
# Seventh Meeting of the Steering Committee for the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE)

**FINAL REPORT**

**St. Petersburg, Russian Federation, 27 October 2021 (online)**

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# 1. Welcome

The Seventh HYDROLARE Steering Committee Meeting was opened at 11:00 on the 27 October 2021 (online) by Prof. Valery Vuglinsky, Director of HYDROLARE. He welcomed the participants to the seventh meeting of the HYDROLARE Steering Committee. He noted that due to the coronavirus pandemic, the Steering Committee meeting was not held in 2019. In his welcome remarks he provided a brief summary of the activity of SHI, role and functions of HYDROLARE and wished the Steering Committee fruitful and efficient discussions.

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## 1.1. Introduction of participants and adoption of the Agenda

Participants were introduced to each other and after a short discussion, the agenda was adopted. The agenda is provided in Annex 1 and the list of participants in Annex 2.

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# 2. Status Report of HYDROLARE

## 2.1. Status Report of HYDROLARE, July 2017 – October 2021.

The Director of HYDROLARE Prof. Valery Vuglinsky provided an in-depth report on the status of activities and achievements made in the period from July 2017 to October 2021. In his report Prof. Vuglinskiy noted that during the reporting period the Centre operated in accordance with the work plan adopted by Roshydromet and following the recommendations of the Sixth Steering Committee meeting. This report was highly appreciated by participants as it showed the significant progress made in the reporting period. Participants acknowledged the dedicated professional work of the staff of HYDROLARE in this regard. Specific items of interest are documented below.

Prof. Valery Vuglinsky reflected main directions of HYDROLARE activity after the sixth session of the Steering Committee:

1.Continue preparation and loading of new portions of historical and current data and metadata from Russia and WMO Members into HYDROLARE database.

2.Development of the HYDROLARE IT-Infrastructure.

3.Continuation of long-term cooperation with the LEGOS laboratory on the exchange of in-situ and satellite observations data and the correction of satellite data on the lake water level and water temperature.

4.Update HYDROLARE Science and Applications plan, take into account latest official documents of WMO, GCOS (TOPC) in hydrology, and evolving tasks.

5.Prepare publications on HYDROLARE activity in scientific journals, newsletters etc.

6.Communicate with WMO on the HYDROLARE progress on a regular basis.

7.Prepare HYDROLARE newsletter (eight, ninth and tenth issued).

Prof. Vuglinskiy made a short description of each activity, and underlined the success achieved by HYDROLARE in this regard.

Prof. Valery Vuglinsky noted that In 2017, a major international program of the European Space Agency «Climate Change Initiative» (CCI) was launched. Within the framework of this program, the Lake Exploration Project is being carried out using satellites, which started in February 2019. The LEGOS laboratory and HYDROLARE are involved in this project, which aims to develop a satellite methodology for determining the following variables constituting the climate change indicator «ECV-Lakes» (GCOS international programme):

- The water level of the lake LWL
- The area of Lake LWE
- Lake Surface Water Temperature LSWT
- Lake Ice Cover LIC;
- Lake water reflectivity LWLR

The overall goal of the «Lakes» project is to prepare and perform the correction and validation of the above variables. Quality control of satellite data is an important part of the work. The LEGOS laboratory and HYDROLARE work with the sets of in-situ and satellite data for monitoring the water level of Russian lakes. The main focus is on the water bodies of the North-West of Russia: large (Ladoga, Onega, Ilmen) and medium-sized (Segozerskoe, Kumskoe, Verkhnee Kujto, Vygozero, etc.).

Constant communication was maintained with WMO and GCOS on the subject of the Center's activities:

- made comments on the requirements for lake ECVs in support of the next GCOS Implementation Plan;

- continue cooperation with WMO Secretariat and the Task Team on global data centres in respect of contributing to e.g. WHOS, HydroHub and other hydrological WMO structures;

- draft of ECV Data Sheets for ECV-Lake was prepared for GCOS Status Report 2021.

## 2.2 The Center's database – its status and maintenance

Ms Elena Kuprienok provided information on the status of data acquisition from national institutions and data centres. She reminded the Committee about general database structure and content and that in the period 2017 – 2021 the centre continued collection and preparation of data from WMO Members, with priority given to water level data (Table 1). In the period 2017-2021, the search and selection of data on water levels and temperature from the websites of the relevant services of Canada, the USA, Sweden and Slovenia and their loaded into the database of the Center continued. The Center received new data on the regime of lakes and reservoirs to replenish the long-term series from Belarus, Kyrgyzstan, Kazakhstan, Switzerland. She, also, presented the lists of stations with water temperature and maximum ice thickness data.

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**Table 1 Water level data (in-situ) in the HYDROLARE data base (status – October 2021).**

