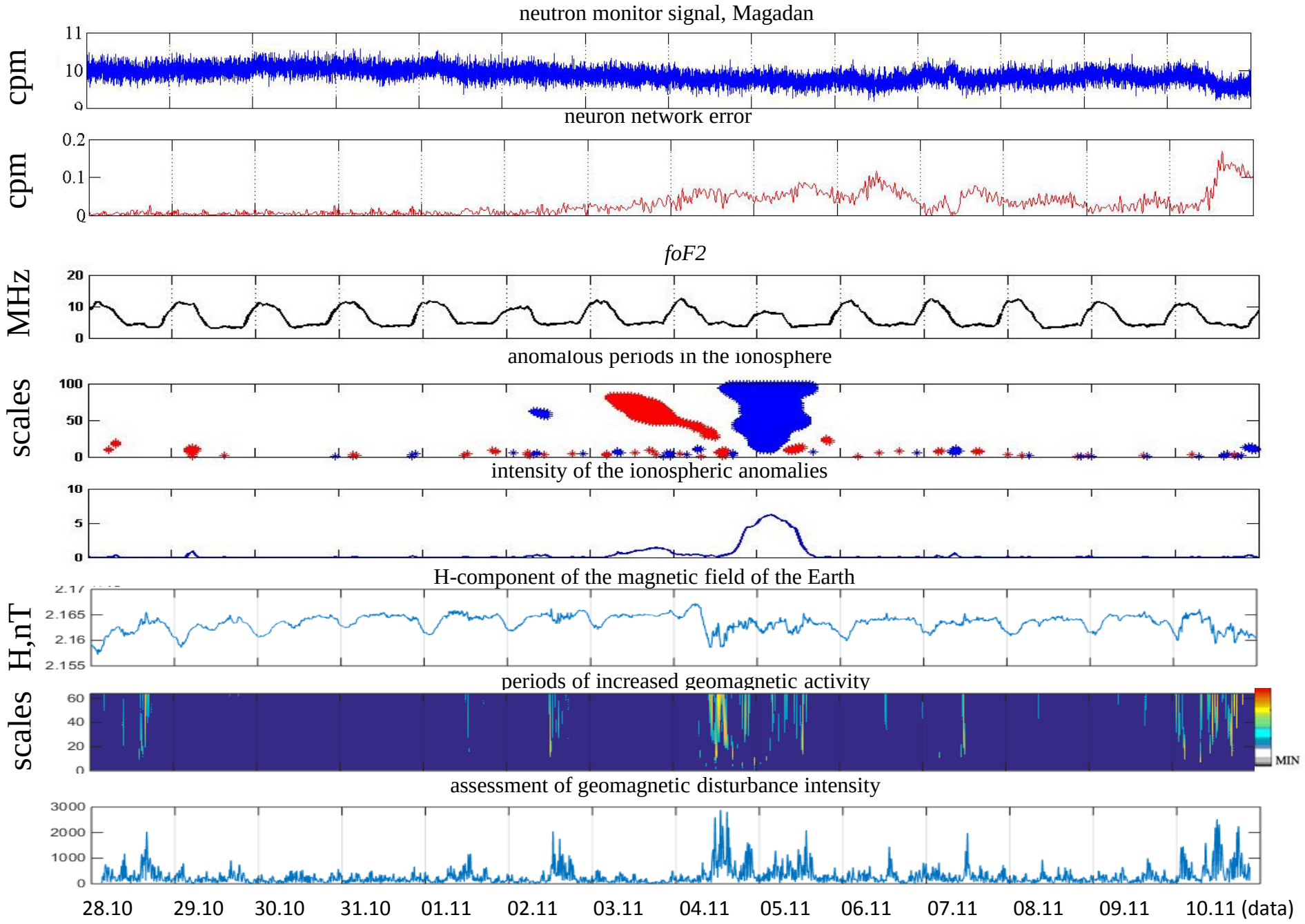
Wavelet-portrait of magnetic storm registered on 12 september 2014 according to the data from station of north-eastern region of the Russia)



