


Public Surveys @ ESO

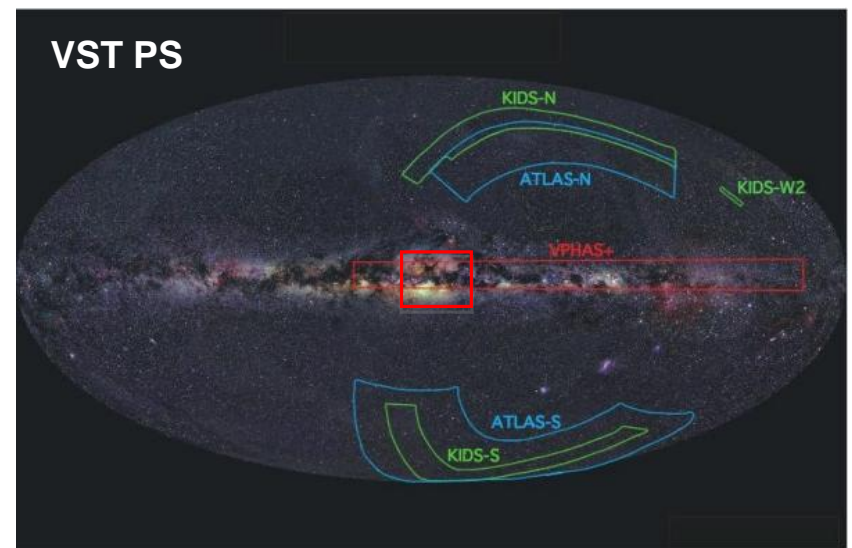
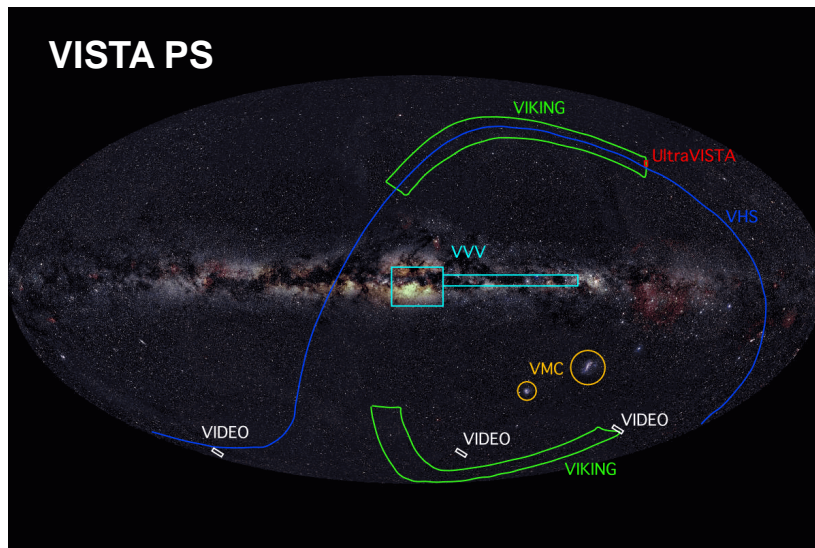
Magda Arnaboldi,
Head - Archive Science Group
marnabol@eso.org

- **Why** (does ESO carry out Public Surveys) ?
- **What** (are the Public Surveys projects @ESO) ?
- **When** (did ESO start) ?
- **How** (is it done)?
- **Highlights**

- Observational astronomy is in an era of surveys  SDSS, UKIDSS, Pan-STARRS, SkyMapper and LSST . These projects all entail large investment in survey “systems” which include dedicated telescopes and instruments to data distribution. **GOAL: target new science in a variety of fields and serve broad communities.**
- ESO has a strong background in survey projects (ESO/SERC southern sky survey 1974 - 1987, EIS).
- ESO operates dedicated telescopes, VST and VISTA , and organizes public surveys projects. ESO holds peer review periodically to ensure legacy value and scientific excellence of the survey program.
- In the current implementation for ESO public survey projects, the community carries out all those activities that go beyond those enlisted in the ESO mission statement .
- The ESO Science Archive Facility is the collection point for the survey products and the primary point of publication/availability of these products to the ESO community (as per ESO Council Meeting 104, 17–18 December 2004).

