WMO Hydrological Observing System (WHOS)

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WORLD METEOROLOGICAL ORGANIZATION

WMO HydroHub

World Meteorological Organization (WMO)

- Set up on **23 March 1950**
- Successor to International Meteorological Organization (IMO, **created in 1873**)
- **Specialized agency** of the United Nations for meteorology, operational hydrology and related geophysical sciences
- **UN system's authoritative voice** on the state and behavior of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources

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Role of WMO in the field of Hydrology and Water Resources

WMO Convention

Art: 2(e): "to promote activities in operational hydrology and close co-operation between Meteorological and Hydrological Services."

WMO Hydrology and Water Resources Programme

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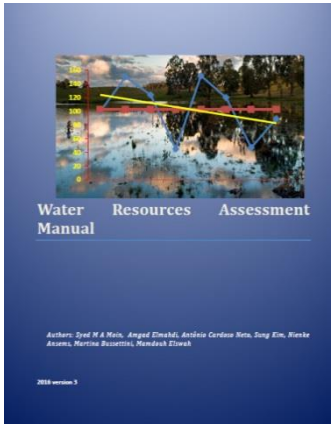
Standards and Quality Management (QM)

- **Quality is essential!**
- **Four benefits of QM:**
  - Better management and a more effective organization
  - Employee satisfaction and commitment to the organization
  - Improving the quality of products and services.
  - Improving customer satisfaction and NHS image



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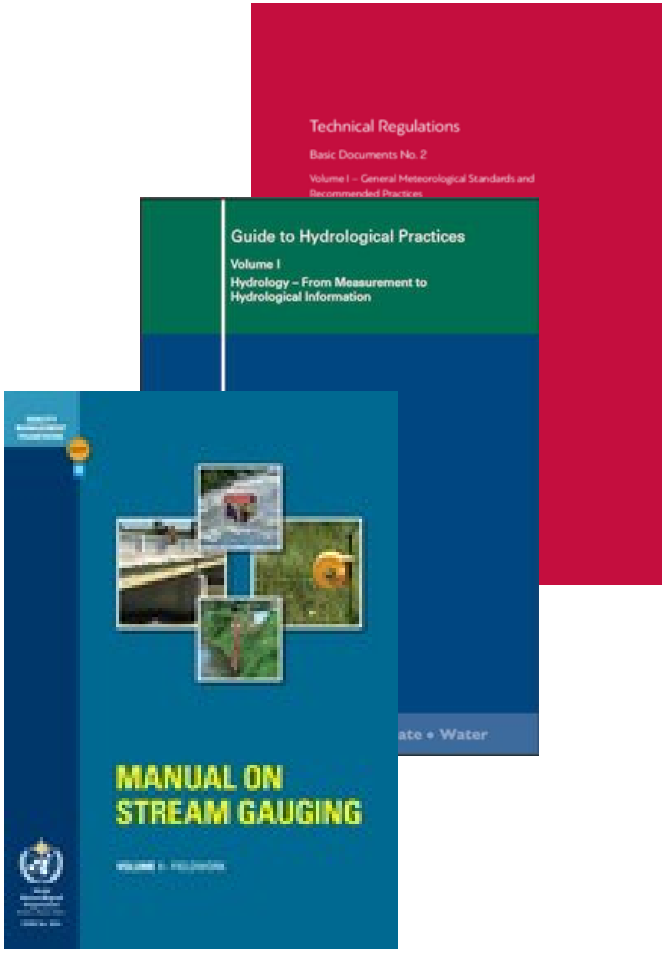
WMO regulatory framework

- Technical Regulation
- Manual
- Guides



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Meteorological, Climatological and Hydrological data base management system (MCH)

For whom?

- NMHSs looking for a simple, customizable and license free solution to store, analyze and generate reports and maps on large amount of data.

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Advantages of MCH

- **OPEN SOURCE** based (no license fees)
- **A configurable system** (you define your variables and stations etc.), and allows you to connect external modules
- Manages **hydrological**, **climatological** and **meteorological data** under a unique platform
- **Multilingual**, using an external text file, currently available in Spanish, English and French
- **Minimum system requirement**

Data exchange and use

Exchanged data should be used to:

- planning, designing, operating and maintaining **water management systems**;
- preparation and distribution of **flood forecasts** and **warnings**;
- design of **spillways**, **highways**, **bridges** and **culverts**;
- **flood plain** mapping;
- determining and monitoring **environmental** or **ecological flows**;
- managing **water rights** and **transboundary water issues**;
- **education** and **research**;
- protecting **water quality** and regulating **pollutant discharges**.

