Variations in signal parameters from the A1F3 VLF transmitter received at the Mikhnevo geophysical observatory during a series of earthquakes in Turkey in February 2023.

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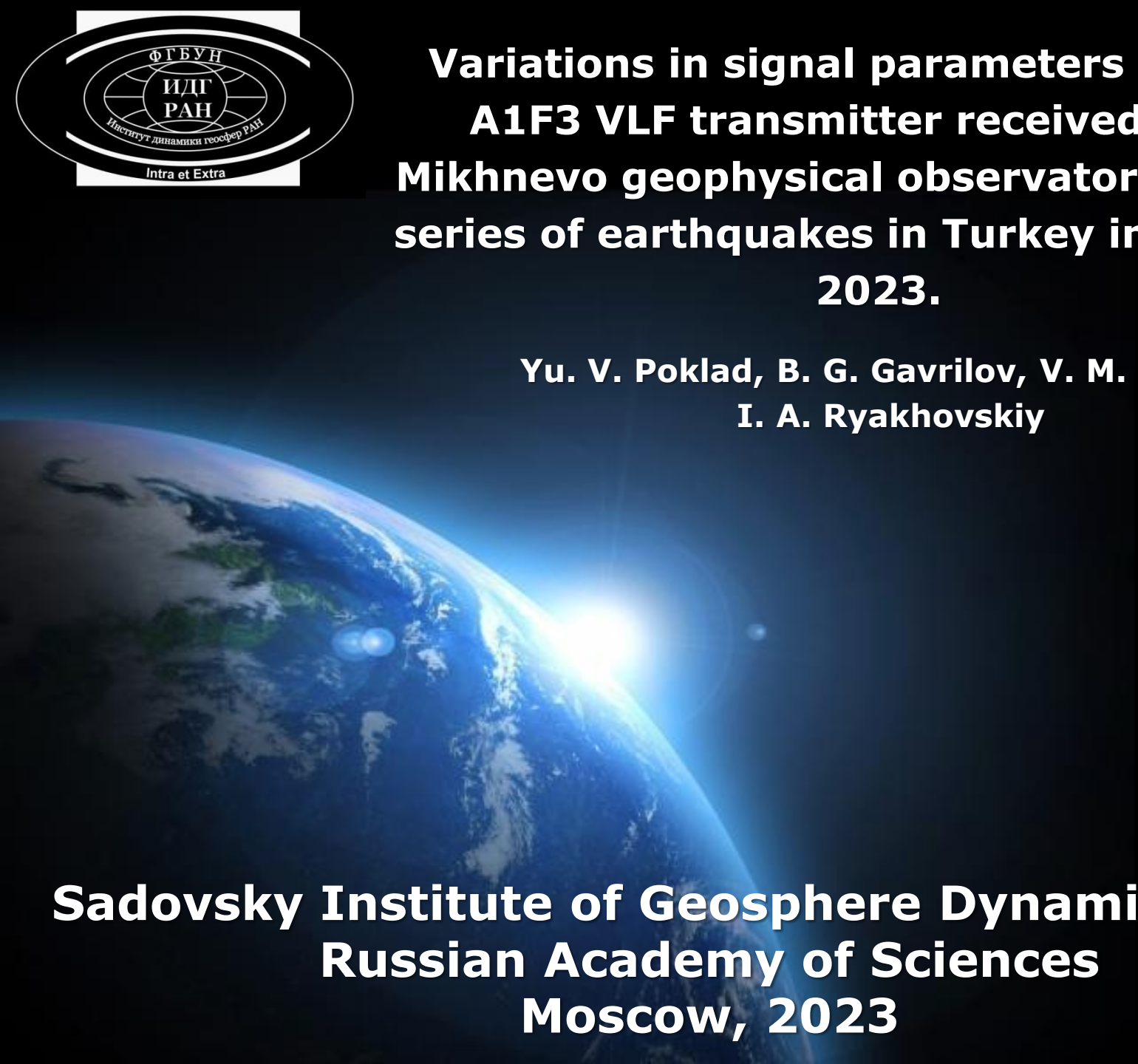
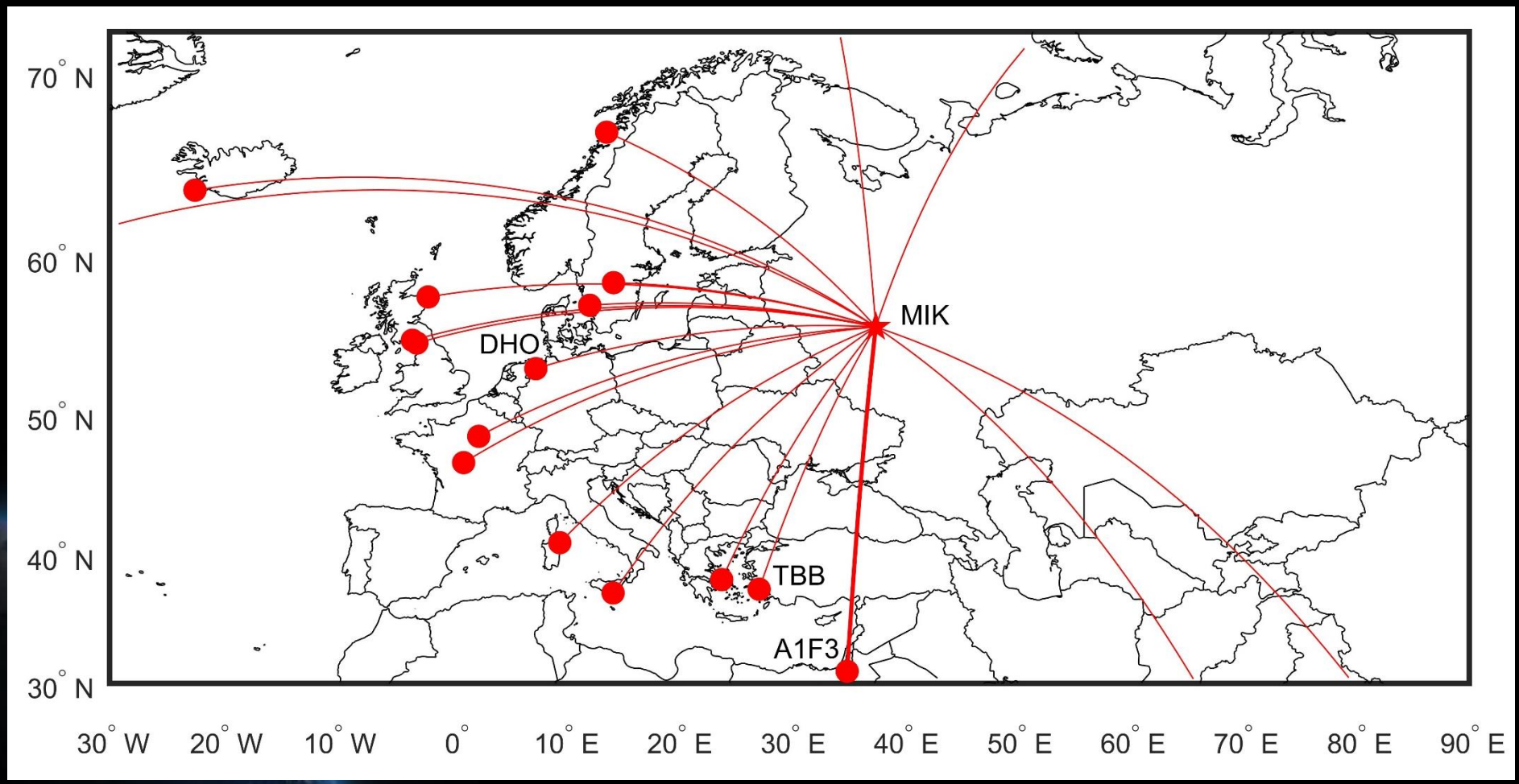


