

# Integration of ESASky in the ESA Astronomy Science Archives via its API

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# ESASky and ESASky API evolution

The screenshot shows the ESASky JavaScript API interface. At the top, there are navigation links for 'SCIENCE MISSIONS', 'EUROPEAN SPACE AGENCY', and 'SCIENCE & TECHNOLOGY', along with a 'SIGN IN' button. The main header features the 'esdc' logo and the ESA logo. Below this, the breadcrumb trail reads 'ESDC » ESASky » ESASky Javascript API'. The main content area is titled 'ESASKY JAVASCRIPT API' and displays a large image of a galaxy (J2000) with various toolbars for navigation and analysis. A table at the bottom shows observation data:

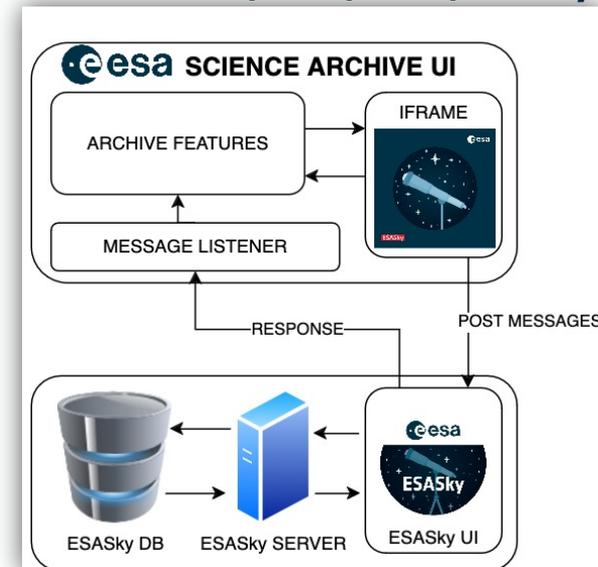
Observation ID
j9z301010
u2ouki01t

Below the table, there is an 'Output window' showing a JSON response: `{\"extras\": {\"message\": \"Image observations from missionId: HST-UV displayed in the ESASky\", \"origin\": \"esasky\"}}`

ESASky is a multi-mission, multi-wavelength, multi-messenger data discovery portal that allows users to discover data from ESA's astronomy missions and from the missions from partner space agencies like NASA, CSA, JAXA, the Chinese Academy of Sciences.

ESASky was released in 2015 and since then its API has evolved significantly to cover the growing needs from pyESASky, EVA bot and several ESDC archives.

<https://www.cosmos.esa.int/web/esdc/esasky-javascript-api>



The Planck Legacy Archive integrated ESASky to provide context in the cutout tool

The screenshot shows the Planck Legacy Archive website. At the top, there are navigation links for 'EUROPEAN SPACE AGENCY' and 'SCIENCE & TECHNOLOGY', and a 'SIGN IN' button. The main header features the 'Planck Legacy Archive' title and the ESA logo. Below the header, there is a navigation sidebar with icons for home, search, and other functions. The main content area is divided into several sections: a welcome message with a background image of a Planck map and a search bar; a 'LATEST NEWS' section with a link to 'Planck PR4 release'; a 'PLANCK LEGACY ARCHIVE CONTENTS' section with icons for 'MAPS', 'CATALOGUES', 'COSMOLOGY', 'TIMELINES AND RINGS', 'SOFTWARE, BEAMS AND INSTRUMENT MODEL', and 'OPERATIONAL DATA'; and a 'USEFUL INFORMATION' section with icons for 'EXPLANATORY SUPPLEMENT', 'EXTERNAL DATA AND SOFTWARE', 'COLLABORATION PAPERS', 'USE OF PLANCK DATA', 'UPDATE HISTORY', 'PLANCK SCIENCE TEAM HOME', and 'HELPDESK AND USER FORUM'.

