CGMS-54-CGMS-WP-26-p

Status of implementation of CGMS High Level Priority Plan (2025-2029)

Prepared by CGMSSEC
Agenda Item: Plenary (Information docs)

Provided for information to Plenary

Status of implementation of CGMS High Level Priority Plan (2025-2029)

This working paper provides the status of implementation of CGMS High Level Priority Plan (2025-2029). It incorporates inputs from:

- WG I, II, III and IV
- CGMS Space Weather Coordination Group
- International Science Working Group chairs and rapporteurs
- GSICS
- CEOS-CGMS Joint Working Group on Climate

The colour coding in the table corresponds to the following:

Green: Priority is reflected in ongoing CGMS actions
Yellow: Actions have been defined associated to the priority, but progress is limited
Red: No actions associated with the priority can be identified or major obstacles is hindering progress

Action/Recommendation proposed:

This is an information document, supporting the annual process for revision of the HLPP

Plenary is invited to note the status of implementation of the HLPP 2025-2029.

This document presents the status of implementation of the CGMS High-Level Priority Plan, as agreed by CGMS at its 53th Plenary Session June 2025 hosted by EUMETSAT in Evian, France

Inputs have also been provided by International Science Working Groups (through WG-II) and the joint CEOS-CGMS Working Group on Climate.

The table present the targets according to the logic of the CGMS end-to-end systems. A colour coding indicates the overall progress of achievement of the target:

ACHIEVED/ REMOVED	Target has been achieved or abandoned, will be proposed for removal from HLPP
	Priority is reflected in ongoing CGMS actions
	Actions have been defined associated to the priority, but progress is limited
	No actions associated with the priority can be identified or major obstacles is hindering progress

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
1	**Operational Continuity and Contingency Planning**	**WG-III**		
1.1	**Mitigate the impact of identified degradation or loss of capabilities of the CGMS baseline and ensure appropriate contingency measures are in place**	**WG-III**	**WG-III at its Risk Assessment Workshop in February identified mitigating actions to address loss of CGMS baseline capabilities. The outcome of the Risk Assessment was presented to all CGMS WGs to consider opportunities to mitigate identified risks. (Associated actions are recorded).**	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
1.1.1	Ensure continuity of passive microwave imager measurements		CGMS recognizes the need for a long-term plan for ~6 GHz frequency microwave imaging in at least one LEO orbit for all weather sea surface temperatures. Recommended mitigating actions included ensuring data availability from HY-2B, continue to work towards having 6 GHz data from two orbits (consistent with section 1.2.2), and NOAA to provide an update on SSMI status and possible follow-on. Europe to confirm plans for the Copernicus CIMR (Copernicus Imaging Microwave Radiometer) mission. It will be investigated by IPWG whether the current and planned µwave constellation provides adequate support for precipitation measurements, as these measurements depend mainly on frequencies around 90 GHz.	

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			As of 2024 there is low risk of not meeting the CGMS Baseline commitment; however, sensor performance requirements for different environmental parameters vary; ~6 GHz frequency microwave imaging critical for all weather SSTs, and >90 GHz frequency critical for precipitation. CIMR Mission confirmed by ESA at RA WS 2024, subject to EU Funding Gate Milestone in June 2024. MR: General situation for µwave imagers is good, but concern remains for continuity of specific µwave measurements. For low frequency conical scanning CIMR-A/B remains to be confirmed by ESA. For precipitation identification of critical measurements is needed.	

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			CGMS WG-III action to improve representation of µwave instruments in CGMS baseline and risk assessment, taking into account needs for precipitation, NWP and ocean applications.	
1.1.2	Ensure continuity of Scatterometer measurements		2023 Risk Assessment: Low risk of not meeting the CGMS Baseline commitment. FY-3J now provides coverage beyond FY-3E in the early morning orbit. Oceansat-3A confirmed at RA WS 2024 ISRO to confirm plans beyond OceanSat-3A.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
1.1.3	Ensure continuity of Radio Occultation Measurements with required quantity, geographical coverage and temporal sampling for numerical weather prediction and for ionospheric monitoring		IROWG assessment 2026 • The CGMS baseline commitment in terms of numbers of profiles per day is currently being met. The recent NOAA data purchase agreement (start in September 2025) with Spire and PlanetiQ puts the number of available profiles above 20000/day, which is above the baseline commitment of 14600/day. Without the data purchase, the baseline commitment would not be met. The purchase agreement ends in September 2026. We cannot comment on NOAA plans after September 2026. After September 2026, the baseline would not be met without purchased data. (Paragraph 1 in progress comments).	

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			• Even if profile numbers reach the target of 20000 per day, an important consideration is spatial and local time coverage. Missions such as COSMIC-2 currently provide critical low-inclination GNSS-RO coverage. Studies including NOAA's Analysis of Alternatives indicate that the distribution of orbit inclinations in a constellation is a critical factor for achieving uniform global and local time coverage. Satellites in low-inclination orbits are needed to achieve the required distribution of profiles. Commercial data purchases that contribute to reaching the target of 20000 profiles per day do not guarantee that the HLPP target is met, since the target	

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			requires uniform global and local time coverage. • Given current circumstances, it is probably no longer necessary for IROWG to characterize the gap between available observations and the baseline commitment. However, the distribution of profiles that may include the recent data purchases remains an important quantity to characterize. This characterization is probably best performed by an operational NWP centre that assimilates the data	

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1.2	Advance the response to the WIGOS 2040 vision for space, by the implementation of new capabilities beyond the CGMS baseline	WG-III	CGMS reviews its response to the WIGOS vision annually, based on the WMO Gap Analysis. This review is conducted in the CGMS Risk Assessment Workshop and by WG-III.	

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1.2.1	Work towards establishing optimum constellations for new observations introduced in the CGMS baseline: - Short Wave IR Spectrometers for monitoring of Greenhouse Gases (CO2 and CH4); - UV limb sounding spectrometry for profiles of Ozone and trace gases;		CGMS contribution to SWIR spectrometer constellation for emission monitoring is being coordinated by the JWGClimate and its GHG Task Team. The capabilities of the CGMS baseline for monitoring of minor trace gases have been assessed and added to the baseline document. Further concrete actions to be discussed with WG-II. MR: Critical measurement of detailed profiling of O3 and trace	

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			gases. Main UV limb sounding continuity provided by JPSS on PM orbit. Meteor and FY-3F included in Risk assessment, but operational usage is unclear. Action on WG-II to look at the data from all missions.	
1.2.2	Advance the new generation of GEO satellites, including advanced imaging, lightning mapping and hyperspectral IR sounding for the whole geostationary ring;		It is now confirmed that both GEO-XO and Himawari-10 will be manifesting IR sounders Action on ISRO to confirm HSIR plans for INSAT	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
1.2.3	Work towards operational hourly daytime UV/VIS mapping of air quality from geostationary orbit;		Sentinel-4 planned for launch in 2025. TEMPO has been launched and ACX is now planned for GEO-XO, with an instrument specification very similar to TEMPO. To be addressed with WG-II. MR: Open. Propose to change to yellow, as GEMS has now been removed from baseline and the UV GEO capability will only be provided by MTG-S1/Sentinel-4 for the foreseeable future.	
1.2.4	Work towards ensuring optimised *Hyperspectral* IR measurements from LEO and GEO orbits to improve time sampling, spatial and spectral resolution and timeliness of observations, including the deployment of HSIR instruments across the GEO ring as per WIGOS vision 2040;	WG-III, support from WG-II and ITWG	Analysis of the current plans and gaps required. Presentation by EUMETSAT at CGMS-52 WG-II, proposing a set of questions to be addressed by ITWG	

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1.2.5	Establish observational requirements for microwave observations (sounder and imager) for NWP and precipitation and perform gap analysis against CGMS baseline. For precipitation, develop a benchmark to conduct comprehensive assessments of current and future scenarios for the CGMS baseline;	WG-III,-II, IPWG, ITWG. IESWG	**IPWG:** The quantitative precipitation community currently lacks a methodology to quantify the impact of a change to the satellite observing system (whether it be the current CGMS baseline, or some expansion of this in the future) upon the resultant global precipitation products. While the NWP community has established OSSE methodologies for quantifying the net +/- impact upon various forecast metrics, resulting from a loss of a satellite system or impacts expected from a new system, the precipitation community has no equivalent method to assess how satellites with varying quality and resampling rates would affect the overall accuracy of weather or climate products.	

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			Several IPWG members have started to outline the steps needed to formalize such OSSE-like capability for global precipitation products. NASA and the US Dept. of Energy have proposed a simulation experiment to DOE that if funded, would create a prototype of the model output needed to support the satellite simulator and retrieval package. However, AI tools to perform fast radiative transfer simulations as well as generalized retrievals that use these simulations to train algorithms still need to be developed and require support from CGMS members. More importantly, it would be useful to assess which CGMS agencies would be interested in such a tool, as their application would be of the order of complexity of running OSSEs – which are neither free nor trivial to implement.	

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			ITWG: The observational requirements for microwave observations from the ITWG perspective have been outlined in a document provided as input to the CGMS Future Directions initiative, as requested by Simon Elliot. There has been a lot of activity in this area within ITWG, and the document summarises a wide range of OSEs and simulation studies that establish the requirements for a constellation of MW sounders. It highlights the benefit of complementary orbits with different overpass times and the continued significant benefit expected in NWP from further MW sounders beyond the 3-orbit baseline.	

