GEWEX Hydroclimatology Panel Presentation

Co-chairs Francina Dominguez Ali Nazemi



2022 Pan-GEWEX Meeting Monterey, CA Jul 26, 2022



Science Objective: To understand and predict continental to local-scale hydroclimates for hydrologic applications.

Regional Hydroclimate Projects



Global Data Centers







3) Global Data Centers

Global Precipitation Climatology Center (GPCC)

Global Runoff Data Center (GRDC)

Hydrology of Lakes and Reservoirs

4) GHP Networks Pannex



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Global Precipitation Climatology Center (GPCC)

Global Runoff Data Center (GRDC)

Hydrology of Lakes and Reservoirs

4) GHP Networks Pannex

GHP Panel

GHP Panel Co-Chairs:

Francina Dominguez (USA) Ali Nazemi (Canada)

Members:

Paola Arias (Colombia), Rowan Fowley (Ireland), Li Jia (China), Xin Li (China), Santosh Pingale (India), Andreas Prein (USA), Joshua Roundy (USA), Vidya Samadi (USA), Anna Sörensson (Argentina), Ivana Stiperski (Austria)



- GHP had one internal and one annual panel meeting during 2021.
- The panel welcomed two new panel members during the 2021 meeting: **Rowan Fowley** from Maynooth University of Ireland who is actively involved with the use of Artificial Intelligence in observing and modeling land surface processes. **Anna Sörensson** from the University of Buenos Aires in Argentina was heavily involved with the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report (AR6), particularly in terms of linking global to regional climate change.
- We recently accepted our newest member **Santosh Pingale** from the National Institute of Hydrology, Roorkee India. He worked as a Professor in Africa (Ethiopia)
- Some self-nominees were not appointed in the panel, they are mapped into envisioned activities.



There are four types of projects within GHP:





TEAMx CC

Mathias Rotach, Stefano Serafin, Helen Ward

Atmospheric processes specific to mountainous regions heavily affect the exchange of momentum, heat and mass between the Earth's surface and the atmosphere. TEAMx is an international research programme that aims at improving our understanding of these processes.



TEAMx objectives:

• to improve understanding of transport and exchange processes both between the surface and atmosphere and at multiple scales within the atmosphere,

• to provide a unique observational dataset,

• to evaluate and improve the performance of weather and climate models over mountainous terrain, and

• to reduce errors in impact models by transferring the knowledge gained to weather and climate service providers.



TEAMx CC

Mathias Rotach, Stefano Serafin, Helen Ward



- Plan for the TEAMx Observational Campaign.
- Second TEAMx Workshop (held in May 2021 over 180 registered participants) was centered around this document and plans for the campaign.
- Mainly focus on the European Alps, although they have some connections with North-American colleagues.
- BAMS paper published providing an overview of the motivation behind TEAMx and the aims of the programme.
- An article for the GEWEX newsletter was submitted.

**INARCH-II,

Hydrological processes in alpine cold regions John Pomeroy, University of Saskatchewan



Station:

Centre:

Basin:

Catchment:

Germany: 15. Zugspitze Basin and Schneefernerhaus Research

Nepal: 16. Langtang Catchment;

Russia: 18. Djankuat Research

Spain: 19. Izas Research Basin;

Weissfluhjoch Snow Study Site;

USA: 24. Dry Creek Experimental Watershed; 25. Grand Mesa Study

Senator Beck Basin Study Area; 28.

Switzerland: 22, Dischma Research Catchment: 23.

Site: 26. Reynolds Creek

Experimental Watershed; 27.

Sagehen Creek, Sierra Nevada.

20. Guadalfeo Monitoring Network; Sweden: 21. Tarfala Research

Norway: 17. Finse Alpine Research

INARCH Research Basins

 Phase II Objectives: To better measure and Austria: 1. Open Air Laboratory atmospheric, hydrological, cryospheric, biol (OpAL); Canada: Canadian Rockies interaction processes; improve their predict Creek Research Basin; 3. Peyto Glacier; 4. Quesnel River Research diagnose their sensitivities to climate chang 7. Upper Maipo River Basin; may be managed to promote water sustain c Research Station for Multisphere

- •The INARCH-II network:
- •50 research scientists with wide-ranging ex Environment; 11. Upper Heihe River world,
- •29 experimental research basins in 14 coun mountain regions on most continents.