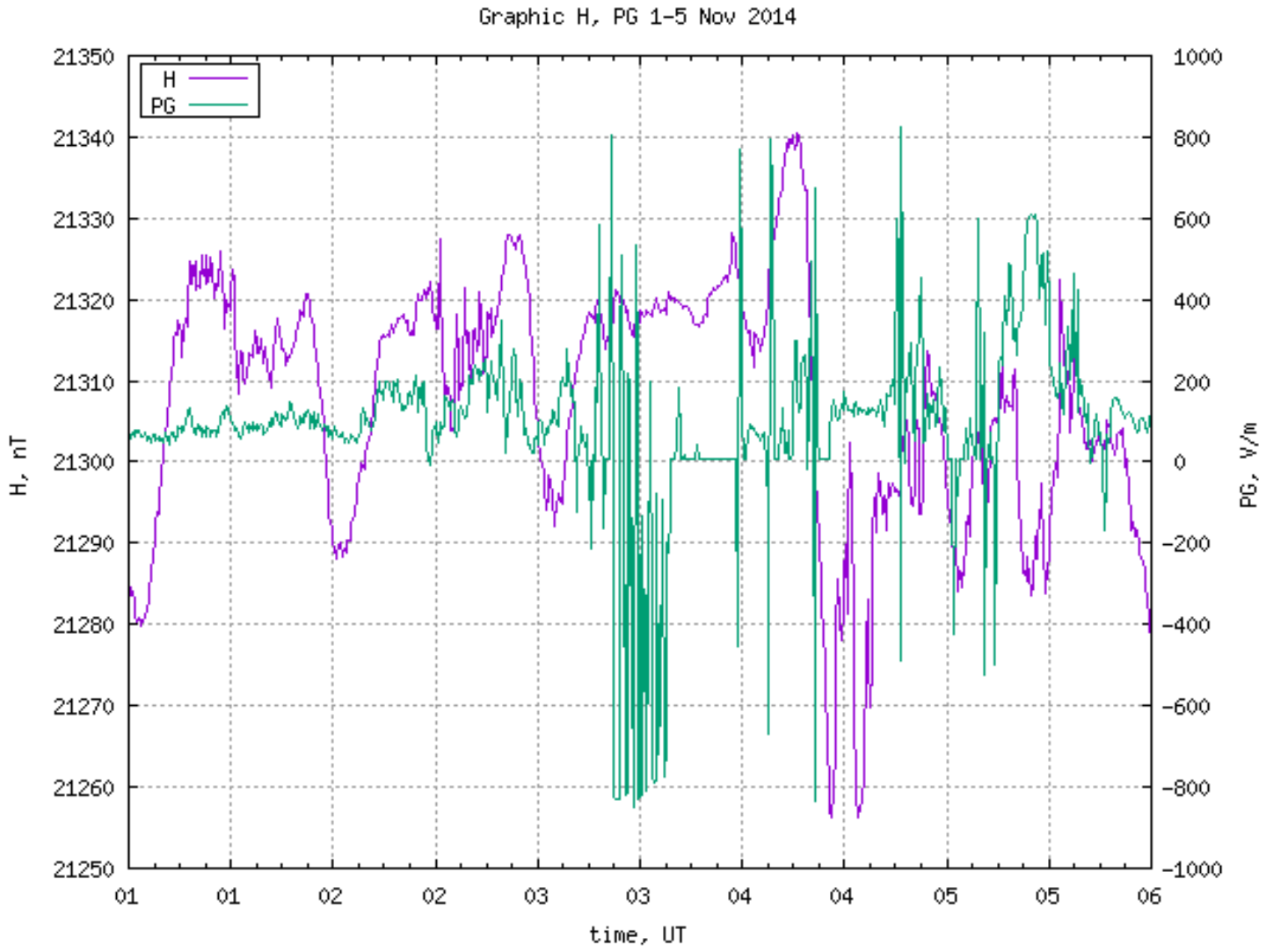
Earth's atmospheric electricity



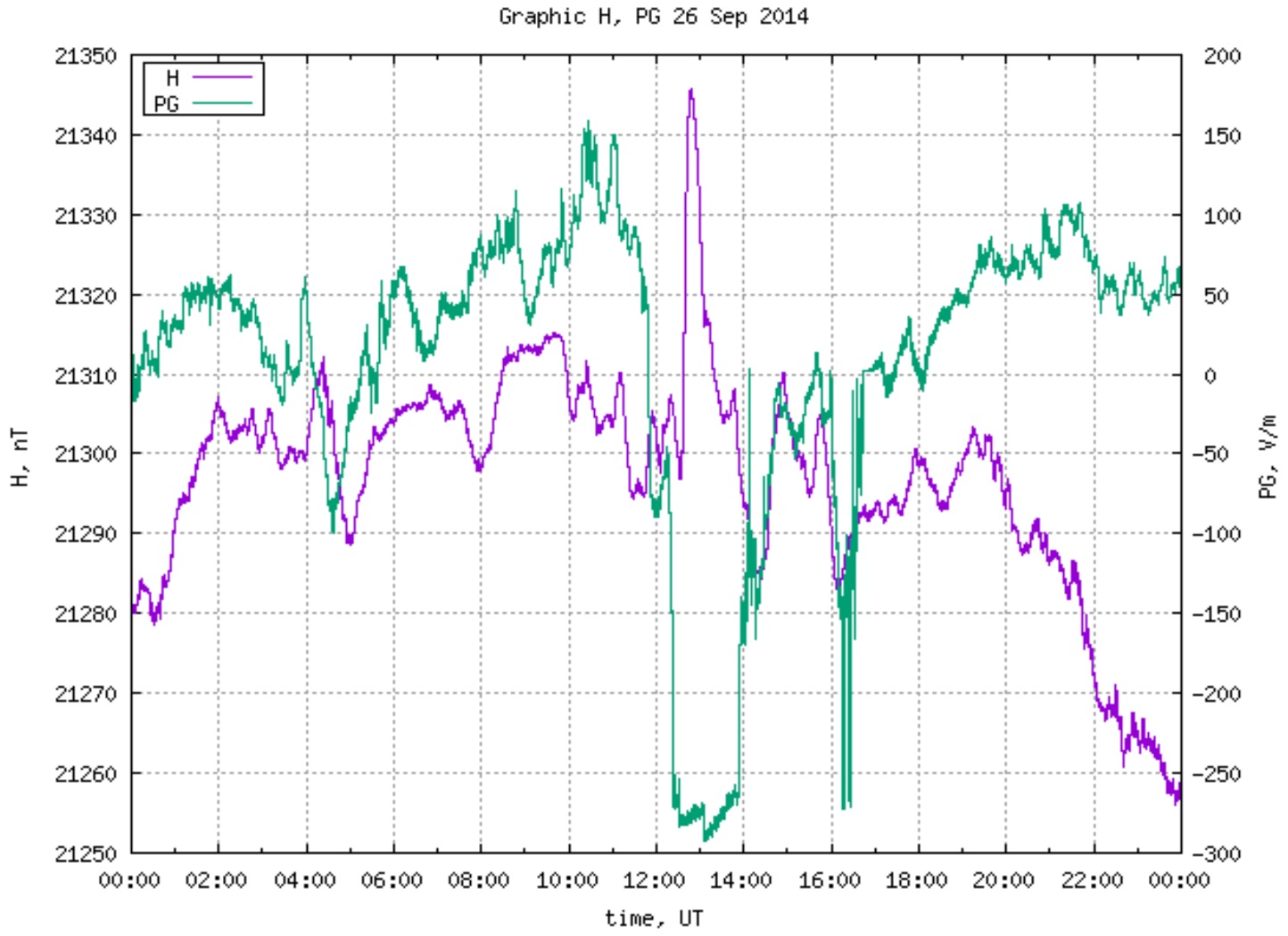
Analysis of geomagnetic storm registered 4 – 5 november 2014 (st. «Paratunka», «Magadan»)