Public Surveys

- Very large programmes (>2 years)
- Legacy value for astronomical community at large (*)
- All raw observations are immediately public
- Survey teams commit to deliver reduced images/spectra and catalogues within ~yearly releases



(*) Several teams presenting their results at the national Astr. Soc. meetings

What? VST Public Surveys

Survey	Area (deg ²)	Filters	Magnitude limits	Depth measure
KIDS	1500	u' g' r' i'	24.1, 24.6, 24.4, 23.4	10 σ (AB)
Atlas	4000	u' g' r' i' z'	22.0, 22.2, 22.2, 21.3, 20.5	10 σ (AB)
VPHAS+	~2000	u' g' H α r' i'	21.8, 22.5, 21.6, 22.5, 21.8	10 σ (AB)

Deep high z Whole Sky Galactic Extragalactic Resolved SFH

Start of operations of VST + Omegacam 15.10.2011, already 100 deg² acquired for KIDS, excellent data quality for weak grav. lensing

What? VISTA Public Surveys

Surveys	Area (deg ²)	Area Observed (Apr 2012)	Filters	Magnitude limit 5 σ (AB), 10 σ (AB) x VMC	Observation hours taken (Apr 2012)
Ultra-VISTA	1.7 deep 0.73 ultra-deep	1.7	Y J H K _s Y J H K _s NB118	25.7, 25.5, 25.1, 24.5 26.7, 26.6, 26.1, 25.6 26.0	475
VHS	17800	>4208	Y J H K _s	21.2, 21.1, 20.6, 20.0	1165
VIDEO	12.0	10	Z Y J H K _s	25.7 24.6 24.5 24.0 23.5	379
VVV	560	562	Z Y J H K _s	21.9 21.1 20.2 18.2 18.1	430
VIKING	1500	>470	Z Y J H K _s	23.1 22.3 22.1 21.5 21.2	616
VMC	180	54.3	Y J K _s	21.9, 21.4, 20.3	325

Deep high z Whole Sky Galactic Extragalactic Resolved SFH

■ Gaia - ESO (PIs: Gilmore, Randich)

- Time allocation 60n/yr over 4yr on UT2 FLAMES – [Start 01.2012](#)
 - extension to 5 yr (300n) pending formal review
- 10^5 stars in all major components of the MW, 100 open clusters
- Synergy with Gaia – phase space structure and abundances for Milky Way stellar populations
- Target selection: VHS, VVV, WFI and other optical photometry

■ PESSTO (PI: S. Smartt)

- Time allocation 90n/yr over 4yr (+ 5th year pending formal review)
- EFOSC2 and SOFI on NTT – single target spectroscopy of Transient Universe: [start 04.2012](#)
- Follow up of ~150 transient objects in an unbiased sample of nearby galaxies drawn from ongoing surveys
- SN explosion physics, SN progenitors

- Letters of intent and proposals for VST public surveys - 2005
- Letters of intent and proposals for VISTA public surveys -2006
- Letters of intent and proposals for Spectroscopic public surveys - 2010
- VISTA and VST – survey telescopes
 - 6 VISTA Public Surveys **started on April 1, 2010**
 - 3 VST Public Surveys **started on October 15, 2011**
- **In 2012: start** of two spectroscopic public surveys
 - VLT/FLAMES and NTT/EFOSC2+SOFI
- **There are 11 public survey projects currently on-going**

■ ESO – operation, data delivery & archive

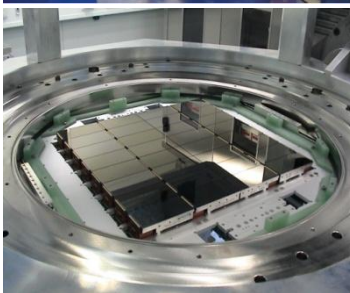
- Provides & operates observing facilities: telescopes, instruments, SM & VM
- Delivers raw data and makes them immediately public
- Archives data products and publish them to the astronomical community
- Organizes high level reviews for monitoring survey progress and ensure scientific excellence

■ Public survey teams – obs. strategy, data reduction, analysis, and delivery of data products

