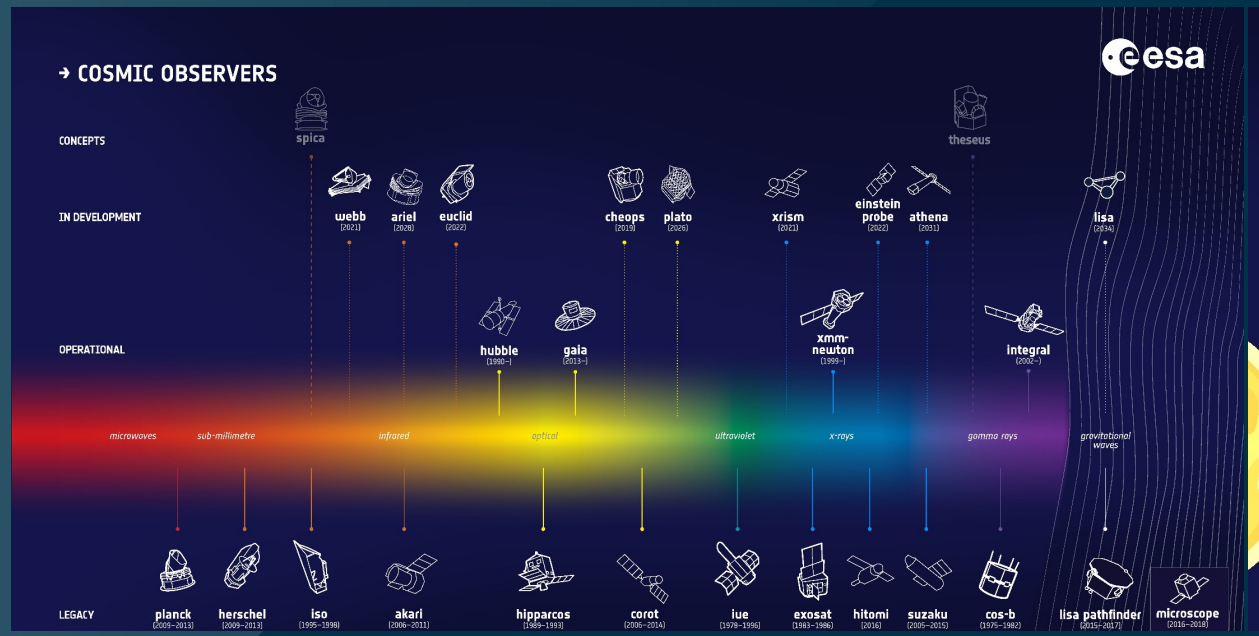
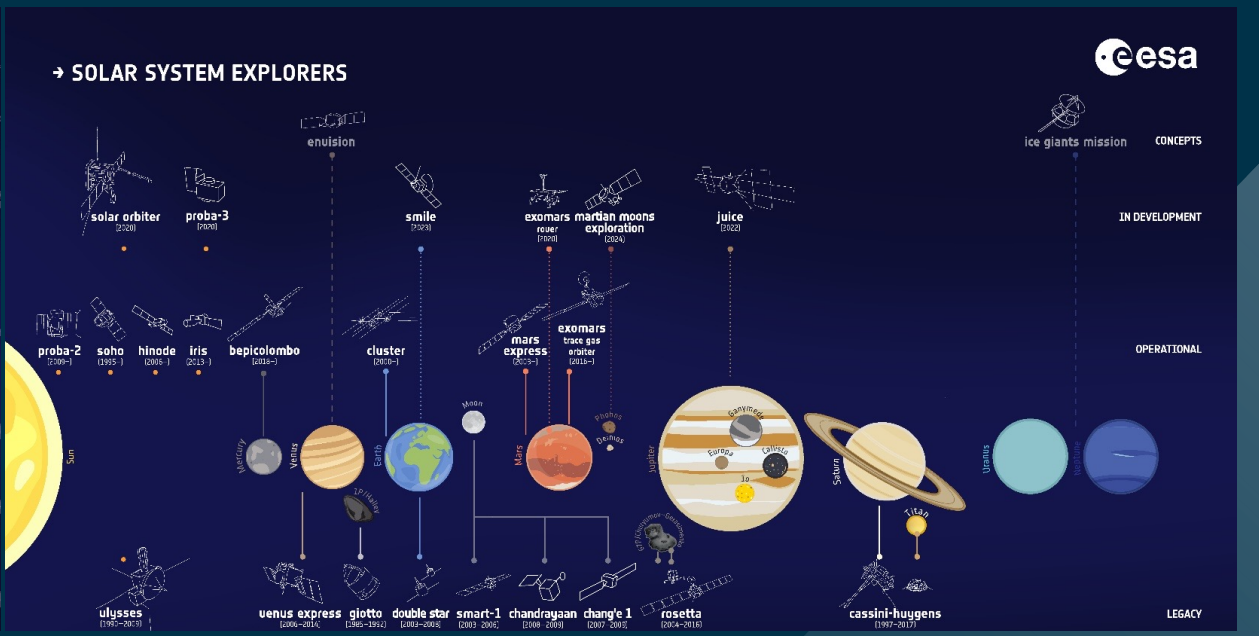
ESA Datalabs
Digital Innovation in Space Science

ESA_Labs – Vicente Navarro

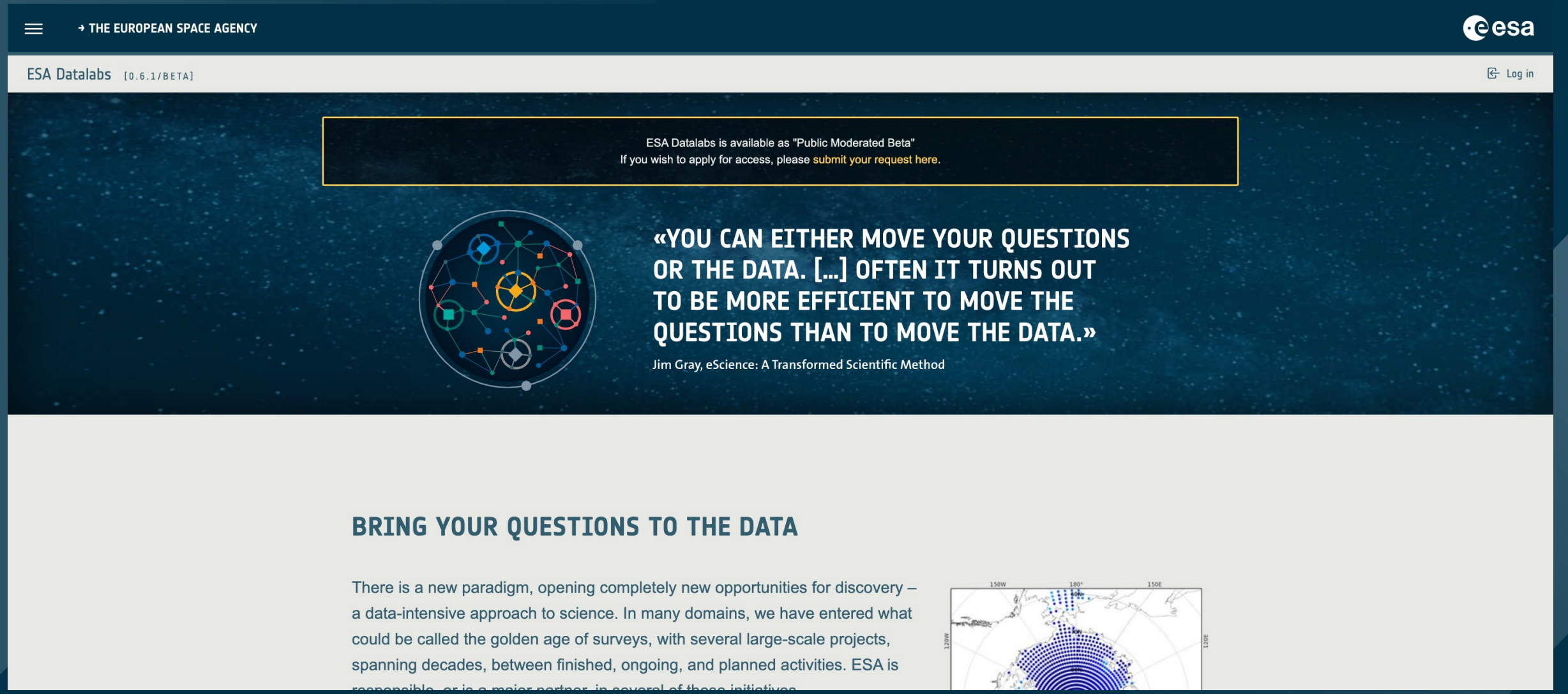
9.05.2023, Venice

Space Science Context





ESA Datalabs – datalabs.esa.int



What does ChatGPT know about ESA Datalabs?

VI

Do you know what is "ESA Datalabs"?

Yes, I'm familiar with ESA Datalabs. ESA Datalabs is a data analytics platform developed by the European Space Agency (ESA) that provides access to a wide range of satellite data and tools for data analysis and processing. The platform is designed to support researchers, scientists, and developers in their work, by providing them with access to data and tools that can help them analyze and make sense of the data they are working with. With its focus on enabling data-driven decision-making, ESA Datalabs aims to provide users with the tools they need to perform advanced data analysis and processing tasks, such as data visualization, data mining, and machine learning. The goal of ESA Datalabs is to help researchers, scientists, and developers unlock the full potential of the data they are working with and to support the development of new and innovative applications based on satellite data.

A Platform Designed to Boost Research Productivity

You can start HERE!