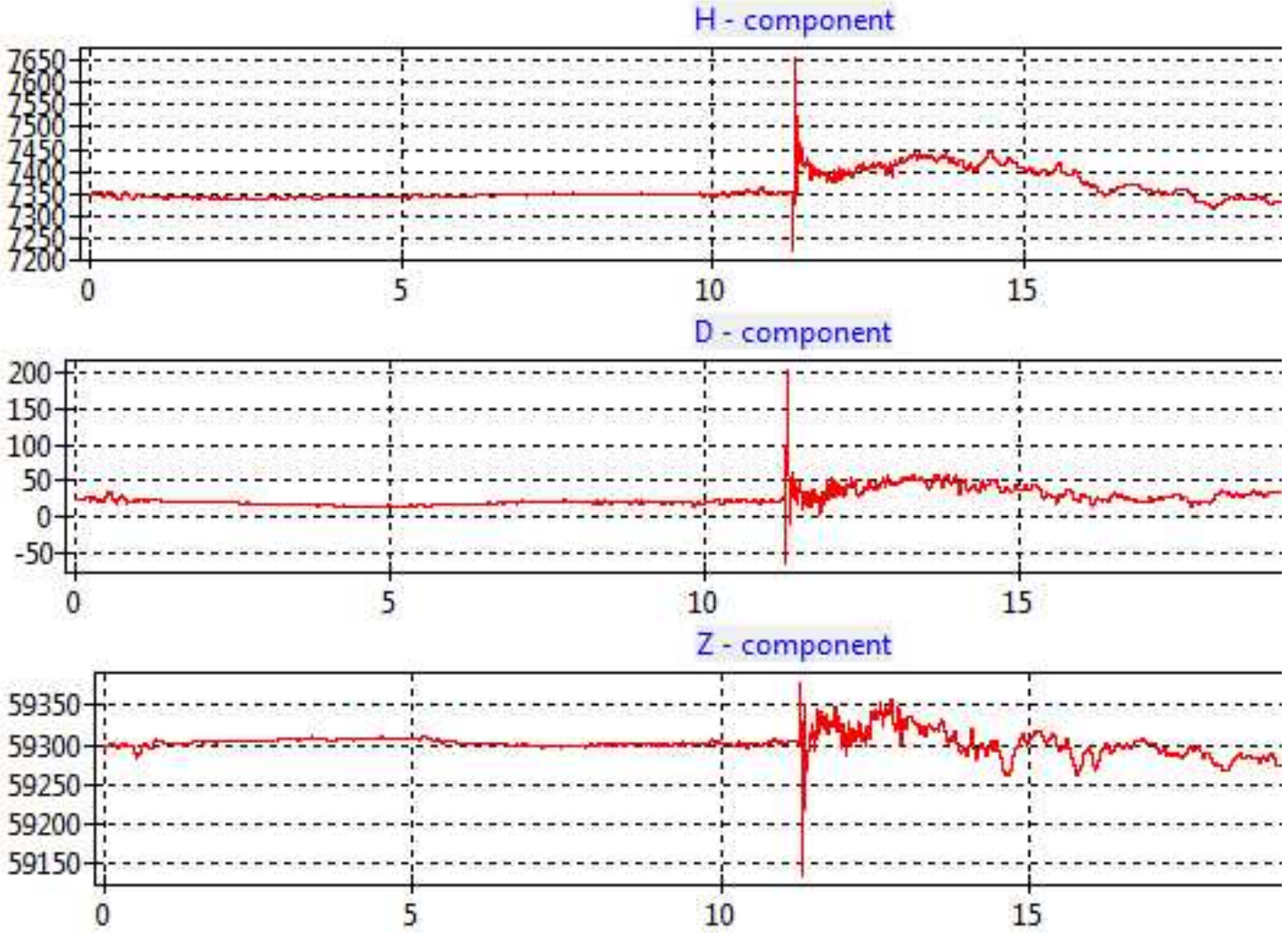
Earth's atmospheric electricity



