WMO Unified Data Policy and Core Satellite Data



Heikki Pohjola ITSC-24, Tromsø, Norway, 16 - 22 March 2023

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

WMO Space Programme News

Kenneth Holmlund retired



- New head of Space System and Utilization (SSU) division will be Natalia Donoho (NOAA) from 3rd Apr 2023
- New staff Jesse Andries joining from 22nd May 2023
 - Space weather and radio frequency coordination
- Existing Staff
 - Heikki Pohjola
 - Zoya Andreeva
 - Chang Liu (Junior Professional Officer by CMA, temporary)

- SSU expert teams:
 - ET-SSU, Expert Team on Space Systems and Utilization
 - Cochairs Fiona Smith (BoM) and Jack Kaye (NASA)
 - ET-SWX, Expert Team on Space Weather
 - Cochairs Kirsti Kauristie (FMI) and Lee-Anne McKinnell (SAWS)
 - ET-RFC, Expert Team on Radio Frequency
 Coordination
 - Cochairs Eric Allaix (Meteo France) and David Franc (NASA)



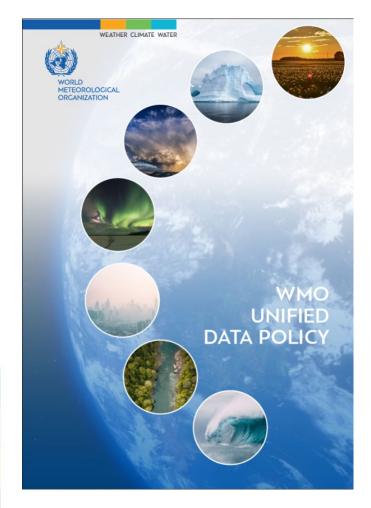
WMO data policy for the international exchange of Earth system data



WMO OMM

- New WMO Unified Data Policy (Res. 1) was approved by WMO members 2021 replacing the old Res 40 (weather), 25(hydrology) and 60 (climate)
- New data policy is single, overarching data policy resolution emphasis on the Earth System data: Observations, Monitoring, Prediction and Services
- As a fundamental principle, WMO commits itself to broadening and enhancing the free and unrestricted international exchange of Earth system data
- Two main categories of data:
 - Core (shall be exchanged)
 - Recommended (should be exchanged)
- The policy is addressed to national governments of WMO Members and cannot dictate private sector entities
 - Exchange of core data is considered mandatory, irrespective of data origin

Satellite data in WMO Unified Data Policy



- Vital importance of satellite data now clearly recognized
- The concept of *Core* satellite data is framed primarily in terms of importance for global NWP
- However, no specific satellite datasets are listed as neither Core nor Recommended in new data policy, or in Manual on WIGOS



Core observational data in WMO data policy

1. Weather-related data

This section lists observational and other data necessary to support weather monitoring and prediction efforts of the WMO Members. Such data are generally exchanged in real or near-real time, depending on the specific application.

1.1 Core observational data:

1.1.1 Surface-based:

Observations provided by the Global Basic Observing Network (GBON) and other observational data, as specified in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).

1.1.2 Space-based:

- (a) Satellite data required in order to ensure the performance and quality of NWP output, as agreed with Members operating satellites or relevant satellite operators, and listed in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160);
- (b) Satellite data required to support nowcasting applications including the generation of warning and advisory products, as agreed with Members operating satellites or relevant satellite operators, and listed in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).

3. Hydrology

This section lists data, including (near) real time data, historical time series and aggregated data, that are fundamental to global knowledge of the hydrological cycle and essential to the application of such knowledge to support and protect life and health; ensure economic prosperity and well-being; and effectively manage resources through the undertaking of operational hydrology.

