



# An Introduction to NASA's Catalog of Archived Suborbital Earth Science Investigations (CASEI)

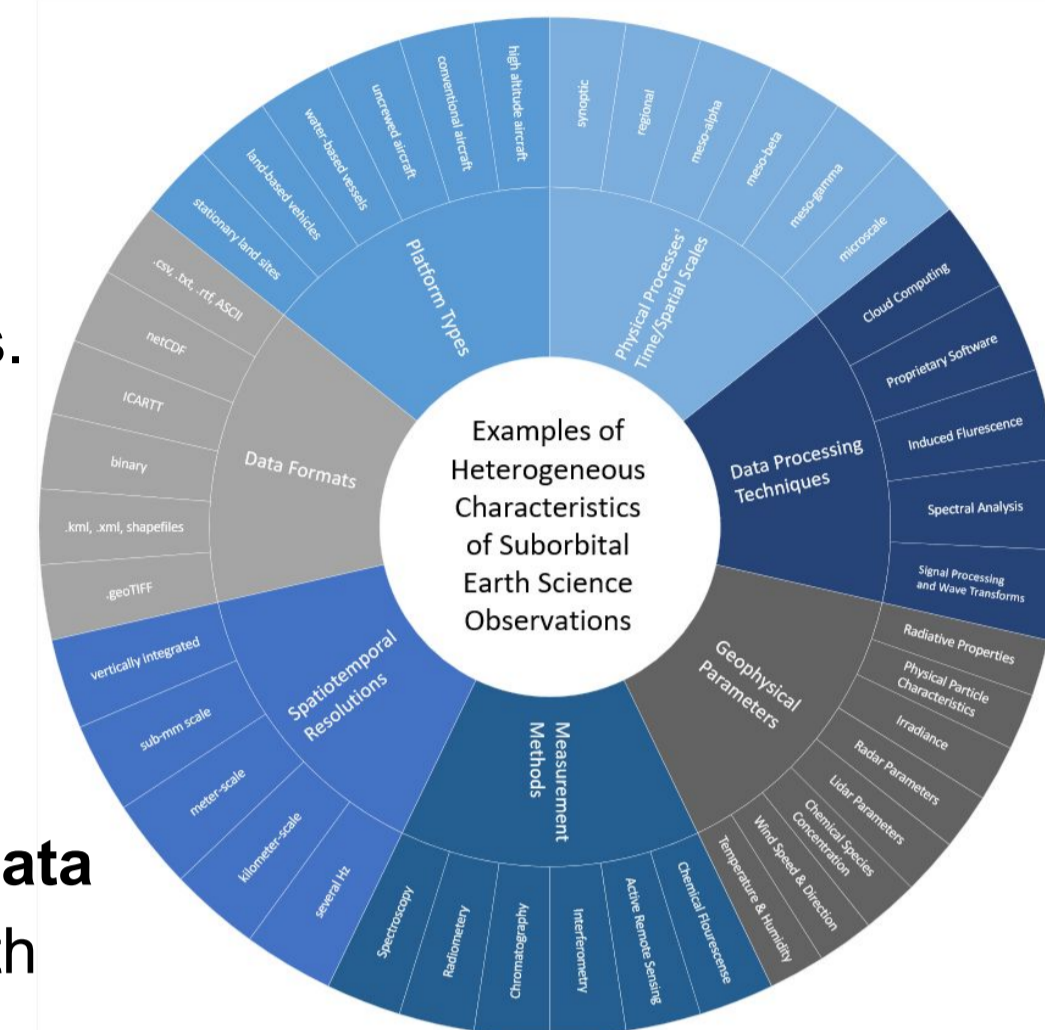
Stephanie M. Wingo<sup>1</sup>, Deborah Smith<sup>1</sup>, Carson Davis<sup>1</sup>, Shelby Bagwell<sup>1</sup>, Heidi Mok<sup>2</sup>, Ed Keeble<sup>2</sup>, Tammo Feldmann<sup>2</sup>, Anthony Lukach<sup>2</sup>, Elijah Walker<sup>3</sup>, Alice Rühl<sup>2</sup>, Camille Woods<sup>1</sup>, Ashlyn Shirey<sup>1</sup>, Jillian Ethridge<sup>1</sup>, and Rahul Ramachandran<sup>4</sup>

Contact: [Stephanie.M.Wingo@nasa.gov](mailto:Stephanie.M.Wingo@nasa.gov)



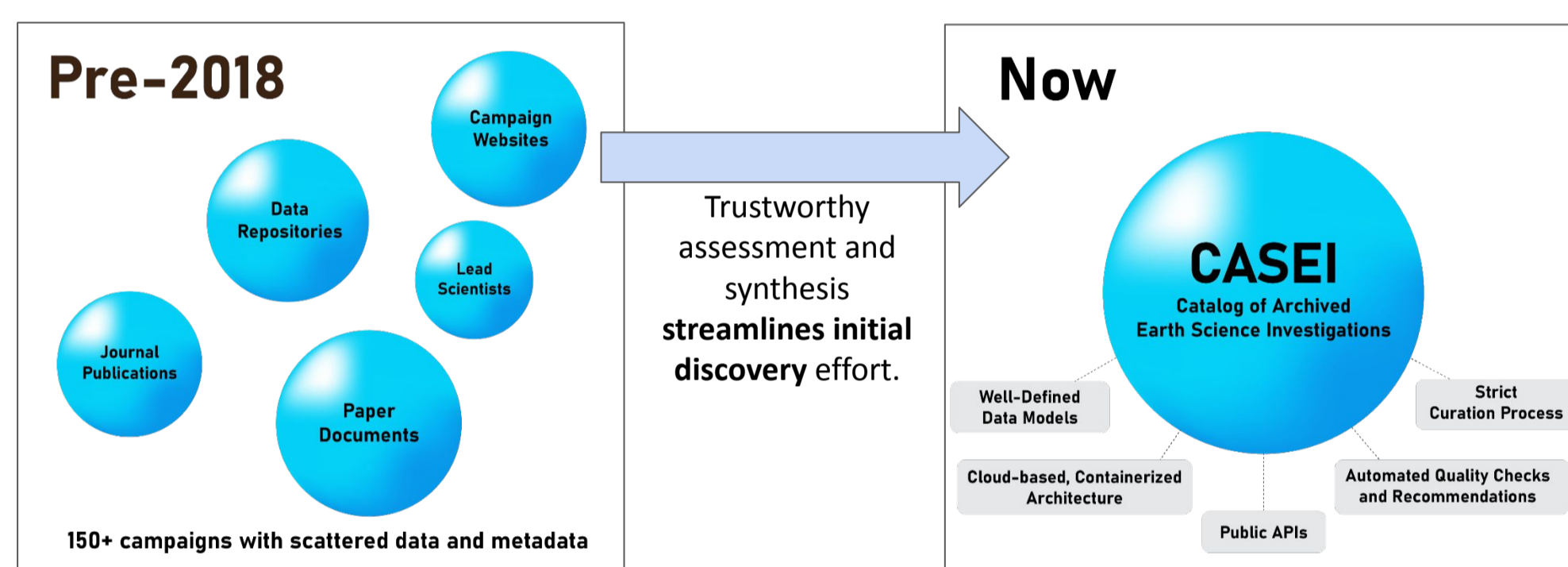
## Science Users Face Data Discovery Challenges

