

# The Role of Technological Innovation in the Earth Observation Enterprise

How AI is Expanding the Use of Earth Observation Data



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Dec, 2025

# The Challenge: From Data Overload to Actionable Intelligence

## The Challenge



The Earth observation community faces a deluge of data from a growing number of sources.

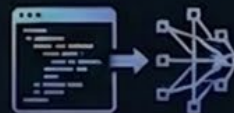
A key challenge is unifying this complex, multi-modal information to make it useful.

## Google's Approach: Foundational AI for Science

Across Google, research teams are developing new AI to help. Two key innovations are:



**Foundational models for Earth:** a model that acts like a virtual satellite, integrating petabytes of data into a unified digital representation.



**AI Research Assistants:** Systems that act as a "code-optimizing research engine," autonomously writing and testing thousands of empirically verifiable software variations to solve complex problems.



# From Unified Data to Accelerated Discovery

## Unifying Planetary Data with Foundation Models:



Compact, consistent “**embeddings**” from dozens of public sources (optical, radar, 3D mapping, etc.)

**Impact:** This enables partners to use the resulting **Satellite Embedding** dataset to map uncharted ecosystems, helping countries better prioritize conservation

## Accelerating Discovery with AI Research Assistants:



System can take on a well-defined scientific problem and generate expert-level software to solve it.

Approach can **discover novel solutions**



# The Future: An Integrated & Actionable Earth Observation Enterprise



## A New Paradigm

The convergence of these technologies points to a future where Earth observation is more integrated and actionable.



## Vision for Cross-Sector Collaboration



Imagine a system where organizations can ask complex questions and received AI-enabled insights that are verifiable and interpretable.



This directly enables the "future resilient and globally integrated Earth observation system" by creating a common, intelligent platform for collaboration.



# Shaping the Future of Observation with AI

From Instrument-Centric to Insight-Centric Planning:

Instrument-Centric



- **The Shift:** Instead of focusing on perfecting single, monolithic instruments, we can design flexible, heterogeneous systems of diverse sensors (space-borne, airborne, in situ).

Insight-Centric



- **How AI Enables This:** AI-driven data fusion is key. Foundational models are built to integrate disparate data types—optical, radar, climate simulations, and more—into a single, unified view.
- This provides resilience and eases the challenge of ensuring continuity across different instruments.