WMO Priorities and Perspectives on IPWG

Stephan Bojinski
WMO Space Programme
IPWG-6, São José dos Campos, Brazil, 15-19 October 2012

Extended Abstract

1. Introduction to WMO

The World Meteorological Organization (WMO) (http://www.wmo.int) was founded 1950 as a UN Specialized Agency, succeeding the International Meteorological Organization (IMO, 1873), in recognition of the necessity for international coordination in the areas of meteorology (weather and climate), operational hydrology and related geophysical sciences (e.g., atmospheric chemistry, oceanography, agriculture).

WMO as the UN "authoritative voice" on weather, water and climate promotes, fosters and otherwise facilitates world-wide cooperation within its area of technical competency, representing 190 Member states and territories. WMO Programmes consist of contributions by Member states with a focus on National Meteorological and Hydrological Services, and many of them require, use or support generation of reliable precipitation estimates in space and time, including estimates from satellites.

WMO Programmes which directly or indirectly rely on IPWG include the following: World Weather Watch, Global Atmosphere Watch, World Weather Research including THORPEX, Hydrology and Water Resources, Climate, Climate Research, Public Weather Services, Agricultural Meteorology, Tropical Cyclones, Marine Meteorology and Oceanography, Disaster Risk Reduction, and Aeronautical Meteorology.

The WMO Space and Education and Training Programmes assume a cross-cutting role, servicing all thematic Programmes.

2. Current WMO Priorities and its Space Programme

WMO high-level priorities for the period 2012-2015 are (i) implementation of the Global Framework for Climate Services (GFCS), (ii) further integration of observation and information systems (through the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) initiatives), (iii) disaster risk reduction, (iv) support to the aviation sector, and (v) capacity building.

The WMO Space Programme and its office at WMO headquarters in Geneva, Switzerland, supports these priorities through a range of activities, as depicted in Fig. 1. Support by the Space Programme to the WMO-CGMS International Precipitation Working Group includes financial contributions to IPWG workshops, linkage to WMO activities and satellite operators in CGMS, assistance in assuring the availability of validation datasets, and contributing to the organization of training events through the Virtual Laboratory for Education and Training in Satellite Meteorology (http://vlab.wmo.int).

Figure 1: WMO Space Programme Activities, including support to IPWG.

3. Requirements for observations of precipitation

Through regular consultation with expert user groups representing WMO and related application areas, a Rolling Review of Requirements[1] for observations has been maintained for many years to inform planning of the Global Observing System. These requirements are in principle "technology-free", i.e. do not related to any particular observing technique. Regular gap analyses and critical reviews are being performed by expert teams associated with the WMO Commission for Basic Systems, who compare the user requirements with the capability of current and planned observing systems in the Global Observing System. The System includes practically all satellite, aircraft and ground-based systems of relevance to WMO applications, with a defined data access policy.

The current status of precipitation-related observation requirements recorded by WMO is listed in Table 1. These requirements evolve over time, and changes can be applied by contacting the designated focal points[2] for each application area. The requirements are accessible online in the Observing System Capabilities Analysis and Review tool (http://www.wmo.int/oscar), along with comprehensive information on current and planned satellite systems and instruments.

Special activities with WMO involvement that depend strongly on satellite-derived precipitation data are:

- The Severe Weather Forecasting Demonstration Project (SWFDP), with four regional projects focusing on improving the uptake of forecasting and nowcasting products including from satellites in developing countries, in situations of severe weather including heavy rainfall;
- The Flash Flood Guidance System (FFGS), aiming at the implementation of currently four regional information systems for flash flood forecasting in developing country flood plains;
- The Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) initiative, aiming at generation of satellite-based climate data records from multiple agencies; the initiative conducts projects to jointly elevate climate data records to a

[1] http://www.wmo.int/pages/prog/www/OSY/Documentation/RRR-process.pdf
[2] http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html#SOG

higher level of maturity, aiming at sustained production, exchange of methodologies, and maximized benefit through cooperation and coordination. A non-funded **call for proposals** for the second phase of SCOPE-CM was issued in December 2012 , and a contribution by IPWG is expected;

- The SCOPE-Nowcasting initiative, with the goal to ensure continuous, sustained provision of consistent satellite products for nowcasting, with initial focus on the Asia/Pacific region; while still in a conceptual phase, the initiative will provide a mechanism through which satellite data and products can be made available simply and quickly, primarily for users in small and developing countries; SCOPE-Nowcasting shall also be beneficial to more advanced countries when combining resources and expertise, thus gaining more efficiency in using harmonized nowcasting products. The initial list of SCOPE-Nowcasting project outlines is given in Table 2.