| Country | Number of stations | Period of observations | Number of lakes | Period of observations | |
|---|---|---|---|---|---|
| | | | | Mean monthly water level | Water level at the first date of each month |
| Australia | | | 220 | 1990 – 2012 | |
| Armenia | 8 | 1938 – 2013 | 1 | 1938 – 1988 | 1938 – 1988 |
| Belarus | 37 | 1901 – 2019 | | | |
| Canada | 23 | 1906 – 2019 | | | |
| Cyprus | | | 18 | 2010 – 2012 | 2010 – 2012 |
| Estonia | 23 | 1921 – 1988 | | | |
| Finland | 36 | 1847 – 2013 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Georgia | 22 | 1928 – 1988 | | | |
| Kazakhstan | 88 | 1934 – 2008 | 5 | 1934 – 2016 | 1934 – 2008 |
| Kyrgyzstan | 16 | 1927 – 2017 | 1 | 1958 – 2017 | 1958 – 2017 |
| Latvia | 31 | 1925 – 1988 | 1 | 1978 – 1988 | 1978 – 1988 |
| Mexico | | | 115 | 1930 – 2014 | 1930 – 2014 |
| Moldova | 7 | 1955 – 2010 | 2 | 1968 – 1988 | 1968 – 1988 |
| Mongolia | 15 | 1963 – 2013 | | | |
| Russian Federation | 626 | 1859 – 2020 | 33 | 1914 – 2019 | 1914 – 2019 |
| Slovenia | 3 | 1919 – 2019 | | | |
| Sweden | 6 | 1858 – 2019 | | | |
| Switzerland | 34 | 1856 – 2018 | | | |
| Turkmenistan | 8 | 1952 – 1989 | 5 | | 1958 – 1989 |
| Ukraine | 88 | 1933 – 1988 | 8 | 1952 – 1988 | 1952 – 1988 |
| United States of America | 43 | 1860 – 2019 | 7 | 1918 – 2018 | 1860 – 2000 |
| Uzbekistan | 12 | 1946 – 1988 | 2 | 1959 – 1988 | 1959 – 1988 |
| Total | 1126 | | 418 | | |

Ms Elena Kuprienok noted that the Hydrolare database has been updated with new satellite water level data obtained from the Legos laboratory. The list of lakes for which such data are contained in the center's database is presented in Table 2.

**Table 2. The list of the lakes with satellite data (without in-situ data) in the HYDROLARE database**

| Lakes | Countries | Period of observations | Lakes | Countries | Period of observa-tions |
|---|---|---|---|---|---|
| **Eurasia** | | | **North and Central America** | | |
| Bosten | China | 2002 – 2015 | Athabasca | Canada | 1992 – 2020 |
| Dongting | China | 1992 – 2015 | Champlain | Canada, USA | 2002 – 2014 |
| Hongze | China | 1992 – 2020 | Great Bear | Canada | 1992 – 2015 |
| Hulun | China | 1992 – 2020 | Great Slave | Canada | 1992 – 2015 |
| Qinghai | China | 1995 – 2020 | Manitoba | Canada | 2000 – 2020 |
| Poyang | China | 1995 – 2010 | Nettilling | Canada | 1992 – 2011 |
| Karasor | Kazakhstan | 2016 – 2010 | Winnipeg | Canada | 1992 – 2020 |
| Chukochye | Russian Federation | 2016 – 2020 | Winnipegosis | Canada | 2002 – 2020 |
| Labaz | Russian Federation | 2013 – 2020 | Izabal | Guatemala | 2002 – 2014 |
| Udyl | Russian Federation | 2013 – 2020 | Managua | Nicaragua | 2002 – 2015 |
| Beysehir | Turkey | 1992 – 2020 | Nicaragua | Nicaragua | 1992 – 2016 |
| Van | Turkey | 1995 – 2020 | | | |
| **Africa** | | | **South America** | | |
| Chad | Chad, Cameroon, Niger, Nigeria | 1992 – 2020 | Chiquita | Argentina | 1992 – 2020 |
| Albert | Congo, Uganda | 1995 – 2020 | Colhue Huapi | Argentina | 1992 – 2015 |
| Turkana | Ethiopia, Kenya | 1992 – 2020 | Titicaca | Bolivia, Peru | 1995 – 2020 |
| Malawi | Malawi, Mozambique, | 1992 – 2020 | Maracaibo | Venezuela | 2002 – 2010 |

| | | | | | |
|---|---|---|---|---|---|
| | Tanzania | | | | |
| Rukwa | Tanzania | 1992 – 2020 | | | |
| Victoria | Tanzania, Uganda, Kenya | 1992 – 2020 | | | |
| Tanganyika | Tanzania, DR Congo, Zambia, Burundi | 1992 – 2020 | | | |
| Kyoga | Uganda | 1992 – 2020 | | | |

In total, the Center's database currently contains observational data on 1050 lakes and reservoirs in 46 countries.

She also voiced the problems that hinder the effective work of the data collection.

- there are no international rules for data collection and replenishment in relation to the WMO Global Data Centers;

- due to the lack of appropriate regulations, the collection of new data for HYDROLARE database is difficult. The main data source is now foreign websites;

- in most cases countries do not update their data; only Switzerland provides regular transmission of new data to replenish long-term series.

### 2.3. Development of the HYDROLARE IT Infrastructure

Dr Ludmila Barinova informed the meeting on the recent developments of the HYDROLARE IT infrastructure. She noted that currently, the developed IT-infrastructure allows to solve various tasks, including:

- conversion and loading of new data into the database;
- maintaining a metadata database;
- search and display on the site in several versions of information about availability of data contained in the database of the Center

For the convenience of users, in addition to the previously developed means of searching for information about the availability of data in the HYDROLARE database (information search engine and electronic catalogue), an interactive cartographic interface has been developed that accelerates the search for the necessary data. In 2019, a cartographic interface was developed

that allows to get information about those organizations that provided HYDROLARE with observation data. The corresponding page of the site contains a complete list of all organizations with links to their sites and a Google map with markers of these organizations, clicking on which you can find out the name of the organization. In addition, the search engine allows to find out which organization provided the observation data for a particular station (Figure 1).

