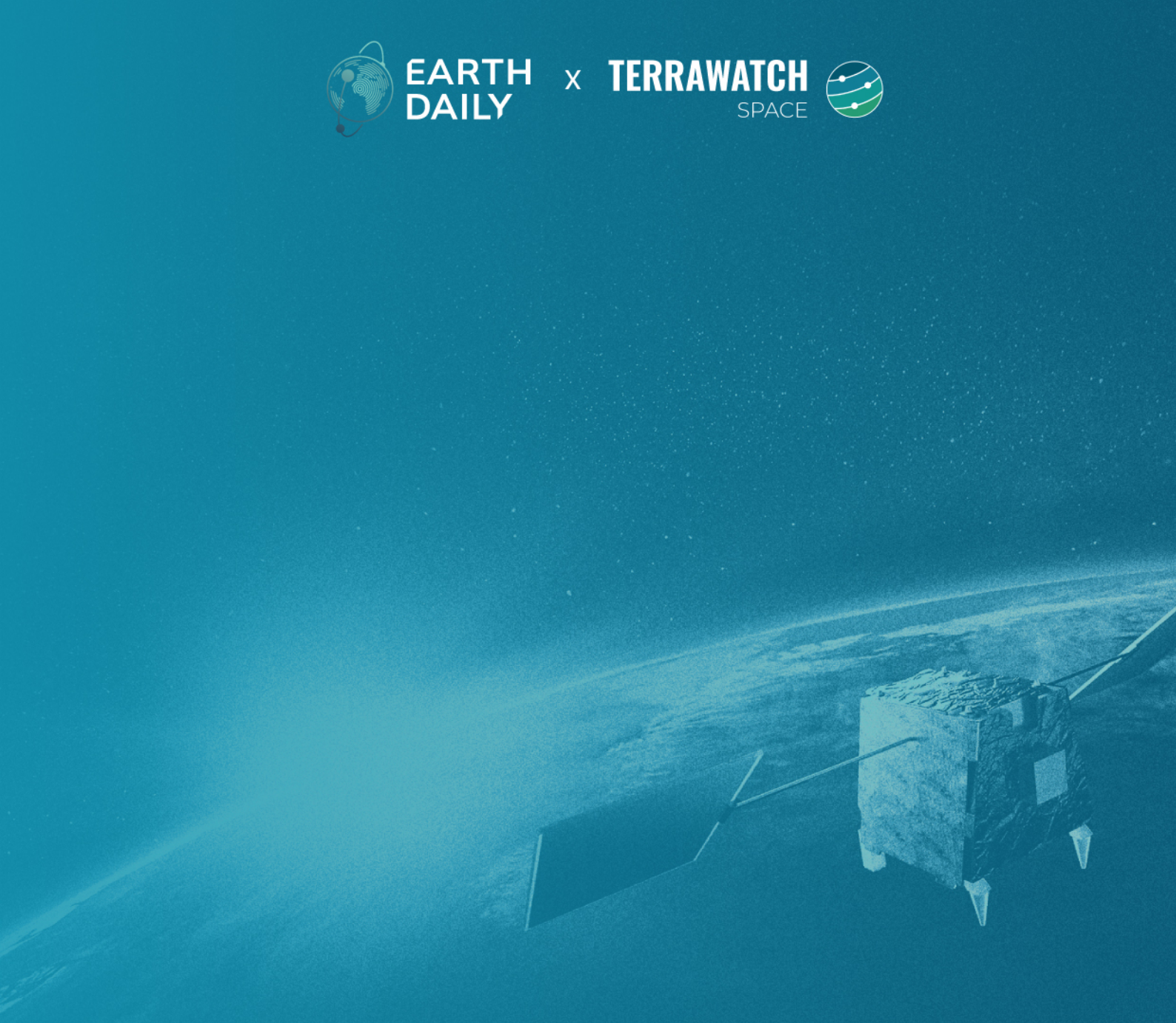
EARTH DAILY x TERRAWATCH SPACE



WHITE PAPER

AI-Ready Earth Observation Data

Increasing the Value and Adoption of EO with AI-Ready Data

Context

STATE OF ADOPTION OF EARTH OBSERVATION

From advancing research to supporting sustainable development, satellite data empowers progress across science, industry, society, and the environment.

Currently, over 1,300 Earth observation (EO) satellites are active in orbit [1], acquiring hundreds of terabytes of data daily—Copernicus alone contributes 16 TB per day via its Sentinel missions [2]. Over the past decade, commercial EO operators have proliferated, deploying constellations with diverse sensing capabilities, driven by developments in the NewSpace ecosystem. As of 2025, more than 75 companies have launched or plan to launch EO satellites [3].