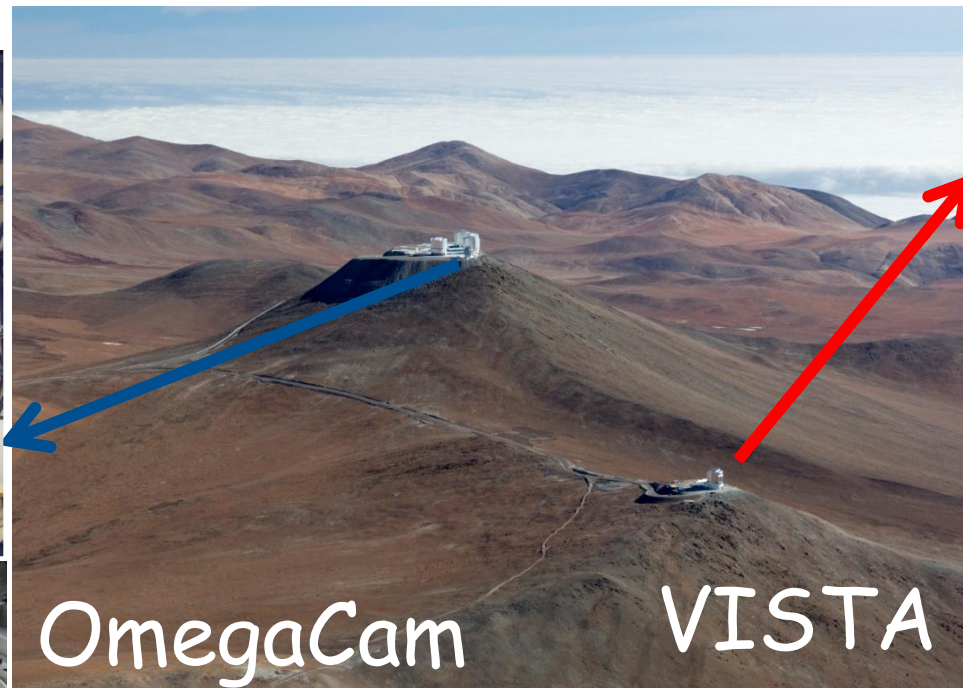
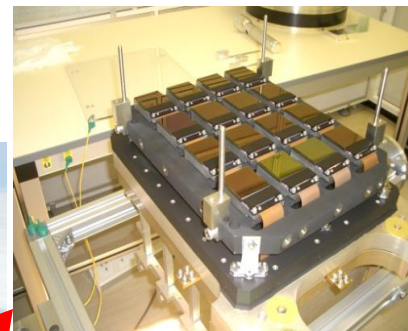
- Prepare and run the observations
- Run final quality control and data reduction
- Deliver reduced images, spectra, catalogues to ESO SAF
- Yearly incremental releases + final release

