



Leibniz-Institut für  
Astrophysik Potsdam

# Daiquiri - Python based framework for the publication of astrophysical data

A. Galkin, K. Makan, W. A. Ahmed, DRI group at AIP / Astro-CC European Data Provider Forum, Heidelberg, Germany / March 2026

# Outline

- Data services at AIP
- Daiquiri features in our archives
- Dockerized setup for a Daiquiri instance

# Data services at AIP

AIP has developed significant expertise in long-term operation and the curation of astronomical data archives.

- AIP is one of the partner data centers for the ESA Gaia mission - [gaia.aip.de](http://gaia.aip.de)
- The range of data is huge: from digitized photographic plates (APPLAUSE) to spectroscopic and photometric data (STELLA, RAVE, 4MOST, MUSE-Wide, CARS), solar data (GREGOR, CoSee-Cat), X-ray satellite data (XMMSSC) to pure simulation data (CosmoSim).
- This diversity is made possible by Daiquiri, a web-based platform developed at the institute. It supports standardized protocols from the International Virtual Observatory Alliance (IVOA) for data access and is available as open-source under the Apache2 license.

4MOST Data Services

Spectrum ID: 1112211121141411463

CoSEE-Cat  
Coordinated Solar Extreme-Emission Catalogue

Virtual Observatory

Data Access @ AIP

Powered by django-daiquiri

Data publications at AIP:  
[data.aip.de](http://data.aip.de)

Daiquiri software stack:  
[github.com/django-daiquiri](https://github.com/django-daiquiri)

# Data services at AIP

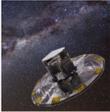
publications projects data imprint

## AIP Data Publications

AIP's EScience section is publishing many data collections, mostly from long running surveys or simulation projects.

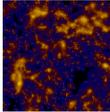
Most publications feature the standard APIs of the [Virtual Observatory](#)

search.



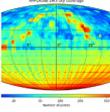
**Gaia**  
Gaia Data from the Gaia satellite, observation of stars in the Milky Way  
**Categories** Astrometry, Photometry  
**Projects** Gaia, Daiquiri  
**Website** <https://gaia.aip.de>

[Query](#) [Metadata](#)



**CosmoSim**  
Cosmological simulations, database  
**Categories** Simulation data  
**Projects** CosmoSim, Daiquiri  
**Website** <https://www.cosmosim.org>

[Query](#) [Metadata](#)



**APPLAUSE**  
APPLAUSE Archive of digitized photographic plates  
**Categories** Astrometry, Spectroscopy, Light curves, Photometry  
**Projects** Applause, Daiquiri  
**Website** <https://www.plate-archive.org>

[Query](#) [Metadata](#)



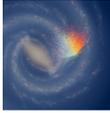
**CARS**  
CARS Close AGN Reference Survey (CARS) data release  
**Categories** Spectroscopy  
**Projects** CARS, Daiquiri  
**Website** <https://cars.aip.de/>

[Query](#) [Gallery](#)



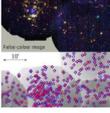
**CoSee-Cat**  
Comprehensive Solar Energetic Electron event Catalogue (CoSEE-Cat)  
**Categories** Solar  
**Projects** CoSEE-Cat, Daiquiri  
**Website** <https://coseecat.aip.de/>

[Query](#) [Catalogue](#)



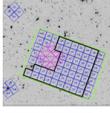
**RAVE**  
RAVE Results of the Radial Velocity Survey (2003 - 2013)  
**Categories** Spectroscopy, Photometry  
**Projects** RAVE, Daiquiri  
**Website** <https://www.rave-survey.org>

[Query](#) [Metadata](#)



**XMMSSC**  
Data release of the XMM-Newton Survey Science Centre (SSC)  
**Projects** XMM-Newton SSC, Daiquiri  
**Website** <https://xmmssc.aip.de>

[Query](#) [Catalogues](#)



