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INTER-PROGRAMME EXPERT TEAM ON SATELLITE UTILIZATION AND
PRODUCTS

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ESSENTIAL SATELLITE DATA: POSITION PAPER (DRAFT v0.1)

(Submitted by the Secretariat)

Summary and Purpose of Document

To provide an update of the draft IPET-SUP position paper on essential satellite data, based on IPET-SUP-1/Doc.5.5 and an iteration by the IPET-SUP task team (S. English, L. Machado, S. Wannop, A. Rea). (Included here is a clean version of the draft; a Word version with comments and tracked changes can be made available in session.)

Data policy issues were discussed in the 13th session of the WMO Consultative Meetings on High-Level Policy on Satellite Matters on 28-29 January 2016 (see IPET-SUP-2/Doc.4 for details).

ACTION PROPOSED

The second session is invited to comment.

What are Essential Satellite Data?

A Position Paper by the WMO CBS Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP)

V0.1, December 2015

Purpose and Scope

The prospect of private-sector operators of basic satellite systems has triggered renewed attention to the issue of data access for global WMO applications, in particular for near-real-time applications. While the value of WMO Resolution 40 is recognized, the satellite-specific provisions in the Resolution reflect the technical reality of the mid-1990 (when the main use of satellite data was imagery for nowcasting) and need revisiting. IPET-SUP decided to develop a Position Paper from the satellite user perspective on what types of satellite data should be considered essential, i.e. available on a free and unrestricted basis (in the sense of Resolution 40), for the protection of life and property. In this context, IPET-SUP proposes a review to the conditions under which satellite operators (public or private) are recognized as contributing to the WMO Integrated Global Observing System.

The Paper does not cover issues of data distribution, processing, documentation and formatting, and any limitations in data utility that users may face as a result.

Objectives

This Paper has the following objectives:

1. To expand the definition of “essential” (in the sense of Resolution 40) satellite data to include those data required for weather and ocean modelling used for the protection of life and property;
2. To recommend that satellite operators be explicit about their data policy (including which data they consider essential) when requesting recognition of their contributions to the space-based components of the WIGOS;

How will this Paper be used?

When adopted by IPET-SUP, the Paper will be submitted to CBS ICT-IOIS and CBS itself for discussion. It will also be presented to the WMO ICG-WIGOS and the WMO Consultative Meeting on High-Level Policy on Satellite Matters.

Background

1. In the context of observational data for weather and climate applications, there are different perceptions of the word “essential”:
 - (i) users often perceive it as the data most critical for their application (e.g., the ten data streams with the highest impact on forecast skill of a NWP model);
 - (ii) data providers often denote data “essential” if they are being distributed in an open manner, with no limitations on use, free of charge; in contrast, “additional” data are subject to some limitations or charges
 - (iii) WIS centres (such as Global Information System Centres, GISC) perceive “essential” data that require caching; hitherto only few satellite datasets are registered in the WIS catalogues
2. WMO Resolution 40 (Cg-XII, 1995) states:

“(1) Members shall provide on a free and unrestricted basis essential data and products which are necessary for the provision of services in support of the protection of life and property and the well-being of all nations, particularly those basic data and products, as, at a minimum, described in Annex 1 to this resolution, required to describe and forecast accurately weather and climate, and support WMO Programmes.”

