

WMO-CIMO Testbed for Meteorological, Radiation and Ozone Observations - Voeikov Main Geophysical Observatory (Saint Petersburg, Russian Federation)

General Site Information

Voeikov Main Geophysical Observatory (MGO) is the oldest meteorological institution in the Russian Federation. It was founded in Saint Petersburg on 1 April 1849, under the decree of Emperor Nicholas I of Russia. Since its very foundation, MGO has been serving as a research and methodological centre for the national weather observation system, including specialized networks such as those providing radiation, total ozone, heat balance, air pollution, atmospheric precipitation chemistry, atmospheric electricity, radar and greenhouse gases monitoring.

The testbed Voeikovo is a division of MGO and it was founded in December 1944 as a meteorological station. At the beginning, the weather station had been named "Seltsy" and later it was renamed to "Voeikovo". The height of the station is 72 m above the sea level.

Currently, the testbed Voeikovo carries out the following practical and scientific functions:

- performing the whole range of meteorological, radiation, heat balance and total ozone observations;
- exploiting, field testing and intercomparing new automatic measurement instruments and systems, aimed at determining reliability and comparability of the measurement results, as well as their suitability for the national meteorological network;
- verifying and calibrating working reference measurement instruments, operational and spare measurement instruments and sensors;
- developing guidelines, methods, recommendations and methodological regulatory documentation in the field of meteorological, radiation, heat balance and total ozone observations;
- providing methodological support for implementation of new measurement tools in the national observation network.

Testbed location: 59.95 °N; 30.70 °E

Climate type: Dfb (Temperate continental climate)

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Main activities

Areas of research

The main Voeikovo testbed's research area covers in-situ meteorological, radiation, heat balance and total ozone observations. In particular, over the past 5 years the following activities have been performed:

- field testing of meteorological optical range sensors under different meteorological conditions, especially atmospheric phenomena of varying intensity and worsening visibility range; development and implementation of algorithms for primary processing of nephelometer measurement results;
- field testing of different types of weighing precipitation gauges under different meteorological conditions during the period of precipitation, identifying comparability of measurement results between automatic instruments and the standard network instrument;
- exploitation of new automatic soil temperature sensors at different depths (Russian production), development of recommendations to manufacturers on how to improve equipment design, and development and selection of optimal processing algorithms with measurement results generalization;
- field testing of automated actinometric measurement systems of different manufacturers;
- field testing of new automatic ultraviolet ozone spectrometers (UVOS), manufactured in the Russian Federation.

Capabilities

The testbed Voeikovo runs 24-hr meteorological observations, which include air temperature, air humidity characteristics, wind speed and direction, atmospheric pressure, ground surface temperature, soil temperature at different depths, meteorological visibility, amount and type of clouds, cloud base height, amount and intensity of precipitation, state of the ground, snow height and sunshine duration. The radiation and heat balance measurements data have been gathering constantly, in addition to the standard meteorological observations.

The testbed Voeikovo performs the regular manual measurements of the total ozone content (TOC) with the filter ozonometers M-124 and recording of TOC and spectral composition of the ultraviolet radiation using automated ultraviolet ozone spectrometers, as well as in clear sky, measuring TOC with Dobson spectrophotometer (Dobson instrument) No. 108.

There are seven high graduated specialists on the testbed Voeikovo.

Facilities

The Voeikov MGO has:

- fenced plot of land in the permanent use of MGO;
- a meteorological site of 52x52 m², allowing to accommodate a huge number of various meteorological instruments;
- office building, including classroom facilities;
- reference instrument base;
- solar power station (2 kW).

Measurement	Instrument
Atmospheric precipitation amount and intensity	-Precipitation weighing gauge OTT Pluvio ² 200 in the defense of Alter, -Precipitation weighing gauge Peleng SF-11 in defense of Tretyakov, -Standart network precipitation gauge O-1 in defense of Tretyakov.
Sunshine duration	CSD3 Sunshine Duration Sensor, Heliograph.
Atmospheric pressure	Digital barometer PTB 220
Air temperature and humidity	Air temperature and humidity sensor HMP155
Wind	Wind sensor Young, Wind Set WA15.
Fresh snow height	SR50a Sonic Ranging sensor
Cloud height	Ceilometer CL31
Prevailing visibility	Weather Detector PWD20
Soil Temperature	Soil Temperature Sensor QMT110
Depth soil temperature	Temperature sensor TSMP
Surface heat balance	Aspiration psychrometer, anemometer, balancemeter M-10M
Direct solar radiation	CHP1 Pyrheliometer, Actinometer Peleng SF-12.
Diffuse solar radiation	CMP6 Pyranometer, Pyranometer Peleng SF-06.
Total solar radiation	CMP6 Pyranometer, Pyranometer Peleng SF-06.
Reflected solar radiation	CMP6 Pyranometer, Pyranometer Peleng SF-06.
Total longwave radiation	CGR4 Pyrgeometer
Reflected longwave radiation	CGR4 Pyrgeometer
Radiation balance	Balancemeter Peleng SF-08

O ₃ (Total ozone)	Dobson instrument No. 108, Filter ozonometers M-124
Spectral UV, O ₃ (Total ozone)	Ultraviolet ozone spectrometers (UVOS)
Broadband EUV	Broadband UV instruments UVI

Ongoing and planned projects

- Systematic and random error analysis of the weighing precipitation gauges of the OTT Pluvio²200 depending on the associated meteorological conditions and the atmospheric type of precipitation.
To accomplish this task, three weighing precipitation gauges OTT Pluvio²200 are installed triangularly, at the testbed. Archiving of measurement results is conducted, together with preliminary analysis. Upon the required data volume will have been accumulated, a detailed analysis of the errors of these types of precipitation gauges will be made.
- Different precipitation gauges measurement results comparison under different meteorological conditions and types of precipitation.
- Development and selection of optimal algorithms for processing and synthesizing results of the sunshine duration observations; sunshine duration observation results intercomparison between the CSD3 automatic sensor and heliograph.