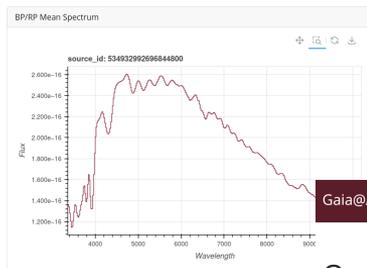
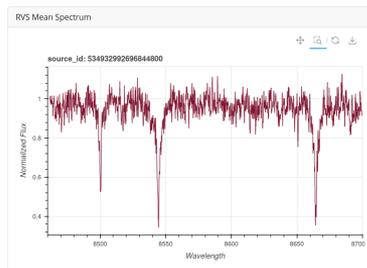
**MUSE-Wide**  
The MUSE-Wide project data release  
**Projects** MUSE, Daiquiri  
**Website** <https://musewide.aip.de>

[Query](#) [Metadata](#)

While most of the AIP archives are published with the Daiquiri framework, there are also several smaller, dedicated projects.

[data.aip.de](https://data.aip.de)

Source Id: 53493292696844800



## Additional Information

Name	Value	Unit	Description
ra	18.857569747375134	deg	Right ascension
dec	72.12510433080504	deg	Declination
l	124.7946299223685	deg	Galactic longitude
b	9.340181606553655	deg	Galactic latitude
parallax	1.9321339944201192	mas	Parallax
parallax_error	0.011514279	mas	Standard error of parallax
pmra	-1.1885483553163859	mas.yr**-1	Proper motion in right ascension direction
pmra_error	0.011644031	mas.yr**-1	Standard error of proper motion in right ascension direction
radial_velocity	-68.66845	km.s**-1	Radial velocity
radial_velocity_error	1.1837056	km.s**-1	Radial velocity error
phot_g_mean_mag	12.713857	mag	G-band mean magnitude
bp_rp	0.97019863	mag	BP - RP colour

## Query interface

## Database status

You are currently using the guest account. For a personal account, please sign up [here](#)

Using shared table space (Guest).

55 GB / 1 TB

Active Jobs: 0 / 10

## New query job

## SQL query

## Cone search

## Upload VOTable

## Job list

Run id: 1	
Run id: 19243	
Run id: 2	
Run id: 20	
Run id: 4	
Run id: 6452351122792130048	
Run id: WR	

## SQL query

Place your SQL statement directly in the text area below and submit your request using the button. You can use the dropdown menus to get information about the database, to query external services or to access example queries.

Optionally, you can specify the name of the resulting database table and/or assign a run id, to group associated queries in the job list. Please choose a queue with a suitable timeout for your query.

indicates columns that are indexed and should be used whenever possible for faster filtering and improved performance.

Database Columns Functions Simbad Vizier Examples

Schemas	Tables	Columns
gaiapr	crowded_field_source	* solution_id
gaiapr_contrib	interstellar_medium_params	designation
gaiadr3	interstellar_medium_spectra	* region_name
gaiadr3_contrib	lens_candidates	* source_id
gaiadr3	lens_catalogue_name	ref_epoch
gaiadr3_contrib	lens_observation	* ra
gaiadr2	lens_outlier	ra_error

A double click will paste the schema/table/column into the query field.

## SQL query

```

1 SELECT source_id, ref_epoch, ra, ra_error, dec, dec_error,
2 pmra, pmra_error, pmdec, pmdec_error,
3 phot_g_mean_mag, l, b, n_scans, 'fpr' as origin
4 FROM
5   gaiapr.crowded_field_source
6 UNION
7 SELECT source_id, ref_epoch, ra, ra_error, dec, dec_error,
8 pmra, pmra_error, pmdec, pmdec_error,
9 phot_g_mean_mag, l, b, -1 as nscans, 'dr3' as origin
10 FROM
11   gaiadr3.gaiapr_source

```

The Gaia mission published the positions and motions of stars in our galaxy. The query interface is the core functionality of Daiquiri that allows users to query the tabular data in an SQL database.

However, each archive has specific features that are tailored to it. Here the spectra viewer for Gaia@AIP.

You will see a long alphanumeric word. Just copy it where ever you see **<your-token>**; in the following examples.

## API token

Your API token is: 065ca[redacted]65ef

[Regenerate token](#)

You can use this token in HTTP requests by using the **Authorization** Header:

Authorization: Token 065ca[redacted]65ef

The **API Token** identifies you and provides access to the results tables of your queries.