- Earth Science observations are from **more than just satellites!** Aircraft, land- and water-based, mobile and stationary platforms
- These data are critical for understanding physical processes and variabilities across a range of spatiotemporal scales and science domains.
- Finding and working with suborbital Earth Science data can be quite challenging:
  - ⚠ **Heterogeneity** **abounds**: data formats, resolutions, measurement methodologies, processing technologies
  - ⚠ NASA's observations **archived across several discipline-oriented data repositories** (Distributed Active Archive Centers or DAACs) - each with long-standing procedures, requirements, and data access pathways
  - ⚠ **Context is crucial** for suborbital observations, yet contextual details are traditionally **arduous and very time consuming** to locate and verify



Visualization of kinds of variety commonly encountered in suborbital Earth Science observations

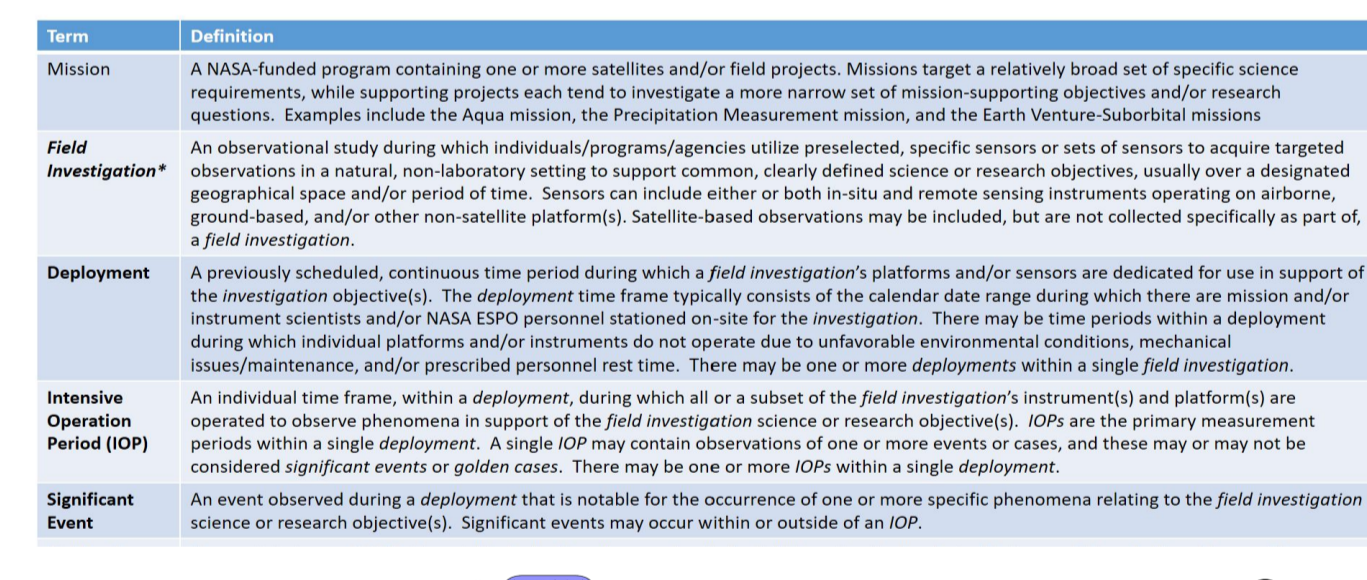
The Airborne Data Management Group (ADMG) within NASA's Interagency Implementation and Advanced Concepts Team (IMPACT) has built the **Catalog of Archived Suborbital Earth Science Investigations (CASEI)** to streamline data discovery and support science users navigating the wide variety of airborne and field observations and simplify access to NASA's data.



CASEI refines the traditionally lengthy and burdensome process of finding, vetting, and synthesizing authoritative information. This enables **more efficient initial data discovery** and can **give time back to scientists** to do science.