Hydrological Observatory - 2. Marmot Basin: 5. Wolf Creek Research Basin:

Interactions: 9. Qomolangma Atmospheric and Environmental Observation and Research Station: 10. Southeast Tibet Observation and Research Station for the Alpine

France: 12. Arve Catchement; 13. Col de Porte Experimental Site; 14. Col du Lac Blanc Experimental Site

**INARCH-II,

Hydrological processes in alpine cold regions John Pomeroy, University of Saskatchewan

•Completed Phase 1 and have a suite of well-instrumented research basins, high-resolution forcing meteorological datasets, and advanced snowdrift-permitting and glacier-resolving hydrological models that are exemplars of Integrated High Mountain Observation and Prediction Systems (IHMOPS).

Phase 2:

- provide common and archived observations for basin diagnosis and modelling through a Common Observation Period Experiment (COPE),
- •enhance observations
- forcing datasets
- •cryosphere-hydrological-water management models
- work with communities





Determining ET CC

Oscar Hartogenesis, Joan Cuxart, Aaron Boone, Anne Verhoef dET is our newest CC. The panel approved the proposal in principle and provided feedback to the group.

1. The four provisional WG will broadly assembly ABL/soil/veg experimentalists and data analysers (WG1), numerical modelers and remote sensing scientists (WG2) landsurface

scientists and ecophysiologists (WG3) and climate scientists and hydrologists (WG4)

2. Data from the LIAISE experiment will be the subject of the first common effort of the CCdET.

New Activity LIAISE Studies Human Influence on the Water Cycle

d)



surface temperature (LST) over irrigated portions of Lleida, Spain, one of the areas under study in the new LIAISE activity, which aims to improve understanding o pact of anthropizatio on the water cycle and land atmosphere-hydrology inter actions It will also investi gate the limitations of models enresenting the terrestrial ater cycle in a semi-arid environment on the Iberian peninsula and contributes to the GEWEX-led WCRP Grand Challenge on "Water for the Food Baskets of the World." LST was obtained by sharp ening Sentinel 2 and 3 Cool colors correspond to irrigat vimately 100x100 km he acquisition date is Jul 2017. This image was pro luced within IRTA's Efficient Program, and you can read more about LIAISE in Boone et al. on page 8.

Vol. 29 No. 1, Ouarter 1 2019

The LIAISE campaign (held in July 2021) was proposed as the experimental testbed

Proposed Irrigation CC

Patricia Parker, Joshua Roundy and Samiro Khodayar



New Activity LIAISE Studies Human Influence on the Water Cycle



The Irrigation Cross-Cut is an initiative of the GEWEX GLASS and GHP panels to advance understanding of the impacts of irrigation on the water and energy cycles and to better represent these effects in models. Volunteer efforts and recently funded projects (e.g., LIAISE, GRAINEX, Irrigation+)

Virtual workshop November 2021.

Proposed Flood CC

Vidya Samadi, Josh Roundy and Andreas Prein

"The GEWEX vision for a flood crosscutting initiative should focus on overcoming barriers in designing appropriate modeling architectures to represent rapid rainfall-runoff processes and mechanisms within Earth system models across current

and future flood-prone regions."

Led an article published in <u>GEWEX Quarterly Vol.</u> <u>31, No. 4, Quarter 4, 2021</u>, are currently gathering interested researchers. Gell/ex_

Opinion: The Role of GEWEX in Moving the Needle on the Resiliency of Society to Flooding

Vidya Samadi¹, Peter van Oevelen², Andreas Prein³, Joshua K. Roundy⁴, Francina Dominguez⁵, and Ali Nazemi⁶

¹Clemson University, Clemson, SC, USA; ²International GEWEX Project Office, Fairfax, VA, USA; ³National Center for Atmospheric Research (NCAR), Boulder, CO, USA; ⁴University of Kansas, Lawrence, KS, USA; ⁵University of Illinois Urbana-Champaign, Urbana and Champaign, IL, USA; ⁶Concordia University, Montréal, QC, Canada

As the world grapples with the health and economic impacts of COVID-19, the impacts of climate extremes are magnifying the suffering of individuals around the world. Of the climate extremes, flooding impacts more people than any other natural hazard and the destructive flash floods of recent months have been a reminder of their devastating impacts on lives, property, and critical infrastructure. Increasing populations, changes in the climate system, expansion of built infrastructure, and sea level rise threaten to further increase flooding impacts and losses around the world over the coming decades. There are four types of projects within GHP:





