



**Eight meeting of the Steering Committee of
the International Data Centre for Hydrology of
Lakes and Reservoirs (HYDROLARE)**

FINAL REPORT

St. Petersburg, Russian Federation, November 08, 2023 (online)

TABLE OF CONTENTS

1. Opening statement and welcome speech	3
1.1 Introduction of participants and adoption of the Agenda	3
2. Status Report of HYDROLARE.....	3
2.1 Status Report of HYDROLARE, October 2021 – November 2023.....	3
2.2 The Center's database – its status and maintenance	4
2.3 Development of the HYDROLARE IT-Infrastructure	6
3. Review of GTN-H activities	7
4. Decisions from Congress and Executive Council, new hydrological teams and preparation of INFCOM-3 for global hydrological data centers.....	8
5. ESA CCI lake project and HYDROWEB database (status 2023).....	9
6. GRDC – current activities and future plans.....	11
7. Progress in implementing the milestones agreed at the previous SC meeting.....	13
8. Discussion of future activities of HYDROLARE. Work plan and main stages for 2023-2025, its adoption, recommendations and conclusions.....	13
9. Closing of the Seventh meeting of the HYDROLARE Steering Committee.....	14
Annex 1	15
Annex 2	16

1. Opening statement and welcome speech

The Eight Meeting of the HYDROLARE Steering Committee was opened at the State Hydrological institute (SHI) in St. Petersburg, on November 08, 2023 (online) by Prof. Valery Vuglinsky, Director of HYDROLARE. He welcomed the participants to the eight meeting of the HYDROLARE Steering Committee. In his welcome remarks he provided a brief summary of the activity of SHI, the role and functions of HYDROLARE and wished the Steering Committee fruitful and efficient discussions.

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, the list of participants is in Annex 2.

2. Status Report of HYDROLARE

2.1 Status Report of HYDROLARE, October 2021 – November 2023.

A report on the activities of the Center for the period from October 2021 to November 2023 was made by the head of the Center V.S. Vuglinsky (SHI). He noted that during the reporting period, the Center operated in accordance with the work plan adopted at the previous meeting of the SC of the Centre in 2021. He announced the following most significant results of the Center's activities:

- Continue preparing and loading new portions of historical data and metadata from Russia and WMO Member countries into the HYDROLARE database.
- Development of HYDROLARE IT-Infrastructure
- Continuation of long-term cooperation with the LEGOS laboratory on the exchange of in-situ and satellite observations data and correction of satellite data on the water level in lake and water temperature.
- Current work on the participation of the Center in the implementation of hydrological programs of WMO, GCOS and other international organizations.
- Participation of the Center in events organized by international organizations.
- Scientific work.

The report was highly appreciated by participants as it showed the significant progress made during the reporting period. Participants highly appreciated the dedicated professional work of HYDROLARE staff in this regard.