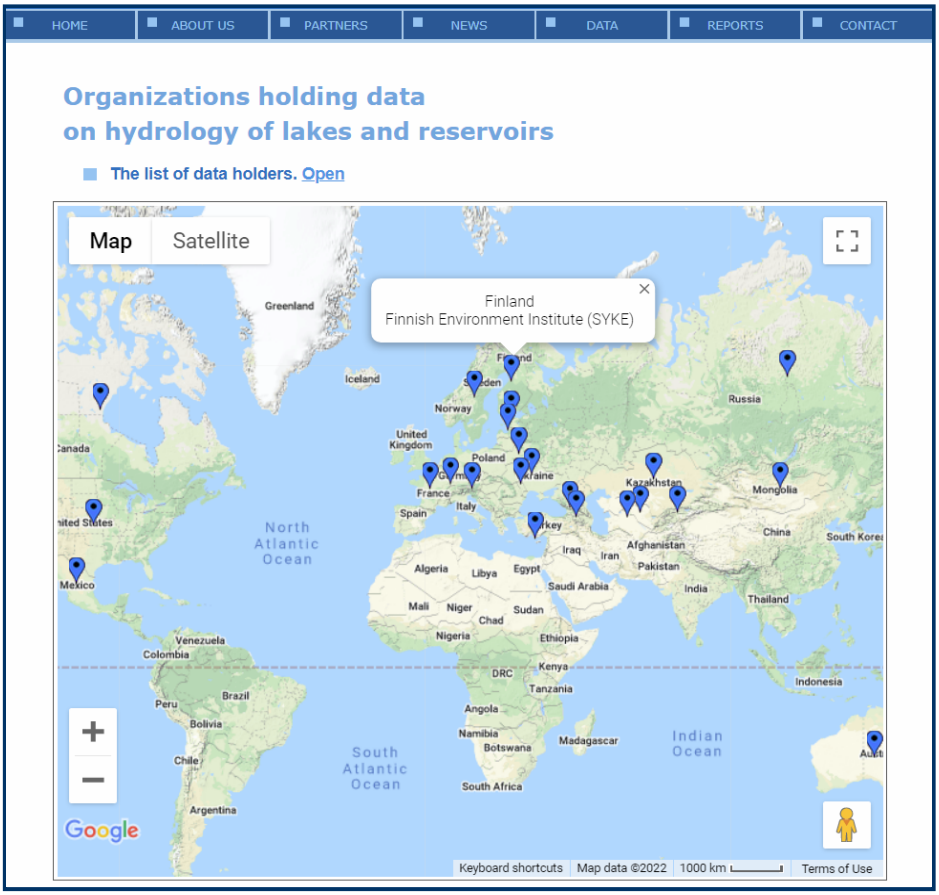


**Figure 1. Markers with data on data source organizations.**

In 2021, an interactive cartographic interface was developed to demonstrate on the Center's website a list of unregulated (natural) GTN-L lakes selected as climate change indicators (ECV-Lakes). The list contains 79 lakes from 43 countries.

During the period from May 2018 to October 2021 about 6000 users from more than 140 countries visited the HYDROLARE website. Most often, users from Russia, China and the USA.

## 3. Formation of new hydrological structures within the framework of the WMO reorganization, their goals and objectives

The report was made by the Head of the Division "Basic Systems in Hydrology" of the Department of Climate and Water of the WMO Secretariat, D. Berod. He described the main hydrological structures that have been created or continue to be created as part of the WMO reorganization in accordance with the decisions of the 18th WMO Congress (2019). D.Berod noted that the main coordinating body in the field of operational hydrology is now the Hydrological Assembly (WMO Hydrological Assembly). The Assembly is considered as an open committee that formulates the WMO policy in the field of operational hydrology and prepares relevant recommendations for the Congress and other WMO constitutional bodies. In addition to the Hydrological Assembly, other WMO hydrological structures have been created, such as: WMO Hydrological Coordination Panel, The Global Hydrometry Support Facility (HydroHub), The WMO Global Hydrological Status Assessment and Outlook System(HydroSOS), The World Water Data Initiative (WWDI) and a number of others. D.Berod described the structure, tasks and areas of activity of these new WMO hydrological bodies.

The WMO Hydrological Coordinating Panel supports and advises on issues related to the study of global and regional water resources, as well as identifies current and emerging scientific and technical problems related to world water resources and their use for their subsequent consideration at the WMO Hydrological Assembly.

The Global Hydrometry Support Fund (HydroHub) is funded by the international donor community. Structurally, it is part of the World Hydrological Observing System (WHYCOS) program, and aims to support the hydrometric activities of national hydrometeorological services in terms of developing international standards and recommendations in this area. The structure and functionality of individual units of HydroHub - this new technological system for collecting, processing, storing and distributing hydrological data, as well as serving consumers with them, in which global data centers should play a crucial role, were demonstrated. D.Berod emphasized the important role of global hydrology data centers in the implementation of the WMO Operational hydrology program and reported on a series of meetings scheduled by the WMO secretariat to be held from November 2021 to January 2022 to review in detail the activities of these centers, including HYDROLARE, and develop recommendations to strengthen the role of these centers in the implementation of the WMO hydrological program.

The WMO Global Hydrological Status Assessment and Outlook System (HydroSOS) aims to coordinate the activities of the WMO member countries to assess the current state of water resources and their possible changes in the future, both at the level of multi-year

and inter-seasonal and intra-annual fluctuations. Within the framework of this initiative, pilot projects have been launched in the Lake Victoria basin and the Ganges and Brahmaputra basins to develop the concept of such assessments with the ultimate goal of achieving subsequent global coverage of such work in assessing water resources and predicting their condition in the future.

The World Water Data Initiative (WWDI) is being implemented jointly with the World Bank and the Australian Government. Its purpose is to disseminate modern advanced strategies in the field of collection and dissemination of hydrological data, including open data policy, in order to improve the quality of information on water resources and better management of water resources.