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Challenges of data exchange: data formats

WMO Guide to Hydrological Practices (updated in 2008) states:

"There are currently no standards for data exchange formats for hydrological data"

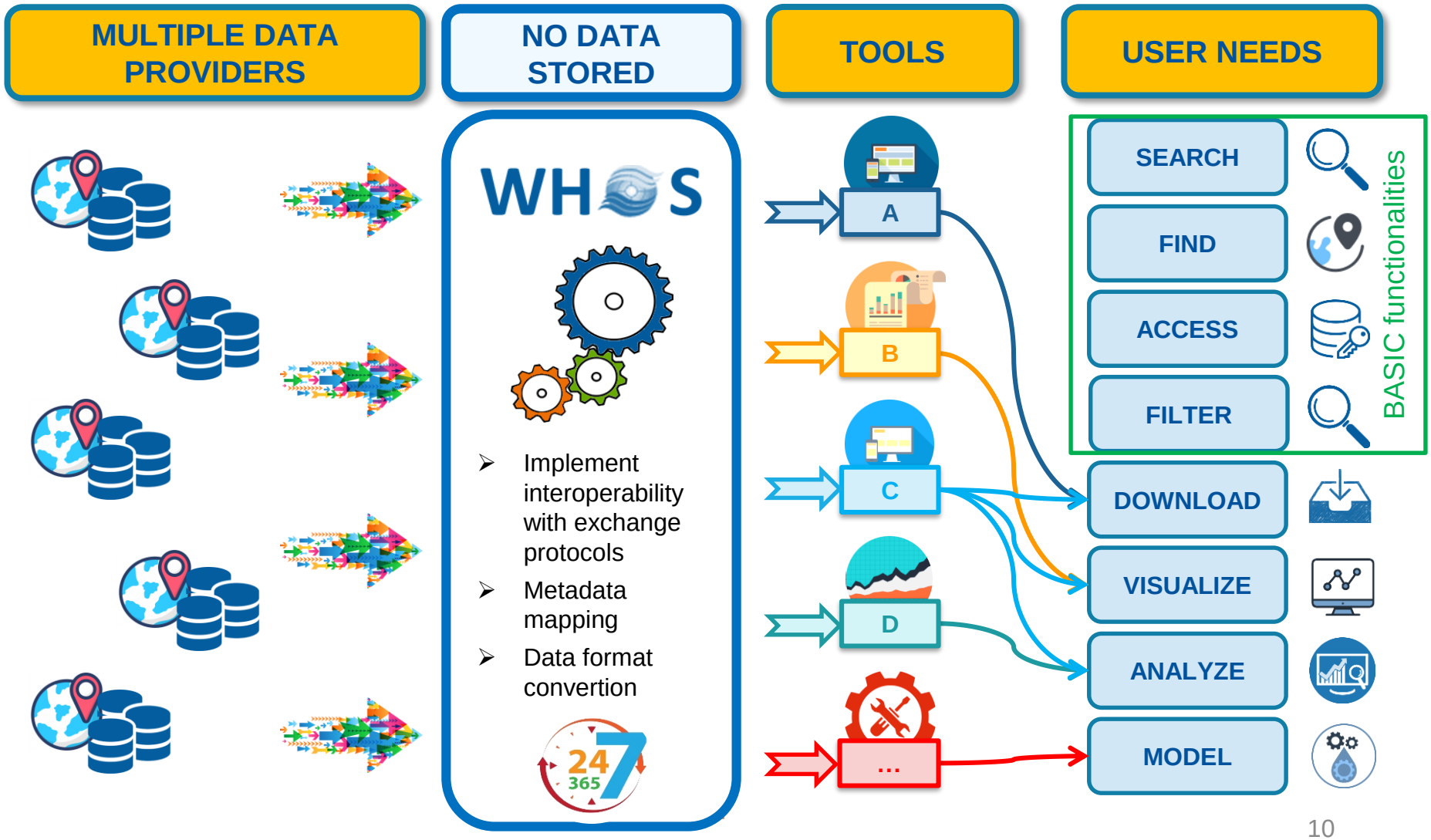
Through joint activities of WMO and Open Geospatial Consortium (OGC), **WaterML 2.0 standard** had been developed and its following parts have been approved by OGS:

- Part 1 - Time Series;
- Part 2 - Ratings, Gaugings and Sections.