The connection to the TAP service can be done that way:

```
import requests
import pyvo

#
# Setup tap_service connection
#
service_name = "Gaia@AIP"
url = "https://gaia.aip.de/tap"
token = 'Token <your-token>'

print('TAP service %s \n' % (service_name,))

# Setup authorization
tap_session = requests.Session()
tap_session.headers['Authorization'] = token

tap_service = pyvo.dal.TAPService(url, session=tap_session)
```

gaia.aip.de

The TAP protocol is a central part of every Daiquiri archive to allow scripted access to the data, including data which is not public (yet). The data release and each table has a Digital Object identifier (DOI). Daiquiri supports export of metadata for DOI minting (OAI).

## Gaia DR3 (gaiadr3)

### Description

The Gaia Early Data Release 3 (Gaia (E)DR3) enhances the DR2 catalogs by 118.79 million objects. It includes five-parameter astrometric solutions – positions on the sky, parallaxes, and proper motions – for more than 585 million sources, an additional pseudo-colour parameter for 800 million further sources (called six-parameter solution), and an additional 400 million sources with only positions, for a total of more than 1.8 billion sources with a mean G magnitude.

Additionally from the 13th of June 2022, the full Gaia DR3 adds radial velocities for more than 33 million sources (about 4 times more than Gaia DR2). Followed by about 200 millions BP/RP spectra and about 1 million high resolution spectra from the radial velocity spectrometer (RVS). Finally Gaia DR3 publish a huge catalog of objects classification of more than 1.59 billion sources, and a large variety of smaller specific catalogs like non-single stars, variable sources, galaxy and QSO candidates, solar system objects, and more.

The Gaia (E)DR3 release delivers an overall improvement in sky-coverage (almost complete down to 19 mag) and a great improvement in precision of both astrometric and photometric measurements.

Gaia (E)DR3 data is based on data collected between 25 July 2014 and 28 May 2017, spanning a period of 34 months of data collection. The reference epoch for Gaia DR3 (both Gaia EDR3 and the full Gaia DR3) is J2016.0. Positions and proper motions are referred to the ICRS, to which the optical reference frame defined by Gaia DR3 (Gaia-CRF3) is aligned. The time coordinate for Gaia DR3 results is the barycentric coordinate time (TCB).

### Attribution

If you have used Gaia data in your research, please use the following acknowledgement:

This work has made use of data from the European Space Agency (ESA) mission Gaia (<https://www.cosmos.esa.int/gaia>), processed by the Gaia Data Processing and Analysis Consortium (DPAC, <https://www.cosmos.esa.int/web/gaia/dpac/consortium>). Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the Gaia Multilateral Agreement.

More information can be found on the [credit and citation instructions page](#).

### Tables

#### Gaia Source (gaiadr3.gala\_source)

This table has an entry for every Gaia observed source as published with this data release. It contains the basic source parameters, in their final state as processed by the Gaia Data Processing and Analysis Consortium from the raw data coming from the spacecraft.

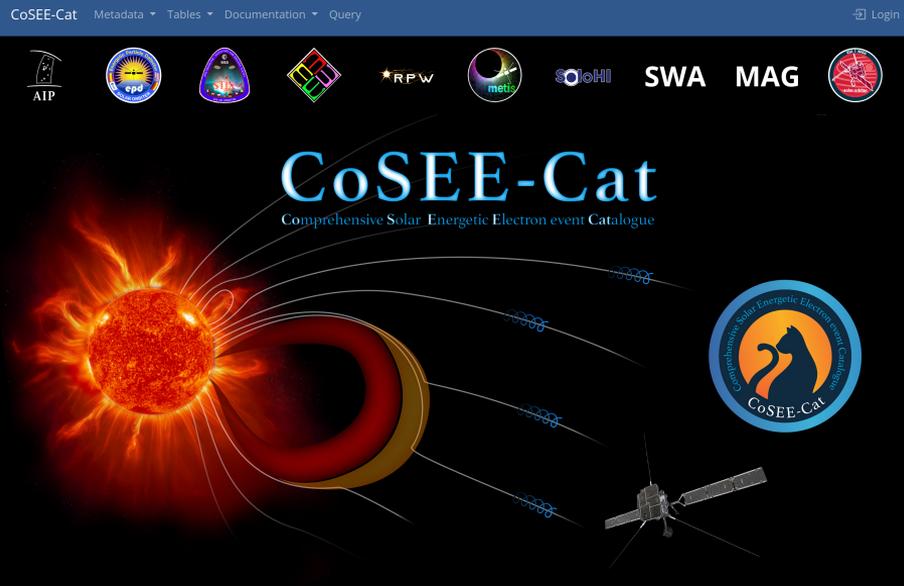
DOI: <https://doi.org/10.17876/gaia/dr.3/1>

