

OPTICAL INSTRUMENTS OF THE NATIONAL HELIOGEOPHYSICAL COMPLEX OF RAS

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Optical instruments for support of complex research of the Earth's upper atmosphere over Eastern Siberia are the modern photometry and spectrometry devices adapted for aeronomical studies. The instruments for airglow passive observations were built up and got the first light in 2020–2023. The instruments are Fabry-Perot interferometers, all-sky imagers, fast photometers and spectrometers of visible and infrared range. The most powerful and modern optical instrument is the multi-wave troposphere-stratosphere-mesosphere-thermosphere lidar now under construction.

During the installation and adjustment stage the instruments have collected some amount of data allowing to illustrate some effects in the airglow during such geophysical events as geomagnetic storms, sudden stratospheric warmings, tidal bores, thunderstorms, regular seasonal and diurnal variations, and also under artificial impacts on the upper atmosphere. The high research potential of the datasets is the multiplicity of information about fine spectral features and spatial and temporal variations of the airglow, temperature and wind. As the optical instruments work in the same atmospheric region with the incoherent scatter radar and the set of ionosondes and GNSS stations, we can observe synchronic variations of neutral and ionized components of the upper atmosphere.

The infrastructure surrounding these optical instruments has been very effective in the educational process in the fields of atmospheric science, space science, and optical instrumentation. We have already conducted several educational events for students and young scientists using these optical instruments.

The set of passive optical instruments should be spread along the meridian from 50° N to 70° N and even higher to support the International Meridian Circle Program. We already have the possibility to close this gap with existing equipment. Future development of the helio-geophysical complex of RAS gives rise to other instruments (lidar, IS radar, heating facility) equipped with the optical instruments as additional sensors, and after finalization the project we can have a rather dense network of observational stations from Mongolian border to the Arctic.

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