



# Ensuring the legacy value of ESO Public Surveys

Community data access  
through the Science Archive Facility

*J. Retzlaff*

On behalf of the ESO **A**rchive **S**cience **G**roup

M. Arnaboldi, N. Delmotte, S. Geier, L. Mascetti, A. Micol



# Outline

---

1. Overview of Public Survey data releases
2. Large programmes & pipeline data reduction
3. Data access statistics
4. Phase 3 process





# Science Archive Facility

<http://archive.eso.org>

ESO – Science Archive Facility

European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!

Science Users Information > Science Archive Facility 08 Oct 2015

**Science Archive Facility**

Welcome to the ESO Science Archive Facility

The ESO Science Archive Facility contains data from ESO telescopes at La Silla Paranal Observatory, including the APEX submillimeter telescope on Liano de Chajnantor. In addition, the raw UKIDSS/WFCAM data obtained at the UK Infrared Telescope facility in Hawaii are available.

The Principal Investigators of successful proposals for time on ESO telescopes have exclusive access to their scientific data for the duration of a proprietary period, normally of one year, after which the data becomes available to the community at large. Please read the [ESO Data Access Policy](#) statement for more information, along with the [relevant FAQs](#).

Browsing the archive does not require authentication, but to request and download data you have to log in to the [ESO User Portal](#). Please [acknowledge the use of archive data](#) in any publication.

**Latest News and Updates**

- New release of stacked reduced images and source lists for the VST Public Survey ATLAS (16 Sep 2015)
- New release of the archive data download shell script (16 Sep 2015)
- New Data Release of VVV Photometric Catalogues via the ESO Science Archive Facility (21 Aug 2015)

More news ...

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
LPO Data Products	Phase 3 main query form Phase 3 imaging query form Phase 3 spectral query form Phase 3 VIRCAM-specific query form	Phase 3 Data Products (ESO public surveys; ESO pipeline-reduced products; Large programs: GOODS, zCOSMOS; etc.)	Currently, Imaging and Spectroscopy	Various Pipeline products for LIVES, XSHOOTER, HARPS, and more to come.
[Description of reduced data products types]	Catalogue Facility query interface	Phase 3 Catalogues [ESO User Portal authentication required also when browsing]	Catalogues	Various
	FEROS and HARPS-Polarimetry pipeline processed data query form	FEROS and HARPS-Polarimetry pipeline processed data	Spectroscopy	FEROS, HARPS-Polarimetry, HARPS reduced calibrations (other HARPS see Phase3 above)
	Other Advanced Data Products (available only as downloadable packages, no query form)	Various (30 Doradus, Corot, GaBoDs, etc.)	Spectroscopy Imaging Flux maps	FEROS WFI APEX
	Science Verification, Commissioning, EIS, etc. (no query form)	Full list of available data packages	Various	Many
APEX Quick Look Products	APEX query form	APEX	Heterodyne, Bolometer	APEX-2A, LABOCA, SABOCA, SHeFI
LPO Schedule	Scheduling query form	ESO Observing Programme Information and Scheduling		All La Silla Paranal instruments, including APEX

- *The ESO SAF is the collection point for the survey products and the primary point of publication/availability of these products to the ESO community.*
- Delivery of the data products to the ESO archive from an ESO Public Survey is the responsibility of the PI, who certifies the scientific quality and accuracy of the data products.





# Public survey data releases 2015

Date	Survey	Data
Sep 2015	VST ATLAS	Stacked ugriz images and source lists. 2000-3000 sq.deg. observations until Sep 2013. 5 TB.
Aug 2015	VVV	ZYJKs photometric catalogues. 418 Mio. sources. 2.5 Billion Ks photom. points. 13 Mio. variables. Including observations until Sep 2011.
Aug 2015	PESSTO	1728 EFOSC2 and SOFI spectra and 392 reduced SOFI images. Associated catalogs.
Jul 2015	VPHAS+	Band-merged catalog based on DR2 imaging includes observations until Sep 2013.
Jul 2015	Gaia-ESO	27359 spectra of point-like sources obtained with FLAMES until Dec 2013.
May 2015	VPHAS+	Images and single-band source lists for data acquired until Sep 2013.
Mar 2015	VIDEO	ELAIS-S1 field
Mar 2015	VVV	Images and source lists including observations until Sep 2013. Ks variability survey.
Feb 2015	VIDEO	CDFS & XMM-LSS field
Feb 2015	VMC	PSF photometry
Feb 2015	VHS	14 TB imaging data including observations until Sep 2013 + band-merged catalog of 590 Mio sources
Feb 2015	KiDS	Images and catalogues including data acquired until Sep 2013. 148 sq.deg. source catalog 17 Mio. sources.
Jan 2015	VMC	YJKs photometric catalogue from 7 completed tiles (10.5 sq.deg) + multi-epoch photometric data + catalogs of Cepheids and Eclipsing binaries.
Oct 2014	VIKING	Images and catalogues including data until Sep 2013. 690 sq.deg + 46 Mio. sources catalog with band-merged photometry.

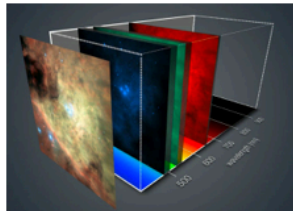


# Announcement of Phase 3 Data Releases to the Community



This newsletter is a summary of recent ESO Science [Science Announcements](#) to read more.

## Science Announcements



### Call for MUSE

16 Apr 2014:

The science visits will take place on... invited to participate to demonstrate...



### ESO Studentships

22 Apr 2014:

The research... students to explore... leading observations...




### ESO Period 9

22 Apr 2014:

The proposal... proposals were... Programme and 44 Target of Opportunity (ToO) proposals.

ESO - Release of Photometric Catalogue Data Resulting from the VISTA Magellanic Survey

www.eso.org/sci/publications/announcements/sciann14018.html



European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!


[Science Users Information](#) > [Science Publications](#) > [Science Announcements](#) > [Release of Photometric Catalogue Data Resulting from the VISTA Magellanic Survey](#) 24 Apr 2014

**Science Users Information**

- Observing Facilities
- Future Facilities and Development
- Observing with ESO Telescopes
- Science Software
- Data Handling and Products
- Science Archive Facility
- Science Activities
- Science Publications
- Science Announcements**
- ESO Science Newsletter
- The Messenger
- ESO Annual Reports
- Science and Technical Meetings
- IT Services
- Libraries
- Job Opportunities

## Release of Photometric Catalogue Data Resulting from the VISTA Magellanic Survey

Published: 11 Apr 2014



The VISTA Magellanic Survey (**e-VMC**) – one of the **six public surveys** current at the Visible and Infrared Survey Telescope for Astronomy (**VISTA**) – aims at determining the spatially resolved star formation history and 3D geometry of the Magellanic system. The **VMC survey** is designed to reach stars below the oldest main-sequence turn-off and the multi-epoch strategy enables accurate *Ks* mean magnitudes for variable stars, e.g. RR Lyrae stars and Cepheids, to be measured. Catalogues from some of the deep co-added survey images have now been released.

This data release, covering the survey tiles LMC 6\_6 (including the 30 Doradus star-forming region) and LMC 8\_8 (including the South Ecliptic Pole region), about 3.5 square degrees in total, consists of the band-merged *YJKs* photometric catalogue based on the deep co-added survey images of at least three epochs in *Y* and *J* and 12 epochs in *Ks*, the multi-epoch photometry in each of the three bands and the catalogue of known Cepheids, including also periods and modes of pulsation from optical-band data. The catalogues were extracted from the reduced images which have been released under **VMC Data Release 2** in June 2013.

The new catalogue data are accessible from the ESO catalogue facility **query interface**, each accompanied by a comprehensive description; see for example, the **description** of the *YJKs* master catalogue.

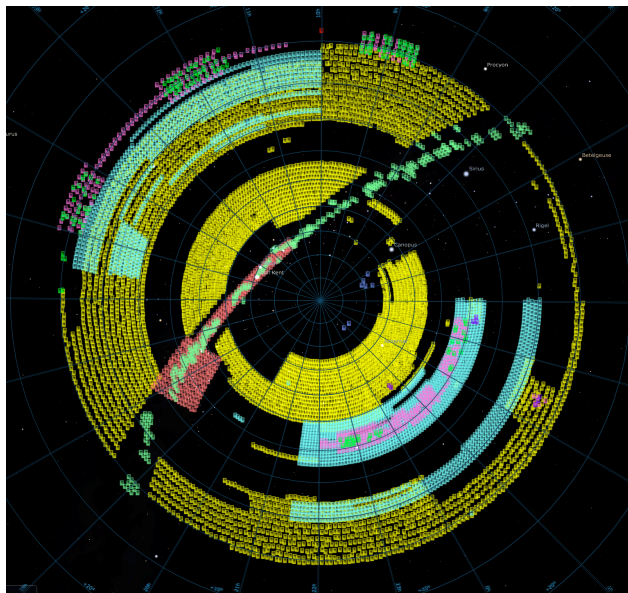
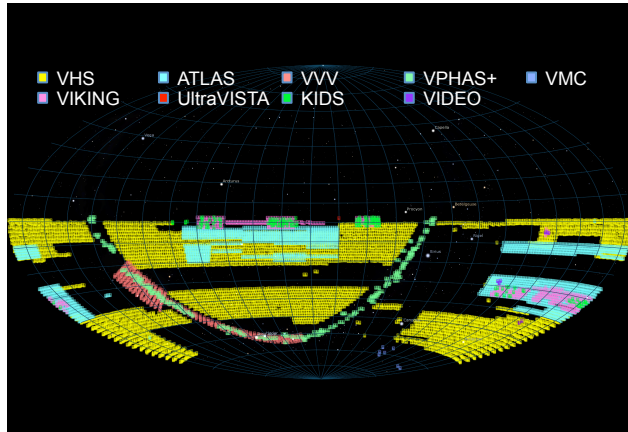
Last Update: 23.04.14 © ESO

