SATELLITE DATA REQUIREMENTS IN OPERATIONAL HYDROLOGY

A WMO PERSPECTIVE



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

World Meteorological Organization

WMO is the UN specialized agency in the domains of weather, climate and water (hydrology):

To promote activities in operational hydrology and to further close cooperation between Meteorological and Hydrological Services;

- Worldwide cooperation (observing networks and data centres)
- Data and information exchange
- Standardization
- Application and services
- Hydro Meteo cooperation
- Research and training





WMO HQ in Geneva, Switzerland

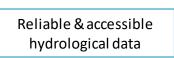


Operational Hydrology: WMO's long term ambitions

- 1. No one is surprised by a flood
- 2. Everyone is prepared for drought
- 3. Hydro-climate and meteorological data support the food security agenda
- 4. High-quality data supports science
- 5. Science provides a sound basis for operational hydrology
- 6. We have a thorough knowledge of the water resources of our world
- 7. Sustainable development is supported by information covering the full hydrological cycle
- 8. Water quality is known.



The WMO **Hydrological Value Chain Initiatives**





Flood Forecasting Initiative

delivers timely and more accurate flood forecasting and warning products and services



DATA

World Water WMO HydroHub enhances and innovates

Data Initiative

supports countries in waterrelated policy development



PRODUCTS & SERVICES

WMO HydroSOS

provides global reference information on current and future status of freshwater systems

Feedback

hydrological monitoring

systems worldwide



DECISION SUPPORT

Water Resources Management

Associated Programme on Flood Management

Integrated Drought Management Programme

Data & products to support decision making

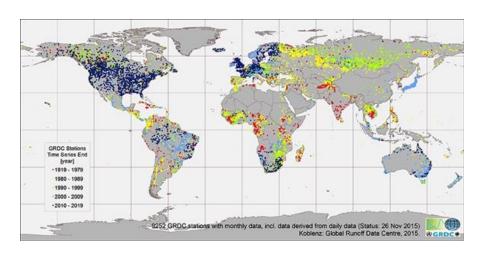
Sustainable water management

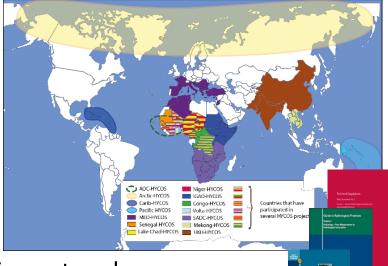
Disaster risk reduction

Economic development Environmental conservation

Consistent & high-quality hydrological data & products

Water challenges require solutions based on sound facts, information and data, but:





- Insufficient coverage of current monitoring networks
- Quality of data not always known
- Many data not shared
- Low visibility and recognition of Hydrological Services
- Need for an innovative approach
- Integrating various sources of data
- Quality and technical standards



Policy basis for Earth System approach: historical decisions from WMO Congress in October 2021

Concept note for hydrological and ocean variables into GBON to be prepared

WMO Unified Data Policy

- Increased international exchange of observations by all Members (<u>Core and</u> <u>recommended data</u>)
- Return of high-quality model output to all Members

See the WMO
Bulletin 70(2),
2021 on data
sharing



Global Basic Observing Network

- Example of regulatory implementation of data policy
- Increased exchange of observations by all Members, facilitated by both Data Policy and SOFF



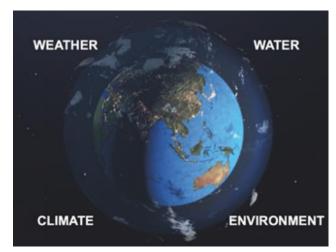
Systematic Observations Financing Facility

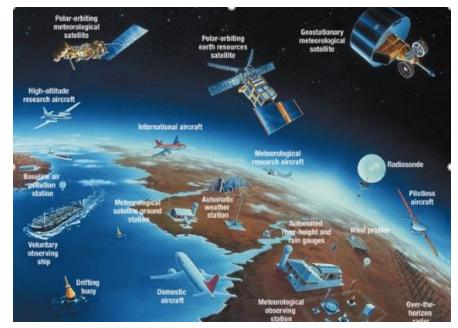
- Technical and financial support for <u>GBON</u> implementation where it is most needed
- Building on GBON regulations



Towards a holistic approach to Earth monitoring

- ➤ Integrated information for better understanding and modeling of Earth processes
- Interoperability of observing systems
- Integration of multi-source data
- Common basic tools for data management
 - Quality assessment
 - Make providers and users life easier