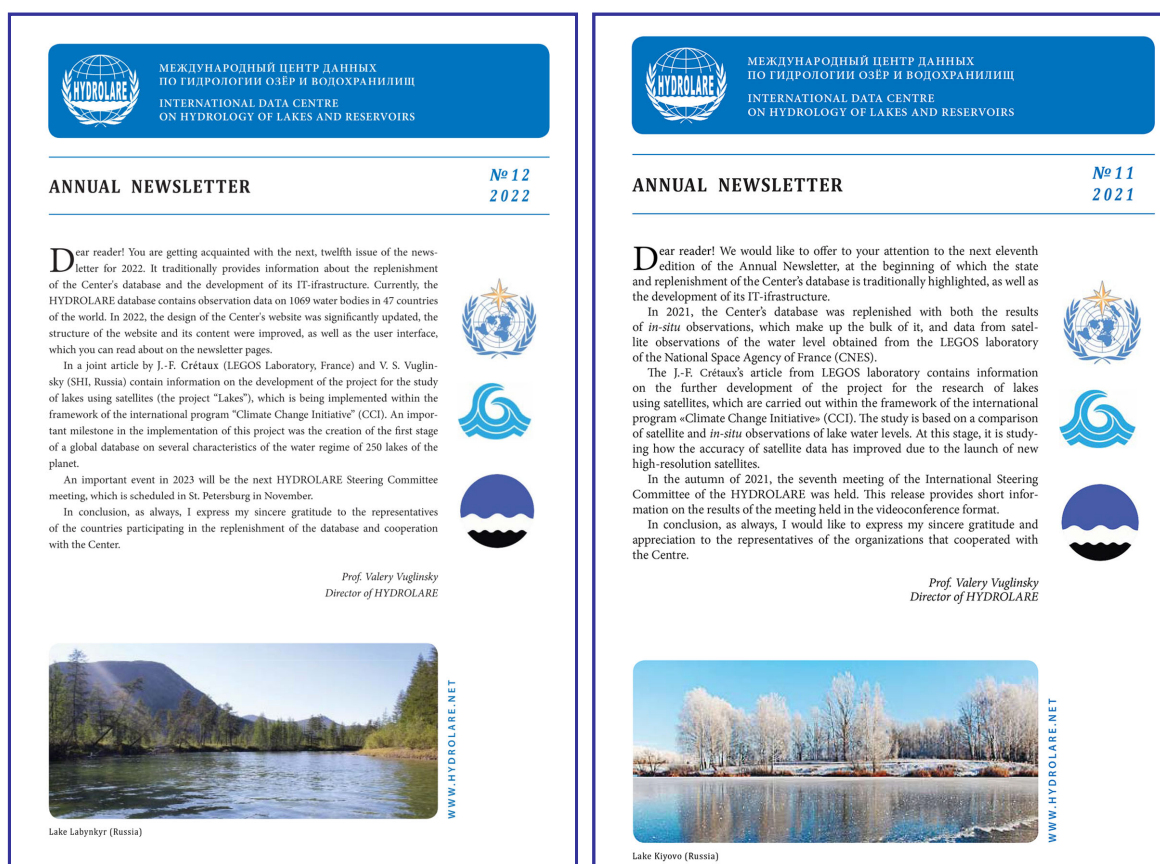


Figure 1. Annual HYDROLARE newsletters were issued for 2021 and 2022

2.2 The Center's database – its status and maintenance

E.I. Kuprienok (SHI) made a report on the formation and maintenance of the Center's database. She noted that for the period 2021-2023, data on lake and reservoirs water levels was added to the Centre's database. The necessary preparation and transformation of the data into the form necessary for loading it into the database was carried out. The Centre obtained data on the regime of lakes and reservoirs in Belarus, Slovenia, Sweden, Canada and the United States, which complemented data from these countries in the past. As a result, the database was replenished with information on water levels at stations in Belarus (10), Slovenia (2), Sweden (6), Canada (23), USA (43) and Russia (259). Data on average levels for water surface of Russian Lakes (20), the Great Lakes of Canada and the USA (5) were also prepared and downloaded. Data on average monthly and maximum water temperatures at observation stations in Belarus (10), Slovenia (2), and Russia (147) were also updated. In addition, the Centre's database includes data on the maximum ice thickness of 79 stations in Russia.

As part of international cooperation with the LEGOS Laboratory, the Center was provided with additional data from satellite observations of water levels on 37 water bodies in Russia for 2020-2021. Taking into account previously obtained data, the total number of lakes and reservoirs with satellite observations has reached 87, and the number of countries in which they are located is 35.

Table 1: Water temperature and maximum ice thickness data (in-situ) at stations in the HYDROLARE database

Country	Number of stations	Observations period		Number of stations	Observations period
		Mean monthly water temperature	Maximum water temperature		Maximum ice thickness
Armenia	7	1938 – 1988	1938 – 1988		
Belarus	29	1945 – 2021	1945 – 2021	20	1928 – 2018
Estonia	17	1947 – 1988	1947 – 1988	17	1925 – 1988
Finland	15	1916 – 2012	1916 – 2012	17	1912 – 2012
Kazakhstan	83	1936 – 2008	1936 – 2008		
Kyrgyzstan	11	1936 – 2012	1936 – 2012		
Moldova	7	1955 – 2010	1955 – 2010	7	1955 – 2010
Mongolia	15	1963 – 2013	1963 – 2013		
Russian Federation	298	1936 – 2022	1936 – 2022	79	1934 – 2021
Slovenia	3	1896 – 2021	1896 – 2021		
Total	485			140	

In conclusion, E.I. Kuprienok noted that there are a number of problems with regularly updating of the Centre's database:

- 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 Belarus provides regular transmission of new data to replenish long-term series.

2.3 Development of the HYDROLARE IT-Infrastructure

The report was made by L.N. Barinova (SHI). She noted that the HYDROLARE IT-infrastructure currently allows solving various problems, including:

- Convert and load new data into the database;
- Maintaining a metadata database;
- Search and display on the website (in several options) information about the availability of data, contained in the Center's IT-infrastructure.
- Maintenance of the Center website.

During the reporting period, the Centre's website was significantly reorganized, its capabilities were expanded, and an Integrated Database (IDB) was created on the average annual and monthly water levels of 27 water bodies around the world.

During the reorganization of the site, its structure and user interface were improved, new sections were added, including a section on the results of cooperation with the LEGOS laboratory, text descriptions were updated and edited. The content of sections on the Centre's activities has been significantly expanded.

The integrated database presents the results of both in-situ and satellite observations of water levels on large water bodies of the Russian Federation and foreign countries for the period of joint observations, usually since 1992. Satellite data for the IDB were kindly provided by LEGOS Laboratory.

In the IDB structure, the data is presented in the form of the following tables:

- Water levels averaged over the water surface,
- Water levels at the station,
- Satellite observations for water bodies.

