2019 Space Weather Activities in Ukraine

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Current goals

- Create an operational space weather centre

- Expand and integrate the space weather instrument network

- Develop plans to use available and future ground instruments to support international and national space missions
Ground segment development

- Installed LEMI-025 1-second-resolution magnetometers at Odesa magnetic observatory and at Vernadsky Antarctic Station
- Installed VSRPC digital ionosondes in Kharkiv and at Vernadsky Antarctic Station
- Installed LEMI-423 magnetotelluric stations in Malyn and Kamianets-Podilskyi
- Expanded GNSS reference stations network
- Upgraded K-120-R VLF receivers in Kamianets-Podilskyi and Gorodok
VLF method: hardware

- Frequency band 0-100 kHz
- Dynamic range 120 dB
- Noise amplitude 1-3 mV
- Distance to the source >10000 km
VLF method: software

Detection of ionospheric anomalies in the amplitude of the carrier frequency of the VLF station
Local geomagnetic forecast

- Updated product, pre-operational phase
- Directly predicts magnetic components at a given observatory
- Lead time: 3 hours + propagation time from L1
- Currently deployed at Main Center of Special Monitoring for Boulder (USA) magnetic observatory
- Co-developed by Space Research Institute and Main Center of Special Monitoring
Regional ionospheric model CERIM

- Updated product
- Provides:
  - peak values of critical frequency (foF2), maximum electron density (NmF2), and height of the maximum electron density layer (hmF2);
  - diurnal variations of maximum electron density (NmF2)
- Developed by the Institute of Ionosphere
Finding: Weak storms modulate ionosphere-plasmasphere interaction (Institute of Ionosphere)

Enhancement of auroral activity increases O\(^+\) density in the topside ionosphere, which cuts off H\(^+\) flux directed to the ionosphere.

See details in (Kotov et al. 2019)

https://doi.org/10.1029/2019JA027076
Plans for 2020

- Finalize the assembly of Microsat spacecraft
- Finalize the construction of a new operations room at MCSM, which will host duty space weather forecasters
- Assemble and install the third K-120-R VLF receiver from spare parts
- Further expand GNSS network
- Design a geophysical class rocket for ionospheric studies
Thank you!