Sadovsky Institute of Geosphere Dynamics of the Russian Academy of Sciences
Moscow, 2023

Map of VHF radio transmitters, received at the "Mikhnevo" geophysical observatory, and their paths

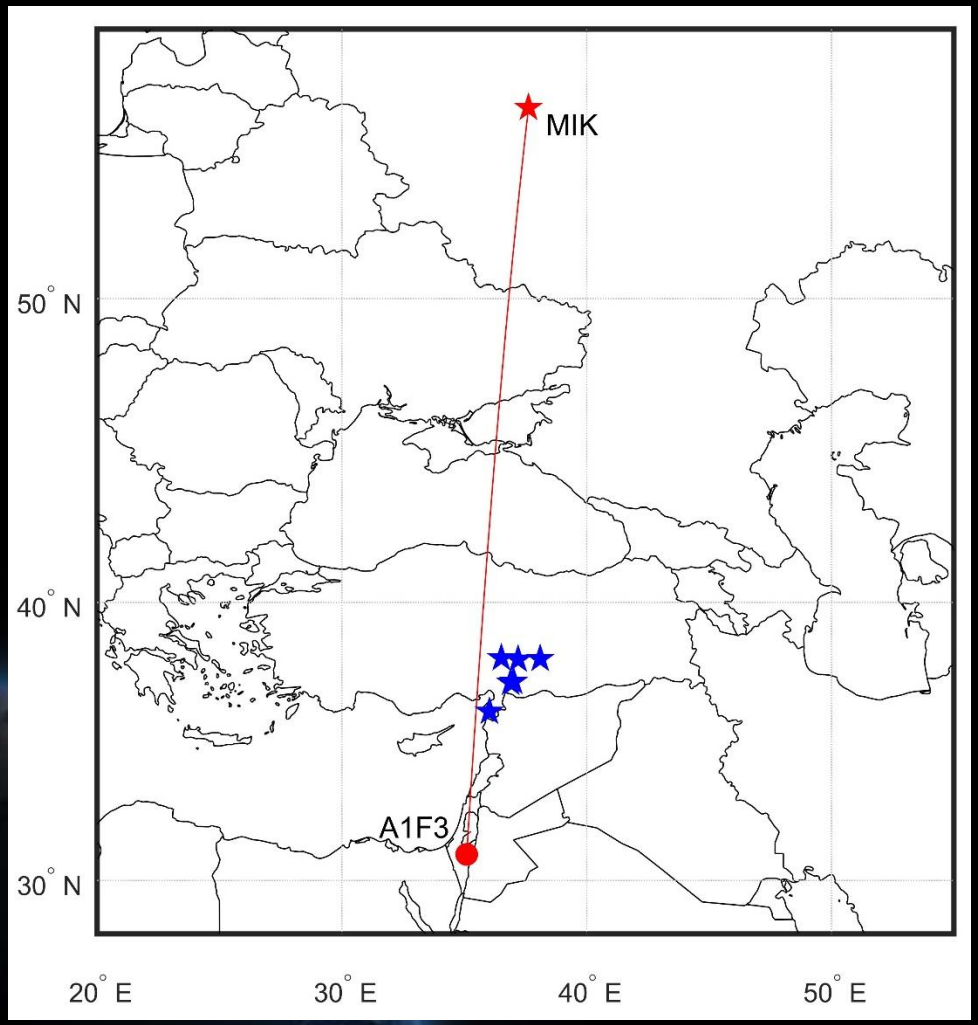
The Mikhnevo observatory is located 100 km south of Moscow: 54°57'N, 37°46'51"E



VLF transmitters, received in «Mikhnevo» observatory, up to 30 kHz.