PannEx





an Open Access Journal by MDPI

Climate Extremes in the Pannonian Basin: Current Approaches and Challenges

Guest Editor:

Message from the Guest Editor

Prof. Dr. Adina-Eliza Croitoru Department of Physical and Technical Geography, Faculty of Geography, Babeş-Bolyai University, Cluj-Napoca, Romania

adina.croitoru@ubbcluj.ro

Deadline for manuscript submissions: closed (31 March 2021)

In recent decades, most of the regions around the world have experienced significant climate changes. The aim of this Special Issue is to address different approaches and methodologies in analysing climate extremes in the Pannonian Basin, which is the focus area of the Pannonian Basin Experiment (PannEx) Regional Hydroclimate Project of the Global Energy and Water Exchanges Project of the World Meteorological Organisation (GEWEX). This Special Issue intends to cover topics to support our ability to understand and predict climate extremes on both continental and local scales by improving the knowledge of environmental water and energy exchanges on a regional scale related to: the analysis of observation data; synoptic and seasonal conditions generating climate extremes and their impact on a local scale; changes detected in the historical records or estimated based on the modelled data; the social, economic, and environmental impacts of climate extremes; perception, public policies and strategies to be implemented at urban, local and/or regional levels. We invite researchers to submit papers for this Special Issue focusing on climate extremes in the Pannonian Basin region.

PannEx Special Issue

- 14 papers published;
- 74 authors: Hungary, Croatia, Serbia, Romania, Spain, Germany, China, Slovenia, Czech Republic, Slovakia, Austria, UK;
- Senior researchers and young researchers (PhD. Students);
- Joint research teams: climatologists, hydrologists, computer scientists;
- Multi-national teams in the Pannonian Basin;
- Studies focused on:

COST Action: FAIRNESS (2021–2025) FAIR NEtwork of micrometeorological measurements

RHPs in the context

Regional Hydroclimatological Projects



Baltic Earth



The North ...

- → extensive forests, mostly coniferous
- \rightarrow sparsely populated
 - > mostly rocky coasts
- \rightarrow subarctic climate in winter

The South...

- \rightarrow intense agriculture
- \rightarrow densely populated
- → mostly sandy coasts
- > moderate climate in winter

- Drainage Basin: 20% of the European continent
- 85 million people in 14 countries
- Baltic Sea: 380 000 km²

BALTEX was founded in 1992 as part of the GEWEX BALTEX Phase I: 1992 – 2003: First <u>10 vear</u> Phase BALTEX Phase II: 2003 - 2012: Second <u>10 year</u> Phase

Baltic Earth – Launch in June 2013

Science plan implimented since 2017

- No central funding
- Club characteristic:
- Summer and Winter Schools jointly funded by IOW and Hereon
- Baltic Earth Conferences co-funded by various participating institutions
- Participation based on scientific interest
- "Club" character, scope and activites depends on voluntary contributions by interested "members

Baltic Earth

EGU General Assembly 2021

22 presentations in 4 sessions

- Regional climate change and impacts
- Biogeochemical change and impacts
- Coastal change and impacts
- Human activities, adaptation and management

Earth System Dynamics

rticles / Special issues	Search
he Baltic Farth Assessment Reports (BE	AR)
litor(s): Markus Meier, Marcus Reckermann, Joakim Langner, Benjamin Smith, and Ira Didenkulova	
More information	
Download citations of all papers	
Bibtex EndNote	
Reference Manager	
All papers O Final revised papers only O Preprints only	
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in the Raltic Se	2
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7071 Fact Sheet	

BSEP n°180



More to come as a Newsletter piece (Currently scheduled for September

Climate change 🜔

Global Water Future









University of Guelph University of British Columbia University of Northern British Columbia University of Calgary Université Laval McGill University Université du Québec à Montréal University of Alberta

University de Montreal

University of Manitoba

University of Victoria

Brock University

APOGÉE

CANADA

FONDS D'EXCELLENCE EN RECHERCHE

CANADA

Canadian Rivers Institute (University of New Brunswick & University of Prince Edward Island)

Yukon University

Global Water Future



GWF's overarching goal is to deliver risk management solutions—informed by leading-edge water science and supported by innovative decision-making tools—to manage water futures in Canada and other cold regions where global warming is changing landscapes, ecosystems, and the water environment.

