

## 2.5 INTERNATIONAL ISSUES AND FUTURE SYSTEMS

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### 2.5.1 Introduction

The ITSC-21 Working Group on International Issues and Future Systems (IIFS) convened on Sunday 3 December 2017 and discussed actions and recommendations from ITSC-20 and a number of topics requiring coordination between agencies. The IIFS enjoyed a lively and useful discussion.

### 2.5.2 Summary of ITSC-19 and 20 Actions and Recommendations

At ITSC-20 the following ITSC-19 action and recommendations remained open:

- **Recommendation IIFS19-1:** Provide examples to the Co-Chairs (Steve English, Jérôme Lafeuille) to show where high frequency soundings proved useful. It was agreed to close this, but to retain IIFS19-2 as a new recommendation.
- **Recommendation IIFS19-2:** Note the growing evidence of likely benefits from hyperspectral geostationary soundings, and where possible to work towards the provision of such instruments in plans for future geo systems (new Recommendation IIFS-6).
- **Action IIFS19-1:** Steve English to request ITWG (involving NWP Group) to provide input to CGMS WG III – via Jérôme Lafeuille – for updating the CGMS Contingency Plan.  
The WG noted that the old draft CGMS contingency plan was discussed at the recent CGMS-45 in June, and agencies and WMO agreed to focus on this topic over the coming months. WMO committed to organize a face-to-face meeting with agencies participating in CGMS WG III to address the plan, and the whole process of CGMS contingency planning. Therefore this action remains open.
- **Recommendation IIFS19-3:** WMO to pursue SATURN, and all agencies to actively contribute information to this portal (and two associated actions).  
This remains open as SATURN is still in an early stage of development.
- **Recommendation IIFS19-4:** CGMS to implement notification process for ITWG recommended events (Stephen English, on behalf of ITWG and in discussion with the NWP WG, to provide list of most relevant events affecting the quality of data, e.g., calibration changes, sensor anomaly, change of operation mode, and indication of the magnitude of the event justifying a notification. CGMS).  
This is closed though the activity continues in the form of action IIFS21-A7, see below.
- **Recommendation IIFS19-5:** Make available pre-processing software for L0/L1 Meteor-M data.

This is closed but there is a new related action IIFS21-A7.

The status of the recommendations from ITSC-20 is as follows:

- **Recommendation IIFS20-1:** Emphasize latency requirement in the HLPP Action 2.3 to increase the use of research and pre-operational satellites. (Action: Mitch Goldberg to propose to CGMS).  
*Closed. Noted by CGMS.*
- **Recommendation IIFS20-2:** When an agency has two or more satellites in the same nominal orbit (e.g., 2pm) that they be staggered by phase (as Metop). With multiple satellites from different agencies it is recommended to stagger them in ECT. (Action: Mitch Goldberg to present to CGMS).  
*Closed. Noted by CGMS.*
- **Recommendation IIFS20-3:** IIFS members to investigate optimal staggering to test working assumption that dual Metop configuration separated by about 180° is best option for future missions.(Action: IIFS members to provide evidence to IIFS Co-Chairs of advantages of orbit staggering).  
*Closed. EUMETSAT-led study selected optimal configuration.*
- **Recommendation IIFS20-4:** Provision of high temporal frequency MW humidity sounding radiances (alongside cloud and precipitation sensitive observations). (Action: Jérôme Lafeuille to present to WMO Vision 2040 workshop).  
*Closed. Noted by ET-SAT.*
- **Recommendation IIFS20-5:** Provision of low-inclination MW humidity sounding to monitor diurnal cycle. (Action: Jérôme Lafeuille to present to WMO Vision 2040 workshop).  
*Closed. Noted by ET-SAT.*
- **Recommendation IIFS20-6:** Achieve SI traceability of operational hyperspectral IR sounders, and ultimately MW sounders, recognising growing need for assessment of calibration uncertainties (Action: Mitch Goldberg and Peng Zhang to present to GSICS).  
*Closed. Noted by GSICS.*
- **Recommendation IIFS20-7:** Provide more GRUAN and tropical ARM sites, given the need for ground-based reference measurements. (Action: Mitch Goldberg and Peng Zhang to present to GSICS).  
*Closed. Noted by GSICS.*
- **Recommendation IIFS20-8:** Develop best practices in pre-flight characterisation of MW sensors (Action: Mitch Goldberg and Peng Zhang to present to GSICS).  
*Closed. Noted by GSICS.*
- **Recommendation IIFS20-9:** Noting the progress made in characterising observation uncertainty for hyperspectral sounders encourage further characterisation of LBL model error and errors arising from cloud screening, with a view to considering