#### Gaia Source (gaiadr3.gala\_source\_lite)

This table has an entry for every Gaia observed source as published with this data release. It contains the basic source parameters, in their final state as processed by the Gaia Data Processing and Analysis Consortium from the raw data coming from the spacecraft.

DOI: <https://doi.org/10.17876/gaia/dr.3/1>

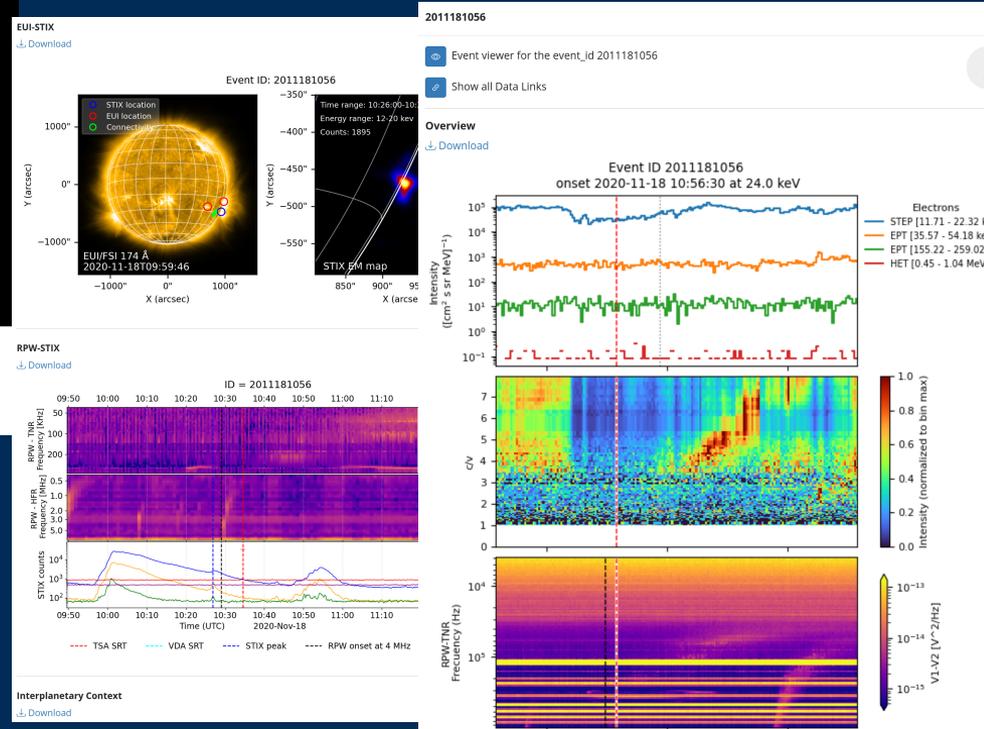
Access
You can access this schema using the <a href="#">query interface</a> and download the results afterwards.
Digital object identifier
You can use the following DOI to cite this schema in a publication: <a href="https://doi.org/10.17876/gaia/dr.3">https://doi.org/10.17876/gaia/dr.3</a>
License
This dataset is published under the Attribution-NonCommercial 3.0 IGO (CC BY-NC 3.0 IGO).



The Comprehensive Solar Energetic Electron event Catalogue (CoSEE-Cat) publishes solar events and associated phenomena by the Solar Orbiter. CoSEE-CAT archive implements the Datalink protocol.