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1.2.6	Advance the atmospheric Radio Occultation constellation, with the long-term goal of providing 20000 occultations per day with uniform spatial and local time coverage on a sustained basis	WG-III,-II, IROWG	Following ROMEX, the recommendation remains a target of 20000 occultations per day.	
1.2.7	Work towards operational 3D wind profile observations from space-based lidar;		EPS-AEOLUS follow-on planned by ESA and EUMETSAT	
1.2.8	Work towards operational infrared/µwave limb sounding for climate monitoring and NWP applications		Measurement will stop at Aura/MLS end of life. Science missions are being considered by NASA (SCRIBE) and ESA (CAIRT), but details, including data availability, are not yet available.	

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1.2.9	Establish the operational framework for the provision of magnetometer data from LEO orbit;	SWCG	Operational need has not yet been demonstrated, but a clear interest has been stated in survey and from scientific community.	
1.2.10	Investigate continuous space weather observations from lunar orbit for terrestrial and future lunar space weather services as well as for heliophysics research, complementing the geostationary and L1 measurements.	SWCG	Lunar Gateway demonstration mission with ESA and NASA payloads under development for launch in 2024. NOAA MoA with NASA has been signed on SW services in support to future lunar operations. Service requirements to be assessed in the context of Lunar Pathfinder and Lunar Gateway missions	

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1.2.11	Work towards auroral monitoring capabilities	SWCG	ESA Aurora-D concept demonstration mission planned for 2027 launch, to be followed by a 4-satellite operational constellation for 2030 (TBC) CMA confirmed that Aurora monitoring observations are provided by the WAI instrument on FY-3D and -H SWCG to consider the data available from FY-3 and the data access	
1.3	**Assess impact and benefits of CGMS satellite missions**	**WG-III**		

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1.3.1	Support satellite impact studies, including in particular impact of data latency and the impact of the Early Morning orbit;	WG-III	The preparation process for the next WMO impact workshop in May 2024 has started and CGMS has provided inputs to the science questions for the workshop, to ensure that impact of data latency is adequately addressed, but it is unclear how these questions have been taken into account in the workshop preparations. Impact workshop 2024 recognized the need for better consideration of data latency in impact studies.	
1.3.2	Collect and make available to CGMS members SEB case studies of relevant satellite systems for the purpose of identifying common practices in the next phase.	SEB Champion	In progress	

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1.3.3	Explore with WMO and other agencies the possibility to develop a study on the SEB value of the space-based observing system responding to WIGOS 2040 in cooperation with CGMS, and to trigger collaboration with CGMS members;	SEB Champion	To be discussed	
1.5	**Identifying partnership opportunities on space and ground segments and establish CGMS coordinated mechanisms;**		Partnership on LEO ground segments being implemented by EUMETSAT and NOAA for Metop-SG and JPSS. It should be noted that this target applies strongly to the CGMS engagement in Space Weather and NOAA is actively pursuing Ground Segment partnerships for the SWFO-L1 mission. WG-III proposes to remove from HLPP	**REMOVE**

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
2	**COORDINATION OF SATELLITE SYSTEMS AND OPERATIONS**	**WG-I**	**WG-I has proposed overall rewording of Section 2, see report from WG-I**	
2.1	**Coordination/Optimisation of data collection systems**	**WG-I**		
2.1.1	Build on the work of the SWOT analysis on the DCS from geostationary meteorological satellites, and particularly progress on the five proposals for further work (covering RFI mitigation including creation of an RFI DCS register, joint DCS PR materials, DCS introduction video, manufacturer workshop, discoverable information);		The SWOT analysis has been completed. Further work building on the SWOT analysis outcomes is to be carried out, specifically work on the five proposals for DCS improvements based on the SWOT analysis, including work with RFI Task Group and DCS RFI register, DCS promotional materials presenting global view of DCS, improved DCS outreach via DCS introduction video, further work on EDCP standard, improvements to DCS user information across agencies. Progress on improvements identified on SWOT is tracked in the DCS Task Group reports. To be stated as completed with the BP on DCS RFI. The further activities are normal work for the DCC TG.	**COMPLETED**

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2.1.2	Establish an enhanced DCP standard, taking into account requirements of tsunami alert systems and in-situ ocean observations (e.g. buoys) and lessons learned from the development of high-rate DCP. This would give agencies a common standard and would once again allow international use of DCPs. It is foreseen that this would be covered under a project with engineering work spanning 2024-2027, which would include the production and testing of a prototype transmitter;		An EDCP standard proposal was approved by CGMS-52 Plenary. This includes a proposed implementation plan 2024 – 2027 and funding requirements. The group is continuing work as per the implementation plan.	Reworded by WG-I
2.2	**Radio Frequency (RF) Protection**	**WG-I**		

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2.2.1	Facilitate an effective preparation of national and ITU-R regional groups' positions for the World Radiocommunication Conference (WRC) 2027 favourable for CGMS-related issues, in particular but not exclusively with regard to the: - Establishment of protection for passive microwave sensors in the bands 50.2-50.4 GHz, 52.6-54.25 GHz and in bands above 86 GHz from unwanted emissions from active services in neighbouring frequency bands (WRC-27 agenda items 1.1, 1.3, 1.8 and 1.18). - Possible new primary frequency allocations to EESS (passive) in the bands 4200-4400 MHZ and 8400-8500 MHz for Sea Surface Temperature (SST) measurements to complement the SST measurements in the 6/7 GHz range (WRC-27 agenda item 1.19).		This topic needs to be kept in the HLPP for securing adequate information flow inside CGMS on national and regional level preparatory activities (as well as the dedicated report from SFCG activities provided by CGMS Liaison representative in SFCG)	Reworded by WG-I

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	- Protection of the frequency bands 7450-7550 MHz, 7750-7900 MHz and 8025-8400 MHz, used for the downlink from MetSat and EO satellites, from possible future frequency usage by International Mobile Telecommunications (IMT) (WRC-27 agenda item 1.7).			
2.2.2	Within the general ITU framework, triggered by ITU-R Resolution 731, regarding the establishment of sharing conditions between active and passive services in bands above 71 GHz, to ensure protection of passive sensing bands, in particular in bands in which all emissions are prohibited (Radio Regulations Footnote 5.340).		WRC-23 corrected the inconsistencies in Resolution 731, by eliminating the possibility to study bands subject to RR footnote 5.340 (all emissions are prohibited) for sharing with active services. Subject to contributions to the relevant groups in ITU-R, responsible for the active and passive radiocommunication services involved, studies can now be put forward under this corrected Resolution 731 for any bands above 71 GHz, either for sharing in bands not subject to RR FN 5.340, or to determine the unwanted emissions to neighbouring 5.340 bands, that are not already covered by WRC-27 agenda items 1.1, 1.3, 1.8 or 1.18, see 2.2.1 above.	**REMOVED**

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2.2.3	Pursue the establishment of a set of best practices for the RFI detection, monitoring, and mapping based on the common aspects of the approaches already adopted by CGMS members;		The recently formed Task Group on RFI has proposed a set of draft Best Practices on RFI detection, monitoring, and mapping for review by CGMS-52 WGI. Further work on the Best Practices has taken place in the lead up to CGMS-53. Is this pursued beyond DCS? No, consider completed.	**COMPLETED**
2.3	**Data acquisition and data processing, including low latency data access**	**WG-I**		

Commented [KN1]: Needs to be changed to a guidance which will be presented CGMS-53 Plenary

Commented [MR2R2]: OK

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
2.3.1	Ensure the ease of use of satellite-derived data and products, disseminate in one of the standard formats, as specified in the CGMS LRIT/HRIT Global Specification and the WMO Manual on Codes. Once the use of netCDF with the CF convention are captured in the WMO Manual on Codes, ensure compliance with this for satellite-derived data and products disseminated in netCDF.		Work has progressed, see the status report provided by EUMETSAT on dedicated paper for CGMS-48, containing also the outcome of specific work achieved by the WG-I participants through dedicated Inter-Sessional meetings. A dedicated CGMS "liaison officer" agreed at CGMS-47. The role is to coordinate with the CF community to concentrate efforts and views of the different CGMS members aiming at contributing to the evolution of these standards by actively participating in the related CF meetings. Topic is proposed to be further developed through the Task Group of Satellite Data and Codes (TGSDC), which will interact with the CF Conventions Committee, the CF Standard Names Committee, and the CF Governance Panel	Reworded by WG-I
2.3.2	To address technical and operational aspects of direct low latency data access (present and future) of mutual or global interest for the CGMS agencies, including facilitating transition to new LEO systems.		The LLDA Task Group has performed and distributed a "Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis of Low Latency Data Access from LEO Meteorological Satellites. This SWOT analysis also contains an analysis on the potential role of satellite platform as a service (SPaaS). Specific actions need to be proposed based on the SWOT. The SWOT analysis needs to be maintained on a yearly basis by the LLDA task group to keep up to date with the space sector context.	