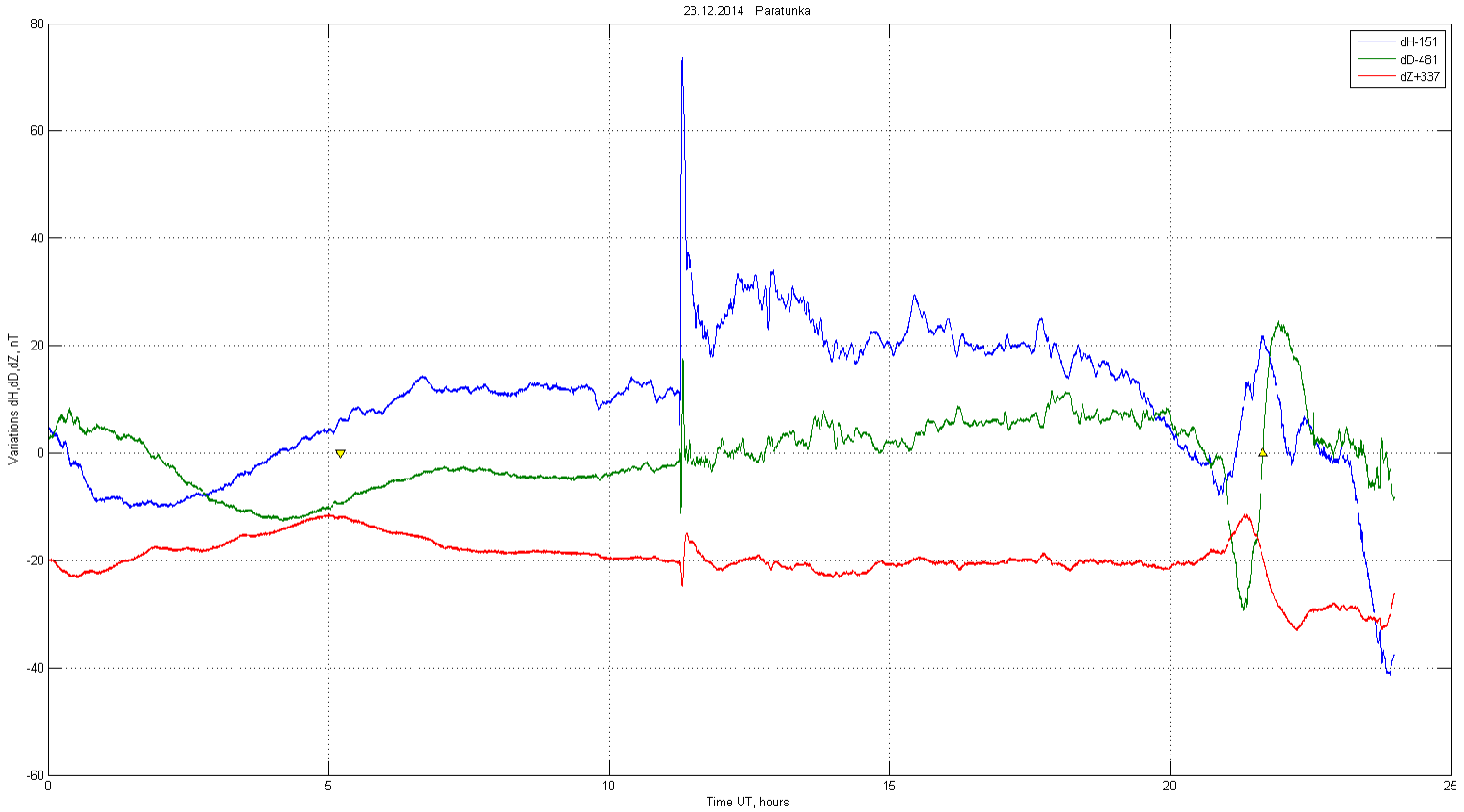
Magnetic storm 26 Sep 2014 observatory Paratunka



