ESA Data Discovery Portal, link to ESA datasets DOIs and to Google Dataset Search

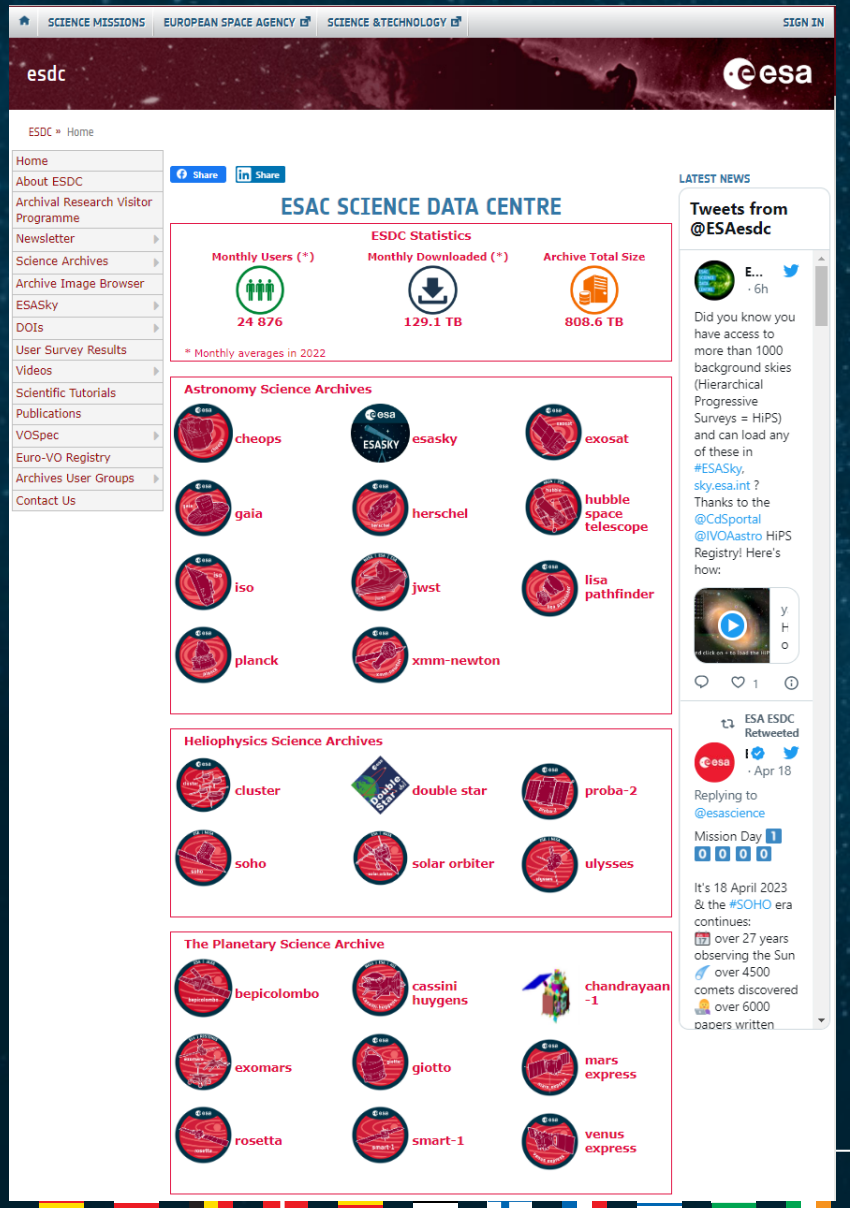
Christophe Arviset, ESA

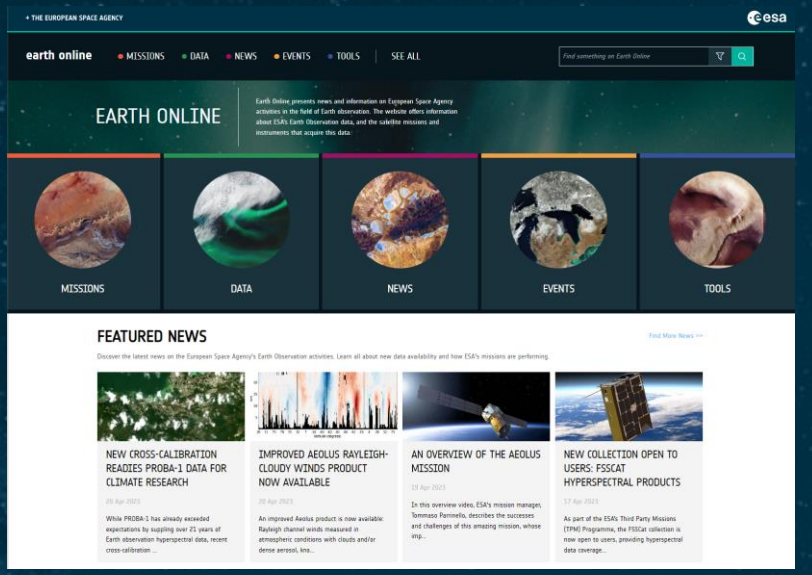
IVOA interoperability meeting, Bologna, Registry/DCP Session