The Comprehensive Solar Energetic Electron event Catalogue (CoSEE-Cat)

CoSEE-Cat event catalogue



## Cutout Service

RA    
 Central right ascension (J2000) in deg  
 Radius in RA in arcsec

DEC    
 Central declination (J2000) in deg  
 Radius in DEC in arcsec

$\lambda_0$     
 Start of the wavelength in Å  
 End of the wavelength range in Å

It can take a moment until the download starts. Please be patient.

This datacube can also be directly downloaded using the following url:

<https://musewide.aip.de/cutout/api/datacubes/?RA=53.0602886&A=6&DEC=-27.81351&B=6&LO=4750&LI=9350>



Leibniz Institute for  
Astrophysics Potsdam

The MUSE-Wide archive is a service by the Leibniz-

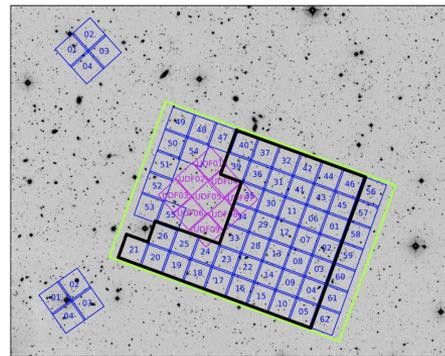
The MUSE-Wide survey is part of the MUSE Consortium and is intended primarily for scientific purposes. The MUSE Consortium is made up of the following institutes: Leibniz Institut für Astrophysik Potsdam (AIP), Centre de Recherche de Astrophysique de Lyon, European Southern Observatory, ETH – Zürich, Institut

musewide.aip.de

The MUSE-Wide survey published deep fields data cubes, so the archive integrates a cut-out service as a Python script because Astropy is already integrated into the Daiquiri software.



## Welcome to the MUSE-Wide survey project pages!



This page describes the MUSE-Wide project – a “shallow” MUSE survey in well known and studied deep fields with extensive multiwavelength data, such as the GOODS-S/CDFS and CANDELS-COSMOS areas.

It also serves as a data release page. The current data release is DR1, which covers 44 fields in the CDFS (see the enclosed area by a black thick line in the image above). It includes:

- links to reduced cubes and a cutout service to download mini-cubes centered on a preferred position.
- an emission line catalog (with spectra and redshift identification) found with a matched filtering approach detailed in Herenz et al. 2017.
- optimally extracted spectra for all photometrically selected objects in the CANDELS catalog (Guo et al. 2013) along with redshift identification for objects brighter than 24th mag\_F775W

Please check out the news pages for science coming out of MUSE-Wide and please cite our data release paper [Urrutia et al. 2019](#) if you use any of these data.

CARS Gallery Targets IFU Data Query Database Tables Documentation

### Data overview for HE0021-1810

Basic parameters

HE0 name:	HE0021-1810
Observation name:	HE0021-1810
RA (J2000):	04:05:32
Type of host galaxy:	AGN
Morphology:	Unresolved edge-on-dominated galaxy
$M_B$ :	-20.44 mag
$L_{\text{AGN}}$ :	$1.25 \times 10^{43} \text{ erg s}^{-1}$
$L_{\text{host}}$ :	$4.0 \times 10^{42} \text{ erg s}^{-1}$
$L_{\text{AGN}}/L_{\text{host}}$ :	0.076 levels
$\log(M_{\text{BH}})$ :	7.45
$\log(M_{\text{BH}})$ :	not observed

License: This dataset is published under the CC BY 4.0 license (CC BY 4.0). Digital object identifier: You can use the following DOI to cite this target in a publication: <https://doi.org/10.17970/cars.p.1761>

Navigation: HE0021-1810  
Back to CARS target list

CARS Gallery Targets IFU Data Query Database Tables Documentation

CARS site Login

## Welcome to the first Data Release (DR1) of the Close AGN Reference Survey (CARS)

CARS is a spatially-resolved multi-wavelength survey of about 39 nearby luminous AGN and 2 starburst galaxies initially