In 2023, the database was expanded with additional data, both in-situ and satellite (the latter provided by the LEGOS Laboratory for 37 water bodies)

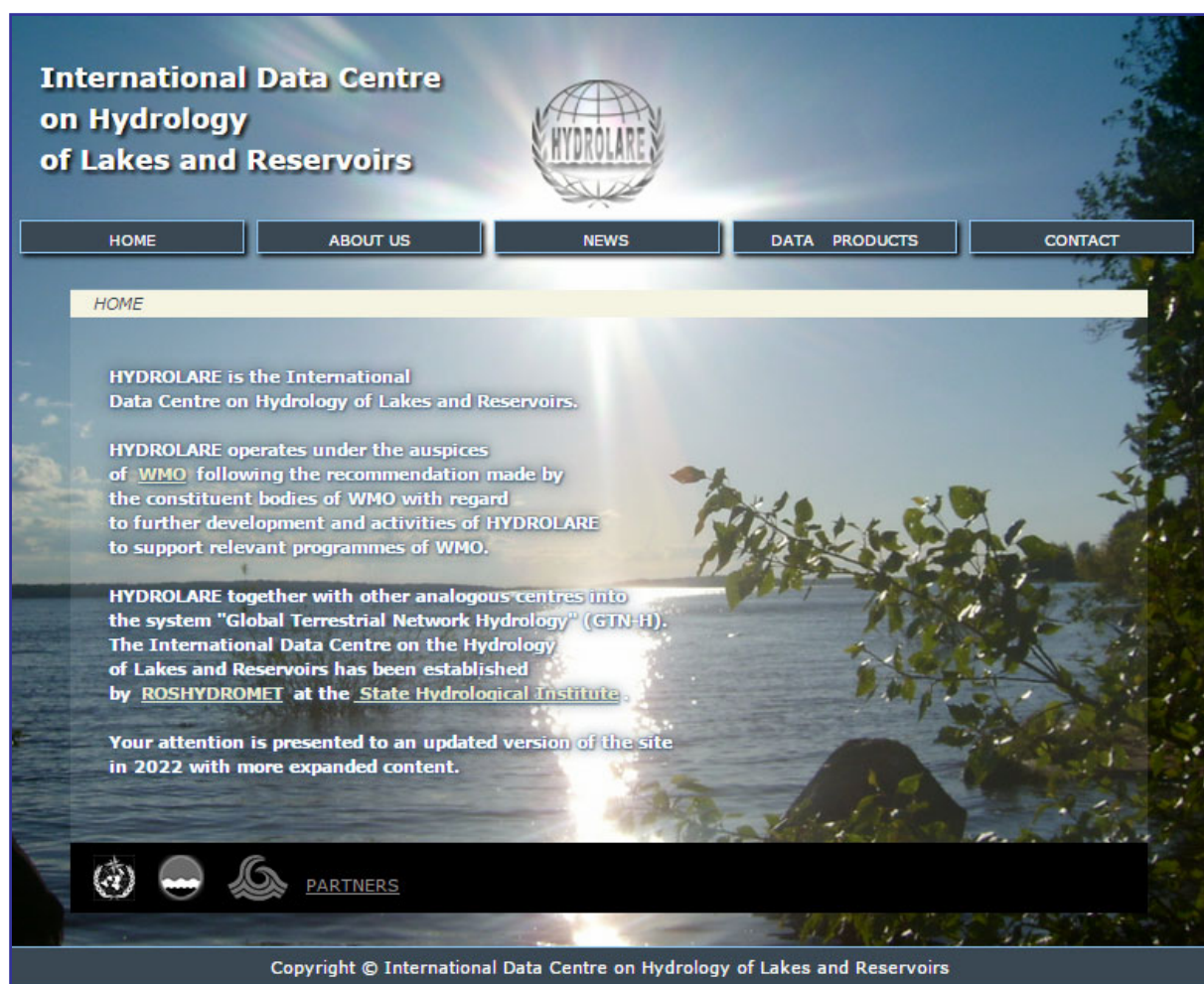


Figure 2. Home page of the Center website: <http://www.hydrolare.net>

Website visitor statistics showed that from October 2021 to November 2023 it was visited by approximately 4,000 users from more than 100 countries.

3. Review of GTN-H activities

The current status of the Global Terrestrial Network (GTN-H) project was presented by its coordinator S. Dietrich (Germany). S. Dietrich identified the main objectives of the project at this stage as coordinating the work of the WMO global hydrological data centers and monitoring the production of land-based hydrological climate indicator (ECV) data for the GCOS program, and the provision of global and regional products by the above-mentioned centers under the WMO and GCOS programmes. As the main tasks for the future, S. Dietrich mentioned the need to include in the databases of global hydrological centers, in addition to in-situ, also satellite observation data (noting the successful collaboration between LEGOS laboratory and HYDROLARE), as well as ongoing work to improve data exchange between related global hydrological centers in order to expand the range of integral complex products for global hydrological cycle research.

S. Dietrich also announced the planned next meeting of the GTN-H Project coordination Group in Geneva on January 24-25, 2024 and invited the participants of the current meeting to take part in it.

4. Decisions from Congress and Executive Council, new hydrological teams and preparation of INFCOM-3 for global hydrological data centers.

