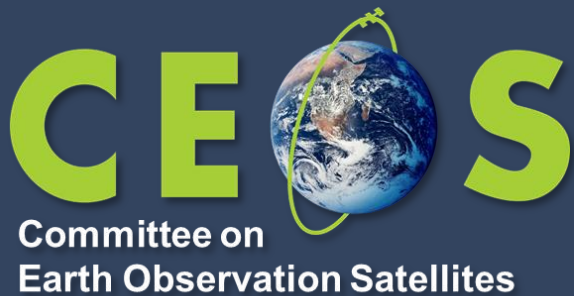


# New Space Task Team

*White Paper Overview and  
Recommendations*



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**From 37<sup>th</sup> CEOS Plenary**  
**15 - 16 November 2023**

## **CEOS: 34 Members and 29 Associated Members → Huge Fleet of EO Satellites in Space**

*Original function of CEOS was to coordinate and harmonize Earth observations to make it easier for the user community to access and use data. CEOS initially focused on interoperability, common data formats, the inter-calibration of instruments, and common validation and inter-comparison of products.*

### **Collaboration between New Space & Public Space sectors:**

- ❖ at national or regional level, Governments are integrating new arrangements with Space 2.0 firms into their satellite EO programme planning
- ❖ What could be the expected mutual benefits and added-value of a public / new space collaboration ?
- ❖ Are there collective actions at CEOS level, that can foster this collaboration at national or regional level ?



**Duality & complementarity between CEOS and New Space:** one of the strategic priorities introduced by ESA  
as 2022-2023 CEOS SIT Chair

1. At COP26, +100 countries signed up to the [Global Methane Pledge](#) to limit emissions by 30% in 2030 compared with 2020 levels

□ **GHGSat joined ESA's Third Party Mission Programme** (May 2022)

2. **ICEYE commercial constellation of 27 small X-band SAR satellites** (31 by end-2023)

Monitoring floods and mining activities, marine vessel detection and iceberg monitoring. 3 hours anywhere on Earth.

□ **ICEYE SAR imagery is provided to all Copernicus services, mainly the Emergency, Security, Land and Marine services, as Copernicus Contributing Mission** (Nov. 2021)

3. **ESA's first [Earth Observation Commercialisation Forum](#)** (ESA HQ, Paris, 30–31 October 2023)