[Send us your comments](#) | [Subscribe to Newsletter](#) | [Privacy Statement](#)



# Science Archive Facility (1)

## Public Survey data products



- 11 public surveys
  - VISTA DR3, VST DR2
  - SPSs: GaiaESO, PESSTO DR2
- Sky coverage >11500 sq.deg
  - Opt./NIR: 4336 / 9445 sq.deg
- Tot. data volume: >35 TB
  - 270k+ files
  - >29k spectra
- High-level science catalogs for all surveys



www.eso.org/sci/observing/phase3/data\_releases.html

European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet

Science Users Information > Observing with ESO Telescopes > Phase 3 > Data Releases

08 Oct 2015

### Overview of the Phase 3 Data Releases

- Data delivered by ESO Public Survey projects:
  - VISTA Surveys
  - VST Surveys
  - Spectroscopic Surveys
- Data reduced by ESO
- Data delivered by other programmes

ESO Programme	Data Release	Date	Access
<b>PUBLIC VISTA SURVEYS</b>			
Ultra-VISTA	Ultra Deep Survey with VISTA	Deep co-added, resampled images and associated source lists per band (2nd data release)	24.01.2014
		YJHKs and NB118 catalogue (based on the 1st data release)	24.09.2012
VIKING	VISTA Kilo-degree Infrared Galaxy Survey	ZYJHKs images and associated source lists of completed survey tiles covering ~690 sq.deg	29.10.2014
		ZYJHKs band-merged catalogue	
VMC	VISTA Magellanic Survey	YJKs images and associated source lists for 7 survey tiles (4th updating data release)	26.11.2014
		YJKs band-merged catalogue	07.01.2015
		Catalogue of known Cepheids	
		Y band photometric light curves	
		J band photometric light curves	
		Ks band photometric light curves	
VVV	VISTA Variables in the Via Lactea Survey	Catalogue of Eclipsing Binary stars	
		PSF photometry catalogue	13.02.2015
		ZYJHKs images and associated source lists in the disk and bulge region	09.03.2015
		ZYJHKs band-merged catalogue	19.08.2015
VHS	VISTA Hemisphere Survey	Catalogue of Variables	
		Multi-Epoch Ks-Band Photometry	
		YJKs images and associated source lists(**)	24.02.2015
VIDEO	VISTA Deep Extragalactic Observations Survey	YJKs band-merged catalogue(**)	
		VIDEO-XMM field: ZYJHKs images and associated source lists	16.02.2015
		VIDEO-XMM field: ZYJHKs band-merged catalogue	
		VIDEO-CDFS field: images and associated source lists	26.02.2015
		ZYJHKs band merged catalogue in the CDFS1 field	
KIDS	The Kilo Degree Survey	VIDEO-ELAIS S1 field: images and associated source lists	26.03.2015
		ZYJHKs band merged catalogue in the ELAIS S1 field	
		ugri stacked images and associated source lists	05.02.2015
		u,g,r,i band-merged catalogue	
VST-ATLAS	The VST ATLAS Survey	ugriz images and associated source lists	16.09.2015
VPHAS+	VST Photometric H $\alpha$ Survey of the Southern Galactic Plane and Bulge	ugri and H $\alpha$ images and associated source lists	12.05.2015
		u,g,r,i band-merged catalogue	30.07.2015
<b>PUBLIC SPECTROSCOPIC SURVEYS</b>			
Gaia-ESO	Spectroscopic Survey of the Milky Way	1-dimensional wavelength-calibrated spectra	21.07.2015
		Catalogue of photometry and stellar properties	
PESSTO	Spectroscopic Survey of Transient Objects	1-dimensional wavelength and flux calibrated spectra, with accompanying NIR imaging of bright sources	03.08.2015
		Transient master catalogue	
		Light curves	05.08.2015

Links to the associated data documentation

Links for Data Access

- ## Release Overview
- ### Phase 3 data releases organized by
- Public survey,
  - pipeline-processed data,
  - large programs etc.





# Phase 3 Release Overview (cont'd)

ESO large programs, normal programs etc.

ESO - Data Releases

Other Programmes

ESO Programme	Data Release	Date	Access
Imaging of the X-ray luminous galaxy cluster XMMU J2235.3-2557	Deep J and Ks images (HAWKI)	11.07.2013	
MATISSE/OCA-ESO Project (AMBRE)	Catalogue of stellar radial velocities and atmospheric parameters	11.07.2013	
zCOSMOS Spectroscopic Redshift Survey	1-dimensional wavelength-calibrated spectra(***)	18.03.2014	
	Galaxy Redshift Catalogue		
ESSENCE/FORS1 High-z Type Ia Supernovae	1-dimensional wavelength calibrated spectra	09.05.2014	
GOODS/FORS2 Spectroscopic Redshift Survey	1-dimensional wavelength-calibrated spectra	11.07.2014	
	Galaxies Redshift Catalogue		
GOODS/VIMOS Spectroscopic Redshift Survey	1-dimensional wavelength-calibrated spectra	12.12.2014	
	Galaxies Redshift Catalogue		
GOODS/VIMOS imaging	U and R band mosaics	12.12.2014	
GOODS/SAAC imaging	Images	12.12.2014	
	Color Catalogue		
HUGS: Hawk-I UDS and GOODS Survey	K-band images of the GOODS-South field	29.09.2014	
	Source catalogue		
	K-band images of the UDS field	29.09.2014	
	Source catalogue		
Y-band images of the UDS field	29.09.2014		
		Source catalogue	
LESS: LABOCA ECDFS Submillimetre Survey	870um flux map and associated source catalogue	23.04.2015	

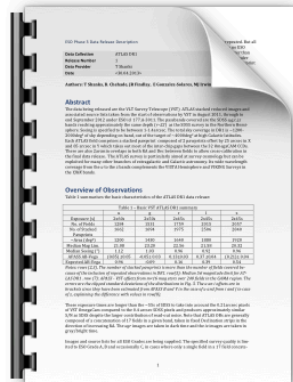
Notes:  
(\*\*\*) Please note that RA and DEC refer to the central position of the pointing. OBJECT denotes the field observed.

Links to the associated data documentation

Links for Data Access



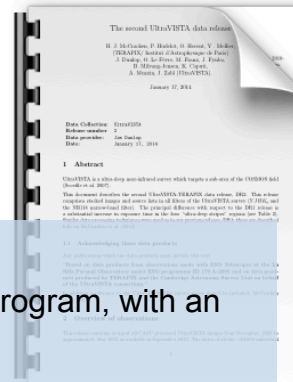




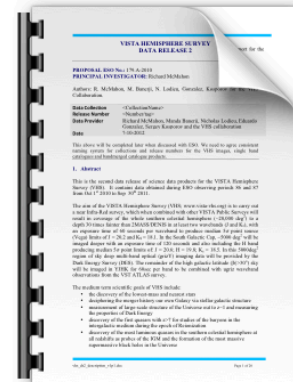
atlas\_dr1.pdf



atlas\_dr2.pdf



vista\_dr2.pdf

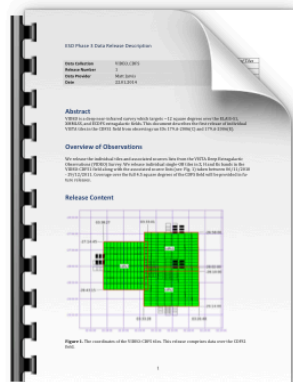


vhs\_dr2.pdf

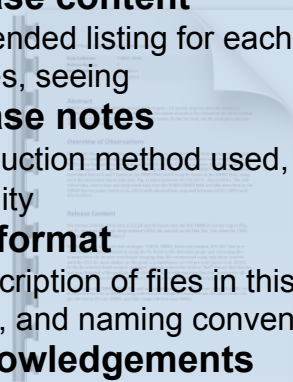
**Data Release Description**

- Provide short broad overview of the program, with an overview/layout of the observations

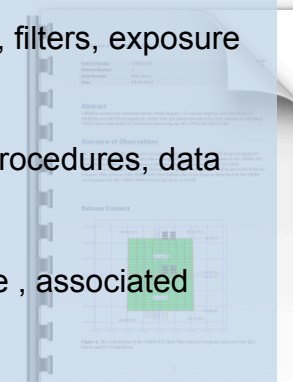
**Essential input for data content validation.**



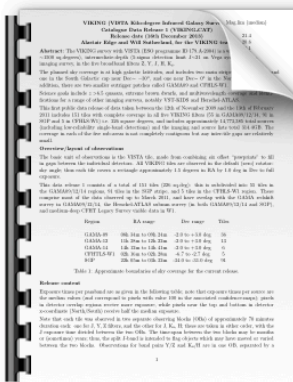
video\_cdfs\_dr1.pdf



video\_dr2.pdf



video\_es1\_dr1.pdf



viking\_cat\_dr1.pdf

**Release content**

- Extended listing for each sky position, filters, exposure times, seeing

**Release notes**

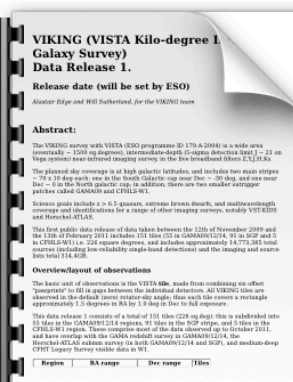
- Reduction method used, calibration procedures, data quality

**Data format**

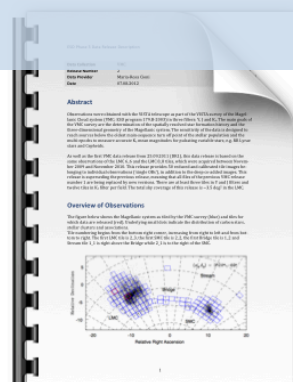
- Description of files in this data release, associated files, and naming conventions

**Acknowledgements**

- Bibliographic reference to be included when using these data.