hyperspectral sounders as an absolute reference. (Action: Mitch Goldberg to ensure this is delivered to IRC and RTWG.)

*Closed. Noted by CGMS.*

- **Recommendation IIFS20-10:** Clarify reporting procedure for notifying ITU of detected RFI. (Action: Rich Kelley to circulate proposed procedure and ITWG members to follow).  
*Closed.*
- **Recommendation IIFS20-11:** WRC outcomes to be provided to ITWG. (Action: Rich Kelley to email summary to ITWG mailing list).  
*Closed.*
- **Recommendation IIFS20-12:** IIFS and other ITWG members to provide information on current usage of protected bands to Rich Kelley. (Action: Stephen English to provide copy of recent ECMWF submission to OFCOM, and to request Met Office to provide copy of their submission as well as encourage other NMSs to provide similar information where it exists).  
*Open – carried forward to ITSC-22.*
- **Recommendation IIFS20-13:** To make MW SRFs available to facilitate RFI investigations when needed. (Action: Stephen English to ask co-chairs to combine with Recs from other WGs and communicate to CGMS).  
*Open – carried forward to ITSC-22.*
- **Recommendation IIFS20-14:** Update Steve English's study from 2005 on the value of individual MW protected bands. (Action: Sid Boukabara to ask Thomas Auligné to consider making this part of the FSOI intercomparison study and presenting to the WMO impacts workshop in Shanghai in 2016).  
*Open – carried forward to ITSC-22, supported by new Action IIFS-9.*
- **Recommendation IIFS20-15:** NMSs to attempt to provide an assessment of the economic value of bands based on the impact assessment, as was done by the Met Office in 2005. (Action: IIFS members to investigate in their countries).  
*Open – carried forward to ITSC-22, supported by new Action IIFS-9.*
- **Recommendation IIFS20-16** WMO and CGMS satellite operators to further maintain OSCAR and SATURN, noting the strong positive feedback from ITWG Members. (Action: IIFS members to review SATURN and provide comments to Stephan Bojinski [sbojinski@wmo.int](mailto:sbojinski@wmo.int))  
*Closed. Noted by CGMS and WMO.*
- **Recommendation IIFS20-17:** Provide information on best practice for the design phase of new programmes. (Action: Dieter Klaes to circulate his paper from the ECMWF satellite seminar, and IIFS members to provide similar information to IIFS Co-Chairs for their agencies if possible.)  
*Closed. Paper circulated.*
- **Recommendation IIFS20-18:** The NWP community to continue to produce and make available Nature Runs to support preparations for, and fair evaluation of,

potential future observations. (Action: IIFS Co-Chairs to bring recommendation to attention of WMO, ECMWF and GMAO.)