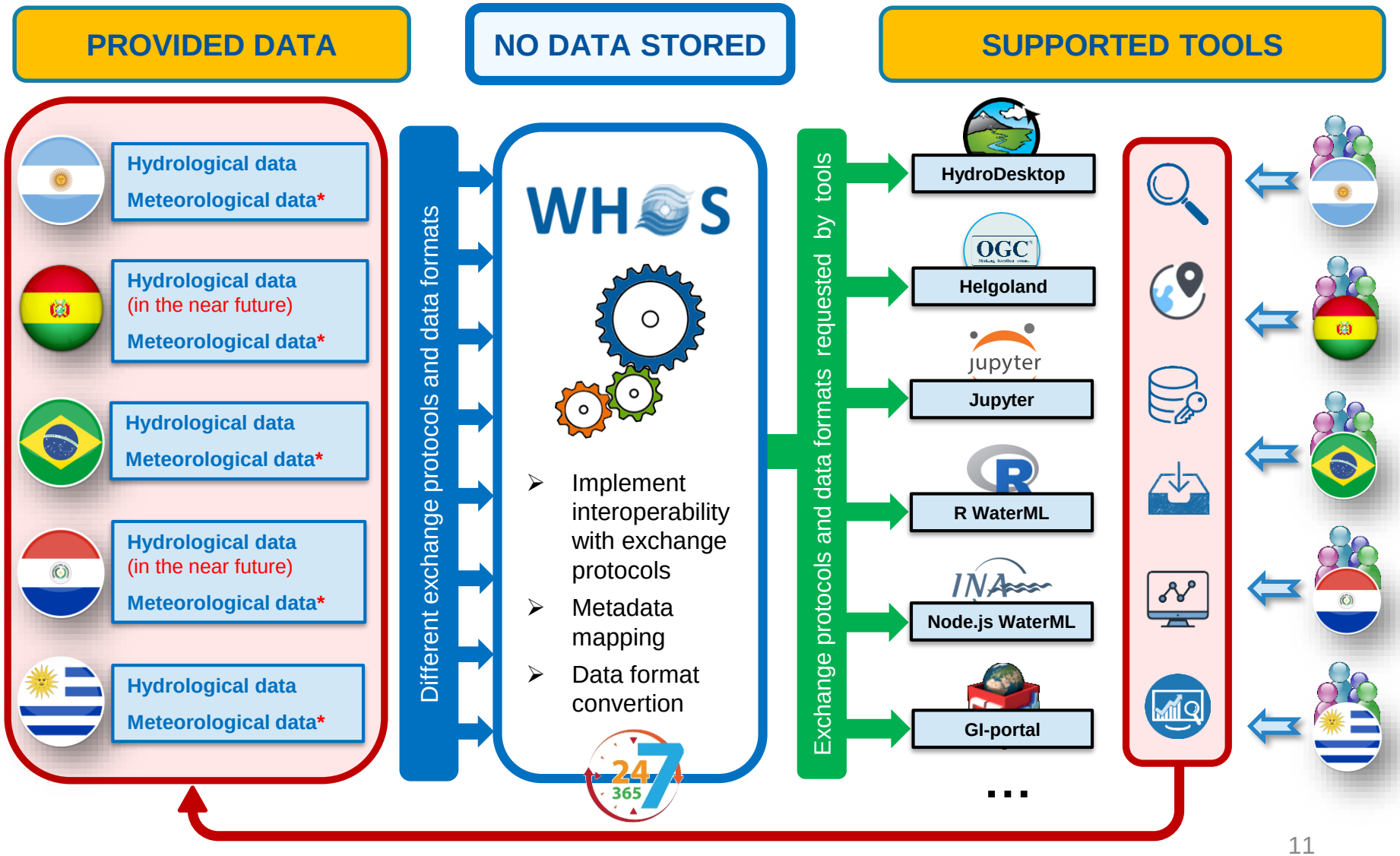
Parts under development:

- Part 3 - Surface Hydrology Features;
- Part 4 - Groundwater Features.