D. Berod, the head of the department “Basic systems in hydrology” of the Department of Climate and Water of the WMO Secretariat made a presentation. He described the main hydrological structures that were created as part of the of 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 WMO Hydrological Assembly. In addition to the Hydrological Assembly, other hydrological structures of WMO have been established, such as the WMO Hydrological Coordination Panel, the Global Hydrometry Support Facility (HydroHub), WMO Global Hydrological Status and Outlook System (HydroSOS), The World Water Data Initiative (WWDI) and others.

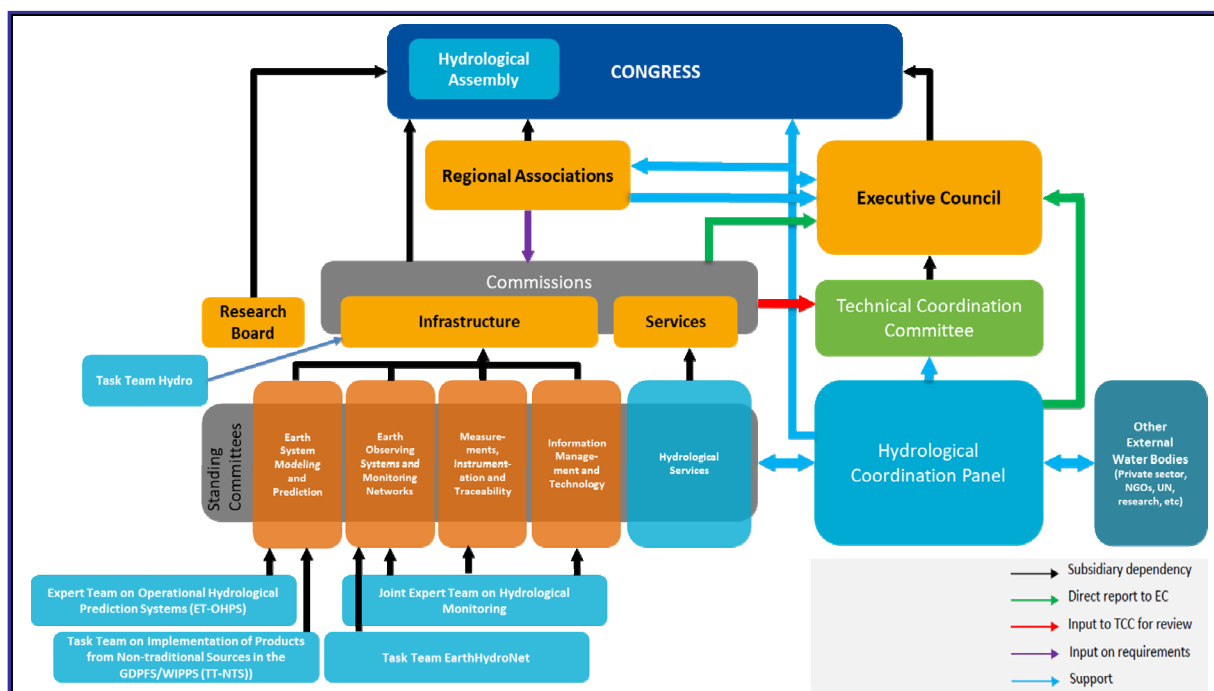


Figure 3. Hydrology better integrated in WMO

D. Berod described the structure, tasks and scope of activities of these new WMO hydrological bodies.

The Global Hydrological Status and Outlook System (HydroSOS) aims to coordinate the activities of WMO Members to assess the current state of water resources and their possible future changes, both at the multi-annual, inter-seasonal and intra-annual levels.

D. Berod emphasized the important role of global hydrological data centers in the WMO Operational Hydrology Programme. He also noted several initiatives to which global hydrological data centers, including HYDROLARE, could make significant contribution:

- The Global Basic Observing Network (GBON) – in terms of selecting the hydrological components of this global network, selection of hydrological stations with long observation series, and assisting in the management of hydrological data.
- The Global Hydrological Status and Outlook System (HydroSOS) – in terms of preparing relevant information products for this system.
- Data Rescue Program – to support countries in preserving their historical data by entering and storing it in global databases.

D. Berod also presented information about the Third Session of the Commission on Observations, Infrastructure and Information Systems (INFCOM-3), which will be held in Geneva, Switzerland, from 15 to 19 April 2024 in the form of a face-to-face meeting with the possibility of online participation. One of the issues of this session as part of the technical discussion (agenda item 8.1) will be consideration of the status and prospects for the development of global hydrological data centers (within the framework of the WMO Integrated Global Observing System). One of these centers is HYDROLARE. D. Berod invited representatives of HYDROLARE to take part in the above meeting.