However, despite increased data availability, adoption outside the public sector—primarily civilian and defense applications—remains limited. The private sector, spanning domains such as finance, agriculture, energy, insurance, and climate services, continues to underutilize EO data. While open data programs like Landsat and Copernicus have gained significant traction and delivered substantial economic value [4], commercial EO data has seen comparatively slower uptake. This can be partly attributed to the accessibility and consistency of open data products, which often serve as entry points for enterprise use, despite offering lower spatial, temporal, or spectral resolution than commercial alternatives.

EO ADOPTION FACTORS

In general, the major enabling factors influencing the adoption of commercial EO data are:

TOTAL COST OF OWNERSHIP

(i.e. cost to user)

representing the overall investment needed by the user in order to derive value from EO

TIME TO VALUE

(i.e. value realization time)

representing how quickly a user starts seeing tangible benefits after adopting EO,

DEGREE OF UTILITY

(i.e. effectiveness of results)

representing how impactful the integration of EO has been for the organization, particularly in terms of significance of results.

While factors such as the type of satellite data, the provider, application-specific demand, and the availability of data processing tools all contribute to EO adoption, one of the most critical elements is data quality, particularly in terms of how ready-to-use it is.

1 - https://orbit.ing-now.com/
2 - https://www.esa.int/Applications/Observing_the_Earth/Copernicus/25_times_Copernicus_made_the_headlines
3 - https://newsletter.terrawatchspace.com/last-week-in-earth-observation-january-20-2025/
4 - https://www.usgs.gov/news/featured-story/landsats-economic-value-increases-256-billion-2023

AI-Ready EO Data

COMMERCIAL EO ADOPTION: STATUS QUO

As shown in the figure on the next page, the current EO value chain typically begins with post-launch calibration of remote sensing instruments, followed by extensive time and resources spent transforming raw data into analysis- and fusion-ready products. While effective to date, this workflow introduces major adoption barriers—namely, high costs, long processing timelines, and reduced reliability of outputs (e.g., false positives/negatives), often due to post-launch instrument characterization.

Interoperability remains a challenge, both across similar sensors from different providers and between diverse instruments. Though multi-sensor fusion products are emerging, they require substantial time and investment.

The lack of standards further complicates the process of combining data from different instruments, forcing users to rely on proprietary or custom-built systems—slowing enterprise-scale adoption.

As the number of commercial EO satellites and the volume of data they generate grow rapidly, users face added difficulty in deciding which datasets are relevant to their needs before committing time and resources. As a result, while open EO data, with higher reliability, quality and accessibility continues to see increased adoption, the uptake of commercial EO data by enterprises has lagged, as evidenced by revenue trends in the sector.

TOWARDS AI-READY DATA

With the number of EO satellites expected to triple over the next decade [5], the EO sector should evolve towards making data AI-ready i.e. one that is designed for seamless integration with artificial intelligence systems that are increasingly delivering faster, more scalable, and more reliable insights.

Ongoing discussions within the EO community focus on defining what constitutes analysis-ready data (ARD) for both human and machine use. Criteria such as radiometric accuracy, spectral response, detector characteristics, nonlinearity, viewing angles and signal-to-noise ratio are central to these definitions. Organizations like the Committee on Earth Observation Satellites (CEOS) continue to lead efforts to standardize ARD specifications [6].

While ARD standards defined through scientific methodologies are essential for dataset harmonization, defining and developing AI-ready datasets, which are optimized for automation, offers a more future-proof path for the EO sector. For instance, the definition of AI-ready EO data could include aspects related to improved consistency in acquisition times and orbital parameters that would reduce spectral variability caused by changing sun angles, atmospheric conditions, or even daily variability in temperature or other environmental factors. This builds on the success of programs like Landsat and Sentinel, which have consistently delivered high-quality, analysis-ready data and supported scalable EO adoption.

The figure on the next page outlines a reimagined EO value chain, where pre-launch calibration and automated pre-processing result in data that is immediately usable. This reduces time to value, lowers resource requirements for end users, and improves overall utility—laying the groundwork for wider adoption of commercial EO data in AI-driven applications.