D.Berod also provided information about the new GCOS program being developed for the coming period and, in this regard, focused on the obligations of HYDROLARE to further develop one of the climate indicators – lakes (ECV-Lake) under this program.

At the end of his speech, D. Berod confirmed the full support of the WMO for HYDROLARE's activities and stressed the importance of using both types of information – terrestrial and satellite - as data sources of the Center.

## 4. Review of GTN-H activities

The representative of the Federal Institute of Hydrology H.Th.Recknagel (Germany) made a report on the current status of the Global Terrestrial Network – Hydrology (GTN-H) project. He provided information on behalf of the project manager S.Dietrich (Germany), who was unable to attend the meeting. H.Th.Recknagel named as the main tasks of the project at the present stage the coordination of the activities of the WMO global hydrology data centers and the supervision of the preparation of data on terrestrial hydrological essential climate varibles (ECV) for the GCOS program, as well as ensuring the preparation of global and regional products by the above-mentioned centers for the WMO and GCOS programs.

He provided detailed information about the regular 10th session of the GTN-H SSG held in the period of June 15-16, 2021, which was held remotely. The session featured presentations by representatives of global hydrology data centers (including HYDROLARE) on their current activities and discussed prospective requirements for the centers from international organizations (WMO, GCOS, UNESCO, GEO, UNEP).

A detailed discussion took place on the future activities of global data centers operating under the GTN-H project. At the end of the session, the results of the implementation of the project work plan for 2019-2021 were discussed and a new project work plan for 2021-2023 was approved.

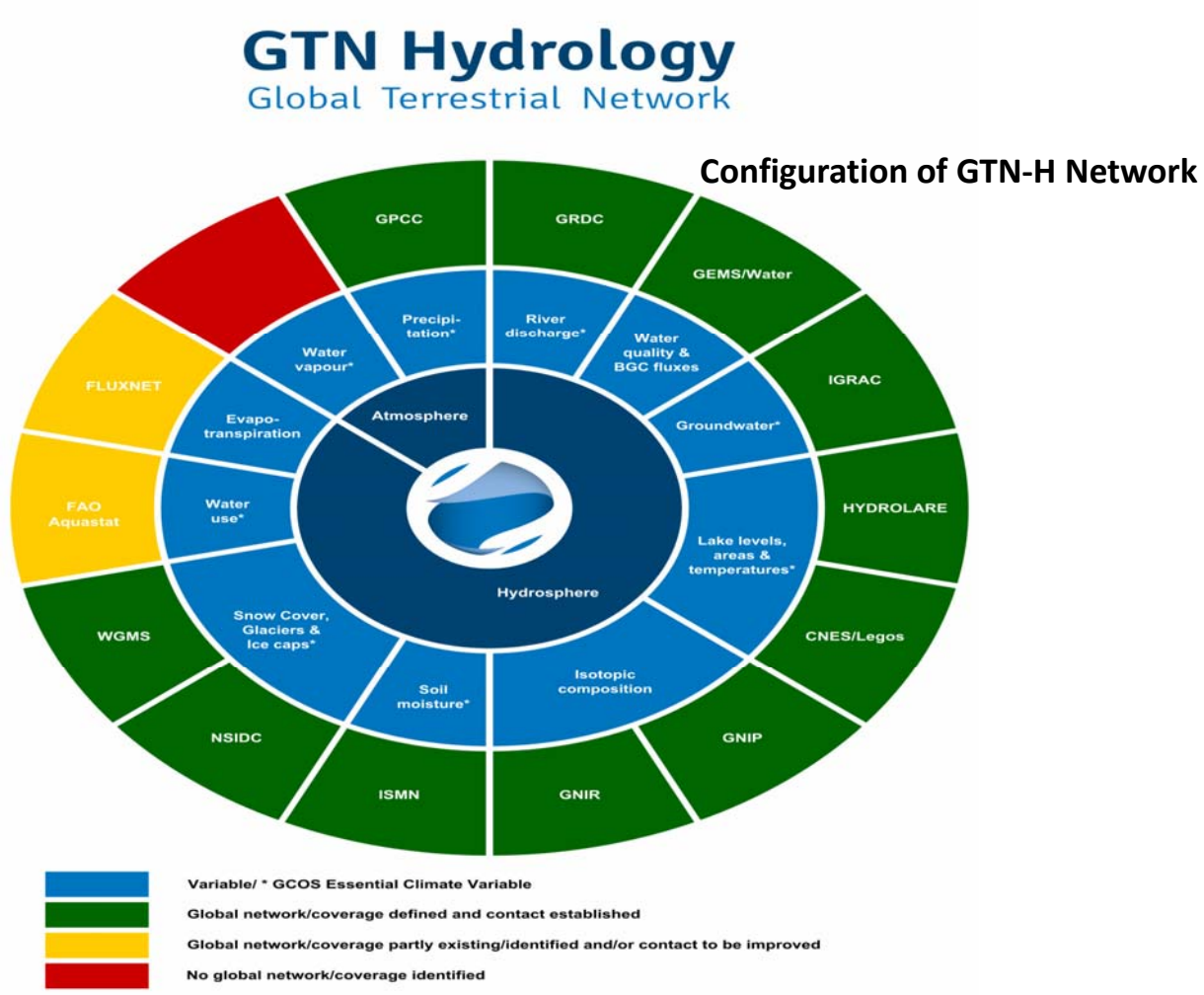


**Figure 2. Configuration of GNN-H Network**

H. Th. Recknagel mentioned as the main tasks for the future the need to include in the databases of global hydrological centers, in addition to ground-based, satellite observation data (the successful experience of cooperation between the Legos laboratory (France) and HYDROLARE in this aspect was noted), as well as continued efforts to improve data exchange between related global hydrological centers in order to expand the composition of integral complex products in the field of studying the global hydrological cycle.