3.1 Core observational data:

(a) Observations from reference network stations, to be detailed in the *global hydrological observing network* and subsequently specified and adopted into the WMO *Technical Regulations, Volume III, Hydrology* (WMO-No. 49) and its annexes;

(b) All satellite data needed to ensure the performance and quality of hydrological forecast and outlook, as agreed with Members operating satellites or relevant satellite operators and specified in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).



Catalogue of Core Data - WIGOS Manual

Initial list of Earth system data to be exchanged as core data

C= E-4/2024\/TNE 4.4

World Metacrological Overnination

Reference to Annex 1	WMO- No.	Part/ Section	Provision	Text of Provision	Data Type	Status	Note	Comment
1.1.2	1160	4	4.5.2.1	Satellite operators shall ensure near-real-time dissemination of the appropriate data sets, as per the requirements of Members, either by direct broadcast via an appropriately designed ground segment, or by rebroadcast via telecommunication satellites.	Not specified	С		
1.1.2	1160	4	4.5.3.4	Satellite operators shall maintain and provide unrestricted access to Level 1B satellite data archives including all relevant metadata pertaining to the location, orbit parameters and	Level 1B satellite data archives	N	Approved by EC-73	Effective 1 Decembe r 2022



The "Status" column includes the following three options, namely "C" (current), "N" (new, approved by EC-73) and "P" (submitted to Cg-Ext(2021) for its approval).

calibration procedures

used.

Defining Core and Recommended satellite data as per WMO Unified Data Policy

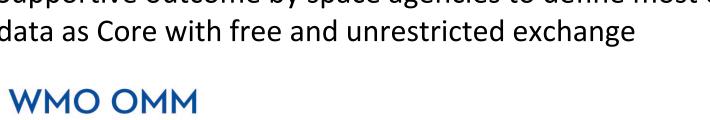
- Analysis of space-based observation capabilities of CGMS members was carried out with WMO **Expert Teams**
 - ET-SSU, ET-SWX and CGMS SWCG
- Based on WMO OSCAR/Space, Vision 2040 for WIGOS, NWP Position Paper and other material as a reference aiming to capture user perspective
- Document for current and near future measurement capabilities was prepared
 - GEO measurement capabilities
 - LEO measurement capabilities
 - Space weather



A core	measuren	nen ts																
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				of atmosphere		24 hrs	Glob					0.25-0.5	5 nm	2600	< 24		spheric C hemistry	1000
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		AIRS	. 1	op of atmosph	ere radiances	12 hrs 12 hrs		in 12 hrs in 24 hrs	13.5 km 20 km		4-15.4 - 100 t	um 0	5 -2 cm-1	-	2378	< 2 hr	NWP Climate	
	AURA	MLS		Jimb view micro Ozone profile	owave radiances	12 hrs 24 hrs		in 3 days in 24 hrs	300 km	118 n 0.	-2500 (27-0.5 t	GHz um 0	42-0.63 n		bands 1560		Atmospheric chemistry Atmospheric chemistry	
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Defining Core and Recommended satellite data as per WMO Unified Data Policy (cont'd)

- Letters with analysis of space-based observation capabilities were sent to Space Agencies (and WMO Members)
- Asking to nominate agency focal point and schedule bilateral discussion between WMO and Space Agency to define which data could be defined as Core or Recommended
- Most of the bilateral discussions already done
- Supportive outcome by space agencies to define most of their data as Core with free and unrestricted exchange





Current CGMS Members capabilities to

Invitation to bilateral discussions on Core Satellite Data an the International Exchange of Earth System Data

The 2021 Extraordinary Congress approved the WMO Unified Policy Members shall exchange Core data on a free and unrestricted basis to

Way forward

- Complete remaining bilateral discussions
- Status update will be presented to Space Agencies in CGMS-51
- Seek endorsement from INFCOM 3 followed by Executive Council and finally WMO Congress for the decision by WMO members
- Consolidated commitments to be tabled in WMO regulatory material (WMO WIGOS Manual) and reflected elsewhere as suitable (OSCAR/Space database)