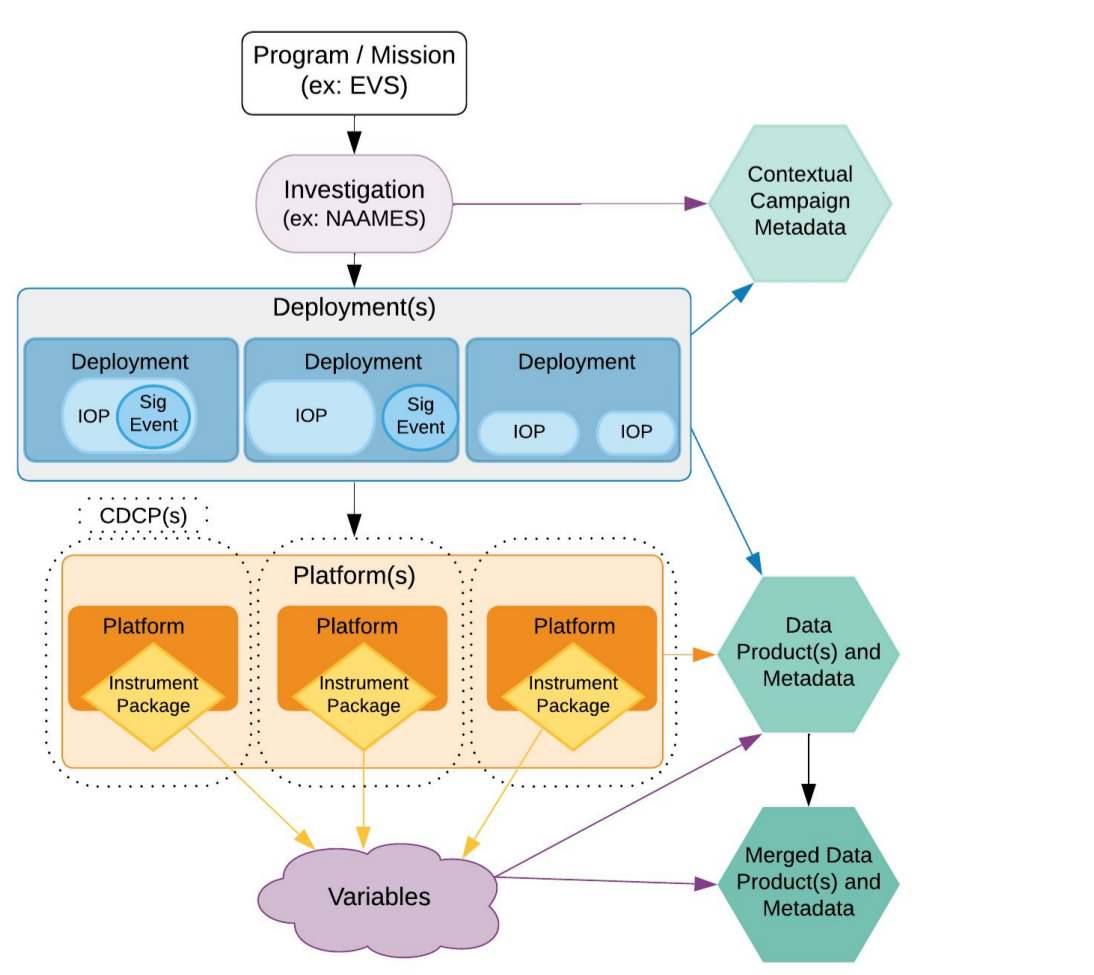
## Curation of Contextual Metadata

- Creation of the CASEI's contextual metadata inventory first faced **communication hurdles** and inconsistencies in documentation:
  - ⚠ Various stakeholders often use **different language to represent similar concepts** or **assign different ideas to identical terms**
  - ⚠ The meaning of terms can **evolve with time**, and vary by science discipline community, organization, or data stewardship roles
  - ⚠ **Relationships** among and between terms and concepts not always clearly conveyed in literature



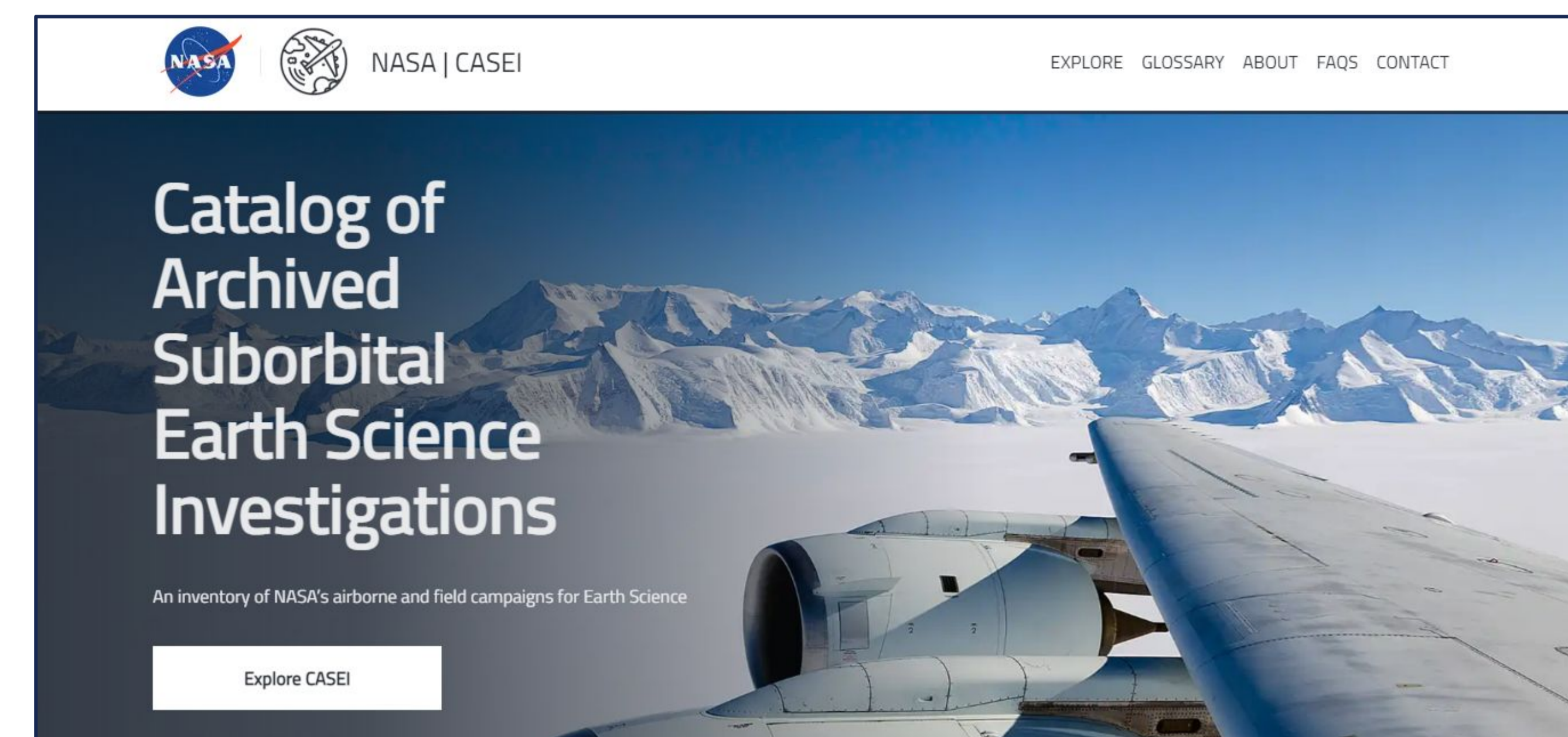
Scan for NASA ESDIS Standards Coordination Office report on stakeholder review of the CASEI definitions