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2.3.3	Develop efficient standardized data handling for high-resolution imaging and hyperspectral instruments		The Task Group has worked with the WMO Secretariat and the WMO Expert Team on Data Standards (ET-Data) on the development of a number of new BUFR encoding sequences and Common Code Table entries. In each case, the Task Group acts as a reference group of experts who are invited to consider and endorse relevant proposals going through WMO's approval process. Between CGMS 53 and CGMS 54 the Task Group on Satellite Data and Codes will continue work on coordinating format standardisation for satellite data.	
2.4	**Satellite Data and Codes**	**WG-I**		

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
2.4.1	Provide coordinated CGMS inputs to WMO on satellite and instrument identifiers for data representation and metadata		The Group continues to encourage WMO to ensure that OSCAR/Space includes references to the Common Code Table entries used for satellite identifiers (table C-5) and instruments (C-8). At the last OSCAR/Space workshop it was confirmed that these changes would be included in the forthcoming update to OSCAR/Space. µcarb and WSF-M1 identifiers have been agreed Data Formats suitable for AI/ML (e.g. Zarr) are being discussed. Between CGMS sessions, the Task Group on Satellite Data and Codes will continue work on implementation of WIGOS station identifiers for satellite platforms and providing subject matter expertise to WMO Expert Teams.	**REMOVED**
2.5	**Operational issues related to Space Weather**			Reworded by WG-I and regrouped under Space Environment Sustainability

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2.5.1	Evaluate existing operational space weather products and services in support of CGMS members' spacecraft operations and recommend additional services as appropriate	WG-I, SWCG	The WGI Space Environment Sustainability Task Group (with support from SWCG) has initiated steps to identify best practices in usage of space weather data by spacecraft operators and their goals for improvement. Outreach activities are being supported at space weather and operations workshops and specific user engagement / test-bed activities are on-going at ESA and NOAA. The TG has identified the requirements in the areas of space weather impacts on drag and on impacts on system health (radiation). On-going.	
2.6	**Space Traffic Coordination**			Reworded by WG-I and regrouped under Space Environment Sustainability
2.6.1	Review of CGMS member agencies' satellite operations for collision avoidance and re-entry prediction.		The WGI Space Environment Sustainability Task Group has collected debris mitigation practices from several members and is organising the analysis.	
2.6.2	Perform a gap analysis between the needs and the available/used space traffic coordination (STC) services, carry out an assessment of service development prospects and prepare a proposal for best practises to support improvement.		This activity will start once the data in 2.6.1 has been analysed.	

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2.6.3	Engage with UN-COPUOS to achieve a global standardised approach for STC based on a CGMS proposal.		This activity will start following the analysis in 2.6.2	
2.7	**Space sustainability**			Reworded by WG-I and regrouped under Space Environment Sustainability
2.7.1	Share space sustainability rating methodologies and carry out a pilot project where some operational mission plannings are evaluated.		The WGI Space Environment Sustainability Task Group has no specific action on this. It will be included in the next intersessional meetings leading up to CGMS-54.	
2.7.2	Follow efforts to establish an international agency policy on "zero debris" and based on the outcome, carry out an assessment of impacts of such policy on operational missions of CGMS members and the private sector.		The WGI Space Environment Sustainability Task Group ToR considers this, but at lower priority than the STC aspects in 2.6	
2.7.3	Prepare a CGMS best practises document for long term space sustainability.		The WGI Space Environment Sustainability Task Group foresees this, with priority on the STC best practices (2.6.2)	

Commented [KN3]: Updated with inputs from Andy Monham

Commented [MR4R4]: OK

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2.8	**New technologies for satellite systems**			
2.8.1	Assess the internet-of-things (IOT) technology for inter- and intra-connections between satellite and ground network.	..	The internet-of-things (IOT) technology study found that IoT applications for LEO services and ground-based systems provide opportunities for CGMS agencies: • GEO IoT can open new mode of operations for LEO meteorological satellites, such as TTMC • LEO relay IoT can complement DCS in polar locations • Direct broadcast remains a better value for money solution to GEO IoT for instrument payload downlink	
2.8.2	Explore improvements to LEO satellite systems low latency data access from both a global and regional perspective, harnessing common emerging technologies and taking account of the evolution of the commercial and agency space systems;	..		

Commented [KN5]: Consolidate with the LLDA TG work described further above

Commented [MR6R6]: Done

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3	**COORDINATED DATA ACCESS AND DIALOGUE WITH USER COMMUNITY**	**WG-IV**		

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3.1	**Support the user-provider dialogue on regional/continental scales through regional coordination groups maintaining requirements for dissemination of satellite data and products through the various broadcast services;**		Regional coordination groups on data requirements are now established in and recognized by WMO regions and those groups are very active: - RA I Dissemination Expert Group (RAIDEG) - RA II WG-I Expert Team on Satellite Observations and Applications (ET-SOA) - RA III/IV Satellite Data Requirements (SDR) Group - RA V WG-I Expert Team on Satellite Utilization (ET-SAT) - RA VI The results from joint meetings and user surveys in the Regions continue to useful for policy makers and CGMS members for satellite product development, data dissemination and user training.	

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3.1.1	Establish a sustained interaction with the operational nowcasting communities with a view to fully utilise the commonality of the future geostationary imagers and sounders.		The responsibility for the priority is between agencies and nowcasting communities, not between Agencies. However, it is recognized that Agency interaction would facilitate further progress and some activities are happening here as well. Looking at some the key players with key current and future capabilities it seems this is progressing reasonably. Whilst some interactions exist, also in the context of the EUMETSAT MTG IRS Mission Advisory Group, a sustained regular interaction across all CGMS members planning to launch geo-satellites with hyperspectral infrared capabilities has not yet been established. Focus of SCOPE-Nowcasting Pilot Project 1 in RA II (Asia) and RA V (South-West Pacific) Note however that SCOPE-Nowcasting has been inactive since 2019. Activity to be coordinated with WGII, no progress so far. Following the ongoing inclusion of Nowcasting requirements in the WMO Core Data set, WG-IV will address the implications on Data Access and User Dialogue	**REMOVE**

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			Remove from HLPP	
3.2	**Prepare operational users for new generation of meteorological satellites through user readiness programmes, with coordinated contributions from CGMS members**		To be addressed by TG on User Readiness	

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3.2.1	Consider the full range of user capabilities (ranging from advanced Short-range NWP to more conventional nowcasting) when planning data utilisation, products generation and dissemination strategies, in particular for the new geostationary satellites		Remove from HLPP	**REMOVE**
3.2.2	Improve the provision to users of characterisation data (including apodization) for geostationary and low Earth orbit hyperspectral infrared instruments.		Remove from HLPP	**REMOVE**
3.2.3	Develop Best Practices for Operational User Notifications			
3.3	**Coordinated global data exchange**		To be addressed by Task Group on Data Access and Exchange	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3.3.1	Develop Best Practices for Global Data Exchange, taking into account both WIS 2.0 and satellite operator broadcast services.			
3.3.2	Explore options for optimal data exchange of advanced data from new generation GEOs, in consultation with the global NWP centres through GODEX-NWP		Remove from HLPP	**REMOVE**
3.3.3	Support the coordination of the operational Digital Video Broadcast (DVB) satellite services for the Americas, Africa, Europe and the Asia Pacific regions;		The communication satellite broadcast systems GEONETCast Americas, EUMETCast, CMACast and HimawariCast are well established and coordinated systems, and no significant issues are observed. Reporting on CMACast and HimawariCast were provided in CGMS-53 WG-IV meeting.	
3.4	**Support to WIS 2.0 Implementation**			
3.4.1	Actively ensure the WIS 2.0 usage for satellite data provision and discovery.		Ongoing.	
3.4.2	Support WIS and WIGOS in the definition of harmonised product metadata for satellite data and implement these for CGMS missions.		To be addressed by the TG on Metadata	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3.6	**Increase operational access to data and products in support to the ocean user community;**		To be addressed by TG on Data Access/Exchange Ocean is addressed in the regional dialogues, but there is a need for a better dialogue with the global ocean community. The future mechanism for structured dialogue between CGMS and the ocean community is still to be defined. KMA has implemented an L-band Direct Broadcast service on GEO-KOMPSAT-2A, providing meteorological and marine data for reception by ships. Even though there is still no coordinated interaction with this community in place, the ocean user community benefits from evolutions in existing data access mechanisms.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3.7.1	Ensure the timely access to and exchange of near-real-time scatterometer data, share access to calibration and validation information across CGMS agencies		To be addressed by TG on Data Access/Exchange	
3.7.2	Promote the product metadata standards within ocean communities, such as on SST, ocean colour, ocean vector surface wind and ocean surface topography, to facilitate common data representation and near-real time exchange. This must be done in dialogue with the relevant CEOS Virtual Constellations.		Remove from HLPP	**REMOVE**
3.7	**Application of Cloud Technologies**			
3.7.1	Monitor the implementation of best practices for cloud services interoperability.		WG-IV requests CGMS members to report on the agency implementation of the Best Practices	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
3.7.2	One or more CGMS members to prepare demonstration of collaboration with private sector regarding satellite data distribution;		Remove from HLPP	**REMOVE**
3.8	**Research to operations**			
3.8.1	Collect the experience of each agency by carrying out a research-to-operations method survey with each agency including identification of research missions with a potential transfer to operations.		Survey issued 2024, under evaluation. Done, remove from HLPP	**REMOVE**
3.8.2	Based on the results of the conducted R2O survey, propose a consistent CGMS research-to-operations baseline process that includes flexibility and adaptability and facilitates the participation of R&D agencies;		Report provided to WG-IV at CGMS-54	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4	**ENHANCE THE QUALITY OF SATELLITE-DERIVED DATA AND PRODUCTS**	**WG-II (Supported as appropriate by ISWGs and GSICS project)**	**Status below is provided based on information from the ISWGs that have met since last CGMS. A complete status of implementation of the proposed targets in the product area will be gradually established by WG-II, the ISWGs (during their cycle of meetings) and the GSICS project.**	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.1	**Establish within GSICS a fully consistent calibration of relevant satellite instruments across CGMS agencies, recognising the importance of collaboration between operational and research CGMS agencies;**			
4.1.1	Maintain within GSICS a framework for inter-calibration of hyper-spectral sounders;	GSICS	Implemented and provides input to the annual GSICS. observing system report. Interoperability within GSICS framework ongoing.	
4.1.2	Establish within GSICS a consistent inter-calibration for thermal IR channels using hyper-spectral sounders as reference. The implementation will be done successively by the individual satellite operators	GSICS	**GSICS to provide update**	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.1.3	Establish a consistent inter-calibration for solar channels using instruments with adequate in-orbit calibration and vicarious methods as reference. The implementation will be done successively by the individual satellite operators.	GSICS	The lunar irradiance and DCC (Deep Convective Cloud) have been suggested by GRWG as targets to transfer the NPP-VIIRS reference calibration for the solar reflective bands. The results have been demonstrated by most satellite agencies, the approach for implementation is still under discussion. It is imperative to stress the need to use the same solar spectrum for inter-comparing sensors based on radiance units. The MODIS, NPP-VIIRS, and N20-VIIRS sensors use the Neckel&Labs, MODTRAN 4.3, and Thuillier 2003 solar spectra, respectively. The GSICS-recommended NOAA NPP-VIIRS V2 calibration reference will use the Thuillier solar spectrum. This multiplicity is confusing. The GSICS VIS/NIR and UV groups have tasked the CU/LASP solar group to prepare a paper (contact: Peter Pilewskie peter.pilewskie@lasp.colorado.edu) to establish a high resolution solar reference spectrum anchored to the newly launched ISS/TSIS-1 sensor. This will be in coordination CEOS WGCV IVOS group.	
4.1.4	Establish a common reference solar spectrum with appropriate spectral coverage and spectral resolution	GSICS		