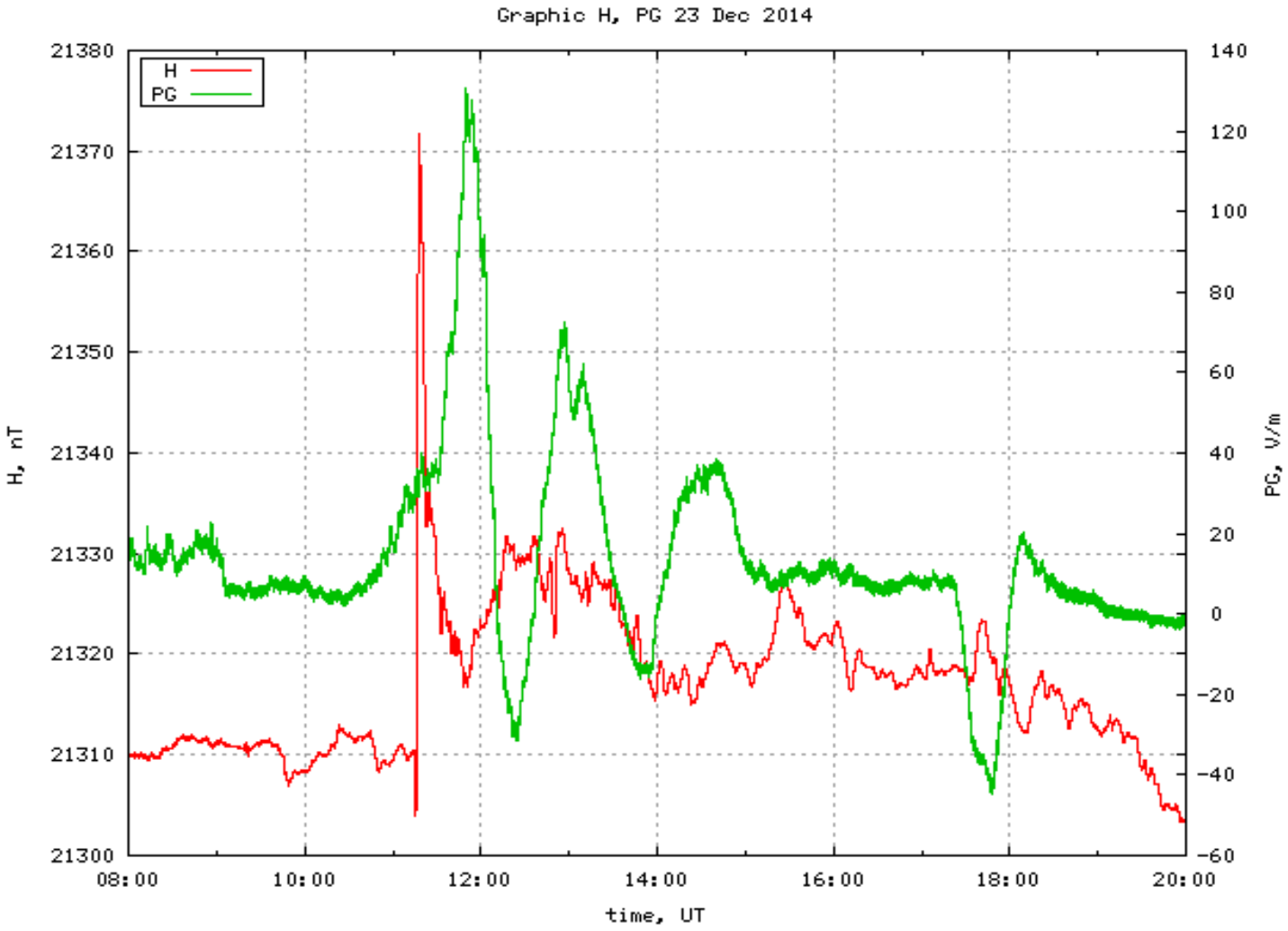
Magnetic storm 23 Dec 2014 observatory Tiksi



