W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

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COMMISSION FOR BASIC SYSTEMS

OPEN PROGRAMME AREA GROUP ON INTEGRATED OBSERVING SYSTEMS

EXPERT TEAM ON SATELLITE SYSTEMS

TENTH SESSION

GENEVA, SWITZERLAND

17 November 2015

FINAL REPORT

WMO General Regulations

Regulation 42

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

Regulation 43

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

EXECUTIVE SUMMARY

The tenth session of the Expert Team on Satellite Systems (ET-SAT-10) was held on 17 November 2015 in Geneva, in advance of the WIGOS Space 2040 Workshop (18-20 November 2015) dedicated to the discussion of a Vision the space-based components of the WMO Integrated Global Observing System (WIGOS) in 2040.

The main outcome of the session was to finalize the input from ET-SAT to this workshop.

The meeting also reviewed the status of actions from previous meetings, and was briefed on the latest developments of the space module of the Observing System Capability and Analysis and Review tool (OSCAR).

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FINAL REPORT

1. OPENING OF THE MEETING

The Director of Observing and Information Systems Department, Wenjian Zhang, welcomed the participants and provided opening remarks on behalf of the Secretary-General. He informed the participants that the seventeenth World Meteorological Congress (Cg-17) held in May-June 2015 had adopted new strategic priorities for the period 2016-2019. In addition to the implementation of WIGOS, these priorities include the improvement of monitoring and prediction services over polar and high mountain areas. This puts further demands on the observing system. He highlighted that the scope of the meeting –developing a vision of observing system in 2040 – was particularly timely and important, as the space-based observing component is the backbone of WIGOS. He concluded in encouraging the Expert Team to tackle this matter with a broad and far-reaching view.

The ET-SAT Chairman, Jack A. Kaye (NASA, USA) welcomed the participants. In addition to the representatives of satellite operators he highlighted the presence of Anthony Rea, Vice-Chair of the Open Programme Area Group on Integrated Observing Systems (OPAG IOS) and Chairman of the Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP), and of John Eyre, Chairman of the Inter-Programme Expert Team on Observing system Design and Evolution (IPET-OSDE). (See list of participants in Annex 1).

The agenda was approved (Annex 2).

2. FOLLOW-UP ACTIONS FROM PREVIOUS MEETINGS

The status of actions from previous meetings was introduced by Jérôme Lafeuille. As reported in ET-SAT-10/Document 2, all actions from the ninth meeting were closed. The session reviewed the status of the four outstanding actions from the eighth meeting: 8.10, 8.20, 8.21, and 8.22.

- Action 8.10: Guennadi Kroupnik (CSA, Canada) reported that the study on socio-economic benefit of the PCW mission was completed, and offered to share the outcome of this study with ET-SAT member, for internal use only since it is not a public document. The Executive Summary was distributed.
- Action 8.20: It was noted that CMA, DLR, ESA, KMA, NASA, NOAA, and ROSHYDROMET had appointed representatives in the Inter-Programme Coordination group in Space Weather (ICTSW). Furthermore, JMA is cooperating with NICT, and CSA with Natural Resources Canada (NRC). Both NICT and NRC are represented in ICTSW.
- Action 8.21: It was noted that CSA, NASA and NOAA had nominated the following points of contacts for information on space-based space weather sensors:
    - CSA: John Manuel (John.manual@canada.ca) and Pierre Langois (pierre.langois@canada.ca)
    - NOAA : Kevin Berberich (Kevin.Berberich@noaa.gov) and Larry Zanetti (Larry.Zanetti@jhuapl.edu)
    - NASA: Elsayed R. Talaat (elsayed.r.talaat@nasa.gov)
- Action 8.22: No possibility had been identified at that stage to provide support to the Secretariat for the coordination of space weather activities, but the CGMS Task Team on space weather would give another opportunity to ET-SAT Member agencies to reconsider their support. It was recalled that a Space Weather Trust Fund had been established to receive voluntary financial contributions in this area.

In conclusion, these four actions were closed. The Chairman highlighted that these actions had enabled a substantial progress on several areas.

3. VISION OF SPACE-BASED WIGOS COMPONENTS IN 2040

The session reviewed and updated the draft ET-SAT input to the Vision for 2040 which had been circulated by the Secretariat: an initial version circulated on 14 April 2015 (http://www.wmo.int/pages/prog/sat/meetings/documents/ET-SAT-9_Vision-2015-04-14.pdf), an updated and summarized version circulated in October, and a draft presentation. John Eyre (IPET-OSDE Chairman) introduced a document comparing the various stages of evolution of the space-based observing system in 1990, 2005, 2015, and its anticipated configuration in 2025 and 2040, giving evidence of the potential for a substantial expansion.

