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GRUAN Station Report for Dolgoprudny

(Submitted by Alexander Kats)

Summary and Purpose of Document

Report from the GRUAN station Dolgoprudny for the period March 2015 to March 2016.



GRUAN Station Report for Dolgoprudny (DLG)

Reporting for the period Mar 2015 to Mar 2016

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Overview

The site is operated by Central Aerological Observatory (CAO) of Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), National Hydrometeorological Service of Russian Federation. CAO is the leading Roshydromet institute on observations in free atmosphere up to 100 km including operational and research upper-air sounding.

CAO has both research and operational staff. Operational staff performs following routine observations: upper air, total ozone column and weather radar observations. Results of routine observations are disseminated on national, regional and international basis.

Upper air observations started since 1940. They are performed twice per day at 00 and 12 UTC, the station name in WMO No.9, Vol.A is MOSKVA (DOLGOPRUDNYJ), index number is 27612 – not to be mixed with station 27612 MOSKVA VDNH, which has a separate entry in Vol.A and situated in another location. Results are disseminated to GTS both in FM35 and BUFR (native, from MARL – with high-resolution data).

CAO operates two aerological secondary radars (older AVK with dish antenna and modern MARL with phased array antenna) and [variety of domestic radiosondes types](#) from different manufacturers with rather obsolete white painted rod thermistor (without pressure sensor) for many reason not suitable for GRUAN operations – the primary is competitive federal procurement procedure.

"The best technology currently available at the site" is considered to be MODEM M2K2-DC radiosonde which is in use for research launches, dual and triple flights for evaluation quality of domestic radiosondes and expeditions.

Dolgoprudny uses 500g Zhuzhou HWOYEE HY-500 balloons with non-uniform performance noticeably degrading in cold time:

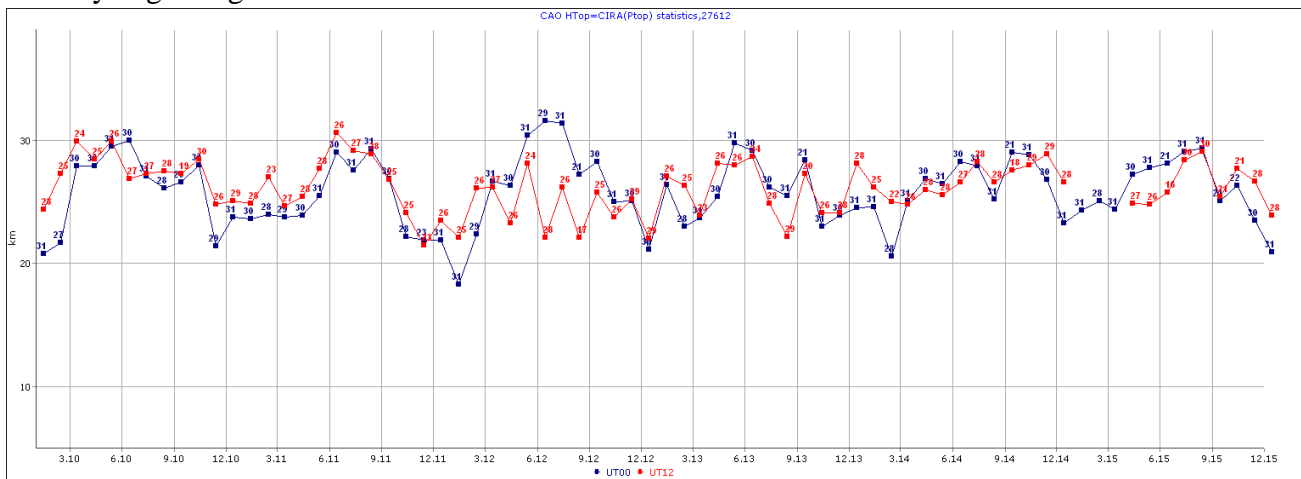


Figure 1: Average monthly sounding heights.

Routine total ozone column observations are performed using M-124 filter ozonometer on the daily basis. Data are submitted to World Ozone and Ultraviolet Radiation Data Centre via Main Geophysical Observatory, [WOUDC Station ID 116 MSC](#).

Weather radar observations are performed with Doppler weather radar DMRL-C, [WMO index number is 39422, the name is Sheremetyevo](#).

Research personnel operates numerous instrumentation both on the regular (or quasi-regular) basis and occasionally, their results are used for scientific researches and special programs. Most of regular scientific observations are, naturally, automated ones and are performed on continuous basis without necessity of consumables and handwork.

The primary interest for GRUAN is GNSS-PW instrumentation operated since 2012: Javad Sigma-G3T GNSS geodetic grade receiver (1 or 10 s sampling rate) equipped with JAV_RINGANT-G3T and automatic weather station (1 min sampling rate), GNSS site identification DOLG.

Another PW instrumentation is under test - new ground-based microwave system "Microradkom", providing nearly continuous measurements of temperature profiles of the troposphere, total water vapor and liquid content. Similar (but simpler and without water vapor measuring capability) equipment, [MTP-5 boundary layer temperature profiler](#) is in long-term operation.

Among others

- Total ozone: apart from M-124 we have [Dobson, Brewer, Mini-SAOZ](#).
- Boundary layer and atmospheric aerosol: TSI 3030, HCT nanoparticle spectrometer, Solair 1001+, CCN-200, multi-wave lidar.
- Last but not least, CAO operates unique Yak-42 airborne laboratory larded with a wide spectrum of instrumentation.