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

5. ESA CCI lake project and HYDROWEB database (status 2023)

B. Calmettes, representative of LEGOS laboratory, reported on the activities of the laboratory (Toulouse, France) to monitor lake levels using satellite altimetry data and the functioning of the corresponding Hydroweb website. She noted that the Hydroweb web service provides information products on lakes, rivers and floodplains based on satellite altimetry data. These products include water level data for 525 lakes around the world. In addition, satellite data are provided on changes in the area of the water surface and water volume for approximately half of the above number of lakes. The LEGOS Laboratory participates in international cooperation and implementation of interstate research programs and is also an official partner of HYDROLARE in providing information on lake levels using satellite altimetry data. As part of a joint cooperation, the Laboratory and the State Hydrological Institute are participating in an ESA (European Space Agency) project to study lakes using satellites within the framework of the Climate Change Initiative (CCI). The goal of the collaboration is to develop a methodology for correcting satellite observations based on their comparison with in-situ data using the example of large lakes. The satellite data required for this work was provided by the LEGOS Laboratory and the in situ data by the State Hydrological Institute.

B. Calmettes informed the meeting participants about the development of new components of the ECV Lakes, which include, in addition to water level, also water surface temperature, water surface area, ice cover area, ice thickness and water reflectivity. Descriptions of these components, prepared in collaboration with LEGOS and HYDROLARE, are provided in «The 2022 GCOS ECV Requirements (GCOS 245)». Development of these components will continue in the coming years, including through the new GCOS Implementation Plan (The 2022 GCOS Implementation Plan (GCOS 244)).

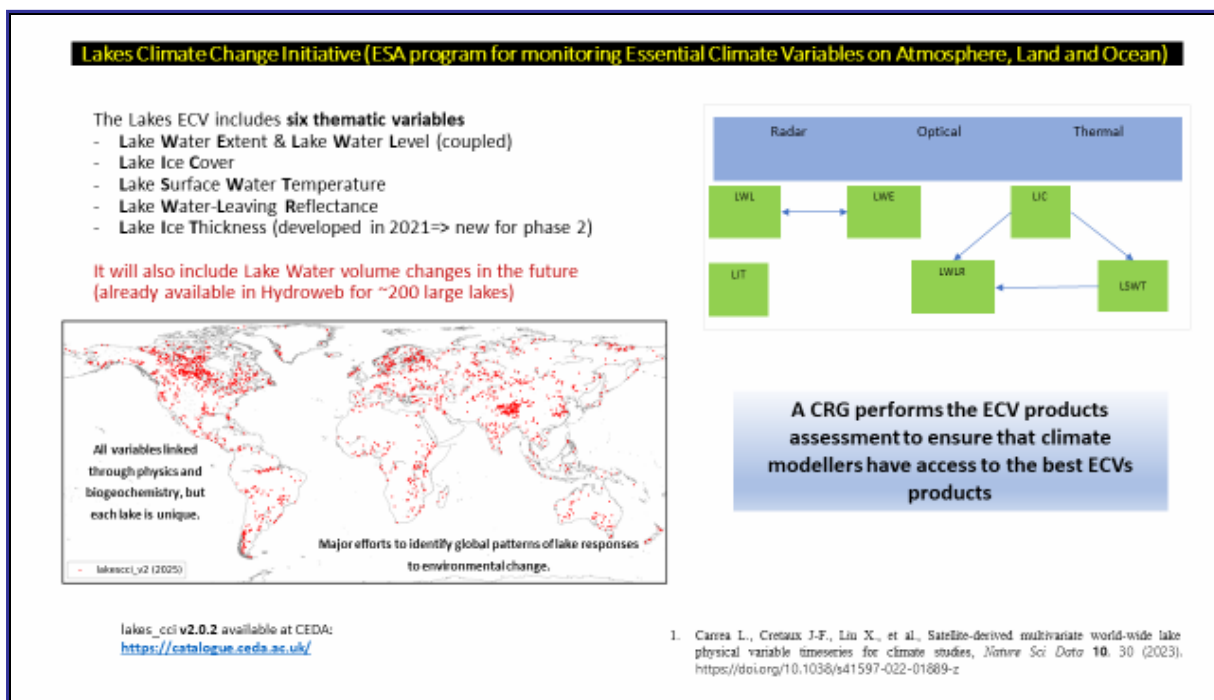


Figure 4. Lakes ECV products

B. Calmettes also informed about the scientific results of the Laboratory's activities, obtained from using of satellite observations, in particular regarding the assessment of changes in surface temperature of lakes for the period 1995-2020, as well as interannual variability of water reserves in lakes and reservoirs of the planet for the period 1992-2020.

B. Calmettes paid special attention to the new satellite mission SWOT, the implementation of which will begin in 2023. New equipment installed on the satellite will make it possible to obtain data on the level, surface area, and volume of water in lakes whose area exceeds 250 x 250 meters. That is, it will be possible to obtain the specified data for a huge number of small lakes (about 1.8 million) where in-situ observations are not carried out. The satellite's orbital period will be 21 days.

