



ESO Public Surveys



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ESO, Germany*

11 ESO Public Surveys

■ 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

■ VISTA and VST – survey telescopes

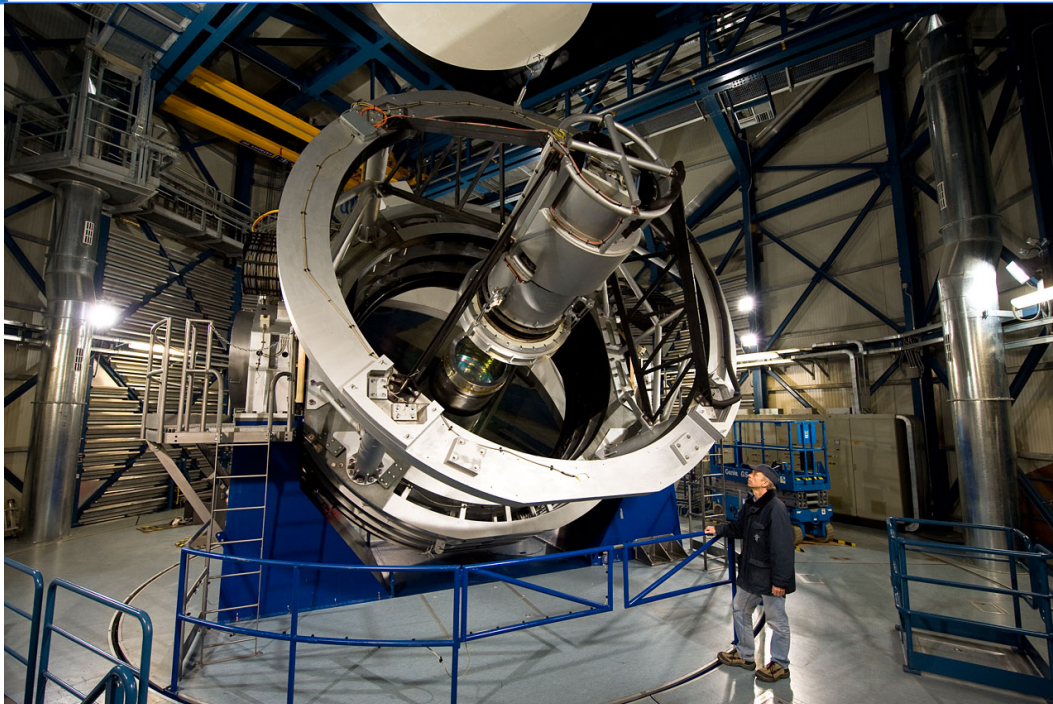
- More than 75% of the time devoted to public survey programmes
- 6 VISTA Public Surveys **started on April 1, 2010**
- 3 VST Public Surveys **started on October 15, 2011**

■ In 2012: start of two spectroscopic public surveys

- VLT/FLAMES and NTT/EFOSC2+SOFI

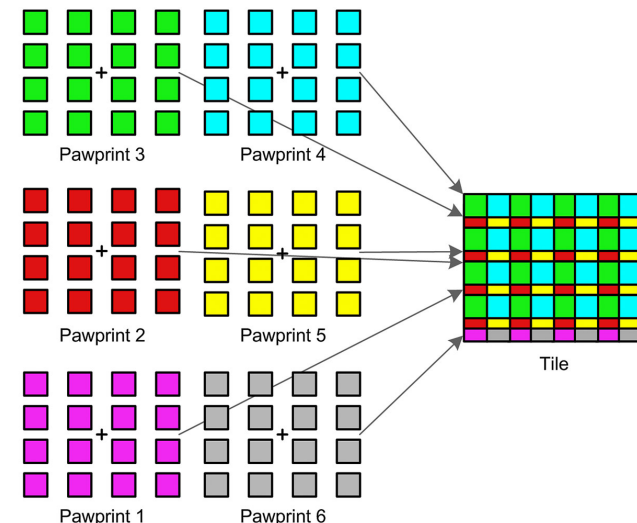


VISTA near-IR Survey Telescope



- ✓ 4.1m aperture
- ✓ Alt-Az mounting; modified Ritchey–Chrétien optics with fast f/1 primary giving f/3.25 focus to the Cassegrain camera
- ✓ 1.65 deg field of view
- ✓ 8k x 8k near-IR camera
 - ✓ 16x2048x2048 pix
 - Raytheon VIRGO HgCdTe
- ✓ Average pixel size: 0.34"