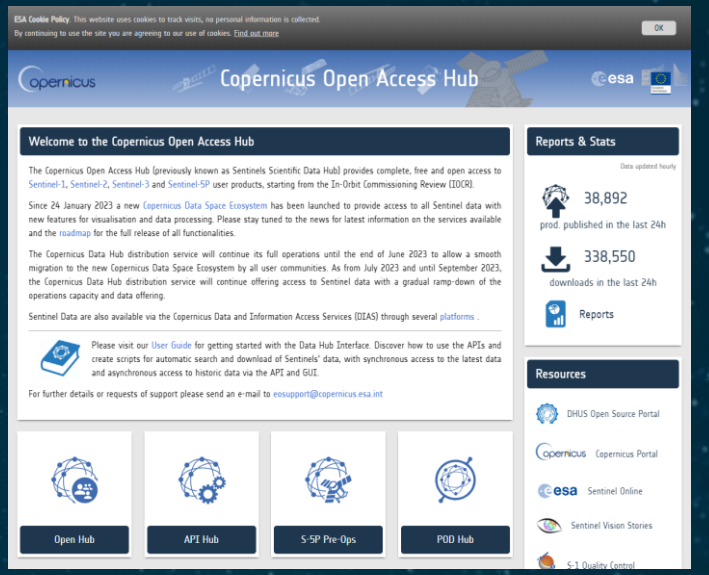
10/05/2023

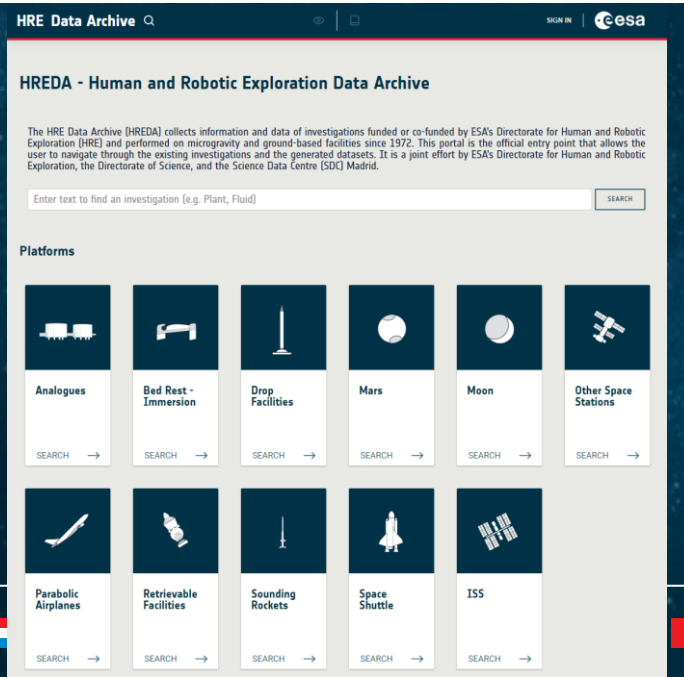
ESA UNCLASSIFIED – Releasable to the Public

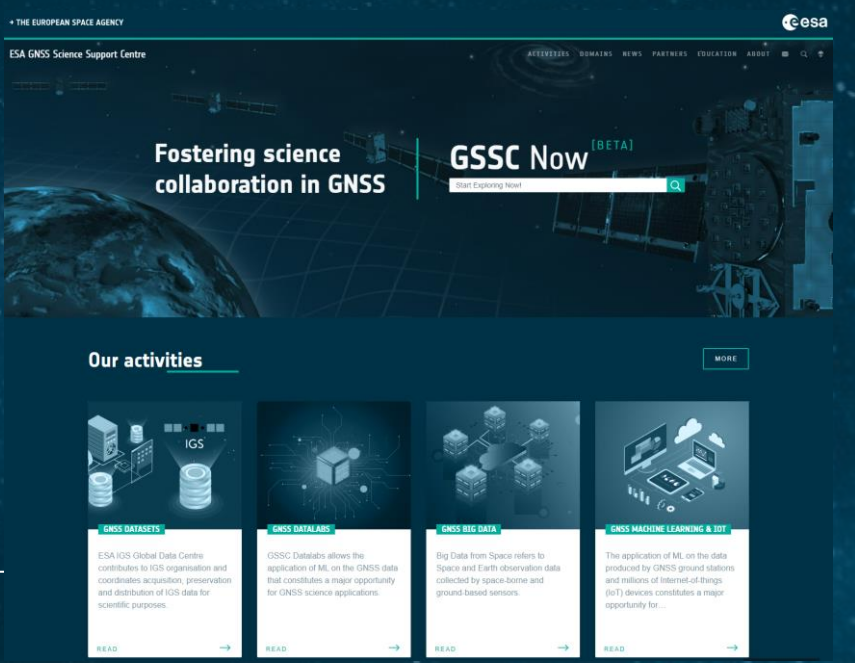
Science Data Archives at ESA











Defining DOIs for every ESA dataset

Define a common set of metadata for all ESA Datasets, regardless of the scientific discipline

DOIs defined through CrossRef and now through DataCite

Common Metadata	
Dataset name	Dataset Description
Mission name and description	Dataset version
Instrument	Publishing date
Scientific domain	Publisher and associated information
Temporal coverage	Credit and citation Guidelines
Link to the actual data	

Build DOI **landing page** that provides a dataset description and a **download link** for the particular dataset