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.1.5	Develop common methods and tools for on-ground calibration and characterisation and inter-calibration of UV-VIS-NIR SWIR spectrometers.	GSICS		
4.1.6	Establish a methodology to characterise microwave instruments for O2 absorption channels through the SNO and RTM modelling. The implementation will be done successively by the individual satellite operators;	GSICS	IPWG asked for confirmation that GSICS also addresses µwave imagers. GSICS has confirmed this and is discussing to invite JAXA for a discussion on µwave intercalibration.	
4.1.7	Establish mechanisms for cross-calibrating scatterometers across the constellation.	GSICS	There have been discussions in MW Subgroup on scatterometer inter-comparison and Xiaolong Dong summarized these in http://gsics.atmos.umd.edu/pub/Development/Annualmeeting2022/CEOS_MW_Activities_GSICS20220317.pptx This is an activity with the CEOS/WGCV microwave subgroup. Status will be provided ahead of the GSICS annual meeting.	
4.2	**Establish commonality in the derivation of satellite products for global users where appropriate (e.g., through sharing of prototype algorithms);**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.2.1	Establish commonality in the derivation of AMV products for global users where appropriate (e.g., through sharing of prototype algorithms) and consider backwards compatibility when designing AMV algorithms for the 16-channel imagers, so that present state-of-the-art algorithms can be applied to old imagery.	IWWG	• Execution of a periodic survey (since 2023) of AMV products that collects detailed information about AMV processing (e.g., satellites/instruments used, channels used, algorithm configurations and dependencies, output formats, etc). A survey is currently in progress. Results from the past survey were made available on the CGMS/IWWG web site and via email list in December 2025 • Planning for the 5th AMV Intercomparison Study is currently under way. This planning is done in coordination with the ICWG. • An active Working Sub-group continues to be used at International Winds Workshops to focus on AMV retrieval methods	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.2.2	Assess value of winds derived from GEO and LEO Hyperspectral IR observations	IWWG	Several IWWG members are actively evaluating/developing Optical Flow (OF) algorithms to retrieve winds from existing and/or future hyperspectral sounders • EUMETSAT: Preparation of 3D winds software (V2) for MTG/IRS; Operational production and evaluation of IASI 3D winds • CMA: Plans to apply and tune its OF wind retrieval algorithm to FY-4C GIIRS data • JMA: Currently developing and evaluating variational Optical Flow (OF) 3D winds retrieval approaches to use for its future hyperspectral sounder instrument on Himawari-10 • NOAA: Currently evaluating variational and AI/ML-based OF 3D winds retrieval approaches with a goal of selecting the approach to develop and use for its future GXS instrument	
4.2.3	Establish a coherent development of volcanic ash products and applications with close user community coordination;	WG II	WG II will discuss the way forward for Ash Product development, updated intercomparisons and definition of suitable parameters for end user applications with SCOPE-NWC, IAW and ICAO." Action on WMO. EUMETSAT will discuss the requirements for volcanic ash products with London and Toulouse VAACs, and report back to CGMS. This could form the basis for a further discussion on standardisation.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.2.4	Assess the cloud properties generated from the geostationary and polar orbiting imagers and pursue best practices that lead to improved consistency and accuracy across the globe and the Geostationary ring;	ICWG	**ICWG:** ● An intercomparison/assessment of contributed cloud products is a high priority for the next ICWG-4, to be held October 2026. This intercomparison effort will use the new ISCCP-NG L1G dataset as the common input for all participating algorithms. ● The use of the ISCCP-NG L1G serves a two-fold purpose – it provides a common framework for evaluating a variety of cloud algorithms, and it enables an evaluation of the L1G datasets themselves via assessments of retrieval performance on these inputs. The latter provides a pathway for ICWG to provide feedback to the ISCCP-NG/Geo-Ring development effort. ● The ICWG ISCCP-NG Topical Group is coordinating these intercomparison efforts and liaising with the L1G development community.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.2.5	Establish together with the user community a commonly agreed approach for retrieval of Principal Component scores and associated parameters from hyperspectral infrared data, minimizing information loss including the mutually acceptable update strategy for the principal component basis and to implement such an approach in a coordinated manner. ITWG suggests removing this from HLPP	ITWG	**ITWG status:** After ITSC-24, the following statement was received from Tim Hultberg (EUMETSAT) on the Hybrid compression of IASI spectra: - As for "feedback from users" we did two parallel studies: https://www.eumetsat.int/use-iasi-reconstructed-radiances-acaq-retrievals (only one of the two "final reports" is currently available from this page, but we have the other and it should be added to the web soon) - The local part of the hybrid is only relevant for very unusual situations and small trends in the bias from reconstruction; we don't use it in EUMETSAT product generation. But we do (since 30th of March 2023) use the global PC scores from the new PC basis (v2.01) with full noise normalisation matrix. Dave Tobin (NOAA/SSEC) reported the following: On the CrIS side of things, we developed the PC product and did internal (internal to the CrIS SDR calibration team) assessments, but when it came time to make it into an official product, the JPSS project decided that they did not have any "user requirement" or user requests for the	**REMOVE**