Science Development

System Development

IT Development

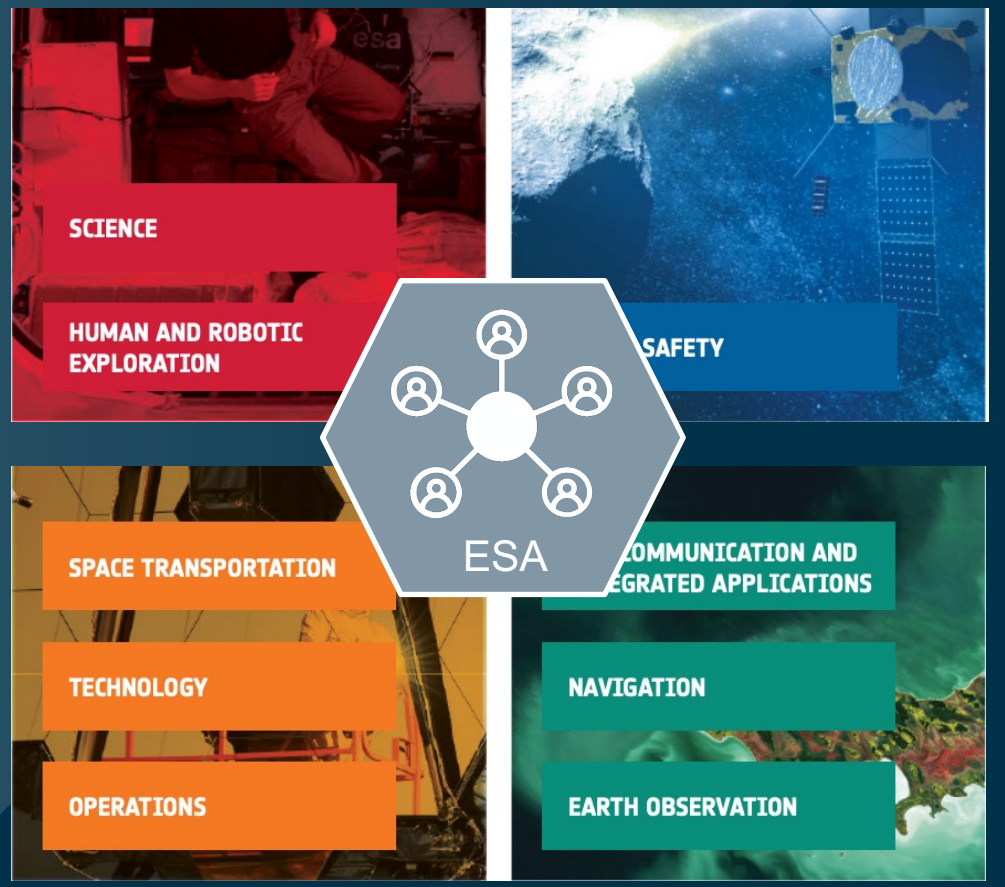
SaaS

PaaS

IaaS

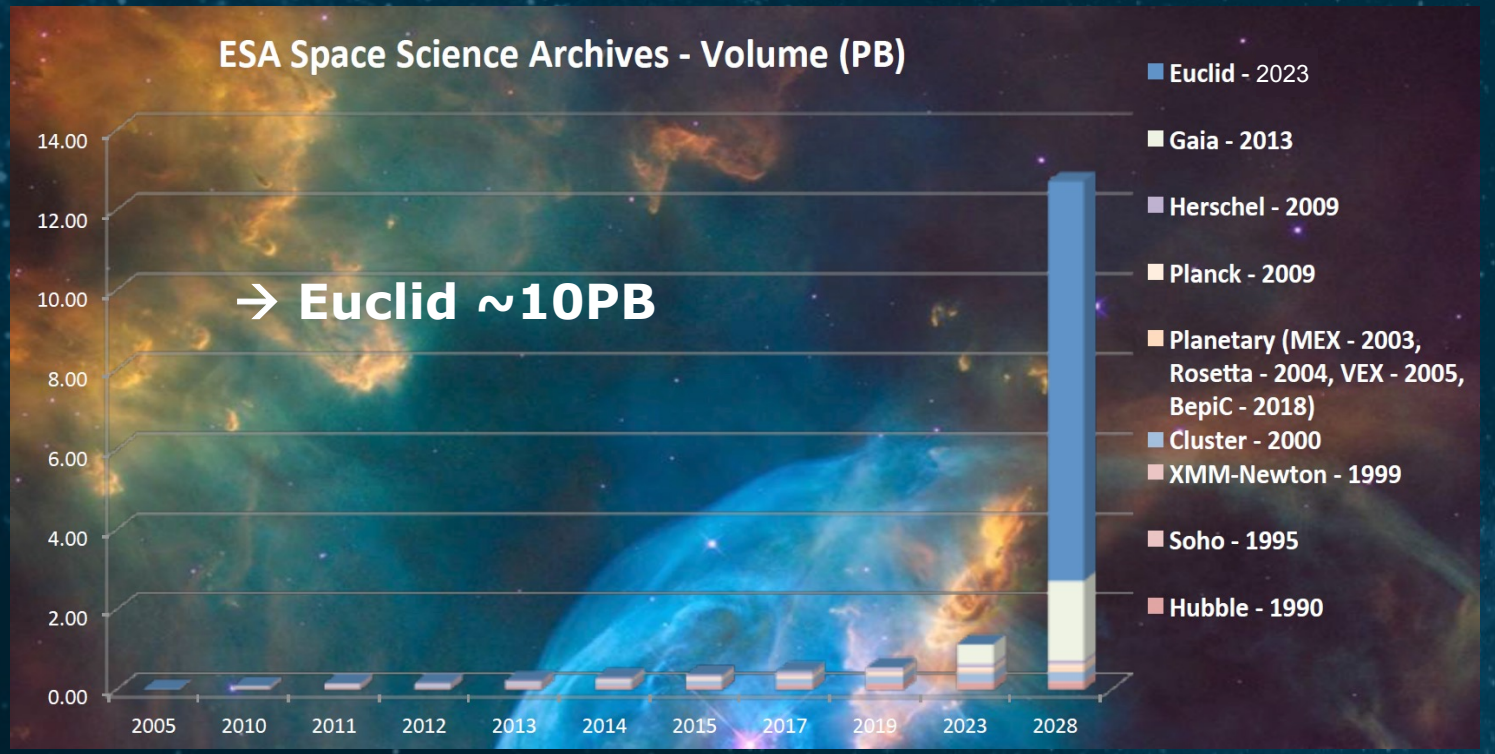
"The tools we use have a profound (and devious) influence on our thinking habits, and, therefore, on our thinking abilities"
Edsger W. Dijkstra

SCI-Driven Multi-Domain & Multi-Mission Digital Platform



Data Analysis
Innovation

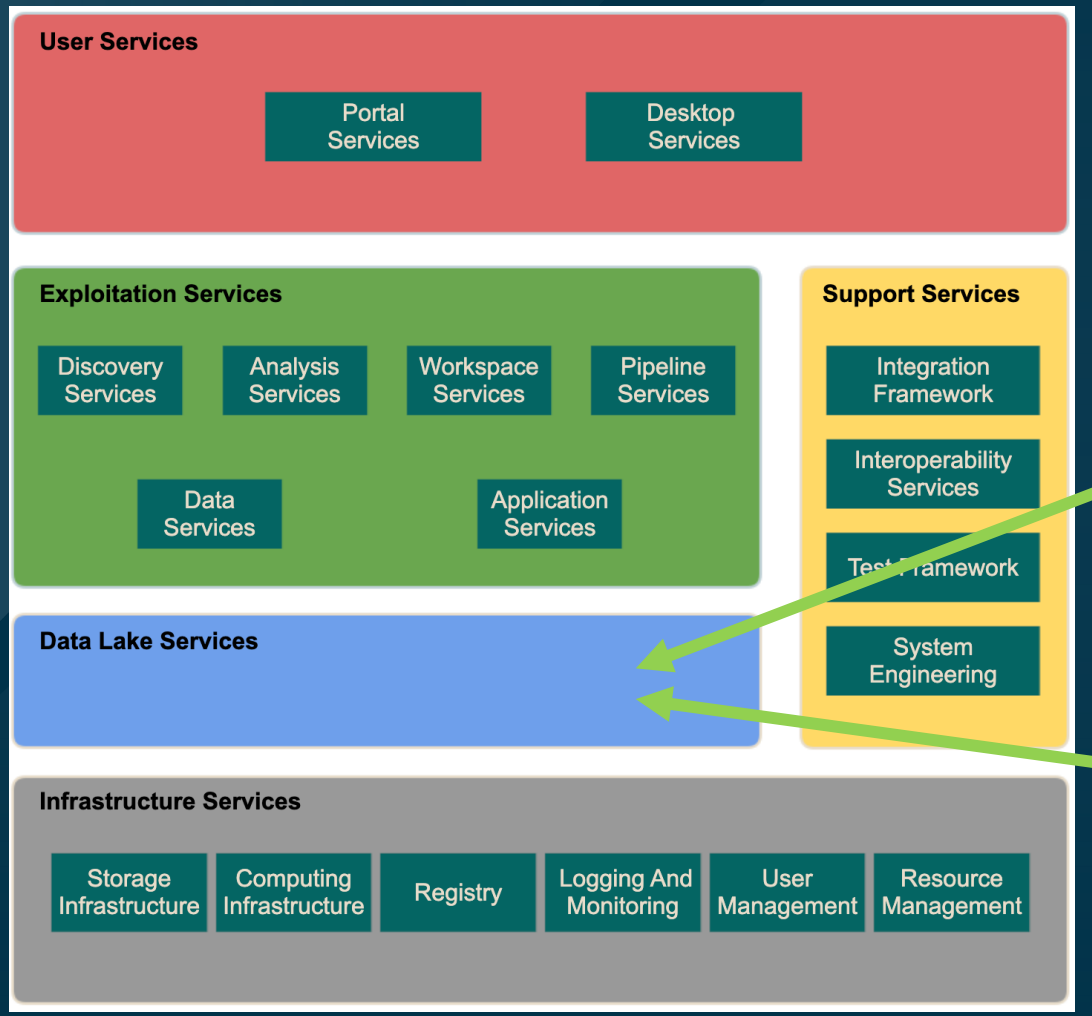
Data Colocation as a Differential Factor



