



# ESO Archive – and a bit more

Presented by Adam Dobrzycki

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- ESO overview
- ESO Archives
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  - Ways to access the archive
  - Why does the archive make sense?
  - Usage
  - Odds and ends
- ESO opportunities
  - Call for Proposals
  - Fellowships/studentships/internships
  - Press Releases



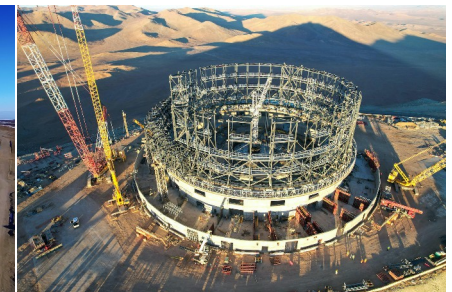
# ESO



# European Southern Observatory

(properly: The European Organisation for Astronomical Research in the Southern Hemisphere)

- Established in 1962. Sixteen “Member States” (since 2015 incl. Poland) plus “Host Country”
- Headquarters in Garching, Germany
- Observatories in Chile:
  - Cerro La Silla (3.6m, 3.5m)
  - Cerro Paranal (VLT, VLTI, survey telescopes)
  - Llano de Chajnantor (ALMA)
  - Coming (relatively) soon: Armazones (ELT)





# Poland joining ESO

The screenshot shows the Squirrel SQL Client interface. The active session is '2 - all-esodbo (user...)' connected to 'adp-archeso'. The catalog is 'user\_portal'. The SQL editor contains the following query:

```
select * from countries where country='Poland'  
  
update countries  
set member_state=1  
where country='Poland'  
select * from countries  
where country='Poland'
```

The results pane shows the execution of the first query, returning one row:

country_id	country	country_code	member_state	permission_group_id	iso_country_co...
1168	Poland	PL	true	1	PL

The status bar at the bottom indicates: '1 Row(s) Updated', 'Query 1 of 1, Rows read: 0, Elapsed time (seconds) - Total: 0.094, SQL query: 0.094, Reading results: 0', and 'Query 1 of 1, Rows read: 1, Elapsed time (seconds) - Total: 0.018, SQL query: 0.002, Reading results: 0.018'. The system tray shows 'Logs: Errors 2, Warnings 0, Infos 13', '36 of 81 MB', and the time '11:17:33 AM CEST'.





# ESO ARCHIVES

## ■ ESO hosts two science archives

- La Silla Paranal Observatory (LPO), i.e. the ESO Science Archive “proper”, fully under the control of ESO
- ALMA Science Archive, a deliverable to the ALMA project, which is also (identically) deployed in NRAO (North America) and NAOJ (East Asia)

Note: ESO archive will be available via the ALMA archive in not-too-distant future

In this presentation we will concentrate on the LPO Archive, though ALMA data are accessible via some of the interfaces.

# ESO Archive: contents

## ■ Raw data

- La Silla: 1991-, Paranal: all, selected APEX: 2005-23
  - Science data, typically proprietary for 12 months
  - Calibration data, public immediately

## ■ Processed data (D.Dobrzycka's talk)

- Continuous streams of products generated (mostly) in-house; access rights inherited from raw data
- Contributed by the community

## ■ Databases

- Metadata of all the above
- Ambient conditions
- Proposals, users, obs.parameters, schedules, etc.



# As of August 2023

## ■ Content:

- 73 million individual files
- 2.6 petabytes
- 55 billion database rows

## ■ Inflow:

- 350,000-450,000 files/month
- 20-30 terabytes/month

## ■ Downloads:

- 1.2-1.5 million files/month
- 50-70 terabytes/month
- 700-800 distinct users/month



# archive.eso.org

The screenshot shows the ESO Science Archive Facility website. The main navigation bar includes 'Public', 'Science', 'User Portal', 'Intranet', 'Contact', 'Site Map', and a search bar. The left sidebar lists various services like 'Data Portal', 'Virtual Observatory', and 'Catalogues, Plates and DSS'. The main content area features a 'Welcome to the ESO Science Archive Facility' message and a central navigation grid with buttons for 'Raw Data', 'Science Portal', 'Catalogue Facility', 'Programmatic', and 'Community Forum'. Below this is a 'Latest News and Updates' section with a list of recent releases. At the bottom, there is a table titled 'To browse the archive' that details different data products and their access points.