Global Water Future

Grand Challenges for GWF

- Water solutions for user-posed questions on water-related aspects of: food security, energy security, infrastructure, economic development, safe communities, ecosystem conservation, governance.
- Improved scientific foundations for solving water problems.
- Improved community engagement and knowledge mobilisation to co-develop solutions.
- National water forecasting and prediction system
- Contribute to decolonisation of Indigenous water management in Canada
- Improved river basin management across Canada
- Science and predictions for water futures, peace and security around the world
- Science and traditional knowledge informing a revitalized water strategy for Canada and the development of the Canada Water Agency
- *Global Water Solutions* for Canada and the world leading to *water sustainability* in a time of rapid climate change and human development.



- Pillar 1 Diagnosing and Predicting Change in Cold Regions
- Pillar 2 Developing Big Data and Decision Support Systems
- Pillar 3 Designing User Solutions



GWF Indigenous Community Water Research Strategy



ANDEX

AMAZON RIVER BASIN

ANDES



ANDES



 $C_{4M} = 841$

 $E_{AM} = 1350$

AMAZON RIVER BASIN





ANDEX

ANDEX Web Page: Near Complete (as Sep-2021): http://www.gewex.org/project/andex/ It was launched several months ago. ANDEX visibility!



ANDEX White Book Summarize Science / Identify Gaps

ANDEX WHITE BOOK		
Chapter 1. Introduction		
Lead authors: René Garreaud and Germán Poveda		
0 Comments		
No comments found.		
Add Your Comment		
Chapter 2. Geographical Context of the Andes		
Lead author: René Garreaud		
0 Comments		
No comments found.		
Add Your Comment		
Chapter 3. Hydroclimate of the Andes		
 Espinoza JC, Garreaud R, Poveda G, Arias PA, Molina-Carpio J, Masiokas M, Viale M and Scaff L (2020). 		
Hydroclimate of the Andes Part I: Main Climatic Features. Frontiers in Earth Science 8:64. doi:		
10.3389/feart.2020.00064		
 Arias PA, Garreaud R, Poveda G, Espinoza JC, Molina-Carpio J, Masiokas M, Viale M, Scaff L and van 		

https://www.gewex.org/article-lander/

ANDEX - Implementation Plan (1)

The building blocks: Science Themes and Questions:

- Moisture corridors (LLJs and aerial rivers) and their influence on precipitation and river flows.
- · Orographic precipitation gradients (OGP).
- Andes-Amazon interactions.
- · Observed trends and climate projections.
- Astronomical cycles (annual, diurnal) and their impacts (Temperature, Precipitation, River flows).
- Hydrosphere and cryosphere.
- Human Health (Vector borne diseases and air pollution).

ANDEX officially became an initiating RHP as of March 2022

While new leadership team brings new excitements, the instigators remain on board and involved

Data

TPE-WS The Third Pole area

The Third Pole covers nearly 5 million square kilometers. It is the youngest, highest and largest plateau on the Earth. The Third Pole environment is similar to that of North Pole and South Pole. Its changes affect more than 2 billion people in the region and downstream.



The Pan Third Pole

Expanded westward from the Third Pole, the Pan-Third Pole region covers 20 million km², encompassing the Tibetan Plateau, Pamir, Hindu Kush, Iran Plateau, the Caucasians, the Carpathians, etc. It is home to over 3 billion people.



In situ observational data

- □ Historical in-situ and current meteorological and hydrological datasets
- Create a high special and temporal (daily and sub-daily) resolution data for the modeling community.
- Soil T and M, vegetation, snow, glacier for land-atmosphere interactions and energy and water cycle processes
- Social and social-economic data

Satellite Data

Hydrological cycle elements derived from remote sensing observations at different scale, especially at watershed scale, including precipitation, snow cover area (SCA), soil moisture (SM), radiation, evapotranspiration (ET), runoff, lake volume and groundwater.

Modeling Output

□ to develop robust high resolution regional models and to form modeling dataset to understand the intricate bondage between atmospheric processes and the hydrological aspects

Scientific activities in 2021:



TPE-WS



Total annual river discharges in 2018: 656±23 billion m³

Fig. 6. Annual discharge at the mountain outlets for 13 major TP rivers in 2018. The estimated total river discharge from TP is 656 ± 23 billion m³ for 2018, based mostly on ground-based observations from existing or newly built discharge gauges.