The Planck Legacy Archive integrated ESASky to provide context in the cutout tool

The screenshot displays the Planck Legacy Archive interface. At the top, it shows the European Space Agency logo and navigation links. The main header reads "Planck Legacy Archive". Below this, a "RESULTS" section shows a table of "FREQUENCY MAPS (26)". The table has columns for "Map name", "Size", "Frequency", "Period", and "BPassCorr". The first row is selected, showing a map named "LFI\_SkyMap\_030-BPassCorrected-field-IQU\_1024\_R3.00\_full.fits" with a size of 144 MB and a frequency of 30. To the right of the table, there are filters for "PR1", "PR2", "PR3", and "PR4", with "PR4" selected. Below the table, there are navigation controls including "Page size: 100" and "Displaying 1-26 of 26".

On the right side of the interface, there is a "Map conversions" section with a "PREVIEW IMAGES" sub-section. It shows a "MAP CUTOUT" of a region labeled "I\_STOKES". Below this, the "ESASKY" section displays a large astronomical image with a coordinate system (GAL: 309.5200000 +19.4200000) and a field of view (FoV: 175° X 82°). The image shows a bright, curved structure, likely a galaxy or nebula. There are various interaction icons for the image, including zoom, pan, and reset.

The eJWST archive was the second archive to integrate ESASky

A fully functional ESASky is used to overlay the footprints from the observations in the results table

**Summary** | Image Preview

Observation ID	jw02727-o007_t062_miri_f1000w
Target	NAME-CARTWHEEL
Target Description	Galaxy; Interacting galaxies
Moving Target	FALSE
Target RA	9.424575833333334
Target DEC	-33.710408333333336
Proposal ID	2727
Proposal Title	JWST Early Release Observation 1
Proposal PI	Pontoppidan, Klaus M.
Instrument	MIRI/IMAGE
Detector	MIRIMAGE
Observation Mode	MIR_IMAGE
Filter	F1000W
Template	MIRI Imaging

J2000 00 37 41.898 -33 42 37.47 FoV: 5.2' X 2.0' DSS2 color

Sci. Mode En Feedback

Search...

Image Opacity

	Observation ID	Download	SAMP	Preview	Cube visualizer	Image visualizer	Target name	Target Desc.	RA	Dec	Distance	Instrument	O
<input type="checkbox"/>	» jw02727-o007_t062_miri_f1000w						NAME-CARTWHEEL		00h 37m 41.89s	-33d 42' 37.47"	23.212	MIRI/IMAGE	MI
<input type="checkbox"/>	Q jw02727-o002_t062_nircam_clear-f444w						NAME-CARTWHEEL		00h 37m 41.89s	-33d 42' 37.47"	23.212	NIRCAM/IMAGE	NF
<input type="checkbox"/>	Q jw02754-o001_t001_miri_f1500w						SN2021AFDX		00h 37m 42.57s	-33d 43' 24.73"	31.941	MIRI/IMAGE	MI

1 of 9 Page size: 50

Displaying 1-50 of 443

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## jwst science archive



- HOME
- SEARCH
- RESULTS
- ESASKY SEARCH
- ADQL SEARCH
- GUIDE

### WELCOME TO THE ESA JWST SCIENCE ARCHIVE

The James Webb Space Telescope (JWST) is the largest optical or infrared observatory ever launched to space. Developed in a collaboration between NASA, ESA, and CSA, Webb observes the Universe in infrared light from its orbit at the Lagrangian point L2, 1.5 million km away from Earth.

The ESA JWST archive user interface allows users to perform simple and advanced searches based on multiple observation parameters such as coordinates, target name, proposal Id, etc., quick explorations of the data products and metadata including use of ESASky, and searches based on ADQL and the astroquery language.

- Quick search by target name or coordinates [J2000]
- Search by Proposal Id
- Click on labels for help.

### JWST LATEST NEWS

**A galaxy far far away...**  
Looking deep into space and time, two teams using JWST have studied the galaxy GN-z11, which existed when our Universe was only about 430 million years old.  
[7 weeks ago - JWST Archive Latest News](#)



SEARCH



ESASky SEARCH



ADQL SEARCH



JWST ARCHIVE USER ACCOUNT



HIGH LEVEL SCIENCE PRODUCTS



eJWST GUIDE



HELPDESK



COSMOS PORTAL FOR JWST



eesa WEBB AT ESA

The ESASky Explorer was added with a customization layer to facilitate the discovery of the eJWST archive contents with custom buttons to filter by observing mode and filter.