Based on extensive review and input from airborne and field data community subject matter experts, ADMG established **definitions and decision trees for key concepts** within suborbital campaigns. The **CASEI field campaign data model** is structured with these terms to support both modern-era as well as historical field data collection efforts.



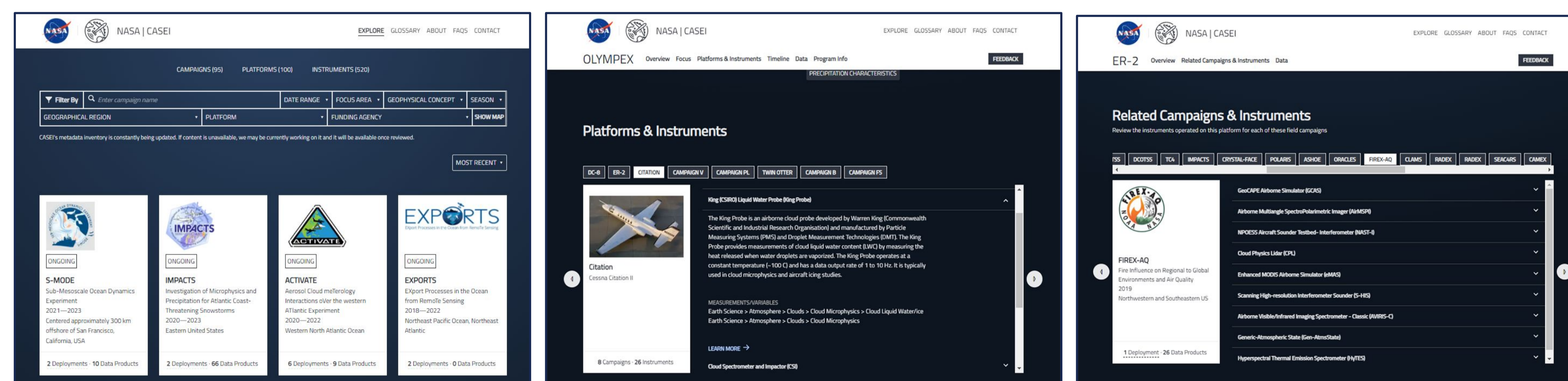
### CASEI Content Curation:

- Curation team comprised of graduate, undergraduate students and seasoned research scientists
- All curators undergo extensive training to ensure reliance on **authoritative sources** and **objective** determinations
- **Three-person vetting** of all contextual metadata
- Content organized for **synthesis and consistency**



