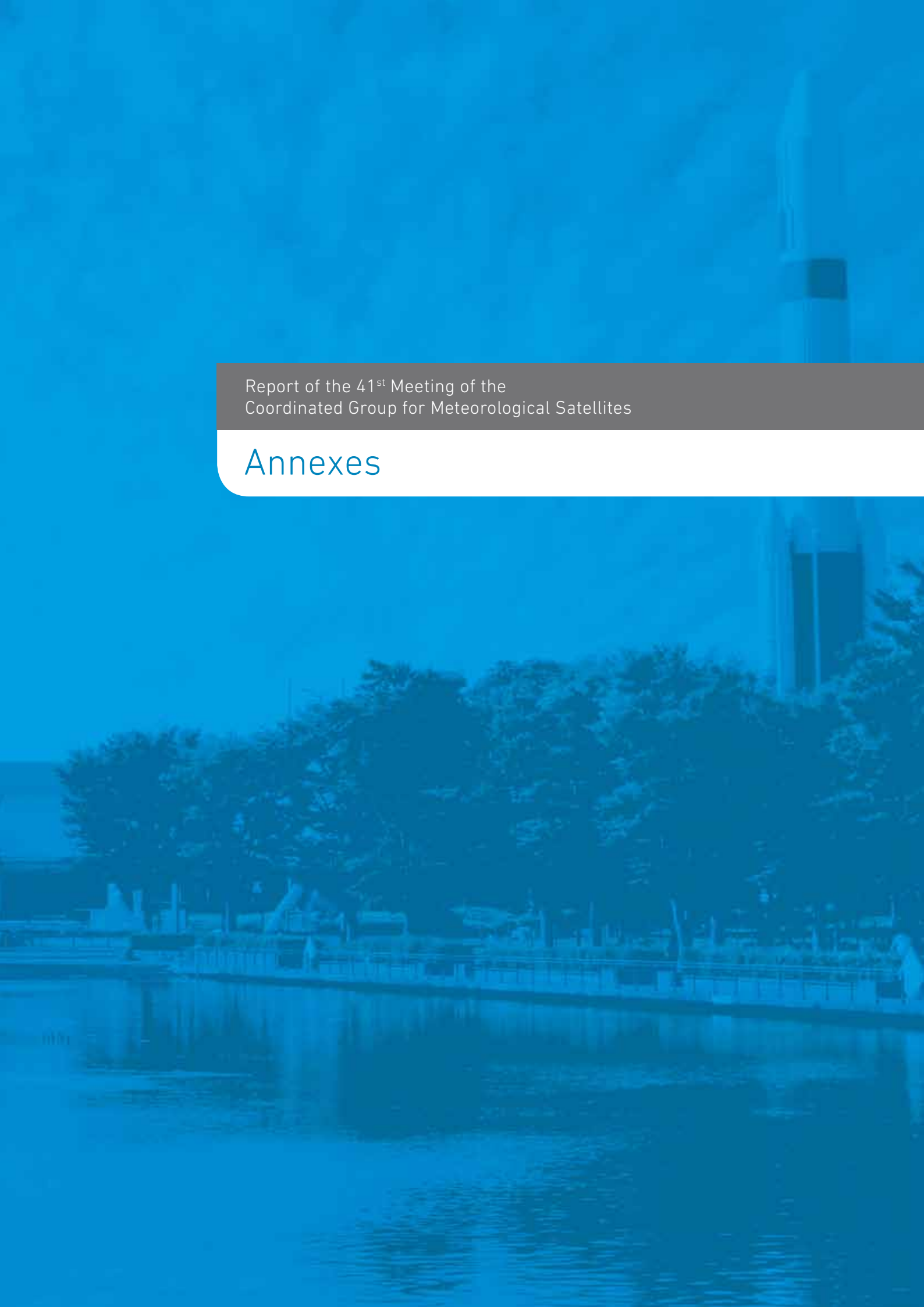
Report of the 41st Meeting of the
Coordinated Group for Meteorological Satellites

Annexes



ANNEXES

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Annotated Agenda and WPs can be found at http://www.cgms-info.org/working-papers

Points of contact information and list servers can be requested from the CGMS Secretariat CGMSSec@eumetsat.int.

ANNEX 1 STATEMENTS IN OPENING CEREMONY

Dr. Mitsuhiko Hatori, Director-General of JMA

Distinguished guests, ladies and gentlemen, welcome to Japan, welcome to Tsukuba.