CARS Gallery Targets IFU Data Query Database Tables Documentation

CARS site Login

IFU data AGN parameters Ionized gas DR1 Spectral geometry SED fitting Morphology

SED

Telescope:	SDT
IFU instrument:	MADE
IFU setup:	WFM-NAGN-IN
IFU grating:	
IFU field of view:	60" × 60"
IFU sampling:	2" × 2"
Wavelength coverage:	4200.0 - 8850.0 Å
Spectral resolution:	2.4 Å
Program ID:	04A-0345(a)
Total exposure time:	700.0 sec
Seeing of the observation:	0.8"
Absolute photometric scale factor:	0.95
Comments for this observation:	Single observation
Path to the reduced data cube:	@150aawHE0021-1810.MA.DE.WFM.NAGN.OBSERVED.Fits.gz
Path to the AGN data cube:	@150aawHE0021-1810.MA.DE.WFM.NAGN.AGN.Fits.gz
Path to the host galaxy data cube:	@150aawHE0021-1810.MA.DE.WFM.NAGN.HOST.Fits.gz
Path to the continuum model data cube:	@150aawHE0021-1810.MA.DE.WFM.NAGN.MODEL_CONTINUUM.Fits.gz
Path to the broad H $\alpha$ data cube:	@150aawHE0021-1810.MA.DE.WFM.NAGN.HA_BROAD.Fits.gz
Path to the full DR image:	@150aawHE0021-1810.MA.DE.WFM.NAGN.FULL_DR.Fits.gz
Path to the broad DR image:	@150aawHE0021-1810.MA.DE.WFM.NAGN.HA_BROAD_DR.Fits.gz

### Gallery of CARS targets

The user can switch between different views of each target with the tabs below. Any image is a link to the specific object overview with more information and data product downloads.

IFU RGB image IFU line RG image BPT diagram gas velocity gas dispersion

scopy taken with  
iEDs)  
gh-level data products are presented in the paper by  
nchromatic SEDs are outlined in Smirnova-Pinchukova  
ws close to AGN is provided in Singha et al. (2021).  
ned in future data releases as the survey analysis

Since metadata is handled in a database and Daiquiri is based on Django, specific views can be created for the data. For example, there is an object viewer and a gallery of CARS targets, which is a spatially resolved, multi-spectroscopic survey.

## Plate from Astrograph, Bamberg Northern Sky Patrol

Preview

000007\_1913\_1.png



Download preview:

000007\_1913\_1.png

Logpage (link)



Download logpage

Plate Observation Scans

Applause ID:	dr.4/plates/208_77014
Archive:	Astrograph, Bamberg Northern Sky Patrol
Plate number in archive:	000007
Institute:	Dr. Karl Remels-Sternwarte, Bamberg
Observer name:	R. Lehnert
Observer notes:	f=60.8
Miscellaneous notes:	
Bibcode of related paper:	

Plate series:	
---------------	--

Plate development information:	
Plate quality:	
Plate notes:	emulsion scratch on W et
Plate format:	12x12 cm
Emulsion:	

Digital object identifier

You can use the following DOI to cite this photographic plate in a publication:

[https://doi.org/10.17876/plate/dr.4/plates/208\\_77014](https://doi.org/10.17876/plate/dr.4/plates/208_77014)

License



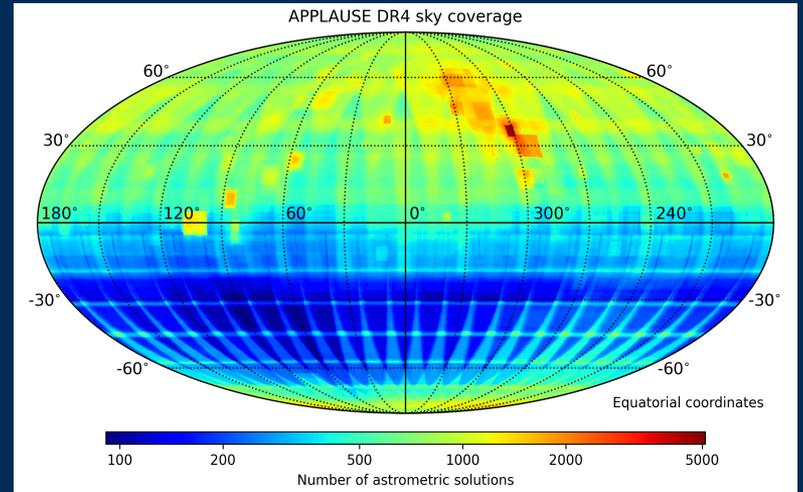
This photographic plate is published under the CC0 1.0 Universal (CC0 1.0).