**Raw Data** (highlighted in red)

**Science Portal** (Processed Data)

**Catalogue Facility** (Catalogue Data)

**Programmatic** (Raw, Processed, Catalogue, and Ambient Data)

**Community Forum** (Share ideas, ask questions, send feedback)

**Latest News and Updates**

- First Data Release of ePESSTO+, the advanced Public ESO Spectroscopic Survey of Transient Objects (18 Aug 2023)
- Final data release (5.1) of the Gaia-ESO public spectroscopic survey (5 Jul 2023)
- Fifth release of UltraVISTA Public Survey data (5 May 2023)
- Data Release of the MUSE Hubble Ultra-Deep Field surveys (AMUSED) mosaic cubes and catalogue (12 Apr 2023)

More news ...

To browse the archive, different types of data products can be reached via different interfaces:

Category	Access Point	Data collection	Data Type	Instruments
LPO Raw Data	Raw data query form (all instrument specific query forms) Direct retrieval of raw data by file name	All ESO raw data	Various	Many La Silla Paranal instruments
LPO Processed Data	Type specific query forms (generic, spectral, imaging, VISTA) Direct retrieval of reduced data by file name	Processed Data (ESO public surveys; ESO pipeline-reduced products; Large programs: GOODS, zCOSMOS, etc.)	Imaging, Spectroscopy, Catalogs, etc.	Various
[Description of reduced data products types]	Catalogue Facility query interface	Catalogues [ESO User Portal authentication required]	Catalogues	Various
	HARPS-Polarimetry pipeline processed data query form	HARPS-Polarimetry and calibration pipeline processed data	Spectroscopy	HARPS-Polarimetry, HARPS reduced calibrations (other HARPS see Phase3 above), FEROS is now available via the Phase 3 interfaces.
	Other Advanced Data Products (available only as downloadable packages, no query form)	Various (30 Doradus, Corot, GaBoDs, etc.)	Spectroscopy Imaging	FEROS WFI
Science Verification, Commissioning, EIS, etc. (no query form)	Full list of available data packages	Various	Various	Many
APEX Quick Look Products	APEX query form	APEX	Heterodyne, Bolometer	ARTAMIS, CHAMP+, FLASH, LABOCA, SABOCA, SEPIA, SHFI
LPO Schedule	Scheduling query form	ESO Observing Programme information and Scheduling		All La Silla Paranal instruments, including APEX





# archive.eso.org

archive.eso.org

## SCIENCE ARCHIVE FACILITY

### Observational Raw Data Query Form

How to use? | Instrument-specific Interfaces | ESO Archive Overview | Archive FAQ | Archive Facility HOME | ESO HOME

This query interface allows to search and to request raw observational data taken by telescopes of the La Silla Paranal Observatory.  
New features 9 November 2020:

- You can now limit your queries to either optical or infrared instruments using the MarkOptical and MarkInfrared buttons in the instrument blue panel
- When looking for images in a certain bandpass, constraints can now be provided using wavelengths in nm, or standard bandpass name (see [help page](#))
- At request time, you can decide whether to download any of the following:
  - the selected raw data,
  - the raw or processed calibrations needed to process the selected raw data,
  - the pipeline-processed data generated out of the selected raw data (if they exist)

Read more...

Search [ ] Reset [ ] Output preferences: html table [ ] Return max 200 [ ] rows. All Fields [ ] Syntax Help [ ]

#### Target, Program, and Scheduling Information

Target Name [ ] Resolved by SIMBAD [ ] Night [ ] (YYYY MM(M) DD)

RA [ ] DEC [ ] J2000 [ ]  
 Search Box [ ] Input [ ] RAIN DEC(deg) [ ]  
 Output [ ] Sexagesimal (h, deg) [ ]

Program ID [ ] PI Col [ ] Title [ ]  
 Program Type [ ] SY [ ]

Otherwise give a query range using the following start/end dates:  
 Start [ ] 12 hrs [UT] [ ] End [ ] 12 hrs [UT] [ ]