Application Area	Uncertainty Goal	Uncertainty Threshold	Hor.Res. Goal	Hor.Res. Threshold	Obs Cycle Goal	Obs Cycle Threshold	Avail.Goal	Avail. Threshold
Agricultural Meteorology (acc)	2 mm/d	10 mm/d	0.25 km	50 km	24 h	3 d	24 h	2 d
Climate-AOPC (i/s)	0.1 mm/h	2 mm/h	100 km	500 km	3 h	6 h	3 h	12 h
Climate - AOPC (acc)	1 mm/d	2 mm/d	100 km	500 km	12 h	24 h	24 h	12 d
GEWEX (acc)	0.5 mm/d	5 mm/d	50 km	250 km	60 min	12 h	30 d	60 d
Global NWP (i/s)	0.1 mm/h	1 mm/h	5 km	50 km	60 min	12 h	6 min	6 h
Global NWP (acc)	0.5 mm/d	5 mm/d	10 km	100 km	60 min	12 h	24 h	30 d
High Res NWP (i/s)	0.1 mm/h	1 mm/h	0.5 km	10 km	30 min	3 h	15 min	2 h
High Res NWP (acc)	0.5 mm/d	5 mm/d	0.5 km	10 km	30 min	6 h	6 h	24 h
Nowcasting (i)	0.1 mm/h	1 mm/h	5 km	50 km	5 min	60 min	5 min	30 min
Nowcasting (s)	0.1 mm/h	1 mm/h	5 km	50 km	15 min	3 h	30 min	2 h
Ocean Applications (i/s)	0.1 mm/h	1 mm/h	1 km	25 km	5 min	60 min	5 min	30 min
Synoptic Meteorology (i)	0.1 mm/h	1 mm/h	20 km	100 km	60 min	6 h	15 min	6 h
Synoptic Meteorology (s)	0.1 mm/h	1 mm/h	20 km	100 km	3 h	6 h	15 min	6 h

Table 1: Technology-free observation requirements for precipitation (rate and accumulated, with distinction of liquid/solid in some cases), by application areas (Source: WMO Rolling Review of Requirements database[3]). "Goal" refers to a value whose improvement would not yield additional impact to the application; "Threshold" is the value to be met to ensure that data are useful (although the existence of other observations must be taken into account in this judgment); "Observing Cycle" is equal to temporal sampling; "Availability" indicates the delay between the observation and the moment data is available to users.

[3] http://www.wmo.int/oscar/

Category	Product	Region	Provider	User	Gaps
Basic nowcasting	Imagery, RGB composites and enhancements, fog detection and cloud products	WMO Region II (Asia) and Region V (SW Pacific)	JMA, CMA, KMA (TBD)	NMSs in Region II and V	No standard products available; products limited
Advanced nowcasting	Ice cloud detection and turbulence to support aviation; potentially adding precipitation, fog	Australia and adjacent Region II (Asia) and V (SW Pacific)	CMA, JMA, KMA (TBD), NASA, NOAA (for precip)	NMHSs in RA II and RA V	No products currently available (except for precipitation)
Advanced nowcasting	Blended satellite global precipitation product (GEO+LEO)	Global coverage	Hydro Estimator, NASA TRMM (3B42), NOAA (real-time MW)	Civil authorities, NMHSs, Flash flood guidance systems, general users	Rapid, facilitated access to quantitative precipitation estimates
RT Ocean Products	Near-Real-Time (3-hourly) Ocean surface winds for NWP	Initially Indian Ocean	IMD/ISRO (Oceansat-2) and EUMETSAT OSI-SAF	NWP Centres, Marine Forecasters	OSVW not fully exploited
RT Atmospheric Composition products	Dust Monitoring and Prediction Products	WMO Region II (Asia) and V (South-West Pacific)	CMA, JMA	SDS-WDCs, NMSs (to issue results and warnings) in RA II and RA V	Regional diversity of aerosol-related products not harmonized

Table 2: Initial outline of pilot projects for the SCOPE-Nowcasting initiative; green shade denotes projects that include precipitation products. Advice by IPWG in advancing these projects will be required. "NMS" denotes National Meteorological Service, "RA" a WMO Regional Association (II: Asia; V: South-West Pacific).