Challenges of data exchange and use

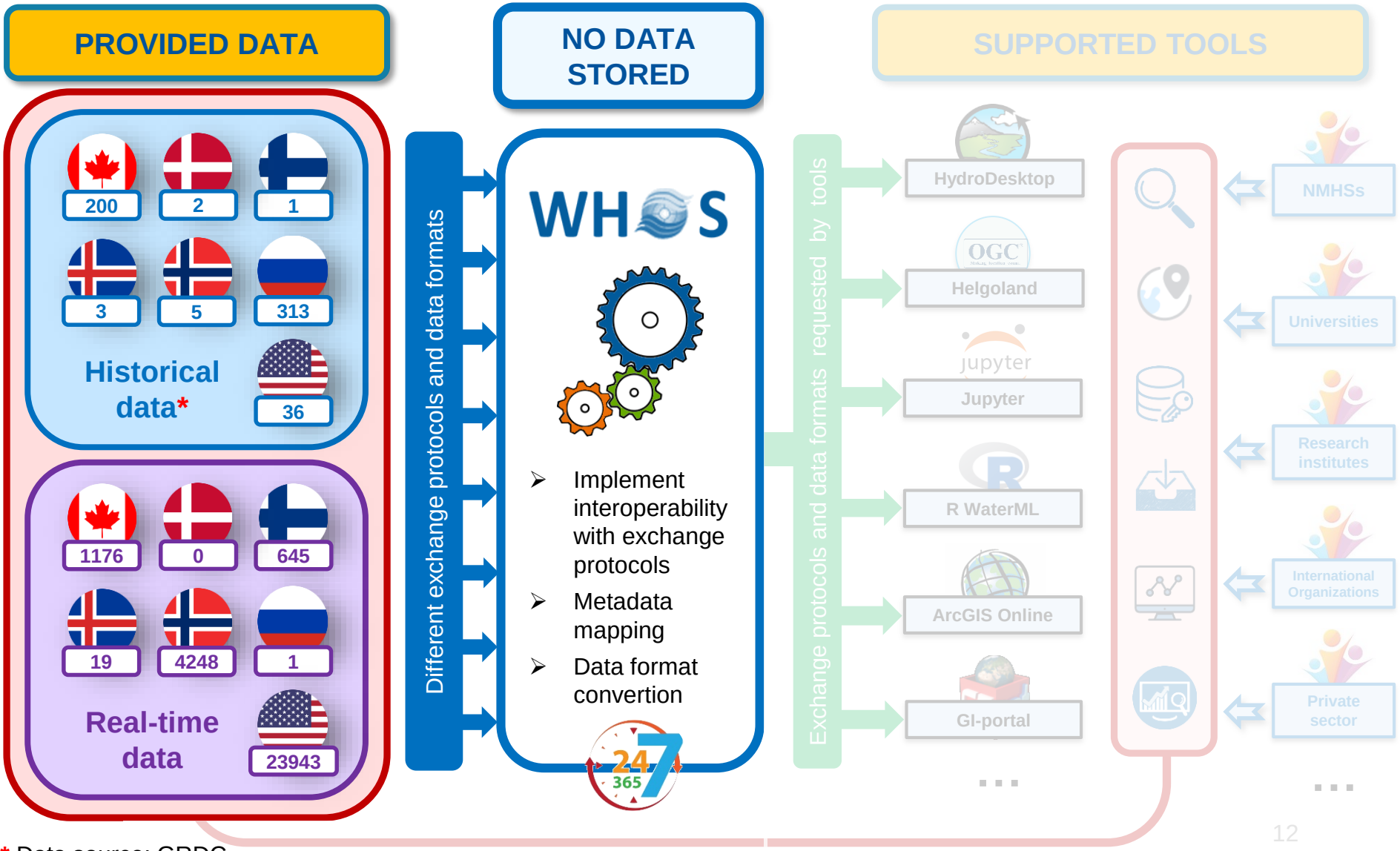


WHOS PLATA: Current status



*through the **Global Information System Centre (GISC) - Brasilia***

Arctic-HYCOS Pilot: Current status



* Data source: GRDC

How does it work?

PROVIDED DATA

- As a pre-condition, data provider need to **publish their data** through local or global platforms (e.g. internet website, FTP, API, GRDC) or **provide direct access** to their online databases
- As a data provider, you need to **describe your data formats and services used** and how the data are published (public or private access), providing access details (e.g. specific IP or login details), if needed
- If data providers want that their data are converted into specific format, they need to **describe the desired output format**
- All this information should be **communicated to WMO Secretariat** *(automatic submission of information on the WHOS Portal will be available soon)*
- Data providers can also request to **create customized data sets (views)**
- Every created data set (view) generates the **new web-links (end-points)** which can be used to discover and access the data included in this view

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CUSTOMIZED DATA SETS (VIEWS)

Tool 1

Tool 2

Tool 3

Web-link 5

Web-link 1

Web-link 2

Web-link 3

Group of countries

Global

Country

VIEW 3

VIEW 2

VIEW 4

Station

VIEW 1

WHOS

Arctic-HYCOS

VIEW 5

selected stations from "Group of countries"

1 selected station from Country 1

VIEW 6

Río de la Plata basin

Data Node (Country 1)

Data Node (Country 2)

Data Node (Country 3)

Data Node (Country 4)

Data Node (Country 5)

Group of countries

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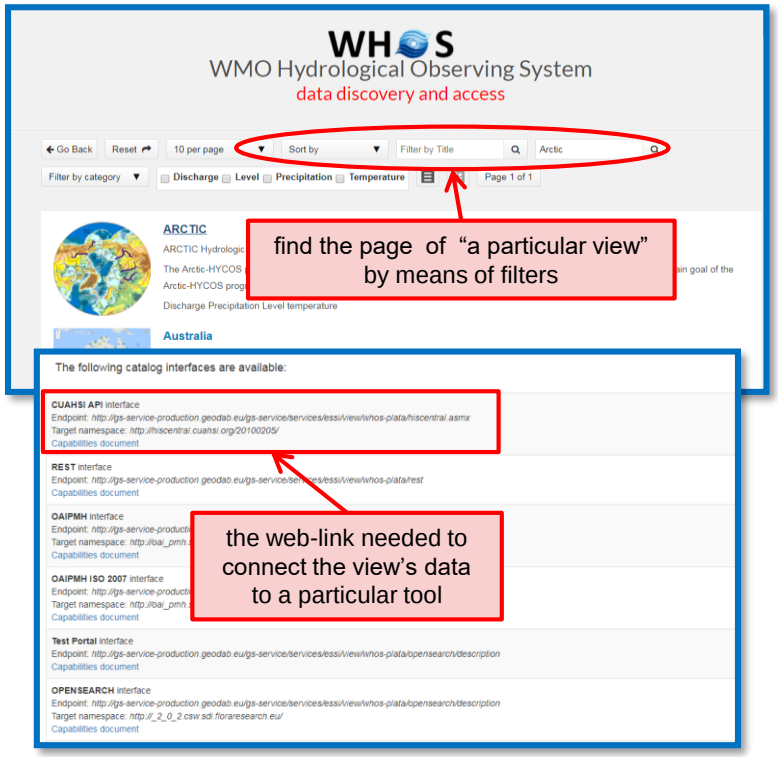
WHOS Portal and webpage for data users

