

INBO WEBINAR

From ground to orbit: combining in-situ and satellite monitoring of water to improve basin management

Satellite information supporting the global hydrological monitoring

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The World Meteorological Organization

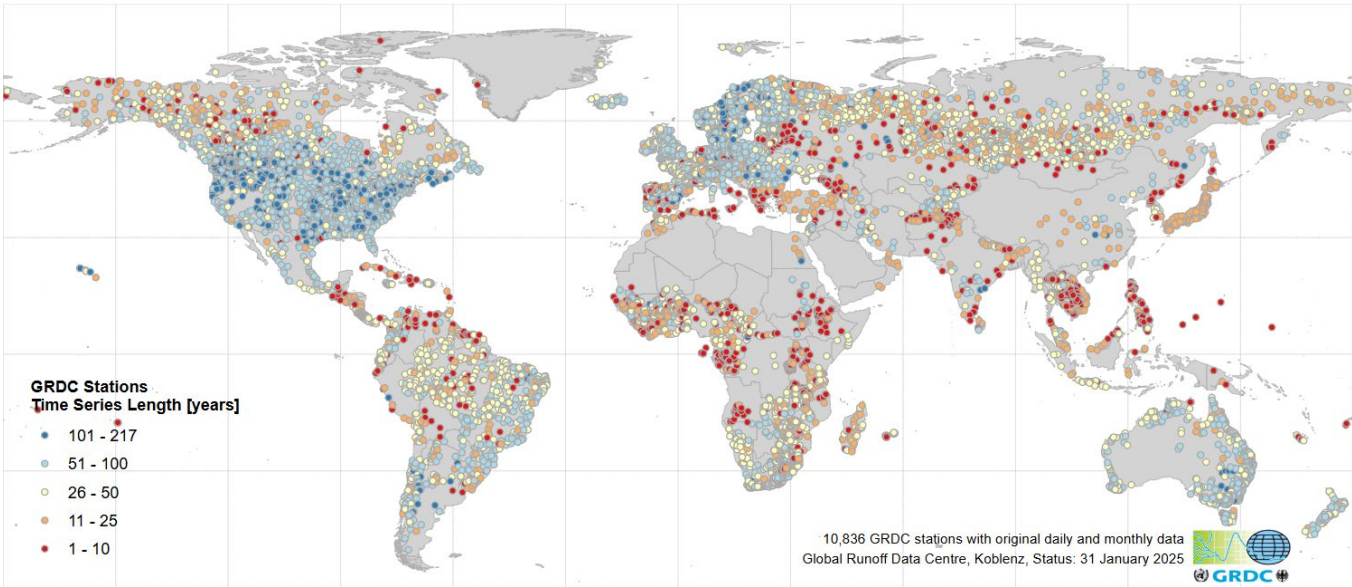
WMO



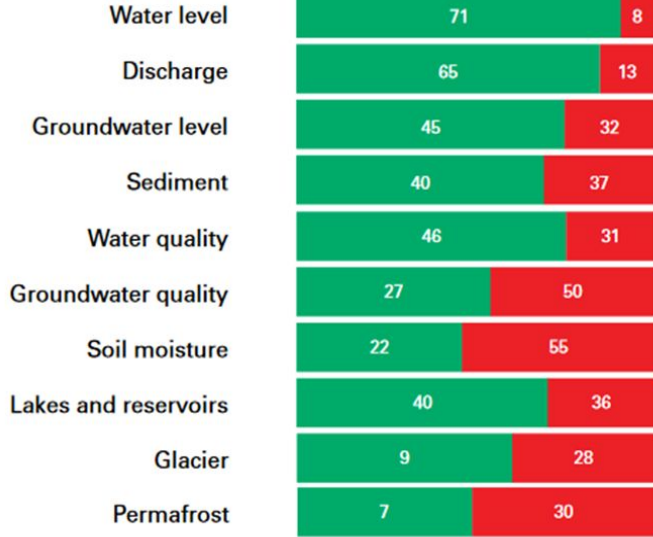
- Coordinating the National Meteorological and Hydrological Services worldwide
- Working in partnership
- Stimulating North South; South-South cooperation

- Hydroclimate services
- Earth System approach
- Global, regional and national monitoring networks
- Unified data policy