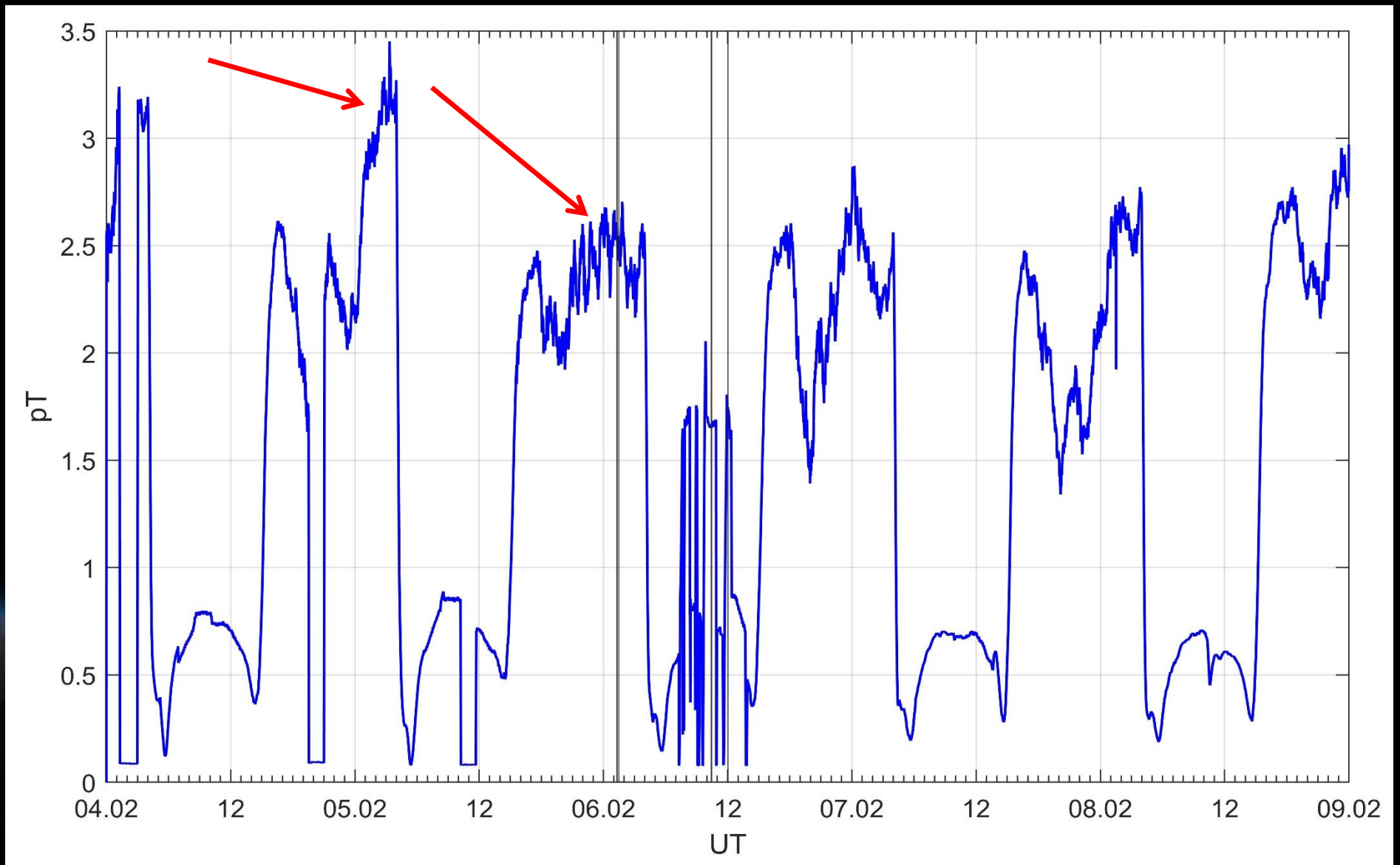
VLF Transmitter	Frequency, Hz	Bitrate, bps	Latitude	Longitude	Location
VTX	16300, 17000	200	08.387	77.753	India
JXN	16400	200	66.970	13.880	Norway
HWU	18300, 21750	200	46.713	1.245	France
GBZ	19580	200	54.912	-3.278	UK
NWC	19800	200	-21.816	114.166	Australia
ICV	20270	200	40.923	9.731	Italy
FTA	20900	200	48.545	2.579	France
GQD	22100	200	54.732	-2.883	UK
DHO	23400	200	53.074	7.614	Germany
NAA	24000	200	44.645	-67.282	USA
NPM	21400	200	21.420	-158.151	USA
TBB	26700	100	37.418	27.323	Turkey
A1F3	29700	200	30.969	35.096	Israel

Map with marks of the A1F3 transmitter, the Mikhnevo geophysical observatory and earthquake epicenters.



Date	Time	Lat.	Lon.	Mag.	Dist.
06.02.23	01:17:34	37.23	37.01	7.8	127
06.02.23	01:28:15	37.19	36.89	6.7	114
06.02.23	10:24:48	38.01	37.20	7.5	132
06.02.23	10:26:46	38.03	38.10	6	212
06.02.23	12:02:11	38.06	36.51	6	74
20.02.23	17:04:29	36.16	36.03	6.3	44

Amplitude of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 04 to Feb 09.