Thank you Merci

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SATELLITE DATA REQUIREMENTS FOR GLOBAL NUMERICAL WEATHER PREDICTION

Table 1: Backbone Satellite for global NWP

Geostationary	core constellation with a mini	mum of five satellites						
providing complete Earth coverage								
Type of satellite sensors	WIGOS Subcomponent	Products						
Multi-spectral VIS/IR imagery	1	Level 1: Radiance products						
with rapid repeat cycles		Level 2:Atmospheric Motion Vectors						
		(AMVs), Aerosol Optical Depth						
		(AOD), Sea Surface Temperature						
		(SST)						
IR Hyperspectral I Sounders	1	Level 1: Radiance products						
		Level 2:AMVs						
	s core constellation satellites							
	(morning, afternoon, early mo							
Type of satellite sensors	WIGOS Subcomponent	Products						
VIS/IR imagery	1	Level 1: Radiance products						
		Level 2: Aerosol Optical Depth (AOD),						
		Atmospheric Motion Vectors (AMVs),						
		Sea Surface Temperature (SST)						
IR Hyperspectral Sounder	1	Level 1: Radiances						
Microwave Sounder	1	Level 1: Radiances						
Microwave Imagery	1	Level 1: Radiances						
		Level 2:SST, total column water						
		vapour, clouds, precipitation, sea ice						
Scatterometer	1	Level 1: Backscattering cross-						
		sections						
		Level 2: Ocean surface vectors						
		winds, soil moisture						
Sun-synchronous	satellites at three additional	(any other than above)						
	nes for improved robustness	and improved time sampling						
Type of satellite sensors	WIGOS Subcomponent	Products						
Microwave Sounder	2	Level 1: Radiances						
Hyperspectral Infrared	Not currently reflected in	Level 1: Radiances						
Sounder	WIGOS Vision 2040							
Wide-swath radar altimeters	1	Level 2: Sea surface height, wind						
and high altitude, inclined,		and waves, ice freeboard						
high-precision orbit altimeters								
Global Navigation Satellite	1	Level 1: Bending angle						
System (GNSS) radio-		Level 2: Refractivity						
occultation (basic constellation)								
UV/VIS/NIR sounders, nadir	1	Level 2: Ozone, aerosol properties						
and limb								
IR dual-angle view imagers	1	Level 2: SST						

Table 2: Additional Satellite for global NWP

Data from Low-Earth orbiting satellites							
Type of satellite sensors	WIGOS Subcomponent	Products					
Multiangle, multipolarization		Level 1: Radiance products					
radiometers	2	Level 2: Aerosol Optical Depth					
		(AOD)					
Precipitation Radar	1	Level 1: Backscatter					
		Level 2: Precipitation rate					
Scatterometer		Level 1: Backscattering cross-					
	Not currently reflected in	sections					
	WIGOS2040	Level 2: Ocean surface vector					
		winds, soil moisture					
Radio-occultation	3 and 4[3]	Level 1: Bending angle					
		Level 2: Refractivity					
SAR imagers	1	Level 2: Sea ice					
Absolutely calibrated broadband							
radiometers and total solar	1	Level 1: Radiance					
irradiance and solar spectral	1	Level 1. Radiance					
irradiance radiometers							

Table 3: Emerging Satellite for global NWP

Geostationary core constellation with a minimum of five satellites providing complete Earth coverage								
Type of satellite sensors	WIGOS Subcomponent	Products						
Lightning mapper	1	Level 2: Strike density						
Data from Low-Earth orbiting satellites								
Type of satellite sensors	WIGOS Subcomponent	Products						
Wind lidar	Currently 2	Level 1: Backscatter, extinction Level 2: Line-of-sight winds						
Cloud lidar	2	Level 1: Backscatter, extinction						
Cloud radar	1	Level 1: Reflectivity						
Sub-mm imagery	2	Level 1: Radiances Level 2: Clouds						