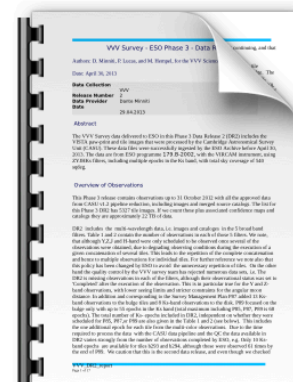
viking\_dr1.pdf



vmc\_dr2.pdf



vphasplus\_dr1.pdf



ww\_dr2.pdf

# Data Product Types

## Survey Tile Image

- Astrometrically & photometrically calibrated FITS image with associated confidence/weight map;
- Quality params. (limiting magnitude, PSF size, etc.)
- Generally: processing provenance (keyword PROVi) to trace back to the original (raw) data.

## 1-dim. extracted wavelength-calibrated spectrum

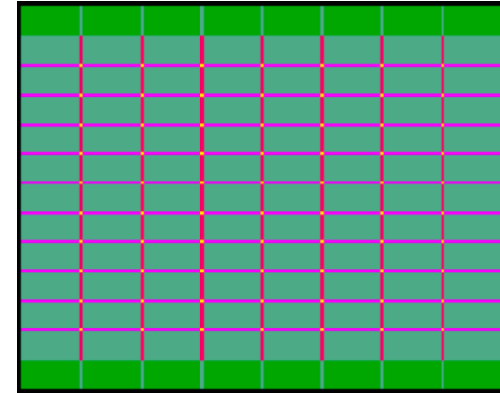
- FITS binary table format (compliant to IVOA Spectral DM, v1)
- Support for 2d spectral frames as ancillary files

## Survey Source List

- Single-band source catalogues directly extracted from the (tile) image –associated to its originating image (provenance keyword PROVi)
- Based on nightly calibrations, degenerate w.r.t. physical sources

## Science Catalogues

- Homogeneous merged multi-band catalogue for each survey (possibly per region)
- Global astrometry/photometry; cross-calibrated using overlapping tiles and across bands
- Multiple detections merged, i.e. unique entries (ultimately)
- Uniform tabular structure including content descriptors (employing UCDs)
- Supports variability surveys: multi-epoch photometric catalogues (i.e. light curves)
- Tile-by-tile scheme supported for data delivery
- Dedicated query interface: [ESO Catalogue Facility](#)



Exposure map of the VISTA survey tile.



# Science Archive Facility

<http://archive.eso.org>

ESO - Science Archive Facility

European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!

Science Users Information > Science Archive Facility 08 Oct 2015

**Science Archive Facility**

Welcome to the ESO Science Archive Facility

The ESO Science Archive Facility contains data from ESO telescopes at La Silla Paranal Observatory, including the APEX submillimeter telescope on Liano de Chajnantor. In addition, the raw UKIDSS/WFCAM data obtained at the UK Infrared Telescope facility in Hawaii are available.

The Principal Investigators of successful proposals for time on ESO telescopes have exclusive access to their scientific data for the duration of a proprietary period, normally of one year, after which the data becomes available to the community at large. Please read the [ESO Data Access Policy](#) statement for more information, along with the [relevant FAQs](#).

Browsing the archive does not require authentication, but to request and download data you have to log in to the [ESO User Portal](#). Please [acknowledge the use of archive data](#) in any publication.

**Latest News and Updates**

- New release of stacked reduced images and source lists for the VST Public Survey ATLAS (16 Sep 2015)
- New release of the archive data download shell script (16 Sep 2015)
- New Data Release of VVV Photometric Catalogues via the ESO Science Archive Facility (21 Aug 2015)

More news ...

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
LPO Data Products	Phase 3 main query form Phase 3 imaging query form Phase 3 spectral query form Phase 3 VIRCAM-specific query form	Phase 3 Data Products (ESO public surveys; ESO pipeline-reduced products; Large programs: GOODS, zCOSMOS; etc.)	Currently, Imaging and Spectroscopy	Various Pipeline products for LIVES, XSHOOTER, HARPS, and more to come.
	Catalogue Facility query interface	Phase 3 Catalogues [ESO User Portal authentication required also when browsing]	Catalogues	Various
	FEROS and HARPS-Polarimetry pipeline processed data query form	FEROS and HARPS-Polarimetry pipeline processed data	Spectroscopy	FEROS, HARPS-Polarimetry, HARPS reduced calibrations (other HARPS see Phase3 above)
	Other Advanced Data Products (available only as downloadable packages, no query form)	Various (30 Doradus, Corot, GaBoDs, etc.)	Spectroscopy Imaging Flux maps	FEROS WFI APEX
	Science Verification, Commissioning, EIS, etc. (no query form)	Full list of available data packages	Various	Many
APEX Quick Look Products	APEX query form	APEX	Heterodyne, Bolometer	APEX-2A, LABOCA, SABOCA, SHeFI
LPO Schedule	Scheduling query form	ESO Observing Programme Information and Scheduling		All La Silla Paranal instruments, including APEX

**New:** Documentation of Reduced data products in the ESO Phase 3 archive

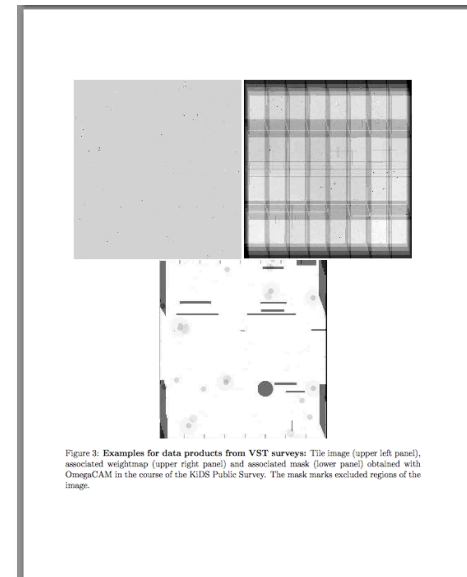


Figure 3: Examples for data products from VST surveys: The image (upper left panel), associated weightmap (upper right panel) and associated mask (lower panel) obtained with OmegaCAM in the course of the KiDS Public Survey. The mask marks excluded regions of the image.



ESO Catalogue Facility

www.eso.org/q/

50 YEARS 1962-2012 ESO European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!

Science Users Information > ESO Science Archive Facility > ESO Data > ESO Catalogue Facility Joerg Retziuff Logout

ESO Data

- Raw Data Query Form
- Reduced Data Query Form
- Instrument Specific Query Forms
- PI Packages
- Observation Schedule
- Ambient Conditions Database
- User Publications
- Data Direct Retrieval
- Data Products
- Data Packages
- ESO Catalogue Facility
- User Help

The catalogue facility provides access to the collection of catalogue data that were produced by PIs of ESO programmes and then integrated into the ESO science archive through the Phase 3 process.

Find catalogues by

Title  Content   include obsolete versions

29 catalogues found (out of 29)

SELECT	TITLE	RELEASE	PUBLICATION DATE
<input type="radio"/>	Atmospheric Parameters and Chemical Abundances from Stellar Spectra	1	2013-07-15
<input type="radio"/>	Deep/Ultra-Deep Near-IR Catalogue of the COSMOS Field (Ultra-VISTA)	1	2012-09-24
<input type="radio"/>	GOODS/FORS2 Spectroscopic Survey	1	2014-07-11
<input type="radio"/>	GOODS/ISAAC imaging	1	2014-12-12
<input type="radio"/>	GOODS/VIMOS Spectroscopic Survey	1	2014-12-12
<input type="radio"/>	Gala-ESO spectroscopic survey	2	2015-07-21
<input type="radio"/>	K band Image of the GOODS-South field	1	2014-10-01
<input type="radio"/>	K band Image of the UDS field	1	2014-10-01
<input type="radio"/>	PESSTO Multi-epoch Photometry	1	2015-08-05
<input type="radio"/>	PESSTO Public ESO Spectroscopic Survey of Transient Objects	3	2015-08-05
<input type="radio"/>	The Kilo-Degree Survey	2	2015-02-05
<input type="radio"/>	VISTA Deep Extragalactic Observations Survey (VIDEO) - CDFS field	2	2015-02-26
<input type="radio"/>	VISTA Deep Extragalactic Observations Survey (VIDEO) - ES1 field	2	2015-03-20
<input type="radio"/>	VISTA Deep Extragalactic Observations Survey (VIDEO) - XMM field	3	2015-02-16
<input type="radio"/>	VISTA Hemisphere Survey band-merged multi-waveband catalogues (VHS)	1	2015-02-12
<input type="radio"/>	VISTA Kilo-degree Infrared Galaxy Survey (VIKING)	2	2014-10-29
<input type="radio"/>	VISTA Magellanic Survey Catalogue of Cepheids (VMC)	2	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey Catalogue of Eclipsing Binaries (VMC)	1	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey Multi-Epoch J-Band Photometry (VMC)	2	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey Multi-Epoch Ks-Band Photometry (VMC)	2	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey Multi-Epoch Y-Band Photometry (VMC)	2	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey YJKs Catalogue (VMC)	2	2015-01-07
<input type="radio"/>	VISTA Magellanic Survey YJKs PSF Photometry (VMC)	1	2015-02-13
<input type="radio"/>	VST Photometric H- $\alpha$ Survey of the Southern Galactic Plane (VPHAS+)	3	2015-07-30
<input checked="" type="radio"/>	VVV: Catalogue of Variables in the Via Lactea	2	2015-08-19
<input type="radio"/>	VVV: Multi-Epoch Ks-Band Photometry in the Via Lactea	2	2015-08-19
<input type="radio"/>	VVV: ZYJKs Catalogue in the Via Lactea	2	2015-08-19
<input type="radio"/>	Y band Image of the UDS field	1	2014-10-01
<input type="radio"/>	zCOSMOS Spectroscopic Redshift Survey	1	2014-03-21

ESO Catalogue Facility 2.0.11 © ESO

Send us your comments | Subscribe to Newsletter | Privacy Statement

# Science Catalogue Data

- 11 public surveys delivered science catalogs.
- 19 (out of 29) new catalogs published this year.
- variety of catalog types, e.g. variables, redshift catalogues etc.
- Largest catalog: >2.5 billion photom. data points (VVV)



# Catalogue Facility Query Interface

Go to the URL  
<http://www.eso.org/qi>

Load an input file containing the list of target names or tab-separated target coordinate pairs (J2000).