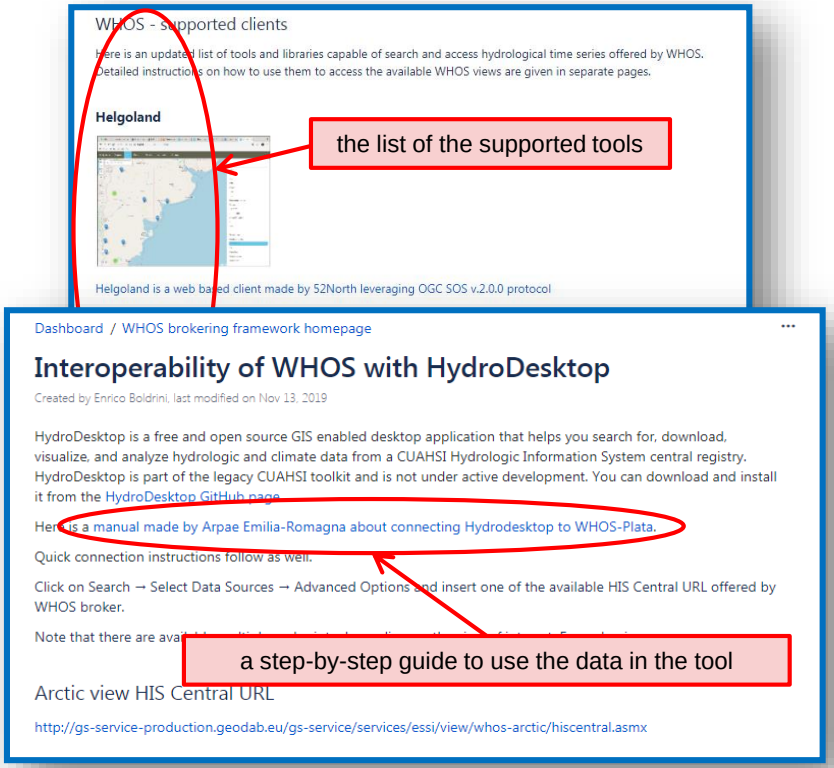
WHOS Portal

provides web-links needed to configure the tools for use of data available through a particular view



WHOS Webpage

provides short technical guides and tutorials to use the supported tools



link

Future WHOS Portal (in process)

- **Map representation** of data providers
- **Multi-filter functionality** to find data
- **Information needed** to configure supported tools
- **Direct links** to supported tools and their manuals
- **Online submission** of request to connect new data to WHOS
- **User guide** for WHOS Portal

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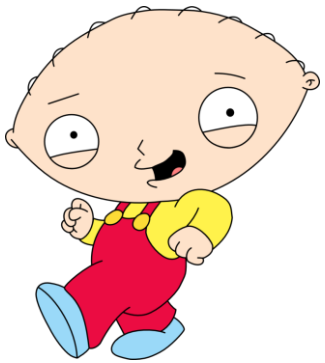
How to use web-links?



- use the web-links generated by WHOS to configure supported tools and applications you would like to use

That's all, now you can discover, access and use shared data!!!

Example

If your **organization would like to use HydroDesktop tool** (currently does not use it):

- connect your data to WHOS
- WHOS will automatically convert your data to the format and exchange protocol required by HydroDesktop
- the converted data can now be directly connected to HydroDesktop and easily used