3. Annex 1 is broad regarding “essential” satellite data, saying that
 - (i) “Those data and products from operational meteorological satellites that are agreed between WMO and satellite operators. (These should include data and products necessary for operations regarding severe weather warnings and tropical cyclone warnings). “
 - (ii) “Free and unrestricted” means non-discriminatory and without charge.
4. The distinction of “essential” and “additional” data in the sense of Res. 40 has helped that different data access and distribution policies could coexist among WMO Members: while those Members with a data policy favouring open and free access declared all their data “essential” (from a provider’s perspective), for others with more restricted data policies, the Resolution enabled commercial distribution of some data while protecting “essential” data from commercial interests.
5. Satellite data exchange and use has dramatically changed since 1995, due to:
 - (i) A transformed ICT landscape, allowing for a range of data access and exchange mechanisms beyond managed, point-to-point lines (e.g., internet, DVB-S), and data reproduction at virtually no cost to providers;
 - (ii) Dramatic improvements in temporal and spatial resolution from satellites; and
 - (iii) The NWP community being the single largest satellite data user today, whereas Res. 40 is formulated against the backdrop of using (geostationary) satellite imagery for nowcasting and severe weather warnings
6. Regarding (non-real-time) climate data, Resolution 60 (WMO Cg-17, 2015) advocates that GFCS relevant data and products developed or acquired under WMO auspices should be made accessible among Members on a free and unrestricted basis; the Annex to the Resolution specifies that such data include, among others,
 - (3) Climate relevant coastal interface data, in particular sea level, waves and storm surges;
 - (4) Data on the composition of the atmosphere including aerosols;
 - (5) Climate relevant satellite data and products;
 - (6) Climate relevant cryospheric data, in particular snow cover, snow depth, glacial monitoring, permafrost and lake and river ice.
7. The GEO Data Sharing Principles promote the full and open exchange of EO data, metadata, and products, recognizing international instruments and national policies and legislation. The Principles are currently under revision to favour a more open position to data exchange by recommending that data should be shared as Open Data by default, and made available as part of the GEOSS Data-CORE (Collection of Open Resources for Everyone). The GEO Data Sharing Principles largely follow work pursued by the Committee on Data for Science and Technology (CODATA; Uhlir et al., 2009).
8. The prospect of private-sector operators of basic satellite systems has triggered renewed attention to the issue of data access for global WMO applications. Actors such as PlanetIQ, GeoMetWatch, and others propose models of data

commercialization and utilization whereby they will sell data under a restricted use licence to multiple users.

9. A key issue is that, where commercial satellite data streams are used to substitute for traditional in situ measurements, the replacement data streams may not be available to WMO members. An example could be the substitution of GPS-RO data for upper air balloon soundings. This could have the effect, over time, of reducing overall availability of data to WMO members.

9. This issue was considered at a 2014 meeting of the CBS Expert Team on Satellite Systems (ET-SAT), which recognized that:

- (i) Private information sources were traditionally outside the scope of meteorological activity, however, with the move towards a more integrated Earth system monitoring, a more open approach may be needed.
- (ii) There are however related risks. In particular:
 - a. Loss of total transparency of the observation and processing chain, and control over integrity and reliability of the data. This may happen if some information cannot be disclosed because they involve proprietary knowledge, or in case of conflict of interests. This risk has to be fully controlled through contracts.
 - b. Limitations to data access. Maintaining and expanding international data sharing is a fundamental goal of WMO, regulated by Resolution 40. Essential data must be exchanged openly without any restrictive condition, but the exchange of additional data may be subject to conditions and possibly charged.
 - c. Preserve international mission coordination for the smooth implementation of the WMO-agreed vision, with priority effort to fill the gaps, and on interoperability.

10. At the recent 4th Session of ICG-WIGOS, this issue was also addressed in a discussion paper (available from: http://www.wmo.int/pages/prog/www/WIGOS-WIS/meetings/ICG-WIGOS-4/Doc-6.4_Data-Management_Data-Policy-v02.doc)

11. The key points made at ICG-WIGOS were as follows:

- Data Policy: The policies of some external data providers place constraints on the use and redistribution of contributed data. These constraints vary by organization and data type, and any constraints are generally seen to challenge the WMO principle of free and unrestricted exchange. WIGOS will require practical policy guidelines and technical implementations to enable constrained data to be usefully contributed to NMHSs and WMO while protecting the operational and intellectual property interests of the data provider. At the same time, it should also be noted that there are many policy drivers toward increasing access to publicly funded data and information (e.g. INSPIRE within Europe, Open Data directives elsewhere) and that in many cases NMHSs and other public institutions are required to respond.
- Commercial Data: There is significant growth in private sector-operated observing networks which may offer useful data to support NMHS and WMO programmes. Further, in some jurisdictions there is direction to explore greater use of the private sector to meet national needs for both surface and space-based observations. As a significant shift from traditional NMHS practice, there is not a broad body of experience nor well established practices regarding licencing arrangements to best support WMO objectives. In the absence of this experience, Members would benefit

from an examination of emerging business models and the establishment of WMO principles on private sector data policies and licensing.

Recommendation: That the broader issue of private operators of observing systems be discussed by ICG-WIGOS, noting the specific issues of satellite data elaborated in this paper.