The screenshot displays the JWST Science Archive interface. At the top, there are navigation tabs: HOME, SEARCH, RESULTS, ESASKY SEARCH, ADQL SEARCH, and GUIDE. Below these, a search bar contains the text 'cartwheel'. A sidebar on the left shows a grid of filter options under the heading 'NIRCam Imaging', including filters like F070W, F150W, F150W2, F182M, F187N, F200W, F090W, F210M, F277W, F300M, F322W2, F335M, F115W, F212N, F356W, F410M, F430M, F444W, F140M, F250M, F360M, F460M, F480M, and WLP4. The main area shows a central image of the Cartwheel galaxy with overlaid red and green observation patterns. Below the image is a table of data products.

File Size	Access Format	Download	Calib Level	Core Id	Dataproduct Type	Datarelease	Em Max	Em Min	Em Res Power	Em Ucd	Em Xel	Facility Name
	application/zip	↓	2	a4884a5e-86ef-43f5-b238-5762b8ac2d48	image	2022-08-02T22:00:00.0	1.668E-6	1.331E-6	NaN	0	0	JWST
	application/zip	↓	1	d050fc96-32da-479f-9b60-24fee113a8de	image	2022-08-02T22:00:00.0	1.668E-6	1.331E-6	NaN	0	0	JWST
	application/zip	↓	2	05f5a871-ebc6-4f11-b5e8-9443db952a28	image	2022-08-02T22:00:00.0	1.668E-6	1.331E-6	NaN	0	0	JWST
	application/zip	↓	1	e1068c35-dc90-4b6a-a149-85ec301c9144	image	2022-08-02T22:00:00.0	1.668E-6	1.331E-6	NaN	0	0	JWST

A fully functional ESASky is used to overlay the footprints from the observations in the results table

**HUBBLE**  
The premier UV and visible light telescope in orbit

A treasure trove of astronomical data

European Space Agency

About [YouTube](#) [Twitter](#) [Facebook](#) [Instagram](#) [LinkedIn](#)

The screenshot shows the top navigation bar with the eHST logo, a search icon, and links for Home, Advanced Search, Spectra Viewer, and User Guides. The main banner features a colorful nebula image with the text "HUBBLE The premier UV and visible light telescope in orbit" and "A treasure trove of astronomical data". Below the banner are five service tiles: HELPDESK, ESA HUBBLE, HCV EXPLORER, ASTROQUERY, and DOI ARCHIVE, each with a "MORE" link. The footer includes the European Space Agency logo and social media icons for YouTube, Facebook, Twitter, and LinkedIn.

ESASky has been integrated in the Single Object tool to provide context

The screenshot shows the Gaia ESA Archive website. At the top, there is a dark red header with the text "gaia archive" and the ESA logo. Below the header is a navigation menu with links for "HOME", "SEARCH", "SINGLE OBJECT", "VISUALISATION", and "HELP". The main content area features a "Welcome to the Gaia ESA Archive" section with a paragraph of text and a circular graphic of the Gaia satellite. Below this is a "Top Features" section with eight icons and corresponding text: "Gaia Mission", "Gaia DR3", "Gaia FPR", "Download", "Software Tools", "Auxiliary Data", "Citation", and "Partners".

ESASky has been integrated in the Single Object tool to provide context

gaia archive
esa

HOME SEARCH SINGLE OBJECT VISUALISATION HELP

Target/Coordinates: Gaia DR3 411183456779557376 Download

### Gaia DR3 411183456779557376

Astrometry
Photometry
Spectroscopy
Astrophysical parameters

Description	Value	Unit
Equatorial ICRS [RA,DEC] at epoch 2016	256.5229102004, -26.5805651308	deg
Galactic [l, b] at epoch 2016	357.0803450631, 8.5731964881	deg
Parallax	1.1538 ± 0.0241	mas
RA proper motion	0.3896 ± 0.0256	mas yr <sup>-1</sup>
DEC proper motion	-0.2893 ± 0.0165	mas yr <sup>-1</sup>
Renormalised unit weight error	0.837	