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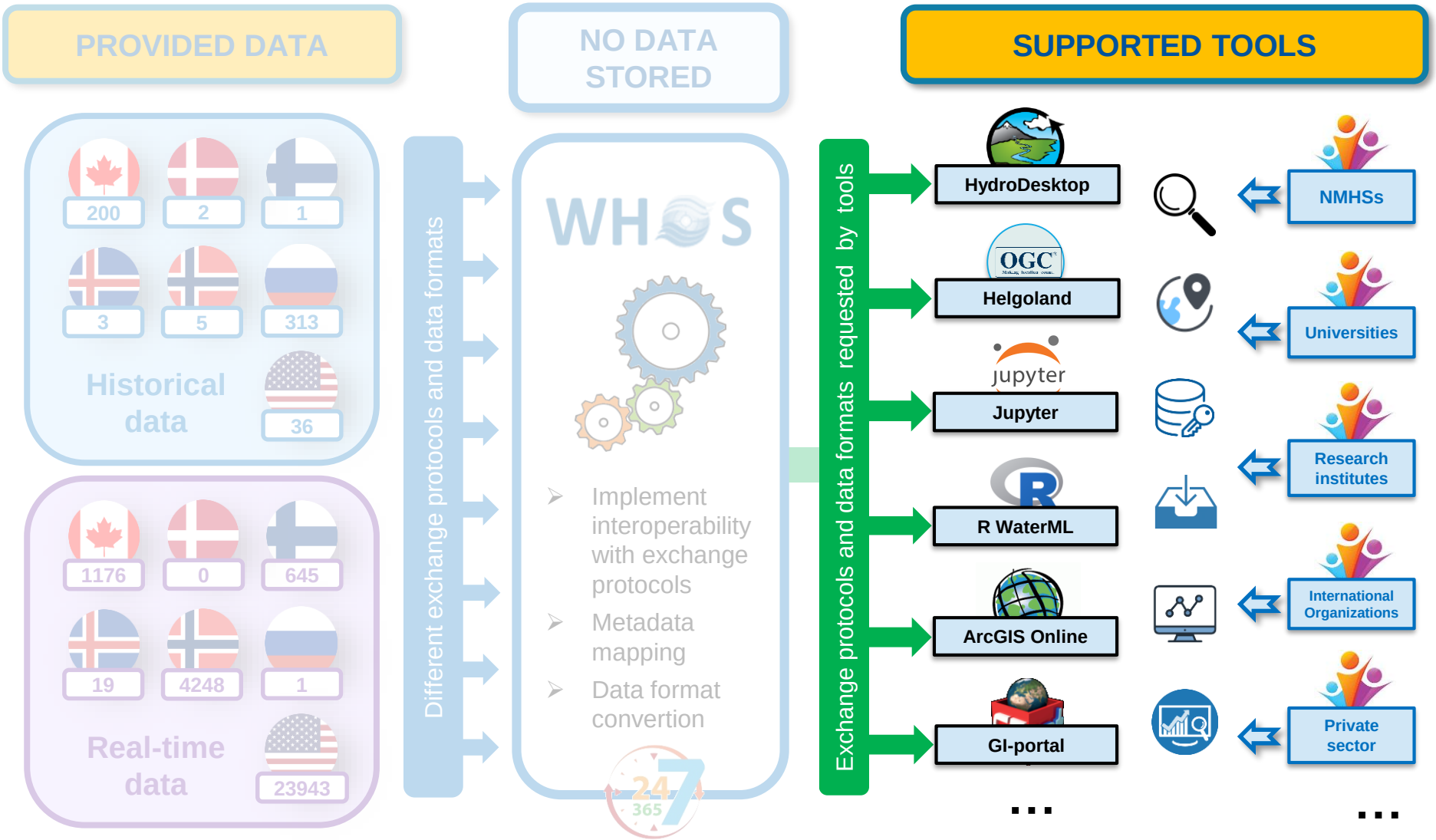