- ✓ 0.84-2.5 μm
- ✓ Broad band filters: ZYJHKs
- ✓ Narrow band filters: 0.98, 0.99, and 1.18 μm
- ✓ Typical survey strategy:
 - Survey area – tiles covering 1x1.5 deg²
 - Tile – fully covered single pointing



VISTA Start of Operations: April 1, 2010

VST – VLT Survey Telescope



- ✓ 2.6m aperture
- ✓ Alt-Az mounting and f/5.5 modified Ritchey–Chrétien optics
- ✓ 1° x 1° field of view

- ✓ OmegaCAM:
 - ✓ 16k x 16k optical camera
 - ✓ 32 CCDs – thinned, blue sensitive e2v; high cosmetic quality
- ✓ Pixel size: 0.21”
- ✓ Narrow gaps between detectors (91.4% filled area)

- ✓ Filters: ugriz (SDSS system), Johnson BV, Stromgren v, H α (~670 nm), z=0.3 H α (~865 nm)

- ✓ VST + OmegaCAM Start of Operations: 15 October 2011

VISTA Public Surveys

- 6 very large programmes
 - 1800 – 3400h per programme
 - Expected to run ~5 years
 - Complementary observing constraints
- Widest area survey – VISTA Hemisphere Survey
 - ~18,000 deg² + complementing with other public surveys covering ~20,000 square degrees; 3400h
- Survey with most observing blocks – VVV
 - 520 sq. deg, 1930h; ~80 epochs → >30,000 OBs¹
- Deepest survey – Ultra-VISTA
 - 0.73 sq. deg, ~1800h, 25.6 mag_{AB}(Ks), >26 mag_{AB}(YJH)

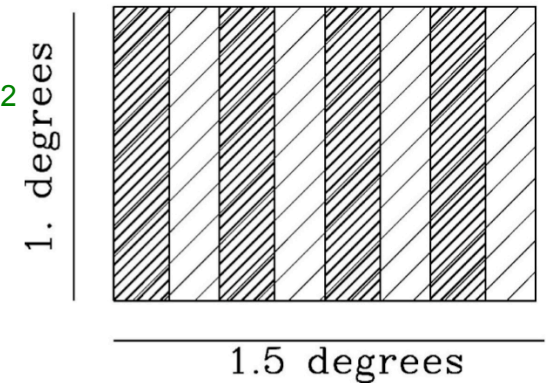
¹ Number of OBs executed on average per year on one UT (VLT): ~4000

VISTA: Deep Surveys

■ Ultra-VISTA (Co-PIs: J. Dunlop, Le Fevre, Franx, Fynbo)

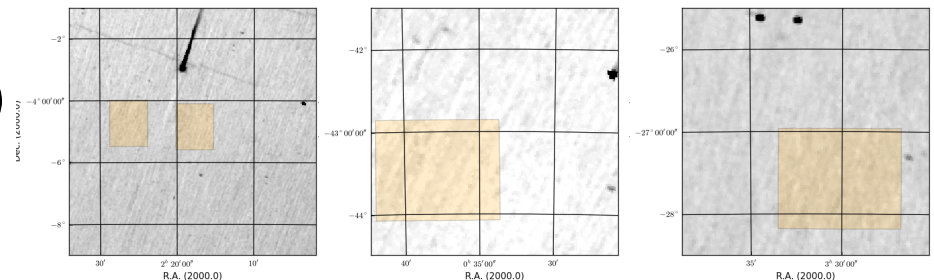
- Stellar mass build-up in galaxies at high redshift
- Search for $z \sim 8$ redshift Lyman α emitters