How? Telescopes for surveys VISTA & VST

VST

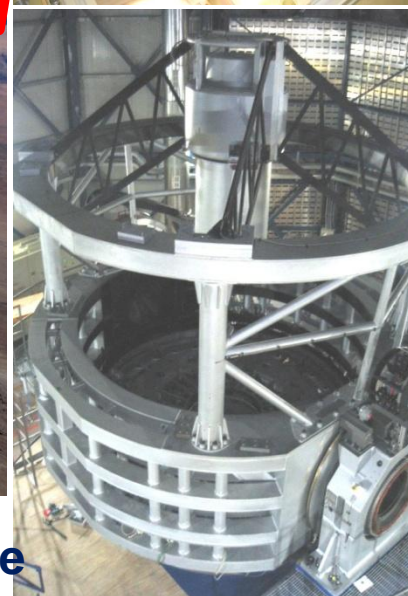


VIRCAM



OmegaCam

VISTA

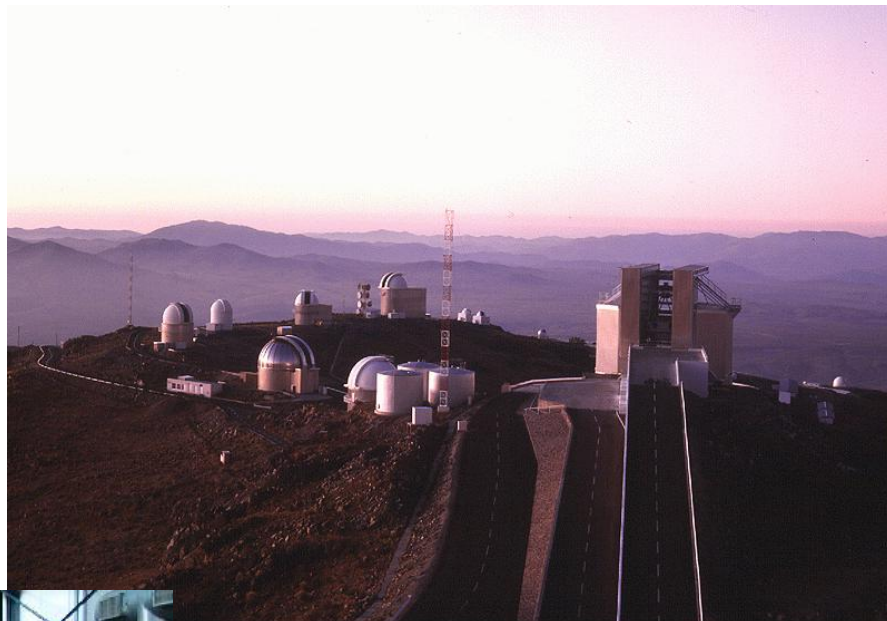


- Observations carried out in service mode
- 1800 – 3400h per programme, several thousands Obs each semester
- Expected to run ~6-8 yrs

How? Telescopes for surveys Flames@UT2 and EFOSC/SOFI@ NTT



FLAMES@UT2



EFOSC&SOFI @ NTT



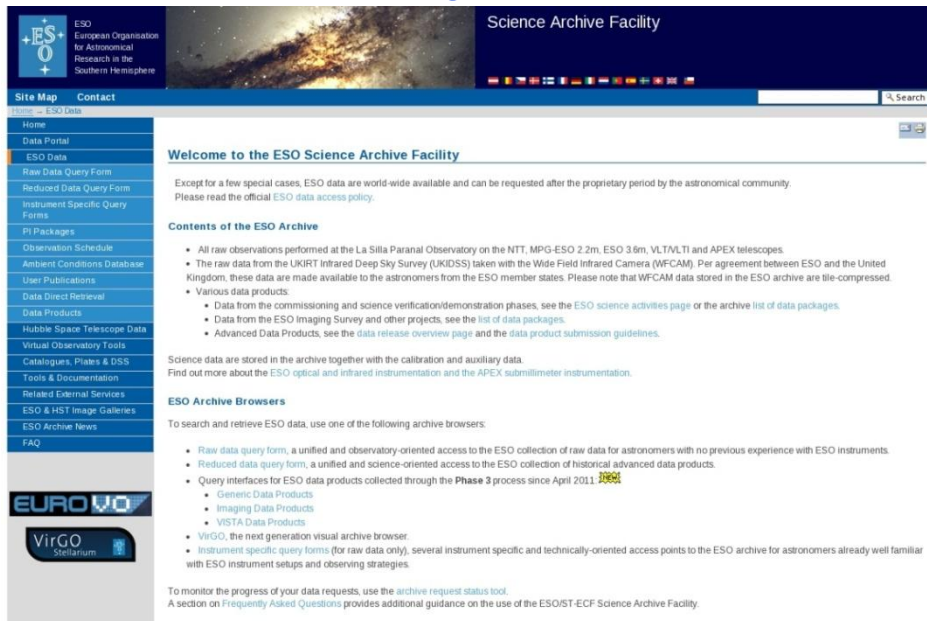
- Observations carried out in visitor mode
- Expected to run for 4-5 yrs