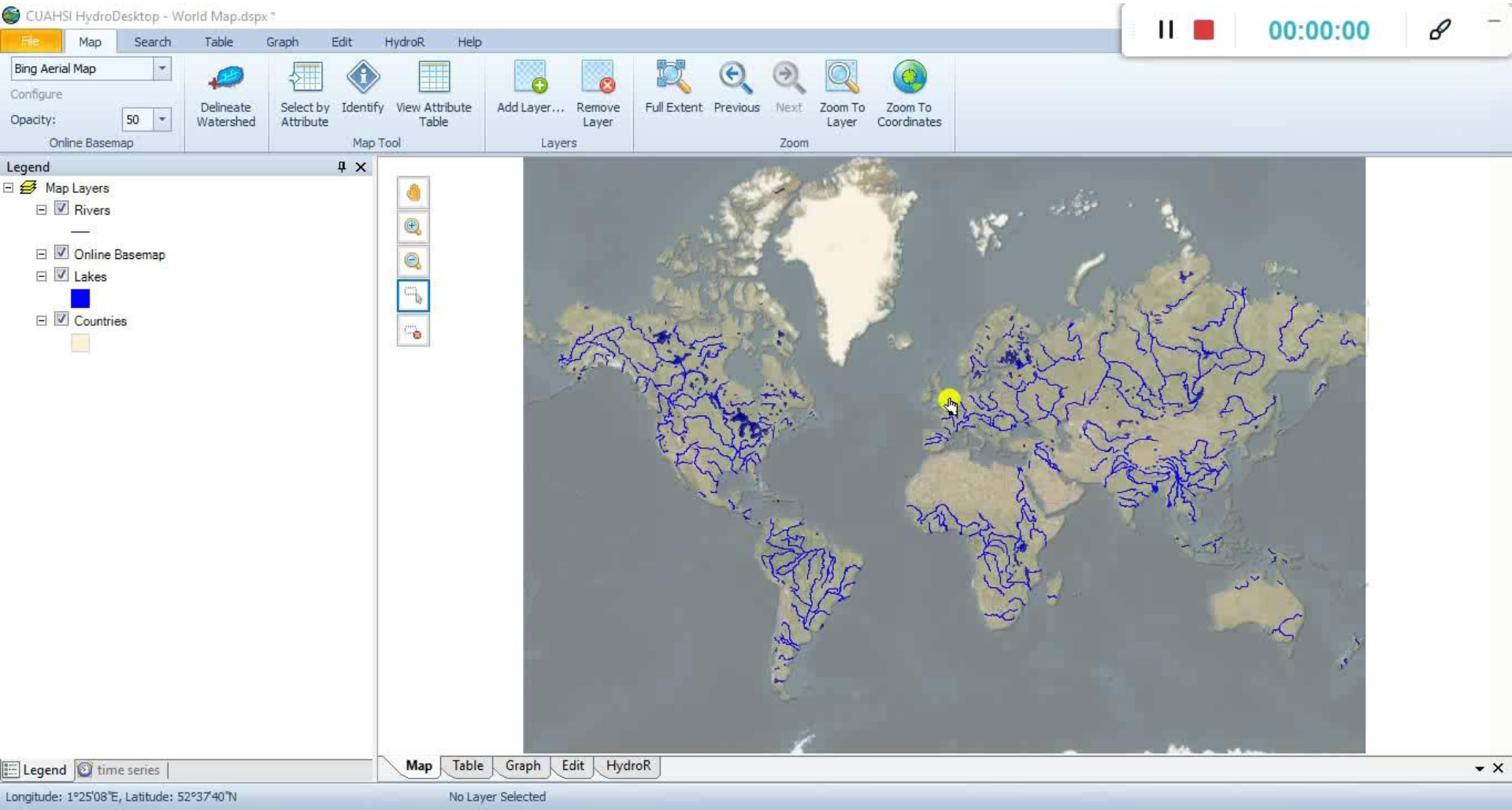
Arctic-HYCOS: Current status