https://www.cosmos.esa.int/web/esdc/doi

A dataset provided by the European Space Agency

Name	CELIAS, Charge, Element, and Isotope Analysis System
Mission	SOHO
URL	https://www.cosmos.esa.int/web/soho/mission-long-files
DOI	https://doi.org/10.5270/esa-iey8z2h
Abstract	The CELIAS experiment on SOHO is designed to measure the mass, ionic charge and energy of the low and high speed solar wind, of suprathermal ions, and of low energy flare particles. Through analysis of the elemental and isotopic abundances, the ionic charge state, and the velocity distributions of ions originating in the solar atmosphere, the investigation focuses on the plasma processes on various temporal and spatial scales in the solar chromosphere, transition zone, and corona. CELIAS includes 3 mass- and charge-discriminating sensors based on the time-of-flight technique: CTOF for the elemental, charge and velocity distribution of the solar wind, MTOF for the elemental and isotopic composition of the solar wind, and STOF for the mass, charge and energy distribution of suprathermal ions. The instrument provides detailed in situ diagnostics of the solar wind and of accelerated particles, which complements the optical and spectroscopic investigations of the solar atmosphere on SOHO. The Proton Monitor (PM) is a subsystem of the MTOF experiment allowing the measure of the solar proton velocities from 200 to 1200 km/s.CELIAS also contains a Solar Extreme ultraviolet Monitor, SEM, which continously measures the EUV flux in a wide band of 17-70 nm, and a narrow band around the 30.4 nm He II line. SEM is mounted on top of the STOF instrument and shares the same electronics.
Description	CELIAS key scientific data products are mission long files of calibrated • Solar EUV flux at 15 seconds and 1 day cadence, from the SEM detector • Solar wind parameters at either 30 seconds, 5 minutes or Carrigton Rotation cadence, from the Proton Monitor detector Daily files of MTOF and STOF are available. CTOF is impaired since October 1996.
Publication	Hovestadt, D., et al., CELIAS - Charge, Element and Isotope Analysis System for SOHO, Sol. Phys., 162, 441–481 (1995); https://doi.org/10.1007/BF00733436
Temporal Coverage	1996 - current
Mission Description	SOHO, the Solar & Heliospheric Observatory, is a project of international collaboration between ESA and NASA to study the Sun from its deep core to the outer corona and the solar wind. SOHO was launched on December 2, 1995. The SOHO spacecraft was built in Europe by an industry team led by prime contractor Matra Marconi Space (now Airbus) under overall management by ESA. The twelve instruments on board SOHO were provided by European and American scientists. Nine of the international instrument consortia are led by European Principal Investigators (PI's), three by PI's from the US. Large engineering teams and more than 200 co-investigators from many institutions supported the PI's in the development of the instruments and in the preparation of their operations and data analysis. NASA was responsible for the launch and is now responsible for mission operations. Large radio dishes around the world which form NASA's Deep Space Network are used for data downlink and commanding. Mission control is based at Goddard Space Flight Center in Maryland. Domingo, V., Fleck, B. & Poland, A.I., The SOHO mission: An overview, *Sol. Phys.*, 162, 1–37, 1995; https://doi.org/10.1007/BF00733425
Creator Contact	Wimmer-Schweingruber, R., Principal Investigator, University of Kiel, Germany, Email : wimmer Berger, L., Project Scientist, University of Kiel, Germany, Email : berger All Email : @physik.uni-kiel.de

Granularity level for DOI assignment – space science

Minting DOIs depends on the way data is organized for each mission type

Astronomy survey missions (e.g. Gaia, Planck, …)

- Catalogue of astronomical objects, cosmology maps
- A few DOIs required

Astronomy observatory mission (e.g. HST, XMM – Newton, Herschel)

- Proposal for a particular scientific topic resulting in many observations
- A few thousands of DOIs

Planetary missions (e.g. Rosetta, Mars Express, BepiColombo)

- Dataset for an instrument for a particular mission phase
- A few thousands of DOIs

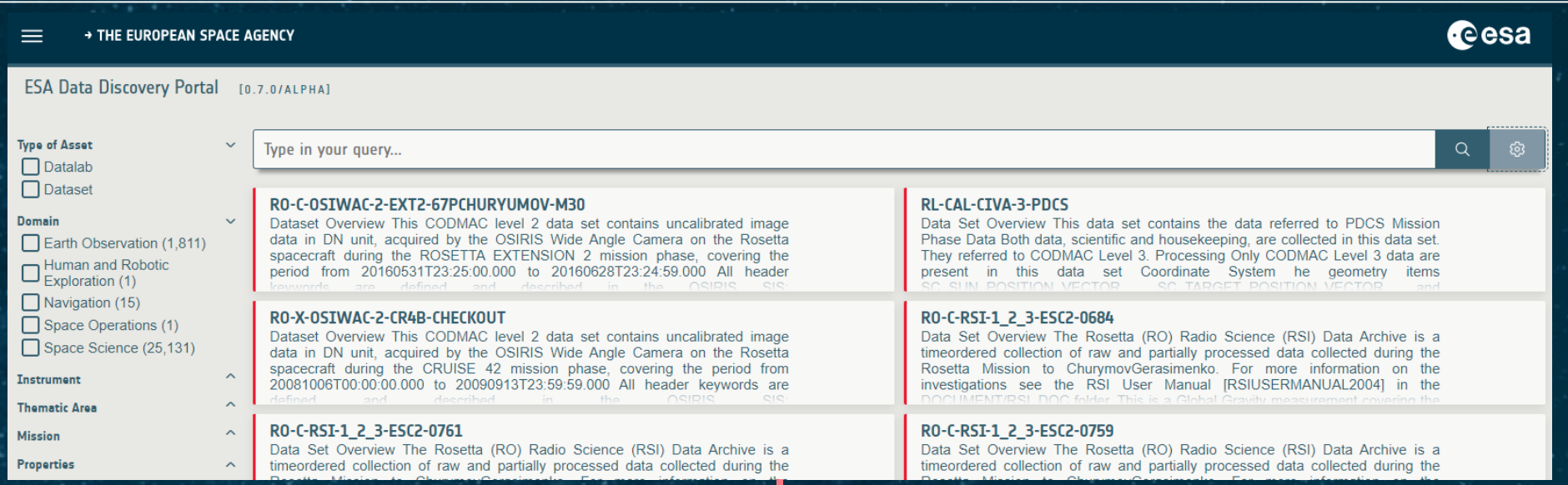
Heliophysics missions (e.g. SOHO, Solar Orbiter, Cluster)

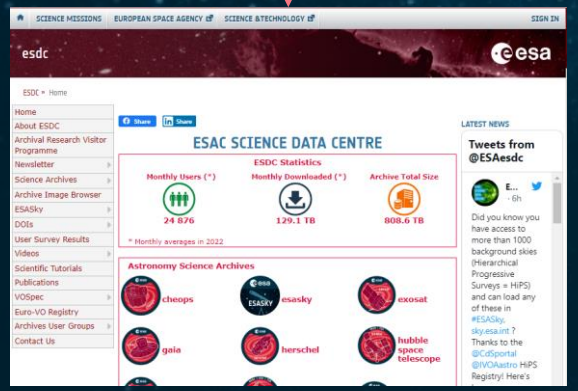
- 1 DOI for each experiment throughout all mission lifetime
- A few tens of DOIs