It is my pleasure to see you all here for the 41st meeting of the Coordination Group for Meteorological Satellites, or CGMS. It is a great honor for me to have a chance to deliver a welcome address as one of the meeting hosts.

CGMS, as you are all aware, came into being in 1972, when representatives of the European Space Research Organisation, Japan, the United States of America, observers from WMO and the Global Atmosphere Research Programme met in Washington to discuss questions of compatibility among geostationary meteorological satellites. Over the past 4 decades, the scope of CGMS has been expanded to polar meteorological satellites, and many satellite operators including research and development organizations have joined CGMS. I believe we can say that the progress of CGMS reflects the progress of meteorological satellites. I am proud of its glorious path as one of the satellite operators.

Nowadays, meteorological satellite data are being used not only for real-time monitoring of weather conditions, but also for assimilation into global and regional numerical prediction models effectively. Meteorological satellites, therefore, play a critical role in the operations of National Meteorological Hydrological Services, especially those for disaster risk reduction. In addition, because of its observation capability across the earth and accumulation of the data over many years, climate monitoring is also becoming the important target of meteorological satellites. CGMS is expected to take its utmost effort to strengthen the related activities.

JMA has stably operated Himawari-series of geostationary meteorological satellites over 35 years around 140 degrees east, as part of WMO's Global Observing System, which is currently one of the essential components of WIGOS. To continue and enhance this key mission, JMA is preparing to launch the first satellite of the next generation, Himawari-8, in 2014. I am sure that its multi-channel, high-frequent and high-resolution data will contribute to the improvement of the weather and climate monitoring capabilities in the East Asia and Western Pacific regions.

In closing, I would like to thank all the participants for your great contribution to the meeting, and I am convinced that this meeting will be very successful and fruitful. I hope all of you have a pleasant stay here, enjoying Japanese cool culture and hot summer.

Thank you very much for your kind attention.

Kiyoshi Higuchi, Vice-President, JAXA

Distinguished guests, Ladies and Gentleman,

Good morning. Welcome to tropical Japan. We have very extraordinary climate in Japan this summer. Usually it would be rainy season in the middle of July. I hope all of you, the coordinating Group for Meteorological Satellites, contribute to understand the reason why we have so unusual weather recently.

As one of the co-hosting agencies, JAXA is very honored to host the 41st meeting of Coordinating Group for Meteorological Satellites. I would like to express my gratitude to all of you who are contributing and participating in this very important meeting.

JAXA has been making much effort to develop, launch and operate the many meteorological and earth observation satellites since the first Geostationary Meteorological Satellite " HIMAWARI" was launched in 1977. Because one of the important roles of JAXA is to promote and enhance the satellite application. Recently we successfully launched and are operating GCOM-W1(Global Change Observation Mission or Shizuku) and GOSAT (Greenhouse gases Observing Satellite or Ibuki) . They are observing the Earth and producing very valuable data for weather and climate phenomena.

Regarding the international cooperation, now we are cooperatively developing new satellites with US and Europe partners. GPM (Global Precipitation Measurement) with NASA will be launched in the beginning of the next year and Earthcare (Earth Clouds, Aerosols and Radiation Explore) with ESA will be ready to launch within 2 years. JAXA is willing to continue these activities.

However, on the other hand, we are facing very challenging financial status. Japanese government has recently announced the new space policy. But, unfortunately, it does not put the priority on the environment monitoring satellites, such as JAXA's GCOM series, nor global climate change issues.

I believe that the CGMS has a long history to coordinate meteorological satellite programs in the world, and is regarded as a major user group of the satellite data for meteorology and climate applications. Then it should be very important for us to share the idea about the importance of the earth environment monitoring by satellites not only in this community but also outside of this community. I expect the CGMS to appeal its activity to the outside of this community. It will help us and make it easier for JAXA to continue the earth environment monitoring missions.

I hope that we will have variable information exchanges and fruitful discussions and get fruitful results in this meeting. And enjoy staying at Tsukuba.

Thank you very much for your attention.