12. EUMETSAT and ECMWF apply the distinction of essential and additional data in providing data to organizations outside the NMHSs of member states. EUMETSAT has extended its set of essential data over time to include three-hourly geostationary imagery, and adopting models for making imagery available online. Other restrictions apply depending on data type, interval, and intended use. Users wishing to access EUMETSAT's non-essential data can do so under a licence agreement. The payment of licence fees applies for commercial use of EUMETSAT's non-essential data. For further details see [RD2].
- 13.
14. In September 2015, NOAA released a draft Commercial Space Policy to define NOAA's interactions with the commercial sector in the areas of data buys, hosted payloads, shared payloads, and launch services. As guiding principle is proposed to adhere to the U.S. full, open and free data policy (while satisfying mission needs), keeping compliance with WMO Resolutions 40 and 25. According to the draft, NOAA will:
 - Periodically evaluate and identify NOAA mission requirements and capability gaps that offer appropriate opportunities for the purchase and use of commercial space capabilities and services.
 - Periodically solicit, identify, and evaluate commercially available space capabilities and services that could potentially address NOAA mission requirements.
 - Explore and, where appropriate, pursue demonstration projects to validate the viability of assimilating commercially provided environmental data into NOAA meteorological models.
 - Apply the same validation criteria to commercial data as to data obtained by other means, before entering into any binding agreement for the purchase and utilization of observations to support the NOAA mission.

NOAA will consider the impact of commercial data acquisitions on other U.S. federal agencies and the academic and research communities. NOAA will also consider the long term maintenance, access, and archival rights associated with commercial data.

Recognizing that some commercial space-based data providers may desire certain exceptions to the open data policy in order to advance their legitimate proprietary interests, NOAA will evaluate the use of space-based data obtained from commercial providers on a case-by-case basis.

Discussion

15. In light of these developments, IPET-SUP developed this Position Paper with the understanding that a designation of "essential" should promote the removal of any limitations on access and use. Such data should also be essential in the sense of "critical for the protection of life and property".

16. [It is the IPET-SUP view that, in principle, any data contributing to the Global Observing System (GOS) should be considered essential (in the sense of WMO Resolution 40)]. Formulating this requirement should consider *inter alia* the fact that data currently considered additional (in the sense of WMO Resolution 40) by Members, and as such exchanged under conditions are also useful and sometimes made available free of charge to some users (e.g., researchers, least-developed countries). Such data exchange within the GOS should not be stifled by a general call for all GOS data being deemed essential (in the sense of WMO Resolution 40).

Global NWP scores (ECMWF , others), pick top 20?

17. With the possible advent of private providers of meteorological satellite data, funds may be necessary to purchase data under license from an operator that would compete with funds needed for a public observation programme and potentially result in overall less data available to the WMO community. This would have implications for basic users as well as NWP centres. The landscape of Earth observation is changing rapidly, with the advent of private operators, new technologies, smaller satellites and reduced launch costs. One response by public systems could be free and open access, such as within Copernicus.
18. Details of the data types to be considered essential are provided in Annex.

- Differentiation between data that are provided freely, and those which can be redistributed freely?

User Views on Essential Satellite Data

19. Satellite users within WMO communities should be polled regarding their view on what constitute “essential satellite data”, in particular:
- Global and regional NWP and those associated with the Global Data Processing and Forecasting System (GDPFS)
 - Nowcasting
- And if possible:
- Aeronautical meteorology
 - Tropical cyclone programme
 - Disaster risk reduction
 - Climate
 - Atmospheric composition

Do we have contacts for each area, how do we poll them, who does it?

Concluding Remarks

How to use this Position Paper in CM, CBS, CGMS ?

References

[R1] In the IGDDS context, generic user requirements for satellite data (e.g., “MW soundings”, “SST fields”) were formulated which could serve as a basis for recommending “essential satellite data” ([WMO IGDDS Implementation Group, First Meeting, 2007](#); see Annex).

[R2] EUMETSAT Data Policy
(<http://www.eumetsat.int/website/home/AboutUs/LegalInformation/DataPolicy/index.html>)

[R3] NOAA advocates for a full and open data policy that allows for sharing of data.
(<http://www.nesdisia.noaa.gov/policy.html>)

[R4] NOAA Commercial Space Policy, Draft September 2015
(<http://www.regulations.gov/#!documentDetail;D=NOAA-NMFS-2015-0109-0002>)

[R5] WMO Resolution 40: https://www.wmo.int/pages/about/Resolution40_en.html

[R6] Uhlir, Paul F., Robert Chen, Joanne Irene Gabrynowicz, and Katleen Janssen. Towards Implementation of the Global Earth Observation System of Systems Data Sharing Principles. *Space Law Journal*, Vol. 35, and *Data Science Journal*, Vol. 9 (2009). Available at:
<http://www.spacelaw.olemiss.edu/jsl/pdfs/articles/35JSL201.pdf>.