#### Observing Information

<p>MarkOptical</p> <p>ALL   NONE</p> <p>EFOSC2/LaSilla EMMI/LaSilla ERIS/VLT FOR2/VLT FOR1/VLT HAWK/VLT GROND/LaSilla ISAAC/VLT NACO/VLT OMEGACAM/VST SOFI/LaSilla SPHERE/VLT SUSI2/LaSilla TIMM2/LaSilla VIMOS/VLT VIRCAM/VISTA VISIR/VLT WE/LaSilla XSHOOTER/VLT</p>	<p>MarkInfrared</p> <p>ALL   NONE</p> <p>CES/LaSilla ERIS/VLT EMMI/LaSilla ESPRESSO/VLT FEROS/LaSilla FOR1/VLT FOR2/VLT GIRAFFE/VLT HARP/LaSilla ISAAC/VLT KMOS/VLT MUSE/VLT NIRXPS/LaSilla SOFI/LaSilla SPHERE/VLT TIMM2/LaSilla UVES/VLT VIMOS/VLT VISIR/VLT</p>	<p>Other</p> <p>ALL   NONE</p> <p>ALPACA/Paranal AFICAM/Paranal BOJ/APEX HET/APEX LGSF/VLT MAD/VLT MASCOT/Paranal SPEGLIOS/Paranal WFCAM/UKIRT</p> <p>Polarimetry</p> <p>ALL   NONE</p> <p>EFOSC2/LaSilla ERIS/VLT FOR2/VLT ISAAC/VLT NACO/VLT SOFI/LaSilla SPHERE/VLT VISIR/VLT</p> <p>Sparse Aperture Mask</p> <p>ALL   NONE</p> <p>ERIS/VLT NACO/VLT SPHERE/VLT VISIR/VLT</p> <p>Coronagraphy</p> <p>ALL   NONE</p> <p>EFOSC2/LaSilla ERIS/VLT NACO/VLT SPHERE/VLT VISIR/VLT</p>	<p>Data Product Info</p> <p>Type [ ] Any [ ]</p> <p>User defined input:</p> <p>Mode [ ] Any [ ]</p> <p>Dataset ID [ ]        Orig Name [ ]        Release Date [ ]        OR Name [ ]        OR ID [ ]        TPL_START [ ]</p> <p>Instrumental Setup</p> <p>TPL ID [ ]        Exptime [ ]        Filter bandpass [ ]        Grism [ ]        Grating [ ]        Slit [ ]</p> <p>Category [ ]</p> <p>SCIENCE [ ]        CALIB [ ]        ACQUISITION [ ]</p>
--	--	---	--

Instrument & Mode [ ]

Additional Tools and Parameters

archive.eso.org

## SCIENCE ARCHIVE FACILITY

### ESPRESSO Raw Data Query Form

How to use? | Other Instruments | Archive FAQ | Archive Facility HOME | ESO HOME

#### Description

This form provides access to observations (raw data) performed with ESPRESSO since September 2018 that are stored on-line in the [Science Archive Facility](#) in Garching. Find more information about ESPRESSO data on the [Quality Control web pages](#). Paranal ambient conditions can be queried separately from [here](#).

Search [ ] Reset [ ] Output preferences: html table [ ] Return max 1000 [ ] rows. All Fields [ ] Syntax Help [ ]

#### Target Information

Target name [ ] SIMBAD name [ ]  
 Coordinate System [ ] Equatorial (FK) [ ] RA: [ ] DEC: [ ] RA: sexagesimal/hours, decimal/degrees  
 Search Box [ ] Equatorial Output Format: [ ] Sexagesimal [ ]

Input Target List [ ] Choose File [ ] no file selected

#### Observation and proposal parameters

DATE\_OBS [ ] (YYYY MM(M) DD of night begin (12:00 UT), DD MM(M) YYYY also acceptable)  
 OR give a query range using the following two fields (start/end dates)  
 Start [ ] 12 hrs [UT] [ ] End [ ] 12 hrs [UT] [ ]

Program ID [ ] TP\_C-NNNN (e.g. 080\_A-0123\*) or PPP.AAAA (as of ESO period 105 e.g. 105.20GY\*)  
 Program Type [ ] SY Mode: [ ] All modes [ ]  
 PI/Col [ ] as PI only [ ]

#### Generic File Information

DP\_ID [ ] archive filename of FITS file (e.g. ESPR2018-01-28T01:41:40.428)  
 OB\_ID [ ] identification number of OB within ESO system  
 OBS\_TARG\_NAME [ ] Observation block target name  
 EXPTIME [ ] Exposure time (seconds)  
 DPR\_CATS [ ] Any [ ] Data category (e.g. SCIENCE)  
 DPR\_TYER [ ] Any [ ] Observation type User defined input: [ ] (e.g. OBJECT or P2VM)  
 DPR\_TECH [ ] Any [ ] Observation technique