[Next plate in this archive --](#)

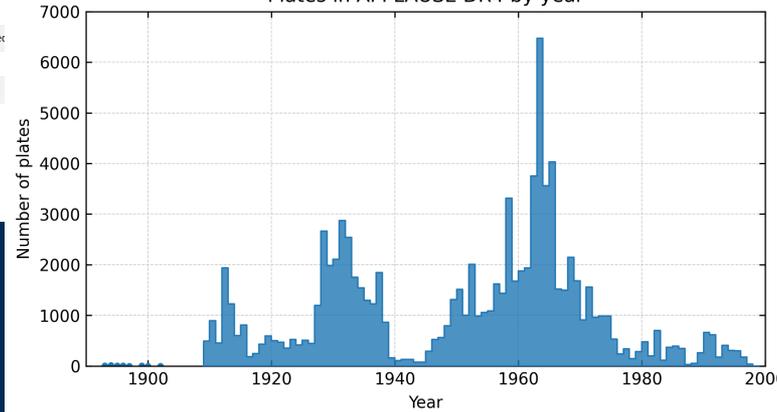
[-- Previous plate in this archive](#)

Select plate from current archive by ID

# APPLAUSE archive



Plates in APPLAUSE DR4 by year



The APPLAUSE archive publishes digitized historical photographic plates. The archive includes viewers for plates and logbooks, as well as tables of extracted sources and light curves. The project has extensive documentaion which is maintained as Markdown and media files.

## Files

### Disclaimer

The file data is provided as is and are available only for registered users.

Please use the README file for each data directory for further information. For ROCKSTAR and Galaxy data, please refer to the database and its documentation.

### How to download the files hosted at CosmoSim

A single file can be downloaded from the command line using wget. Replace \$url with the direct file URL, or use \$urlList containing multiple URLs. The URLs and URL lists are available on the corresponding download pages.

Your personal authorization token is available in the profile menu ("API Token") in the top-right corner of the webpage.

```
wget --header "Authorization: Token <token>" $url
wget --header "Authorization: Token <token>" -i $urlList
```

A query link below the catalogs indicates that these are also uploaded into the database and thus can be queried via the database.

### MultiDark

#### Particles

Here you can find exported particles tables for the MDR1 (and Bolshoi) simulations which were previously hosted as CosmoSim archive.

Simulation	Description	Files
<a href="#">MDR1 (MultiDark)</a>	Box side length: 1000 Mpc/h, Particles: 2048 <sup>3</sup>	<a href="#">Particles</a>
<a href="#">Bolshoi</a>	Box side length: 250 Mpc/h, Particles: 2048 <sup>3</sup>	<a href="#">Particles</a>

# CosmoSim database

The CosmoSim database provides results from cosmological simulations. Alongside the tables, it provides particle files for download.

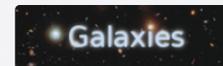
# CosmoSim

The CosmoSim database provides results from cosmological simulations performed within different projects: [MultiDark](#) and [Bolshoi](#) and [Galaxies](#).



The Spanish MultiDark Consolider project supports efforts to identify and detect matter, including dark matter simulations of the universe.

[MDR1](#)      [BigMDPL](#)  
[SMDPL](#)      [Bolshoi](#)  
[MDPL](#)      [BolshoiP](#)  
[MDPL2](#)



Available now for the MDPL2 simulation - galaxy catalogs contain galaxy properties from different semi-analytical codes.

[MDPL2 Galacticus](#)  
[MDPL2 SAG](#)  
[MDPL2 SAGE](#)

Please visit the linked sites for more information about the projects and about the appreciated form of acknowledgment, if the data is used in a scientific publication or proposal.

Check out the [Data](#) and the [Services](#) section for more information.

Register to CosmoSim



CosmoSim.org is hosted and maintained by the Leibniz-Institute for Astrophysics Potsdam (AIP).