Most needed and most missing: hydrological data

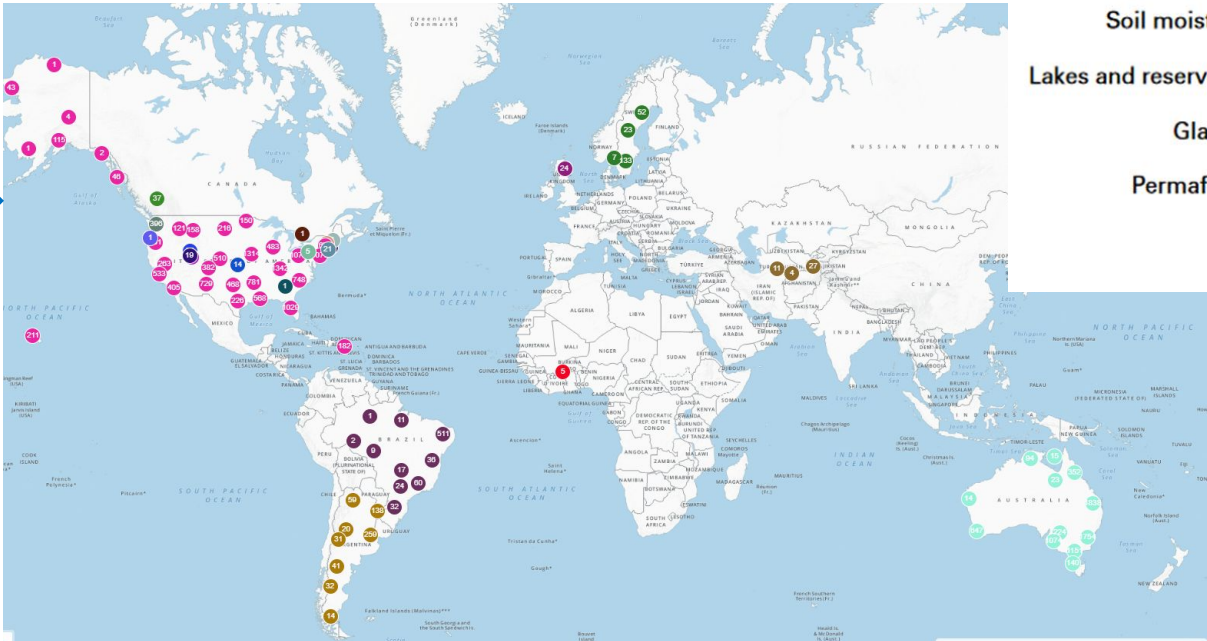


Global Runoff Data Center



Yes No

WMO Hydrological
Observing System
WHOS

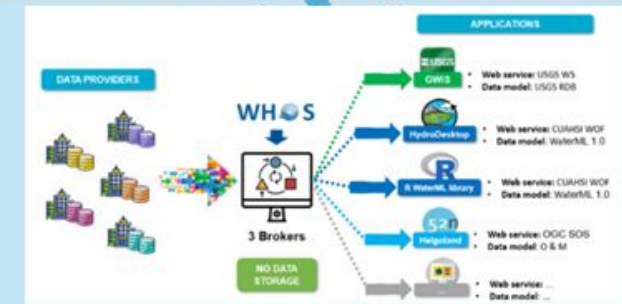


WMO support hydro monitoring through projects and standards, bringing innovative approaches

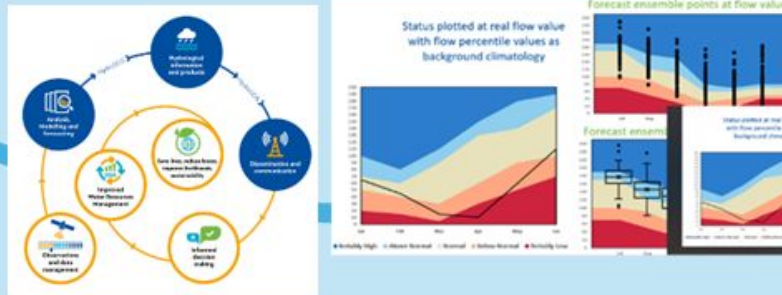
Data collection: WHYCOS, HydroHub and Project X