- deep (Y=25.7, J=25.5, H=25.1, Ks=24.5) 1.5 deg²
- ultra-deep (Y=26.7, J=26.6, H=26.1, Ks=25.6, NB118=24.1; 5 σ AB mag) - 0.73 deg²
- COSMOS field (RA=10h)

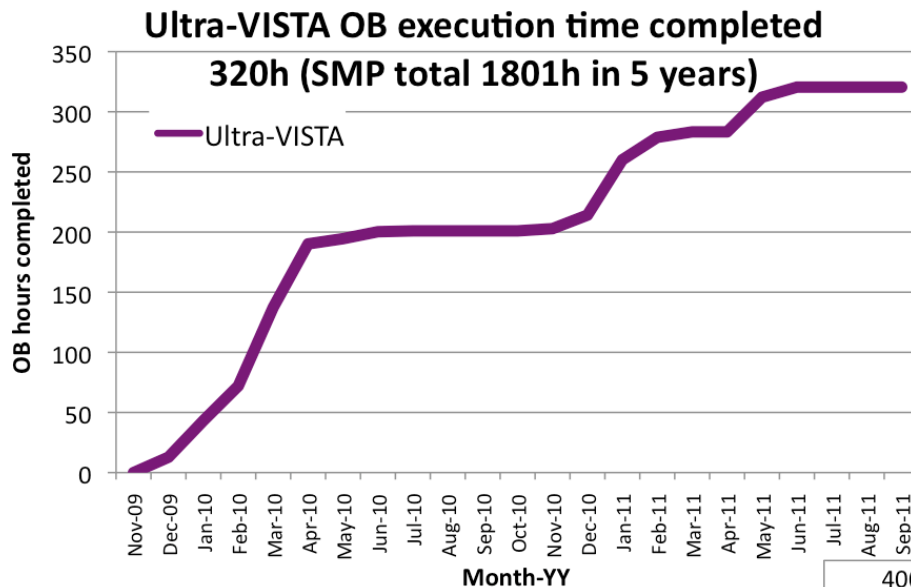


■ VIDEO (PI: M. Jarvis)

- galaxy evolution as a function of epoch and environment to $z \sim 4$
- AGN, galaxy clusters, massive galaxies up to reionization epoch
 - Z=25.2, Y=24.0, J=23.7, H=22.7, Ks=21.7 (5 σ AB mag) – 12 deg²
 - 3 regions (ELAIS-S1, ECDF-S, XMM-LSS)



VISTA Deep Surveys Data

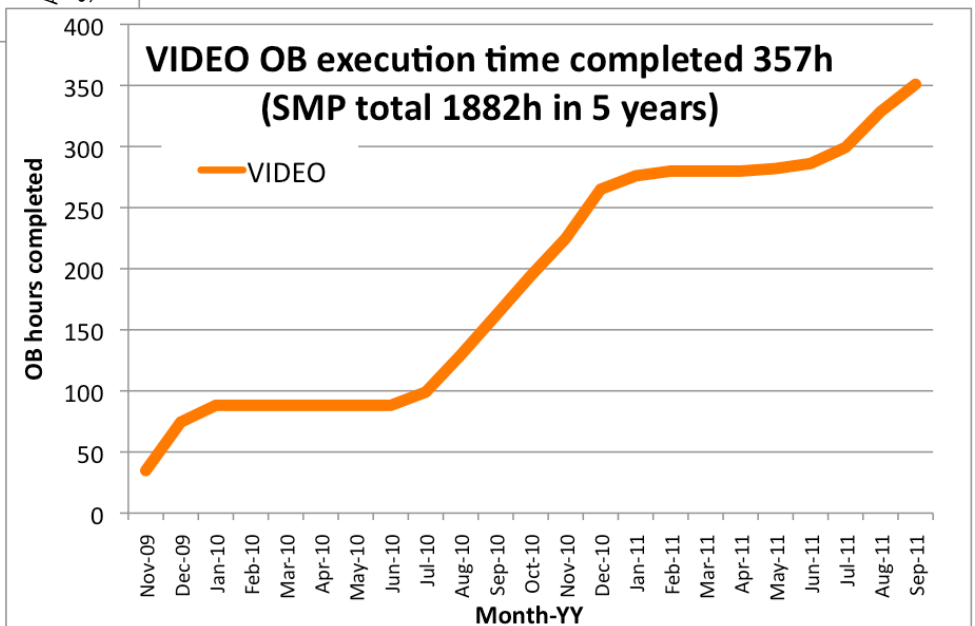


Ultra-VISTA Data Products:

- stacked images, sextractor catalogue, Ks-band selected multi-band YJKs catalogue
- Submitted in Oct 2011
- Area: 1.5 deg² – COSMOS field
- 70 GB (15 files)
- Includes observations between Dec 2009 – April 2010

VIDEO Data Products:

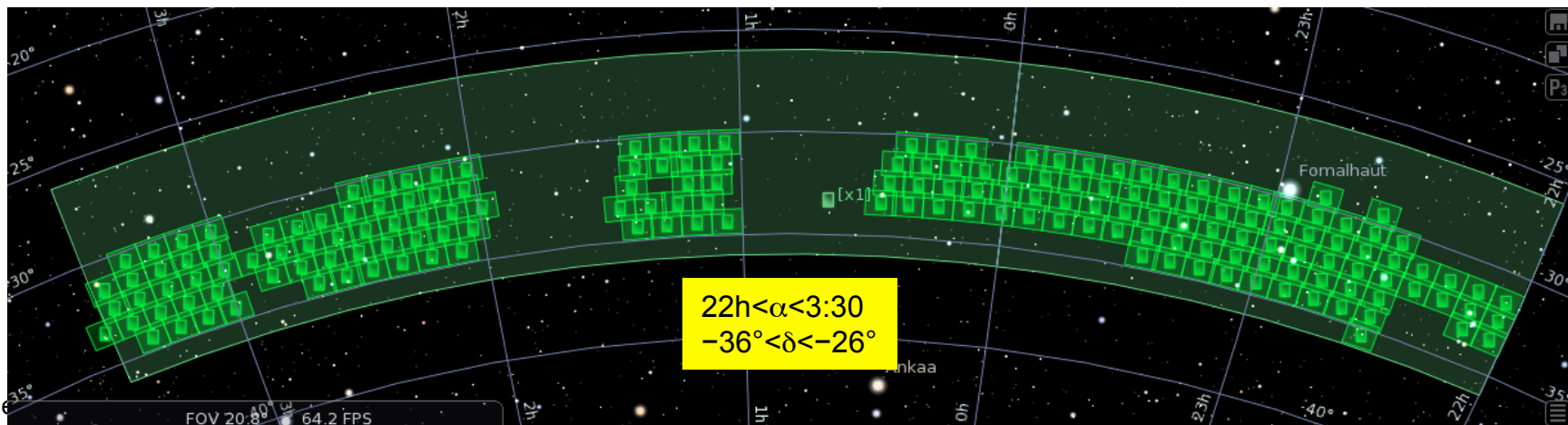
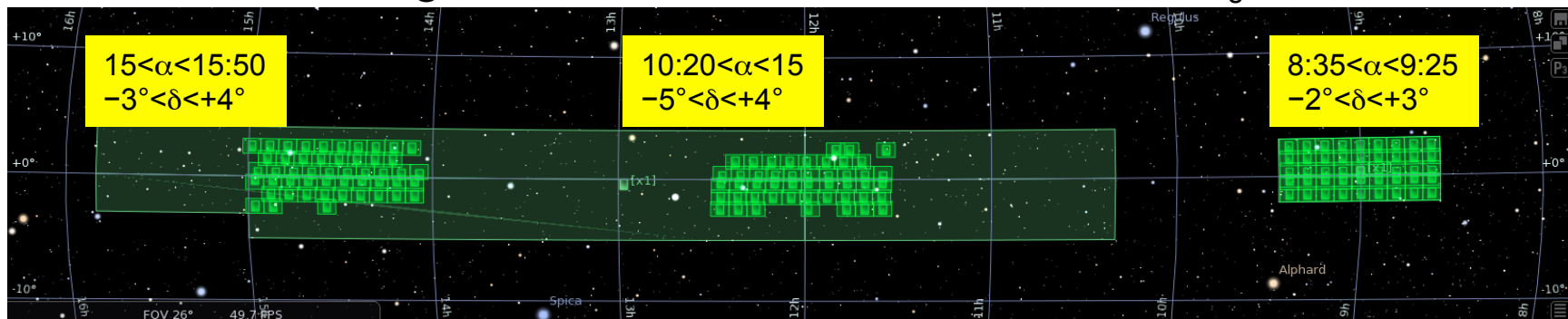
- Tiles and single band source lists YJKs
- Published at ESO: 25. 7. 2011
- Area: 1.5 deg² - XMM-LSS field
- 24 GB (291 files)
- Includes observations taken between: Nov 2009 – Feb 2010