5 - https://nova.space/press-release/earth-observation-satellites-set-to-triple-over-the-next-decade/
6 - https://ceos.org/ard

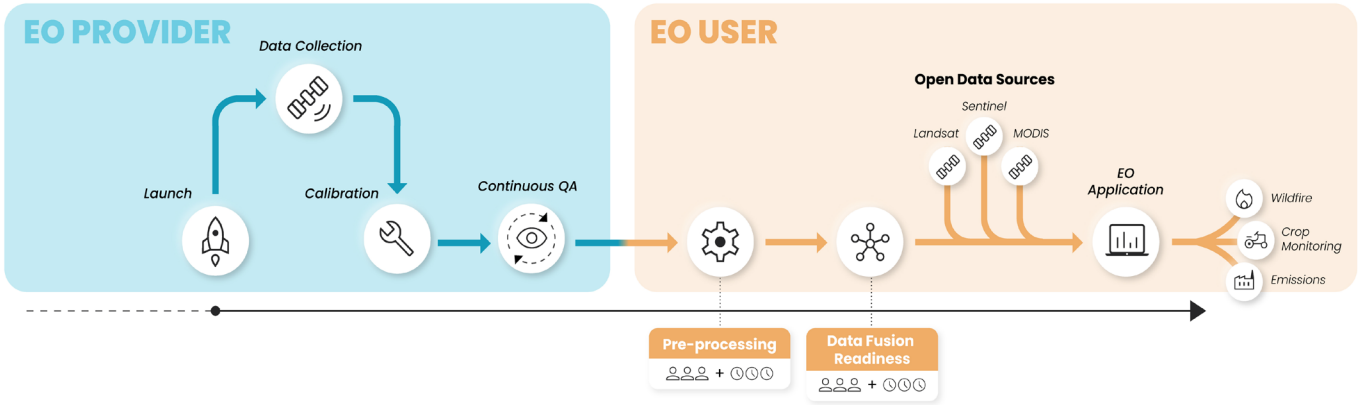
Commercial EO Adoption

STATUS QUO VS AI-READY EO DATA VALUE CHAIN

Status Quo

In most cases, status quo involves the launch of the satellite by the commercial EO provider followed by calibration of the remote sensing instrument performed after launch. This data is then delivered to the user, who invests significant time and resources to perform pre-processing tasks, in addition to making the data fusion-ready to be able to combine with open data sources. Finally, after this extensive preparation, the data is ready for processing and translating into insights for various applications.

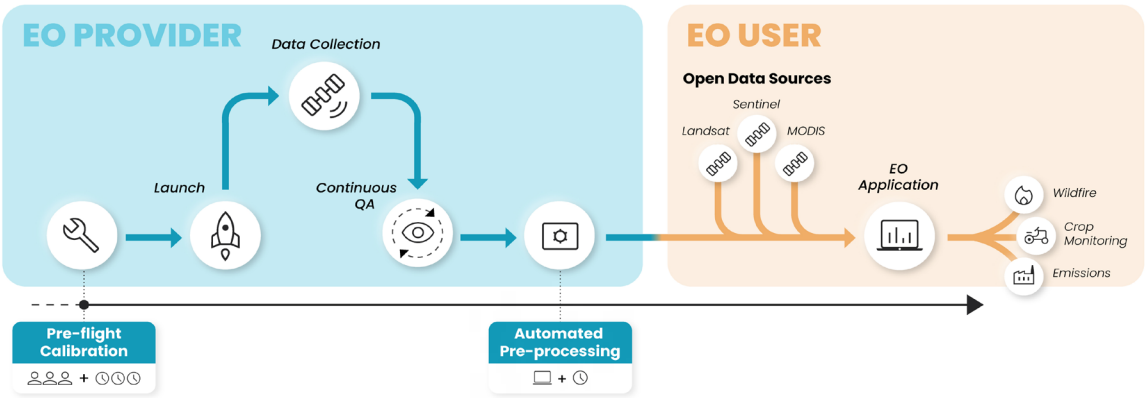
- HIGH COST TO USER
- HIGH TIME TO VALUE
- SELECTIVE ADOPTION



AI-Ready EO

The AI-Ready scenario involves the commercial EO provider performing calibration of the remote sensing instrument before the launch, followed by continuous quality control and automated pre-processing after data collection. This means that the user can then readily fuse the commercial EO data with open data sources and proceed directly to application, significantly reducing the time and resources needed to derive value from EO.

- LOW COST TO USER
- LOW TIME TO VALUE
- INCREASED ADOPTION



Benefits of AI-Ready EO

The benefits of moving towards AI-ready EO data have implications across multiple use cases, as described below. Applications that are based on detecting changes over time require datasets that have been carefully pre-calibrated and subject to standard pre-processing techniques, in order to suffer from fewer unforeseen variations and hence, lead to fewer false positives/negatives. Moreover, high-quality data is a key requirement for deep learning applications that require training datasets that are harmonious and accurately labeled for object detection applications. For instance, data from missions like the EarthDaily Constellation, which standardizes imaging times and angles globally, could enable consistent multi-temporal, multi-modal analysis by minimizing artifacts from daily variability.