*Closed. ECMWF are producing new nature run.*

- **Recommendation IIFS20-19:** Welcoming the decision of CMA to operate FY-3E on the e-am orbit but noting the current lack of any long-term plan for this orbit, to consider follow-up and back-up missions ensuring continuity of e-am post FY-3E and DMSP. (Action: Nancy Baker and Peng Zhang to pass Rec to DoD and CMA.)  
*Closed. ISCC\* is the formal forum for consultation regarding the future Fengyun programme. DoD: Discussion continues, no definitive decision has been taken. Note Paul Menzel, Hank Revercomb, Mitch Goldberg and Steve English are members of ISCC.*
- **Recommendation IIFS20-20:** Continue the SSMIS 60 GHz UAS capability, noting the trend for NWP models to extend higher in the stratosphere and lower mesosphere and the development of thermosphere modelling for Space Weather applications. (Action: Nancy Baker to report to DoD and Jérôme Lafeuille to raise at WMO Vision 2040 workshop.)  
*Closed. Reported to DoD and raised at ET-SAT Vision 2040 discussions.*
- **Recommendation IIFS20-21:** WMO to promote standards to foster interoperability and usability of possible missions from commercial providers. (Action: Jérôme Lafeuille or his successor to provide information when the need arises).  
*Closed. WMO is developing a position paper on what types of satellite data users consider critical for applications, and which principles should apply to these data (international exchange, transparency, etc.). WMO engages satellite operators in CGMS in this process.*
- **Recommendation IIFS20-22:** Secure full government control for observations classed as essential under WMO Res 40. (Action: Mitch Goldberg to Report to CGMS).  
*Closed, noted by CGMS.*
- **Recommendation IIFS20-23:** Noting the strong overlap of interest among the CGMS international science groups for some subjects (e.g., ITWG, ICWG about MTG-IRS) co-chairs to ensure coordination where appropriate of communications to CGMS. (Action: Mitch Goldberg to Report to CGMS).  
*Closed. This coordination is confirmed to be happening through CGMS working group 2.*

### **2.5.3 The CGMS High Level Priority Plan (HLPP)**

The coordination activities of CGMS are reflected in a High Level Priority Plan (HLPP) initially endorsed by the CGMS-40 plenary session in 2012. Items relevant to the IIFS from the HLPP were reviewed. In general the HLPP was again welcomed. Some editorial items were noted. It was agreed that item 3.3.3 should be brought to the attention of Liam Gumley at UW (L2 intercomparisons). The following new recommendations and actions were agreed:

#### **Action IIFS-1 on Mikael Rattenborg**

**To note IIFS comments in next draft of the HLPP.**

### **Action IIFS-2 Action on Christoforos Tsamalis**

**To provide input to Mikael Rattenborg on item 3.4.1 (new common vocabulary and methodology for the errors associated with validation data).**

### **2.5.4 Radiative Transfer Standards**

The IIFS noted a need for more work on LBL spectroscopic uncertainty and a unified model for describing the shape of the relevant atmospheric water vapour lines from the microwave (MW) to the visible. This should include the thermal (TIR) and shortwave infrared (SWIR) regions. This resulted in the following recommendation to IRC.

#### **Recommendation IIFS-1 to IRC**

**Development of a new unified model for describing spectroscopic and water vapour continuum absorption (Action: IIFS Co-Chairs to discuss with RT Co-Chairs how to communicate).**

Furthermore noting the value of the HLPP, it was felt ITWG members should retain a familiarity with the document to make HLPP discussion at future ITSCs more efficient.

#### **Recommendation IIFS-2 to ITWG members**

**ITWG members to become more familiar with the HLPP (Action: IIFS Co-Chairs to suggest to ITWG Co-Chairs to circulate HLPP to ITWG).**

### **2.5.5 Orbital Configurations**

The WG noted that the synergy arising from concepts like the Aqua A-train can be valuable. When agencies propose new free flyers and research satellites the WG recommends that flying in formation with an operational satellite may be advantageous. This was particularly noted for the FORUM mission with Metop. However because of the different geometry of view and other aspects it is important for CGMS to see actual data coverage plots when proposed to fly in formation to reach an informed judgment.

#### **Recommendation IIFS-3 to CGMS**

**Having similar equatorial crossing times is helpful but not sufficient to ensure synergistic opportunities between separate missions. Therefore it is recommended to also take note of projected data coverage when considering opportunities for formation flying of multiple missions (similar to A-train).**

#### **Action IIFS-3 on Claude Camy-Peyret**

**To provide more information to IIFS members on the FORUM proposal.**

Note that this is not contradictory to the ITSC-20 conclusion that there is significant advantage to staggering satellites of the same nominal orbit (i.e., am, pm, e-am) in order to improve the sampling and coverage. The support for an A-train concept applies when other missions benefit from synergy. When other missions are very similar to the main operational mission then it is more advantageous to introduce a small separation.