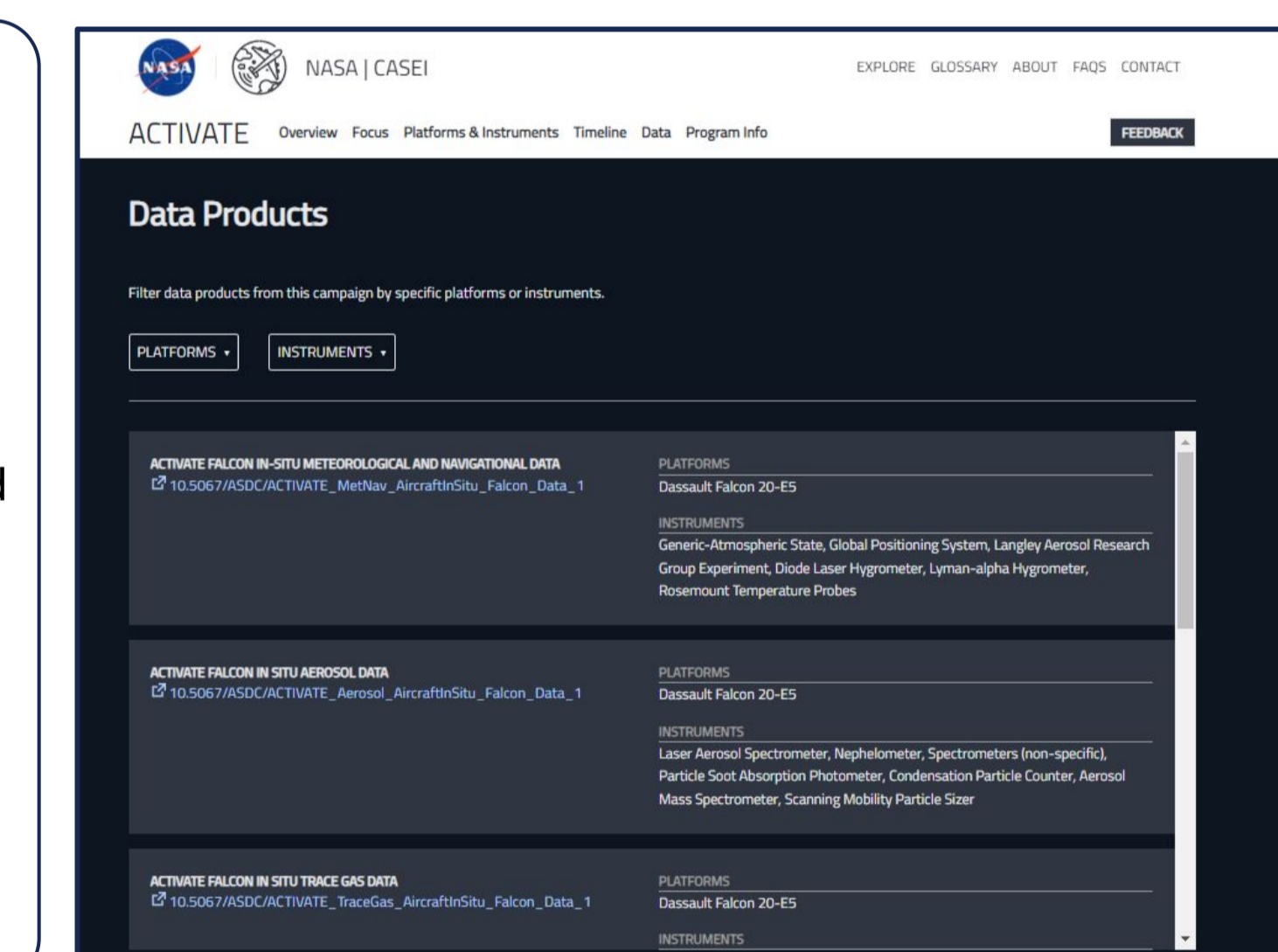
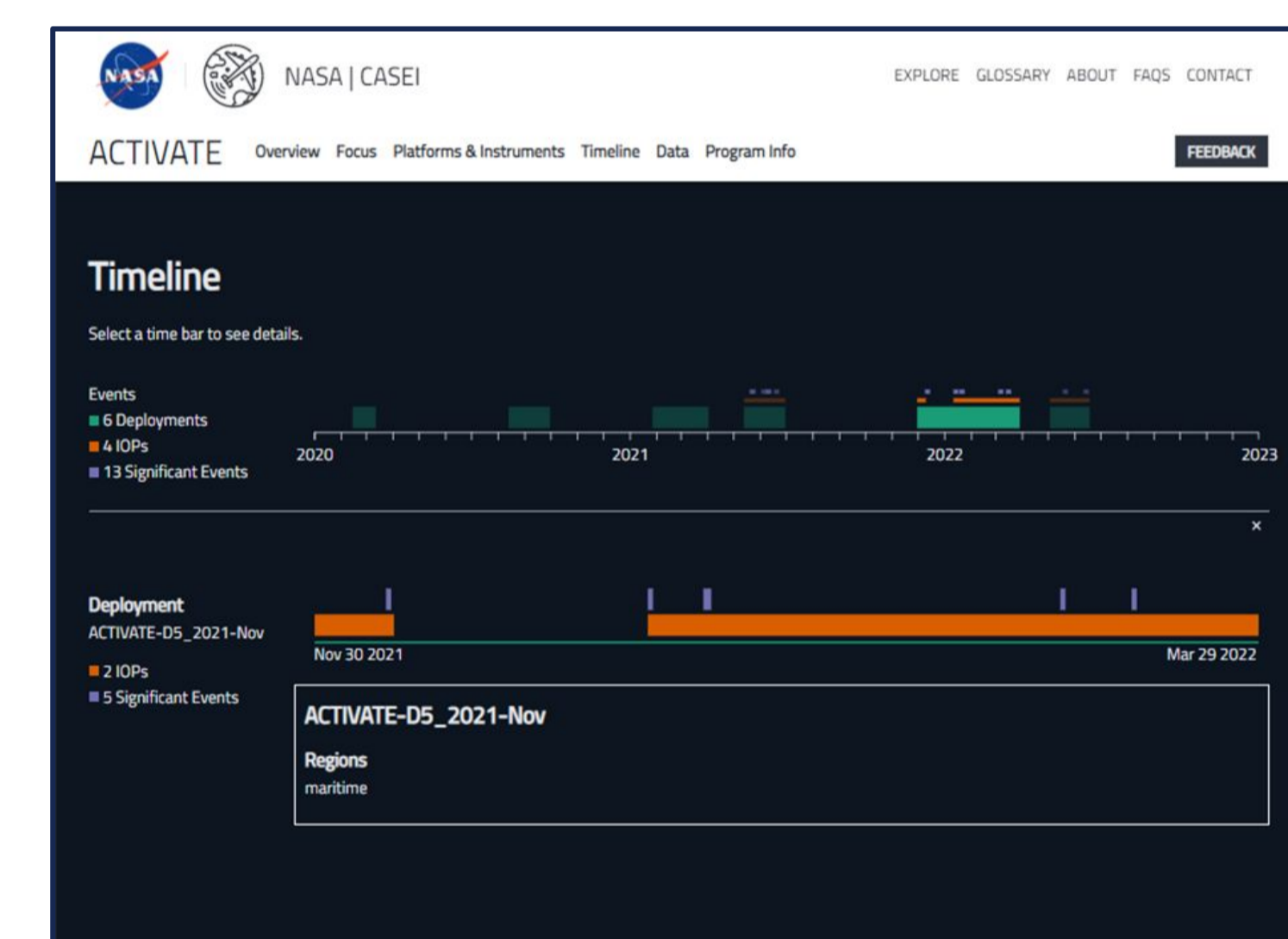
## CASEI Enables Efficient, Intuitive Data Discovery, Context, and Access for Suborbital Earth Science Observations

← Explore CASEI now!