Click on the catalogue title to display detailed information

Click to inspect the kind of content

Entry page

Catalogue query form

Query results

Examples:  
=10  
>99  
<=1.5  
!=5  
10 .. 20  
=abc%

Constraint qualification using the ASU syntax

Click to sort the result set

Download for further scientific data analysis on the user's local computer.

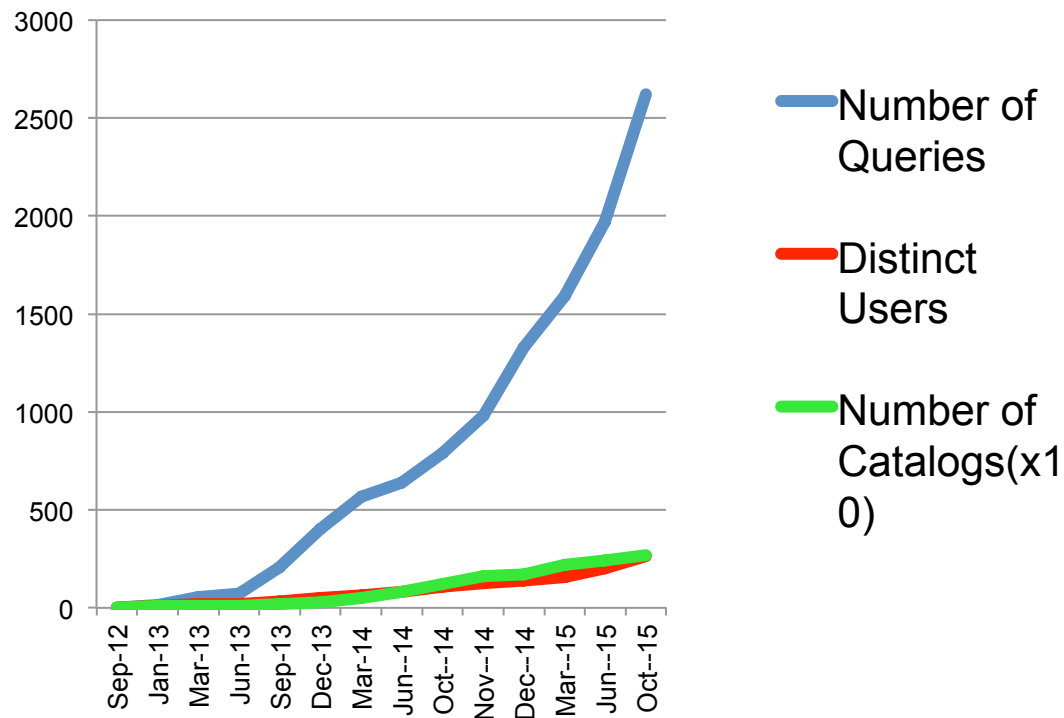
The image shows a composite of several screenshots from the ESO Catalogue Facility website. At the top left is the ESO logo. The main title is 'Catalogue Facility Query Interface'. Below this, there are several numbered steps (1-6) illustrating the workflow: 1. Accessing the website and finding a catalogue entry. 2. Using the 'Catalogue query form' to search for a specific catalogue. 3. Applying constraints using ASU syntax. 4. Viewing the 'Query results' table. 5. Sorting the results. 6. Downloading the data for further analysis. A data visualization plot is also shown, representing the scientific data analysis step. The website interface includes a search bar, a list of catalogues, a query form with various filters, and a table of search results with columns for 'Number', 'RA', 'Dec', 'Mag', etc.





# Access to catalog data

Access to the ESO archive catalogue query interface - All catalogues have been queried for!



## Collaboration with CDS

- Based on the independent evaluation of catalogue data (format and metadata) and quality criteria by ESO/ASG.
- CDS adds user value to the science catalogue content provided by ESO, i.e. by cross matching with other wavelengths/data, and further dissemination in the VO.





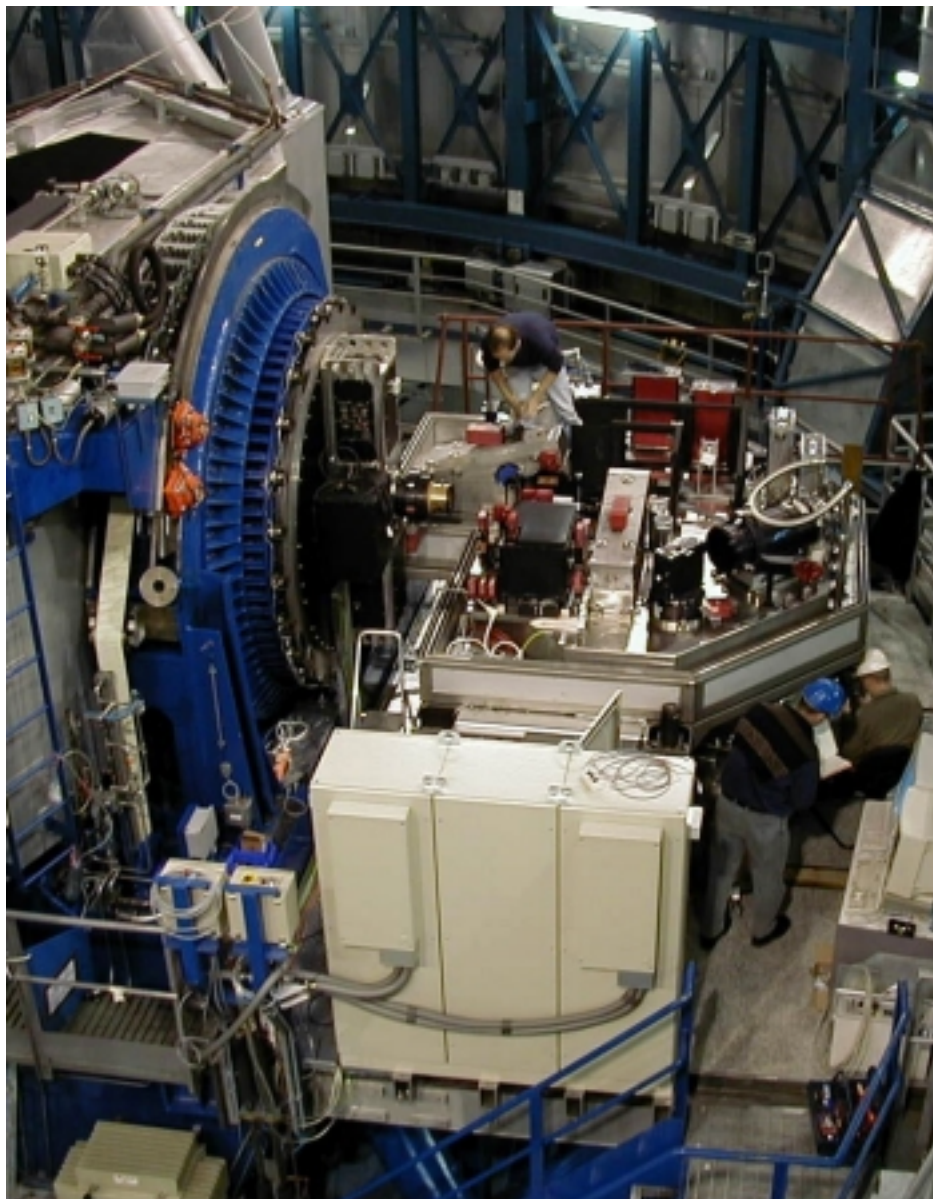
## Origin of Data Products in the ESO/SAF

- ① Data Processing by P.I./Co-I for a particular programme and delivery to the ESO archive (Public Surveys, Large programs)
- ② Uniform processing of data from selected instruments/modes integrated with ESO data flow operations independent of the original science goals





# Release of UVES-Echelle SDPs



- As of Sep 2013: Reduced scientific data obtained with the UVES@VLT available.
- Extracted wavelength- and, whenever possible, flux-calibrated 1-dim. spectra in tabular format following the established ESO SDP standard.
- Observations from the beginning of 2000 until now including the current stream of UVES data; reduced products becoming available in monthly release cycles
- Currently ~94000 spectra of point-like sources.





# Publication of ESO pipeline-processed science data

- Production of **science-grade** data products for selected instruments & modes based on an evaluation of the quality of data reduction and legacy value of the respective data products.
- **Phase 3-compliant** fashion for seamless access of all DPs whether provided by PI's or processed by ESO.
- ESO Data Access Policy: Data products of normal and large programmes become publicly accessible once the proprietary period (usually one year) has expired; before that date, access to the data products is restricted to the P.I. of the observing programme and her/his collaborators.

	No. of spectra	GB
UVES-Echelle	105,666	274
X-Shooter	46,487	855
HARPS	235,295	2,343
Giraffe-Medusa	1,130,268	5,260

=> **Synergy effects** due to one common archive for data produced by public surveys, large programs and ESO pipeline data reduction.





# Spectral Science Data Products in the ESO Archive

ESO Science Archive - Data Products

Other data products query forms

This form provides access to **reduced spectra** that were produced externally by PIs of ESO programmes, or internally at ESO (using ESO calibration) integrated into the ESO Science Archive Facility through the **Phase 3 process**. Each available data set is fully described; please see the [list of data releases](#) please use the [Generic Data Products query form](#), the [Imaging query form](#), or the [VISTA Data Products](#). Other spectral data not yet migrated to the Phase 3 archive are available on the [archive home page](#).