From *bring the data to the user*

To *bring the user to the data*

Leveraging on existing ESA Data Archives

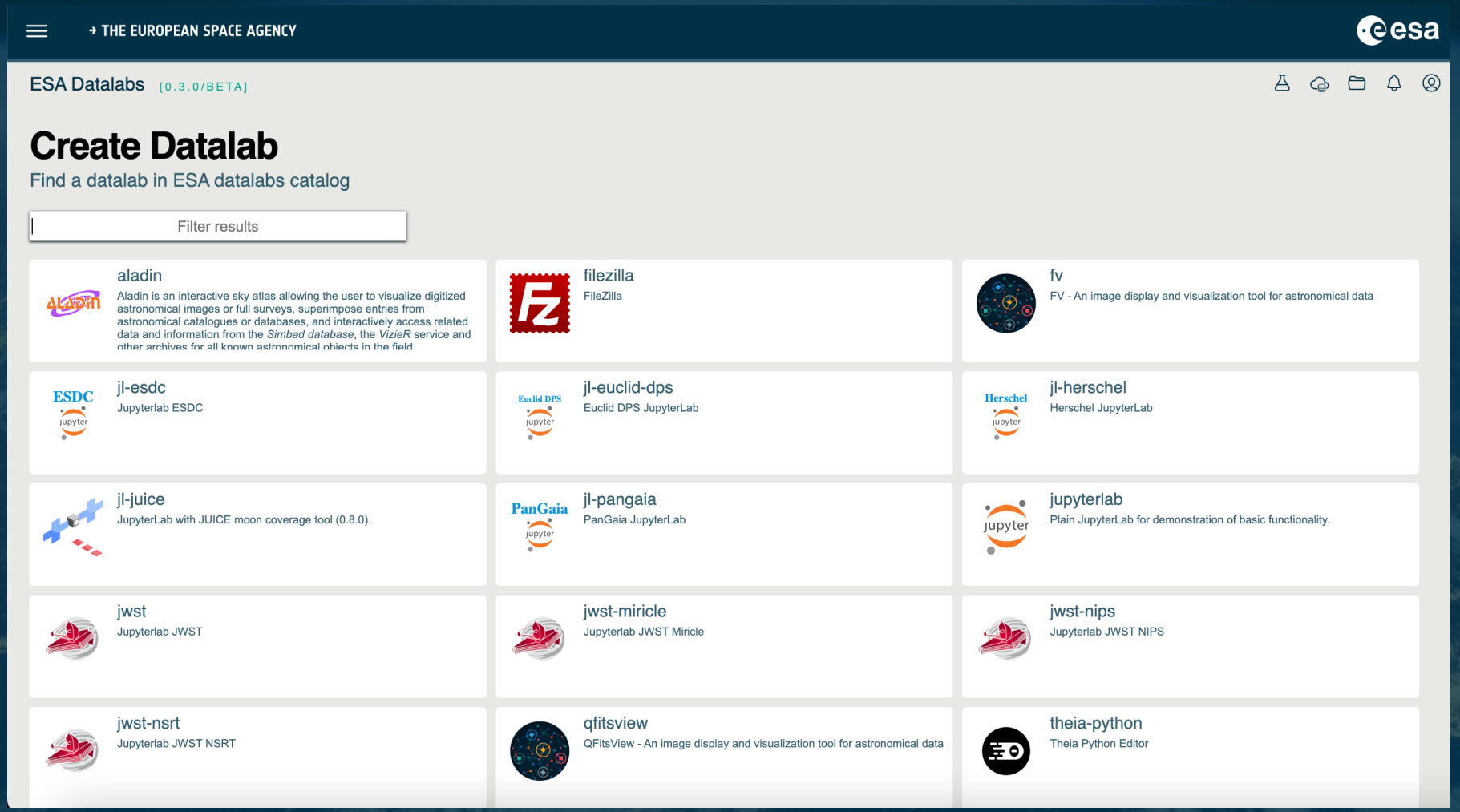


datalabs.esa.int

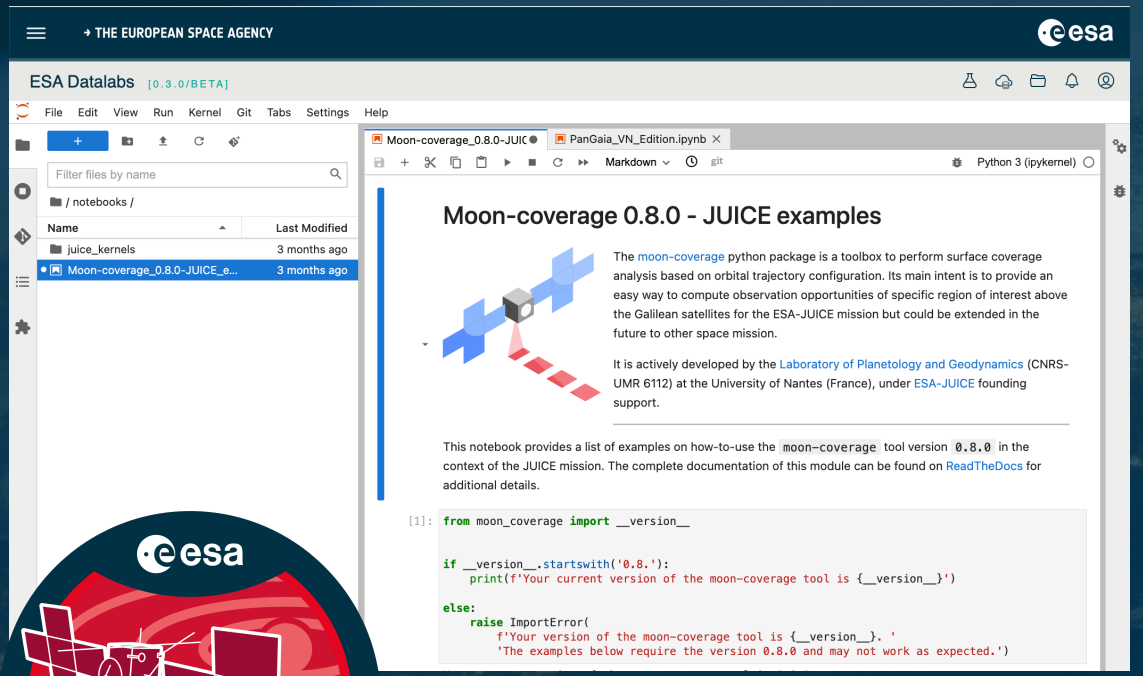
ESDC

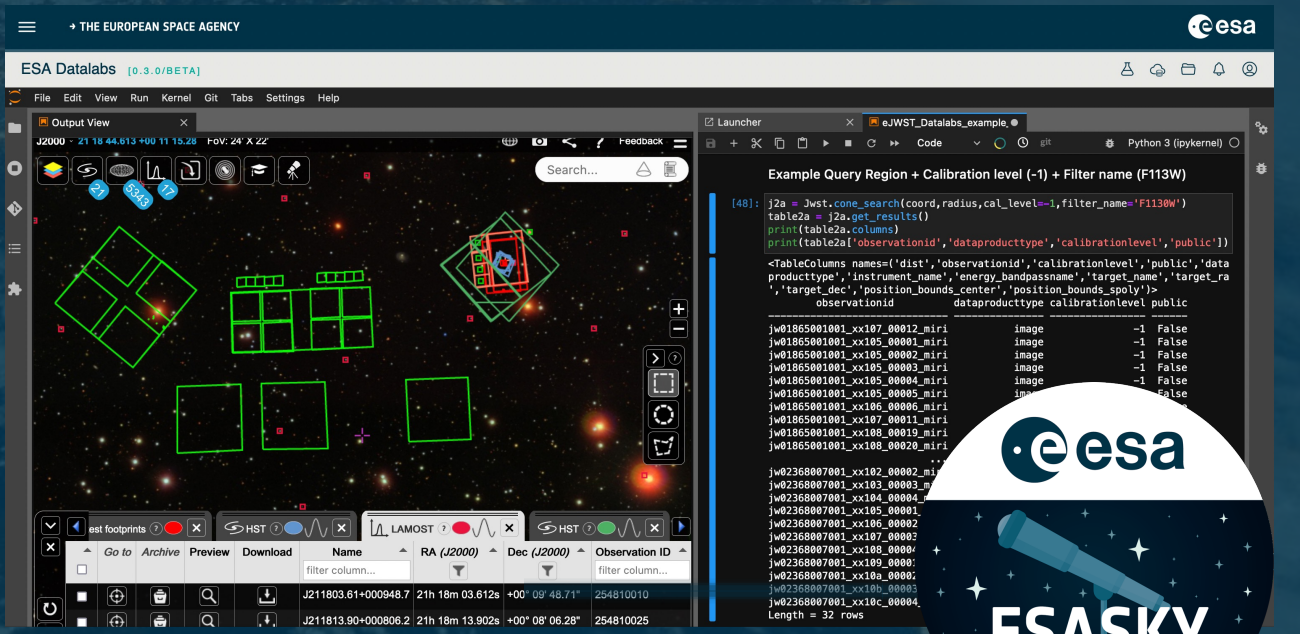
NAV, HRE, EOP ...