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			CrIS PC product, and so we did not proceed to making an official product supplied to users. So, no real user feedback. More recently, we have some interest in the CrIS product from the GeoXO GXS project, and will continue with the project and provide products. So, maybe some feedback in the ~1 year time frame. At the conference, users were encouraged to get in touch with Dave if they were interested to test the data. Update as of March 2024: - NOAA is considering a proposal to continue development and demonstration of PC products for JPSS CrIS SDR radiance data, as well as for future hyperspectral microwave data. - Sample Hybrid PC data based on the NASA CrIS L1B radiance data will be available in the next weeks via the NASA GES DISC. - The GeoXO GXS project is currently planning for a PC product, with details to be defined, to be the primary product (opposed to raw radiances), similar to the path used for MTG-IRS. To be discussed in ITWG NWP SG and other WGs for consideration ECMWF study: https://www.ecmwf.int/en/newsletter/175/news/exploring	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			-alternatives-radiance-assimilation-hyperspectral-infrared-sensors ITWG update 2026: - ITSC-25 DA/NWP section notes multiple centers adopt global and local PC approaches and that many users assimilate reconstructed radiances rather than PC scores directly. - ITWG suggests consider dropping this item from HLPP because assimilation practice is trending toward reconstructed radiances.	
4.2.6	Explore the application and value of stereographic approaches to combinations of GEO and LEO satellites/instruments for the derivations of winds	IWWG	**New**	
4.2.7	Explore the use of optical flow approaches to derive dense wind datasets aimed at targeted applications to include nowcasting, Numerical Weather Prediction (NWP), nowcasting, and air quality forecasting.	IWWG	**New**	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3	**Foster the continuous improvement of products through validation and inter-comparison through international working groups and SCOPE-type mechanisms;**		The IWWG achieves this target via these activities: • An active Working Sub-group at International Winds Workshops that focuses on AMV retrieval methods • Execution of a periodic survey (since 2023) of AMV products. A survey is currently in progress. • AMV Intercomparison Studies which are done in coordination with the ICWG. Planning for the 5th AMV Intercomparison Study is currently under way. • NWP SAF AMV Monitoring Reports: Released every 2-years to help guide discussion on improvements to the AMV derivation and data assimilation. Results are presented at the workshops. The 11th Analysis Report (AR11) was released 26/03/25.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3.1	Apply the IPWG validation protocol (as defined on its web page) to precipitation combination datasets generated using multiple satellite and in-situ data sources, and expand the number of participating agencies to broaden the validation domain. The IPWG website is currently being transitioned, and will be updated to reflect the status of previous, current and newly added operating validation regions	IPWG	The South Korean validation website is up and running. It has been presented to the IPWG community during one of the virtual sessions IPWG did hold in 2021. The sites, some of which are still operational, see relatively little traffic because validation statistics are not uniform across sites, and it is nearly impossible to distinguish differences due to weather regimes from differences in the quality of validation data. IPWG has a working group whose task is to develop a Baseline Surface precipitation Network, working with WMO and their Inter-Program Expert Team on Operational Weather Radars. Pekka Rossi is the coordinator. The US, Korea and Japan have contributed data. A requirements document has been prepared by the current working group. The requirements are: • Radar with rain gauges for approx. 1 year • A PI willing to verify quality of the product	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3.2	Conduct an inter-comparison study between the different methods to derive level 2 data from infrared hyperspectral sounders, recognising that there are several software packages available utilizing AIRS/IASI/CrIS data.	ITWG	NPROVS supported satellites, sensors, and products relevant to this comparison include: S-NPP and NOAA-20: CrIS/ATMS NUCAPS/HEAP from NOAA MetOp-B/C: IASI/AMSU NUCAPS/HEAP from NOAA; IASI Level 2 from EUMETSAT Aqua: AIRS Level 2 from NASA • Results comparing NOAA (NUCAPS), EUMETSAT IASI L2, and NOAA (MiRS) MW-only soundings from MetOp-B were provided; mismatch among these data are minimal lending high confidence. • Results comparing GNSS COSMIC-2 versus GRAS retrievals were provided; mismatch among these data is larger (than for polar satellites) lending moderate confidence. • Overall, enterprise assessment differences among polar satellites appear larger (despite smaller mismatch) than for GNSS. NPROVS data, results, and documentation are available at https://www.star.nesdis.noaa.gov/smcd/opdb/nprovs/ ITWG Update 2026:	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			• NCMRWF volunteered to compare EUMETSAT and NOAA products over India vs radiosondes. • ITSC-25 lists this as an action (ASWG) to conduct intercomparison and communicate results quickly. • ITSC-25 highlighted use of enterprise validation systems (e.g., NOAA NPROVS) that routinely compare CrIS, IASI, and other hyperspectral retrieval products against radiosondes and model analyses. These systems provide continuous monitoring of L2 product consistency across agencies, supporting the HLPP intercomparison objective.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3.3	Coordinate and improve the use of cloud properties in the high impact applications, in particular Atmospheric Motion Vectors and All-Sky Radiance Products .	ICWG, IWWG	**ICWG:** ● Ongoing movement to use cloud height products, generated via cloud height algorithms designed and developed by cloud retrieval algorithm experts (many active in ICWG), to assign heights to AMVs. (EUMETSAT, NOAA) ● Aside from cloud-top height, there is currently limited use (e.g., quality control) of other retrieved cloud properties (e.g., microphysical properties - optical depth, ice water path, cloud particle distribution, etc) in AMV retrieval schemes. ● The IWWG and ICWG are discussing this as a possible topic to include in the 5th AMV Intercomparison study.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3.4	Support the continued analysis and growth of the cloud climatology assessment data archive initiated by GEWEX and the coordinate the development and assessment of cloud climate products for the next generation of the International Cloud Climatology Project (ISCCP-NG)	ICWG	• Most ICWG algorithm teams contributed datasets to the most recent GEWEX cloud assessment (Stubenrauch et al., 2024). • The ISCCP-NG project is expected to leverage the Geo-Ring L1G under development by EUMETSAT and NOAA and that will serve as the common input for our next cloud property intercomparison exercise. • That intercomparison exercise, and related algorithm coordination efforts, are being actively led by the ICWG ISCCP-NG/Geo-Ring Topical Group. An update on these efforts and discussion of next steps is expected at the upcoming ICWG-4. • This remains one of the most popular activities in ICWG and as long as it is relevant to GEWEX, we should continue.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.3.5	Establish a coherent development of a Snow Water Equivalent (SWE) product and applications with close user community coordination	IESWG	As a part of information gathering, IESWG is working to identify pre-existing efforts to establish user requirements for such a data set Address improvements above the operational algorithms already implemented e.g. by the H-SAF. Upcoming TSMM mission is relevant to achieve such improvements. Feedback from IESWG April 2026: The issue here is that our community doesn't have the background to develop products, nor the funding for that matter. The land surface community has largely been an end-user of products, only few of us have actually developed EO products. Much of our modelling efforts are based on point measurements scaled up to our model grid. It's not an easy task to get people to actually think about EO data as a tool to support model development at the large scale. You can tell by the fact that operational centres are basically only assimilating surface soil moisture routinely. And that more than 25 years since the first passive microwave products were disseminated. We are just now moving towards vegetation DA.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			IESWG view is that we need to first establish better communication between the EO and surface modelling communities, in order to explore what is feasible and what is needed. And that is where I see us as IESWG within CGMS in the first instance. The snow is certainly an important aspect, but for that, we'd also need the right sensors in space. E.g. dual-pol SAR is good for soil moisture, but snow needs quad-pol to get the best out of it for our purpose. And then, we'd also have to figure out how to deal with the new information of the snow's heterogeneity in our models. ERA5 has a pixel size of ~31km, we wouldn't be able to assimilate a 20m product into it easily.	
4.4	**Maintain, enhance and improve the methods to describe the error characteristics of satellite data and products.**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.4.1	Establish a common vocabulary and methodology with appropriate error propagation to include the errors associated with validation data (e.g. radiosonde temperature, water vapour, precipitation and winds).	ITWG, ~~ICWG~~	**ITWG:** ● ITSC-25 Climate WG discussion frames validation as comparison of two independent estimates with uncertainties and explicitly references HLPP 4.4.1. ● ITSC-25 confirms that EUMETSAT has implemented error statistics within IRS Level-2 products, providing uncertainty information directly within the retrieval products. ● Climate working group will report in 2028 on validation of ERA-6 vs CrIS which will include this. The insights will contribute to the evidence base and definitions. **ICWG:** ICWG will not contribute further to this target. Focus is now on the GEO-Ring intercomparison that inherently includes these principles.	
4.5	**Strengthen interaction with users in selected thematic areas by establishing a close relation with them as beta-testers and foster optimum use of satellite data.**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.5.1	Report on the progress within the Nowcasting community toward the use of hyperspectral sounders and work toward common products to serve the requirements of the global community.	WG II	The value of hyperspectral infrared has been discussed at the EUMETSAT Nowcasting Workshop in 2017 follow up with a report that was prepared in 2018 and update in 2019 by Hazardous Weather Testbed group. In addition, FY-4A/GIIRS has been launched and data is now available routinely and with sufficient quality to explore the value of the data in Nowcasting. At the joint WG II/III session OSSEs for Assessment of Hyperspectral Infrared Measurements from Geostationary Orbit was presented by NOAA. In addition, EUMETSAT has been using polar orbiting data to demonstrate the potential value of hyperspectral IR from GEO. Report from NOAA will be provided at WG-II. EUMETSAT relevant reports at https://www.eumetsat.int/severe-storm-forecasting-lab The approach will be significantly affected by AI/ML	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.5.2	Enhance the use of satellite precipitation datasets through an IPWG-led user workshop where training on visualization and analysis tools will be one of the topics.	IPWG	Multi-day training sessions were successfully coordinated at July 2024 during the IPWG-11 workshop. In addition, IPWG members have actively participated in the online Satellite Precipitation Applications Workshops co-organized with the GPM application group, and with the GPM Mentorship Program. IPWG expects further training events to be planned during the IPWG-12 workshop in 2026.	
4.6	**Foster and support research regarding enhanced radiative transfer capabilities, recognising the paramount importance of radiative transfer developments for satellite products**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.6.1	Continue support for line-by-line (LBL) reference model development and enhanced characterization of spectroscopy to ensure that product development teams and users of level 1 data have access to the latest updates in LBL forward modelling and the uncertainties involved.	ITWG	**ITWG:** ● Radiative Transfer and Surface Property (RTSP) WG reported continued development and testing of LBL reference models such as LBLRTM, including evaluation of updated spectroscopy databases (e.g., HITRAN updates). ● Work also includes evaluating alternative LBL implementations to ensure robustness of reference radiative transfer modelling. The ITWG Radiative Transfer and Surface Modelling Working Group has provided the following information about specific requests for support. **LBL modeling** 1. Continuous support for line-by-line modelling should be guaranteed. The community needs the development of competing line-by-line codes. There are concerns that line- by-line models are not flexible enough to accommodate the use of line parameters from alternative databases. For instance, LBLRTM uses line mixing coefficients that are not compatible with the GEISA line parameters because the LBLRTM line mixing coefficients are based on HITRAN line data.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			2. Although the semi-empirical MTK_CKD model is perhaps adequate for many applications, there is still the need for a physically based representation of the water vapour continuum absorption which should eventually be implemented in state-of- the-art LBL models. 3. Further research is needed into the modeling of line mixing processes for CO2, CH4, N2O and to a lesser extent water vapor. This is especially true for the 4μm absorption band of CO2. 4. The effects of pressure and Doppler line broadening should be modelled using a better representation of the line shape than the Voigt profile. Proposed replacements to the Voigt profile will require different broadening coefficients for all the molecules and consequently the need for significant updates to LBL models. 5. To allow the exploitation of spectral regions affected by non-LTE effects, it is important that these effects are accurately represented in LBL codes. In parallel, efficient representations of non-LTE effects should also be sought for implementation in fast RT models. **Spectroscopy** 1. A strong emphasis should put on the continuous support of theoretical and laboratory spectroscopic	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			studies. It is crucial that a compilation of basic line parameters is maintained. 2. It should be assessed if there is a requirement to introduce more molecular species, including isotopes, and understand what accuracies are required. 3. It should be assessed if there is any requirement regarding the precision of the spectroscopic parameters 4. Using the synergy between the IR and the UV/Vis some inconsistencies have been observed in the retrieval of ozone profiles which could attributed to an inconsistency of the precision of the spectroscopic parameters between the 2 spectral ranges. Inconsistency problems have also been observed for SO2. 