It is a contribution to the German Astrophysical Virtual Observatory.

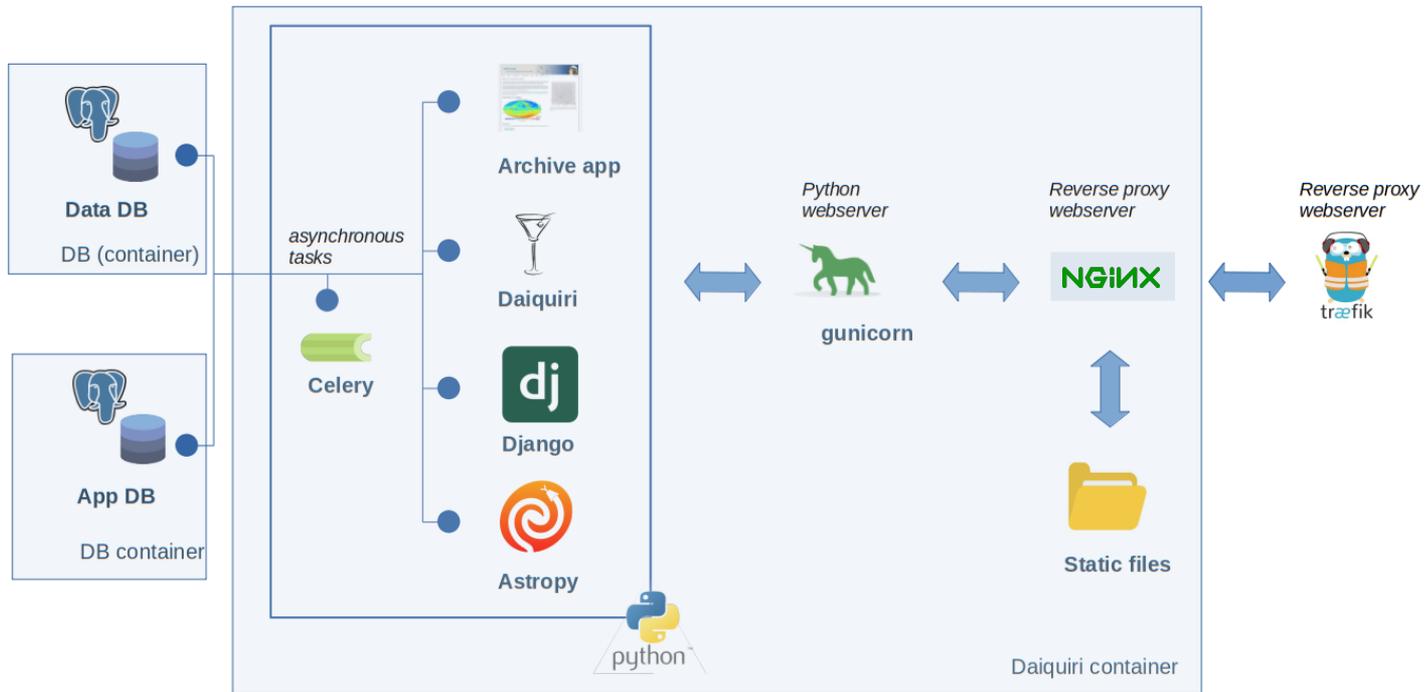
# Daiquiri features

For users:

- SQL Query – web interface
- Scripted access and Topcat access via TAP protocol
- User storage and DB space for logged-in users (depending on the data provider's resources)
- File download

For data providers:

- Easy publication of tabular data
- Different data access levels – private, group, internal and public
- Metadata management
- User management
- Support for exporting of metadata in a format suitable for DOI minting (OAI)
- Integration of documentation and customized looks for your project



Dockerized setup for a Daiquiri instance: two database docker containers, Daiquiri docker container and the web proxy

Please join the hands-on session on Daiquiri:  
4:00 to 5:30 pm

Questions?

Daiquiri software stack:  
[github.com/django-daiquiri](https://github.com/django-daiquiri)

Data publications at AIP:  
[data.aip.de](https://data.aip.de)

Anastasia Galkin  
[agalkin@aip.de](mailto:agalkin@aip.de)