Datalabs Catalogue: Interactive Analysis

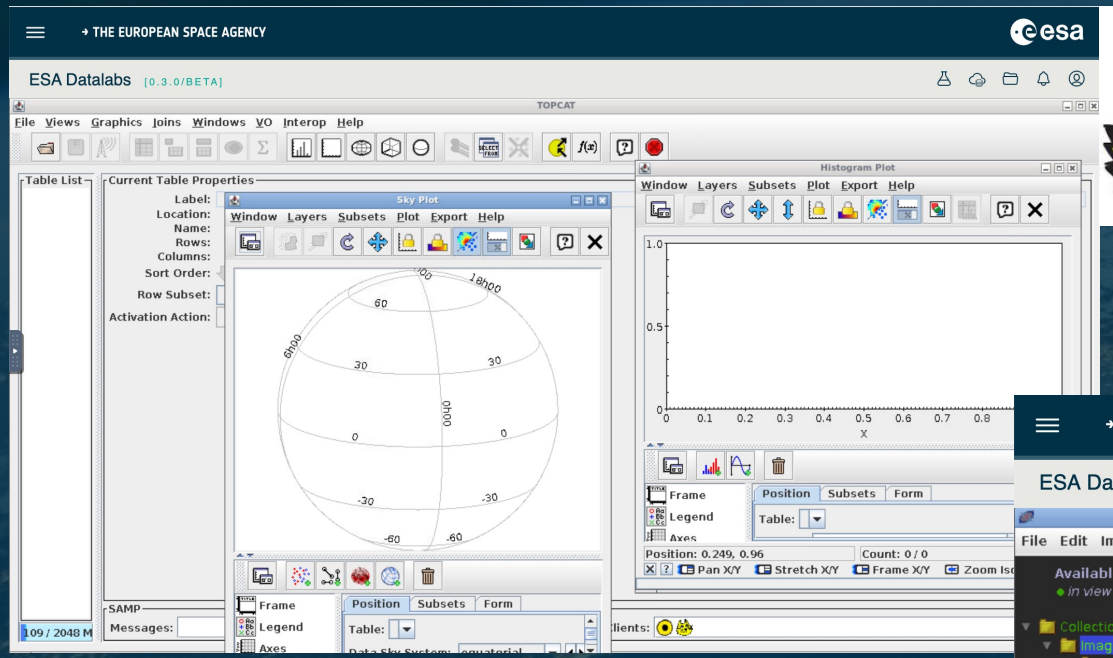


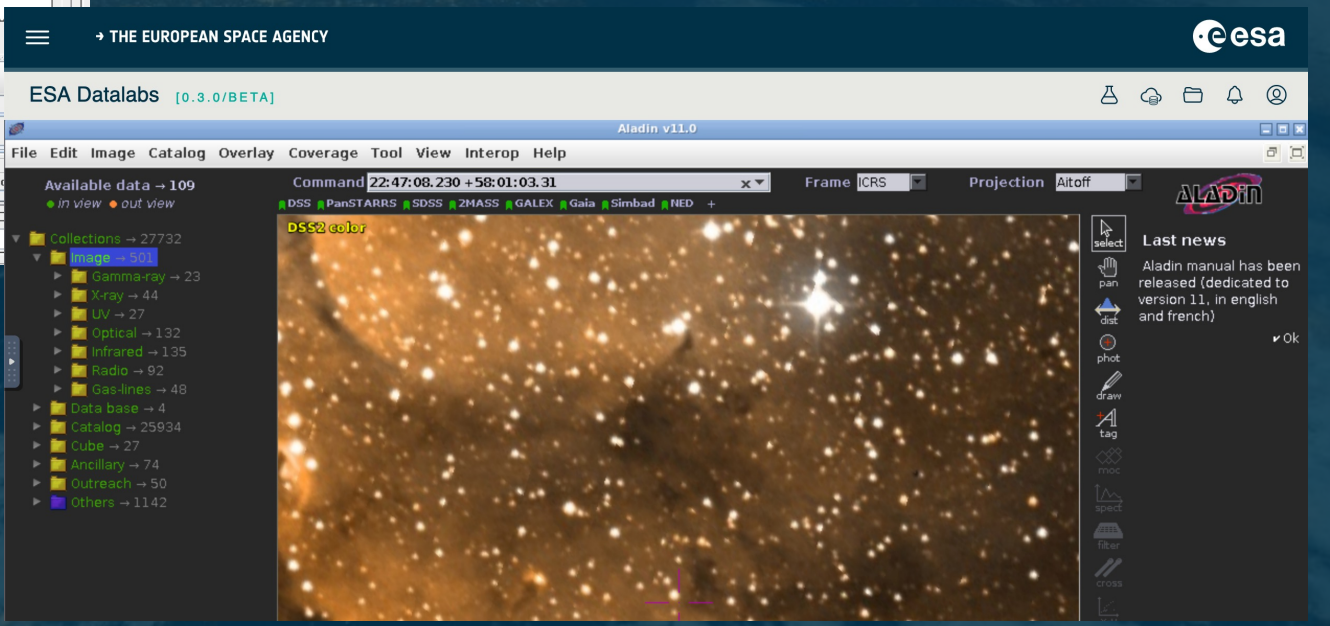
Web-Based Datalabs



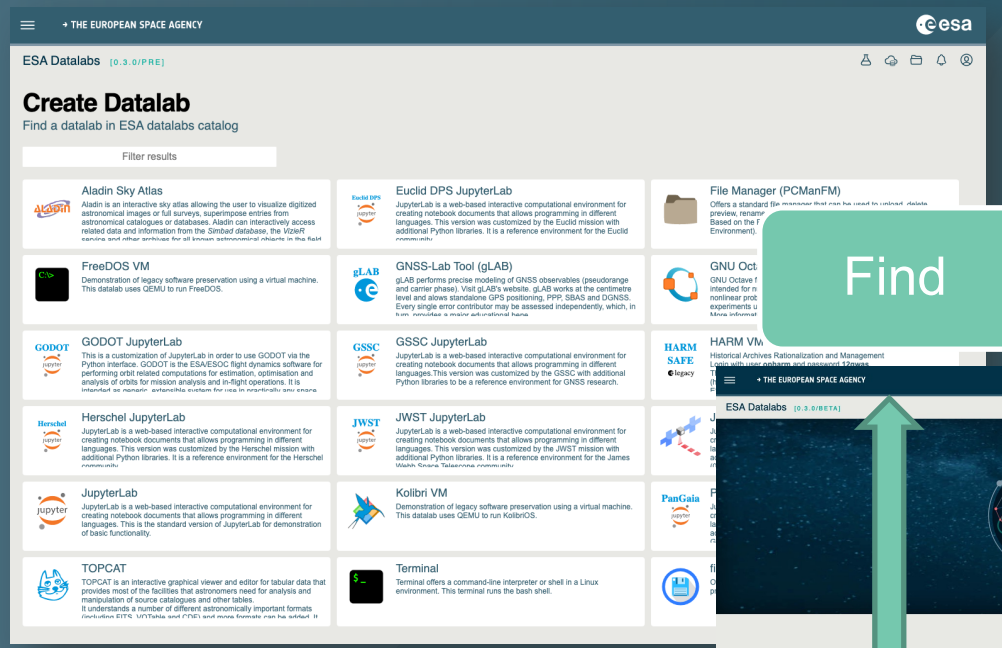


Desktop Datalabs

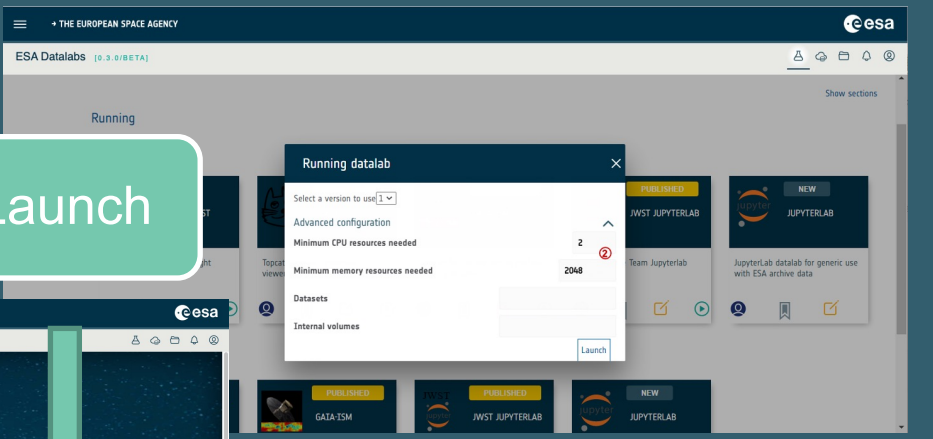




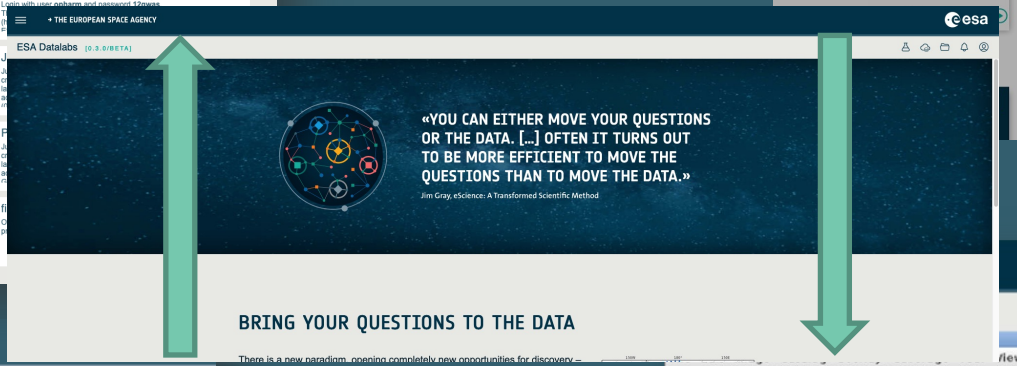
Datalab – Utilisation Lifecycle

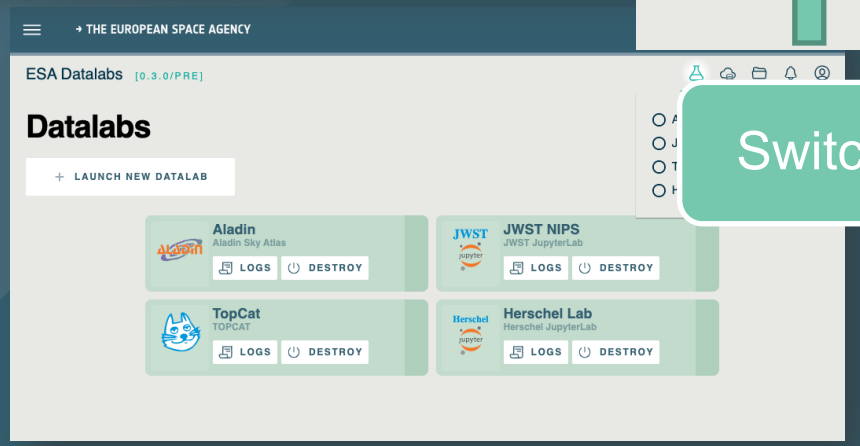


Find



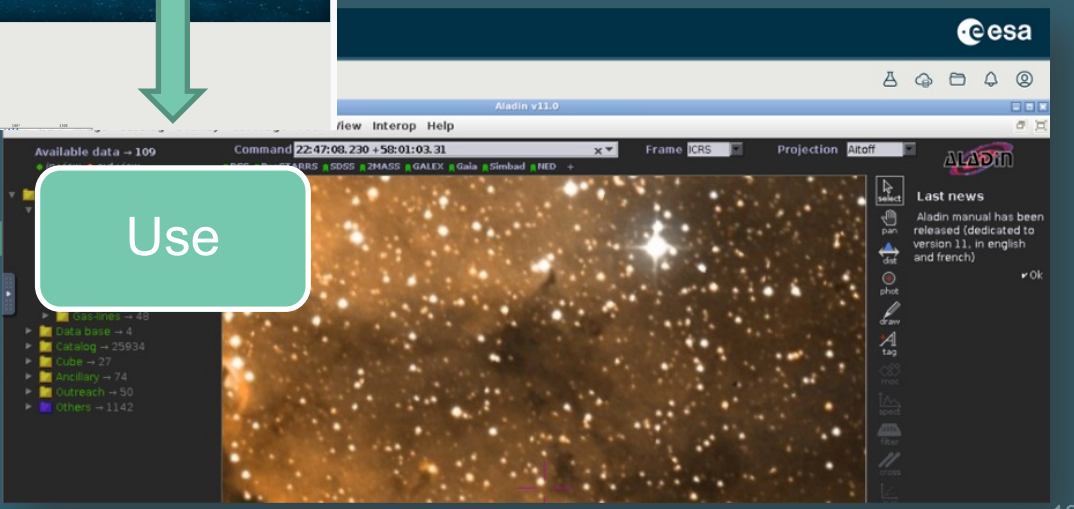
Launch



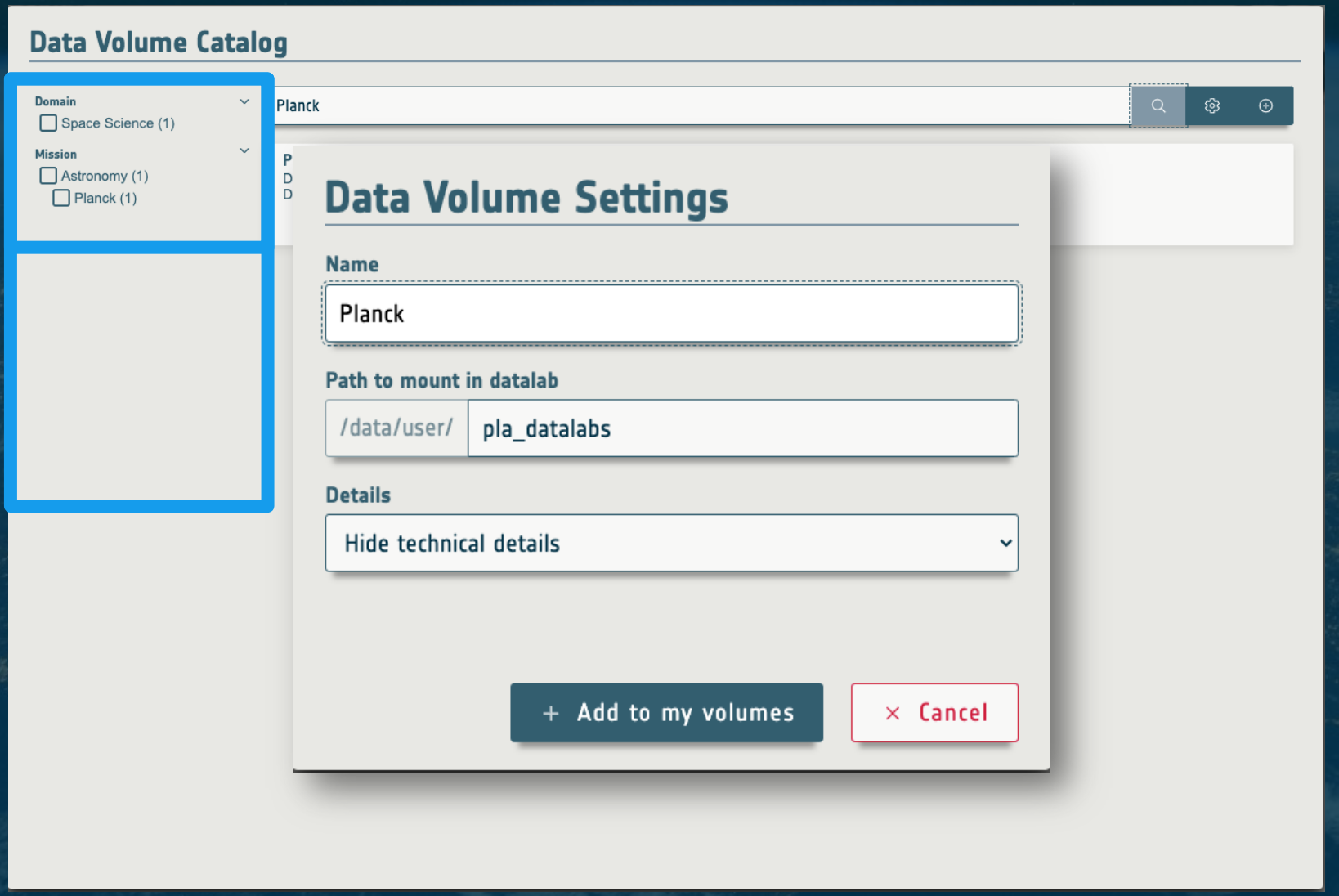


Switch