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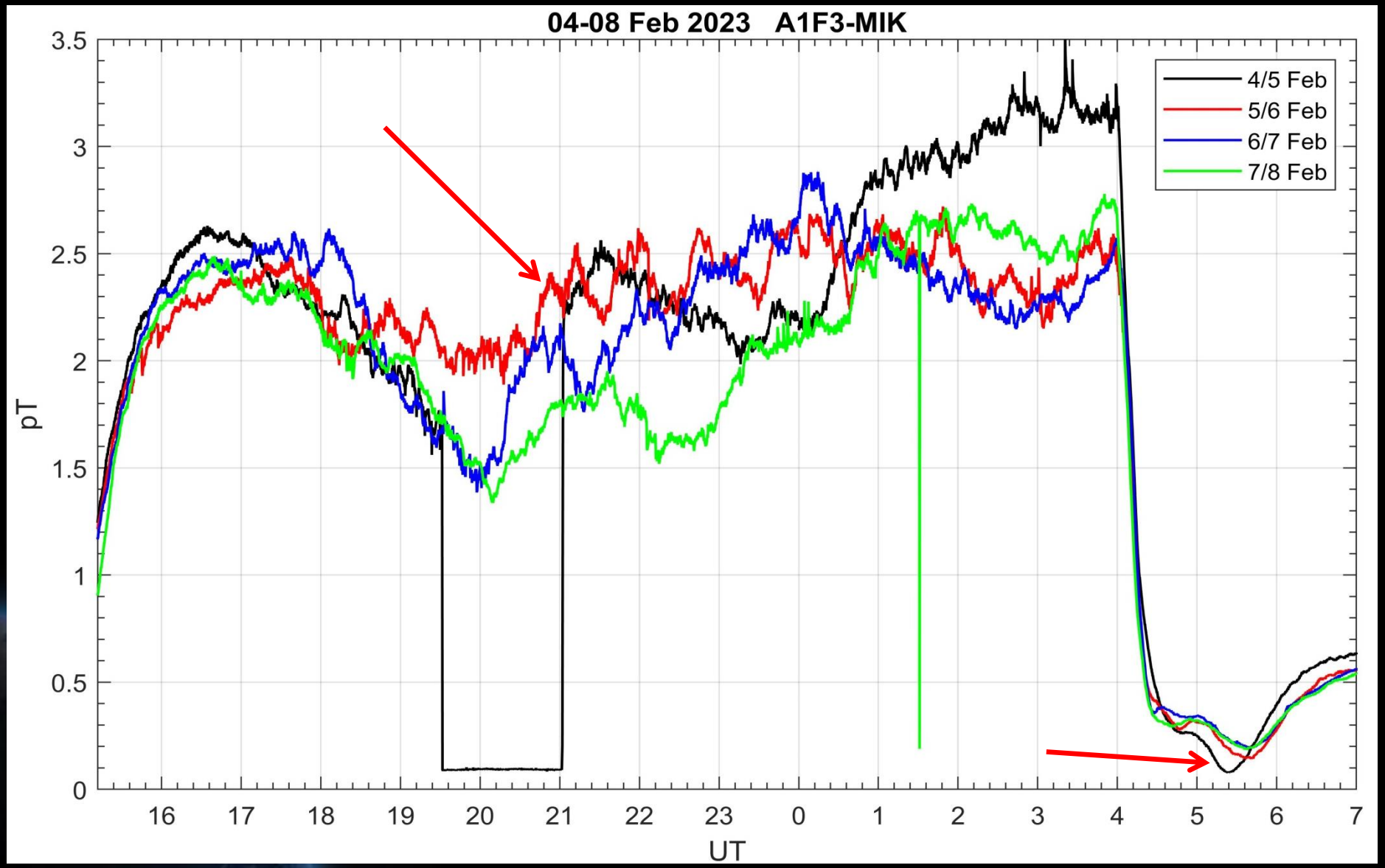
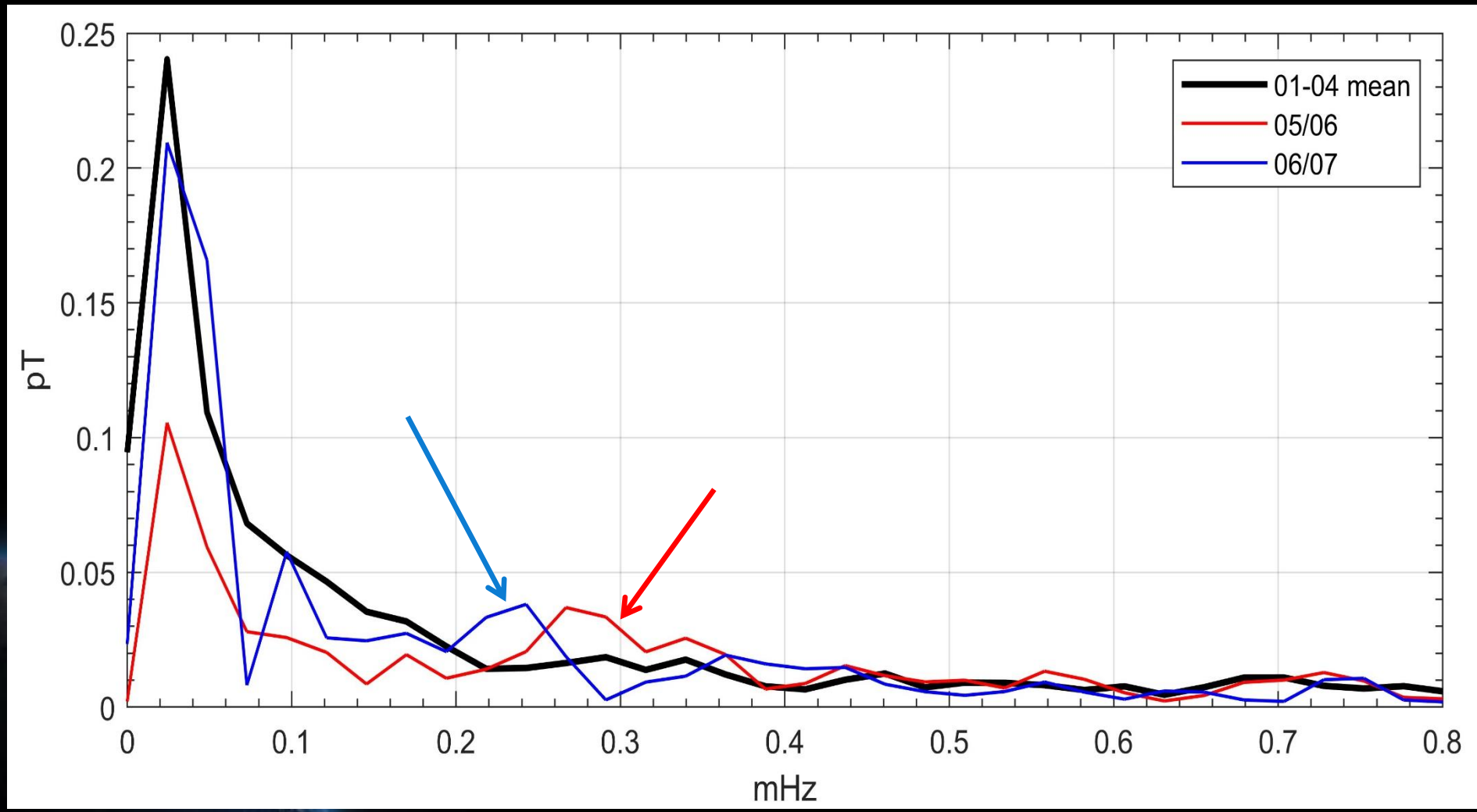
"Night" amplitude of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 04 to Feb 08.



