CEOS-CGMS WGClimate GHG task-team requirements for operational GHG products from space-based global mappers

Presented to CGMS-54 Plenary session

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Recalling the CGMS High Level Priority Plan
Item 5: Monitoring of climate including greenhouse gases

The CGMS High Level Priority Plan specifies the following priority tasks under item 5 on ***Monitoring of climate including greenhouse gases***:

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.

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Recalling the relevant objectives of the WGclimate roadmap for a coordinated implementation of Carbon Dioxide and Methane monitoring from space.

The key GHG roadmap objectives, relevant to this report on requirements for space-based operational GHG products, are:

- Ongoing efforts to engage with new partners, including the World Meteorological Organization Global Greenhouse Gas Watch (WMO G3W) and United Nations Environment Programme International Methane Emissions Observatory (UNEP IMEO);

- An updated summary of the evolving requirements and capabilities for space-based measurements that can quantify CO2 and CH4 concentrations and support flux estimation; and

- Efforts needed to foster the transition from research to operations (R2O) to support the development of an operational GHG Monitoring and Verification Support (GHG MVS) system that serves stakeholders in the science, inventory, policy and regulatory communities; and

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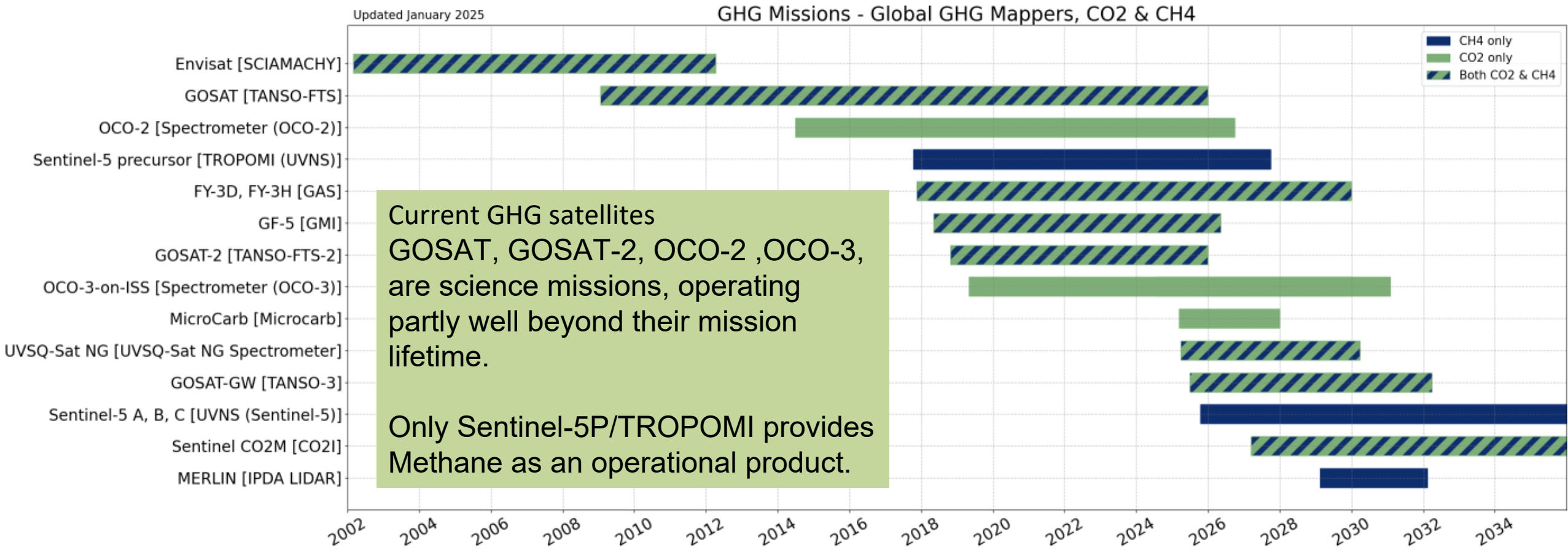
The proposed requirements are for products from the suite of space-based global GHG mapper.[1)]



Current GHG satellites
GOSAT, GOSAT-2, OCO-2 ,OCO-3, are science missions, operating partly well beyond their mission lifetime.

Only Sentinel-5P/TROPOMI provides Methane as an operational product.

[1)] Facility scale mappers are not considered at this stage

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Definition of requirement categories

Threshold - limit at which the product is of some use for GHG emission quantification.

Breakthrough - is considered the current engineering target for MVS systems for monitoring sources down to the 0.5 ppm (XCO2) and 10 ppb (XCH4) anomaly level and supporting MVS monthly emission budget reporting.

Goal - monitoring sources at or below the 0.5 ppm (XCO2) and 10 ppb (XCH4) anomaly level and supporting MVS daily emission budget reporting.

The following product quality performance requirements apply for operational GHG products from global mappers (for definition of terms see the WGclimate GHG roadmap):

Product	Spatial resolution	Precision			Bias		
		threshold	breakthrough	goal	threshold	Breakthrough[1]	goal
XCO2	8-2km	1 ppm	0.7 ppm	0.2 ppm	1 ppm	0.5 ppm	0.2 ppm
XCH4	8-2km	20 ppb	10 ppb	5 ppb	15 ppb	5 ppb	2 ppb

[1] “breakthrough” is considered the engineering target

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The following requirements concern the GHG product provision and are proposed in addition to the product performance requirements. These product provision requirements qualify the products as operational:

Product attribute	threshold	breakthrough[1]	goal
Product revisit time	<14 days	<4 days	<3 days
Product Timeliness / Latency	<1 week	<24h	<5h
Availability	>85%	>95%	>99%
Operator driven anomaly response	<1 week	<24h	<12h

[1] "breakthrough" is considered the engineering target

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Key issues of relevance to CGMS:

- The GHG task-team of the WGclimate recommends to the plenary session of the CGMS-54 to endorse the product performance and product provision requirements for operational GHG products of column-averaged dry-air mole fractions of XCO2 and XCH4 from space-spaced global GHG mappers as proposed in this paper.

- For a detailed definition of sensor categories and physical basis of the outlined requirement the GHG task-team refers to the GHG road-map of the WGclimate and the WMO OSCAR requirements (application area “G3W analysis and forecasting”), as well as to the requirement for an operational global greenhouse-gas Monitoring and Verification Support capacity as outlined by WMO G3W initiative and its requirements paper.

- GHG task-team A53.01 is responding to the CGMS High Level Priority Plan (HLPP) item 5.4 to “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.”

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To be considered by CGMS:

- For endorsement of ***the WGclimate GHG task-team proposed operational GHG product requirements from space-based global GHG mappers.***

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