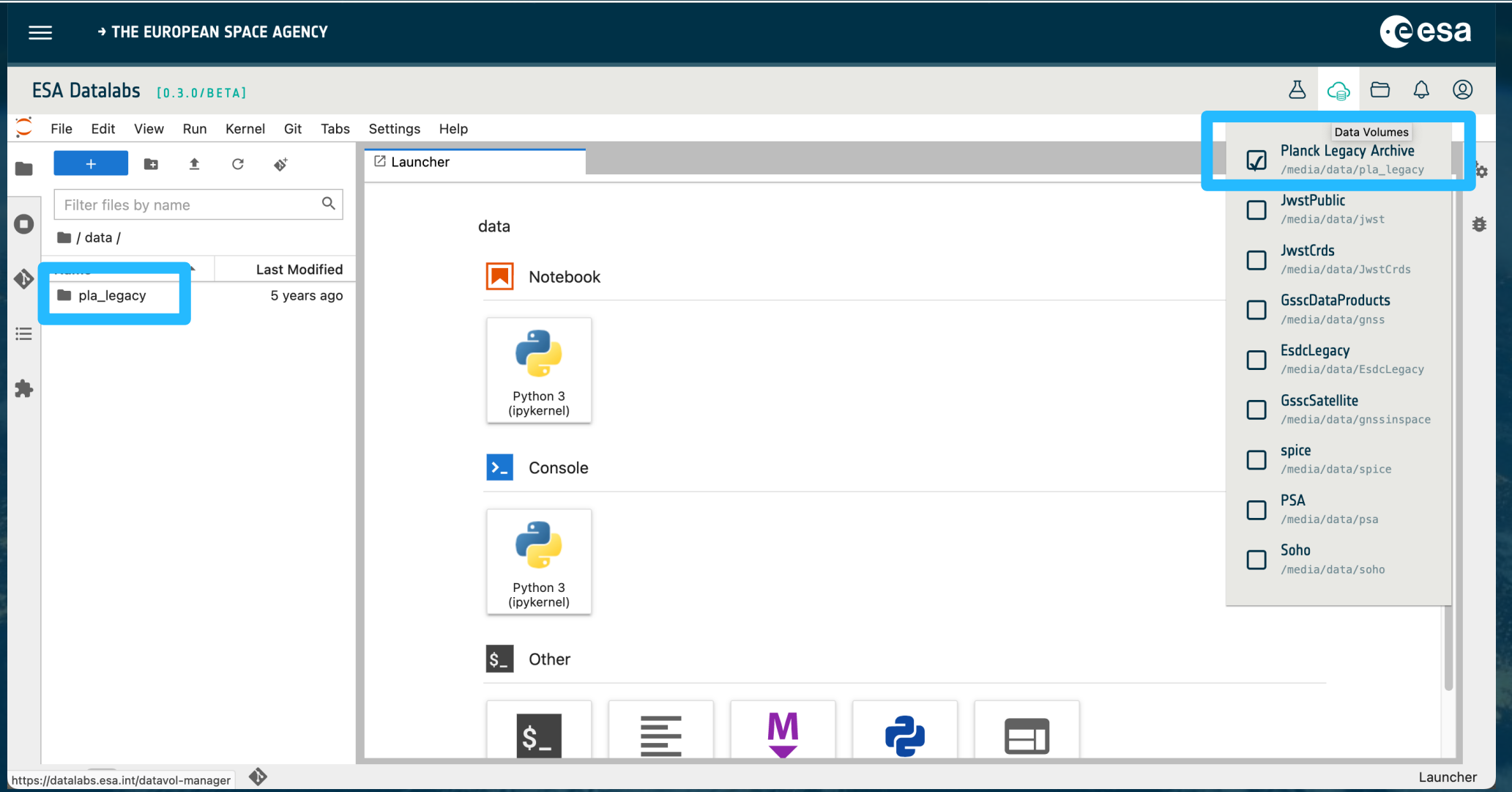
Use



Computing & Data Colocation – Data Volume Catalog

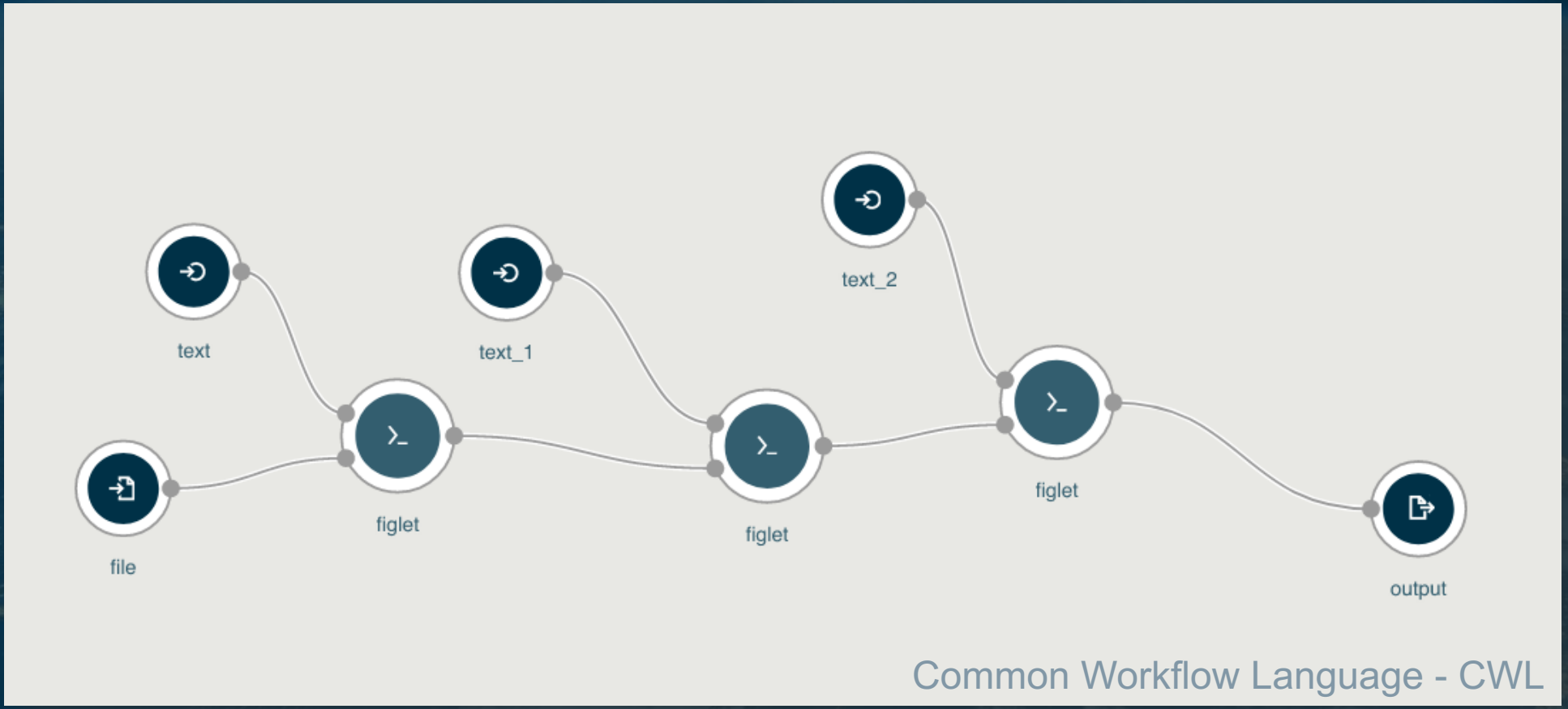


Datalab & Volume Integration

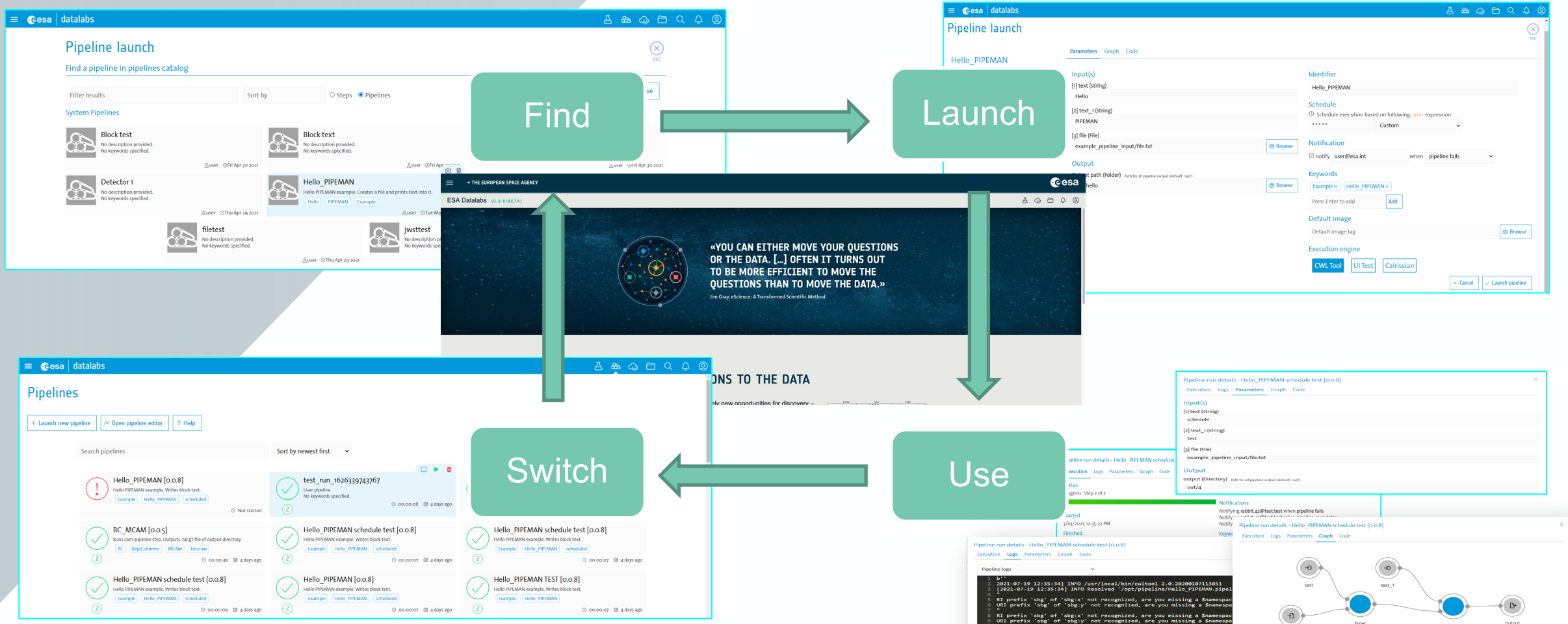


Data Processing Innovation

Pipelines on Datalabs: Batch Processing Analysis



Pipelines Catalogue & Utilisation Lifecycle



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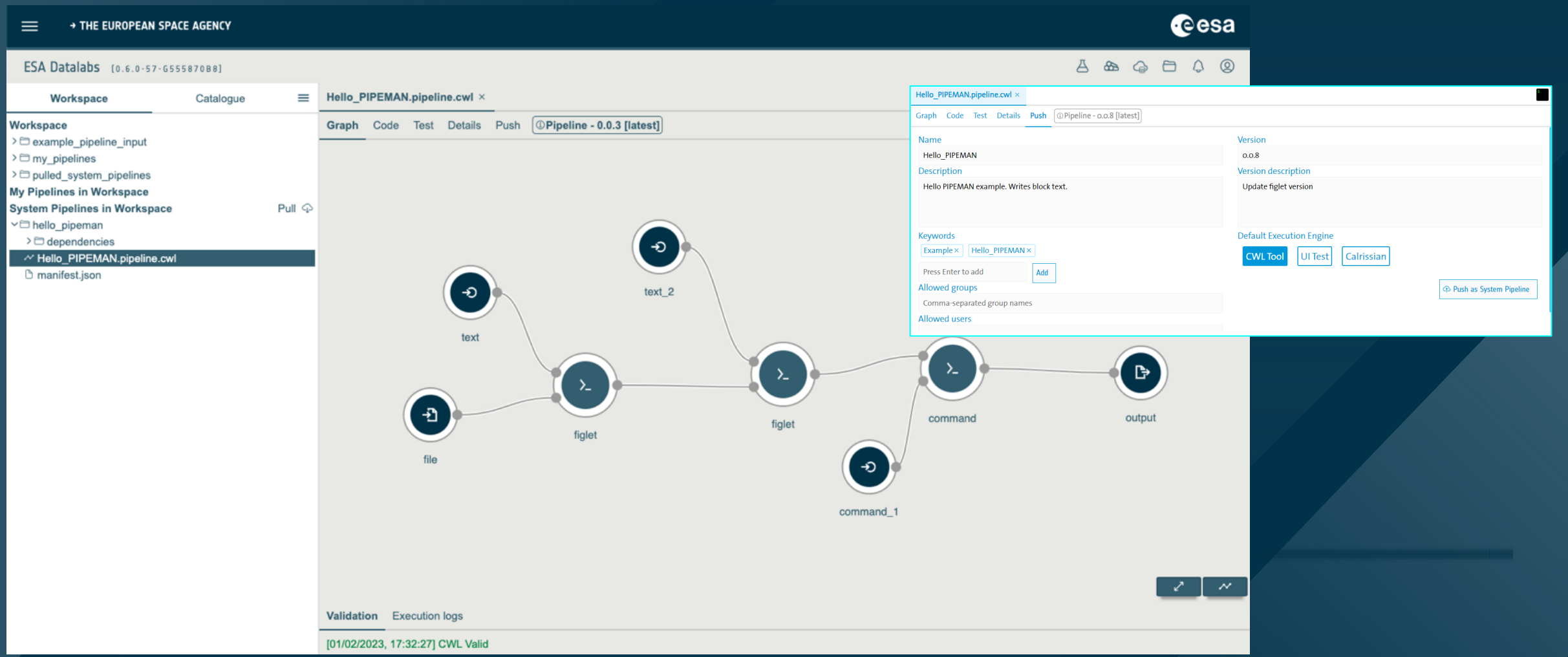
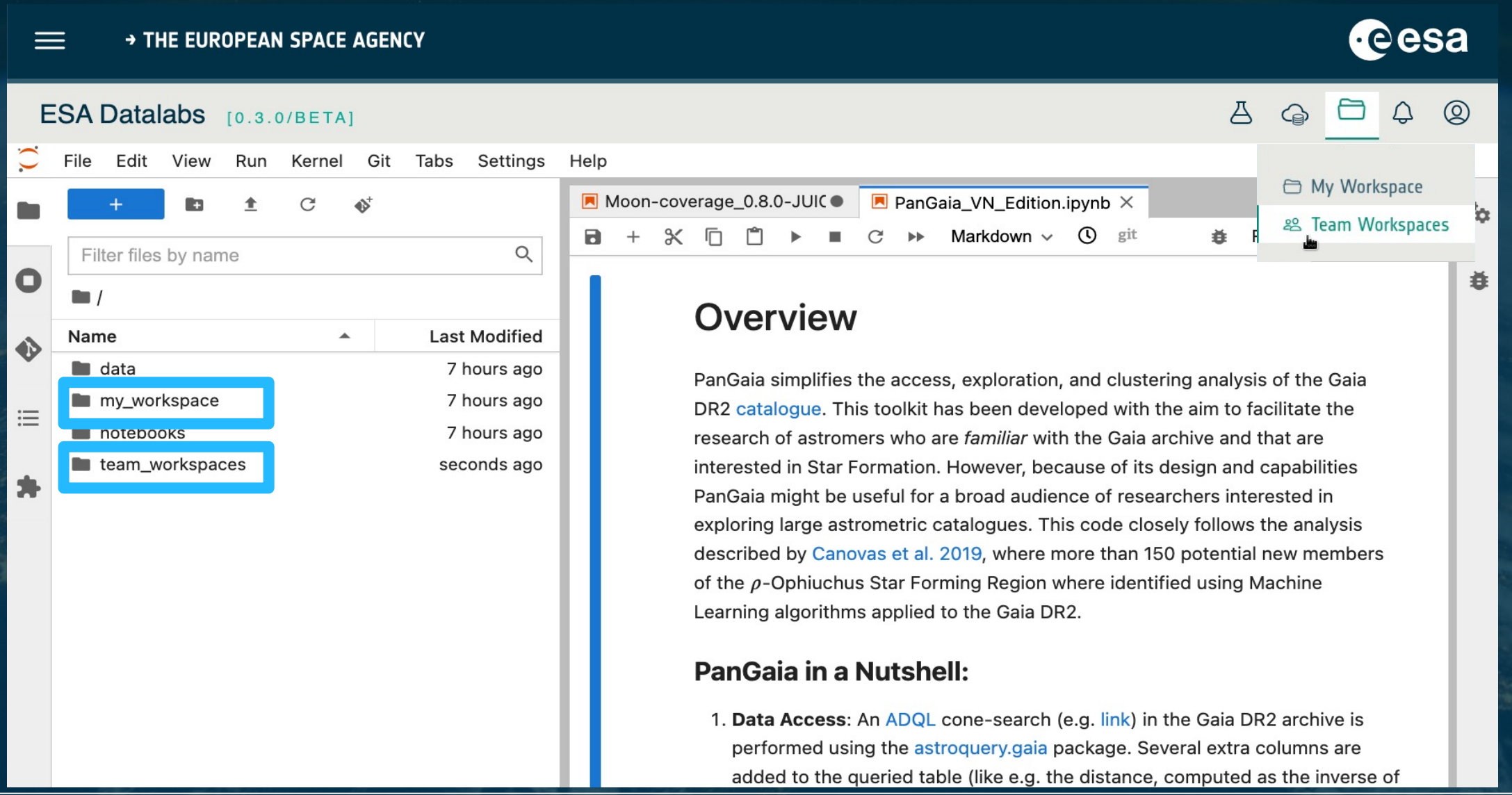
Pipeline Development Environment