[R7] In the GFCS context, Seventeenth World Meteorological Congress adopted Resolution 60 “WMO Policy for the International Exchange of Climate Data and Products to Support the Implementation of the GFCS”

The Resolution:

“will apply only to meteorological, hydrological and climatological data and products, including related environmental data and products, developed or acquired under WMO auspices and required to support the implementation of the Framework, hereinafter referred to as GFCS relevant data and products”

Decided:

“(1) to adopt the policies and practices, including the guidelines, of Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) for the exchange of GFCS relevant data and products to enable the achievement of the goals and objectives of the Framework;
(2) That the climate data and products covered by Resolution 40 (Cg-XII) and the GFCS relevant data and products subsumed under Resolution 25 (Cg-XIII) will continue to be governed by these resolutions;
(3) That the GFCS relevant data and products from the WMO WDCs, GPCLRFs, RCCs, RCOFs and the ICSU WDS, as well as from the framework of the GCOS ECVs (Atmospheric, Oceanic and Terrestrial), will constitute an essential contribution to the Framework and therefore should be made accessible among Members, in particular through the GFCS CSIS, on a free and unrestricted basis;”

Urged Members:

(1) To provide the additional GFCS relevant data and products that are required to support and sustain the operational climate services as the core element of the Framework and WMO initiatives at the global, regional and national levels and, further, as mutually agreed, to assist other Members to enhance access to GFCS relevant data and products and in the provision of climate services in their countries; such additional GFCS relevant data and products are listed in the annex to the present resolution and could have

conditions associated with their use, such as restrictions on their use for commercial purposes, attribution of their source or licensing

[...]

The Annex to Resolution 60 (Cg-17) says:

“In addition to the climate data and products provided under Annex 1 to Resolution 40 (Cg-XII), as well as the GFCS relevant data and products subsumed within the general designation of hydrological data and products in Resolution 25 (Cg-XIII), and in addition to all data and products that are already available on a free and unrestricted basis, the following types of data and products are considered necessary for the implementation of GFCS:

- (1) Historical climate time-series from the Regional Basic Climate Networks (RBCNs), the GCOS Upper-Air Network and GCOS Surface Network at a temporal and spatial resolution necessary to resolve the statistics of climate, including trends and extremes;
- (2) Essential climate variables for the ocean (full depth) (as defined by the GCOS Implementation Plan);
- (3) Climate relevant coastal interface data, in particular sea level, waves and storm surges;
- (4) Data on the composition of the atmosphere including aerosols;
- (5) Climate relevant satellite data and products:
- (6) Climate relevant cryospheric data, in particular snow cover, snow depth, glacial monitoring, permafrost and lake and river ice.

Annex: Specific IPET-SUP recommendations for Essential Satellite Data

Table 1: Generic requirements for satellite data (up to level 1)

Type of satellite data and source	IPET-SUP Position what should be Essential Satellite Data (in the sense of WMO Res.40)	
	Type of data	Repeat cycle; Timeliness ¹
GEO imagery		1-hourly; 20 minutes (ex.)
GEO sounding channels		
GEO lightning data		
GEO other instruments		
Operational LEO VIS-IR imagery		
Local operational LEO sounding data		
Regional operational LEO sounding		
Global operational LEO sounding		
LEO MW Imagery		
Other LEO data from operational or preoperational instruments (such as Earth radiation, UV)		
Scatterometer		
Radio-occultation sounding		
R&D instrument data		
Other (please specify)		

¹ For example: Repeat cycle 1 hour means “update every hour”; Timeliness 30 minutes means “maximum of 30 minutes between time of observation and data availability”

Satellite-based Product Categories	IPET-SUP Position what should be Essential Satellite Data (in the sense of WMO Res.40)	
	Type of data	Repeat cycle; Timeliness ²
Wind vectors (from GEO)		
Wind vectors (polar)		
Sea surface winds		
Sounding T,U (radiometric)		
Sounding T,U (radio occultation)		
Cloud analysis		
Stability index		
Total Precipitable Water		
Precipitation		
SST		
Wind-waves		
Sea level		
Solar and Earth radiation products		
Albedo		
Fire detection		
Ice and snow extent		
Vegetation index		
Oceanic chlorophyll		
Volcanic ash		
Others (please specify)		

² For example: Repeat cycle 1 hour means “update every hour”; Timeliness 30 minutes means “maximum of 30 minutes between time of observation and data availability”