TPL\_NAME [ ] ESPRESSO template name  
 TPL\_NEXP [ ] total number of exposures within the template  
 TPL\_START [ ] starting time of template (UT)

#### Instrument Specific Information

INS\_MODE [ ] Any [ ] Instrument mode  
 DET\_BINX [ ] Any [ ] Setup binning factor along X  
 DET\_BINY [ ] Any [ ] Setup binning factor along Y  
 DET\_READ\_CURNAME [ ] Any [ ] readout mode name  
 TELESCOPE [ ] Any [ ] Telescope Information [ ] OCS ENABLED FE: [ ] Unit Telescope(s)  
 INNS\_LSELA\_NAME [ ] Any [ ] calibration source for Fibre A  
 INNS\_LSELB\_NAME [ ] Any [ ] calibration source for Fibre B

#### Ambient Parameters

DIMM\_Seeing-avg [ ] [arcsec] DIMM Seeing average over the exposure (FWHM at 0.5msec)  
 Airmass [ ] +/- 0.1  
 Night? [ ] Any [ ] Indicates whether the observation was taken during the Night (Ng), Twilight (Tw) or Daytime (Dy)  
 Moon Illumination [ ] Moon illumination during the exposure (percentage, negative when moon below the horizon)

Sort by [ ] nothing (faster) [ ]

#### Extra Columns on Tabular Output

Uploaded target [ ]

Use tabular output even if only one row is returned.  
 Use full-screen output even if more than one row is returned.

ESO HOME | ARCHIVE HOME | ARCHIVE FAQ





# archive.eso.org

The screenshot shows the archive.eso.org website. The main navigation bar includes 'Public', 'Science', 'User Portal', 'Intranet', 'Contact', 'Site Map', and a search bar. The 'Science Archive Facility' section is highlighted in the left sidebar. The main content area features a 'Welcome to the ESO Science Archive Facility' message, followed by a navigation diagram with 'Science Portal' highlighted in a red box. Below this is a 'Latest News and Updates' section with several news items. At the bottom, there is a table titled 'To browse the archive' which lists various data categories and their access points.

**Navigation Diagram:**

- Raw Data
- Science Portal (Processed Data)
- Catalogue Facility (Catalogue Data)
- Programmatic (Raw, Processed, Catalogue, and Ambient Data)
- Community Forum (Share ideas, ask questions, send feedback)

**Latest News and Updates:**

- First Data Release of ePESSTO+, the advanced Public ESO Spectroscopic Survey of Transient Objects (18 Aug 2023)
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- Data Release of the MUSE Hubble Ultra-Deep Field surveys (AMUSED) mosaic cubes and catalogue (12 Apr 2023)

**To browse the archive**  
Currently, raw data and various types of data products can be reached via different interfaces:

Category	Access Point	Data collection	Data Type	Instruments
LPO Raw Data	Raw data query form (all instruments) Instrument specific query forms Direct retrieval of raw data by file name	All ESO raw data	Various	Many La Silla Paranal instruments
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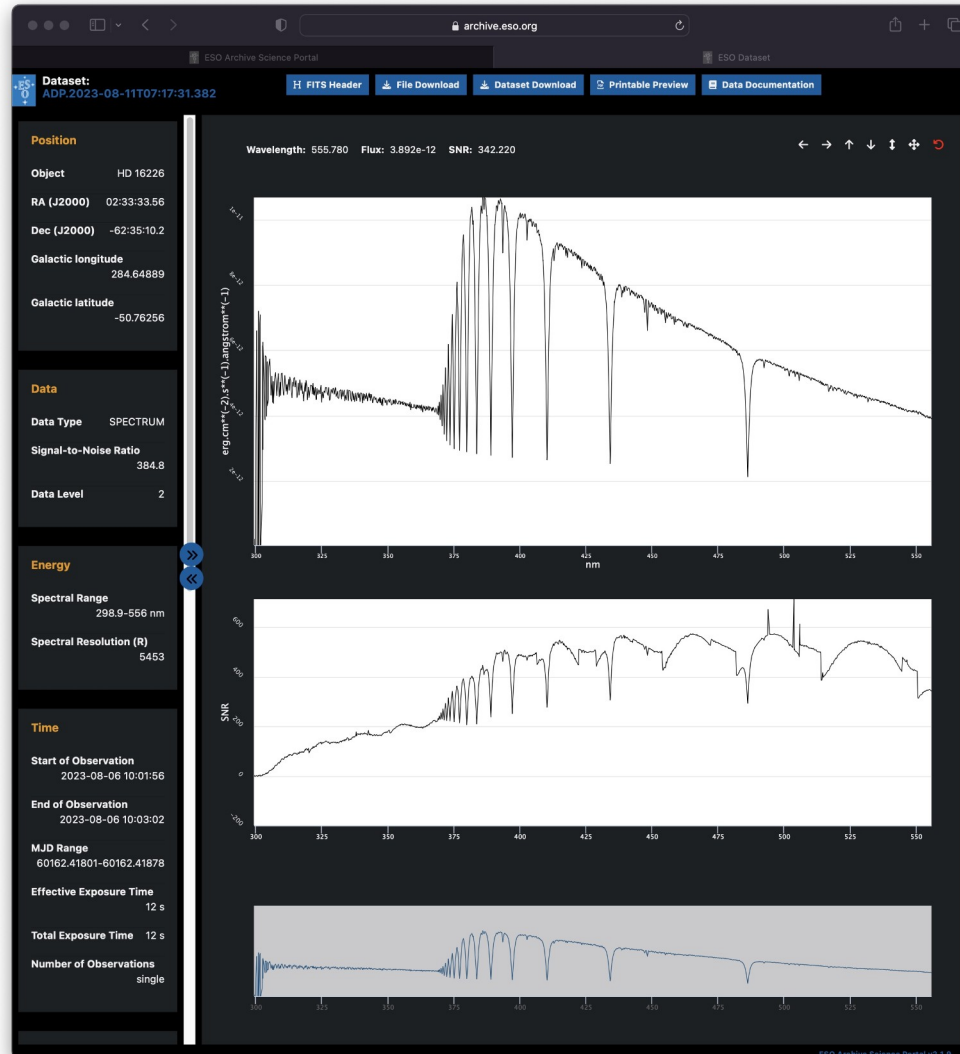
# archive.eso.org

The screenshot displays the archive.eso.org interface. At the top, the search bar shows 'J2000' and 'Target'. The left sidebar contains several filter sections:

- Observatory:** La Silla Paranal (3342773), APEX, ALMA (460886)
- Data Type:** SPECTRUM (1983816), IMAGE (849979), CATALOG (544301), CUBE (421771), VISIBILITY (3792)
- Spectral Range:** A horizontal bar chart showing ranges for UV, opt, NIR, MIR, and mm.
- Filter/Band:** Ks (682056), J (257039), Band 6 (204068), Band 3 (134714), Y (86715)
- Spectral Resolution:** A horizontal bar chart showing ranges from 10k-100k to 10M.

The main panel shows a star field with a grid overlay. Below it, a table lists datasets with the following columns: Actions, Data Type, Spec.Range, Spec.Res., SNR, Sens. (AB mag), Obs.Date, FoV, and Sky Res.

Actions	Data Type	Spec.Range	Spec.Res.	SNR	Sens. (AB mag)	Obs.Date	FoV	Sky Res
	CUBE	475-935 nm	3027	-	23.42	2023-08-10 06:47:41	1.52'	1.129"
	CUBE	475-935 nm	3027	-	23.89	2023-08-10 05:49:29	1.52'	1.060"
	SPECTRUM	994-2101 nm	5573	229.4	-	2023-08-06 10:02:04	-	-
	SPECTRUM	533.7-1020 nm	8935	366	-	2023-08-06 10:02:01	-	-
	SPECTRUM	298.9-556 nm	5453	384.8	-	2023-08-06 10:01:56	-	-
	SPECTRUM	994-2101 nm	8031	179.7	-	2023-08-06 09:59:36	-	-
	SPECTRUM	533.7-1020 nm	11333	319.8	-	2023-08-06 09:59:33	-	-
	SPECTRUM	298.9-556 nm	6655	381.3	-	2023-08-06 09:59:28	-	-
	SPECTRUM	994-2479 nm	4287	270.7	-	2023-08-06 09:57:11	-	-
	SPECTRUM	533.7-1020 nm	5040	436.7	-	2023-08-06 09:57:08	-	-





# archive.eso.org

**Dataset:**  
ADP.2019-08-26T11:44:16.664

**Position**

Object	3C273
RA (J2000)	12:29:06.83
Dec (J2000)	02:03:11.5
Galactic Longitude	289.95177
Galactic latitude	64.36078
Sky Coverage	1.3 arcmin <sup>2</sup>
Field of View	1.6'
Sky Resolution	0.657"
Pixel Scale	0.2"