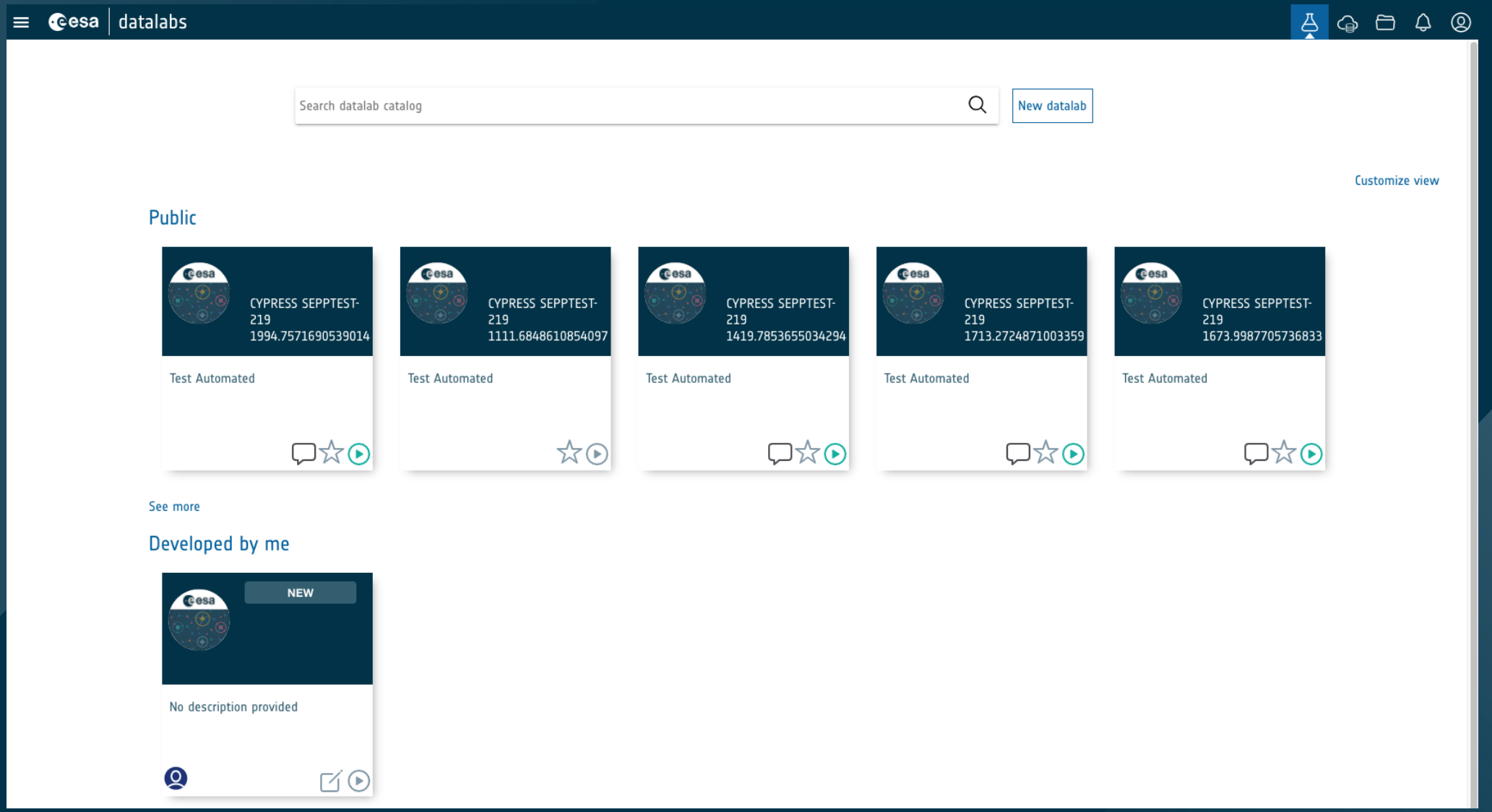
JWST @ ESA Datalabs

Collaboration
Innovation
SOLUTION
BRANDING
IDEAS
MARKETING
SUCCESS

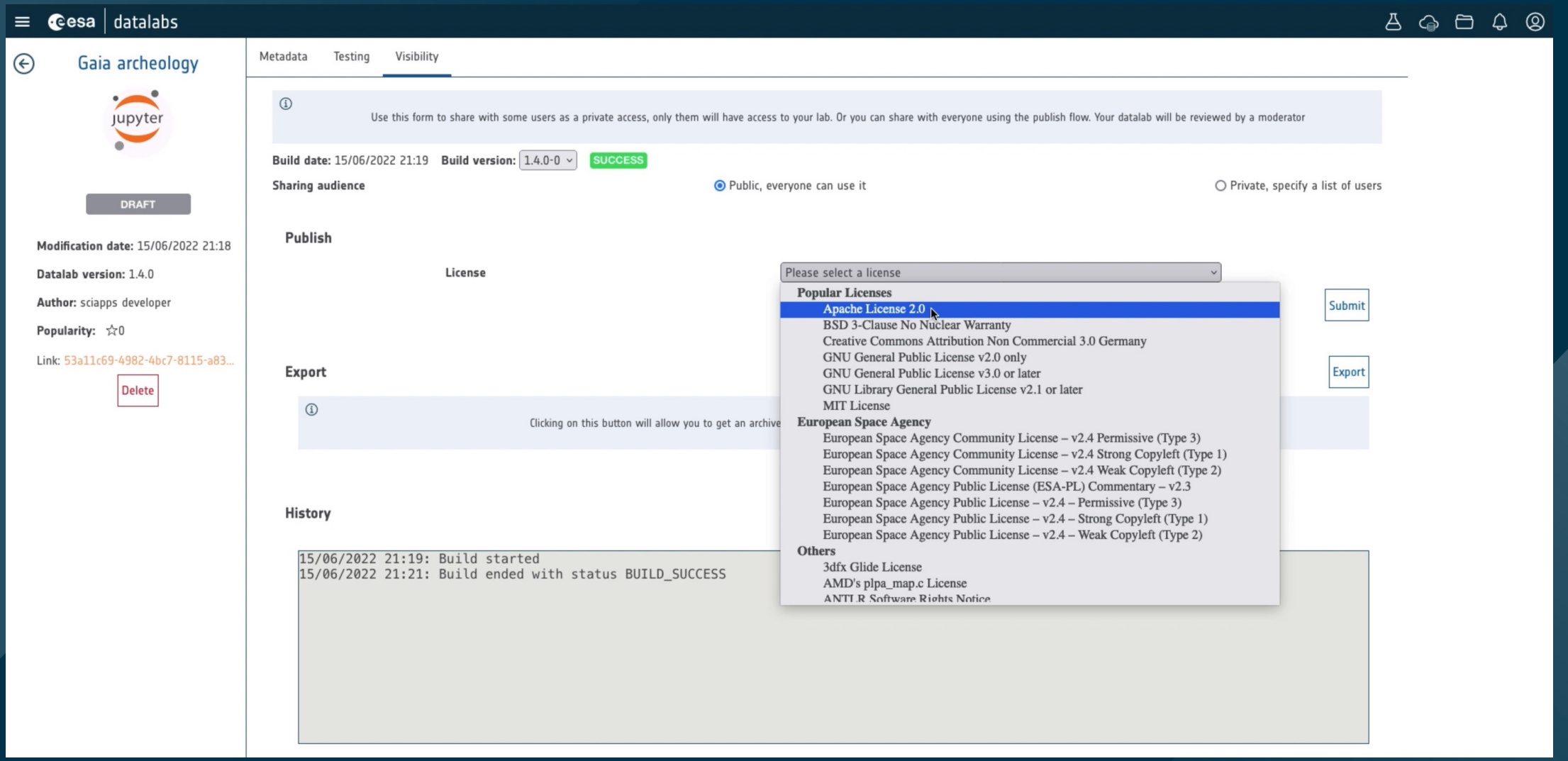
Data Centric Collaboration – Personal and Team Workspaces



Application Centric Collaboration – Datalabs Marketplace



Application Centric Collaboration: Datalabs IDE



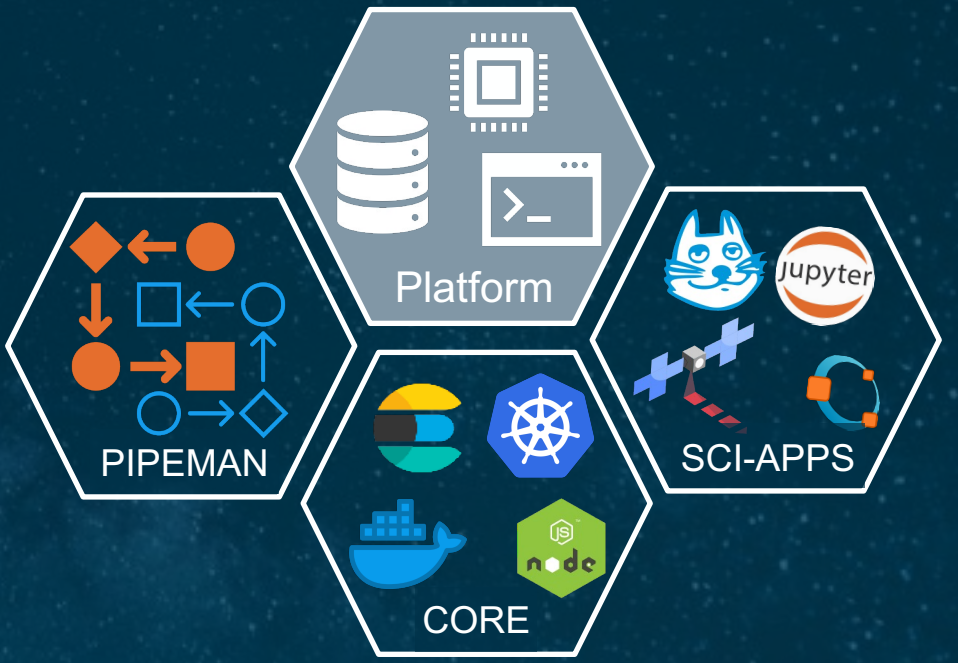
The Future?

Platform and Community Release Roadmap

Q1 2022 Private Beta

Q1 2023 Public Beta Moderated

Q4 2023 Public Beta Unmoderated



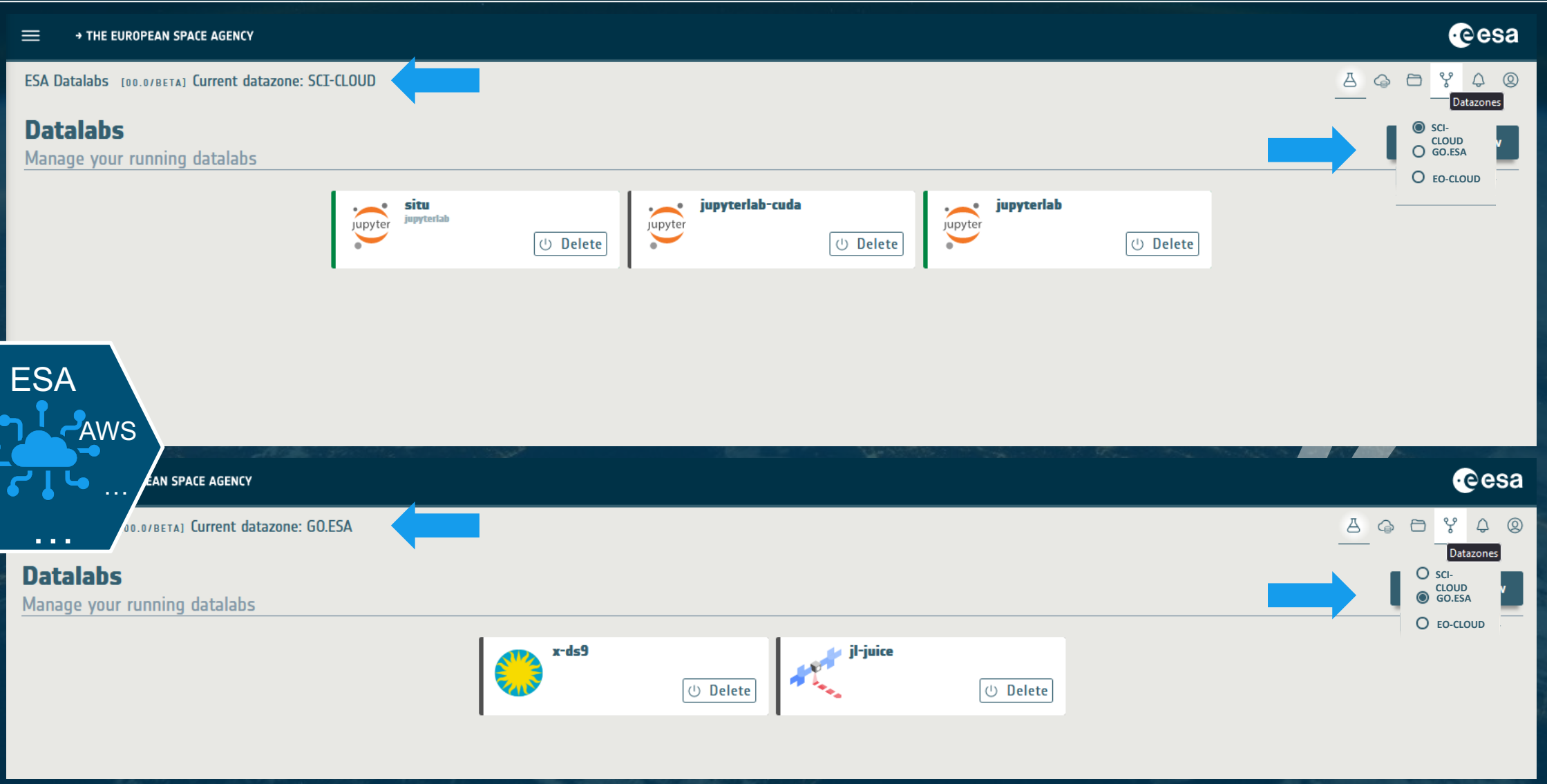
Engaging a growing community of scientists