It was clarified that the Vision to 2025 was still a valid target for 2025, with minor adjustments, but that substantial changes were expected between what could be achievable in 2025 and in 2040. The session supported the view that the future Vision should include a backbone component, which would be precisely specified in terms of orbit and measurement approach, based on currently demonstrated missions, augmented by a component which would be defined in a more open way, without prejudging the final measurement approach, and which could include new technologies that are not yet fully demonstrated.

The session stressed the importance of microwave imagery, which was not emphasized enough in the current Vision. It underlined that geostationary microwave sounding was one possible way of achieving frequent microwave sounding coverage, but not the only one, depending on the space and tine resolution needed. Cloud computing and big data analytics should be referred to.

The team also discussed the respective roles of commercial missions and public good governmental missions, and provided guidance in this respect. This was however considered as a policy issue to be discussed by the Consultative Meetings on High-level Policy on satellite Matters (CM) rather than in the WIGOS Space 2040 workshop.

It was agreed that ET-SAT-10/Document 3.1 should be updated taking into account these remarks. The Expert Team then reviewed the presentation to be communicated to the WIGOS Space 2040 workshop to check that it conveyed the key messages.

The outcome of this discussion was presented at the workshop: http://www.wmo.int/pages/prog/sat/meetings/documents/WIGOS-Space-2040_Doc_04_Kaye-ET-SAT-Contribution-to-the-Vision.pdf.

> **Action 10.1:** Secretariat to update ET-SAT-10/Document 3.1 taking into account the comments from ET-SAT-10 and subsequent feedback from the WIGOS Space 2040 Workshop. (December 2015)

4. BRIEF UPDATE ON OTHER ON-GOING SPACE PROGRAMME ACTIVITIES

The Secretariat gave a short demonstration of a new version of OSCAR/Space, currently in test. It was emphasized that this new version, where sensor assessments are based on an expert system, had a strong potential to become a collaborative tool. Several participants reported that OSCAR/Space was widely used by ET-SAT member agencies and users. With the new version, it was felt that the value of OSCAR/Space would further increase. The session encouraged the Secretariat to secure resources to maintain this service of great benefit to the space provider and user community.

> **Action 10.2:** The Secretariat to report at ET-SAT-11 on the plan to maintain OSCAR/Space. (ET-SAT-11)

5. ET-SAT WORK PLAN FOR 2016

The new Terms of Reference of ET-SAT were recalled in ET-SAT-10/Document 5.

It was agreed to defer the review of the ET-SAT future work plan to a virtual meeting. It was highlighted however that finalizing the Vision of the WIGOS space-based component in 2040 would be a central task in 2016. Moreover, it was recalled that Actions 8.08 and 8.11 from the eighth meeting had been closed with the understanding that they should be addressed as Permanent Actions in the work plan, in accordance with the Terms of Reference and the decision from CBS to task ET-SAT to keep under review the description of space–based capabilities in OSCAR (programmatic and technical update), which is a pre-requisite for conducting a gap analysis. (See Document 5).

> **Action 10.3:** The Secretariat and the Chairman to schedule virtual meetings to discuss and implement the future work plan of ET-SAT (Spring and Fall 2016).

6. ANY OTHER BUSINESS

ET-SAT-10/Document 6 addressed several issues arising from the United Nations Committee on Peaceful Uses of Outer Space (COPUOS), including : (i) the definition and delimitation of “outer space”; (ii) the sustainable use of the geostationary orbit; and (iii) space debris. As an observer to COPUOS, WMO was invited by the United Nations Office for Outer Space Affairs (OOSA) to provide its views on these issues.

It was agreed to address these issues in a virtual meeting.

> **Action 10.4:** The Secretariat and the Chairman to schedule a virtual meeting to discuss the issues related to COPUOS discussions, presented in ET-SAT-10/Doc. 6 (December 2015).

7. CONCLUSION

The Chairman noted that the schedule of future meetings should be defined when there will be a better visibility on the Secretariat staff availability to support ET-SAT meetings, given the imminent retirement of J. Lafeuille. He thanked Mr Lafeuille for his role in supporting the work of ET-SAT along the years.

Meanwhile, he looked forward to the participation of ET-SAT Members in the WIGOS Space 2040 Workshop starting the next morning, and to a continued dialogue on the Vision of space-based observing system in 2040.

The meeting was closed at 18h30 on Tuesday 17 November 2015.