# 5. Presentations from collaborating partners

## 5.1 HYDROWEB status 2021

A representative of the LEGOS laboratory J.F. Cretaux (Toulouse, France) made a report on the activities of the laboratory to monitor lake levels using satellite altimetry data and the functioning of the corresponding Hydroweb website. He noted that the Hydroweb web service provides information products on lakes, rivers and floodplains obtained from satellite altimetry. Among these products are data on changes in water levels of 160 lakes in the world. In addition, satellite data on changes in the water surface area and water volume for about one hundred lakes of the world are provided. For 60 lakes included in the Hydroweb database, satellite monitoring and processing of the received data are carried out in near real-time mode, and the data themselves are publicly available.

The LEGOS Laboratory participates in international cooperation and the implementation of interstate research programs and is an official partner of HYDROLARE in providing information on lake levels according to satellite altimetry data. Within the framework of joint cooperation, the Laboratory and the State Hydrological Institute (SHI) are participating in the implementation of the ESA (European Space Agency) project to study lakes using satellites within the framework of the Climate Change Initiative (CCI) program.The purpose of this program is to develop a methodology for correcting satellite observations based on their comparison with ground data on the example of large lakes. The satellite data needed to perform this work is provided by the LEGOS Laboratory and the ground data is provided by the SHI. A single integrated database has been created containing long-term average monthly and average annual water levels of large lakes of the planet. This database is also of great importance for the implementation of the GCOS Project Implementation Plan and the development of the GTN-H initiative.

As part of the CCI project, a quantitative assessment of the accuracy of satellite measurements is being carried out, a comparison of satellite and ground-based lake water level measurement data and an improvement in the methodology for correcting satellite data to increase their accuracy. One of the objectives of the CCI project collaboration is to determine, using ground-based observational data, how much the accuracy of the data obtained with the new satellites can increase compared to previous missions. This

work is being carried out, among other things, with the involvement of data from three dozen lakes located on the territory of the Russian Federation (mostly in the North-Western region).


**Figure 3. Print screen of the Hydroweb site on the north western region of Russian Federation where several lakes are used for validation of altimetry products.**

J.-F. Cretaux commented on the first results of joint research on the example of four lakes of the Russian Federation (Ladoga, Baikal, Segozerskoe and Kumskoe reservoirs) and more than 15 lakes located in other countries of the world. It has been shown that satellite data make it possible to obtain centimeter accuracy when measuring water levels on large lakes and decimeter accuracy on small ones.