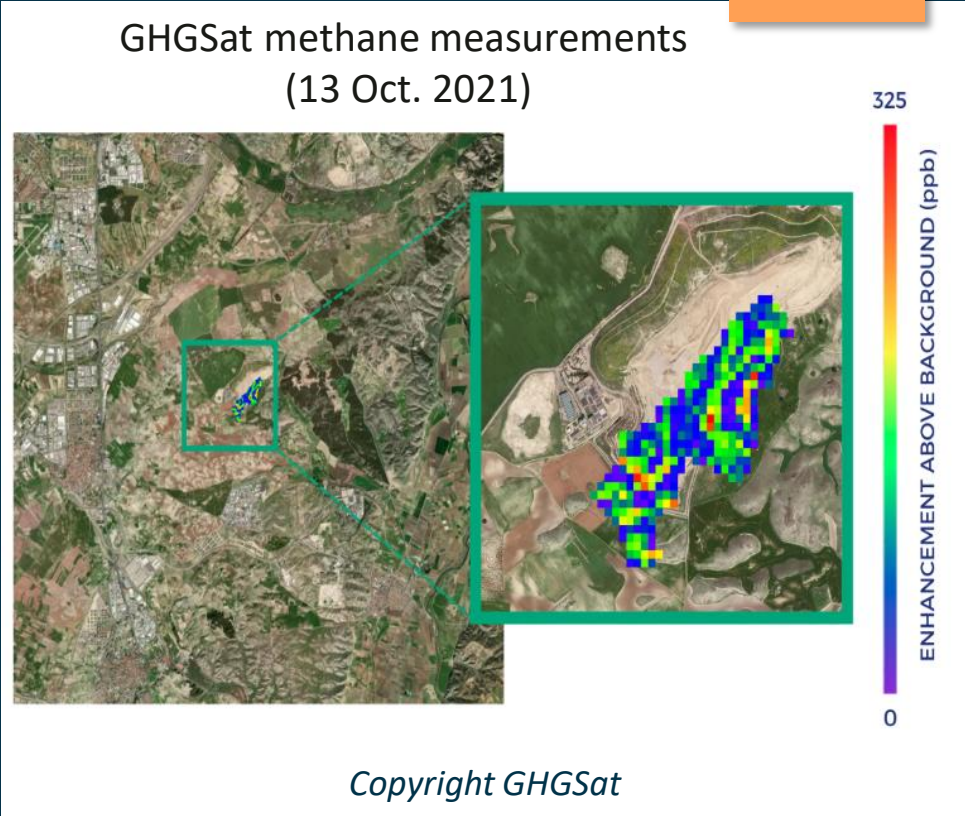
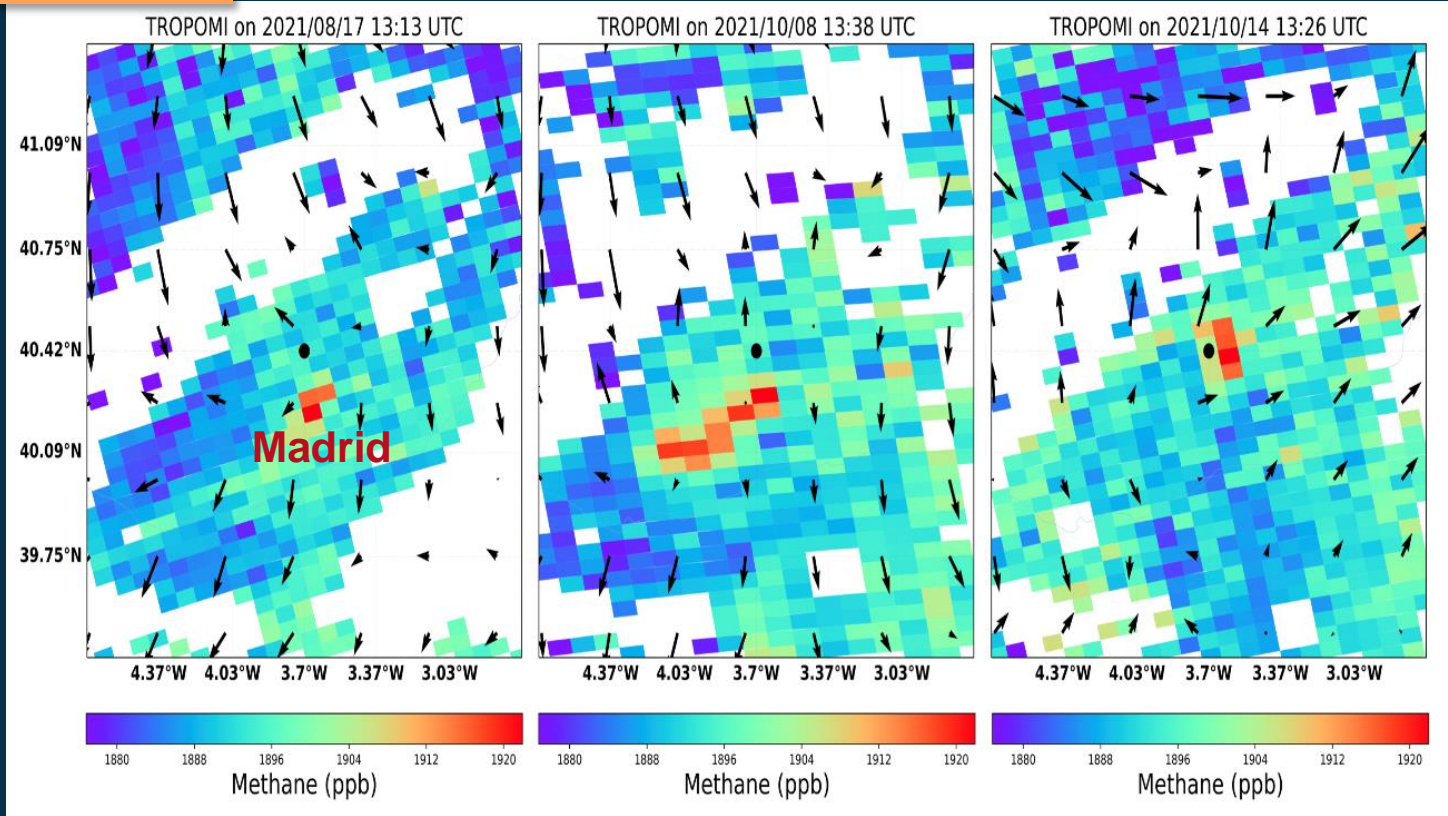


Through data buy, ESA stimulates the synergy between commercial EO missions and public EO missions

→ Example of synergy between Sentinel-5P and GHGSat (ESA TPM) : Methane concentration/emissions from landfills close to Madrid