ANNEX 2 LIST OF PLENARY PARTICIPANTS

CMA
Feng Lu
Dongfeng Luo
Chunfang Wang
Xuebao Wu
Peng Zhang

CNSA
Jun Gao
Zhao Shaohua
Yong Xie
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Embassy of India
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ESA
Jean-Louis Fellous

EUMETSAT
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Paul Counet
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Volker Gaertner
Joaquin Gonzalez
Livio Mastroddi,
Alain Ratier
Mikael Rattenborg
Klaus-Peter Renner
Robert Roebeling
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Anne Taube
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GEO
Osamu Ochiai
Toshio Koike

ISRO
Kamaraju

IOC/UNESCO

David Halpern

JAXA

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Azusa Fukuki
Yukio Haruyama
Kiyoshi Higuchi
Keiji Imaoka
Chu Ishida
Misako Kachi
Masatoshi Kamei
Takayuki Kawai
Riko Oki
Arata Okuyama
Kazuo Umezawa
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JMA

Kazumasa Aonashi
Mitsuhiko Hatori
Yasushi Izumikawa
Yukihiro Kumagai
Hiroshi Kunimatsu
Toshiyuki Kurino
Toshihiro Manda
Toshimasa Marui
Yasutaka Murakami
Masashi Nagata
Yoji Nagata
Naoki Nanrin
Masanori Obayashi
Tomoo Ohno
Nozomu Okawara
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Hiroaki Tsuchiyama
Tetsuyuki Ueyama
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Masahiro Yoshida

KARI
Koon-Ho Yang

KMA
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Dohyeong Kim
Tae-Sun Kwon

NASA
Jack Kaye
Brian Killough
Anthony Mannucci

NILU
Fred Prata

NOAA
Mitch Goldberg
Suzanne Hilding
Charles Wooldridge

ROSHYDROMET
Zoya Andreeva
Vasily Asmus
Liubov Kramareva
Alexey Rublev
Alexander Uspenskiy

ROSCOSMOS
Anton Baliev
Kirill Borisov
Yury Golovin
Harun Karchaev
Alexander Karelin
Dmitry Kozlov
Fedor Lyubchenko
Mikhail Novikov
Vyacheslav Pastarnak
Stanislav Smirnov,
Alexander Tkachenko

University of Wisconsin-Madison

Liam, Gumley

WMO

Stephan Bojinski
Jerome Lafeuille
Anthony Rea
Lars Peter Riishojgaard
Adrian Simmons
Wenjian Zhang

ANNEX 3 LIST OF WORKING GROUP PARTICIPANTS

List of participants in WGI

Feng Lu	CMA
Chunfang Wang	CMA
Xuebao Wu	CMA
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Sivaji Chadaram	Embassy of India
Simon Elliott	EUMETSAT
Joaquin Gonzalez	EUMETSAT
Livio Mastroddi	EUMETSAT
Mikael Rattenborg	EUMETSAT
Klaus-Peter Renner	EUMETSAT
Kamaraju	ISRO
Yukio Haruyama	JAXA
Hidekazu Inoue	JMA
Yasushi Izumikawa	JMA
Yukihiro Kumagai	JMA
Masanori Obayashi	JMA
Tomoo Ohno	JMA
Yoshio Shimazu	JMA
Hiroshi Tomita	JMA
Keiko Yamamoto	JMA
Hironobu Yokota	JMA
Koon-ho YANG	KARI
Mitch Goldberg	NOAA
Suzanne Hilding	NOAA
Charles Wooldridge	NOAA
Zoya Andreeva	ROSHYDROMET
Liubov Kramareva	ROSHYDROMET
Alexander Tkachenko	ROSCOSMOS
Wenjian Zhang	WMO

List of participants in WGII

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Johannes Schmetz	EUMETSAT
David Halpern	IOC-UNESCO

Misako Kachi	JAXA
Takayuki Kawai	JAXA
Arata Okuyama	JAXA
Kazuo Umezawa	JAXA
Akiyoshi Ando	JMA
Kotaro Bessho	JMA
Kenji Date	JMA
Ryo Dojo	JMA
Masahiro Hayashi	JMA
Keita Hosaka	JMA
Takahito Imai	JMA
Shiro Ishizaki	JMA
Toshiharu Izumi	JMA
Tsutomu Jomura	JMA
Hiroshi Kunimatsu	JMA
Yukio Kurihara	JMA
Toshiyuki Kurino	JMA
Koki Mori	JMA
Hidehiko Murata	JMA
Ryuichiro Nakayama	JMA
Masanori Obayashi	JMA
Kozo Okamoto	JMA
Takeshi Otomo	JMA
Kazuki Shimoji	JMA
Yasuhiko Sumida	JMA
Masaya Takahashi	JMA
Kunio Takase	JMA
Ayako Takeuchi	JMA
Hidetaka Taniguchi	JMA
Hiroaki Tsuchiyama	JMA
Satoru Tsunomura	JMA
Yoshito Yoshizaki	JMA
Eun-Jong Cha	KMA
Dohyeong Kim	KMA
Tae-Sun Kwon	KMA
Jack Kaye	NASA
Brian Killough	NASA
Anthony Mannucci	NASA
Mitch Goldberg	NOAA
Fred Prata	NILU
Alexey Rublev	ROSHYDROMET
Alexander Uspenskiy	ROSHYDROMET
Zoya Andreeva	ROSHYDROMET
Liubov Kramareva	ROSHYDROMET
Vasily Asmus	ROSHYDROMET