TOOL: HydroDesktop

Río de la Plata basin view

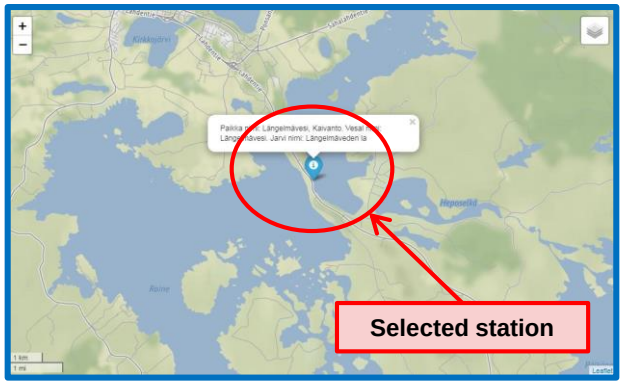
ACCESS | FILTER | VISUALIZE | DOWNLOAD

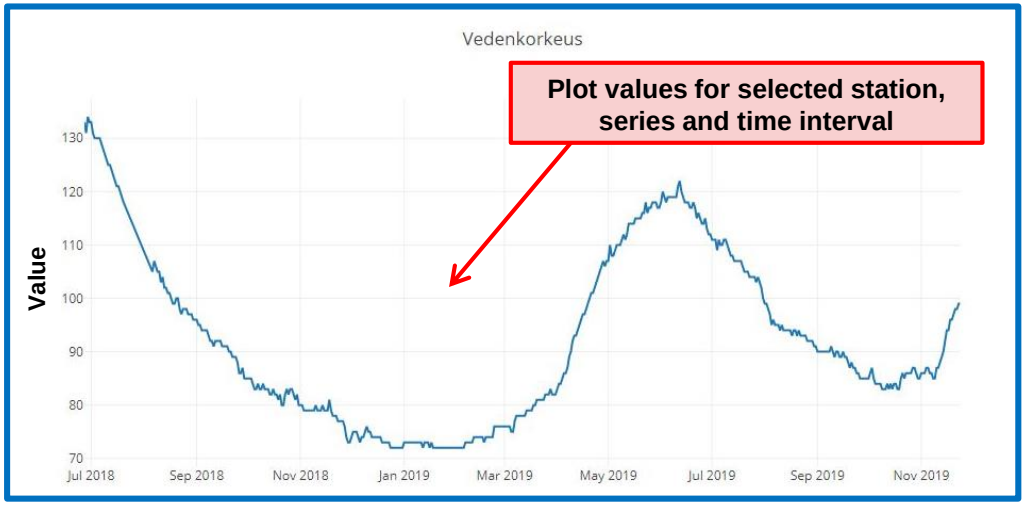


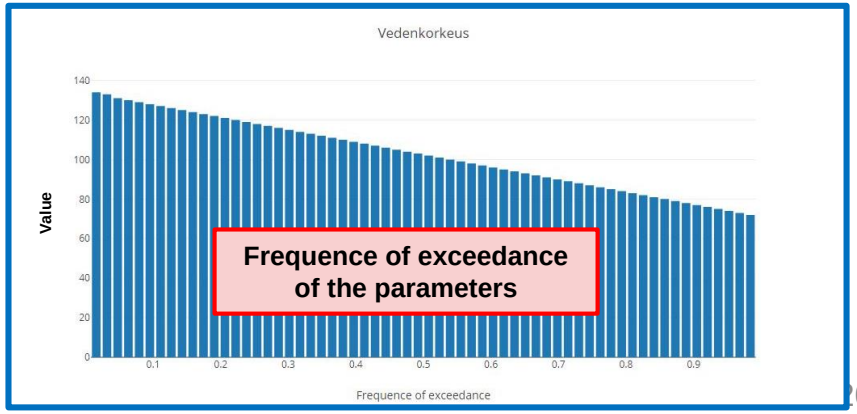
TOOL: Jupyter notebooks

Arctic-HYCOS view

ACCESS | FILTER | VISUALIZE | DOWNLOAD | ANALYZE







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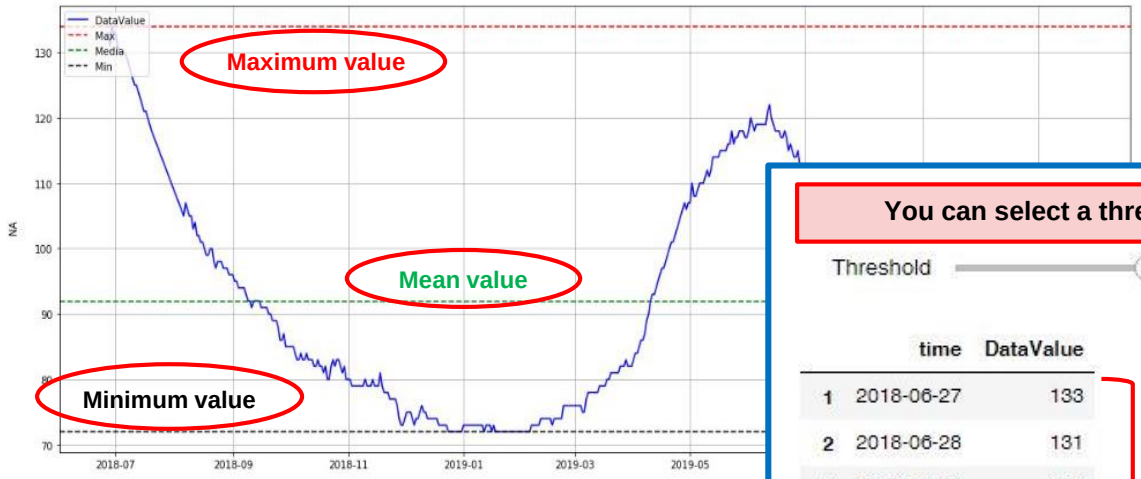
TOOL: Jupyter notebooks

Arctic-HYCOS view

Mean	Maximum	Minimum
91.866	134	72

Graph with the analyzed data



You can select a threshold

Threshold 128

	time	DataValue
1	2018-06-27	133
2	2018-06-28	131
3	2018-06-29	134
4	2018-06-30	133
5	2018-07-01	133
6	2018-07-02	131
7	2018-07-03	130
8	2018-07-04	130
9	2018-07-05	130
10	2018-07-06	130

Only the data that have a higher value are visualized!

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Benefits of using WHOS?

- ✔ NMHSs **can share their hydrological data and information** customizing views and access (any data format and service are supported)
- ✔ Shared data and information **can automatically be converted** by WHOS into standardized and non-standardized formats requested by end-users
- ✔ Automatic conversion of data **speeds the use of hydrological applications**
- ✔ Make use of tools and applications through the WHOS **without any additional local development**
- ✔ The **data and information are not duplicated** due to direct connection to data providers
- ✔ Possibility to **test models** using data from other countries with same hydrological conditions
- ✔ During the emergency situations, WHOS facilitates **international cooperation** (including transboundary basins and islands)

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Learning about WHOS

How to learn more about WHOS?

Distance Learning Course and tutorials are being prepared together with COMET Program (UCAR - University Corporation for Atmospheric Research, USA)**.**

Learning objectives:

1. Describe the WHOS architecture
2. Explain the needs for hydrologic data sharing that are driving the need for WHOS
3. Explain the seven components of WHOS: *Data, Format, Services, Mediator, Broker, Ontology, Client*
4. Demonstrate how to share data and information via WHOS
5. Demonstrate how to use shared data in different applications

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Thank you!

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