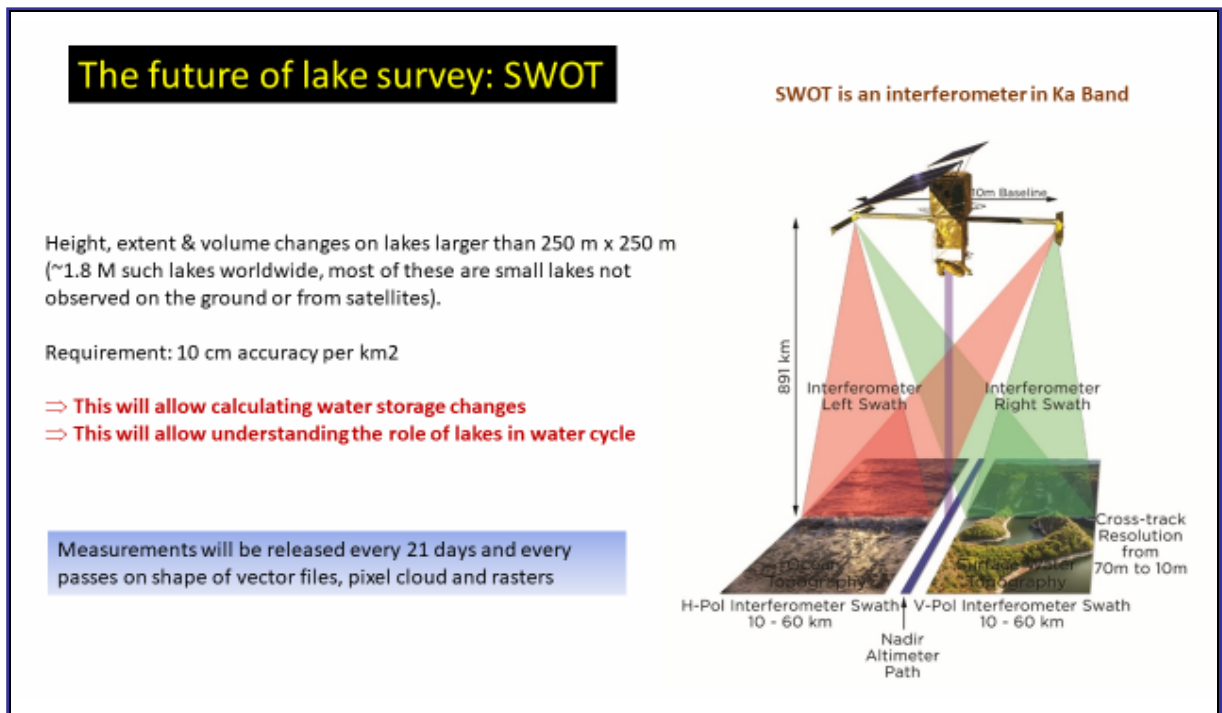


Figure 5. Satellite mission SWOT

B. Calmettes also reported on the prospects for the implementation of the second phase of the CCI project and possible areas of cooperation with HYDROLARE in its implementation.

6. GRDC – current activities and future plans

The new director of the Global Runoff Data Center (GRDC), S. Mischel (Germany), spoke about its current status and the prospects for its activities. He described the main functions of the Center, reported on the international projects and programs that the Center provides with data, and informed about the policy for providing data. Statistical data on the content of the Center's database were provided (by regions, countries and WMO projects), as well as the dynamics of development of the database and its status as of November 2023 were described (in total, the Center's database contains information on 10,707 stations in 160 countries; the average length of long-term series is 40 years). Maps were presented showing the distribution of stations around the globe, data for which is contained in the Center's database.