Anton Baliev	ROSCOSMOS
Fedor Lyubchenko	ROSCOSMOS
Vyacheslav Pastarnak	ROSCOSMOS
Stanislav Smirnov	ROSCOSMOS
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Stephan Bojinski	WMO
Anthony Rea	WMO

List of participants in WGIII

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Mikael Rattenborg	EUMETSAT
Anne Taube	EUMETSAT
Osamu Ochiai	JAXA
Kamaraju	ISRO
Takayuki Kawai	JAXA
Yasushi Izumikawa	JMA
Tomoo Ohno	JMA
Yoshiaki Sato	JMA
Yoshio Shimazu	JMA
Keiko Yamamoto	JMA
Hironobu Yokota	JMA
Yukihiro, Kumagai	JMA
Koon-Ho Yang	KARI
Tae-Sun Kwon	KMA
Suzanne Hilding	NOAA
Charles Wooldridge	NOAA
Kirill Borisov	ROSCOSMOS
Yury Golovin,	ROSCOSMOS
Harun Karchaev	ROSCOSMOS
Alexander Karelin	ROSCOSMOS
Dmitry Kozlov,	ROSCOSMOS
Fedor Lyubchenko	ROSCOSMOS
Mikhail Novikov	ROSCOSMOS
Vyacheslav Pastarnak	ROSCOSMOS
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List of participants in WGIV:

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Joaquin Gonzalez	EUMETSAT
Livio Mastroddi	EUMETSAT
Klaus-Peter Renner	EUMETSAT
Kamaraju	ISRO
Hidekazu Inoue	JMA
Yasushi Izumikawa	JMA
Kumagai Yukihiro	JMA
Masanori Obayashi	JMA
Tomoo Ohno	JMA
Yoshio Shimazu	JMA
Shougo Tanaka,	JMA
Hiroshi Tomita	JMA
Keiko Yamamoto	JMA
Hironobu Yokota	JMA
Koon-Ho Yang	KARI
Suzanne Hilding	NOAA
Charles Wooldridge	NOAA
Zoya Andreeva	ROSHYDROMET
Alexey Rublev	ROSHYDROMET
Alexander Tkachenko	ROSCOSMOS
Jerome Lafeuille	WMO
Wenjian Zhang	WMO

ANNEX 4 MINUTES OF THE AD-HOC MEETING ON SPACE WEATHER ON 10 JULY 2013

FINAL REPORT OF THE AD-HOC MEETING ON SPACE WEATHER

CGMS-41, Japan, 10 July 2013

1. Introduction and background

The meeting was convened on Wednesday, 10 July 2013 at 11h00, with Ms Suzanne Hilding (NOAA) as Chair and Mr Jérôme Lafeuille (WMO) as Rapporteur. The participants included in total 24 representatives of CGMS members and observers: CMA, CNSA, ESA, EUMETSAT, ISRO, JMA, KARI, KMA, NASA, NOAA, ROSCOSMOS, WMO, GCOS, IROWG, NICT, CGMS Secretariat. (See list in Annex)

The Chair highlighted the relevance of Space Weather for CGMS members since space weather events were regularly the cause of anomalies on spacecraft and, furthermore, many of these spacecraft were carrying a space weather payload. Therefore, CGMS members had the potential to play an important role in support of space weather activities, and to take benefit of such activities.

She recalled Recommendations 40.34, 40.36, 40.41, 40.42 and 40.43 of the last meeting and underlined that the CGMS High-Level Priority Plan (HLPP) identified Space Weather as one of the “Cross-cutting issues and new challenges” with two objectives:

- Establish a coordinated approach to the monitoring of space weather and the reporting of space weather-related spacecraft anomalies;
- Assess how CGMS is organized to address space weather matters.