How? Optical & NIR surveys and telescopes

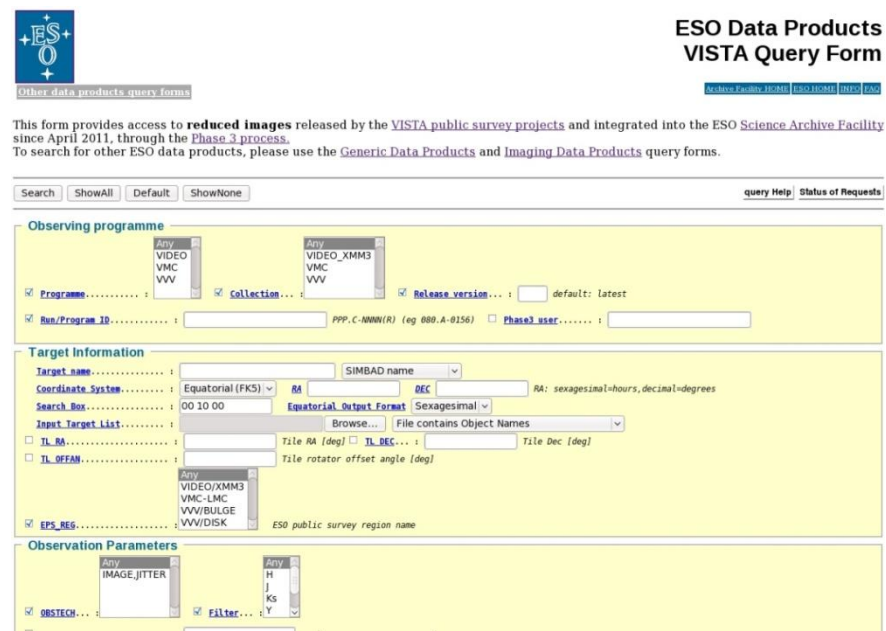
	Telescope Diameter	FoV	Etendu [m ² deg ²]	Pixel size [arcsec/pixel]	Wavelength range [μm]
Ground					
SkyMapper	1.4	5.7 deg ²	6.6	0.500	0.32-0.95
Pan-STARRS 1	1.8	2.8 ^o x2.9 ^o	16.3	0.300	0.4-1.15
SDSS	2.5		6.0	0.394	0.33-1.0
MegaCam	3.6	0.96 ^o x 0.94 ^o	7.6	0.187	0.34-0.95
CTIO (DES)	4.0	4.0 deg ²	16.0	~0.20	0.6-1.0
VISTA	4.0	1.65 ^o deg circ	5.2	0.339	0.88-2.15
SuprimeCam	8.0	34'x27'	13.5	0.200	0.36-1
VLT HAWK-I	8.2	7.5'x7.5'	0.81	0.106	1-2.2
VLT-VIMOS	8.2	4 x 7'x8'	3.2	0.205	0.36-1
<i>LBC@LBT</i>	8.4	23'x23'	8.1	0.230	0.32-1.0
<i>VST</i>	2.6	1 deg ²	5.5	0.210	0.33-1.0
<i>Subaru</i>	8.0	1.5 deg circ	94	0.17	0.36-1
<i>HyperSuprime</i>					
LSST	8.4	3.5 deg circ	319	0.200	0.33-1.07

How? Phase 3, data releases and community access via ESO SAF

- Phase 3 – final step in the execution of PS. New Phase 3 infrastructure allows reception, validation and publication of data products from PS to the ESO SAF – <http://www.eso.org/sci/observing/phase3/>
- Data standards characterize level of data reduction & track provenance
- Data products (DPs) – images, weight maps, source lists and catalogues (spectra + catalogues)



The screenshot shows the ESO Science Archive Facility website. The header includes the ESO logo and the text 'Science Archive Facility'. A navigation menu on the left lists various options like 'Home', 'Data Portal', and 'Raw Data'. The main content area is titled 'Welcome to the ESO Science Archive Facility' and contains a list of contents and a section for 'ESO Archive Browsers'. The 'ESO Archive Browsers' section lists several query forms: 'Raw data query form', 'Reduced data query form', 'VISTA Data Products', and 'VIRGO, the next generation visual archive browser'. It also mentions 'Instrument specific query forms (for raw data only)'. At the bottom, there is a note about monitoring data requests and a link to frequently asked questions.



The screenshot shows the 'ESO Data Products VISTA Query Form'. The form is titled 'Other data products query forms' and includes a search bar and a 'query Help' link. The form is divided into several sections: 'Observing programme', 'Target Information', and 'Observation Parameters'. The 'Observing programme' section has dropdown menus for 'Any VIDEO VMC VV' and 'Any VIDEO_XMM3 VMC VV', and checkboxes for 'Programme', 'Collection', and 'Release version'. The 'Target Information' section has fields for 'Target name', 'Coordinate System', 'Search Box', 'Input Target List', and 'IL BA / IL OFFAN'. The 'Observation Parameters' section has dropdown menus for 'Any IMAGE/JITTER' and 'Any H J Ks Y', and a checkbox for 'Filter'. The form also includes a 'Phase 3 user' field and a 'PPP.C-NNN(R)' field.

http://archive.eso.org/wdb/wdb/adp/phase3_vircam/form



How? Phase 3, data releases and community access via ESO SAF

- VISTA DR1 – about 7 TB of data products (DPs) - announced on ESO web pages, ESO newsletter & Messenger
- VISTA DR2 and catalogue release – upload ongoing & publication planned for 2012 Q4
- DPs available from the newly deployed query interfaces

Science Archive Facility

Welcome to the Science Archive Facility

Except for a few special cases, please read the off-line documentation.