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

**Spectral Observing Programme**

Programme: [ ] Collection:  UVES\_ECHELLE [ ] Release version: [ ] default: latest [ ]

Run/Program ID: [ ] eg 179.B-2003(B) [ ] Phase 3 user: [ ] Product origin: [ ] Any [ ]

**Target Information**

Target name: [ ] Phase 3 target name: [ ]

Coordinate System: [ ] Equatorial (FK5): RA [ ] DEC [ ] RA: sexagesimal-ho [ ]

Search Box: [ ] 00 02 00 [ ]

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

Equatorial Output Format: [ ] Decimal [ ] Display:  RA  DEC  Gal long  Gal lat [ ]

**Observation Parameters**

Telescope: [ ] ESO-VLT-U2 [ ] Instrument:  UVES [ ] OBSTECH [ ]

Any ECHELLE ECHELLE,ABSORPTION-CELL

DATE OBS [ ] YYYY-MM-DDThh:mm:ss [ ]

MJD OBS [ ] Modified Julian Date [ ]

EXPTIME [ ] Total integration time per pixel [s] [ ]

MULTI EPOCH [ ] Any [ ]

MULTI OB [ ] Any [ ]

**Spectrum Characteristics**

Wavelength coverage [ ] [nm] Examples: 656, 393\_AND 656, 393..656.

R ( $\lambda/\Delta\lambda$ ) [ ] e.g. > 10000 or < 3000 or 3000..10000 [ ]

Spectral bin [ ] [nm] [ ]

SNR [ ] [ ]

Flux Calibration [ ] Any [ ]

Aperture (slit width or fiber diameter) [ ] [arcsec] [ ]

Dispersive element [ ] [ ]

Extended object [ ] Any [ ]

Normalised [ ] Any [ ]

Total flux [ ] Any [ ]

**Data Product Properties**

Release Date [ ] [ ]

Publication Date [ ] [ ]

ORIGFILE [ ] Original File Name [ ]

ARCFILE [ ] Archive File ID [ ]

**Other**

REFERENC [ ] Bibliographic reference [ ]

Sort results by [ ] None (Faster) [ ]

**Case 1:**  
 High-resolution stellar spectroscopy;  
 UVES blue arm  
 Origin: in-house pipeline processing;  
 Original programme: 65.L-0507(A),  
 P.I. Primas et al.

**Case 2:**  
 High-redshift QSO ( $z=4.76$ ,  $V\sim 19$ )  
 UVES red arm  
 Origin: in-house pipeline processing  
 Original programme: 166.A-0106(A),  
 P.I. Bergeron et al.

**Case 3:**  
 Stellar spectroscopy (medium-resolution, GIRAFFE)  
 Origin: Gaia-ESO Spectroscopic  
 Public Survey

⇒ Thanks to standard Phase 3 keywords seamless access from a unique query form is provided independent of the original science programme.

[http://archive.eso.org/wdb/wdb/adp/phase3\\_spectral/form](http://archive.eso.org/wdb/wdb/adp/phase3_spectral/form)





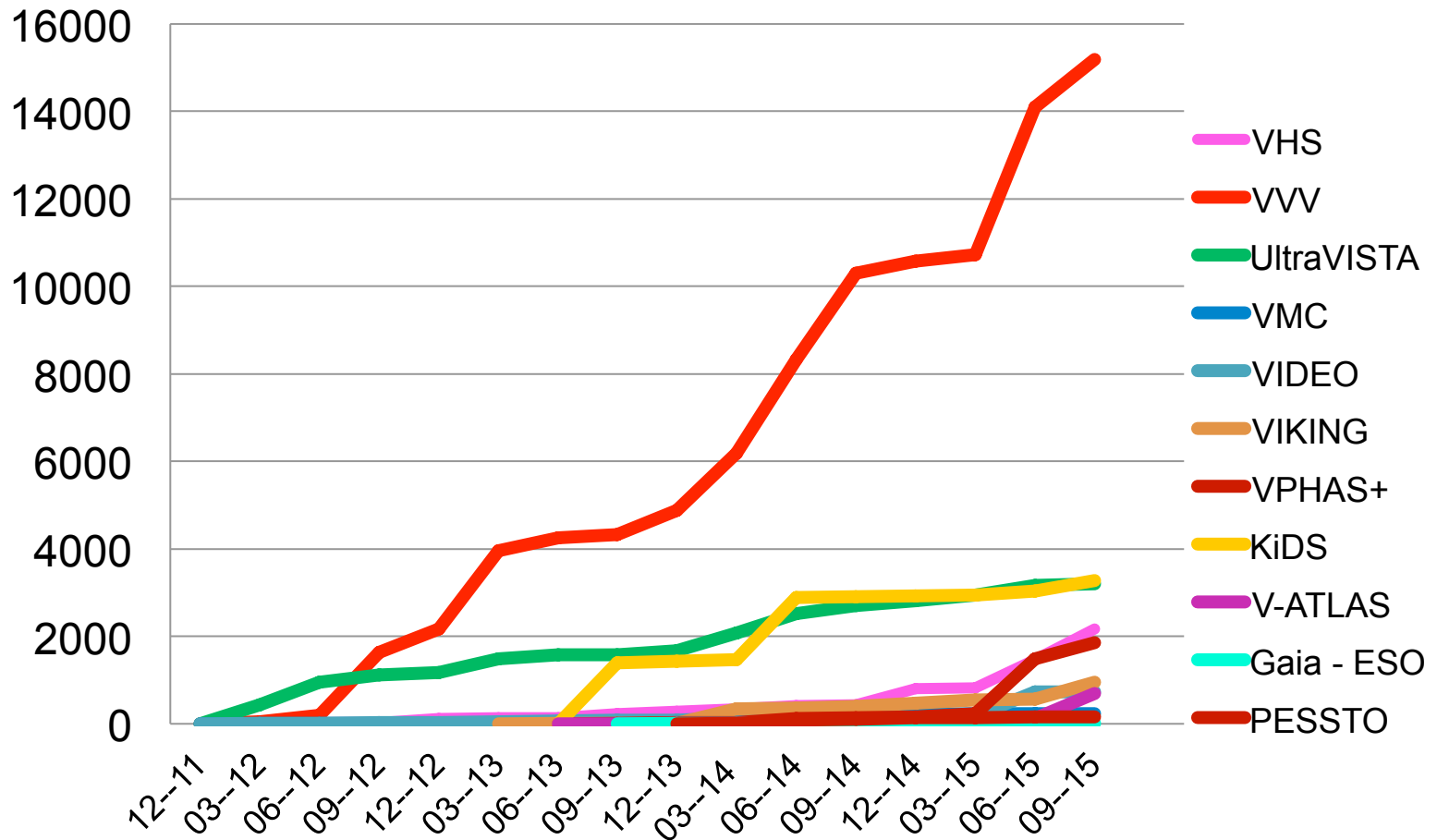
# DATA ACCESS STATISTICS





# Access per survey

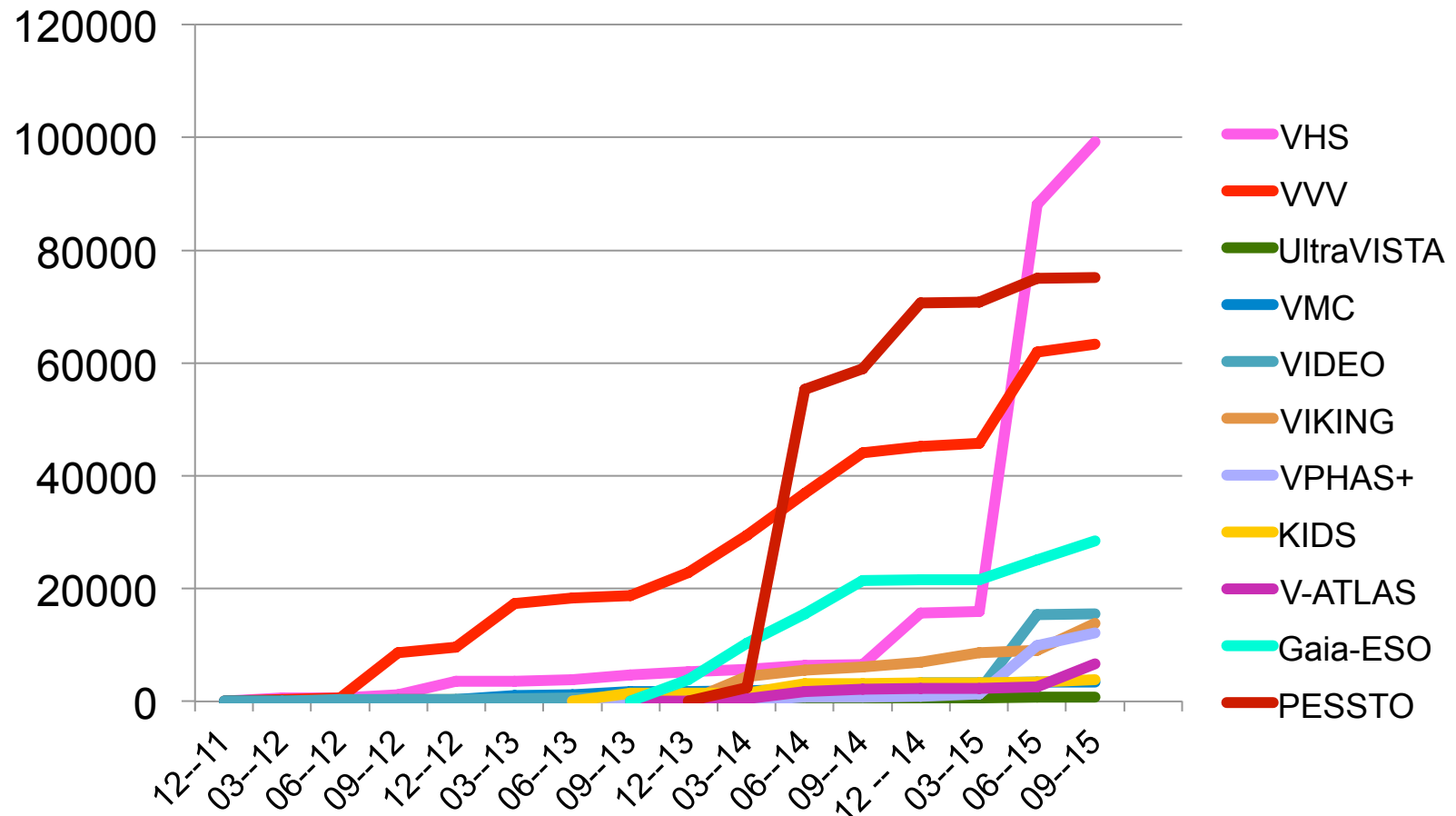
Data volume download from ESO SAF of public survey products