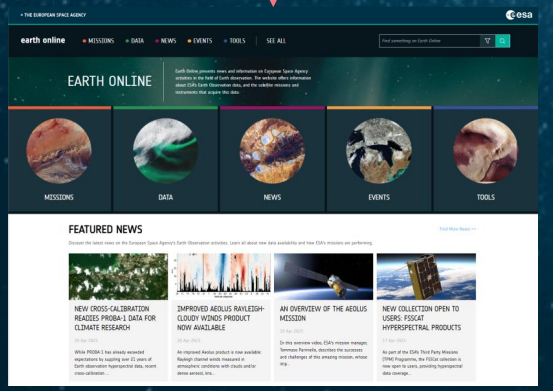
Science Mission	Domain	DOIs
HST	Astronomy	10901
XMM - Newton	Astronomy	4270
ISO	Astronomy	3877
Rosetta	Planetary	3594
Mars Express	Planetary	3512
CHEOPS	Astronomy	2971
Herschel	Astronomy	741
Venus Express	Planetary	727
SMART-1	Planetary	22
SOHO	Heliophysics	13
Cluster	Heliophysics	12
Ulysses	Heliophysics	12
Giotto	Planetary	10
ExoMars TGO	Planetary	10
Planck	Astronomy	9
Cassini-Huygens	Planetary	8
Lisa PathFinder	Astronomy	8
Double Star	Heliophysics	8
Solar Orbiter	Heliophysics	7
Chandrayaan-1	Planetary	6
Proba-2	Heliophysics	5
Gaia	Astronomy	4
ISS-SolACES	Heliophysics	1

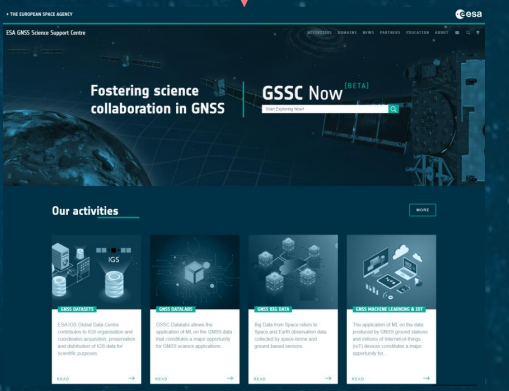
Around 30.000 DOIs

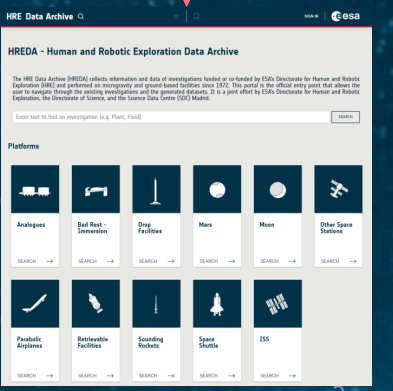
ESA Data Discovery Portal – data.esa.int











ESA Data Discovery Portal – main concepts

Common Portal for all ESA datasets from all disciplines

- ESA branding, homogenous description of ESA datasets through DOI (data.esa.int/asset/<reference>)
- Provides link to the corresponding mission data archive for dataset download
- (In progress) Provides access to tools / software available to analyse the datasets (datalabs)