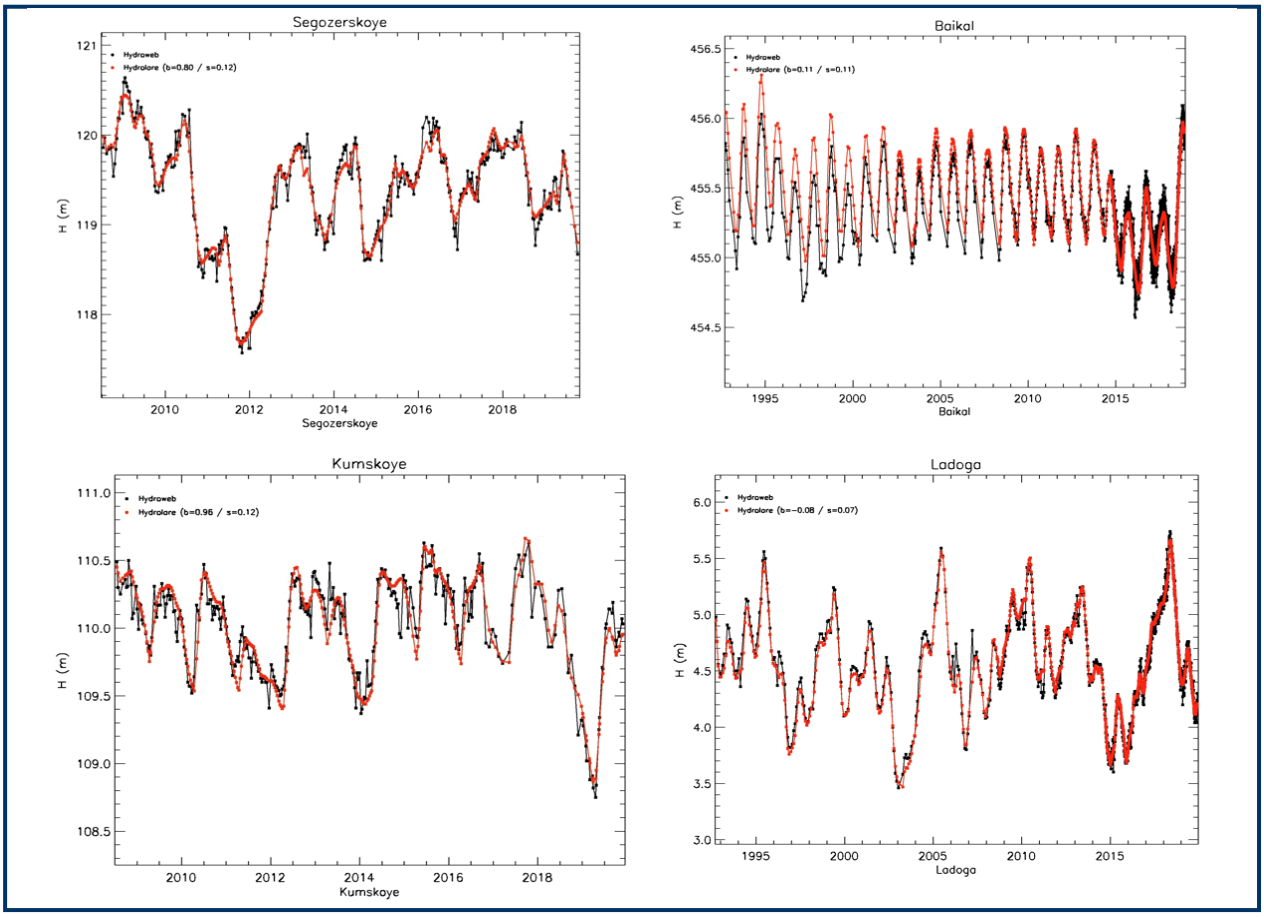


**Figure 4. Some preliminary results showing comparisons over 4 lakes between in situ measurements acquired by SHI and altimetry from LEGOS. Accuracy for these lakes are close to 10 cm**

J.F.Cretaux also informed the meeting participants about the development of new components in the composition of the ECV–Lakes, which include, in addition to the water level, also the water surface temperature, water surface area, water surface ice coverage, ice thickness and water reflectivity. Descriptions of these components, prepared with the participation of representatives of Legos and HYDROLARE, are presented in the consolidated current report on the GCOS program (The Status of the Global Climate Observing System 2021: The GCOS Status Report (GCOS-240), pub WMO, Geneva). This work will continue in the coming years, including within the framework of the new plan for the implementation of the GCOS program.

### 5.2 GRDC. Current activities and future plans

A report on the current status of the Global Runoff Data Cente - GRDC and the prospects of its activities was made by the Director of the Center U.Looser (Germany). He described the main functions of the Center, informed about the international projects and programs that the Center provides with data, informed about the data provision policy. Statistics on the content of the Center's database were provided (by WMO regions, countries and projects), and the dynamics of the database development and its status as of June 2021 were characterized. Maps reflecting the distribution of stations around the globe, data on which are contained in the Center's database, were presented.

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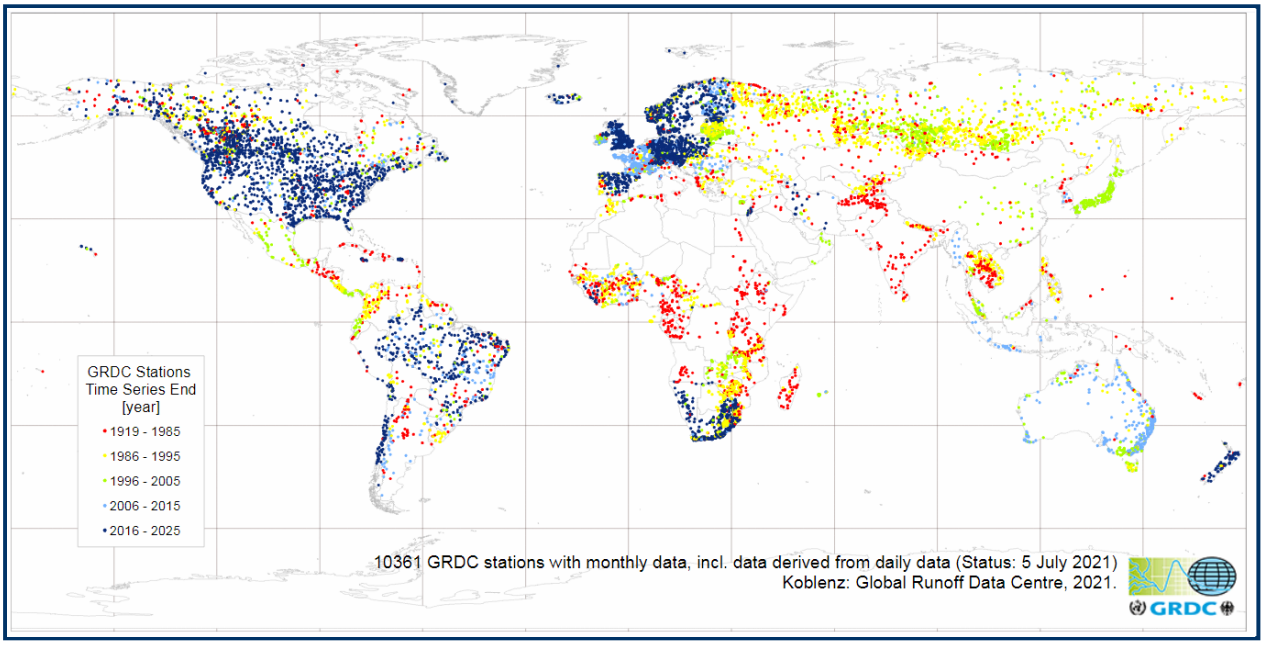
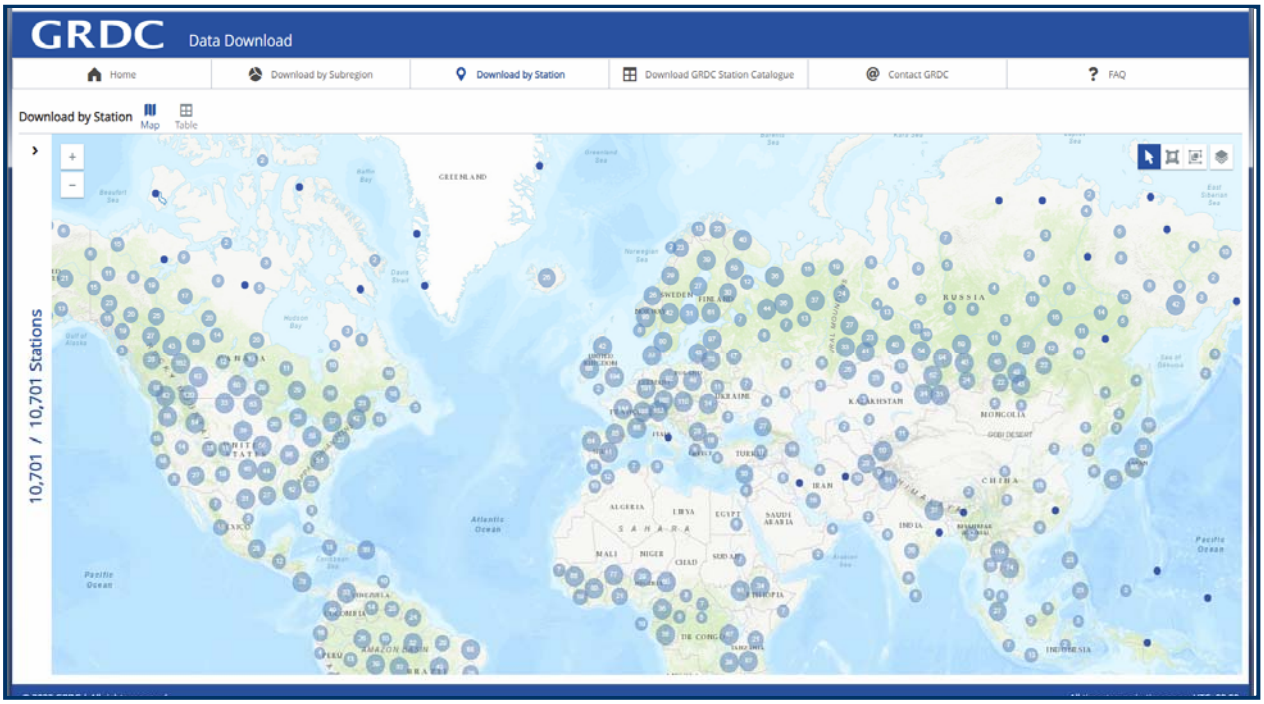