# Access per survey (2)

Number of files download from ESO SAF of public survey products

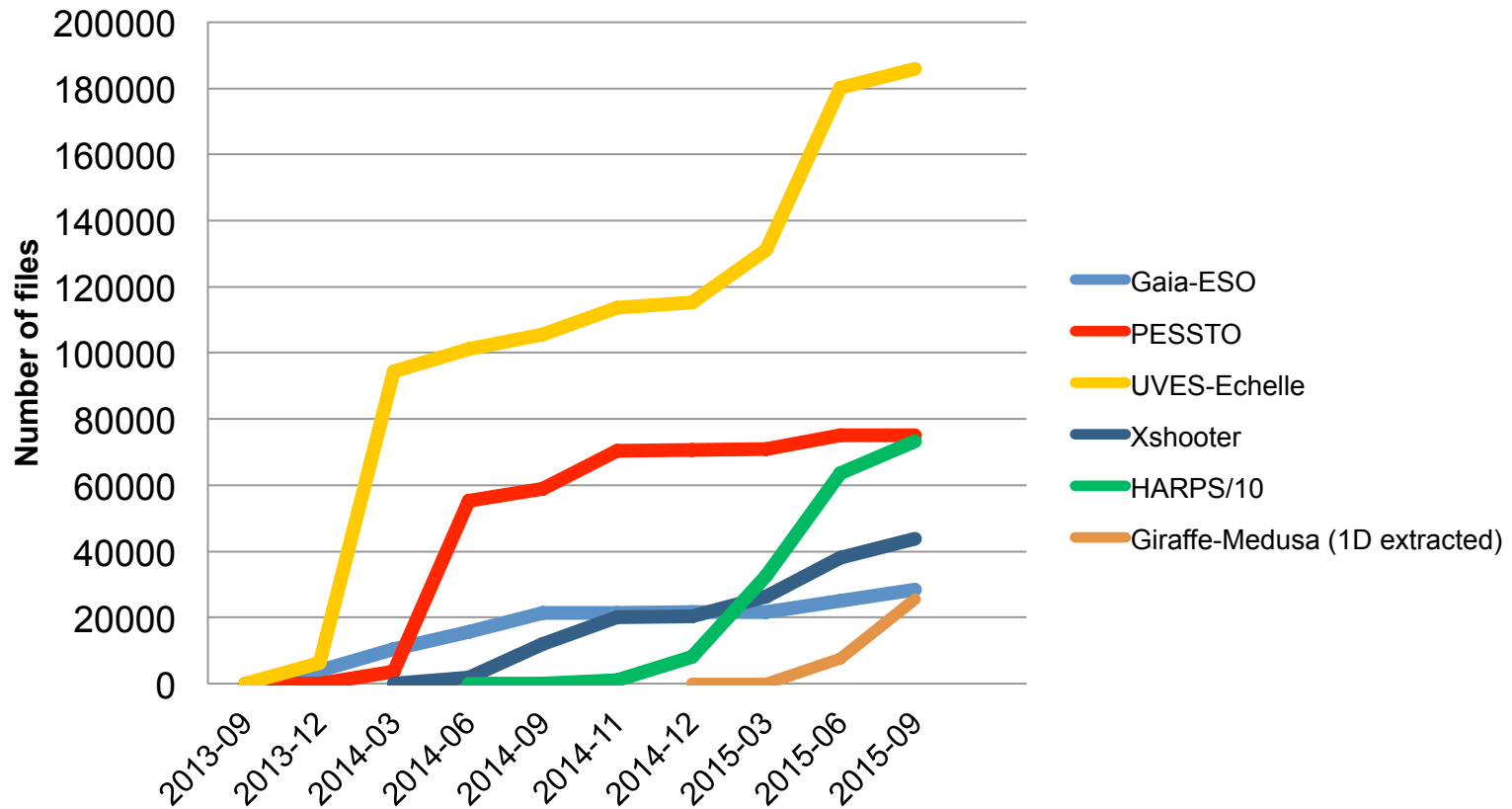




# Access to Spectral Data

Spectroscopic surveys (Gaia-ESO, PESSTO)

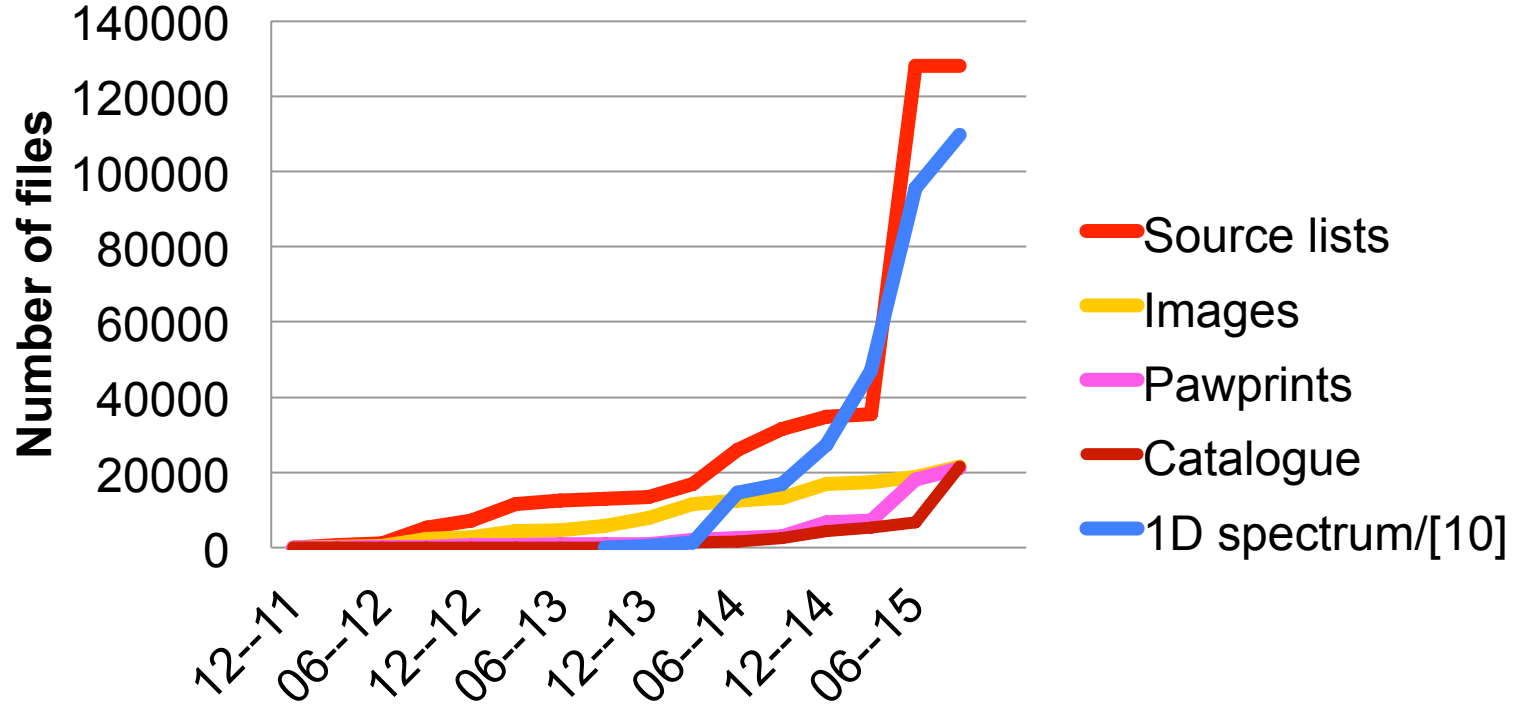
Pipeline-processed (UVES-Echelle, Xshooter, HARPS, Giraffe-Medusa)





# Access per data type

Number of files and products download from ESO SAF for public surveys & IDPs: all types of SDPs have been accessed/downloaded