INDUSTRY-SPECIFIC APPLICATIONS

Crop monitoring

The use of AIRD enables accurate crop classification due to consistent spectral analysis, dependable crop stress monitoring as a result of temporal consistency, large scale monitoring for insurance underwriting and seamless fusion of multiple data sources required for crop yield predictions.

Wildfire detection

Adoption of AIRD allows fire managers, researchers, and commercial users to directly integrate satellite data into fire monitoring systems' real-time response by enabling rapid active fire detection, mapping burned areas for assisting recovery efforts and multi-temporal analysis of vegetation regrowth and ecosystem management to support restoration activities.

Emission monitoring

AIRD reduces the time and effort for extensive pre-processing, allowing researchers, regulators, and enterprises to reliably derive insights such as improved source attribution thanks to spatial and spectral consistency as well as accurate emission quantification due to the use of pre-calibrated data that increases the reliability of retrieval algorithms.

BROADER APPLICATIONS

Geospatial Foundational Models

In addition to improving the effectiveness of EO in specific applications, the benefits of AIRD extend to broader, far-reaching applications. High-quality EO data is vital for building geospatial foundation models (GFM) that require radiometrically calibrated, spatially consistent, and temporally stable datasets, such as Landsat and Sentinel.

Data inconsistencies or misalignments can degrade model performance in tasks like land cover classification, change detection, and object recognition. AI-ready commercial EO datasets can enhance the performance of GFMs by providing high-fidelity data that could increase model accuracy and generalizability, particularly for localized or high-frequency monitoring applications.

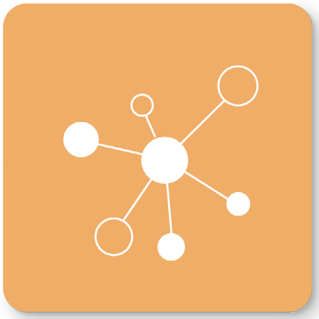
Future of EO with AIRD

While the integration of AIRD will improve several applications of EO, it is also expected to create wider impacts across the EO sector, not only improving its adoption and creating value for users but also to contribute to much-needed revenue growth for the industry.

Increased RoI for EO

Given that the fundamental principle behind AIRD is focused on reducing the time and costs required for users to start deriving value from EO data, the return on investment (RoI) is expected to be higher than the status quo, which involves significant investment from the user.

This is especially relevant for larger enterprises that did not use EO previously and are creating EO-based workflows for the first time, as well as smaller enterprises that otherwise would not have been able to leverage EO.



Improved Adoption of EO

Making EO AI-ready eliminates the need for specialized pre-processing expertise, making EO data more accessible to non-expert users across industries and easier to integrate into existing workflows, business systems, and analytical platforms.

Given the reduced investment needed and the proliferation of AI-based processing techniques, the introduction of AIRD will give organizations more confidence to invest in EO-based solutions, decreasing the perceived risk and increasing willingness to experiment.

Evolution of EO Business Models

As AIRD improves the consistency and quality of EO data, users are likely to extract greater value from a larger proportion of acquired data, leading to increased utility and better results for organisations deploying EO-based solutions.

This enhanced utility supports a shift away from traditional high-volume data sales, which is the status quo, towards pay-per-use or outcome-driven business models, which lower entry barriers and can significantly boost long-term adoption of EO.