INNOVATIVE MEASUREMENT



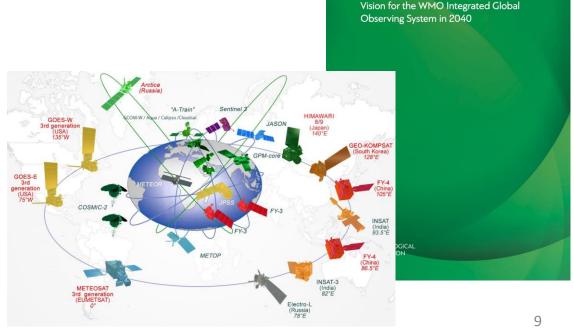
IMOMO





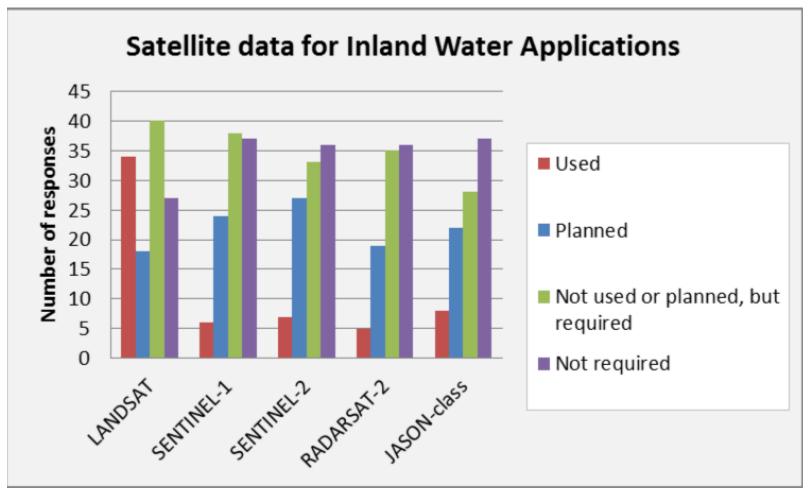
WMO space programme

- Since 2003
- Promote availability and utilization of satellite data and products for weather, climate, water and related applications
 - Promote observation
 - Use of data and products
 - Capacity Building
 - Space weather





WMO user survey 2017 Satellite data for inland water-related applications





Example of possible collaboration with satellite

- Community
 Data Collection: water level (e.g., Congo, Niger), soil moisture (SWOT, SMOS), Groundwater (GRACE)
- Data platform and centers:
 - WHOS will be contributing to UNOOSA Space4Water
 - HYDROLARE (WMO data center for Lake and Reservoirs) is supported by LEGOS for combining in situ and satellite data
- Projects: HydroSOS (global, regional and national hydrological situation – Today and in the Future), will combine in situ and satellite information. Collaboration foreseen with ECMWF, NCAR, ...
- Other collaborations: COPERNICUS (exploratory discussions),
 CEOS-Water, International Network of Basin Organization, ...
- Private sector (e.g., e-Ray)
 WMO OMM



A new paradigm for Hydrometry

We drive innovation, establish partnerships, break boundaries and unlock funding

Hydrological

Services Information Platform

Helpdesk

We develop capacities, catalyze sustainable funding and monitoring, and support innovative

approaches

Innovation Hub

World Hydrological Cycle Observing System (WHYCOS) We share information and identify opportunities

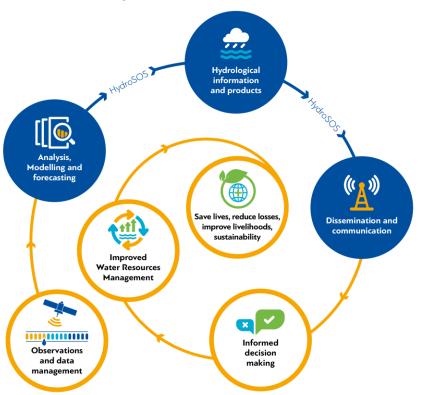
We promote free and open data

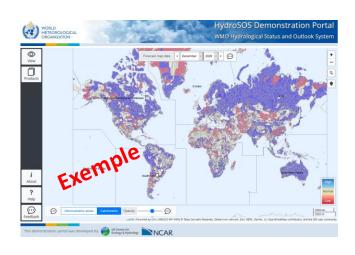
WMO Hydrological Observing System (WHOS)