VISTA: Intermediate Surveys

■ VIKING (PI: W. Sutherland)

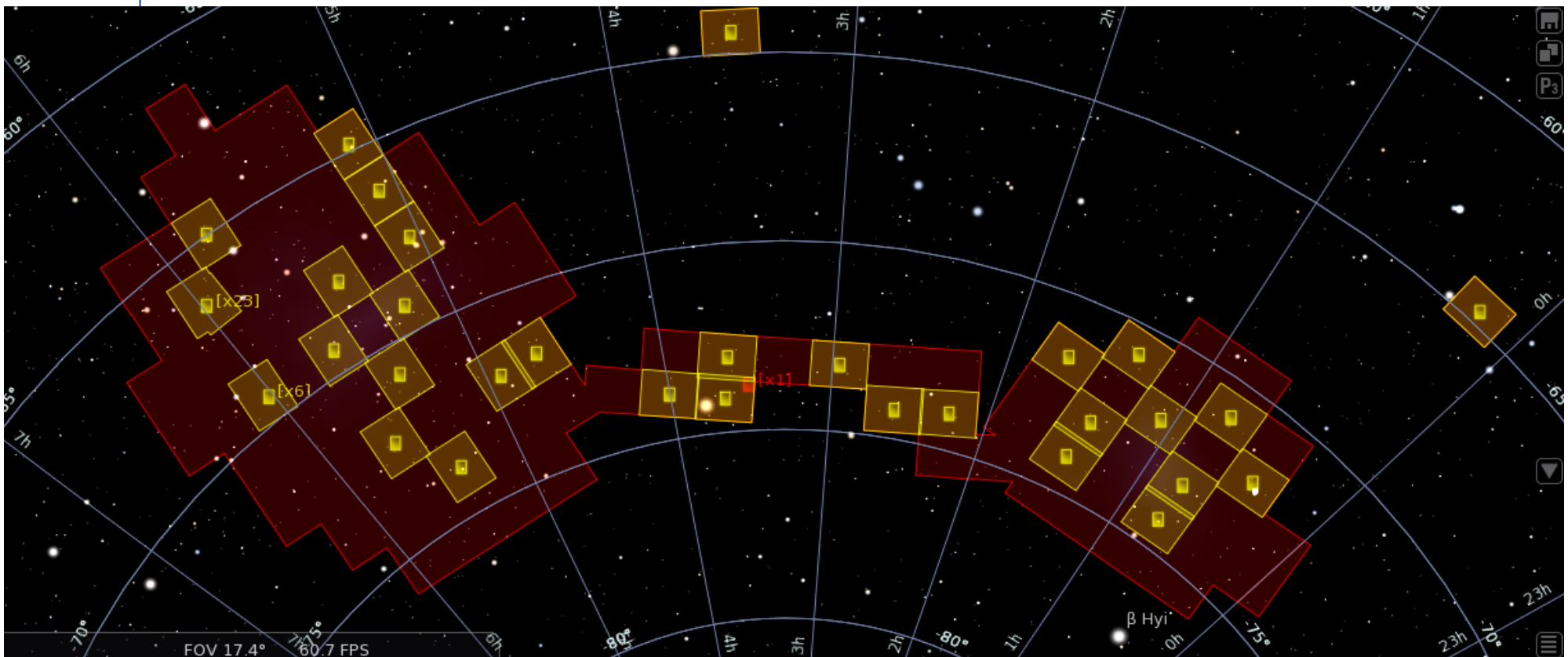
- High-z quasars, galaxy clusters, galaxy stellar masses
- Near-IR complement to KIDS (VST)
 - photo-z for weak lensing and baryonic acoustic oscillations
 - 1500 deg² to Z=23.1, Y=22.3, J=22.1, H=21.5, K_s=21.2 (5σ AB)