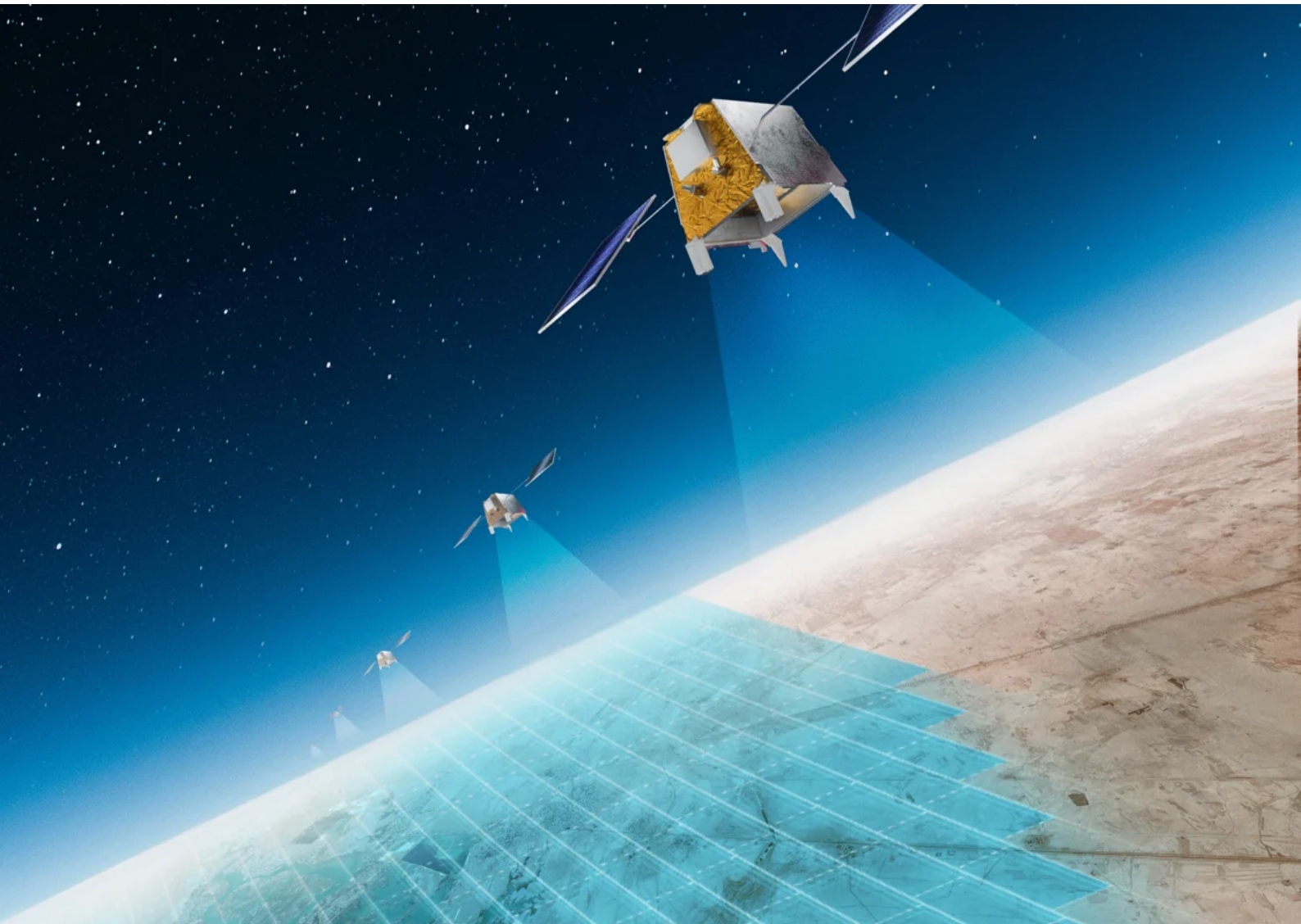
EarthDaily Analytics

ENABLING AI-READY EARTH OBSERVATION DATA

EarthDaily Analytics is at the forefront of transforming the Earth Observation space through the delivery of inherently AI-ready data through its new EarthDaily Constellation by providing new capabilities inherent in modern analytics. Our systems are built to allow for improved radiometric performance - and we define this as a repeatable radiometric response that establishes a consistent radiometric baseline for reliable change detection and AI/machine learning applications.

Our spectral bands intentionally align with heritage bands from Landsat and Sentinel-2 and tap into the massive breadth of existing AI models, while providing improved resolution, revisit frequency, and market-leading cloud masking. By engineering pre-launch calibration and automated standardization into our data pipeline, we eliminate the preprocessing burden that slows traditional EO workflows, allowing organizations to focus on deriving insights rather than preparing data.

From precision agriculture and real-time methane monitoring, EarthDaily's optimized datasets improve the time-to-value for AI applications while ensuring the underlying quality meets standards expected for foundational geospatial models.



EarthDaily Analytics is a global leader in Earth Observation providing actionable insights and data that empower industries and governments to make informed decisions for a more resilient future. With the launch of its groundbreaking EarthDaily Constellation this year, the company is revolutionizing how we monitor, understand, and interact with our planet.

Learn more about EarthDaily

TerraWatch Space is a strategic advisory and communication firm exclusively focused on the Earth observation (EO) sector, working with public and private organizations globally on strategic, commercial, marketing policy-related and due diligence assignments.

Founded by Aravind Ravichandran, a recognized expert and communicator in the Earth observation (EO) and wider space industry, TerraWatch has experience delivering go-to-market and positioning studies, commercial strategy and due diligence assignments for startups, large enterprises, space agencies and investors. In addition, TerraWatch publishes a weekly newsletter that provides analysis and insights on the EO sector and the applications of satellite data.

Learn more about TerraWatch