5. Promote research into spectroscopy of higher frequency microwave channels up to 664GHz. 6. Line shapes of water vapor broadening for trace gases need improvement. 7. Regarding the database of cross sections, in general, we have access to the absorption coefficients for a set of pressure and temperature. The experience gained with IASI suggests that we should address the following points: a) The number of temperature and pressure values available in databases may not be sufficient to ensure that the error made	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			when interpolating to the actual temperature and pressure is smaller than the noise of the instrument. b) Even if the spectral variation is low, cross section measurement have not been done using the best spectral resolution (especially in the center of the absorption band). • Some measurements have been done with an instrumental noise which was too high resulting in negative absorption coefficients. **Spectroscopic databases** The present status of the atmospheric databases is the result of numerous studies performed during the last 20 years in several dedicated spectroscopic laboratories all over the world. International cooperation contributed to the establishment of a number of spectroscopic databases for atmospheric applications. These include: • GEISA under the responsibility of N. Jacquinet-Husson and R. Armante from LMD, Palaiseau, France. The last update has been done in 2011 (Jacquinet-Husson, N. and others, 2011), the next one is planned for the end of 2015. • HITRAN under the responsibility of Phillips Laboratory, Cambridge, USA (Rothman et al., 2013).	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			• MIPAS specifically dedicated to satellite experiments in the Earth's atmosphere (Flaud, 2003). • BEAMCAT, for millimeter and sub-millimeter wave propagation in the Earth's atmosphere (Feist, 2004). • JPL Catalog (Pickett et al., 1998) of microwave to sub-millimeter transitions. It mostly contains rotational transitions of a few hundred molecules which can be potentially observed in the Earth's atmosphere or in the atmosphere of other planets. It also features molecules present in the Inter Stellar Medium (ISM) or in Circum Stellar Envelopes (CSE) of late type stars. It comprises a small, but increasing, number of entries for infrared transitions. • CDMS Catalog (Müller et al., 2001, 2005). Like the JPL catalogue, it mostly contains rotational transitions of molecules important for the ISM or CSEs. Some of the molecules are of course also relevant for application in Earth's atmosphere or in the atmosphere of other planets and a number of entries are for infrared transitions of such molecules. Of all the databases listed above, GEISA and HITRAN are of primary importance for data assimilation. Finally, the VAMDC consortium (http://www.vamdc.eu/) aims at being an interoperable e- infrastructure that provides the	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			international research community with access to a broad range of atomic and molecular data. **Overall status at ITWG in Q1/2024** Following ITSC-24, the ITWG Radiative Transfer and Surface Modeling Working Group reported: 1. The NWPSAF Technical report "Literature Review on Microwave and Sub-millimetre Spectroscopy for MetOp Second Generation" (2022) by Turner, E., Fox, F., Mattiolo, V. and Cimini, D was highlighted to be an important reference material (https://nwp-saf.eumetsat.int/site/download/members_docs/cdop-3_reference_documents/NWPSAF_report_submm_litrev.pdf). 2. The need for a characterization of model biases and uncertainties in key spectroscopic parameters. 3. The need to map spectroscopic uncertainties into radiance uncertainties. 4. Encourage comparison studies in model and/or laboratory spectroscopic measurements. In this regard, it is recommended to work more closely with the planetary/astronomy community for knowledge of LBL / spectroscopy information.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			5. Continuous support of theoretical and laboratory spectroscopic studies. A compilation of basic line parameters must be maintained. 6. Recommends promoting research regarding the spectroscopy of higher frequency microwave channels up to 1000 GHz (specially the H2O lines in the sub-mm range of particular importance for the upcoming launch of ICI onboard Metop-SG). 7. Continuous support of FAR-IR model developments in preparation for future missions (sigma-IASI - FORUM model, or FIREX requirements). 8. The importance of maintaining the Rosenkranz MW/sub-mm model as there are concerns it might become discontinued. 9. There are raised concerns regarding the LBL needs in hyperspectral MW missions. 10. Recommends maintaining the last LBLRTM version upon the release of the Community LBLM (CLBLM) model.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.6.2	Perform validation and intercomparison of LBL models/spectroscopy to assess the impact of spectroscopic uncertainties and the differences between line-by-line and fast radiative transfer models.	ITWG	At ITSC-23 a presentation was given by Thibault Delahaye (Laboratoire de Météorologie Dynamique/IPSL) et al. titled "*CO2 spectroscopy in 4A/OP: new developments and applications to satellite missions*". This presentation described the development and validation of a new CO2 full line-mixing algorithm and software package. This is required by missions including IASI in order to retrieve CO2 concentration by inversion of infrared spectra using radiative transfer-based algorithms. This method fundamentally relies on the precision of CO2 molecular spectroscopy knowledge. The authors presented the status of the CO2 spectroscopy and its implementation and validation in the radiative transfer software 4A/OP. Following ITSC-24, the RTSP Working Group emphasizes the significance of intercomparison studies to refine the accuracy and reliability of fast atmospheric radiative transfer models. In this context, the Community Radiative Transfer Model (CRTM), Radiative Transfer for TOVS (RTTOV), and Advanced Radiative Transfer Modeling System (ARMS) are highlighted as crucial components in the broader effort to advance atmospheric modeling capabilities.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			The RTSP Working Group advocates for a strategic inclusion of these models in benchmarking exercises against more accurate (but much slower) counterparts like kCARTA, LBLRTM, and CNR/Florence Klima LBL. By engaging in such comparative analyses, the aim is to leverage insights gained to drive enhancements in these fast models, ensuring they remain at the forefront of radiative transfer modeling capabilities for operational and time-constrained applications.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.6.3	Through coordination between IPWG, ITWG and IESWG, continue to improve microwave radiative transfer models to include complex surfaces (e.g., snow, desert, etc.) and scattering atmospheres (e.g., frozen hydrometeors) to support improved algorithm development for current and future sensors.	IPWG, ITWG, IESWG	**IPWG comments:** This is always an ongoing topic and challenge, but we are pleased to report some headway. IPWG has established a Focus Group on Particle scattering led by Guosheng Liu (FSU). The goals of the group is to create greater community understanding of the state-of-the-art research and to communicate available tools to the broader precipitation community. It has also created a Land Surface FG led by Sarah Ringerud (GSFC) and Joe Turk (JPL) The goals of the group is to create greater community understanding of the state-of-the-art research in this area to facilitate future improvements. These focus groups should be inter-disciplinary. **Overall status at ITWG in Q1/2024** Following ITSC-24, the ITWG Radiative Transfer and Surface Modeling Working Group reported the following notes regarding aerosols, clouds, complex surfaces and radiative transfer modeling in general. Aerosols 1. The working group discusses the existence of a new UV optical database: the Super-spheroid model (Lei Bi, oral presentation 11.05 ITSC-2024). Kong, S., Sato, K. and Bi, L., 2022. Lidar Ratio-Depolarization Ratio Relations of Atmospheric Dust	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			Aerosols: The Super-Spheroid Model and High Spectral Resolution Lidar Observations. Journal of Geophysical Research: Atmospheres, 127(4), p.e2021JD035629 and the development of ML approaches to parameterize the database and its jacobians Yu, J., Bi, L., Han, W. and Zhang, X., 2022. Application of a neural network to store and compute the optical properties of non-spherical particles. Advances in Atmospheric Sciences, 39(12), pp. 2024-2039. 2. It was reported that the fast RT model RTTOV OPAC/CAMS database now includes new species (volcanic ash, Asian dust and the ICON-ARTS species). It was recommended that RTTOV developers reach out to the aerosol community and survey their aerosol (physical) needs. 3. It was encouraged that the aerosol community publish a literature review that includes new aerosol studies and challenges regarding VIS/near-IR aerosol sensitivities and spectral dependencies. 4. Continuous support for field campaigns and the community to use field campaign data for validation studies. 5. Recommendation to connect aerosol Fcs to RT evaluation studies. Clouds 1. Continue support for refractive index dependence studies on temperature in the far-IR.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			2. Continue support to exploit synergy (i.e., FORUM+IASI-NG) in studies of cloud properties and retrievals. 3. The development/evaluation of fast scattering solvers such as the Chou/Tang phase function scaling methods (i.e., poster 1p.12 ITSC-24 presented by Vidot et al.) 4. The continuous support for the development of cloudy RT model validation datasets. 5. Continuous support to address the discussion as to whether physical consistency is important: “true” hydrometeor size/shape or spectral “significant” parameters are enough. In this regard it is important to mention the recent work presented at ITSC-24 (Ether Villeneuve’s work, presentation 1.05) that indicated that perturbations of NWP model parameterizations have a larger impact than hydrometeor habit assumptions. In radar sensitivity (Ku): convective parameterization / cloud fraction has a larger impact than changing shape / PSD parameters. In radiance space: representation of the cloud overlap scheme also has a large impact. 6. Continuous support of sub-grid variability studies (NUBF effects / cloud fraction impact) studies. 7. Support studies that can assess the impact/importance of habit/PSD parameter on radiance space. 8. Continuous the ongoing recommendation of model inter-comparison. Surface properties	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			1. The working group discusses that microwave observations over land are a problem for data assimilation (DA), and recognizes the importance of improved land surface emissivity models with the explicit intent of improving data assimilation over land (possibly to research into AI approaches). **IESWG:** The IESWG continues to support these efforts, and radiative transfer particularly in snow, soil and vegetation and at lower microwave frequencies would help in the uptake and use of this data in land data assimilation. The ability to work with mixed surface types is also of high importance to our group.	
4.7	**Stimulate trade-off analyses for the development of future passive sounding instruments**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.7.1	Conduct studies to investigate the technical feasibility to reduce the field of view sizes for future microwave sounders to keep in line with the spatial resolution expected for future global NWP models.	IPWG, ITWG	For EPS-SG, EUMETSAT has concluded that no major improvements for MWS can be anticipated (over current microwave state-of-the-art sounders) within known technical limitations. For the foreseeable future, no significant improvements are expected for the CGMS baseline." However, it should also be noted, that for ongoing considerations of microwave constellations and miniaturisation of microwave instruments, the continued trade-off studies are essential. Relevant discussions also in IPWG Key question regarding hyperspectral µwave is on capabilities for the lower troposphere Will be addressed in ITWG advanced sounding WG and WG-II intersessional work ITWG proposes to reword along the lines of "Conduct studies investigating the technical feasibility (instrument/constellation/processing) relevant to future observing concepts"	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.7.2	Conduct trade-off studies regarding the benefits of spectral, radiometric, and spatial resolution of infrared sounders, taking into account aspects such as scene inhomogeneity and uncertainties in spectroscopy; ITWG proposes to consider this completed	**ITWG**	• ITSC-25 notes no new studies since ~2017 and that forthcoming GEO HSIR systems share similar resolution characteristics, making the issue reduced concern for operational NWP. • ITSC-25 discussions confirmed that new hyperspectral sounder missions are converging on similar spectral performance, but emphasized that reducing spatial footprint remains beneficial for resolving scene heterogeneity. • Consider dropping this item and instead encourages footprint reduction where possible.	**COMPLETED**
4.8	**Support to emerging application areas**			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.8.1	Foster the coordinated development of novel products and applications of the new generation of imagers, initially for the areas of fire, aerosols, flood-mapping and river ice break-up.	WG-II	Collaboration on flood mapping is progressing well between NOAA and CMA. In addition the flood mapping was discussed at CGMS-48 WG-II meeting establishing links with CEOS and the WMO Flood Forecasting Initiative. Roshydromet also presented promising high resolution flood mapping results that could be used as independent validation. Hence, in summary flood mapping is progressing well. Limited progress and collaboration was presented in other areas. Fires covered by GOFC-GOLD	
4.8.2	Provide support to users in the WMO application areas, including for agricultural, hydrology, cryosphere, marine/ocean and other applications, with a focus on the WMO co-led UN Early Warnings for All (EW4ALL) identified priority hazards (heat, drought, flood, and tropical cyclones); and, where appropriate, identify and follow-up on opportunities by other entities (e.g. CEOS led activities).	WG-II	WMO has initiated surveys on observational gaps in different areas It should be considered that WG-IV should lead the EW4ALL issues	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
4.8.3	Review capabilities of and identify critical gaps in the CGMS constellation for the provision of physical snow and ice products in support of operational cryosphere, polar and high-mountain monitoring, and reflecting WMO priorities to address global and regional impacts of changes in the cryosphere (2024-2027).	WG-II, IESWG	**IESWG:** IESWG has identified Snow Water Equivalent (SWE) measurements as a gap in space-borne products. There is an additional need for a continuous purpose-designed record of soil moisture relevant observations. We note HLPP item 4.2.4 as a similar gap item, and wonder if a similar statement could be made regarding SWE? (4.2.4 Establish a coherent development of volcanic ash products and applications with close user community coordination.). Such a product would be based on a number of operational µwave sensors, in particular AMSR and CIMR, as well as contributions from R&D sensors.	
4.8.4	Establish product development priorities including synergistic products for operational monitoring of cryosphere, polar and high-mountain regions;	IESWG		