**Figure 5. Distribution of stations in the GRDC database with river flow measurements, around the globe.**

In total, the GRDC database for June 2021 contained data on average monthly river runoff (for a number of stations - and daily river runoff) for 10361 stations in 160 countries of the world. U.Looser noted that since 2019, a new universal software package has been operated at the Federal Institute of Hydrology of Germany, in which GRDC

operates, which is called WISKI 7 and which is intended for multidimensional use for the purpose of collecting, processing and distributing data within the framework of international projects supervised by the institute. This complex has absorbed all the new developments of the WMO, uses the formats recommended by the WMO (in particular, the ML-2 exchange language) and connects with the corresponding web services. On the basis of this complex, GRDC has been operating an online data portal (GRDC data portal) since June 2020.




**GRDC data portal online since June 2020** [https://portal.grdc.bafg.de/](https://portal.grdc.bafg.de/)

U.Looser presented information about new GRDC products:

Geographically generalized products:

* Major River Basins of the World, 2nd ed. (GRDC, 2020)
* WMO basins and Sub-basins, 3rd ed. (GRDC, 2020)
* Watershed boundaries bounded by GRDC stations (GRDC, 2011).

Information products and services:

- Access to all GRDC time series data.
- Annual characteristics and statistics of data of long-term time series of river flow in GRDC.

* Inflow of fresh water into the World Ocean (GRDC, 2021)

The historical dynamics of the initial replenishment of the GRDC database was also presented, as well as the dynamics of requests for data provision. Since June 2020, more than 3.5 million time series of river runoff have been provided online through the new portal at the request of consumers from 120 countries.

## 6. Progress on implementation of milestones agreed at previous SC meeting (HYDROLARE and partners)

Prof. Vuglinskiy made a short description of main achievements of HYDROLARE up to October 2021 based on the milestones for HYDROLARE defined during the Sixth Steering Committee Meeting (2017). All participants of the meeting took part in a discussion on the results of the implementation of previous decisions. It was noted that basically all the work planned at the last meeting was completed. The table below shows the main achievements achieved during the period under review.

**Main achievements of HYDROLARE up to October 2021 based on the Milestones for HYDROLARE defined during the Sixth Steering Committee Meeting**

| Action |
|---|
| Continue preparation and loading of new portions of historical data from Russia and former USSR countries into HYDROLARE database |
| Continue contact all institutions holding data on lakes and reservoirs of relevance for HYDROLARE |
| Provide data products (combined graphs of water level) based on terrestrial and satellite-based observations |
| Update HYDROLARE Science and Applications plan, take into account latest official documents of WMO, GCOS (TOPC) in hydrology, and evolving task |
| Prepare publications on HYDROLARE activity in scientific journals, newsletters etc |
| Document metadata in HYDROLARE and HYDROWEB and provide a metadata catalogue on the website |

| |
|---|
| Provide inputs for next GCOS Implementation Plan |
| Update a list of organizations which have observation data for hydrology of lakes and reservoirs on the HYDROLARE website |
| Communicate with WMO on the HYDROLARE progress on a regular basis |
| Prepare HYDROLARE newsletters (eight, ninth and tenth issues) |