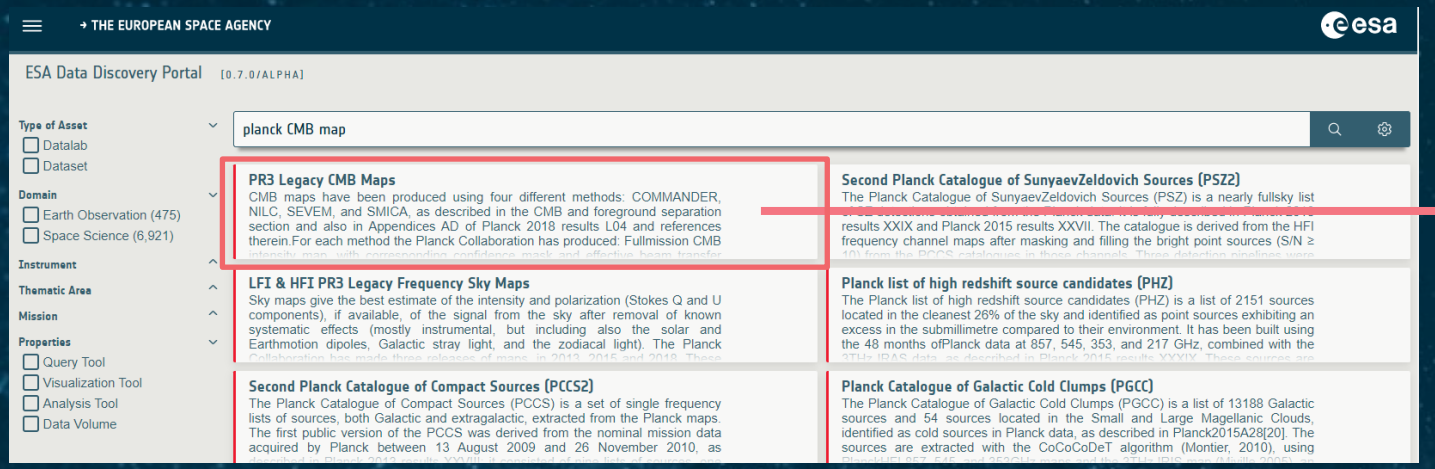
Simple Search Interface

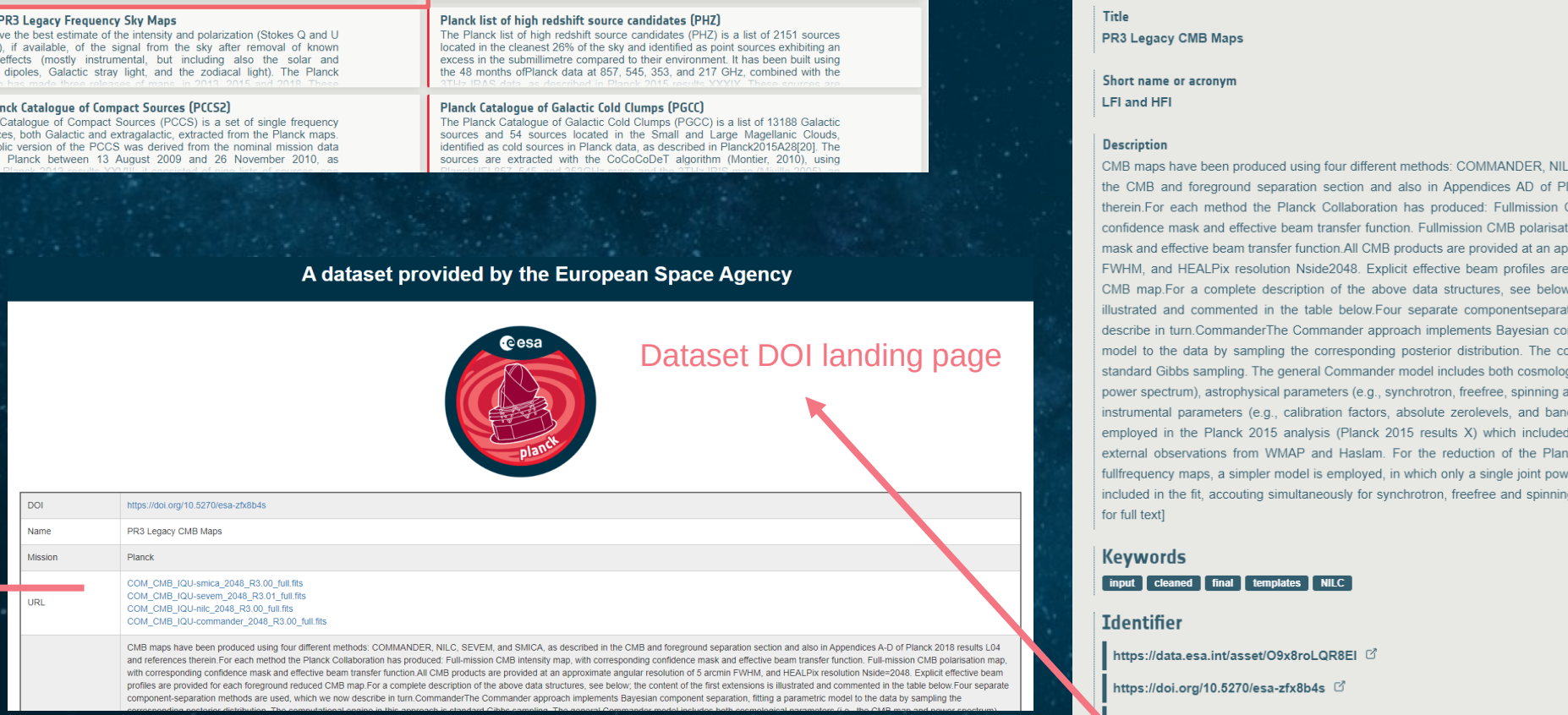
- Drill down your search through faceted search criteria selection
- Domain, Thematic area, Mission, Instrument

Not an actual data archive

- Does not actually archive datasets (but only common metadata)
- Does *not* supersede the existing mission data archives

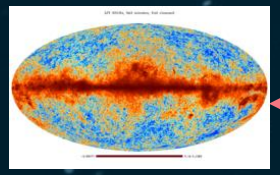
From ESA Data Discovery Portal to Dataset download





A dataset provided by the European Space Agency

Dataset DOI landing page



Dataset Download

Google Dataset Search - https://datasetsearch.research.google.com/

Released in September 2018, targeting

- Open data and open science
- Researchers, data geeks/scientists/journalists, students, …
- 25M datasets referenced

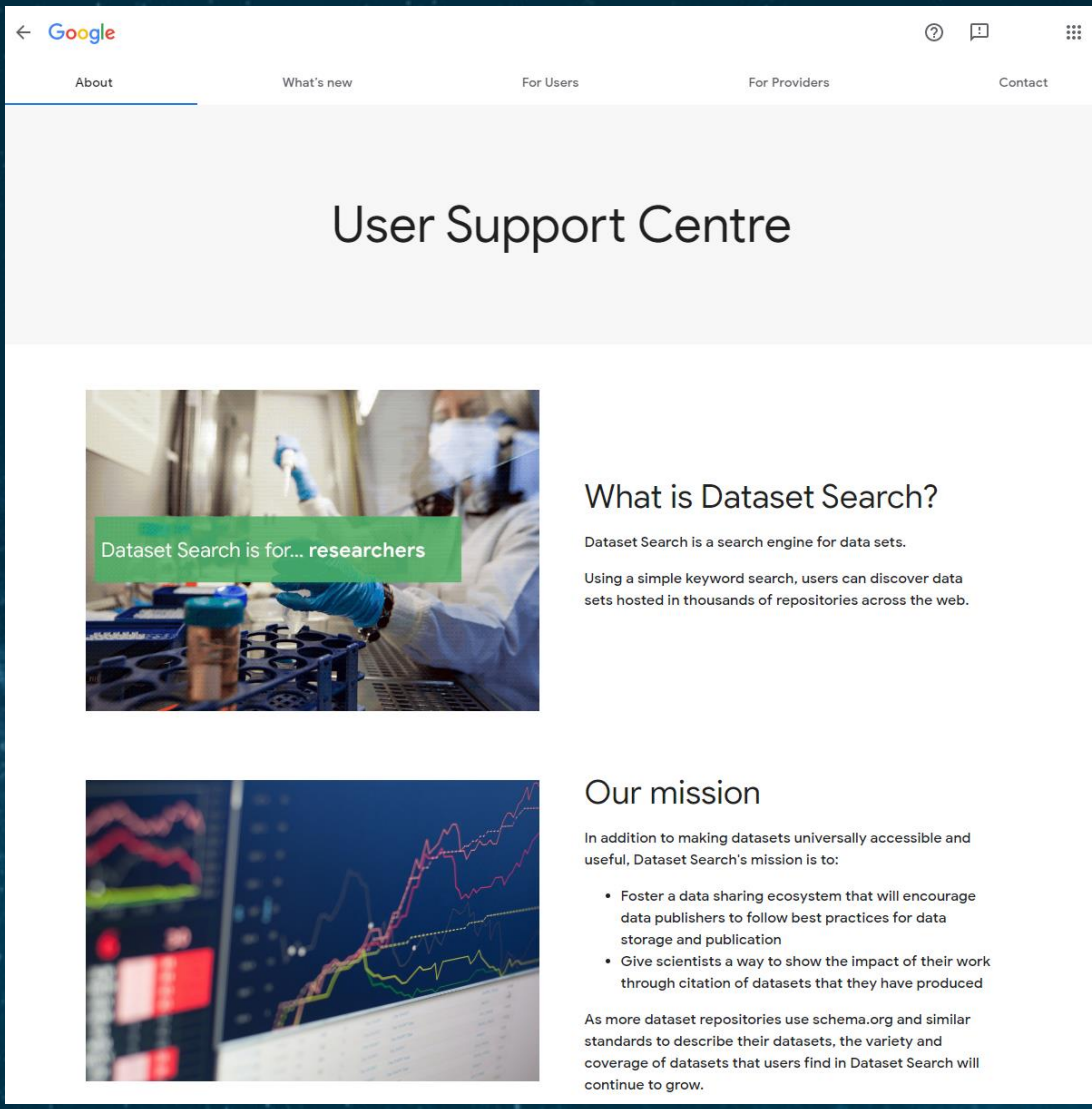
All datasets referenced through schema.org vocabulary