Sentinel-5P

GHGSat



Copyright: Contains modified Copernicus Sentinel data (2021) / processed by SRON

[https://www.esa.int/Applications/Observing\\_the\\_Earth/Satellites\\_detect\\_large\\_methane\\_emissions\\_from\\_Madrid\\_landfills](https://www.esa.int/Applications/Observing_the_Earth/Satellites_detect_large_methane_emissions_from_Madrid_landfills)

- ❖ **New Space sessions at all SIT, SIT TW and CEOS Plenary in 2022-2023.**

- ❖ Sharing of experience of CEOS Agencies (*CNES, CSA, EC, ESA, GISTDA, NASA, NOAA, UKSA, USGS*) and presentation of activities e.g. CEOS-ARD, WGCV,....

- ❖ **A temporary Task Team with representatives from +20 CEOS Agencies and from CEOS WGs, produced a list of early key findings (2022 CEOS Plenary).**

- ❖ **'New Space' Task Team (NSTT) created at 2022 Plenary**

- ❖ Objective: to explore opportunities between public and private commercial services that bring mutual benefit to all parties, including the identification of concrete initiatives.
- ❖ Terms of Reference for a CEOS 'New Space' Task Team endorsed @2022 Plenary
- ❖ Delivery of a White Paper with findings and recommendations @ 2023 Plenary for endorsement

## NSTT White Paper authorship & process :

- ❖ Open to representatives of all CEOS Members and Associates who were then free to consult within their respective communities to bring forward observations and ideas.
- ❖ Leads of the various CEOS entities (*Working Groups, Virtual Constellations, and ad hoc teams*) were consulted in order to assess the potential for existing CEOS initiatives to better address the potential of the New Space sector and to consider what else might be done in the context of their work.

**76-pages document: a huge work by NSTT , coordinated by SIT Chair...**

**Many thanks to all CEOS Agencies and CEOS groups !!!!**



## 1. Introduction & Objectives

## 2. Definition and Scope of New Space relevant to CEOS

## 3. Interaction between Governmental/Public and Private actors in New Space for EO

## 4. CEOS Agencies' Experiences in their Interactions with EO New Space

- *CNES, CONAE, CSA, CSIRO, DLR, EC, ESA, EUMETSAT, GA, GISTDA, ISRO, JAXA, NASA, NOAA, NSO, UKSA, USGS*

## 5. Opportunities for New Space

### 5.1. Thematic Area Observation Gap Opportunities

- *AFOLU, SDG, Precipitation, GHG, Climate, Disasters, Agriculture, Capacity Development, Land Surface Imaging, Ocean Surface Wind Vector, Sea-surface Temperature, Ocean Surface Topography,..*

### 5.2. Opportunities for New Space to support science

- *incl. Radio Occultation, Hyperspectral Imaging, SAR, Thermal IR, Very Hi-Res Commercial Optical Imagery,.*

## **6. Current CEOS Activities Supporting New Space**

- *incl. CEOS Cal/Val, CEOS ARD, CEOS Interoperability Framework, Open Data Cube, CEOS Engagement with Standards Organisations, CEOS MIM, Combined and harmonised data streams.*

## **7. Conclusion and Recommendations**

**Appendix A - Recommendations to CEOS Plenary**

**Appendix B - Recommended Deliverables for inclusion in the CEOS Work Plan**

**Appendix C - Task Team Membership**

**Appendix D - Further details on Cal/Val References**

**References**



# CEOS Agencies' Experiences in their Interactions with EO New Space



- ❖ Although the experience with “New Space” in EO is heterogeneous and depends on national policies, strategies and capabilities, **all the participating Agencies, directly or indirectly, support private investments in the space sector (e.g. for SME)**
- ❖ **Many dedicated programmes are flourishing at national and international level**
- ❖ **Motivations range from stimulating space economy and the competitiveness of national industry to the provision of novel products and services** complementing the traditional “big” satellite missions.
- ❖ **PPP and anchor tenancy are the most common arrangements methods.**
- ❖ **The use of commercial data are also being explored for scientific and operational applications,** thus creating synergies between industry, academia and government