## 7. Work plan and milestones 2021-2023, its adoption, recommendations and conclusions

Steering Committee members agreed on the following list of on-going actions for HYDROLARE beyond 2021:

**Ongoing Actions for HYDROLARE on the period October 2021-2023**

| № | Action | Who (Lead) | Deadline |
|---|---|---|---|
| 1 | Continue preparation and loading of new portions of historical data and metadata from Russia and WMO Members into HYDROLARE database | HYDROLARE | Ongoing |
| 2 | Continue contact all institutions holding data on lakes and reservoirs of relevance for HYDROLARE | HYDROLARE, LEGOS, WMO | Ongoing |
| 3 | Prepare HYDROLARE newsletters (eleventh and twelfth issues) | HYDROLARE | Ongoing |
| 4 | Prepare publications on HYDROLARE activity in scientific journals, newsletters etc. | HYDROLARE | Ongoing |
| 5 | Update HYDROLARE Science and Applications plan, take into account latest official documents of WMO, GCOS (TOPC) in hydrology, and evolving tasks | HYDROLARE, LEGOS, | Ongoing |

| № | Action | Who (Lead) | Deadline |
|---|---|---|---|
| 6 | Update a list of organizations which have observation data for hydrology of lakes and reservoirs on the HYDROLARE website | HYDROLARE, LEGOS, WMO | Ongoing |
| 7 | Communicate with WMO on the HYDROLARE progress on a regular basis | WMO, HYDROLARE | Ongoing |
| 8 | Provide data products based on terrestrial and satellite-based observations of the water level of lakes | HYDROLARE/ LEGOS | Ongoing |
| 9 | Keep user statistics | HYDROLARE | Ongoing |

The meeting participants discussed and agreed on the work plan of the Center for the period October 2021-2023.

## Actions and Milestones for HYDROLARE until October 2023

| № | Action | Who (Lead) | Deadline |
|---|---|---|---|
| 1 | Analyze HYDROWEB river level data for rivers inflowing and outflowing from lakes and reservoirs and establish cross-linkage with HYDROWEB website | HYDROLARE, LEGOS | End 2023 |
| 2 | Refine the criteria for inclusion of lakes in the GTN-L list and update it accordingly | HYDROLARE, LEGOS | June 2023 |
| 3 | Implement an analysis of the long-term dynamics of lake water temperature for Russian lakes and prepare a report | HYDROLARE | Sept 2023 |

| | | | |
|---|---|---|---|
| 4 | To continue comparative analysis of the results of satellite and in situ observations for various lakes and reservoirs in order to assess the effect of various factors on the accuracy of satellite water level measurements and to improve the technique of satellite water level measurements. Prepare a summary report for users. | Legos and HYDROLARE | Oct. 2023 |
| 5 | To continue cooperation with the WMO secretariat in the coordination and development of the activities of the global hydrological data centers, taking into account the functioning of the connection with the emergence of new WMO structures (WHOS, HydroHub, HydroSOS and others). | WMO/ HYDROLARE | Oct. 2023 |
| 6 | Take an active part in the meetings of the data centers group from JET-HYDMON to continue the discussion on data centers operations and functionalities, including getting data, contribution to WMO programs and capacity building. | WMO/ HYDROLARE | Oct. 2021 – June 2022 |
| 7 | Evaluation of the possibility of using the international standard WaterML 2.0 for data exchange. | HYDROLARE | Jan. 2023 |
| 8 | Improve the structure and user interface of the HYDROLARE website | HYDROLARE | Jan. 2023 |

This plan may be refined in connection with the reorganization of the WMO and the emergence of new requirements for the activities of global hydrological data centers.

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## 8. Final Remarks

The Director of HYDROLARE Prof. Vuglinsky thanked the members of the Steering Committee for their active participation, and recalled the importance of the guidance and support provided by the former to further the developments of HYDROLARE with a view to enhance its service capability to users. Meeting participates expressed their gratitude to the staff of HYDROLARE for their dedicated work and SHI as organizer of the meeting for its much appreciated hospitality and effectiveness of the conduct of the meeting.

## 9. Closure of the Seventh HYDROLARE Steering Committee meeting

The meeting closed on Thursday, 27 October 2021 at 7.00 pm.

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## Annex 1

## Final Agenda

11.00 – 11.15 Welcome

11.15 – 11.30 Introduction of participants and adoption of the agenda

11.30 – 12.00 Status report of HYDROLARE (HYDROLARE, V. Vuglinsky).

12.00 – 12.30 The Center's database – its status and maintenance (HYDROLARE, T.Kuprienok).

12.30 – 13.00 Development of HYDROLARE IT-infrastructure (HYDROLARE, L.Barinova).

13.00 – 13.30 Formation of new hydrological structures within the framework of the WMO reorganization, their goals and objectives. (WMO, D. Berod ).

13.30 – 14.30 Lunch

14.30 – 15.00 HYDROWEB status 2021 (LEGOS, J-F. Cretaux).

15.00 – 15.30 Review of GTN-H activities (GTN-H, T. Recknagel)

15.30 – 16.00 Current activities and future plans (GRDC, U.Looser).

16.00 – 16.15 Coffee Break

16.15 – 16.45 Progress on implementation of milestones agreed at previous SC meeting (HYDROLARE and partners)

16.45 – 17.15 Discussion on future HYDROLARE activities (HYDROLARE, All)

17.15 – 17.45 Work plan and milestones 2021-2023, its adoption, recommendations and conclusions (All)

17.45 – 18.00 Closure of the meeting

# Annex 2

# List of Participants

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