VISTA: Intermediate Surveys

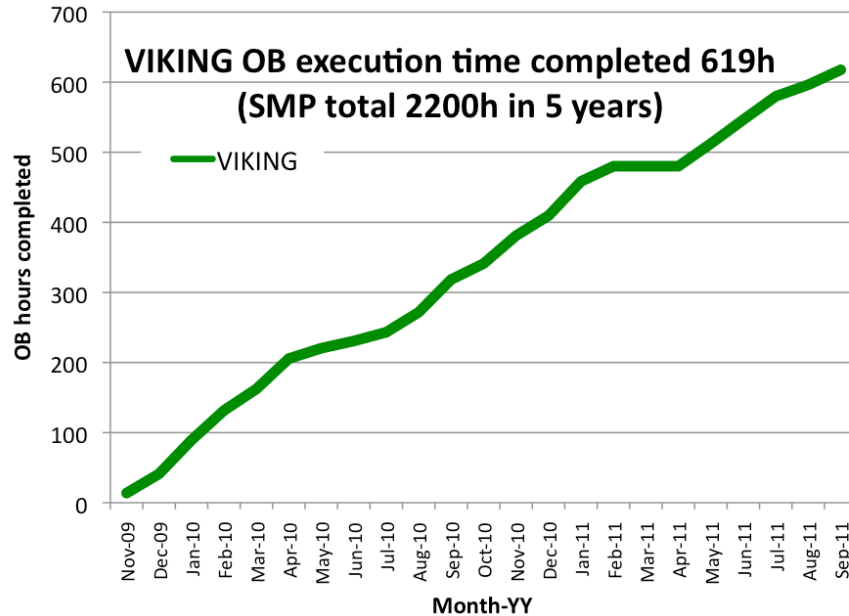
■ VMC (PI: Cioni)

- resolved stellar populations study of the LMC, SMC, Magellanic Stream and the Bridge
- star formation history, variable stars & 3D structure
 - $\sim 180 \text{ deg}^2$ to $Y=21.9$, $J=21.4$, and $Ks=20.3$ (10σ , Vega); Ks 12 epochs