### **2.5.6 Global Design, Characterisation and Calibration of WIGOS**

In addition to the long standing support to high temporal resolution hyperspectral infrared sounding, at the previous ITSC-20 meeting the IIFS had concluded that there is evidence for the need for high temporal frequency MW humidity sounding and imagery data.

Science questions for next WMO OSE workshop are being assembled in 2018 where the evidence for this can be critically reviewed, to highlight the need for improved timeliness and temporal repeat cycle.

**Action IIFS-4 on IIFS members**

**To provide science questions to WMO in the first half of 2018 (Lars Peter Riishoejgaard at riishoejgaard@wmo.int) and to undertake studies and encourage others to also do so, to support this as a significant theme of the next OSE workshop.**

The group noted the upcoming TROPICS mission with a low inclination MW constellation. Such a mission is of potential interest to meet the temporal repeat requirement, but it needs to be critically evaluated by a number of centres.

**Recommendation IIFS-4 to multiple agencies**

**Evaluation of TROPICS mission to be undertaken by appropriate agencies in partnership with TROPICS mission (e.g., NWP centres)**

**Action IIFS-5 on S. English / P. Zhang**

**To bring this to the attention of major NWP centres and TROPICS mission.**

In addition to initiatives like TROPICS the IIFS noted the increasing number of sounding missions, with programmes in many different countries, and a mixture of research and operational missions. The IIFS noted that new observations that can be considered “core” will be evaluated by all centres as soon as they become available. However more innovative observations, or observations whose quality is uncertain, could be evaluated collaboratively by a group of centres, sharing the workload. This coordination could be achieved by a modest extension of the scope of the existing GODEX group rather than creating a new entity.

**Recommendation IIFS-5 to GODEX-NWP**

**To organise and oversee agreed sharing of the evaluation of instruments not considered to be “core” by NWP centres.**

**Action IIFS-6 on Mikael Rattenborg**

**To discuss with GODEX-NWP members how this initiative could be implemented (next meeting Autumn 2018).**

Also the recommendation from ITSC-19 (Recommendation IIFS19-2) remains open and important but is renamed for ease of reference:

**Recommendation IIFS-6 to CGMS**

**Note the growing evidence of likely benefits from hyperspectral geostationary soundings, and where possible to work towards the provision of such instruments in plans for future geo systems.**

**2.5.7 CGMS Change Notifications**

Recommendation IIFS19-4 has led to an agenda item for CGMS in 2018. The principal of a CGMS notification procedure to guide satellite agencies may be agreed. It is important that ITWG can provide details when/if this happens.



#### **Action IIFS-7 on IIFS Co-Chairs**

**In partnership with NWP WG the IIFS WG Co-Chairs to devise a set of criteria for this CGMS procedure to follow.**

#### **2.5.8 Data Timeliness Issues**

Noting Recommendation IIFS19-5 the Co-Chairs are asked to remind Roscosmos, who are the owner of the existing software package and can modernise to modern OS (linux type), of the requirement for a DB software package to enable use of Russian data in DBNet, to lend support to WMO.

#### **Action IIFS-8 on Mikael Rattenborg and the IIFS Co-Chairs**

**To draft a letter for ITWG Co-Chairs to send to Roscosmos and Roshydromet explaining the importance of access through DB-Net and processing of real time MTVZA-GY and MSU-MR data (Alexander Uspensky to advise full postal address of whom to send to).**

The WG noted that timeliness of CYGNSS does not meet requirements, despite strong real time interest in this mission. This remains typical of research missions.

#### **Recommendation IIFS-7 to CGMS**

**Re-emphasize best practise is to consider timeliness requirements early in the planning stage of new missions, including research and pre-operational.**

This should take into account that the timeliness requirement will depend on the user applications, and there is not a fixed time requirement that must always be met. There needs to be discussion on a mission by mission basis and with specific applications in mind.

#### **2.5.9 Instrument Characterisation**

The group went on to consider the absolute calibration of satellite observations, noting efforts such as the Horizon2020 projects GAIA-CLIM and FiduCEO in Europe to establish SI traceability of MW and broadband IR observations to reference observations, as well as CLARREO for hyperspectral observations in the United States. The group welcomed these efforts and encouraged their continuation. The group noted GSICS leadership in this area and encourage GSICS to pay specific attention to SI traceability of hyperspectral sounders.