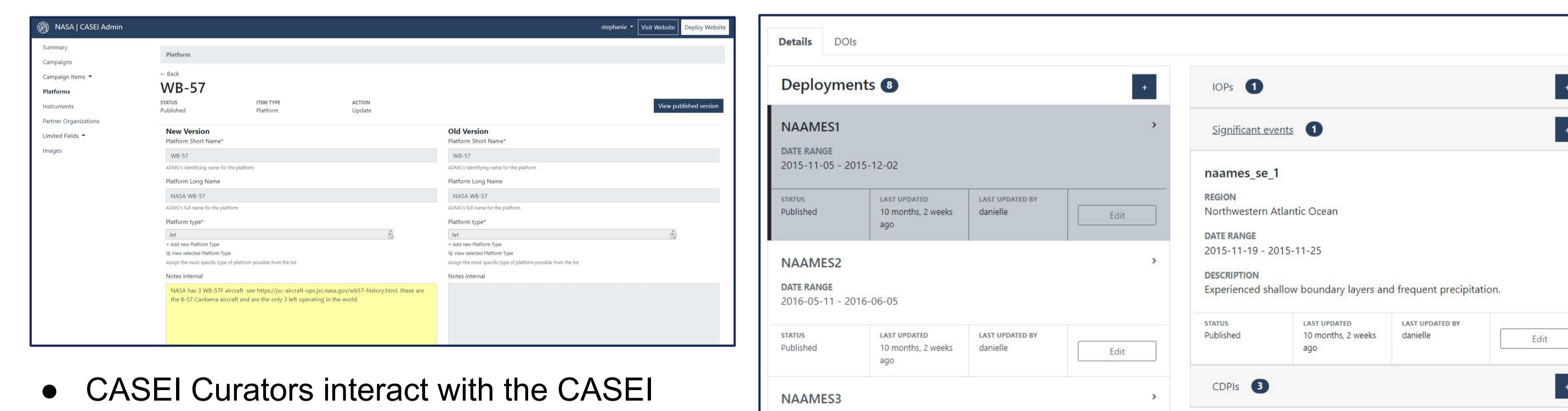


### Some parts of CASEI's public website:

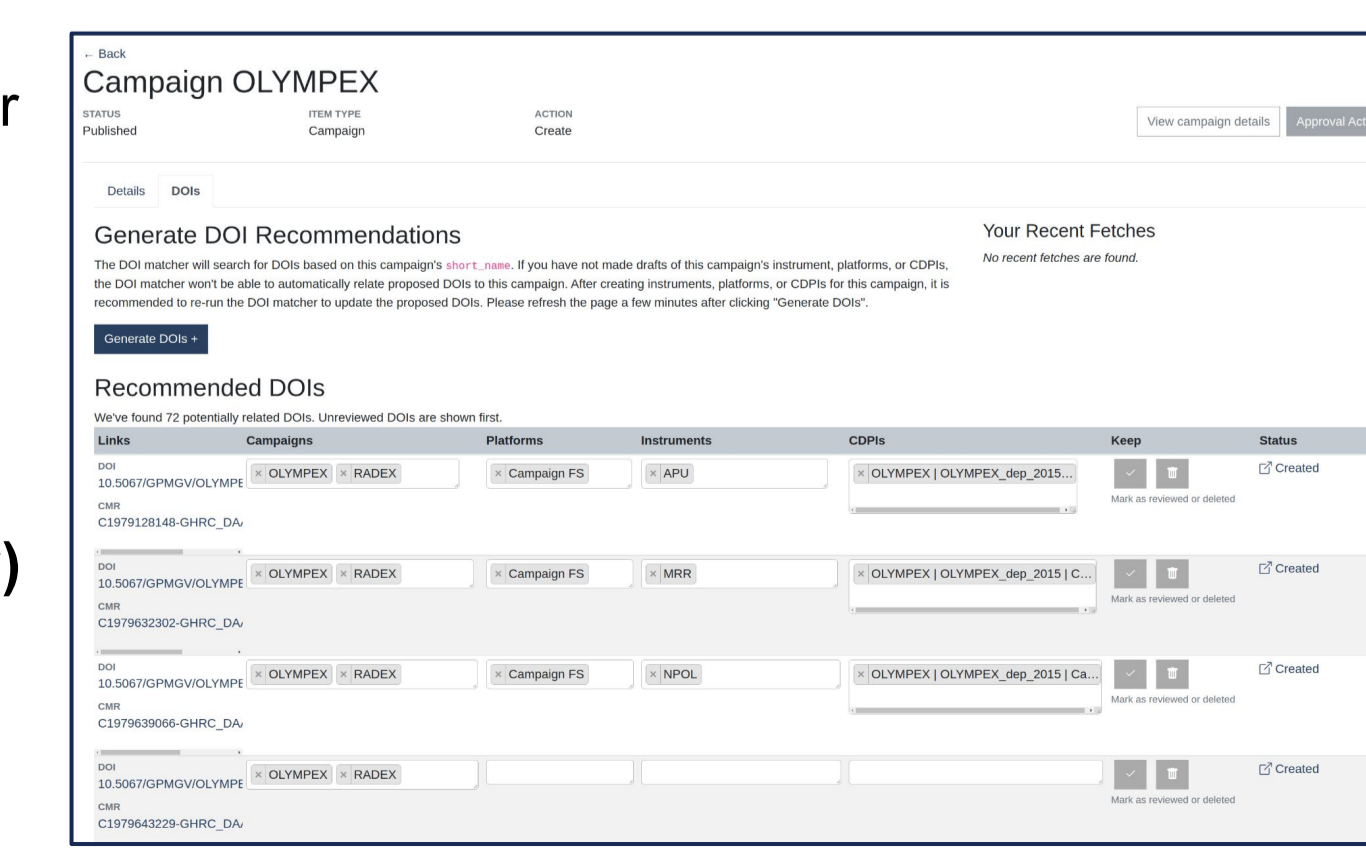
- **Explore Page** for high level browsing of Campaigns, Platforms, Instruments
- **Platform & Instruments** section of Campaign pages shows instrument packages within the campaign
- **Campaigns & Instruments** section of Platforms page shows variety of instrument packages employed
- **Timeline** section on Campaign pages gives broad view of when deployments occurred and key events with data relevant to campaign science objectives
- **Data Products** section: Present on Campaign, Platform, Instrument pages, allows nimble filtering of data products, gives quick access via DOI links, regardless of the repository holding the data