Data access and sharing: WHOS (tech) and WWDI (policy)



Data analysis: HydroSOS



Role of WMO in hydrological monitoring from space

- Defining key variables, implementing the unified data policy
- Engaging with satellite community for requirements and research
 - Coordination Group for Meteorological Satellite CGMS, including hydrology: operational
 - Committee on Earth Observations Satellites CEOS: rather research
 - COPENICUS, ESA, EUMETSAT, NASA, JAXA, etc.
- Providing capacity building to Countries
- Latest activity: satellite webinar 13-14 March 2025
 - Support identification of core and recommended satellite data for hydrology
 - Engaging with the community for addressing requirements and cooperation

Draft Table of Satellite hydrological cycle Variables

Variables (Surface Water, Ground water, Water Quality, Soil)-TT-EHN Data Policy

Sources of variables (International Glossary of Hydrology (WMO-No. 385), WMO Code Registry (WMDR), Guide to Hydrological Practices Volume II (WMO-No. 168), WMO-No.680-Manual on water quality monitoring.pdf))

Updated with the inputs/comments from H-SAF/EUMETSAT (Feb 2025)

	Satellite Observations	Calculated from other variables (derived)		Satellite Observations	Calculated from other variables (derived)		Satellite Observations	Calculated from other variables (derived)
a) Surface Water (Quantity)			d) Atmospheric parameters			f) Water Quality (surface & groundwater)		
Water level/stage/ gauge height	✓		Precipitation (rain and snow)	✓		Turbidity	✓	
Water depth	✓	✓	Precipitation intensity at surface	✓		Water Color	✓	
Lake level (Reservoir)	✓		Terrestrial Radiation	✓		Electrical conductivity (of water)		
Lake volume	✓	✓	Wind speed (near surface)	✓		pH		
Reservoir storage/total storage	✓	✓	Wind direction	✓		Total sediment load		
Stream discharge/ Streamflow	✓	✓	Air temperature (2-meter)	✓		Biochemical oxygen demand (BOD)		
Stream velocity/river velocity	✓	✓	Relative humidity	✓		Chemical oxygen demand (COD)		
Stream Surface Velocity	✓	✓	Air moisture/Air humidity	✓		Dissolved oxygen saturation		
Suspended Sediment Concentration			Specific humidity	✓		Total dissolved solids		
Runoff		✓	e) Soil			Total dissolved Nitrogen		
Cross section area of runoff			Soil moisture content	✓	✓	Total dissolved Phosphorus		
Lake/Reservoir inflow discharge		✓	Soil moisture (in the roots region)	✓	✓	g) Land/Vegetation Cover		
Water temperature	✓		Root Zone Soil Moisture (RZSM)	✓	✓	Land cover or Vegetation type	✓	
b) Groundwater			Soil moisture at surface	✓	✓	Leaf Area Index (LAI)	✓	
Groundwater depth	✓		Infiltration capacity			(FPAR) The Fraction of the Photosynthetically Al	✓	
Groundwater storage change	✓		Density of soil (bulk density)			Plant Available Water		
Groundwater discharge (abstraction)		✓	Soil temperature	✓		Evaporation	✓	✓
c) Snow - Ice			Land surface temperature	✓		Transpiration/leaf area index	✓	
Depth of Snow fall/snowfall	✓		Soil drainage (groundwater recharge)		✓	Evapotranspiration	✓	✓
Snow depth	✓		Soil moisture deficit		✓	h) Other		
Snow coverage (Snow cover)	✓		Soil depth			Consumptive Water Use	✓	✓
Snow surface state/ Snow status		✓	Soil type			Isotope hydrology (3H, 2H, 14C, 13C, 18O)		
Water equivalent of snow	✓	✓				Sea-Surface Salinity	✓	
Lake Ice Cover	✓							
Lake Ice Thickness	✓							

Conclusions

- ❑ Telling the obvious: we need in situ and satellite monitoring
- ❑ Modern monitoring network design must combine all technologies
- ❑ Connections between users and providers is key to define operational requirements
- ❑ Capacity building is a sustainable effort
- ❑ The INBO-WMO Task Force on satellite can make the difference!