VISTA Intermediate Surveys Data

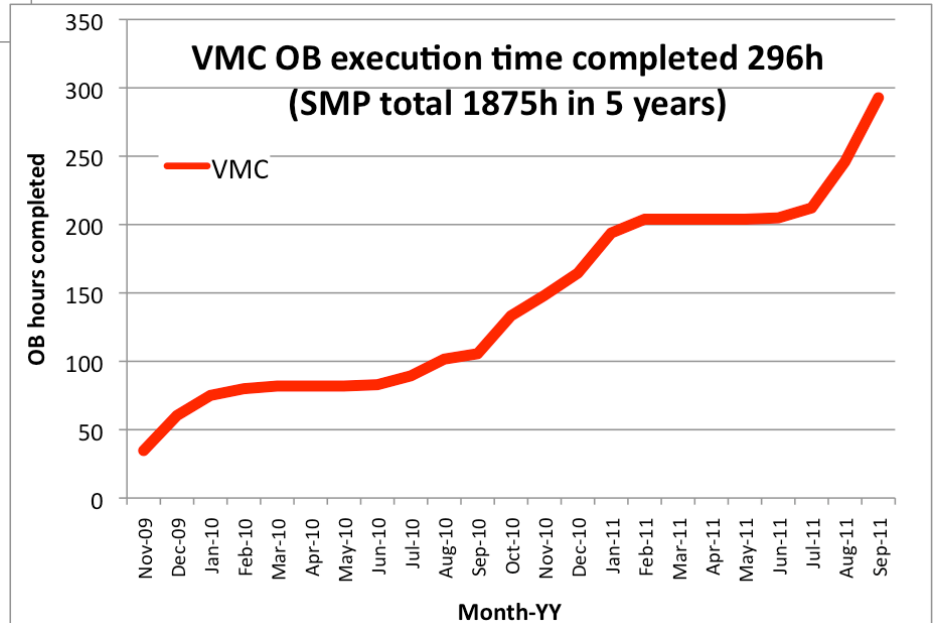


VIKING Data Products:

- 19 GB of data products uploaded in Oct 2011

VMC Data Products:

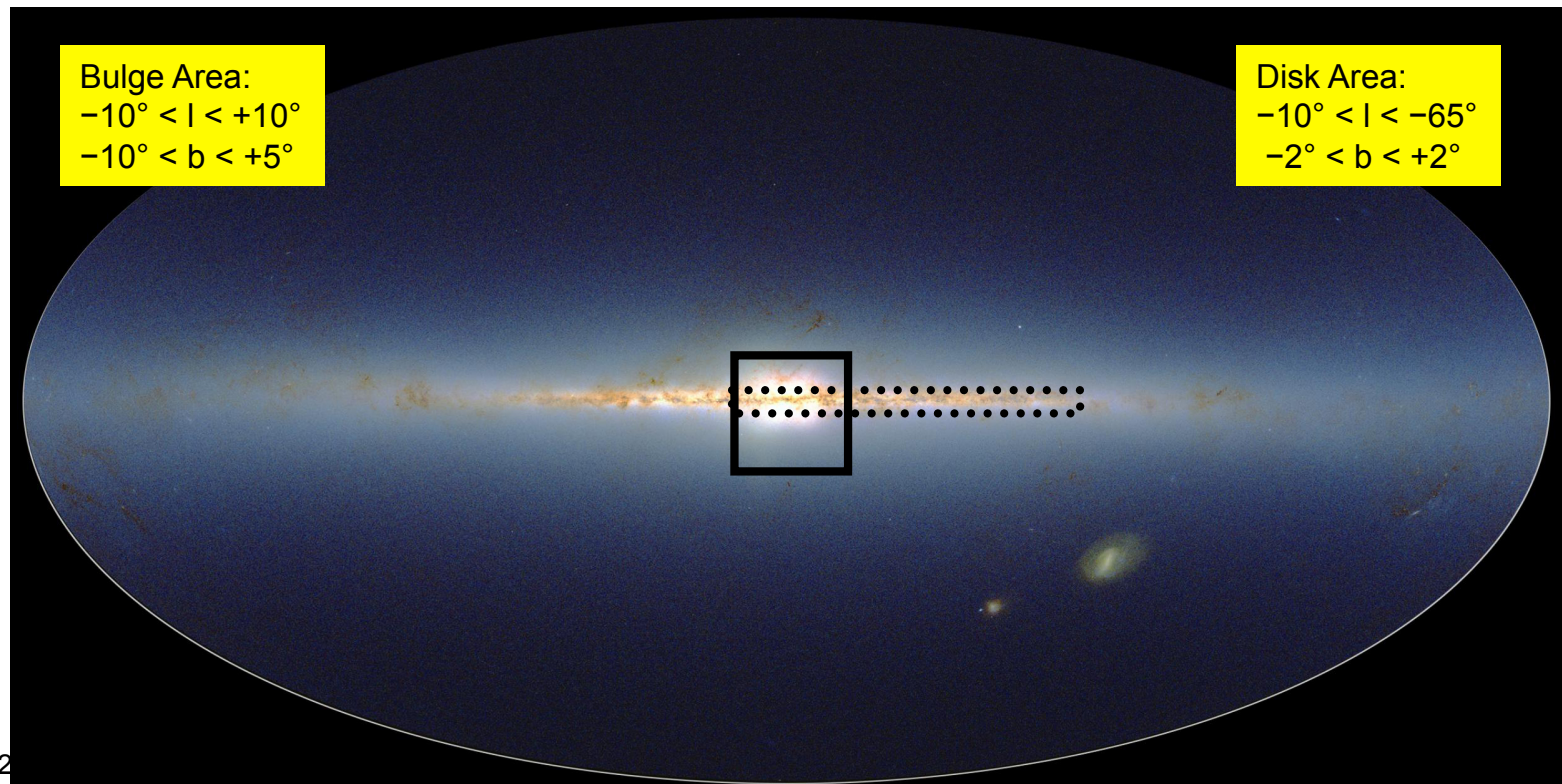
- Stacked tiles and pawprints, single band and *merged source* lists YJKs
- Published at ESO: 25. 9. 2011
- Area: 3 deg² - 2 tiles in the LMC (30 Dor, South Ecliptic Pole region)
- 8.1 GB (1256 files)
- Includes observations taken between: Nov 2009 – Nov 2010