WMO indicated that Space Weather coordination had been recognized by the WMO Congress (Cg-16, May 2011) as one of the activities of the WMO Space Programme and that an Inter-Programme Coordination Team on Space Weather (ICTSW) had been established. The ICTSW has started its work by reviewing the requirements for space weather information and the observing capabilities supporting these requirements, which has led to a “Statement of Guidance on Space Weather Observations” containing recommendations for improving current ground and space-based observations for Space Weather. Recognizing both the valuable contribution of individual CGMS Members and the lack of a coordinated approach for space weather observations from space, it has invited the CGMS to consider its active involvement in the coordination of satellite activities in support of space weather.

2. Reports from CGMS members

The **NOAA-WP-21** report on Anomalies from Solar Events provided examples of new space weather products under development, the progression and prediction of the solar cycle, a summary of recent significant space weather events, and a discussion about the

growth of space weather services and international cooperation. The Spacecraft Environmental Anomalies Expert System – Real Time (SEAESRT) at the Space Weather Prediction Center will provide geosynchronous satellite operators with information about space weather hazard levels from energetic particles in the space environment. This information, along with other tools developed at the National Geophysical Data Center, will be used to support satellite anomaly investigation. NOAA is also partnering with the international community to strengthen the world's satellite fleet through better design standards. Predictions are given for the time and magnitude of Solar Cycle 24 maximum. The consensus prediction that the new cycle will be smaller than recent cycles is consistent with current observations; however solar maximum, based on a running 13-month average of sunspot numbers, may be later than the predicted May 2013. Although the solar cycle may be small, we note that historically some of the largest geomagnetic storms have occurred during small solar cycles. An update was provided on the levels of recent space weather activity based on solar and near-Earth observations. NOAA finally noted the increasing international interest in space weather and related international coordination.

CMA-WP-08 provided an overview of recent activities of CMA relating to the space weather. The meeting noted that CMA had standardized its operational methodology for quantitative space weather forecast. Besides the routine space weather monitoring, forecasting and services, the CMA activities related to space weather also include several project-supported R&D, conferences, and educational initiatives to increase the public awareness of the space weather.

NASA-WP-07 summarized the NASA Space Weather activities, referred to in the NASA structure bas " Applied Heliophysics". The goals are to provide space weather relevant data to NASA assets and other governmental agencies; to transition Heliophysics science to operational space weather knowledge and products; and to support NASA missions with relevant tools and understanding. These activities can be broadly grouped into three areas: space weather observing systems and services, space weather research, Inter & Intra- Agency Coordination. An update was given on the current and future satellite missions of NASA supporting space weather activities.

NOAA-WP-15 provided a report on ground and space-based observations, which are at the heart of space weather forecasting and specification. These observations extend from the Sun to interplanetary space, to the magnetosphere, ionosphere and upper atmosphere, and are used to support a growing and diverse user community. Space weather observations are used as situational awareness, as input to drive models that can provide spatial and temporal forecasts, in assimilative models, to validate model performance, and for research that may ultimately lead to improved space weather applications. NOAA supports both ground and space-based observations (e.g. from GOES and POES) that provide continuous measurements of the vast space environment.
Also critical for supporting space weather operations are data from NASA, NSF, the USAF, the USGS, and international partners. The report described many of the space weather observing systems in use, and planned for, at the NOAA Space Weather Prediction Center and how these observations support space weather services.

In another presentation, **NOAA-WP-28**, NOAA gave an overview of the products and services delivered by its space weather prediction centre. NOAA suggested different activities for CGMS in the area of space weather: to contribute to the availability and coordination of space weather observations – including traditional measurements (solar, energetic particles, magnetic field, GNSS radio occultation) and non-traditional measurements (coronagraph, solar wind); to assist with defining user requirements and evaluating space weather products ; to collect space weather driven spacecraft anomaly information and encourage its availability and use; and to contribute to a strategy for the long-term continuity of space weather observations.

KMA-WP-08 described the status of KMA Space Weather Service. KMA initiated the delivery of space weather services to the public in April, 2012 with three main targets: 1) support to satellite operation, 2) support to aviation, and 3) ionospheric dynamics. KMA proceeds with tree major projects to build the infrastructure supporting space weather operations, which are focusing respectively on: building the observation system (ground-based GNSS receivers, and plans for a Geo-Kompsat-2A space weather payload), developing the prediction system (modeling the solar and interplanetary region and the magnetosphere-ionosphere-atmosphere region), and delivering space weather services (for aviation, spacecraft operations, and telecommunications).