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4.9	**Identify AI/ML technologies for applying to the product processing and data management infrastructure and develop best practices**	**AI/ML Champion, WG-II, supported by all ISWGs, WG-I and WG-IV**	Comments from International Science Working Groups: **IPWG** has created a Machine Learning WG with the explicit purpose of setting up a common evaluation tool for individual investigators. The tool will provide the same training data to each participant and then assess the quality of the ML learning algorithm by testing against and independent but similar dataset and a dataset from a different region that the algorithm has never encountered. IPWG will present a consolidated view of AI/ML use cases from all ISWGs **ITWG:** ● Centres (e.g., ECMWF, Met Office) advancing ML-ready data formats (Zarr/cloud access); satellite agencies encouraged to provide complete hyperspectral information and metadata to support ML training workflows. ● Field is changing rapidly, wide range of active developments. No clear preferred methodology or area of focus ● Use of Reanalyses (e.g. ERA-5) for training of ML, need for continued investment ● Data curation in ML-ready formats ○ Reanalysis	

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			○ Satellite obs to include e.g. geolocation, orbital position etc ○ Hyperspectral IR to include all channels The ITWG Radiative Transfer and Surface Modeling Working Group has identified areas where AI is being used effectively. For example: ● Neural network-based methods for simulating cloud- and aerosol-affected solar satellite channels (Leonhard Scheck, presentation 11.06 on ITSC-2024): MFASIS in vis/near-IR/IR 0.4 – 2.2 micron ● Hatfield, Sam, et al. "Building tangent-linear and adjoint models for data assimilation with neural networks." Journal of advances in Modeling Earth Systems 13.9 (2021). The working group further identified areas that could benefit from AI approaches. For example: ● Cloud and precipitation. parameter tuning to decide the best configuration based on a large training dataset for DA. i.e., Geer, A.J.: Physical characteristics of frozen hydrometeors inferred with parameter estimation, Atmos. Meas. Tech., 14, 5369-5395, https://doi.org/10.5194/amt-14-5369-2021, 2021 ● Land surface emissivity methods The EUMETSAT "AI roadmap" was mentioned as being the only "coordinated" effort at operator level that was known in the working group. The general consensus was	

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			recommending funding agencies to fund 3+ years for AI research into replacing or developing components that get used in operational context (e.g., fast models). **IROWG:** Efforts using AI/ML were reported at IROWG-10, but are relatively few and in the research stage. While no formal IROWG activity is currently focused on AI/ML approaches, IROWG recognizes the value of exploring such approaches. **IWWG:** AI/ML technologies are actively explored for: • Development of capabilities to generate 3D winds from geostationary imager and hyperspectral sounder instruments (NASA, NOAA, EUMETSAT, ESA, JMA, CMA, industry partners) • Use of machine learning to extract horizontal motion from derived variables (e.g., moisture, temperature, ozone) (NASA, NOAA, industry partners) **ICWG:** - Many ICWG algorithms already employ AI/ML in some capacity.	

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			- ICWG members are active in developing AI/ML analogs of their physical algorithms or forward models - Given the passivation of CALIPSO/CloudSat, EarthCare now is of high interest for AI/ML algorithm training Given the ubiquity of AI/ML for cloud remote sensing, we recommend updating this to focus on the generation of community standards and tools to enable AI/ML training on EarthCare.	

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5	**ADVANCING THE ARCHITECTURE FOR CLIMATE MONITORING FROM SPACE (THROUGH THE JOINT CEOS-CGMS WORKING GROUP ON CLIMATE)**	**Joint CEOS-CGMS Working Group Climate (WG Climate)**	**Status reported at CGMS-53, will be updated by JWGClimate at the CGMS-54 plenary**	
5.1	Update the Climate Data Record (CDR) Inventory, which replaces the former Essential Climate Variable (ECV) Inventory. The CDR Inventory features an enhanced user interface with added functionalities to improve the discoverability and usability of space-based CDRs. Inputs to the Inventory will be harvested by the EUMETSAT support team from publicly available data sources and will be updated continuously. Periodic gap analyses and development of a coordinated action plan (CAP) based on the CDR Inventory will be carried out by CEOS and CGMS to support climate research and services.		Inventory V5.0 was released on Oct. 31, 2024, which contains 1289 CDR entries (918 existing and 371 planned). The 2024 Gap Analysis Report and updated Coordinated Action Plan were sent to CEOS and CGMS for review in October 2024 and comments received were addressed.	

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5.2	Engage the UNFCCC Subsidiary Body for Scientific and Technological Advice – Research and Systematic Observation (SBSTA-RSO) to ensure the provision of fit-for-purpose satellite data that informs decision-making. This is a recurring effort, with regular annual reporting at the UNFCCC Conferences of the Parties (COP).		WGClimate and its GHG task team are rebuilding the connections with UNFCCC secretariat and invited Heather Maseko and Maryam Navi to present at the WGClimate-22 meeting. Their presentations were well received and the discussions were productive. Follow on meetings and collaboration were also outlined. To address the ongoing scientific and decision-support needs, and better collaborate with the emerging international initiatives to provide actionable information, the issue 2 of "Roadmap for a coordinated implementation of carbon dioxide and methane monitoring from space" was developed in 2024 and was endorsed by CEOS and CGMS. WGClimate is leading a first global stocktake (GST) lessons learned exercise to better space agencies for the future GST process. The report is available for review now and will be endorsed in April 2025.	
5.3	Support GCOS in the preparation of its status report and the GCOS Implementation Plan and lead the development of the space agency response. This is a cyclical task aligned with GCOS's five-year planning cycle.		WGClimate has completed the "Space Agencies' Response to the 2022 GCOS Implementation Plan", which was sent to GCOS panels for review. WGClimate is currently addressing the panels' feedback and will circulate the document for review in March 2025 and will seek endorsement in April 2025.	

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5.4	Engage with WMO and other initiatives to create an integrated global operational greenhouse gas observing system that combines space-based and surface-based assets to deliver fit-for purpose data products. Engage with WMO, CEOS, and other parties to define the requirements for the space-based operational observing system.		WGClimate and its GHG TT have been actively working with these partners/stakeholders. Stakeholder engagement is an important aspect of the issue 2 of "Roadmap for a coordinated implementation of carbon dioxide and methane monitoring from space", and they are active in our meetings and discussions.	
5.6	Coordinate CGMS contributions to the operational greenhouse gas constellation with CEOS and WMO. This includes coordination on mission planning, inter-calibration, product development and validation, data formats and access mechanisms, reprocessing, as well as capacity building and outreach efforts.		This was a very productive meeting was reconvened in June 2025 before the CGMS-53 plenary.	
5.7	Develop lessons learnt on impact of delivery made to the 1st UNFCCC Global Stocktake and provide advice for the future.		WGClimate is leading a first global stocktake (GST) lessons learned exercise to better space agencies for the future GST process. The report is available for review now and will be endorsed in April 2025.	