Contents of the Science Archive Facility

- All raw observations
- This raw data is available to the astronomical community worldwide.
- Various data products
- Data from various instruments
- Data from various instruments
- Advanced search options

Science data are stored in the Science Archive Facility. Find out more about it!

ESO Archive Browser

To search and retrieve data from the Science Archive Facility, use the following query interfaces:

- Raw data query form, a unified and observatory-oriented access to the ESO collection of raw data for astronomers with no previous experience with ESO instruments.
- Reduced data query form, a unified and science-oriented access to the ESO collection of historical advanced data products.
- Query interfaces for ESO data products collected through the Phase 3 process since April 2011.
- Generic Data Products
- Imaging Data Products
- VISTA Data Products
- VISO, the next generation visual archive browser.
- Instrument specific query forms (for raw data only), several instrument specific and technically-oriented access points to the ESO archive for astronomers already well familiar with ESO instrument setups and observing strategies.

To monitor the progress of your data requests, use the archive request status tool. A section on Frequently Asked Questions provides additional guidance on the use of the ESO/ST-ECF Science Archive Facility.



ESO Data Products VISTA Query Form

Other data products query forms

Science Archive Facility

Home

Search

query Help

Status of Requests

Data products are available for download by the astronomical community worldwide!

TL_RA [deg] TL_DEC [deg] Tile RA [deg] Tile DEC [deg]

TL_OFFSET [deg] Tile rotator offset angle [deg]

VIDEO/XMM3
VMC-LMC
VV/BULGE
VV/DISK

ESO public survey region name

Observation Parameters

Any IMAGE_JITTER

Any H J Ks Y

OBSTECH [] Filter []