Global Runoff Database – Status Report Update

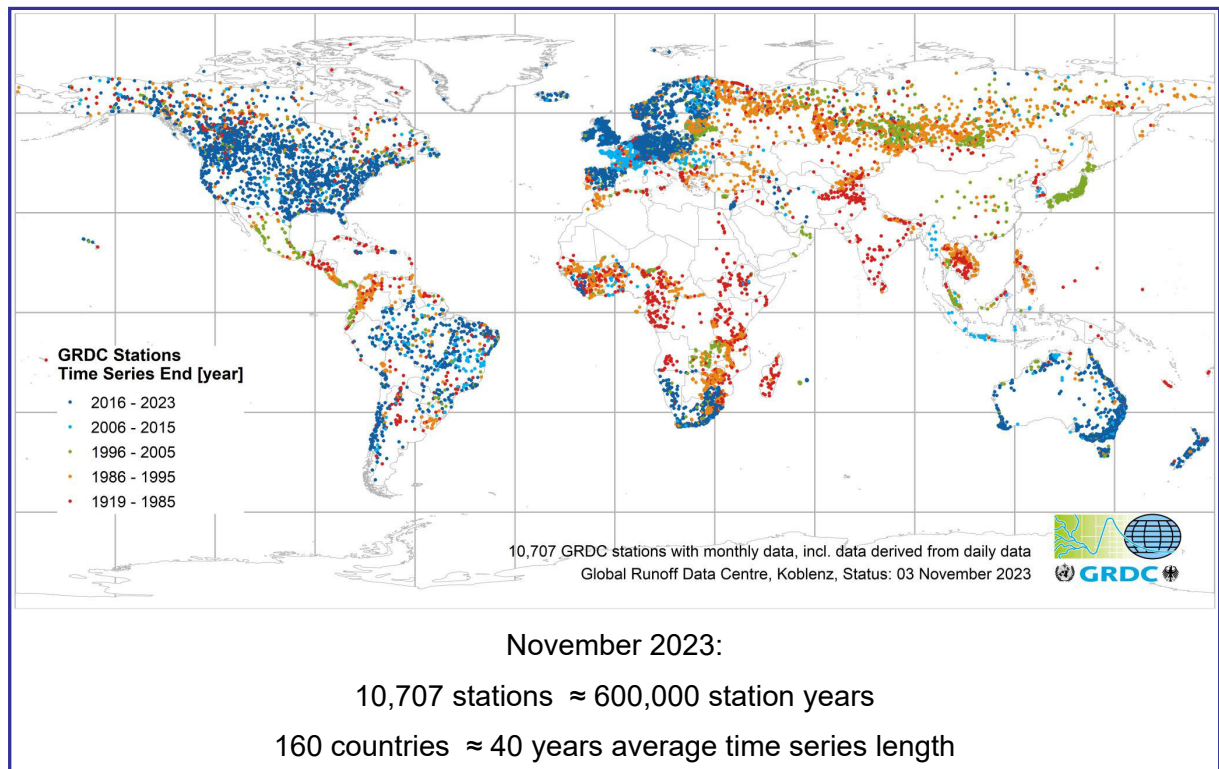


Figure 6. Global runoff database (November 2023).

S. Mischel noted that since the last meeting of the HYDROLARE SC in 2021, data requests of 61 countries have been completed (Oct. – Dec. 2021 – 9, 2022 – 24, 2023 – 28). Since June 2020, the Federal Institute of Hydrology, where the Center operates, has been using a new universal software package, WISKI 7. It is intended for multifaceted use for the purpose of collecting, processing and disseminating data within the framework of international projects supervised by the Institute. Based on this complex, the GRDC data portal operates online. Since the portal's launch, more than 9.4 million river flow data series have been downloaded on requests from 100 countries.

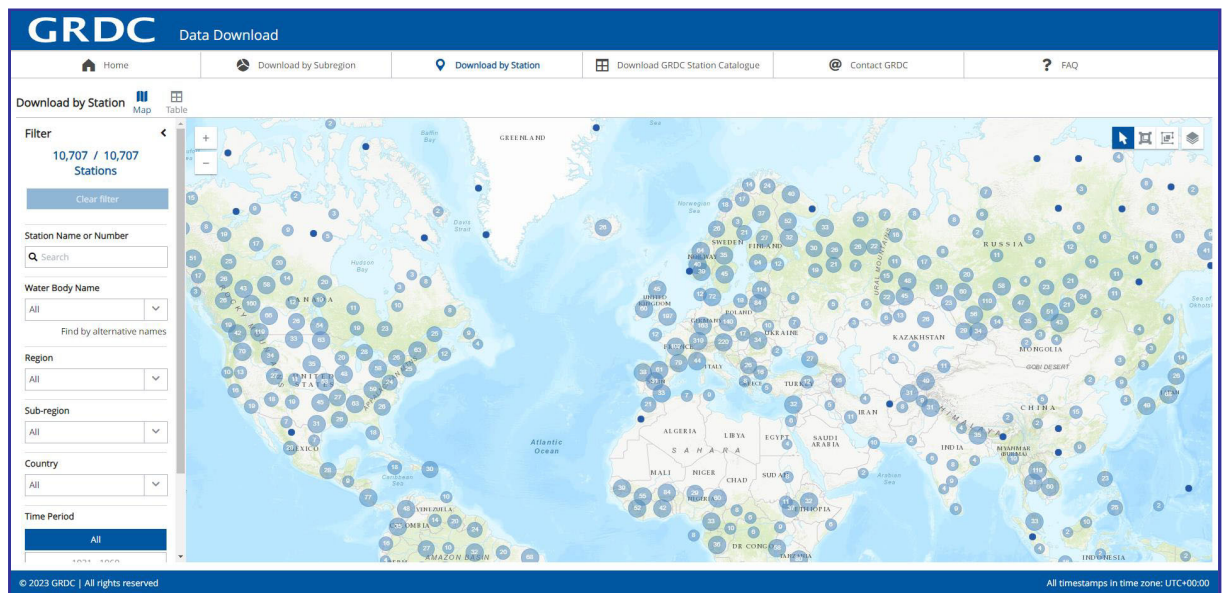


Figure 7. GRDC Data portal

S.Mischel also noted that it is planned to upgrade the GRDC database with HydroSHEDs v2 software. Its use will make it possible to detail the image of the river network (with a resolution of 30x30 m.), more clearly delineate the boundaries of river catchments areas and more accurately determine their areas. The timeline for the implementation of this software is unclear.

7. Progress in implementing the milestones agreed at the previous SC meeting

All meeting participants took part in a general discussion of the results of the implementation of previous decisions of the VII meeting of the HYDROLARE SC (2021). It was noted that the decisions taken at the previous meeting have been largely implemented.