#### ESASky

Set target Expand

#### Epoch Photometry

Show errors Expand

#### BP/RP (XP) Spectrum

Expand

#### RVS Spectrum

Expand

If you find an issue with the data, please contact the Gaia Helpdesk

(Cookie policy) (v3.5.3)

ESASky was added with a customization layer to facilitate the discovery of Euclid data

The screenshot shows the Euclid Science Archive website. At the top, there is a navigation bar with links for EUROPEAN SPACE AGENCY, ABOUT ESAC, and SIGN IN. The main header features the 'euclid science archive' logo and a menu with options: HOME, SEARCH, RESULTS, VISUALISE, ANALYSE, and SUPPORT. The main content area is titled 'WELCOME TO THE EUCLID SCIENCE ARCHIVE' and includes a list of mission goals: Discover the origin of the accelerated expansion of the Universe, Discover the nature of 95% of the Universe: dark energy and dark matter, Measure shapes of galaxies, and their distortion due to dark matter acting as a lens, and Measure the clustering of galaxies, resulting from the action of gravity. To the right of this text is a stylized illustration of the Euclid satellite. Below this is a 'TOP FEATURES' section with four icons and descriptions: 'EUCLID MISSION' (Information, news and resources on the Euclid mission for the community), 'ESA SKY' (ESA Sky visualization for Euclid Science Archive), 'SEARCH' (Search the Euclid data processed by the Euclid science ground segment), and 'HELP' (Comprehensive guide to all aspects of using the Euclid Science Archive). At the bottom of the page, there is a small text block: 'ESA uses cookies only to track visits, no personal data is collected. Click here for detailed privacy policy information. Click here for terms and conditions of the data' and a version number '[1.1.0-otf]'.

ESASky was added with a customization layer to facilitate the discovery of Euclid data

The screenshot shows the 'euclid science archive' interface. At the top, there are navigation tabs: HOME, SEARCH, RESULTS, VISUALISE (active), ANALYSE, and SUPPORT. Below the tabs, the current view is 'J2000' with coordinates '18 32 16.943 +67 29 49.19' and 'FoV: 25° X 11°'. The main display area shows a star field with a grid of observation frames overlaid. A sidebar on the left contains an 'Observations' panel with two colored boxes labeled 'VIS' (purple) and 'NISP' (blue). Below the main display is a table of observation data.

	Go to	Access Url	Dataproduct Type	Dataproduct Subtype	Obs Collection	Obs Id	Obs Publisher Did	S Ra
<input type="checkbox"/>			filter column...	filter column...	filter column...	filter colu	filter column...	
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000001-QMIGF3I-20231205-135623-68-dpdcalibrated_frames-1	17h 58m 58.79
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000001-ZK0W2CC0-20231205-135352-56-dpdcalibrated_frames-1	17h 43m 11.08
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000000-YMCVWRPO-20231204-184850-60-dpdcalibrated_frames-1	17h 49m 45.86
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000000-MOYH5F89-20231204-184910-62-dpdcalibrated_frames-3	17h 54m 54.87
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000001-PNI1YFAU-20231205-140100-89-dpdcalibrated_frames-1	18h 19m 17.26
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000000-TNGYWATL-20231204-184750-54-dpdcalibrated_frames-2	17h 48m 34.93
<input type="checkbox"/>			image	DpdVisCalibratedFrame	sedm	65774	ivo://esavo/EUC765774/VIS_ProcFId-Split_EUC_1.0.6-ON_THE_FLY-pcasenov-PLAN-000000-CBS5JCA-20231204-185549-101-dpdcalibrated_frames	18h 09m 14.83

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1.1.0-otf



# Summary and Future plans

ESASky is a data discovery tool based on VO protocols developed by the ESAC Science Data Centre. It has an extended API that allows other ESA archives as well as external parties to integrate it in their user interfaces to show data already available from ESASky or other data sets.

Several ESA Archives are using ESASky in their user interfaces taking advantage of the extended customization capabilities and more archives will integrate it in the future. ESASky will update to AladinLite3 this summer, which will allow for further improvements in other areas like preview visualization.

The ESASky team always welcomes feedback and suggestions on how to improve the application and its API capabilities, so if you have specific requests do not hesitate to contact the ESASky team.



THANKS!!