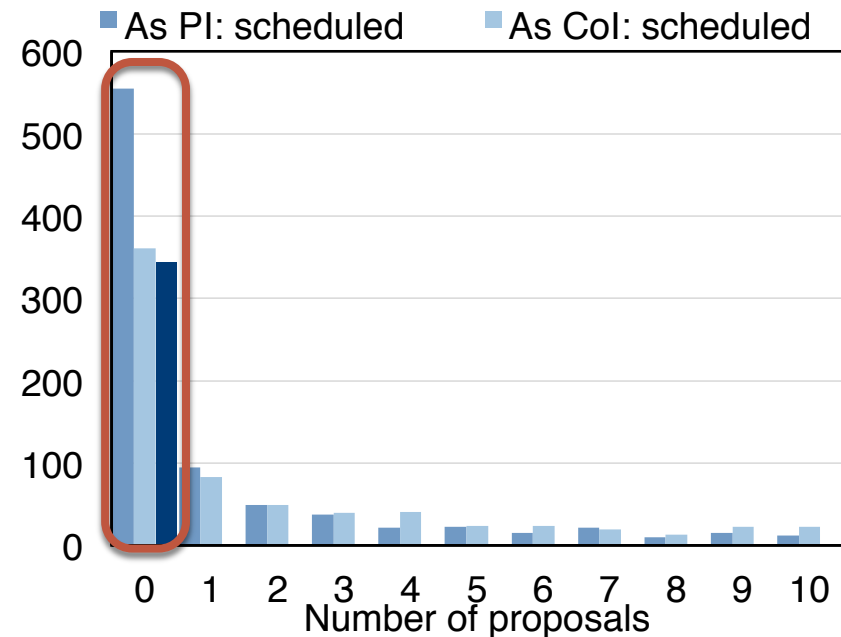
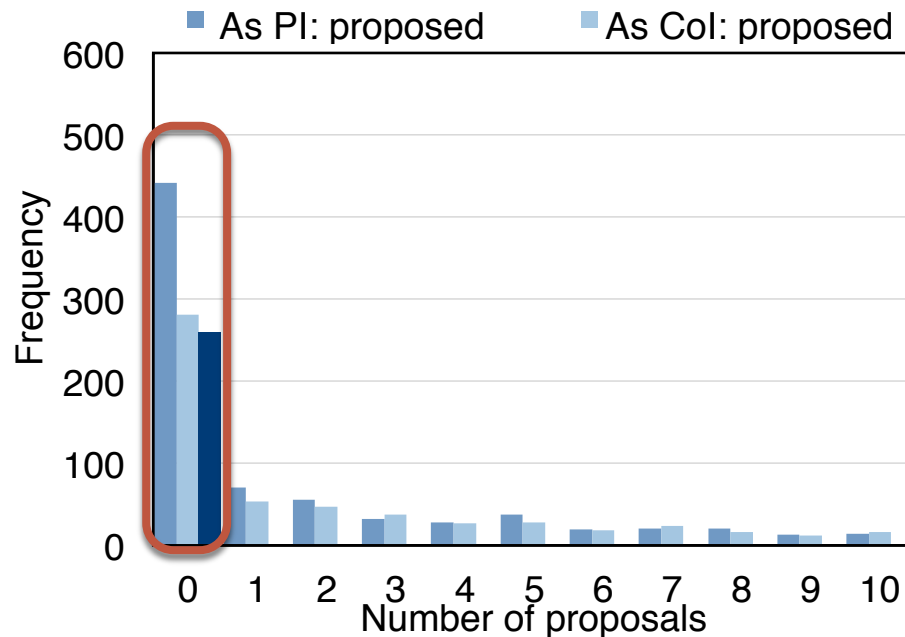
**>25 TB and one million files  
downloaded since December 2011!**





# Phase 1 habits of archive users

## Data products



Source: ESO Back-end Operations

- SAF data products users: 28% (260) have never applied for time, neither as PIs nor co-Is; 37% (344) have never gotten time, neither as PIs nor co-Is
  - For comparison, 1/3 of the Phase 1 PIs have never got time





How do we operate?

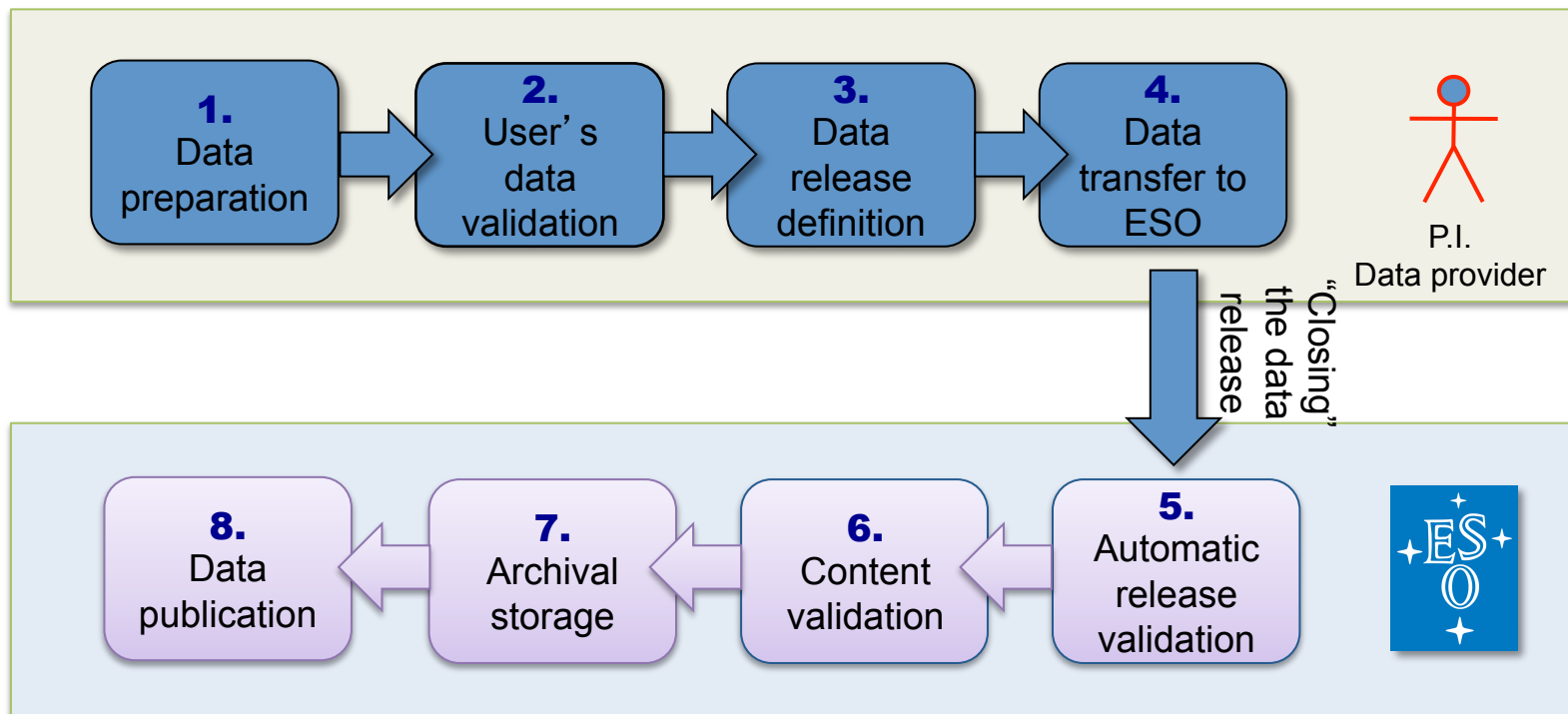
# PHASE 3 IMPLEMENTATION



# Phase 3 Implementation

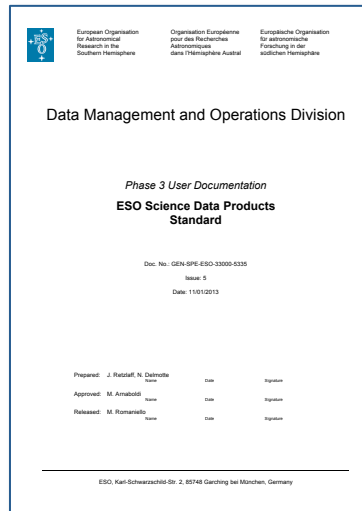
**Phase 3 process:** preparation, submission, validation and ingestion of science data products for storage in the ESO Science Archive Facility, and subsequent publication to the scientific community.

- The data provider i.e. survey P.I. is responsible for data reduction and final QC, delivering reduced data to ESO.
- ESO is responsible for the definition of the data products standard, archiving the data and publication to the community.





# Phase 3 Data preparation



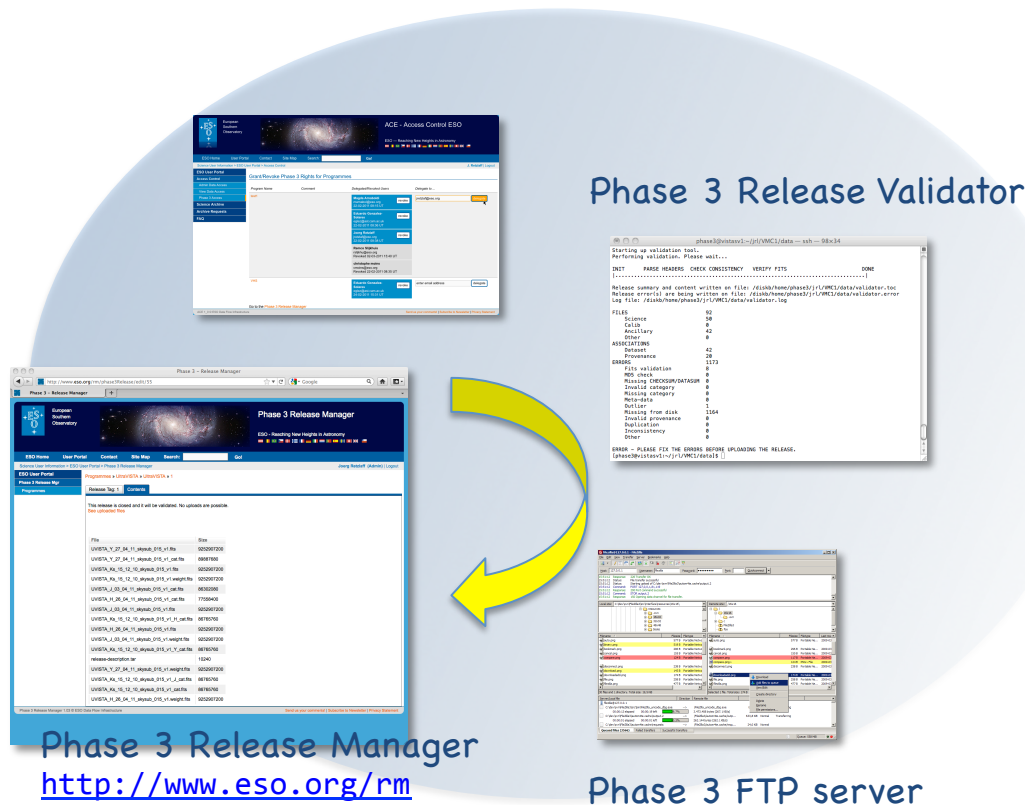
Phase 3 data must adhere to the **ESO Science Data Product Standard** regarding format and required metadata, i.e. relevant keywords for data characterization, quality, processing provenance etc.