**Data**

Data Type	CUBE (IFS)
Sensitivity (AB mag at 5σ)	24.29
Data Level	3

**Energy**

Spectral Range	475-935.1 nm
Spectral Resolution (R)	3027

**Time**

Start of Observation	2016-03-31 04:20:23
End of Observation	2019-02-11 07:59:26
MJD Range	57478.18083-58525.33294
Effective Exposure Time	4682 s

Circular Aperture:  $\phi$  1"

2" 1" 2" 5" 10" diameter

FoV: 5.96"

J2000 12 29 6.827 +02 03 11.48  
FoV: 1.6'

Sum of 19 spaxels centered at 12:29:06.83 02:03:08.9

10<sup>-17</sup>(20<sup>0</sup>erg)/s/cm<sup>2</sup>/Angstrom

Angstrom

ALADIN

ESO Archive Science Portal v2.1.9

The screenshot displays the ESO Archive Science Portal interface. The main view shows a selected dataset with the following details:

- Coordinates:** 00 33 7.795 +02 00 14.56
- Field of View (FoV):** 1.77'

The interface includes a sidebar with filter options:

- Observatory:** La Silla Paranal APEX (1)
- Data Type:** CUBE (1)
- Spectral Range:** 1 (with a plot showing a range from 'opt' to '1')
- Filter/Band:** No data to display
- Spectral Resolution:** 1k-10k (with a plot showing a range from '1' to '10k')
- Signal-to-Noise Ratio:** No data to display
- Sensitivity (AB mag):** No data to display

The main image area shows a large, bright, circular object, likely a star, with a smaller, dimmer object visible below it. The interface also features a table of datasets and a table of actions.

Actions	Data Type	Spec.Range	Spec.Res.	Sens.(AB mag)	Obs.Date	FoV	Sky Res.	Collec
<input type="checkbox"/>	CUBE	470-935.2 nm	3015	11.84	2022-07-30 07:24:03	1.47'	0.629"	MUSE

ES0 Archive Science Portal v2.1.9



# Why use archive? (1)

- Loads and loads of top-quality data
- Enabling verification of scientific claims  
(the cornerstone of the Scientific Method)
- Opening new possibilities: increased samples, multi-epoch, multi-wavelength, etc.
- Something exploded: what was there before?
- Planning of future observations
- One's Garbage is Another's Treasure: serendipitously observed objects
- Same object, different science

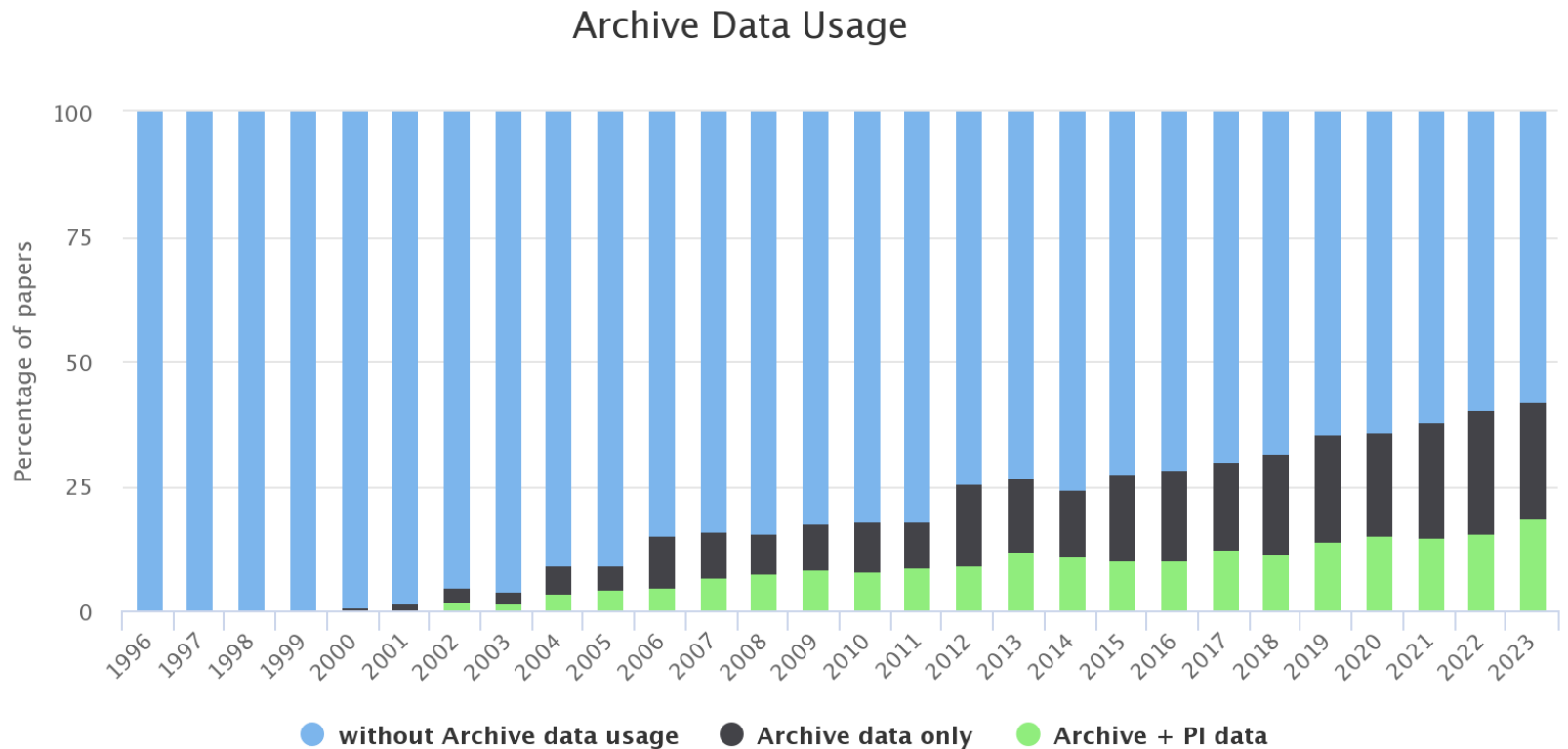
# Why use archive? (2)