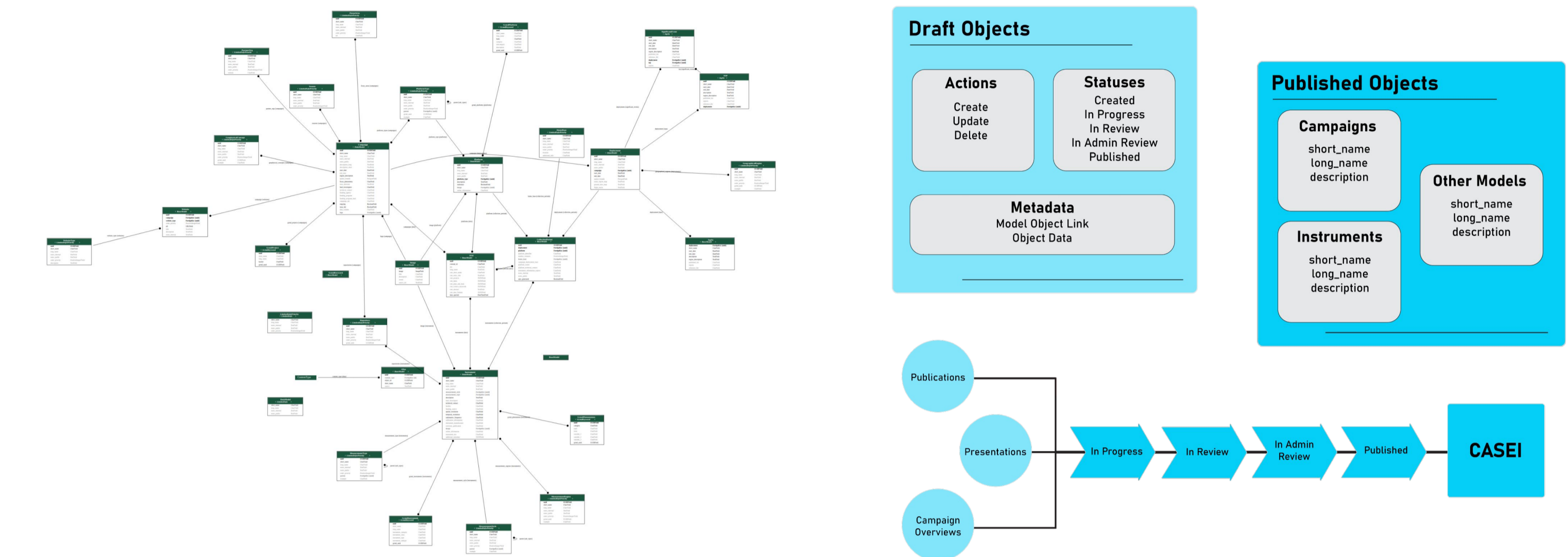
## Maintenance Interface (MI)



- CASEI Curators interact with the CASEI relational database via a **purpose-built MI**
- **Dashboard** organizes campaign metadata forms for various information levels
- Provides curators an **intuitive view of updates** to existing database records, while tracking occurs within the **series of drafts** (see Tech Stack section)
- **Automated CMR (Common Metadata Repository) queries** suggest data products for linking to each campaign, platform, instrument
- **Campaign - Deployment - Platform - Instrument relationships** associated with data products



## CASEI Components and Tech Stack



- CASEI metadata stored in a PostgreSQL relational database hosted on an AWS RDS instance
  - Supports the content curation and approval process
  - Managed via Python layer over Django object model backend
- Information Model - comprehensive metadata model for holistic tracking
  - Tables represent primary concepts
  - Fields capture individual metadata elements
- CASEI also includes a fully documented API
  - <https://admg.nasa-impact.net/api/docs/>