Not clear if really to be used by scientific community which is probably better served through our mission data archives

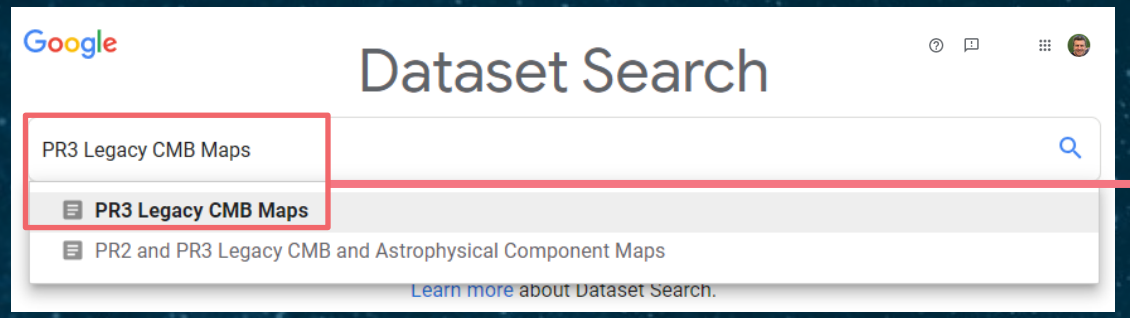
But ESA datasets need to be properly referenced in Google to ensure access to correct and quality data

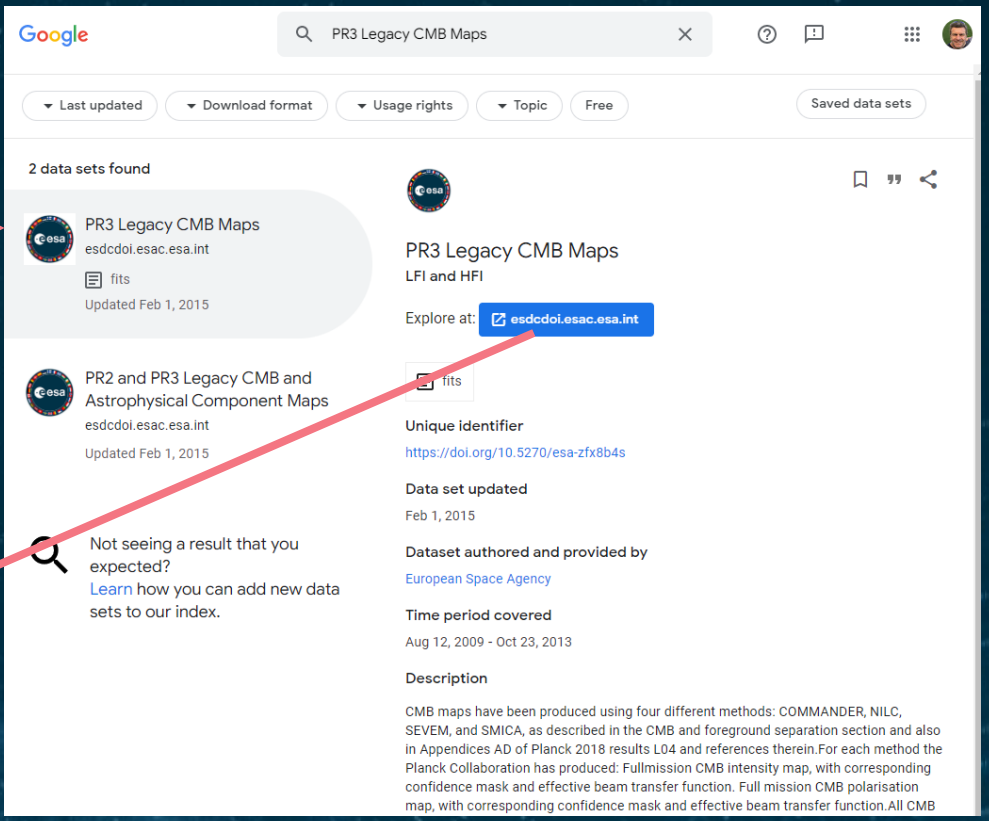
When minting DOI for ESA Dataset, add creation of schema.org for it (as great overlap with DOI metadata)