CAO scientist have a great experience in developing and investigating Lyman- α FLASH-B balloon hygrometer and its operation in various campaigns and expeditions but due to rather high cost of the instrument so far had little chances to launch it in Dolgoprudny. The same applies to ozonesondes launches which were organized and performed by CAO scientists in various sites in Siberia due to external grants.

Change and change management

The very first fearful steps were undertaken:

It was started preparation a draft of the document with GRUAN site essential meta-data according to GRUAN TN-6 "Essential Meta-data of New GRUAN Stations". Web-annex to the document with site related photos is located at http://cao-ntcr.mipt.ru/all_doc/caosite.

GRUAN GNSS site log was prepared according to GRUAN TD-6 "GRUAN Ground-based GNSS Site Guidelines" and submitted to GRUAN GNSS PW-TT and GFZ-Potsdam along with samples of files with GNSS and meteorological data. Filenaming conventions were agreed. Data files are archived and could be available for retrospective processing.

There were performed preliminary test flights using TOTEX TX500 balloons which proved better stability and higher burst altitudes in cold time.

Dolgoprudny site is located at 55.93°N 37.52°W 187 m amsl. It is the Kremlin which is located at 55.75°N 37.62°E indicated on GRUAN web page. It is a nice place but using hydrogen is not allowed there unfortunately.

Resourcing

We do not expect essential troubles for meeting minimum entry requirements as specified by it. 5.2.2 of GCOS-171, as operational expenditures are financed on the existing level while extra cost is not so big. The entry cost would be even less if MODEM M2K2-DC could be approved as GRUAN instrument. The most painful current challenge is human resources – most of operational personnel are retirees, which is in fact a result of financial limitations due to relatively low salary level in Roshydromet. The next great challenge is UT/LS water vapor observation where we rely upon FLASH-B implementation that is still quite expensive to Roshydromet.

Finally, experience of GRUAN site implementation in Dolgoprudny is important for establishing more GRUAN sites in Russian Federation.

Site assessment and certification

Formally Roshydromet requested CAO to prepare by the end of 2016 a draft of formal application for certification. Real observations meeting minimum GRUAN requirements are about to start not earlier than 2017. Definitely some time is required since the site started operation according GRUAN requirements before certification process could start. This is to be discussed at ICM-8.

GRUAN-related research

The most important for GRUAN seems to be researches aimed to put FLASH-B into operation. As well CAO is interested in development of GRUAN MODEM product.

Others include balloon-borne optical and electric field observations. More involvement to GRUAN research interests is expected along with further involvement of CAO scientists to Dolgoprudny site operation. Formally, Mr. A. Kats belongs to TT-Radiosonde – in fact, he was passive for the TT due to involvement into several national R&D projects of highest priority in 2012-2015.

Papers:

Mélanie Ghysels et al, Dec 2015, Atmos. Meas. Tech.: Intercomparison of in situ water vapor balloon-borne measurements from Pico-SDLA H₂O and FLASH-B in the tropical UTLS

J. Meyer et al. Atmos. Chem. Phys., 15, 8521–8538, 2015: Two decades of water vapor measurements with the FISH fluorescence hygrometer: a review.

E. N. Kadyrov et al, Nov 2015, Atmospheric and Oceanic Optics: Ground-based microwave temperature profilers: Potential and experimental data.

V. Dorokhov et al, Atmosphere-Ocean Vol.53, Issue 1, 2015: Brewer, SAOZ and Ozonesonde Observations in Siberia.

Bruce Ingleby et al, 2016, Bulletin of the American Meteorological Society: Progress towards high-resolution, real-time radiosonde reports.

WG-GRUAN interface

Letter encouraging support for development and implementation FLASH-B hygrometer would be welcomed.

Items for ICM-8 plenary discussions

- GRUAN data product and processing stream for MODEM radiosondes
- Sites not attaining regularly 10 hPa
- The Modem Radiosonde Appendix
- Ozonesonde Technical Document
- FLASH-B potential as GRUAN instrument
- But the main topics under interest – what is to be a GRUAN site and site-candidate?

Future plans

Nearest plans:

- Establishing automatic GNSS data flow seems to be the nearest goal. Minor preparations are required to convert meteorological data to standard RINEX format and organizing files upload according to agreed filenaming conventions.
- Completion preparation of the site meta-data collection.
- Establishing procedures of dual and, possibly, triple launches with enlarged suspension length and flight bar or bars (so far all comparison flight were performed arranging radiosondes on the same suspension $\leq 15-20$ m to simulate operational flight conditions one beneath other using synchronization by time).
- Implementation of RSLaunchClient.
- Training routine staff for operation with RSLaunchClient, MODEM SR10 M2K2-DC (there is rather a large stock of them available) and multiple radiosonde rig releases.
- Performing special tests flights with FLASH-B hygrometer.

Mid-term plans:

- Arranging weekly MODEM M10 launches according to GRUAN procedures.
- Participating in establishing data product for MODEM M10 and FLASH-B hygrometer.
- Getting ready to apply for the site certification.

Long-term plans

- Organizing FLASH-B launches.
- Organizing ozonesondes launches.