Spectra of variations in the amplitude of the nighttime signals of the A1F3 transmitter from February 1 to 8



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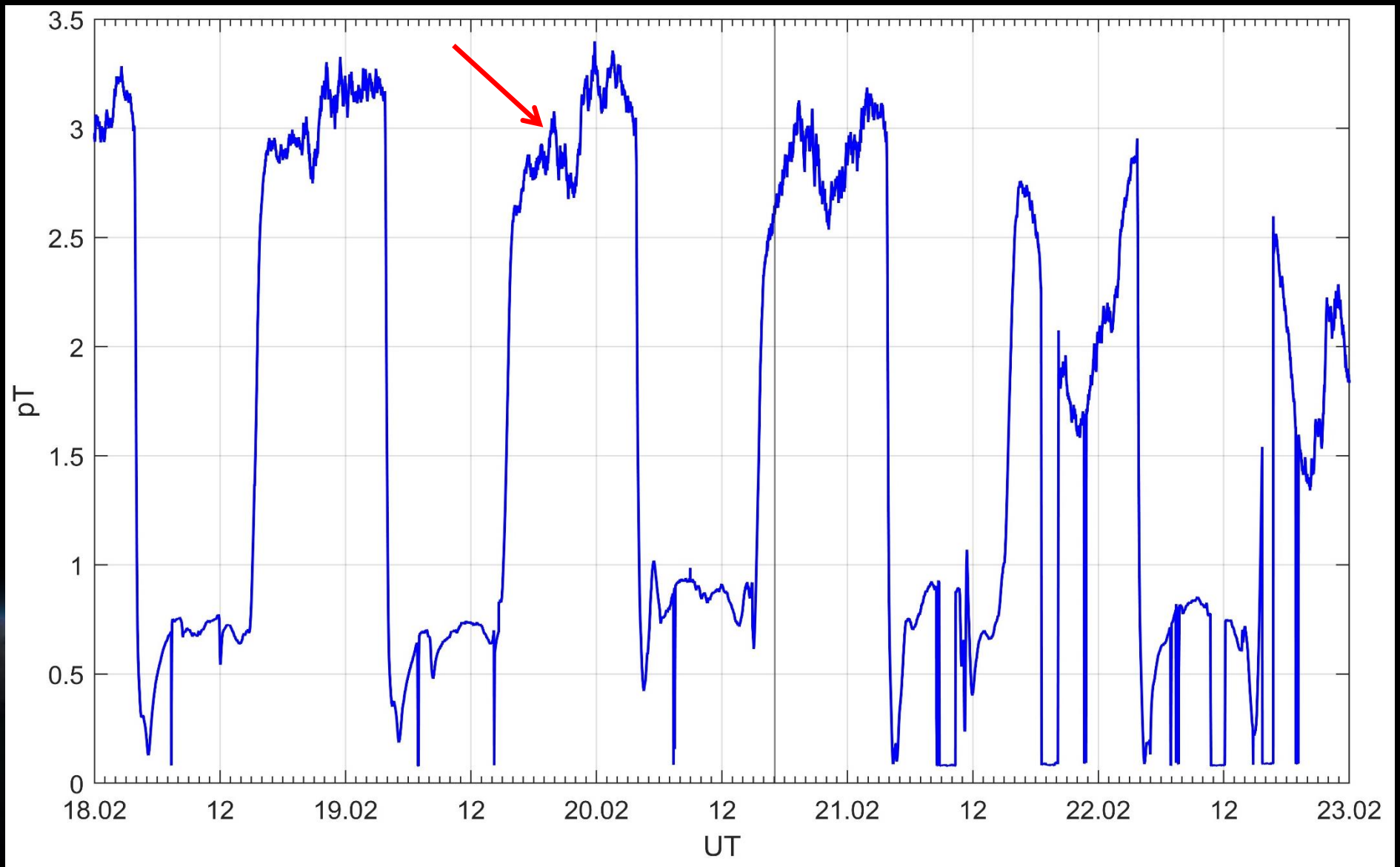