=> ESA Datasets then get referenced into Google Dataset Search

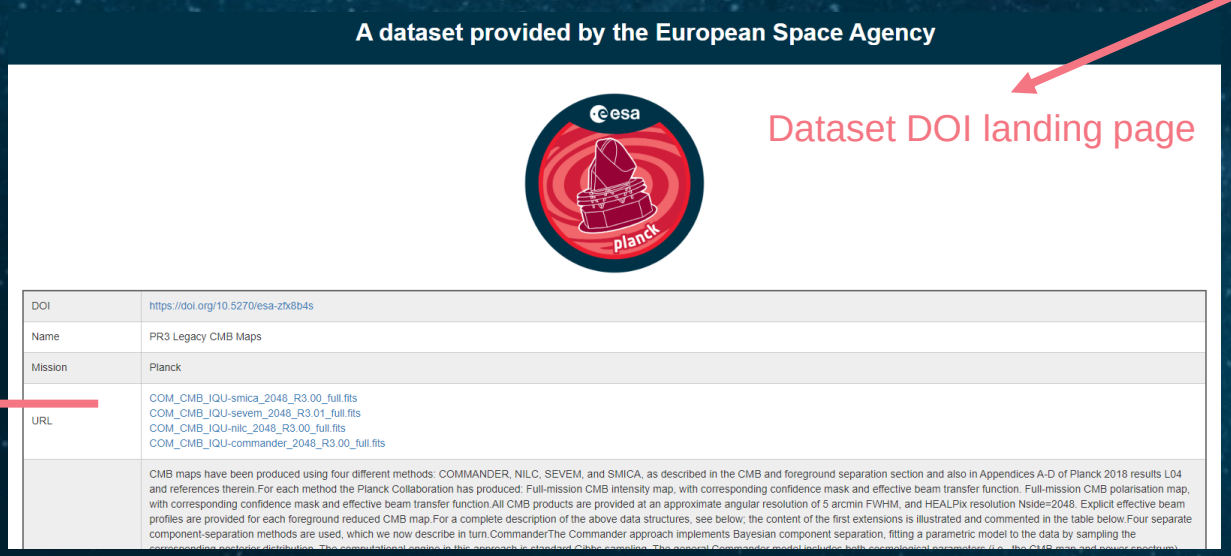


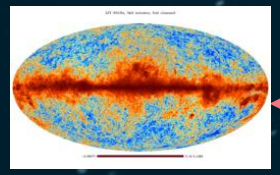
From Google Dataset Search to ESA dataset download





Dataset DOI landing page



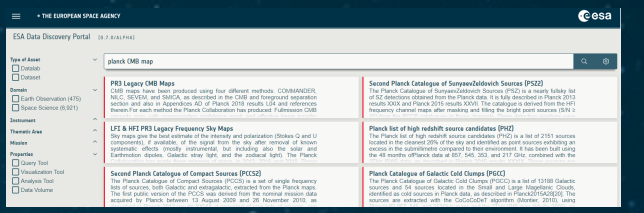


Dataset Download

Conclusions and next steps

ESA Data Discovery Portal (data.esa.int)

- Offers a unified entry point to all ESA datasets from all ESA directorates
- Is complementary to the existing ESA data archives where data resides



DOI minted for all ESA datasets

- Common metadata description for all
- Granularity depends on type of mission
- Almost complete for Space and Earth Science, in progress for other disciplines

ESA Data Discovery Portal planned to expand to ESA Datalabs science exploitation platform

- Discovery of datasets and discovery of “datalabs”
- From the data to the visualization / analysis tools

Backup slides

ESA Datalabs – datalabs.esa.int

Multi-Domain and Multi-Mission Digital Platform

ESA Science Exploitation Platform

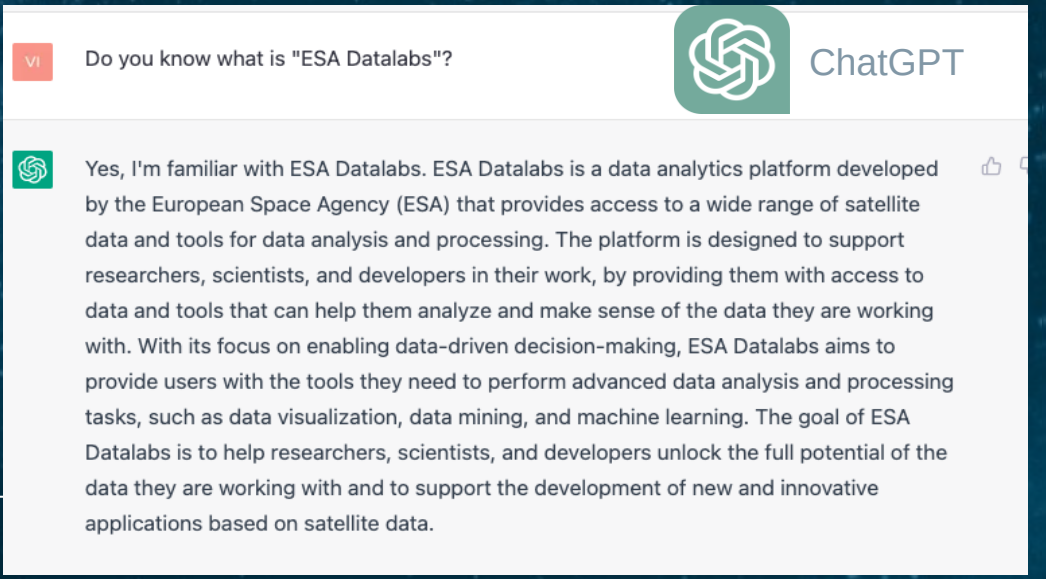
- Science Data available for researchers to work on it, made easy