Publication list

Results of the pilot operation phase of the Peleng SF-11 weighing gauge. Voeikov Main Geophysical Observatory Proceedings, 569, 2013.

<http://voeikovmgo.ru/images/stories/publications/569.pdf>

Recommendations on the operation of automated meteorological systems in observation sub-units. http://voeikovmgo.ru/images/download/publication/2014/52_04_818_2014.pdf

RD 52.04.839-2016 Guidance on output and processing of observational data of atmospheric precipitation at automatic weather stations.

<http://voeikovmgo.ru/images/stories/publications/2016/me.pdf>

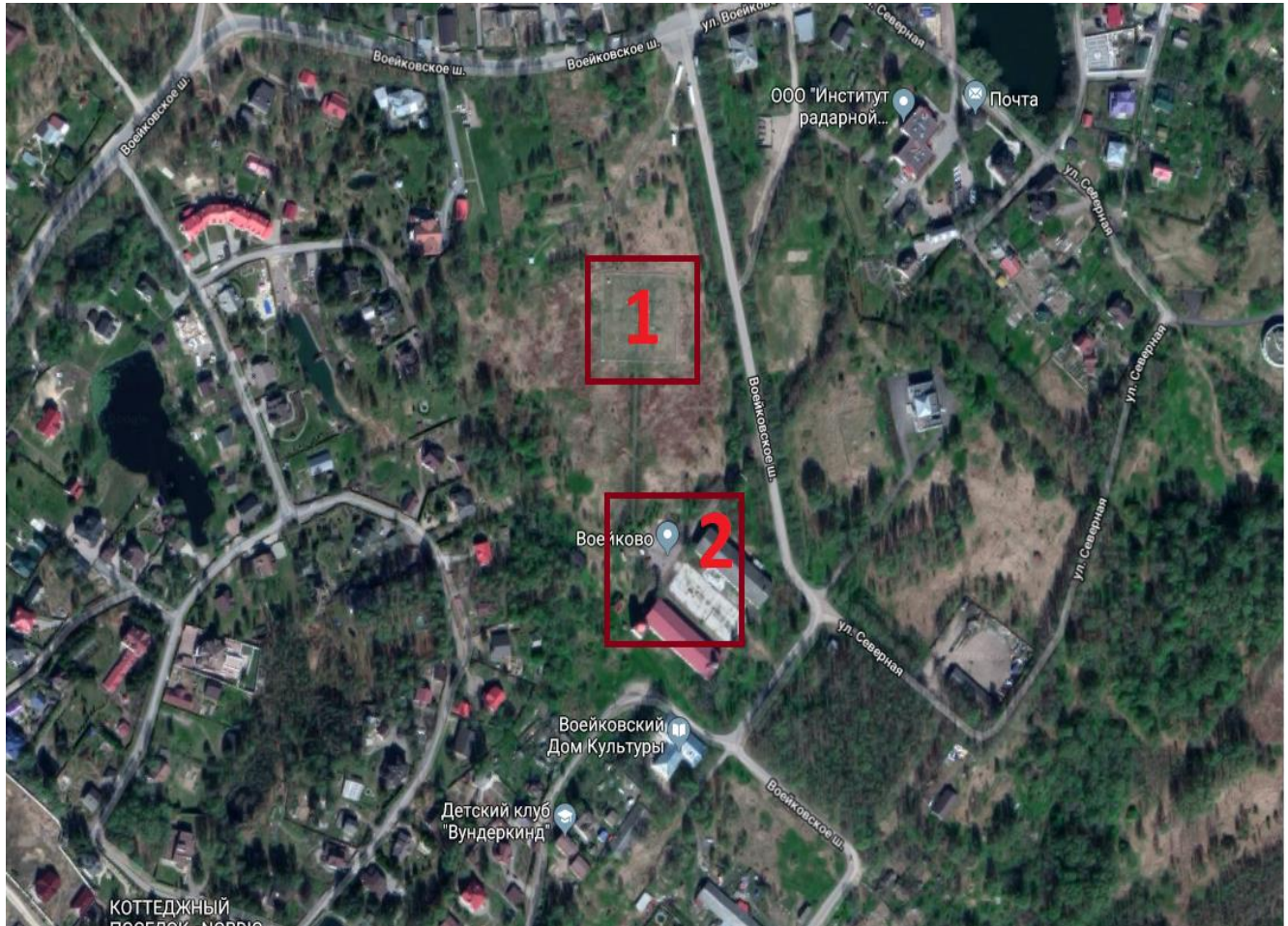
RD 52.04.859-2016 Terms and definitions in the field of heat balance measurements

<http://voeikovmgo.ru/images/download/publication/2017/10/1.pdf>

Guidelines for the use of additional sensors in the automatic meteorological complex

<http://voeikovmgo.ru/images/stories/publications/2018/>

Site Maps



1 – Meteorological station

2 – Administrative building

Site Photographs



Meteorological Voeikov testbed



Solar radiation instruments at the Voeikov testbed



Precipitation gauge testing



Total ozone measurements

Web Links

The Voeikov Main Geophysical Observatory

<http://voeikovmgo.ru>

The Roshydromet Climate Centre

<http://cc.voeikovmgo.ru/ru/>