Noting that whilst pre-flight characterisation is important, instrument are sometimes stored for a long time on the ground, and in any case in-orbit characterisation is needed, the WG made the following recommendation:

#### **Recommendation IIFS-8 to CGMS**

**Recognizing the growing need for assessment and on-orbit optimization of the accuracy of operational hyperspectral IR sounders, the traditional approaches for pre-flight SI traceability and post-flight validation should be enhanced by flying a CLARREO-like on-orbit reference standard capability (featuring on-orbit SI verification) with orbits designed to provide inter-calibration capability for refining the calibration of the international fleet of operational sounders.**

The WG noted the value of the GAIA-CLIM activity and the GRUAN and ARM sites. Such sites are important and should be maintained, and expanded where possible. It was noted that

GRUAN has no resources for such an expansion, so the recommendation is to GCOS to consider how this could be achieved.

**Action IIFS-9 on Peng Zhang**

**To check status of reference sites in China and their availability.**

**Recommendation IIFS-9 to AOPC GCOS**

**Maintain and where possible expand GRUAN and ARM sites.**

**2.5.10 Radio Frequency Interference Issues**

The group welcomed recent successes in work carried out by many agencies including NOAA, EUMETNET, EUMETSAT and ESA. However there remains a clear and growing risk to the activities of ITWG from other users of spectrum. The group therefore discussed in some detail ITWG's role in this area.

The WG noted the challenges posed by RFI and the need to, where possible, detect RFI. Some suggested techniques were noted in the presentation by Rich Kelley.

**Recommendation IIFS-10 to CGMS**

**Space agencies to develop, where possible, improved capability to detect RFI in level-0 data.**

When RFI is detected MW SRFs are essential to prove its illegal emissions in protected bands. So the need for SRFs is reiterated. The WG noted this is also important for climate and for radiative transfer.

**Recommendation IIFS-11 to CGMS**

**Space agencies to ensure that provision of SRFs for MW instruments is routine practise for future instruments and published on the SATURN portal. Furthermore to obtain wherever possible and practical the SRFs for existing and old instruments, and also to provide on the SATURN portal.**

Furthermore the WG noted that the two recommendations to update the current use of MW bands and their economic and social value. Therefore Recommendations IIFS20-14 and IIFS20-15 remain open and in addition there is a new action to try and actively acquire and update this information via a Workshop.

**Action IIFS-10 on Steve English**

**To ask ECMWF if it is willing to host a short workshop (1-2 days) to present updated information with respect to Recommendations IIFS20-14 and IIFS20-15.**

**2.5.11 Feedback to WMO on Saturn and WMO Contingency Plan**

The group continues to strongly support WMO's OSCAR and SATURN facilities and thanked WMO for their continuing strong support to the community through their provision. IIFS members reported that OSCAR is now a very well established source of information in standard working practices and that the SATURN initiative is also very warmly welcomed. The group encourages WMO to continue to support these efforts and to help establish SATURN through constructive feedback. The recommendation from ITSC-19 (IIFS19-3) remains open but is reformulated as Recommendation IIFS-12.



**Recommendation IIFS-12 to WMO**

**To continue to pursue SATURN, and all agencies to actively contribute information to this portal (and two associated actions).**

**2.5.12 Commercial Satellite Observation Providers**

The WG had a lively discussion on the growing role of commercial satellite observation providers, especially in the US. At present there is no single coherent policy within the meteorological community. There are many discussion papers (in agencies, international agencies, WMO). However WMO are attempting to create a policy document. This has key principles. The group agreed with the principles and noted potential additional points:

- Data continuity and long-term planning is critical to operational centres;
- The new notification procedures will need to be respected if adopted by CGMS; and
- New data needs to undergo a thorough scientific evaluation to demonstrate quality and impact for operational users prior to commercial sale.

**Action IIFS-11 on Steve English and Peng Zhang**

**To bring these suggested changes to WMO teams considering these questions (CGMS, IPETSUP, ICT-IOS...)**