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LIST OF PARTICIPANTS

KAYE, Jack A. (Chair)
NASA Science Mission Directorate
Mail Suite 3F71
WASHINGTON DC 20546
United States of America
Tel.: +1 202 358 2559
Fax: +1 202 358 3172
Email:jack.a.kaye@nasa.gov

von BARGEN, Albrecht
Deutsches Zentrum für Luft- und Raumfahrt (DLR) German Aerospace Center
Earth Observation
Königswinterer Str. 522-524
53227BONN
Germany
Tel: +49 228 447 218
Fax: +49 2258 447 747
Email: albrecht.von-bargen@dlr.de

BOUKABARA, Sid-Ahmed
National Oceanic and Atmospheric Administration (NOAA)
NESDIS/STAR
Senior Data Assimilation Scientist
Deputy Director, JCSDA
5830 University Research Court
COLLEGE PARK, MD 20740
Tel: +1 301 683 3615
Fax: +1 301 683 3616
Email: Sid.Boukabara@noaa.gov

HOLMLUND, Kenneth
EUMETSAT
EUMETSAT-Allee 1
D-64295 DARMSTADT
Germany
Tel.:
Email: kenneth.holmlund@eumetsat.int

KURINO, Toshiyuki
Director, Satellite Program Division
Observation Department
Japan Meteorological Agency (JMA)
1-3-4 Otemachi,Chiyoda-ku
Tokyo 100-8122, Japan
Phone: +81-3-3201-8677
Fax : +81-3-3217-1036 Japan
Email: tkurino@met.kishou.go.jp

KROUPNIK, Guennadi
Canadian Space Agency (CSA)
6767, route de l'Aéroport
Saint-Hubert J3Y 8Y9
QUEBEC
Canada
Tel.: +1 450 926 6492
Fax: +1 450 926 4576
Email: guennadi.kroupnik@asc-csa.gc.ca

OKI, Riko (remotely)
Japan Aerospace Exploration Agency (JAXA)
Satellite Applications Mission Directorate I
Earth Observation Research center (EORC)
Tsukuba Space Center
2-1-1 Sengen Tsukuba
IBARAKI 305-8505
Japan
Tel..:+81 5033623823
Fax: +81 298682961
Email: oki.riko@jaxa.jp

LU, Feng
China Meteorological Administration
46 Zhongguancun Nandajie
100081 BEIJING
China
Tel.: +
Fax: Email: lufeng@cma.gov.cn

REA, Anthony
Vice-Chair, OPAG-IOS
Chair, IPET-SUP
Bureau of Meteorology
GPO Box 1289
MELBOURNE 3001 VIC
Australia
Tel: +61 (3) 9669 4222
Fax: +61 (3) 9669 4168Email:
a.rea@bom.gov.au

EYRE, John
Chair IPET-OSDE
Met Office
FitzRoy Road
EXETER EX1 3PB
United Kingdom
Tel.: +44 1392 88 5175
Fax: +44 1392 88 5681Email:
john.eyre@metoffice.gov.uk

WMO SECRETARIAT
Mail address:
7bis, avenue de la Paix,
Case Postale 2300,
CH-1211 GENEVA-2,
Switzerland
Fax: +41 22 730 80 21

ZHANG, Wenjian
Director, Observation and Information Systems Department
Tel: +41 22 730 8567
Email: wzhang@wmo.int

LAFEUILLE, Jérôme
Chief, Space-based Observing System Division
Tel: +41 22 730 8228
Email: jlafeuille@wmo.int

Bojinski, Stephan
Scientific Officer
Satellite Utilization and Products Division
Tel: +41 22 730 8319
Email: sbojinski@wmo.int

AGENDA

1. OPENING OF THE MEETING

2. FOLLOW-UP ACTIONS FROM PREVIOUS MEETINGS

3. VISION OF SPACE-BASED WIGOS COMPONENTS IN 2040

- Review and update the draft ET-SAT input to the Vision for 2040 (http://www.wmo.int/pages/prog/sat/meetings/documents/ET-SAT-9_Vision-2015-04-14.pdf)
- Identification of key ET-SAT messages to be communicated to the WIGOS Space 2040 workshop

4. BRIEF UPDATE ON OTHER ON-GOING SPACE PROGRAMME ACTIVITIES

- OSCAR/Space, GSICS, Satellite Data Access Strategy and DBNet,
- Applications, regional activities, user preparedness, training
- Space Weather

5. ET-SAT WORK PLAN FOR 2016

6. ANY OTHER BUSINESS

7. CONCLUSION