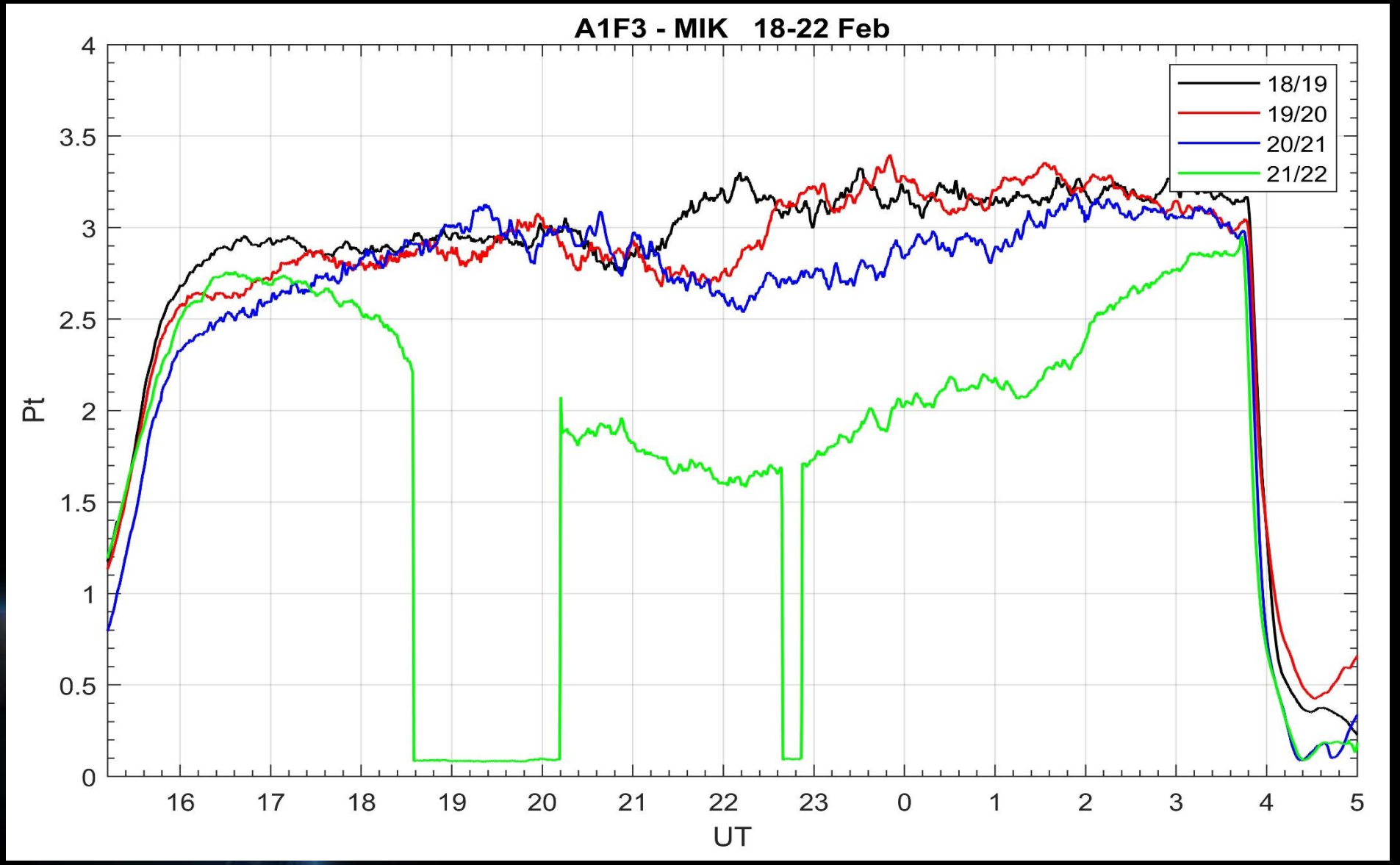
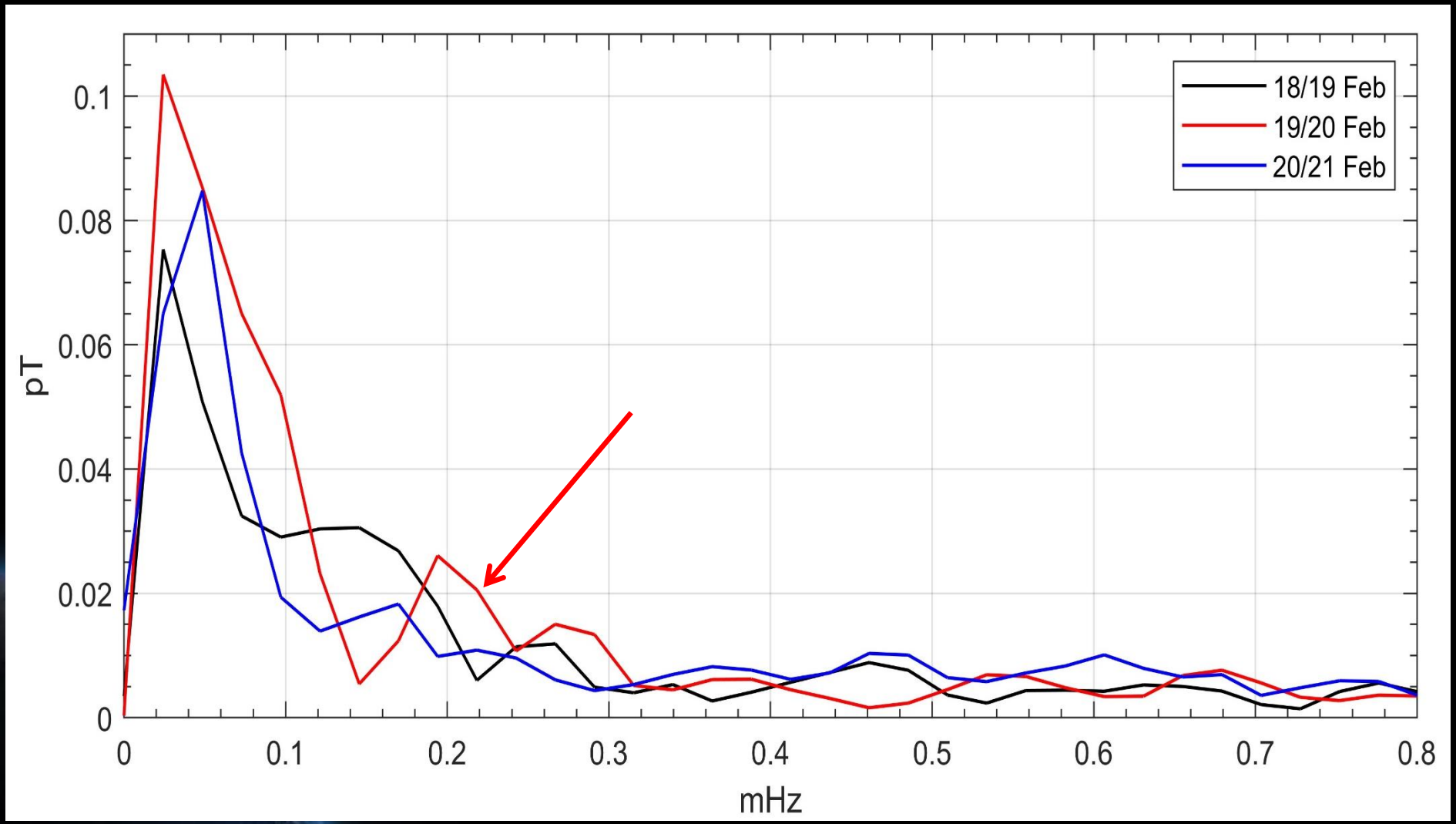
Amplitude of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 19 to Feb 22.