## The Future of CASEI

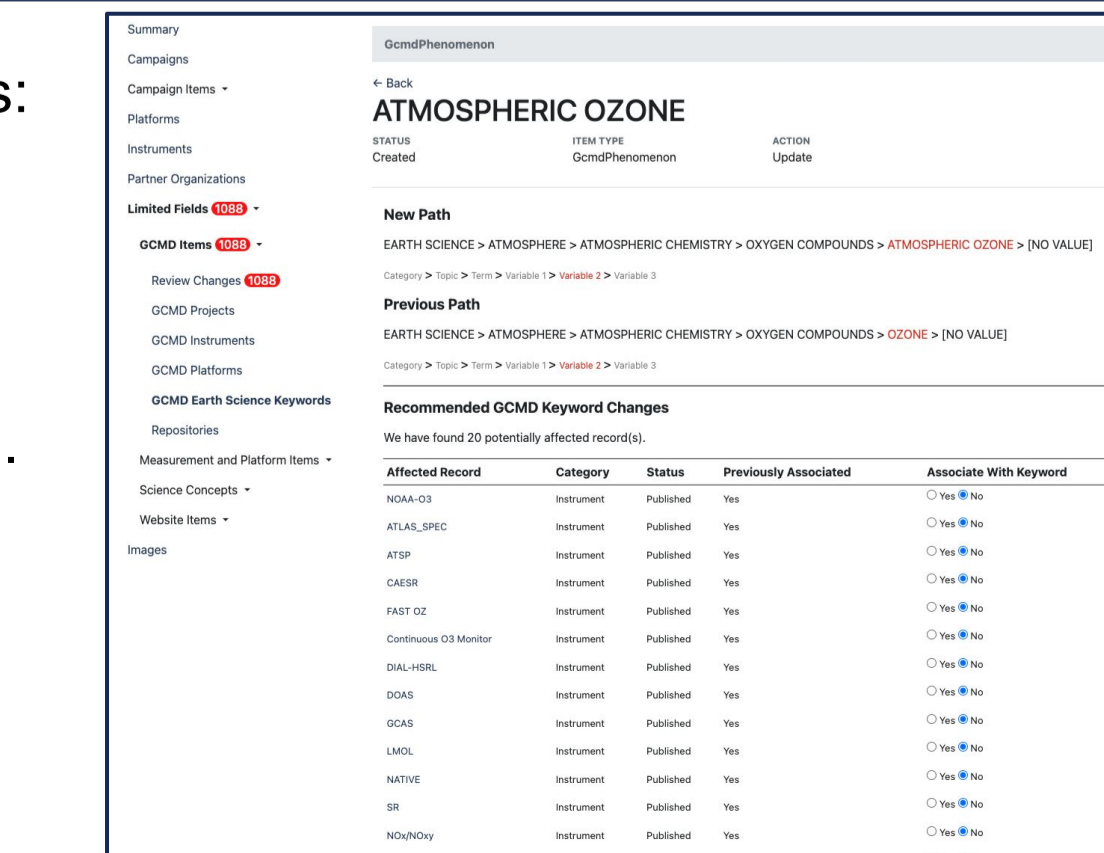
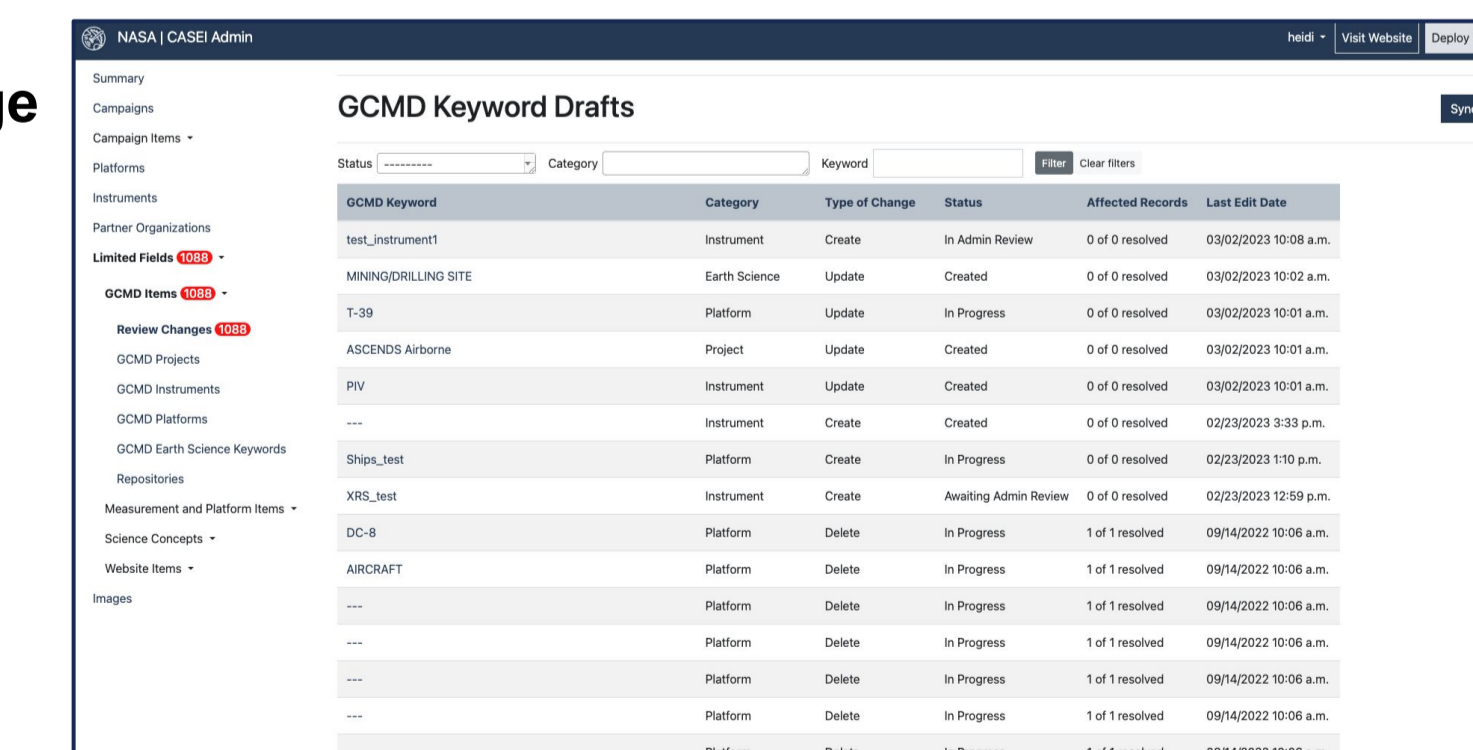


Google analytics applied to CASEI UI show global use, even prior to full (non-beta) release of the resource.

- CASEI's first public (beta) release occurred in Summer 2021
  - Initial analytics metrics indicate worldwide user audience
- Curation efforts continue to add contextual metadata for both historical and modern-era field campaigns
- Additional forthcoming improvements include:
  - Maps for platform locations / tracks
  - Even more flexible free text search capability
  - Transparent curation status updates
  - Support for determining coincident satellite overpasses

## Semi-Automated Keyword Syncing

- NASA's **GCMD (Global Change Master Directory) keywords** are a critical controlled vocabulary included in CASEI and many other scientific metadata models.
- CASEI smoothly adjusts to **periodic version updates to the GCMD keywords**
- Curators alerted to **GCMD keyword updates**:
  - **Deleted or Modified keywords**: CASEI database records associated with these are noted. Curators evaluate new associations before changes are applied.
  - **New keywords**: MI suggests potential CASEI database records to associate. Curators evaluate before changes are applied.



## Full Release of CASEI (non-beta) summer 2023!

- Curated metadata for well over half (65%) of known campaigns
- Extended details for 100 + Platforms and 500 + Instruments
- Intuitive, nimble, efficient suborbital data discovery, search, access

CASEI was born in response to user needs highlighted by the inaugural Satellite Needs Working Group Assessment Cycle. As CASEI progresses into and beyond a full official release, **ADMG and ESDS are exploring long term solutions** to support its unique metadata and discovery capability.