218 Beta Users

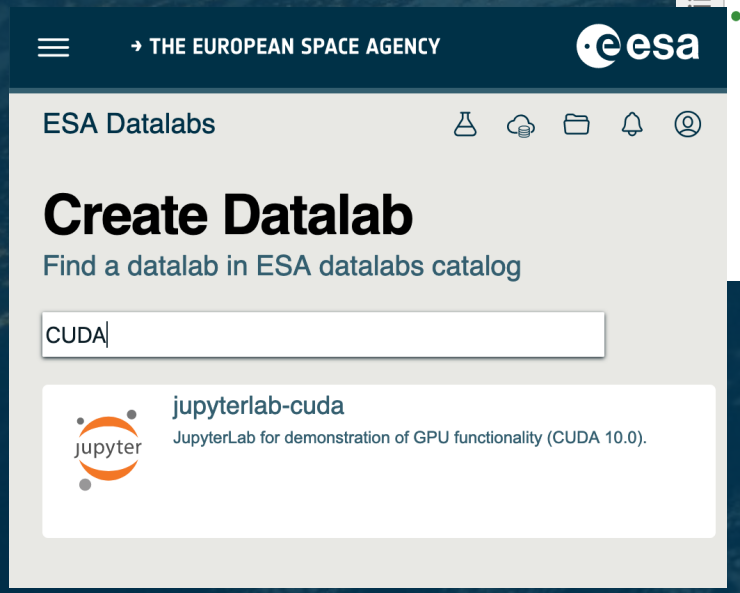
168 Waiting List

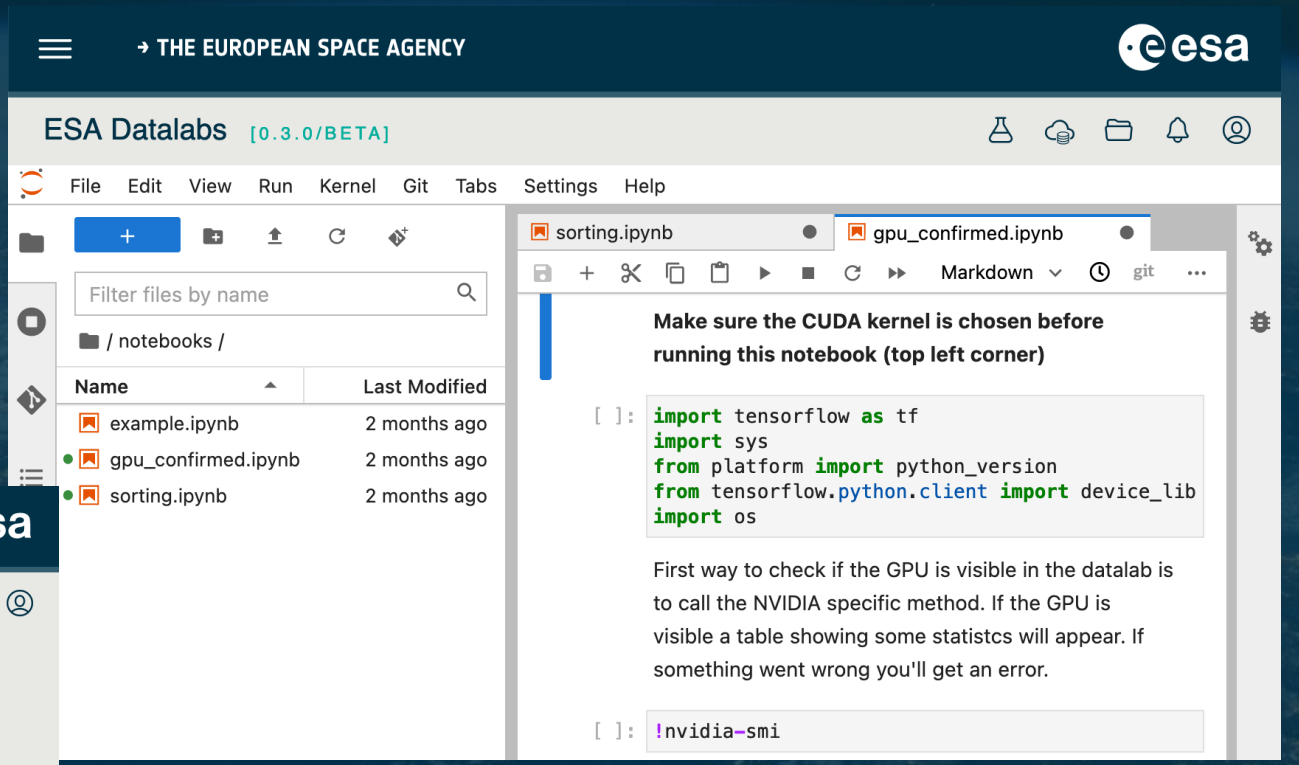
ESA Datalabs Workshop, ESAC 24-25 Nov 2022

Interoperability Across IT Infrastructures PoC



GPU Computing PoC

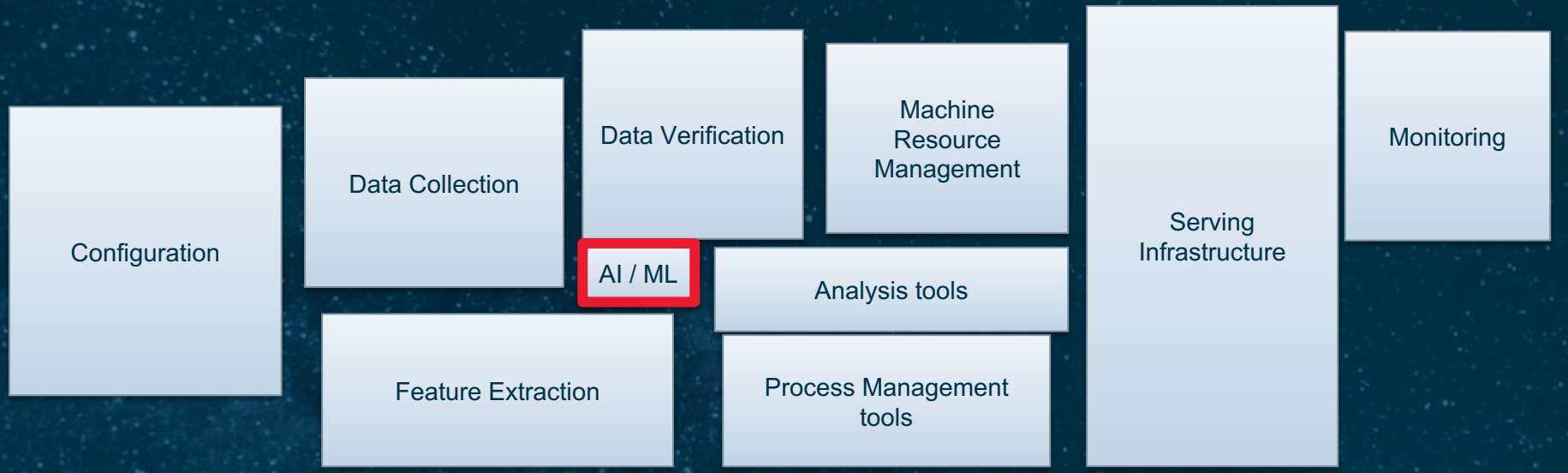




Time measured	numpy + no gpu	numpy + gpu	cupy + gpu
Total execution time	≈ 44m47s	≈ 14min26s	≈ 3min2s