Science Plan submitted; currently under review



Fig. 3 | **Region-wide present GLOF hazard and risk across the Third Pole. a,b**, Pie charts showing the proportion of different GLOF hazard (**a**) and risk (**b**) levels per region. VL, very low; L, low; M, medium; H, high; VH, very high. Aggregated hazard and risk values are the total sums of normalized values within each region. **c**, Histogram presenting the distribution of GLOF hazard levels across all moraine-dammed glacial lakes assessed. The vertical dashed lines indicate the distribution of assessed GLOF hazard values for glacial lakes where historical GLOFs have been recorded, which were further used to validate the overall model performance. The dots refer to the number of GLOF sources for a given hazard value.

AsiaPEX

Objectives of the AsiaPEX

- General Objective
 - Understanding of Asian Land Precipitation over Diverse Hydroclimatological Conditions: For Better Prediction, Disaster Reduction and Sustainable Development
- Science Highlight / Science Issues
- Discussion on Science Plan of AsiaPEX
 - Project initiation and kick off Conference in Sapporo
 - Significance of six approaches are confirmed in the Conference





Science plan is still awaiting

US RHP

GEWEX is a Core Project of the World Climate Research Programme on Global Energy and Water Exchange



Water: P + Q_{in} = ET + Δ S + Q_{out} Energy: R_n + G = λ ET + H

Refine estimates of these terms; quantify their uncertainties; understand how will they change.

The <u>Carbon Cycle</u> most directly ties in through the " R_n " (energy) and "ET" terms.

<u>Anthropogenic</u> impact all of these cycle





Four broad themes have emerged, *thus far*:

1)Closing the gap between models and observations

2)Improving our tools to understand and address a changing hydroclimate
3)Determining the energy and water
budgets at the surface with greater fidelity
in a rapidly changing world
4)Integrating the socio-economic and
physical sciences (new)
A "Big Tent" Framework for Hydroclimate Change Science



US RHP

US-RHP Affinity Group Overview

Format: Meets bi-weekly. Usually a 20-30 minute technical/scientific presentation –including reflections on the nature of the RHP– followed by 30-40 minutes of robust discussion.

As of 11/1/2021:

- 80 members signed up
- 25-30 typically attend a biweekly meeting
- 7 meetings





- Technical Presentations from:
 - Ruby Leung (DOE) "North American Hydroclimate Research"
 - Jeff Basara (OU) "Living in a World of Extremes and Extreme Transitions – The Nort American Hydroclimate (Research Examples and Identifying Gaps/Opportunities)"
 - Kirsten <u>Findell</u> (NOAA) "GFDL Research Highlights" of Relevance to the GEWEX US Regional Hydroclimate Project Affinity Group
 - Craig Ferguson (SUNY Albany) "Self-Introduction and Prospective on a GEWEXorganized U.S. Regional Hydroclimate Project"
 - Fei Chen (NCAR) "Improved Convection Permitting Modeling Through Capturing Fine-Scale Land-Atmosphere Interactions"

GHP Score Card...

- Remains to be addressed
- In Progress
- Good shape

	RHP Criteria*	Status
	1. A science plan should state the central science and applications questions to be addressed by the RHP and proposed tasks to achieve it	 Notional plan in the works Need to broaden our interdisciplinary team (social scientists; indigenous community) Depends in part on sponsors priorities Hence, we need more time
t	2. A coordination mechanism (e.g., a Science Steering Group or equivalent) that includes a GEWEX contact (e.g., SSG chair, or project coordinator).	 Project leadership established (NCAR, IGPO) Active community established and growing (Affinity Group) Web presence being developed (prototype) Imminent: formation of a 'planning committee'
o'	3. Adequate resources and personnel with potential sources of funding or existing funding identified.	 Ongoing since 2019 We are receiving a number of positive indications Small seed funds to support development (NASA)
	4. A end date and an exit plan that includes a science and applications synthesis and data archival procedure.	PendingTo be considered in the plan
t' ?-	5. A mechanism for collecting, managing, and providing access to <u>hydroclimatological</u> data sets with participation in the international exchange of scientific information and data.	 RHP "Hub" (or Testbed) To be documented in the plan Depends in part on funding mechanisms

*RHP Criteria at the outset of a project (Francina Dominguez to AG; 7/15/2021)