http://archive.eso.org/wdb/wdb/adp/phase3_vircam/form

How? Phase 3, data releases and community access via ESO SAF

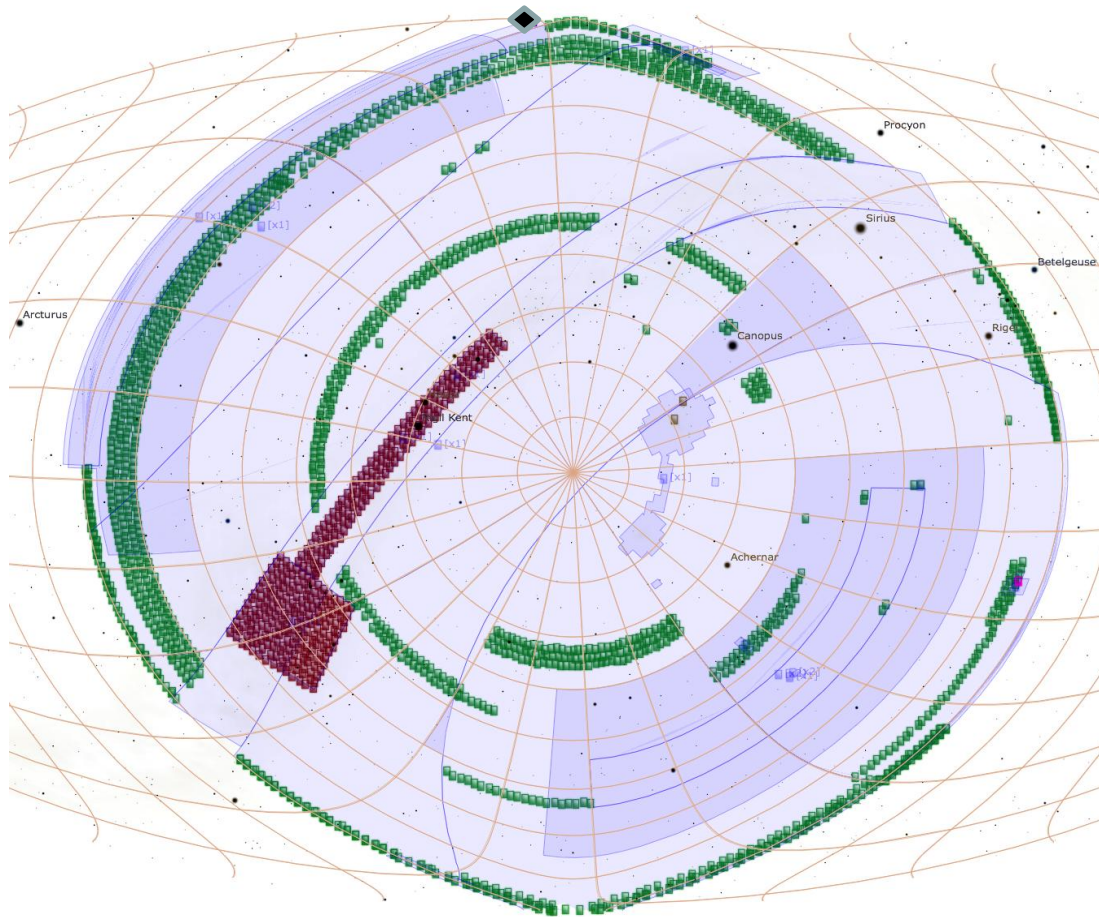
Survey	Submission Date	Date of Observations	Release Content	Pass-bands	Sky coverage (sq.deg)	Type of Data Products	Total volume	Total number of files	VISTA tile images	Pub. date
VVV	03.05.2011	Feb 2010 – Sep 2010	Contiguous patch of bulge and disk region including multi-epoch data in Ks	ZYJHKs	~520 (348 tiles)	Tiles, single-band source lists	1.5 TB	7980	2660	25.07.2011
VIDEO	03.05.2011	Nov 2009 – Feb 2010	XMM-LSS field	YJHKs	1.5	Tiles, single-band source lists	24 GB	291	97	25.07.2011
VMC	08.09. 2011	Nov 2009 – Nov 2010	2 tiles in the LMC: one overlapping the 30 Doradus and the other the South Ecliptic Pole region	YJKs	3	Stacked tiles and pawprints, single-band and band-merged source lists	8.1 GB	1256	6	25.09.2011
VHS	15.09.2011	Nov 2009 – Sep 2010	VHS DES: 120 secs in JHK VHS ATLAS: 60 secs in YJHK VHS GPS: 60 secs in JK	YJHKs	~1910	Tiles, pawprints, single-band source lists	3.9 TB	96474	4560	17.10.2011
UltraVISTA	06.10.2011 – 30.01.2012	Dec 2009 – Apr 2010	Deep imaging of the COSMOS field	YJHKs, NB118	1.5	Stacked images, SExtractor catalogues including Ks-selected multi-band catalogue	87 GB	19	5	15.02.2012
VIKING	10.10.2011	<i>Phase 3 data submission to be closed by P.I.</i>					19 GB	6276		

Phase 3 start of operations: 10 March 2011

DPs available from http://archive.eso.org/wdb/wdb/adp/phase3_vircam/form

Release descriptions at http://www.eso.org/sci/observing/phase3/data_releases.html

How? Phase 3, data releases and community access via ESO SAF



The VISTA public survey DPs released through the Phase 3 process in 2011/2012 cover almost **2500 square degrees** of the Southern Hemisphere.

- VHS - green,
- VVV - red,
- VMC - yellow,
- VIDEO - pink,
- UltraVISTA - black

Entire survey footprints are shown in light blue.

Table 1: Overview of Phase 3 catalogue data deliveries from the ESO/VISTA public survey programmes