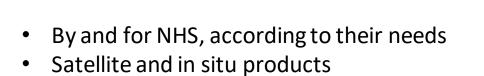
We share knowledge and foster collaboration



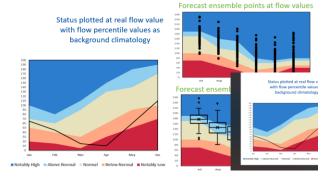
HydroSOS: Status and Outlook of the Hydrological Cycle

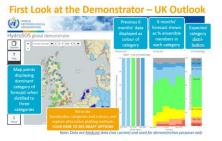






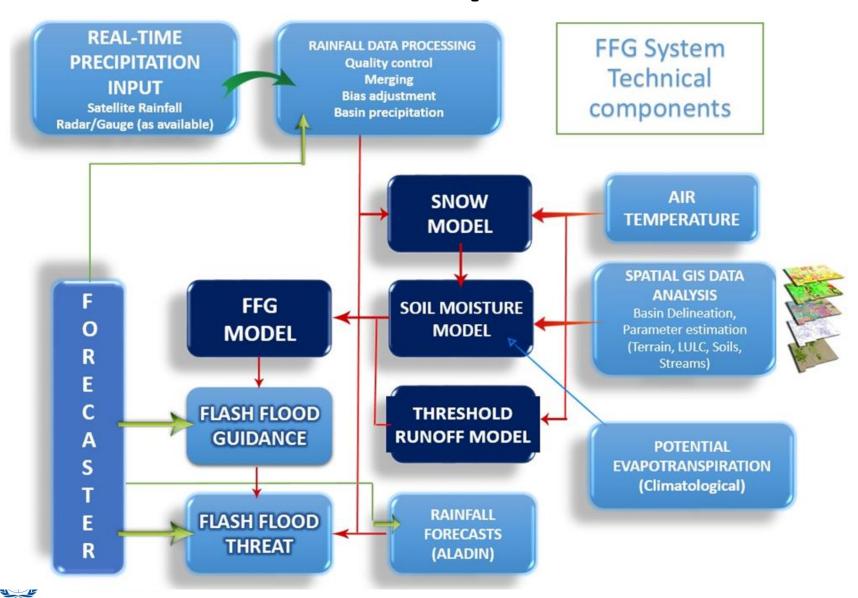
Regional and global models



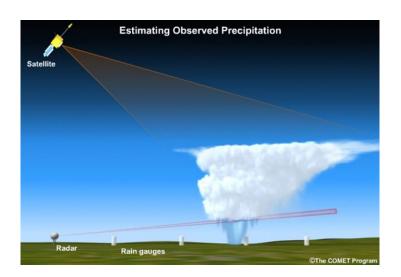


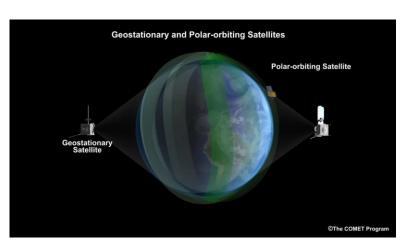


FFGS Components



Satellite Precipitation Estimates in FFGS

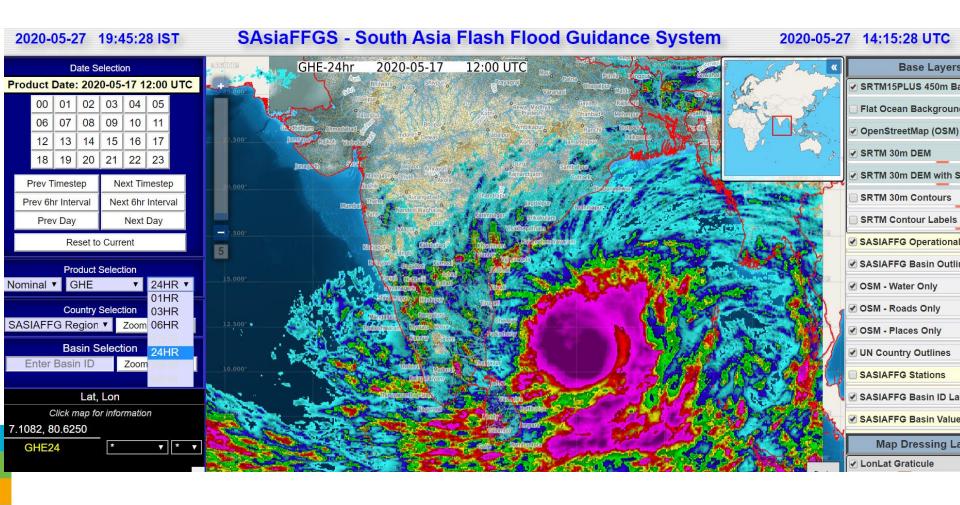




- Satellite data provider: NOAA
- The big advantage of the meteorological satellites is that they are covering the entire globe, which is very important in regions with sparse coverage by traditional gauge or radar networks.
- The relatively high spatial and temporal resolution is critical since heavy rain often covers a relatively small area and can change very quickly.



Global HydroEstimator Satellite Precipitation Estimates



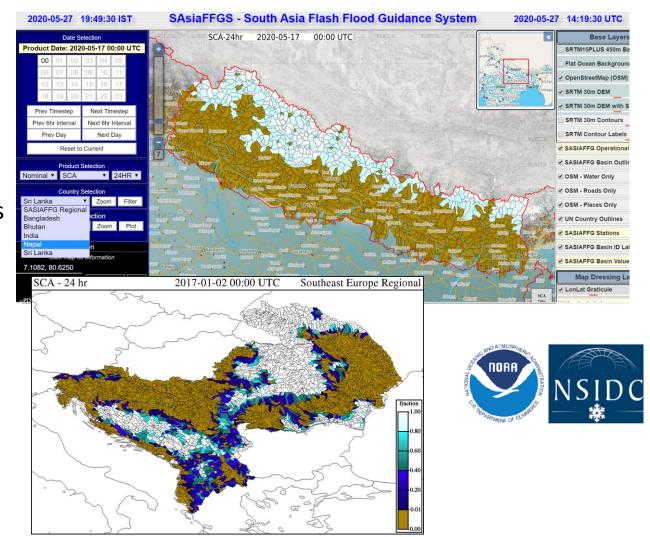


Latency: 15-20 min

Spatial resolution: 4 km

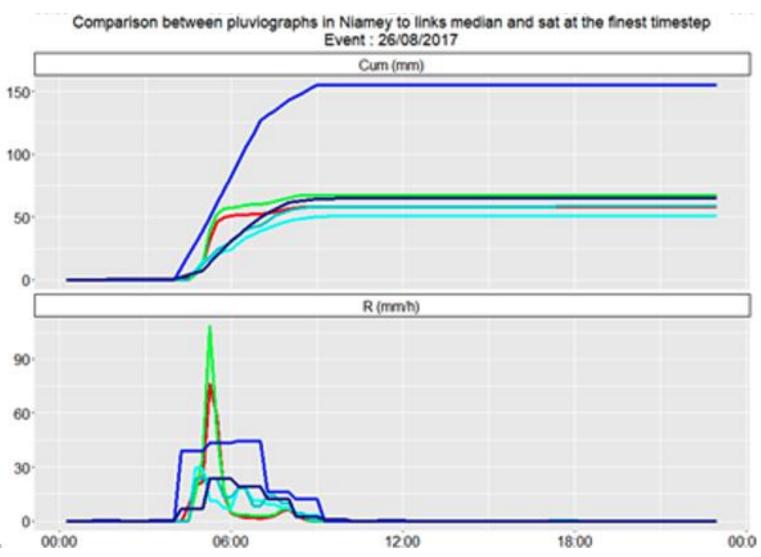
Snow Coverage Area in FFGS

- This product provides the latest estimate of the fraction of snow cover for each subbasin.
- For FFGS, snow cover is retrieved daily from the Interactive Multisensor Snow and Ice Mapping System (IMS), made available as a global product through the National Snow and Ice Data Center, NOAA.





Integrating satellite and CML attenuation data



Source: Rain Cell project

Conclusions

- Water is a complex system: no good decision without good information: data are central
- All data sources must be combined: In situ, citizen science, remote sensing: Cooperation a key
- Data quality must be ensured!
- WMO paves the way to innovative water monitoring (HydroHub) and to information on possible water related problems (HydroSOS)
- Needs for satellite information for water are growing
- Only a few NMHSs a effectively using satellite information
- Interactions between WMO hydrology and satellite community should be coordinated in a well-defined framework



Thank you Merci



World Meteorological Organization Organisation météorologique mondiale