HyMeX-II Beyond HyMeX

- During the 2019 Hymex workshop it was decided to create a steering committee to think of the future "beyond 2020"
 - A provisional *international steering committee* has been formed Alexandre Stegner (France), Aristeideis Koutroulis (Greece), Christan Horvath (Croatia), Christian Massari (Italy), Eric Defer (France), Cindy Lebeaupin Brossier (France), Aaron Boone (France), Helene Roux (France), Olivier Payrastre (France), Pere Quintana Segui (Spain), Emmanouil Flaounas (Greece), Luca Brocca (Italy), Silvio Davolio (Italy), Francesca Costabile (Italy), Katerina Papagiannaki (Greece), Hamouda Dakhlaoui (Tunisia), Yves Tramblay (France), Samiro Khodayar (Spain),
- Goal:

(a) to respond to societal and scientific challenges for the Mediterranean area

(b) to establish(serve as) a network/umbrella for former and new members

Network building activities



HORIZON EUROPE – Climate Science and responses

SOCLEX -Toward Improved Integration of Societal and Climate Futures: Extreme Weather and the Considerations of Vulnerability, Resilience, and Adaptation in the SSP-RCP Scenario Matrix

SOCLEX's ambition is to fulfil this community need of developing improved "integrated higher resolution high resilience mitigationadaptation pathways" to go beyond the state of the art in climate management knowledge. Thereby, SOCLEX will consider high impact weather, as well as adaptation and mitigation action from global-to-local and across temporal, geographical and sectoral scales.



COST (European Cooperation in Science and Technology) Action -

FUTURE4Med: A TRANSDISCIPLINARY NETWORK TO BRIDGE CLIMATE SCIENCE AND IMPACTS ON SOCIETY

FUTURE4Med will foster new climate change related science and synergies the state-of-the-art beyond understanding serving as a transdisciplinary and integrative platform that bridges high-impact weather (HIW) and climate change impacts' knowledge in the Mediterranean region.



Global Data Centers in the context



GPCC

GPCC Product	Spatial Resolution	Time Coverage	Possible Application
First Guess Monthly	1.0°	2004 - present	drought monitoring
First Guess Daily	1.0°	2009 - present	analysis of extremes
Monitoring Version 2020	1.0°, 2.5°	1982 - present	calibration of satellite data
Full Data Monthly Version 2020	0.25°, 0.5°, 1.0°, 2.5°	1891 - 2019	hydrological studies
Full Data Daily Version 2020	1.0°	1982 - 2019	analysis of extremes
HOAPS/GPCC global daily precipitation Version 2	0.5°, 1.0°, 2.5°	1988 - 2015	analysis of extremes
HOMPRA Europe Version 1	0.5°, 1.0°, 2.5°	1951 - 2005	trend analysis
Precipitation Climatology Version 2020	0.25°, 0.5°, 1.0°, 2.5°	1951/2000	for application as a reference, and for utilization of the anomaly interpolation method
Interpolation Test Dataset	1.0°	1988	comparison of interpolation schemes
Drought Index Version 1	1.0°	2013 - present	drought monitoring
Drought Index Version 1.1	1.0°	1952 - 2013	drought monitoring
GPCC Visualizer			access to the GPCC Visualizer, where you can create maps with your own coordinates and parameters
GPCC Home			detailed information about GPCC
Many thanks to the data suppliers			country list of data suppliers

The new release V.2021 of GPCC's product portfolio ٠ **Precipitation Climatology (new version ca. 90,000 stations,** V.2020 84,800),

Full Data Monthly for 1891-2020,

Monitoring Product,

Full Data Daily for 1982-2020 (using SPHEREMAP analysis method, as for other products)

is now scheduled to become available in Dec. 2021 (currently working on the integration of substantial data sets for i.e. Brazil,

Canada, Poland, Iran, Kenia)







۱I

GRDC

Status of the Global Runoff Database

Global Coverage of GRDC Stations indicated by time series end



GRDC data portal online since June 2020

https://portal.grdc.bafg.de/



HYDROLARE (and beyond)

HYDROLARE

- established in 2009 by Roshydromet at the State Hydrological Institute under umbrella of the World Meteorological Organization (WMO);

- together with other hydrological data centers enters the system "Global Terrestrial Network-Hydrology" (GTN-H);

- provides data on hydrology of world lakes and reservoirs.

- operates on the basis of free dissemination of information (used for non-commercial purposes) for governmental, scientific, educational, public and commercial institutions.



GHP is moving towards considering other possible data sources to fill the current gap in data availability and provide a sustainable data support to feed the envisioned activities, e.g. Irrigation, dET and Water Resource Management.