Name	Title	Content	2012 Data Release
UVISTA_DEEP_CAT	Deep Near-Infrared Catalogue of the COSMOS Field	Aperture-matched source catalogue in YJHKs and NB118 based on the deep stacked images.	✓
UVISTA_UDEEP_CAT	Ultra-deep Near-Infrared Catalogue of the COSMOS Field	Aperture-matched source catalogue in the YJHKs and NB118 based on the stacked images of the ultra-deep part of the survey.	
VIKING_CAT	VIKING J-Band Selected ZYJHKs Source Catalogue	Merged multi-band source catalogue with aperture-matched photometry in ZYJHKs for all objects selected and defined in J-band.	✓
VMC_CAT	VISTA Magellanic Survey YJKs Source Catalogue	Homogeneous epoch-merged and band-merged master source catalogue in YJKs	✓
VMC_VAR	VISTA Magellanic Survey Catalogue of Variables	Mean magnitude, amplitude/likelihood of variation (when possible), variable type (i.e. RR Lyrae stars, Cepheids, late-type giants, eclipsing binaries)	✓
VMC_MPHOT	VISTA Magellanic Survey Multi-Epoch Photometry	Homogeneous catalogue of multi-epoch photometric data points listing the measured magnitude as a function of source ID and time of observation (also known as light curve).	✓
VVV_CAT	ZYJHKs Catalogue in the Via Lactea	Homogeneous source catalogue with aperture-matched photometry on the whole survey area (bulge and plane region) based on the first-epoch data.	✓
VVV_VAR	Catalogue of Variables in the Via Lactea	Mean magnitude, amplitude/likelihood of variation (when possible), variable type (i.e. RR Lyrae stars, Cepheids, late-type giants, eclipsing binaries).	
VVV_MPHOT	Multi-Epoch Ks-Band Photometry in the Via Lactea	One homogeneous catalogue of multi-epoch Ks photometry in the VVV bulge and plane region.	
VHS_DES_CAT	VHS-DES Source Catalogue	Merged multi-band source catalogue with aperture-matched photometry in JHKs.	✓
VHS_ATLAS_CAT	VHS-ATLAS Source Catalogue	Merged multi-band source catalogue with aperture-matched photometry in YJHKs.	✓
VHS_GPS_CAT	VHS-GPS Source Catalogue	Merged multi-band source catalogue with aperture-matched photometry in J and Ks.	✓
VIDEO_ELIAS_CAT	Deep ZYJHKs Catalogue of the ELIAS-S1 field	Combined multi-band source catalogue with aperture-matched photometry in ZYJHKs based on the deep (i.e. stacked) images.	
VIDEO_XMM_CAT	Deep ZYJHKs Catalogue of the XMM-LSS field	Combined multi-band source catalogue with aperture-matched photometry in ZYJHKs based on the deep (i.e. stacked) images.	✓
VIDEO_CDFS_CAT	Deep ZYJHKs Catalogue of the Chandra Deep Field South	Combined multi-band source catalogue with aperture-matched photometry in ZYJHKs based on the deep (i.e. stacked) images.	

Catalogue data delivery from the VISTA PS. High level DPs including light curves (VMC, VVV).

ESO SAF will deploy new query interface for the exploration of the catalogues' content and data download

- Eleven public survey projects ongoing – several hundreds astronomers involved as PIs,co-Is
- Nine ESO press releases based on VISTA data since 01/2010
- Four ESO press releases based on VST data since 01/2011
- 23 refereed papers from ESO public surveys
- ESO workshop 15 – 18 Oct, 2012 on “Science from the next generation imaging and spectroscopic surveys” <http://www.eso.org/sci/meetings/2012/surveys2012.html>



ESO Public Surveys – Workshop 15-18 Oct 2012

Science from Next Generation
15-18.10 Imaging and Spectroscopic
2012 Surveys – an ESO Workshop
ESO
HQ, Garching,
Germany

Main science topics include:

- VISTA public surveys science
- First results from the VST public surveys observations
- Overview of spectroscopic public surveys at ESO
- Ongoing and planned large survey projects
- Synergies between ground-based and space surveys
- Data mining and the availability of survey products

SOC:

- Magda Arnaboldi (Chair)
- Arnette Ferguson
- Laura Ferrarese
- Lynne Hillenbrand
- Mike Irwin
- Andy Lawrence
- Bruno Leibundgut
- Duccio Macchetto
- Yannick Mellier
- Thomas Staafert

LOC:

- Magda Arnaboldi
- Oscar A. González
- Michael Hilker
- Valentin D. Ivanov
- Steffen Mieske
- Monika Petr-Gotzens
- Marina Rejkuba (Chair)
- Jörg Retzlaff
- Christina Stoffer

Web link:
www.eso.org/sci/meetings/2012/surveys2012.html

Contact email:
surveys2012@eso.org

Image: VISTA ESO public surveys program

More information at

<http://www.eso.org/sci/meetings/2012/surveys2012.html>



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<http://www.eso.org/sci/meetings/2012/surveys2012.html>
- **First public data release from VISTA PS on 12/2011**
- **More than five thousands files and ~ 2.0 TB of VISTA data products downloaded by the community.**

- Thanks to the PS PIs and their collaborators for the hard work!