The meeting was pleased to note the important activities reported by the members, ranging across the whole end-to-end chain from observation, to modeling, prediction methods, delivery of services, outreach and education. It also pointed out the scope for greater integration, in particular as concerns observation means.

3. Report from ICTSW

The **WMO-WP-18** report provided by the WMO/ICTSW suggested that WMO and CGMS had complementary interests in space weather and, among the international organizations engaged in space weather, were uniquely focused on operational service aspects. The purpose of ICTSW is to support space weather observations, data exchange, product and service delivery, and operational applications. CGMS provides a substantial contribution to space weather in operating space environment monitors and solar instruments on meteorological satellites, and CGMS has an interest in mitigating the impacts of space weather on satellites.

CGMS members were thus encouraged to develop a strategy for involvement in space weather and were invited to coordinate with the WMO/ICTSW. It is envisioned that CGMS could contribute in numerous areas, including the utilization of satellite anomaly information, the acquisition of space weather observations, the development of a plan for long-term continuity of observations, and the solicitation of space weather product requirements.

4. Outcome of the discussion

The Chair then opened a discussion on the possible role of CGMS with respect to Space Weather in expressing the view that CGMS had the potential to play a role in the coordination of the space weather observing constellation, similar to the role played regarding weather and climate observation satellites. The IROWG representative reinforced and illustrated this view in reporting the need for improved coordination of the radio-

occultation constellation and a better understanding of which radio-occultation missions have also the capability to monitor the ionosphere.

WMO stressed the need for CGMS to remain focused on an operational perspective. CGMS activities should be driven by user requirements derived from user needs for products and services. An effort should thus be undertaken to clearly identify the user basis (e.g. through a survey to participating countries, or compiling results of existing surveys). There was scope for developing a synergy between space weather services and meteorological services to certain users (e.g. aviation, telecommunications, energy, disasters)

The meeting agreed that, beyond the historical role to report on spacecraft anomalies and to host space weather payload, CGMS could assist in global coordination of satellite aspects. It should however keep a clear focus on operational needs, to support provision of products and services.

This would facilitate integration of observing capabilities across space weather communities. In defining a baseline and fostering integration of the current suite of observations, CGMS would help to sustain future observing capabilities.

CGMS should recognize other international partners with complementary roles, e.g. : the Committee on Space Research (COSPAR) has a Panel on Space Weather and is developing a roadmap, the International Space Environment Service (ISES) coordinates operational space weather warnings. The meeting also recognized the need to communicate the socio-economic benefits of space weather prediction with policy makers, public, non technical community.

5. Actions taken

The meeting identified two actions: a short-term action regarding the collection of spacecraft anomaly information in response to WMO/ICTSW, and a broader action of strategic nature to develop the Terms of Reference of future CGMS activities in Space Weather.

- CGMS Members to nominate points of contact to work with WMO/ICTSW in order to define jointly a procedure to improve the collection, availability, and use of satellite anomaly information (Due date: **30/09/2013)**
- CGMS Members to nominate a team to develop the TOR for CGMS space weather activities, taking into account the guiding principles discussed in the ad-hoc session, for consideration by CGMS-42 (Due date: **30/09/2013)**

During the meeting, the following organizations already volunteered to serve on this team: CMA, NOAA, WMO, JMA (to be confirmed), KMA (to be confirmed).

Annex: List of participants at the Ad-hoc Meeting on Space Weather on 10 July 2013

NAME	Organization
COUNET, Paul	CGMS Secretariat
LU, Feng	CMA
WU, Xuebao	CMA
ZHANG, Peng	CMA
GAO, Jun	CNSA
FELLOUS, Jean-Louis	ESA
GAERTNER, Volker	EUMETSAT
RATTENBORG, Mikael	EUMETSAT
SIMMONS, Adrian	GCOS
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MANNUCCI, Anthony	IROWG
KAMARAJU	ISRO
IZUMIKAWA, Yasushi	JMA
KUMAGAI, Yukihiro	JMA
MURAKAMI, Yasutaka	JMA
YAMAMOTO, Keiko	JMA
YANG, Koon-Ho	KARI
KIM, Dohyeong	KMA
ISHII, Mamoru	NICT
HILDING, Suzanne (Chair)	NOAA
BOJINSKI, Stephan	WMO
LAFEUILLE, Jérôme (Rapporteur)	WMO
REA, Anthony	WMO
ZHANG, Wenjian	WMO