Magnetic storm 23 Dec 2014 observatory Paratunka



Magnetic storm 23 Dec 2014 observatory Paratunka



Conclusions

- Small-scale ionospheric anomalies, mostly positive and having different intensities, were isolated In moments of solar flares and particle emissions.
- Geomagnetic disturbances with greatest intensity occurred during periods of significant increase in the solar wind speed
- Electron density was significantly reduced and large-scale negative ionospheric anomalies were formed during the main phase of geomagnetic storms
- Large-scale positive ionospheric anomalies, arising before the start of geomagnetic storms and having duration of a day or more, were highlighted.
- Local fluctuations in cosmic ray variations (both short and longer Forbush effects), which reached its greatest intensity during periods of significant increase in geomagnetic activity and emergence of large-scale negative ionospheric anomalies, were recorded.
- Sudden onset of magnetic storm leads to oscillatory processes in atmospheric electricity

Conclusions

List of main publications by authors:

1. Mandrikova O.V., Solovev I.S, Zalyaev T.L. (2014) Methods of analysis of geomagnetic field variations and cosmic ray data. Earth Planet Space. 2014 Vol. 66, I. 1 doi:10.1186/s40623-014-0148-0
2. Mandrikova O, Glushkova N, Zhivet'ev I (2014) Modeling and analysis of ionospheric parameters by a combination of wavelet transform and autoregressive models. Geomagnetism and Aeronomy 54(5):593-600. doi:10.1134/S0016793214050107.
3. Mandrikova OV, Solovjev I, Geppenerc V, Taha A-KR, Klionskiy D (2013) Analysis of the Earth's magnetic field variations on the basis of a wavelet-based approach. Digit Signal Process 23:329–339
4. O.V. Mandrikova, V.V. Bogdanov, I.S. Solov'ev, (2013) Wavelet analysis of geomagnetic field data // Geomagnetism and Aeronomy. Vol. 53, No. 2, pp. 268-273
5. O.V. Mandrikova, Yu.A. Polozov, V.V. Bogdanov, E.A. Zhizhikina (2012) Method of detection of abnormal features in ionosphere critical frequency data on the basis of wavelet transformation and neural networks combination / A Journal of Software Engineering and Applications, Vol. 5, No. 12B, pp. 181-187 doi:10.4236/jsea.2012.512b035. Published Online December 2012.
6. Smirnov S. Reaction of electric and meteorological states of the near-ground atmosphere during a geomagnetic storm on 5 April 2010. Earth, Planets and Space 2014 66:154
7. G.A. Mikhailova, O.V. Kapustina, S.E. Smirnov Effects of solar and geomagnetic activities in variations of power spectra of electrical and meteorological parameters in the near-Earth atmosphere in Kamchatka during October 2003 solar events // Geomagnetism and Aeronomy, 2014, Vol. 54, No. 5, pp. 645-654
8. Vasily V Bychkov, Yuri A Nepomnyashchiy, Andrey S Perezhogin and Boris M Shevtsov Lidar returns from the upper atmosphere of Kamchatka for 2008 to 2014 observations // Earth, Planets and Space.2014, 66:150

Thank you
for your attention!