4. Use of satellite-derived precipitation estimates

In 2012, WMO conducted a global survey on the use of satellite data and received responses from 226 institutions and individuals from 96 countries. Results show the heavy use of satellite-based precipitation estimates in all parts of the world (cf. Figure 2), although there are differences in the degree to which products are needed but not available or useable (compare SW Pacific with Asia, for example).

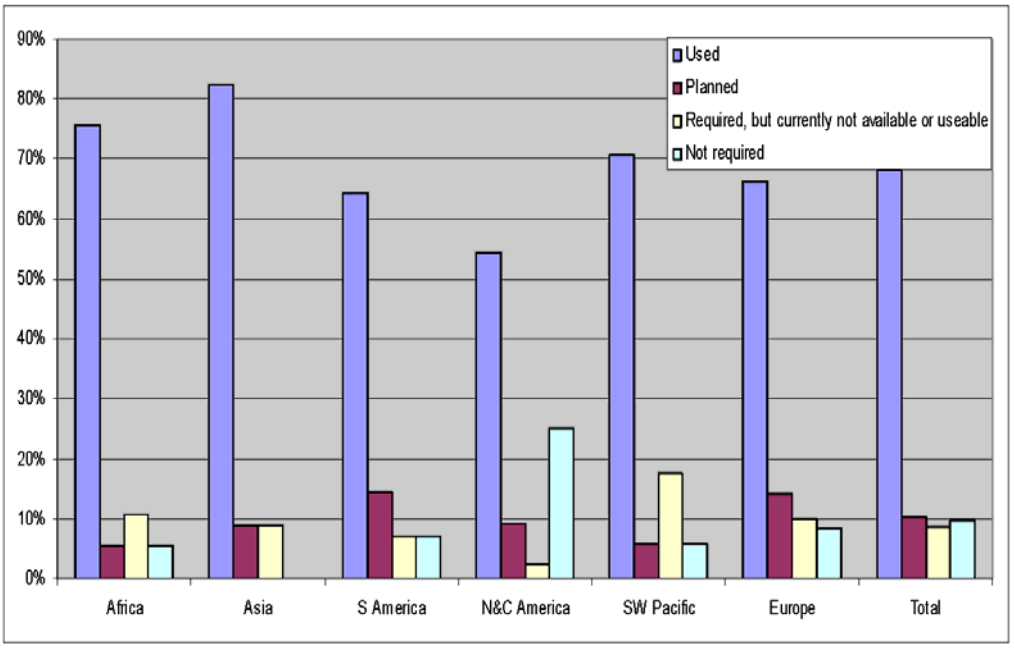

Figure 2: Use of satellite-based precipitation estimates (Source: WMO Survey 2012)

5. Summary and Recommendations

Based on its successful work and vibrant membership, WMO recommends that IPWG strives to:

1. Continually evaluate and assess precipitation-related methods and datasets;
2. Harmonize quality assessment and verification;
3. Discuss the scientific state-of-the-art;
4. Develop best practices and access/interface tools;
5. Assist in integration and interoperability of rainfall estimates from different sources;
6. Take action to leverage its results for operational applications;
7. Respond to the needs of WMO application areas that require satellite precipitation estimates in the areas of weather, hydrology, climate, cryosphere, and the oceans;
8. Contribute to the SCOPE initiatives on climate monitoring and nowcasting;
9. Contribute to training and education activities, including through the WMO-CGMS VLab;
10. Develop concise, high-level recommendations (<5) for attention by satellite operators in CGMS.

WMO emphasizes its continuing support to IPWG.