<http://www.eso.org/sci/observing/phase3/p3sdpstd.pdf>

- Uniformity of products across the ESO/SAF in terms of data format, level of characterization, search capabilities, and data documentation.
- Current Issue covers all PS data products, imaging, spectroscopy; Sub-mm flux maps (e.g. APEX/LABOCA)
- Format for IFU data cubes (MUSE etc.) available



# Phase 3 Key Features



- Phase 3 User Delegation
- Support for incremental and superseding data releases.
- Association of ancillary data files with science data products
- Processing provenance to trace original science data
- Data documentation following standard structure (“release-description.pdf”)

**Phase 3 content validation** includes consistency checks of submitted data content w.r.t. documentation, check of completeness and quality of the metadata (keywords) prior to archive ingestion.





ESO - Phase 3

www.eso.org/sci/observing/phase3.html

European Southern Observatory

ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!

Science Users Information > Observing with ESO Telescopes > Phase 3

06 Oct 2015

### Phase 3

**16 September 2015**

- New release of stacked reduced images and source lists for the VST Public Survey ATLAS [Read More]

**21 August 2015**

- New Data Release of VVV Photometric Catalogues [Read More]

**6 August 2015**

- New Release of PESSTO Spectroscopic Public Survey Data [Read More]

[More News...]

In a nutshell, Phase 3 denotes the process of preparation, validation and ingestion of science data products (SDPs) for storage in the ESO science archive facility, and subsequent data publication to the scientific community. SDPs are produced by 1) principal investigators of ESO observing programmes, and 2) ESO pipelines as part of the quality control (QC) process or from specific, dedicated, re-processing projects for homogeneous raw data sets.

ESO's policies governing Phase 3 are specific to the type of observing programme. Phase 3 is mandatory for ESO Public Surveys and for ESO Large Programmes since period 75. For other ESO programmes there is no obligation but PIs are invited to take advantage of the Phase 3.

To ensure the successful integration of SDPs into the archive, ESO supports the users in carrying out the Phase 3 process by defining ESO/SDP data standards, by devising procedures and providing the infrastructure for the delivery of SDPs, and by supplying tools for the data preparation.

The description of the policies, the data standard and the procedure for the submission of reduced data products applicable to the ESO Phase 3 process given here is intended to provide the information for the preparation and successful completion of the ESO Phase 3 process.

The target audience consists of 1) principal investigators and their collaborators who return reduced data products resulting from ESO observations for public release to the astronomical community through the ESO archive, 2) ESO scientists involved in the QC process or in specific re-processing projects, 3) instruments scientists and pipeline developers for the new and existing ESO instruments.

#### Phase 3 Quick Links

- Phase 3 Main Level
- ESO SDP Standard (v5) [PDF]
- APEX Sub-mm Sky Maps [PDF]
- Integral Field Spectroscopy: 3D Data Cubes [PDF]
- Phase 3 User Guide [PDF]
- Phase 3 Release Manager
- Release Validator
- Phase 3 FTP upload
- Get template for the data release description
- Contact the Phase 3 Helpdesk

#### Instructions and Documentation

- Overview of the Phase 3 process
- Phase 3 Policies for ESO Public Surveys
- ESO Science Data Products standard [PDF]
- Phase 3 User Guide to the Data Submission [PDF]

#### Phase 3 Infrastructure and Software Tools

- Phase 3 Release Manager
- Release Validator
- FTP upload (phase3tp.eso.org)

#### Further Information

- Questions & Answers
- News and Changes

In March 2011, Phase 3 operations have started to support the validation, transfer and publication of the first data products from ESO public surveys. Other ESO observing programmes will be handled through the Phase 3 system as soon as the underlying data products standard and infrastructure have been extended to cover the respective instruments and data product types.

#### Contact the Phase 3 Helpdesk

For any questions regarding Phase 3, its policies, the data content and format, or the submission process of data products to the ESO Archive, please feel free to contact the ESO Archive Science Group via email at

usd-help@eso.org, subject: Phase 3

Last Update: 06.10.15 © ESO

Send us your comments | Subscribe to Newsletter | Privacy Statement

Overview of data published via Phase 3

How to prepare and submit the data..

Get the Science Data Product Standard (data format & required keywords):

1. Images+Spectra (main doc.)
2. APEX sky maps (appendix)
3. IFU Data cubes - new



# Phase 3 Upgrade

## ■ Main Goals

- Minimizing the overall time to data publication
  - Optimize the feedback loop with the data provider regarding the data validation status
  - and uploaded data content
  - Reducing workload for data providers as much as possible
- Adding missing operational requirements
  - Better support for very large data releases using submission via multiple ‘batches’
  - New Survey manager role
  - Improved communication and tracking of data-related issues between data providers and ESO (“Phase 3 RIX’es mgt.”)



# New Phase 3 Release Manager

European Southern Observatory

Phase 3 Release Manager

ESO - Reaching New Heights In Astronomy

ESO Home User Portal Contact Site Map Search Go Fabio Sogni | Logout

Science User Information / ESO User Portal / Phase 3 Release Manager

### Data collections

New data collection

#### ESO public surveys

Data releases	Batches	Name	Comment	Owner	URL	Test	Survey manager	Actions
+ 2	4	PESSTO	Public ESO Spectroscopic Survey of Transient Objects	Stephen Smartt	http://www.pessto.org	✗	-	
+ 3	4	TestProgram10	test	Joerg RetzlaffOPS		✗	-	
+ 2	3	UltraVISTA		J.S. Dunlop		✗	-	
- 3	11	VHS		R. McMahon	http://www.vista-vhs.org	✗	-	

New data release New batch

Data release	Batches	Total files	Total volume	Title	URL	Data rel. desc.	Content summary	Actions
+ VHS	9	0	0	VISTA Hemisphere Survey images and single-band source lists	-	-	Generate	
+ VHS_DR2_CATALOGUES	1	0	0	VISTA Hemisphere Survey bandmerged multi-waveband catalogues	-	-	Generate	
+ VHS_DR3_CATALOGUES	1	0	0	VISTA Hemisphere Survey band-merged multi-waveband catalogues (VHS)	-	-	Generate	

+ 3	7	VIDEO		M. Jarvis		✗	-	
+ 4	6	VIKING	The VIKING survey is a five-band near-IR (Z, Y, J, H, Ks) intermediate depth survey, of high galactic latitude sky (eventually 1500 sq.deg). Major overlapping surveys include VST-KIDS and Herschel-ATLAS.	A. Edge		✗	-	

- Phase 3 Programme merged with “Data Collection”
- Local validation fully replaced by server side validation; validation on demand also possible
- Flexible management of Data Releases by ESO
- Up-to-date statistics of uploaded data (content summary)
- New Survey Manager role for ESO Public Surveys
- Flexible management of Release Documentation (Description) via the new Release Manager interface





# New Content Summary – 1

## Content summary of Data Release VHS

### All files summary

**Data collection:** VHS  
**Data Release:** VHS  
**Total files:** 568088  
**Total size:** 25,559.40 GB

### All files by category

Category	#files
ANCILLARY.WEIGHTMAP	189367
SCIENCE.IMAGE	26861
SCIENCE.MEFIMAGE	162506
SCIENCE.SRCTBL	189354

### All files by filename extension

Filename extension	#files
fits	189354
fits.fz	378734

### All files by filename extension and category

Filename extension	Category	#files	Size (GB)
fits.fz	ANCILLARY.WEIGHTMAP	189367	6,837.23
fits	SCIENCE.SRCTBL	189354	1,872.82
fits.fz	SCIENCE.MEFIMAGE	162506	11,873.81
fits.fz	SCIENCE.IMAGE	26861	4,975.54







# New Content Summary – 2

## Science files summary

**Total files:** 378721  
**Start period:**  
**End period:**  
**Start date:** Wed Nov 04 00:29:13 UTC 2009  
**End date:** Sat Oct 01 04:35:41 UTC 2011  
**Sky area:**

## Science files by PRODCATG

PRODCATG	#files
SCIENCE.IMAGE	9943
SCIENCE.MEFIMAGE	60231
SCIENCE.SRCTBL	70139

## Science files by OBSTECH

OBSTECH	#files
IMAGE,JITTER	140313

## Science files by INSTRUMENT

Instrument	#files
VIRCAM	140313

## Science files by MULTOB

Multob	#files
false	
true	

## Science files by FILTER

Filter	#files
H	27658
J	49424
Ks	48632
Y	14599

## Science files by ESO period

Period	#files
TODO	0

## Science files by PROCESOFT

PROCSOFT	#files
TODO	0



# Summary

- The Science Archive Facility is the central repository for ESO Public Survey data products.
- >35 TB of data from 11 public surveys are currently available for download.
- The SAF contains science data products including calibrated images, spectra, source lists and high-level catalogues.
- These data are complemented by pipeline-reduced science-grade data products for selected instruments/modes processed by ESO and by other data deliveries, e.g. by large programmes.
- Download statistics demonstrate a large ongoing interest by the user community.
- Offering PS data and archival data in general extends ESO's user community.



*Many Thanks to PS and LP teams for having  
returned their data products!*

*ESO/ASG is ready to support your data  
submission. Please contact the Phase 3 helpdesk at  
[usd-help@eso.org](mailto:usd-help@eso.org), subject: Phase 3*