Increase Science Operations Efficiency

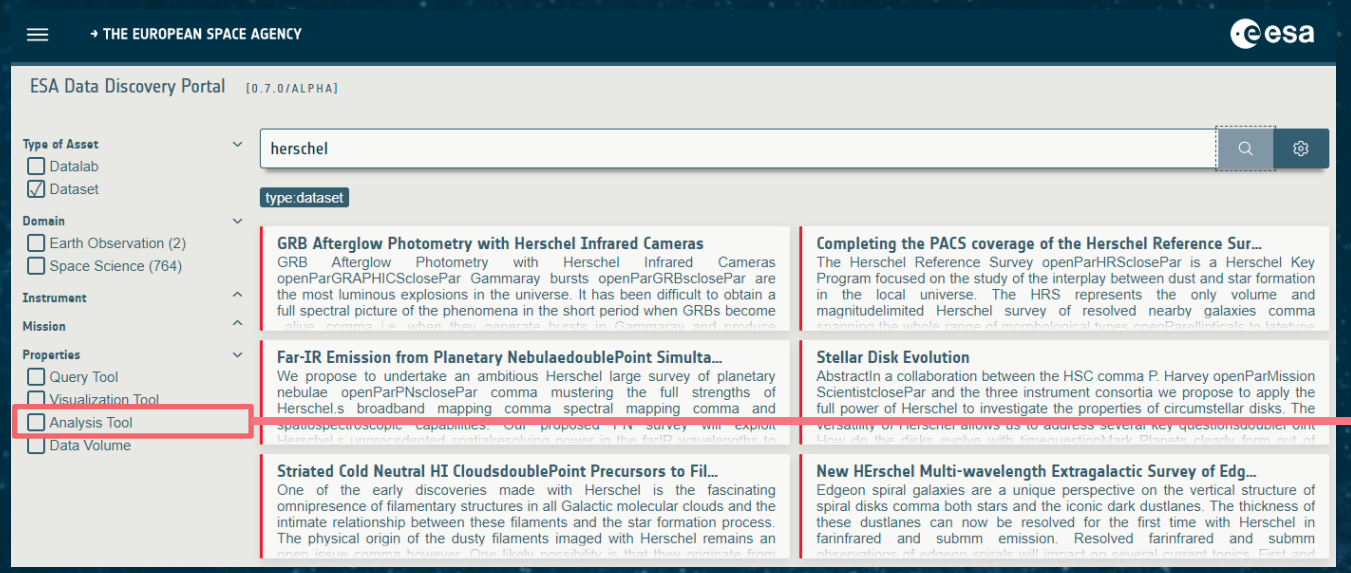
- Reusable for fast implementation of Scientific Processing Pipelines
- Reusable for fast implementation of Scientific Analysis and Visualisation Tools

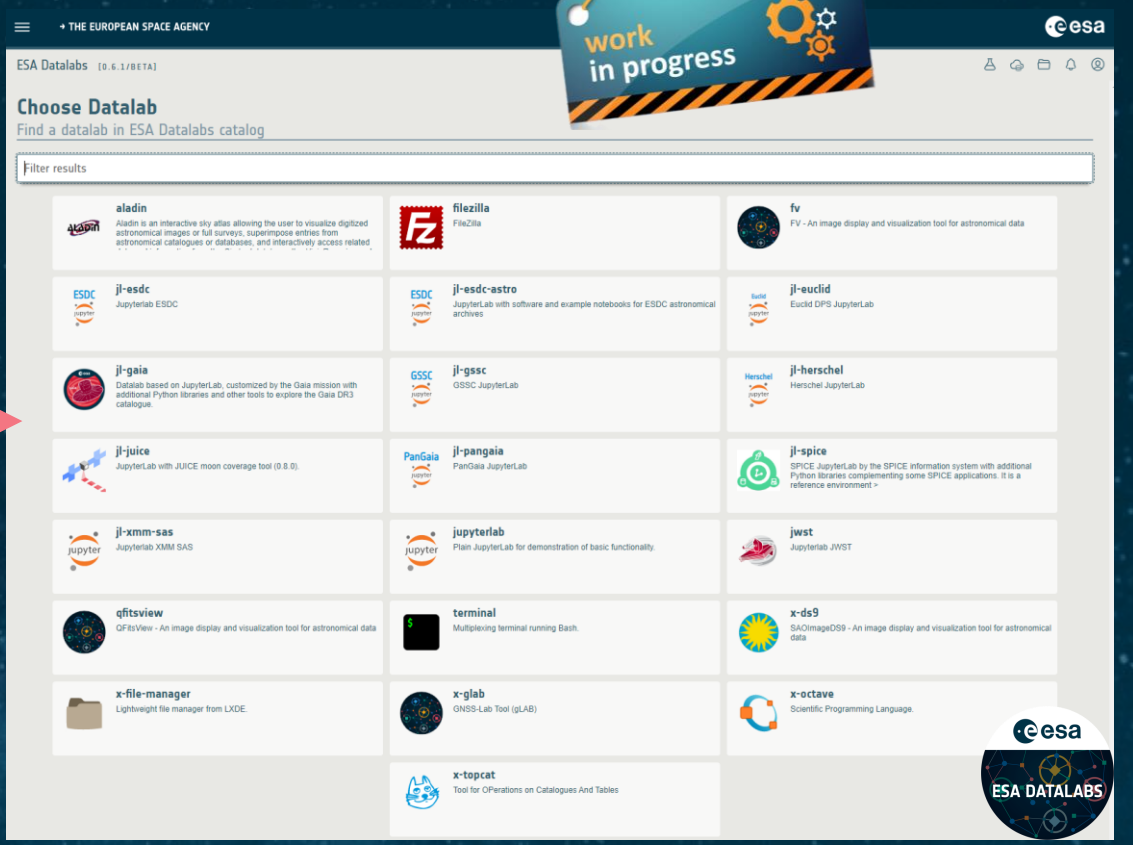
Collaboration and Open Science

- Share complex processing tools and data with your team
- Share your contributions with the community in ESA Datalabs Science AppStore



From ESA Data Discovery Portal to ESA Datalabs





Search for Tools associated with data

Launch it directly into ESA Datalabs platform

- Data will automatically be loaded into your datalab
- Start analysing the data