8. Discussion of future activities of HYDROLARE. Work plan and main stages for 2023-2025, its adoption, recommendations and conclusions

All meeting participants took part in a general discussion on the proposed plan of the Center's activity for 2023-2025. During the discussion, the activities of HYDROLARE for the period 2023-2025 were discussed and agreed upon.

Table 2: Current Actions for HYDROLARE for the period October 2023-2025

No	Action	Who (Lead)	Deadline
1	Continue preparing and loading new portions of historical data and metadata from Russia and WMO Members into HYDROLARE database	HYDROLARE	Ongoing
2	Continue to contact all institutions holding data on lakes and reservoirs related to HYDROLARE	HYDROLARE, LEGOS, WMO	Ongoing
3	Prepare HYDROLARE newsletters (thirteenth and fourteenth issues)	HYDROLARE	Ongoing
4	Prepare publications about HYDROLARE activities in scientific journals, newsletters etc.	HYDROLARE	Ongoing
5	Update the HYDROLARE Science and Applications plan, take into account the latest official documents of WMO, GCOS (TOPC) in hydrology, and evolving tasks	HYDROLARE, LEGOS,	Ongoing
6	Update the list of organizations that have observation data on the hydrology of lakes and reservoirs on the HYDROLARE website	HYDROLARE, LEGOS, WMO	Ongoing
7	Continue cooperation with the WMO Secretariat in coordinating and developing the activities of 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	Ongoing
8	Keep user statistics	HYDROLARE	Ongoing

In addition to the above, other activities were agreed upon, arising from the recommendations adopted at the 8th meeting of the HYDROLARE Steering Committee, as well as the Center's commitments to WMO and Roshydromet.

At the end of the meeting its foreign participants expressed gratitude to the team of the Center and SHI for the excellent organization of the meeting and hospitality.

9. Closing of the Eight meeting of the HYDROLARE Steering Committee

The meeting closed on Wednesday, November 8, 2023 at 7.00 pm.

Annex 1

Final agenda

10.00 – 10.15 Welcome

10.15 – 10.30 Introduction of participants and adoption of the agenda

10.30 – 11.00 Status report of HYDROLARE (HYDROLARE, V. Vuglinsky).

11.00 – 11.30 Review of GTN-H activities (GTN-H, S. Dietrich).

11.30 – 12.00 The Center's database – its status and maintenance (HYDROLARE, E. Kuprienok)

12.00 – 12.30 Development of HYDROLARE IT-infrastructure (HYDROLARE, L. Barinova)

12.30 - 13.30 Lunch

13.30 – 14.00 Decisions from Congress and Executive Council, new hydrological teams and preparation of INFCOM-3 for global hydrological data centers. (WMO, D. Berod)

14.00 – 14.30 ESA CCI lake project and HYDROWEB database (status 2023) (LEGOS, B. Calmettes).

14.30 – 15.00 GRDC – current activities and future plans (GRDC, S. Mischel.).

15.00 – 15.15 Coffee Break

15.15 – 15.45 Progress on implementation of milestones agreed at previous SC meeting (HYDROLARE and partners)

15.45 – 16.15 Discussion on future HYDROLARE activities (HYDROLARE, All)

16.15 – 16.45 Work plan and milestones 2023-2025, its adoption, recommendations and conclusions (All)

16.45 – 17.00 Closure of the meeting

Annex 2

List of Participants

Dr. Ludmila Barinova

Main Specialist
HYDROLARE
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: cntgwk@hydrology.ru

Ms Galina Barinova

Engineer HYDROLARE
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: cntgwk@hydrology.ru

Dr. Dominique Berod

Chief, Earth System Monitoring Division
World Meteorological Organization (WMO)
P.O.Box 2300
7 bis, avenue de la Paix
1211 Geneva 2
Switzerland
E-mail: dberod@wmo.int

Dr Beatriz Calmettes

Collecte Localisation Satellites - CLS
8-10 rue Hermès
31520 Ramonville St. Agne - France
Phone: +33(0)5.61.39.37.88
E-mail: bcalmettes@groupcls.com

Dr.Stephan Dietrich

Federal Institute of Hydrology
Am Mainzer Tor1, 56068 Koblenz,
Germany
Phone +49 (0)261 1306 5059
E-mail: dietrich@bafg.de

Dr. Sergei Gusev

Chief, Center of Water Cadastre
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: cntgwk@hydrology.ru

Ms Elena Kuprienok
Main Specialist
HYDROLARE
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 12 61
Fax: +7 812 323 10 28
E-mail: fdc@hydrolare.net

Dr.Simon Mischel
Head, Global Runoff Data Centre (GRDC)
Federal Institute of Hydrology (BfG)
Am Mainzer Tor 1 56068 Koblenz,
Germany
Phone: +49 261 1306 5224
Fax : +49 261 1306 5722
E-mail: mischel@bafg.de; grdc@bafg.de

Prof. Valery Vuglinsky
HYDROLARE Director
State Hydrological Institute
2nd Line, 23
199053 St.Petersburg
Russian Federation
Phone: +7 812 323 34 58
Fax: +7 812 323 10 28
E-mail: vvuglins@mail.ru