Data-Intensive Approach to Science Exploitation

MLOps



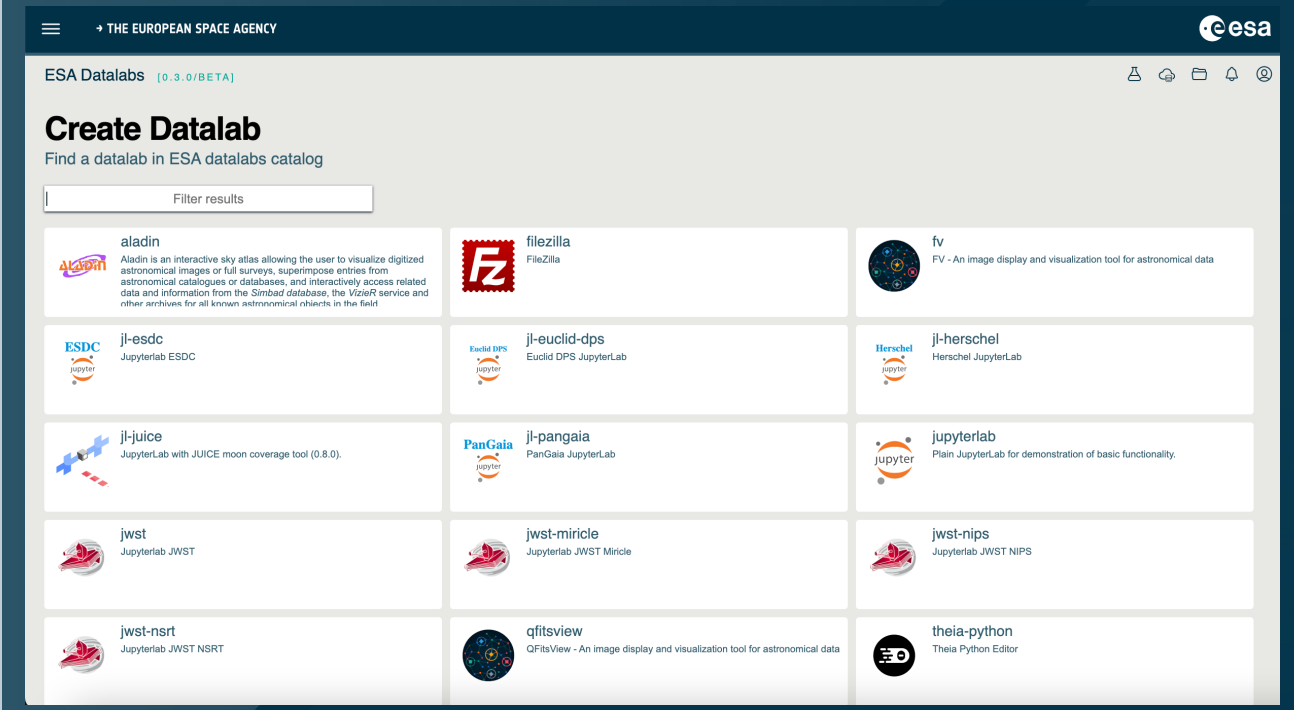
Model Development

Model Deployment

*Source: Hidden Technical Debt in Machine Learning Systems

System of Systems For Science Exploitation

ESA Datalabs - Multi Domain



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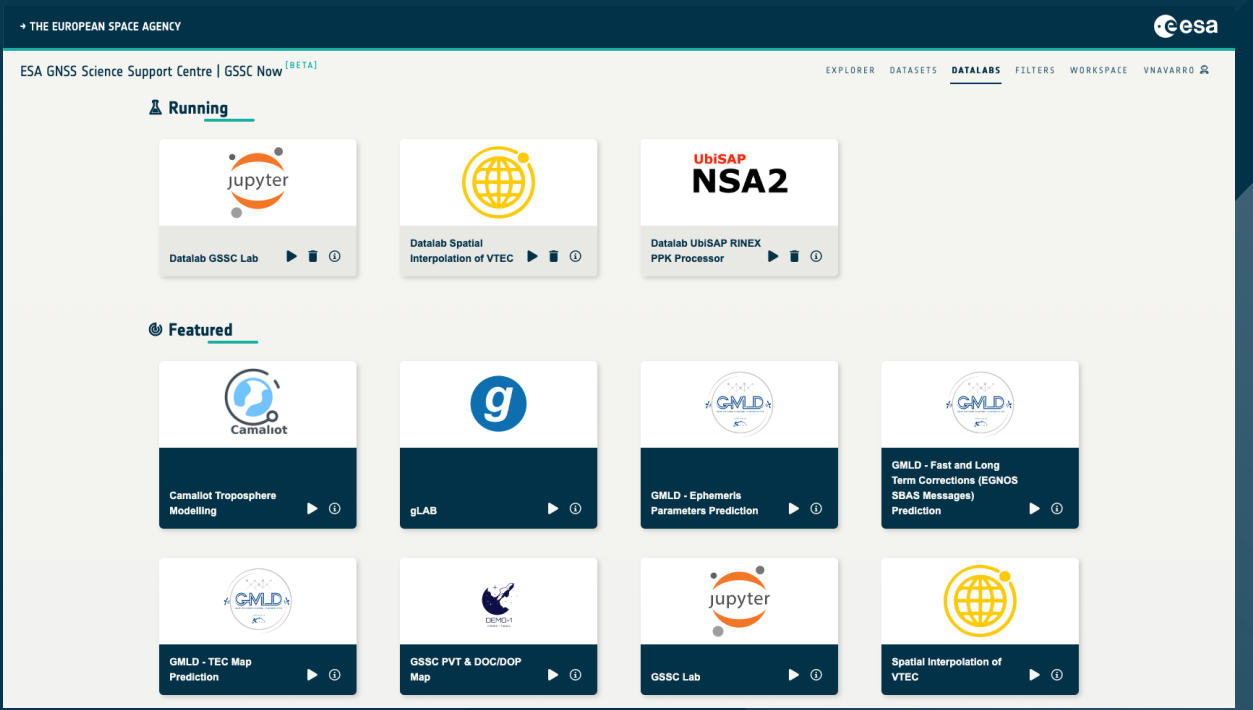
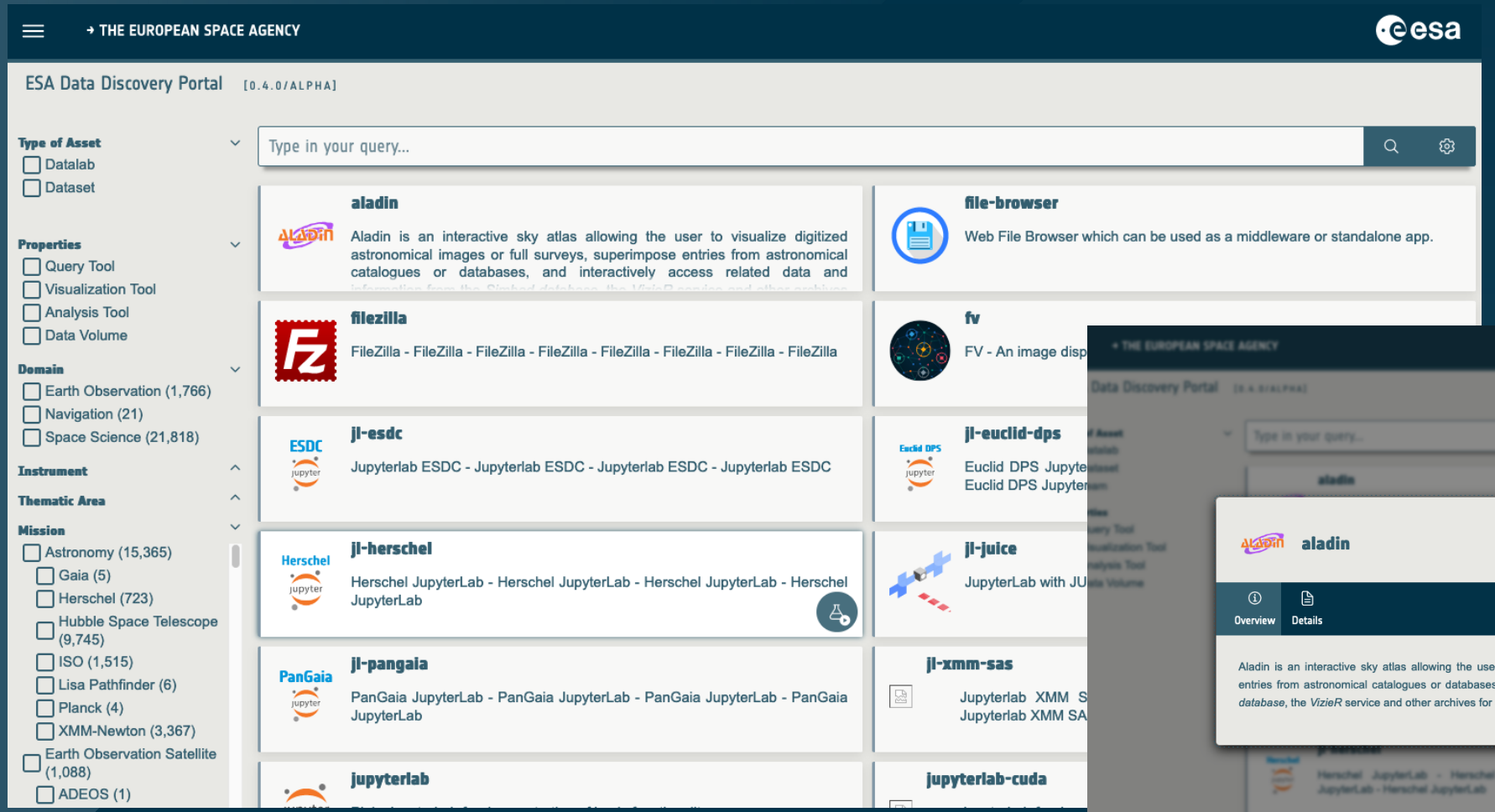
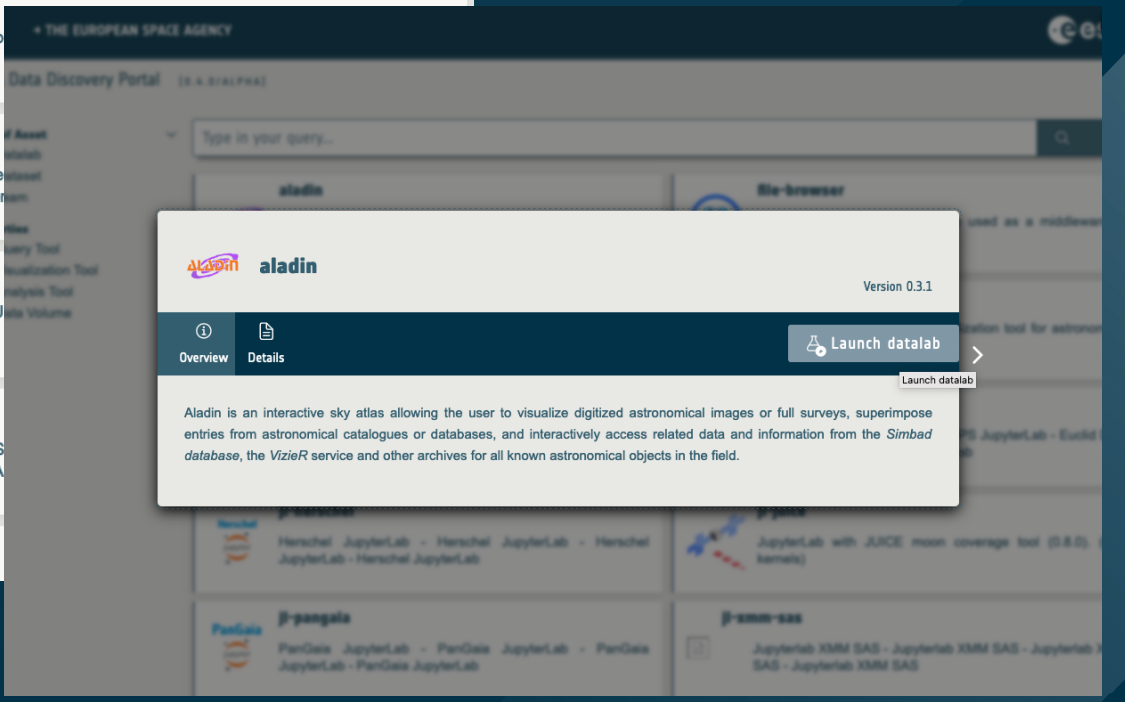
GSSC Now - Navigation Science Domain



gssc.esa.int/now

Interoperability Across Exploitation Platforms





Take away messages

The ESA Space Science Exploitation Platform

- SCI Data available for researches to work on it, made easy

Increase Space Science Operations Efficiency

- Reusable for fast implementation of Scientific Processing Pipelines
- Reusable for fast implementation of Scientific Analysis and Visualisation Tools

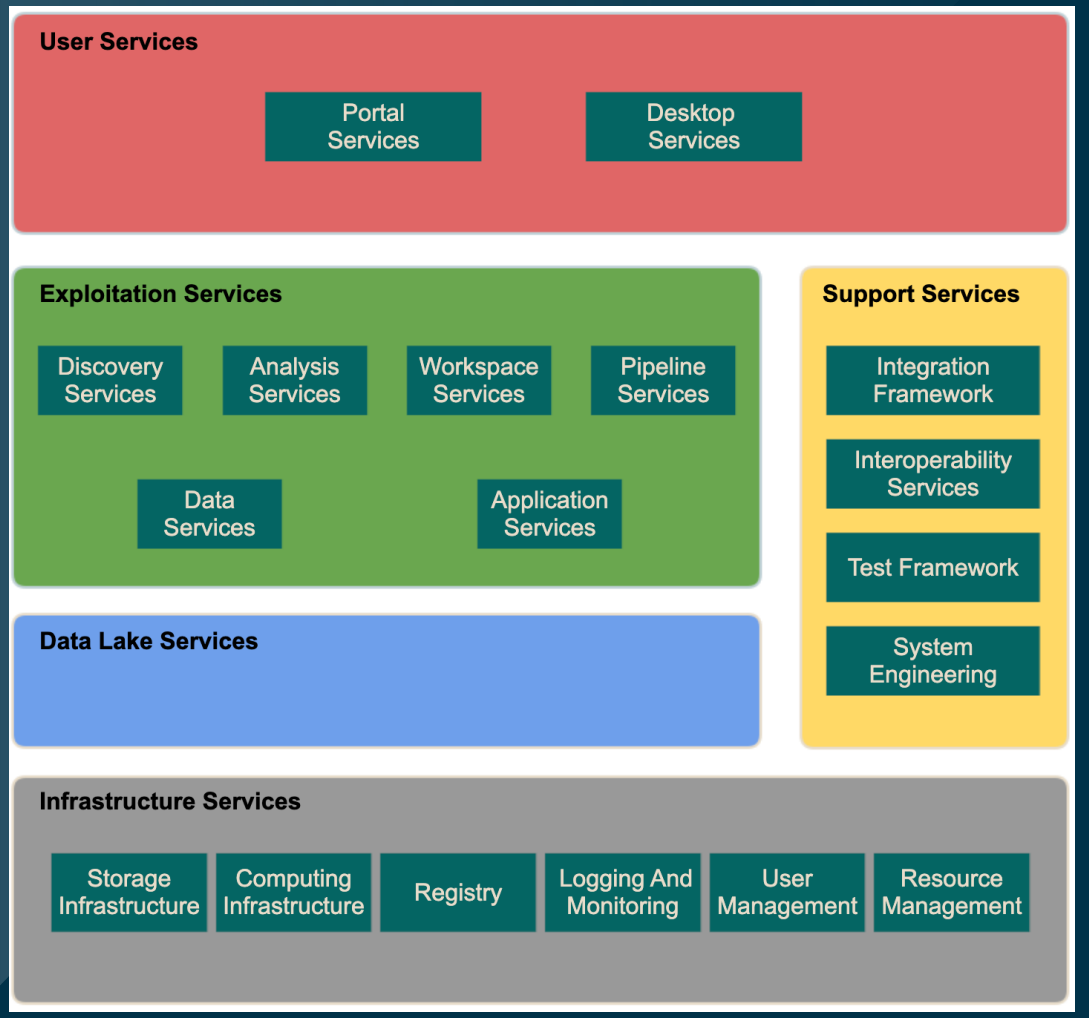
Enable Collaboration and Open Science

- Share complex processing tools and data with your team (ala JWST)
- Share your contributions with the community in SCI ‘s AppStore

Thank You!

datalabs.esa.int

Acknowledgements: The diverse skillset required for the development of ESA Datalabs and GSSC Now, requires involvement of different multi-disciplinary groups. Hence, we would like to thank our industrial partners, Edisoft, Uninova, CGI, ACRI-ST, GMV and Ideorum. Thanks also to the Science and Operations Technical IT Unit at ESAC, the ESA Datalabs User's Group, the members of ESA Space Science missions, and the ESAC Science Data Centre.

Back-Up Slides

Architecture – Technology Stack