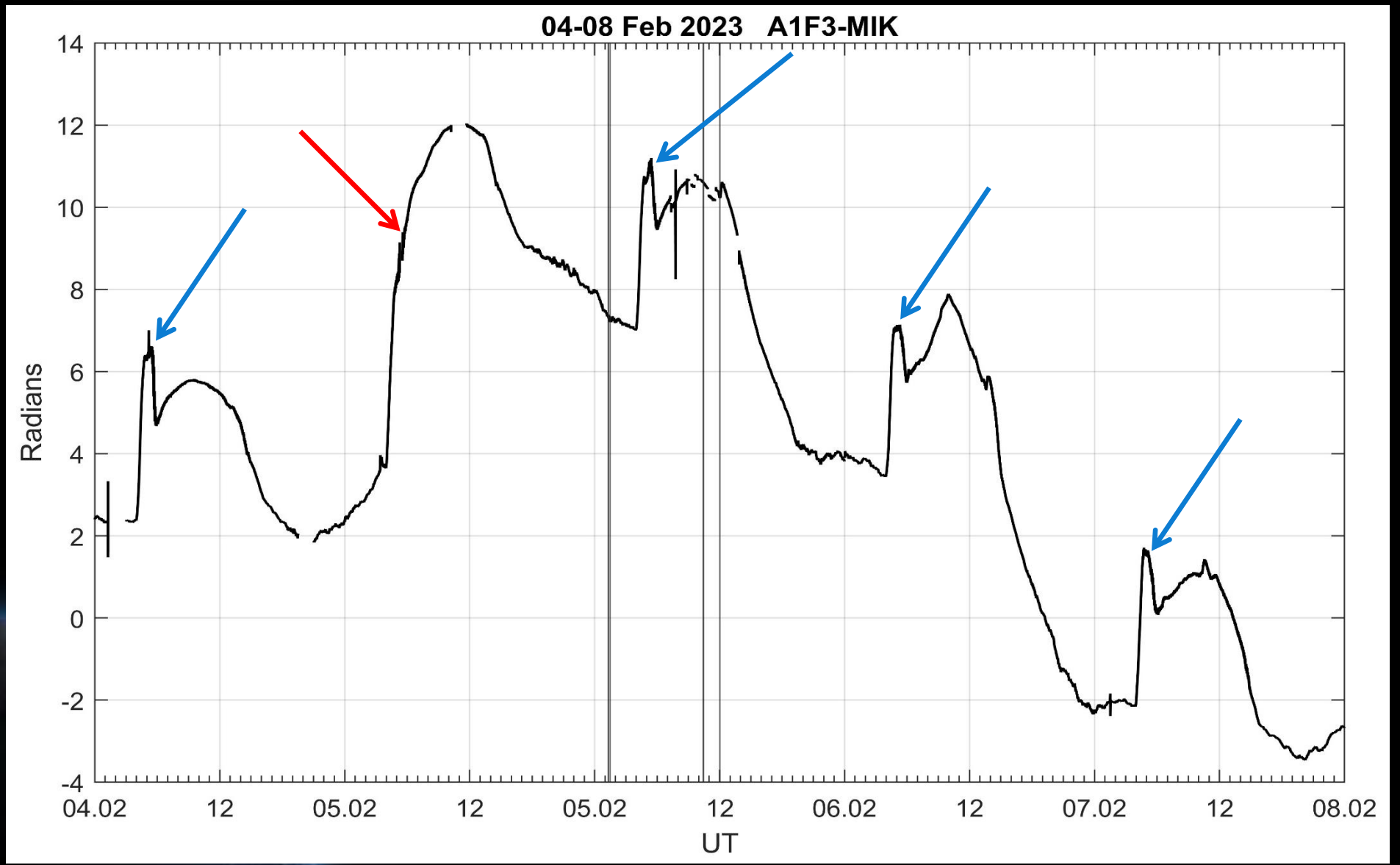
“Night” amplitude of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 18 to Feb 22.