- No need to write proposals!
- Time between having an idea and working on it short; data available immediately; weather is not a problem!
- One can experiment with data (dare I say AI...?)
- A lot of data already processed, using s/w written by instrument experts
- Cost of archive is peanuts compared to telescopes, esp. when it comes to EUR/USD/PLN per publication<sup>#</sup>

<sup>#</sup> To be absolutely clear: I am **NOT** saying that we do not need telescopes...

# ESO Archive usage

- Currently ca. 40% of all ESO data-based publications use archival data



Source: telbib.eso.org



# Archive's wackier side...

- Users keep us on the edge of our seats sometimes...

Subject: Bug

Date: Sun, 3 Jul 2016 03:41:53 -0300

From: [REDACTED]

To: [REDACTED]

Hi, not sure where I am supposed to send this, but there is a bug. I am a werewolf. I was bitten. When I die being a werewolf I am not able to revive in that place nor in the wayshrine.

Thanks for your attention.



# ESO OPPORTUNITIES



# ESO opportunities

## ESO Call for Proposals P113

Proposal Deadline:  
26 September 2023, 12:00 noon CEST



ESO Call for Proposals  
is issued twice per year

CfP for Period 113  
(Apr-Sep 2024)  
is out **NOW**

Deadline: **26.9.23**

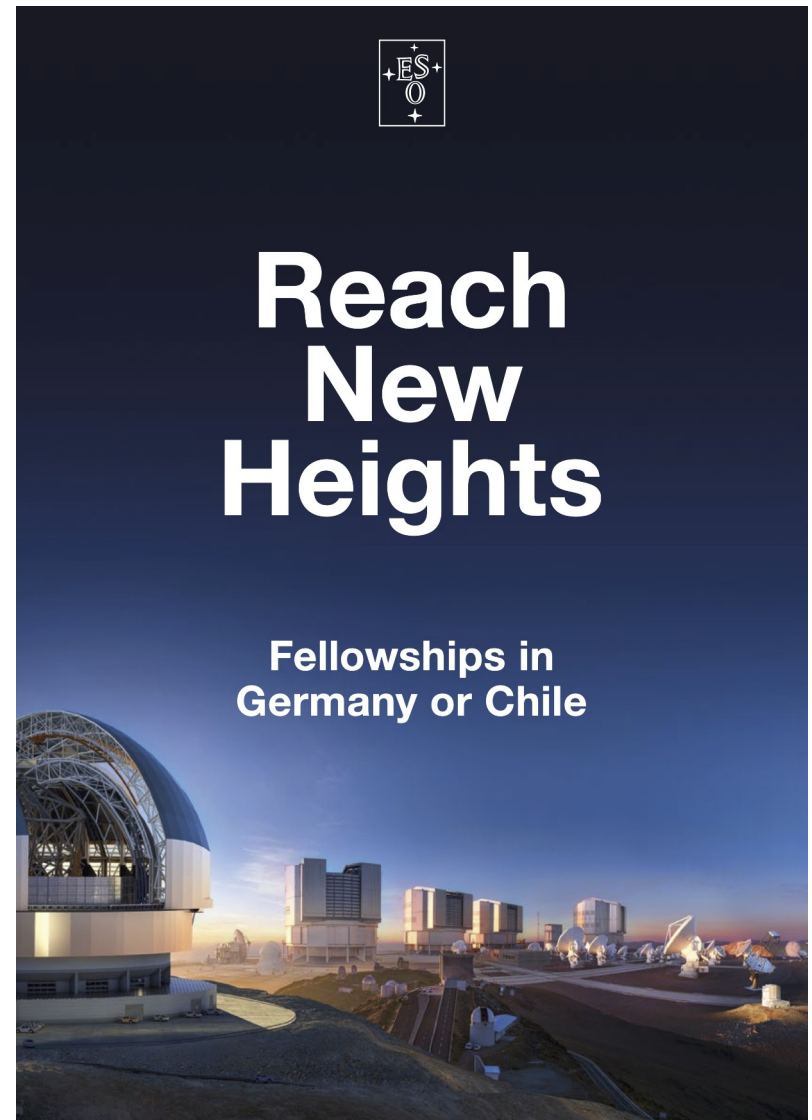


# ESO Opportunities

ESO Fellowship  
Programme (post-doc)  
Germany or Chile

Once per year

Current deadline:  
**15.10.23**





# ESO Opportunities



## Road to the stars

A unique opportunity to conduct part of your PhD research at the European Southern Observatory

#ESOJOBS  
[eso.org/studentship](https://eso.org/studentship)

ESO Headquarters, Garching near Munich, Germany  
ESO Vitacura, Santiago, Chile

Application deadline: 30 April and 30 October, each year

ESO Studentship  
Germany or Chile

Once per six months  
Next deadline: **30.10.23**



# ESO Opportunities

IMPRS Fellowship  
(doctoral studies)

Garching

Once per year

Current deadline:

**1.11.23**

## Want a PhD in Astrophysics?

We are one of the largest astrophysical research centers in Europe, covering every subject from planets, stars and galaxies to cosmology and telescope development.