Thematic Areas Observation Gaps - Opportunities	
<b>Agriculture Forests and Other Land Use</b>	Documenting smaller scale AFOLU variables and land management, augmenting rather than replacing the observations of long-term programmes, increasing the revisit time.
<b>SDG</b>	Very High spatial and temporal resolution, with short latency tasking over specific location
<b>Precipitation</b>	1) Timely precipitation products in near-real time for operational weather and hydrological services, ensuring consistency over time scales from few hours to decades. 2) Expanding the measurement network of GHG, provided that transparency on algorithms and datasets are guaranteed (IPR).
<b>Climate</b>	1) Low-cost, affordable and sustainable frequent sampling and redundancy are potentially transformative for climate work, but dataset homogeneity shall be guaranteed, and the potential value depends upon the data use. 2) <u>IPR and data costs may hinder the benefits of "New Space" implying commonality of contractual language</u>
<b>Disaster</b>	1) Urgent tasking, acquisition and short latency from the data request, high revisit and high resolution for the different stages of disaster 2) Great interest for emergency response in spite of the intrinsically limited image quality 3) Identify provisions to access free and open data policy while preserving the commercial interests of industry
<b>Agriculture</b>	1) New Space data are already used e.g. in precision agriculture and crop classification, requiring consistent radiometric calibration 2) 10 m resolution TIR (+ VNIR) and 10-30 m radiometers with reliable and long-term access to archives 3) Hyperspectral data potentially add value to agricultural application 4) CEOS Agencies cooperate with industry and provide to develop user cases in exchange of data. Unclear the sustainability of this process.
<b>Capacity Development</b>	Albeit not traditionally engaged with the private sector in their activities, WDCapD advocate free and open use of data archives held by the private sector. Historical archives are of interest, which have negligible commercial value.
<b>Land Surface Imaging</b>	1) Defined acquisition requirements for Essential Agriculture Variables: moderate resolution and tasking time can be contributed by Commercial/New Space 2) Fill the gaps in LST for Climate data record 3) Analysis Ready Data is of great interest in this sector, with trends in Machine learning and Artificial Intelligence
<b>Ocean Surface Wind Vector</b>	1) For studies on mesoscale the target is 10 km with a frequency of, ideally, 6 h so addressing the need of scatterometer constellation 2) Ocean Current Retrieval, would, in future require Doppler scatterometers 3) Ocean Wind information would also require accurate information for wind speed greater than 30 m/s
<b>Sea Surface Temperature</b>	New Space could push the boundaries for higher spatial IR and temporal resolution for observations dynamic in sub-mesoscale coastal ocean region (0.1-10 km) [Niche application]

Current Activities Supporting New Space in CEOS	
<b>Calibration and Validation References</b>	1) CEOS WGCV provides reference for Cal/Val and allow comparison of results that New Space can use to anchor its own satellites' observations to assess fitness of purpose for these new data sources so reducing time to market and the return of investments 2) Achieve a good understanding of observation characteristics for interoperability and increase opportunity for global applications (agriculture, water use, climate applications etc). Harmonisation in Cal/Val is fundamental for augmenting the trust in accuracy and characterisation 3) Establishing reference for geometry and image quality Cal/Val via Reference Ground Control Point Database
<b>Intercomparison of CEOS and New Space Data Base</b>	CEOS WGCV has ongoing activities aimed at establishing intercomparison algorithms or approaches to Cal/Val, with obvious benefits for New Space
<b>SI-Traceable Satellite SITSat Coordination</b>	WGCV is coordinating SI-Traceable Satellite missions for the traceability of the measurement standards and measuring instruments to the International System of Units (SI) considering unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurements. A dedicated WG has been proposed for mission coordination, new technologies and spectral domain in view of integrated system approach.
<b>Cal/Val Maturity Matrix</b>	NASA launched the CSDA Project and ESA the EDAP to assess the quality of data from new vendors and constituted a common framework to verify claimed mission performances (ESA-NASA EO Mission Quality Assessment Framework). This is an interactive process between assessors and vendors. New Space gains knowledge of their data quality and have a feedback for improvements, increasing synergies between New Space and CEOS missions
<b>CEOS Analysis Ready Data (CEOS-ARD)</b>	CEOS-ARD and LSI-VC have engaged with a few new Space Providers and continues establishing dialogue for the sector, developing connections in the frame of VH-RODA, JACIE and LPS meetings. Having datasets processed to a minimum set of requirement and organised in a form allowing immediate analysis is of great benefit for New Space.
<b>CEOS Interoperability Framework</b>	The 2022 CEOS Plenary recorded a decision for a CEOS Interoperability Framework to be developed as a multi-Working Group and multi-Virtual Constellation activity, to provide guidance for the development of interoperable service and data. This may include and be beneficial for "New Space"
<b>Open Data Cube</b>	The Open Data Cube (ODC), created and facilitated by CEOS, is an open-source software architecture that can be equally used to manage CEOS datasets and New Space datasets. To date, there have not been any efforts to integrate and test CEOS data with New Space data in an ODC framework, but it can offer obvious advantages to CEOS and NS firms
<b>CEOS Engagement with Standard Organisations</b>	If CEOS considers the definition of standards to be one of its roles in supporting the New Space sector, additional coordination is necessary. In fact, New space has been active in the Spatio-Temporal Access Catalogue specification (i.e. a common language to describe geospatial information, so it can more easily be worked with, indexed, and discovered). CEOS needs to be reactive on this.