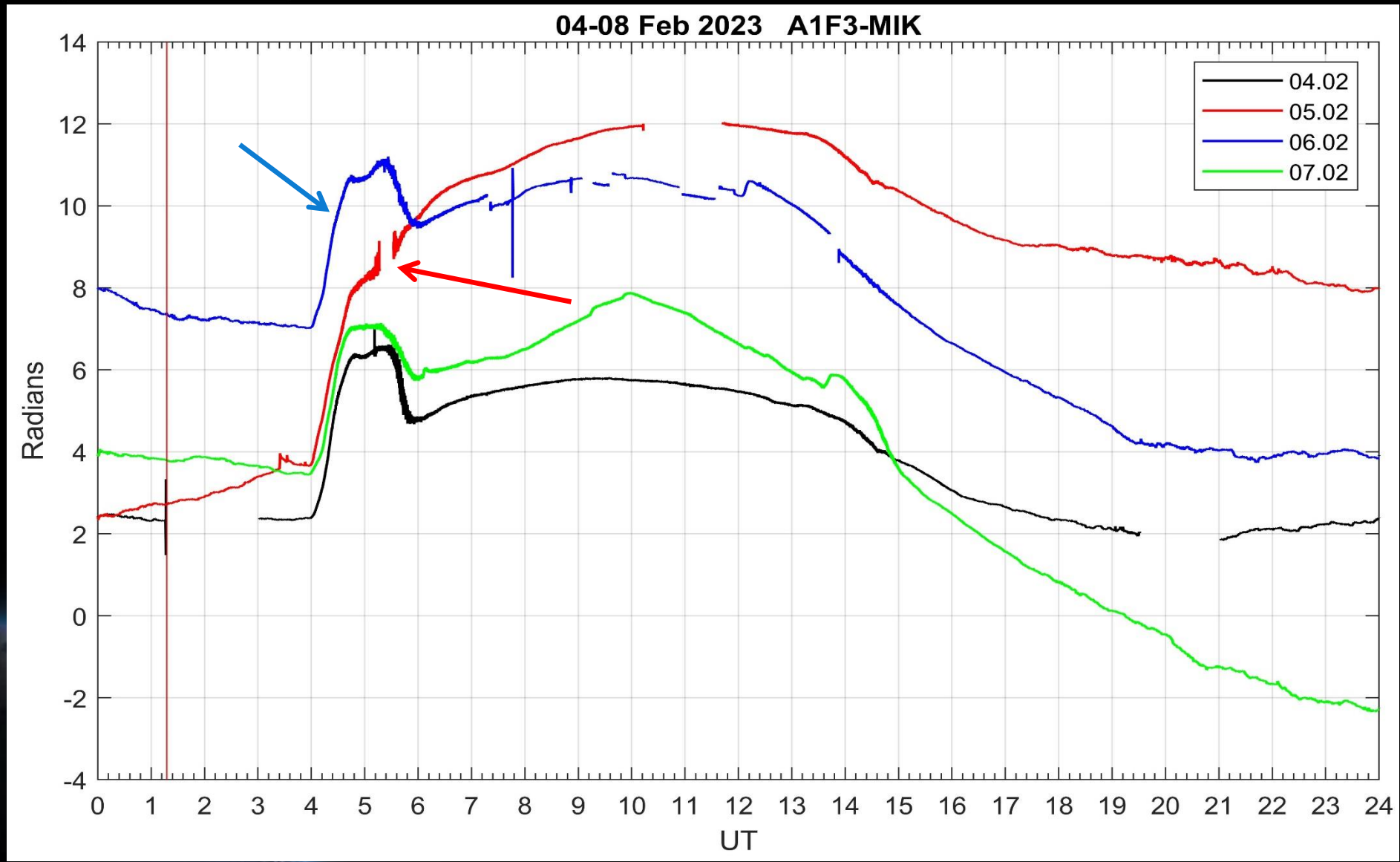
Spectra of variations in the amplitude of the nighttime signals of the A1F3 transmitter from February 1 to 8



Phase of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 04 to Feb 09.



Phase of the A1F3 transmitter signal, received in the Mikhnevo geophysical observatory from Feb 04 to Feb 09.



Conclusions

1. During the day before and after the earthquake at night, fluctuations in the amplitude of the signal from station A1F3 were observed at frequencies of 0.25-0.35 MHz.
2. At the morning terminator before the earthquake, a continuous increase in the phase of the A1F3 transmitter signal was observed, which was absent on other days.
3. These effects may be associated with earthquake preparation processes.

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Thank you for your attention!