Access to the world's largest telescopes and a stimulating scientific environment provides students with ideal conditions for their PhD research.

**Successful applicants will be funded for their PhD studies!**

**Application due date is every November 1st**



**IMPRS**

International Max-Planck Research School  
on Astrophysics at the University of Munich

[www.imprs-astro.mpg.de](http://www.imprs-astro.mpg.de)



# ESO Opportunities

ESO Summer Research Programme, Garching (not officially announced yet for 2024)

Six weeks research stay for university students

Once per year

Likely next deadline:

**31.01.24**

Inquiries:

[summerresearch@eso.org](mailto:summerresearch@eso.org)





# ESO Opportunities

ESO Engineering and  
Technology Research  
Fellowships,  
Studentships,  
Internships

Monitor [jobs.eso.org](http://jobs.eso.org)

ESO Engineering & Technology

Fellowship, Studentships  
and Internships

You are finishing or have recently finished your degree in engineering or physics and you want to study challenging technologies in an international, multi-disciplinary high-tech environment?

Then come and help us on one of our R&D projects as a Master student, a PhD student or a post-doctoral fellow.

More info under <http://www.eso.org/engfellowship/>

European Southern Observatory

Are you an author on an upcoming study done with ESO data that presents exciting results or stunning images?

**Pitch your paper to ESO comms ([press@eso.org](mailto:press@eso.org)) as soon as you submit it to a journal for a chance to feature in an ESO press release.**

# Links

- ESO Archive main page: [archive.eso.org](https://archive.eso.org)
- Science Portal: [archive.eso.org/scienceportal](https://archive.eso.org/scienceportal)
- ESO User Portal: [www.eso.org/userportal](https://www.eso.org/userportal)
- ESO main page: [www.eso.org](https://www.eso.org)
- ESO opportunities page: [jobs.eso.org](https://jobs.eso.org)

# Thank you!

For more information, visit ESO Booth in the lobby