- 1. Sharing of experience in engaging with New Space actors is beneficial to CEOS community.**
  - 1. New Space actors' data aimed at an increasing number of priority applications that have historically been the domain of publicly-funded missions e.g.**
    - Carbon and greenhouse gas monitoring, Climate risk reporting, Disaster risk management, etc.
  - 1. New Space actors' data generally seen as augmenting, rather than replacing, long-term institutional programmes, albeit with potentially reduced quality.**
    - Data from institutional missions are used by commercial actors as a reference to improve the accuracy of their own data products, and also to fuse multiple data sets to generate higher level information products.
- 1. Data quality is an essential factor for scientific and operational endeavours:**
    - Need for harmonised assessment methods.
    - CEOS Agencies are key to ensure long-term confidence in accuracy and quality of all space-based EO data and products, produced by public or private missions.
    - CEOS has a long experience in the development of common methodologies and practices for data harmonisation.
    - CEOS can supply EO data (such as calibration and validation of sensors and data), and provide intercomparison opportunities for all space-based datasets, including those generated by New Space companies.

R1) **To increase the scientific and operational potential of long-term institutional programs, CEOS Agencies should act collectively to identify and support potential complementary capabilities enabled by New Space and other commercial actors.**

R2) **CEOS Agencies should continue to share information on relevant events and activities related to the new space, incl. results of business data assessment where possible.**

- CEOS agencies should also explore ways to work together on cooperative agreements with New Space players, possibly incl. common lines for resolving end-user licensing agreements and IPR issues.

R3) **Cooperation and collaboration opportunities should be sought to facilitate interoperability between private and public sector data**

- Future CEOS SIT Chairs are encouraged to routinely provide opportunity for CEOS Agencies to report on developments in the standards domain, from both public or private sources.

# White paper: Deliverables to include in CEOS Work Plan (1/3)



**D1)** To ensure users can benefit from increased complementarity and interoperability of CEOS Agency and New Space datasets, **the CEOS-ARD initiative should identify and implement mechanisms to deepen engagement with the New Space sector, consistent with CEOS Governing Documents.**

- *Examples include establishing a mechanism to consult the New Space sector during the development and review of CEOS-ARD Product Family Specifications (PFS), encouraging commercial sector participation in the ISO-OGC ARD Standards Working Group, and encouraging and assisting New Space entities to undertake self-assessments of their datasets against CEOS-ARD PFSs.*

**D2)** CEOS Members and Associates should continue unified engagement with New Space actors on key topics such as ARD, Cal/Val and data quality via **CEOS representation at key meetings** including VH-RODA, JACIE, IGARSS, Living Planet Symposium, and ARD2x.

# White paper: Deliverables to include in CEOS Work Plan (2/3)



**D3)** A revision of **CEOS-ARD Industry Engagement Strategy** should include consideration of aspects of specific relevance to the New Space sector, and the CEOS-ARD Oversight Group should consider the merits of organising a dedicated New Space workshop.

**D4)** The **CEOS Interoperability Roadmap will ensure that legacy and new public and commercial datasets can be used more interoperably** to generate advanced decision-support products and new research applications. As such, adequate resources should be made available to complete its development and maturation

**D5)** The CEOS Systems Engineering Office should **demonstrate the integration of New Space data into the CEOS Analytics Lab** and evaluate its interoperability with common CEOS datasets.

## **Data Quality:**

In line with the CEOS WGCV's mission to ensure long-term confidence in the accuracy and quality of EO data and products, produced by either public or private missions, it is highly recommended that CEOS Members and Associates support the development of :

- a Radiometric Cal/Val matchup Database
- the development of a Ground Control Point (GCP) Database.

Further, it is highly recommended that CEOS Members and Associates support the development, maintenance and operation of Cal/Val sites and networks, which are essential to all EO sectors.

- Cal/Val Park
- Network : RadCalNet, TIRCALNET, SARCALNET  
HYPERNET,  
TCCON, COCCON, NDACC...etc...