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5.8	Expanding the utility of the CDR Inventory to meet emerging needs.		The goal is to enhance discoverability and uptake of CDR Inventory by external users/stakeholders of EO data. Initial step is to define application/stakeholder typology categories.	
5.9	GHG Cal/Val Supersites			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
6	ADVANCE OPERATIONAL SPACE WEATHER MONITORING FROM SPACE	SWCG		

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
6.1	Coordinate CGMS activities and align priorities with the space weather user community, in particular the ICAO Space Weather Centres, ISES, WMO ET-SWx and the UNCOPUOS STSC		Several ICAO SWC members are participating in SWCG and are also members of ISES. ISES is invited to give presentation at SWCG. The SWCG Task Group on Improving Data Access objective is directly related to this coordination activity and includes ISES representation. 5 teleconferences have been held. A dedicated CGMS-ISES meeting will take place as part of the ISES annual meeting on 17 Marchl 2025. The UNCOPUOS STSC ET on SWx recommendation for WMO, ISES and COSPAR to initiate an activity to improve coordination has been followed up with the creation of the WMO Expert Team which includes CGMS representation from SWCG, together with ISES and COSPAR members. The published UNCOPOUS STSC Long Term Sustainability Guidelines covering space weather and reporting of spacecraft anomalies have been considered within CGMS and WMO-ET-SWx. An apportionment of the extent to which CGMS on the one hand and WMO (ET-SWx) on the other hand address each of the Guidelines is ready for publication on CGMS website. Inputs on data-requirements for ICAO services have been collected through the SWCG and action ongoing to assess how these can be addressed at short and longer timeframe by the . The WMO Rolling Review of Requirements process, the related WIGOS vision (currently being updated) include SWx application	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
			areas and the corresponding Space Weather observation requirements. Hence response of CGMS baseline and HLPP to the user requirements is expected to primarily take place through the process of the WMO Gap analysis. Propose to remove	
6.2	Establish a consistent inter-calibration framework in GSICS for energetic particle measurements using instruments with adequate in-orbit calibration and vicarious methods;		The GSICS SWx subgroup regularly conducts discussions on inter-calibration of high energy particle sensors. The COSPAR PRBEM Data Analysis Procedure document was reviewed as standardization of cross calibration of energetic particles and discussed revisions to the document with COSPAR PRBEM which were accepted. In addition, in view of the increase in space-based solar wind observations at L1 point, discussions on the cross-calibration of solar wind measurements at the L1 point have started. The progress of the GSICS SWx sub-group activities are reported to CGMS/SWCG.	
6.3	Advance the coordination of Space Weather activities with the relevant CGMS working groups;		The integration of Space Weather activities in relevant CGMS WGs is continuing. SWCG Chairs and rapporteur participate in relevant Intersessional activities to ensure coordination: Joint session with WG-I and -IV, GSICS discussions, participation in annual CGMS Risk Assessment workshop.	

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6.4	In coordination with IROWG establish requirements for and recommend an implementation of an optimised system for radio occultation observations for ionosphere monitoring.		Progress is being made in the development of advanced methods to reduce residual effects of the ionosphere on atmospheric retrievals and an increasing number of receivers are able to collect ionospheric data, for example, the extension of GRAS RO profiles into the ionosphere under testhas been implemented for on Metop first generation satellites, soon later to be complemented by Metop second generation ionospheric RO data. End-user utilization of ionospheric RO is increasing, with COSMIC-2 ionospheric data starting to be integrated into SWPC models. The SWCG Task Group on Radio Occultation system optimisation has been established, including IROWG leadership to reduce end-to-end data and product median latencies to at or below 30 minutes and perform Observation System Simulation Experiments to determine the optimal orbital configurations and necessary measurement counts. A recommendation will be made to plenary by IROWG regarding a SWX-ROMEX activity.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
6.5	Ensure the timely access to and global exchange of space weather data of CGMS Members, including instruments hosted on third-party satellites		WMO is in the process of: 1/ establishing the definition of space weather data types as "core" or "recommended", with core data enjoying free and open distribution. 2/ promoting the use of WIS2.0 for standardised data dissemination. EUMETSAT is enhancing existing partner cooperation agreements to encompass space weather exchange. NOAA and EUMETSAT are discussing the expansion of currently exchanged data sets, as are CMA and EUMETSAT. Data exchange with KMA was started in 2024.	

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6.6	Document current data formats for space weather observations		The SWCG surveys of data providers and data users include information on formats used for operational space weather purposes. The SWCG Task Group on improving data access is working towards standardised data formats and meta data (it is being envisioned as a first step to define prototype WMO CF-profiles to establish NetCDF standard formats for certain datatypes). Coordination with WMO-ET-SWx is also on-going in this respect.	

Commented [努長7]: I think this is our activity about future direction of data format on space weather observation. I could be wrong, but we haven't documented "current data format".

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
6.7	Produce a report of space weather (SWx) observation requirements for improved STC services and space sustainability and consider impact on future SWx observations due to increased demand on SWx services.	SSA Champion	Discussions are on-going between CGMS members and their regional SSA / space traffic coordination responsible entities regarding the prediction of the thermospheric drag environment. An ESA presentation on the status of their activities was made at CGMS-51 SWCG. New actions have been raised regarding the use of POD data for determination of thermospheric environment at satellite altitudes. Cross-check with WG-I SES targets	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at last CGMS)	Overall Status
6.8	Work on comparing different measurement strategies/techniques for characterising thermospheric environment.		New actions have been raised regarding the use of POD data for determination of thermospheric environment at satellite altitudes. CMA plans inclusion of mass spectrometer on FY3-J. Cross-check with WG-I SES targets	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
7	**OUTREACH AND TRAINING**			
7.1	**Engage in communication and outreach activities to promote Space Weather observations benefits.**	**Plenary**	The CoE at the University of Buenos Aires offers a Space Weather Forecasting Course every other year. Other CoEs offer Space Weather webinars on an as needed basis. This is a desired topic of interest for all regions, particularly as it related to aviation hazards.	
7.2	**Training**	**Plenary /VLab**		

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
7.2.1	Continue to foster optimum use of satellite data for weather forecasting, climate applications, and environmental assessments including hazardous events such as volcanic ash and flooding;		VLab members reported delivery of a range of satellite courses, workshops, webinars, online modules, and informal regular weather briefing sessions that focus on basic and advance use of satellite imagery and products in the forecast process and climate applications. Members have also reported on training focused on multi-hazards and priority hazards associated with the Early Warning for All (EW4ALL) initiative. Many VLab members participate in capacity building efforts targeted at flooding and drought through the Earth Observation Training, Education, and Capacity Development Network (EOTEC DevNet)	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
7.2.2	Update and develop new training material through the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) and in partnership with the WMO Training and Education Programme. Link training materials to the 2025 update of 'Guidelines on Satellite Skills for Operational Meteorologists and Specialists in Related Application Areas'		Training on new satellite capabilities, including preparations for and operational use of Meteosat Third Generation (MTG) geostationary data, was delivered by VLab members. There was also significant progress of training material provided on data access, display, and interpretation for mature satellite observation systems. View the VLab working paper for a summary. The 2025 version of 'Guidelines on Satellite Skills' updates the guidelines for operational meteorologists and adds new guidelines for specialists in the provision of climate and agrometeorological services. VLab worked closely with climate experts to determine the skills. Climate is a rapidly changing area. CGMS members are invited to encourage communications between the CEOS-CGMS Joint Working Group on Climate and VLab to identify training priority areas.	
7.2.3	CGMS Members and Centers of Excellence (CoE) to coordinate and collaborate on succession planning. Many members are experiencing staff shortages due to employee turnover and retirement.			

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
7.2.4	CGMS Members and CoEs to collaborate on training development programs for CoE trainers.			
7.2.5	Ensure availability and training in usage of satellite data and products in monitoring regional priority hazards in addressing the UN Early Warnings for All (EW4All) initiative. Engage in communication and outreach activities that enhance the success of early warnings		There was significant progress of training material provided by the VLab. Of note, a pilot project with 5 CoEs in RA-III&IV was initiated to develop case study training materials for priority hazards identified by WMO surveys. View the VLab working paper for a summary of events. As a small part of EW4All efforts, many VLab members include sessions on jargon-free and relevant messaging to disaster response partners and the public. Many VLab members also conduct outreach activities for their communities. These communication and outreach activities are typically not reported by VLab.	

Ref	Target	Primary responsible for target in CGMS	Summary/highlights of progress (as reported at the last CGMS)	Overall Status
7.3	**User Conferences** Conduct regional satellite users conferences to (i) share experience and foster the exchange of ideas; (ii) promote better access, and improve the utilisation of, existing satellite data and products; (iii) prepare the user community on new satellite systems' data products and services; (iv) engage with the user community on the application of new Climate Data Records, supported by the CEOS-CGMS Joint Working Group on Climate; (v) gain user feedback on data, product and system real-world application; (vi) engage young people entering the field; (vii) other items as appropriate.	**Plenary**	Series of Asia-Oceanic, EUMETSAT, and NOAA satellite users' conferences continue. Science, operations, education, training, feedback, and communication are the topics of sessions and presentations at conferences. Training workshops on data access, display, and application are conducted. These activities address the aspects i - vii on the left. Because Satellite Operators in different regions are not on the same satellite deployment schedules, these conferences provide opportunities to share knowledge, experiences, and exchange ideas among and across Regions.	