VISTA: Wide Surveys

■ VVV (PI: D. Minniti, Co-PI: P. Lucas)

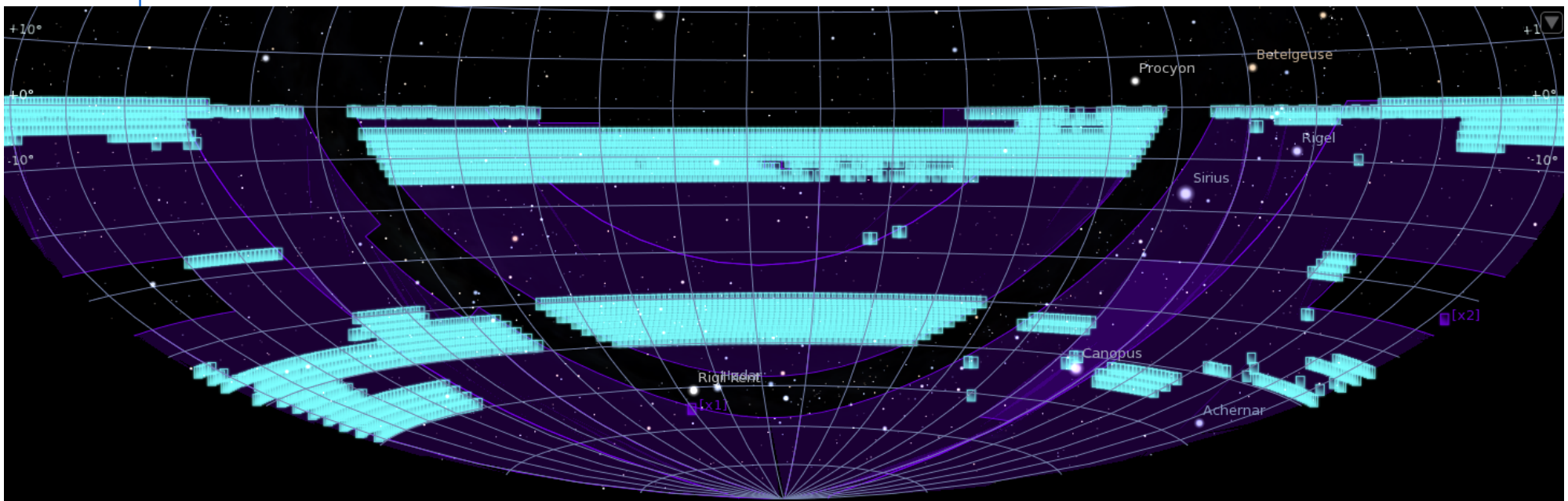
- 3D map of the Bulge from RR-Lyrae observations
- stellar populations, globular clusters, stellar IMF
 - 520 deg² Bulge+Plane – ZYJHK_S ~ 4mag deeper than 2MASS and much better resolution (~0.8-1" image quality) + variability in K_S
 - Optical complement on the VST – VPHAS+ (J. Drew)



VISTA: Wide Surveys

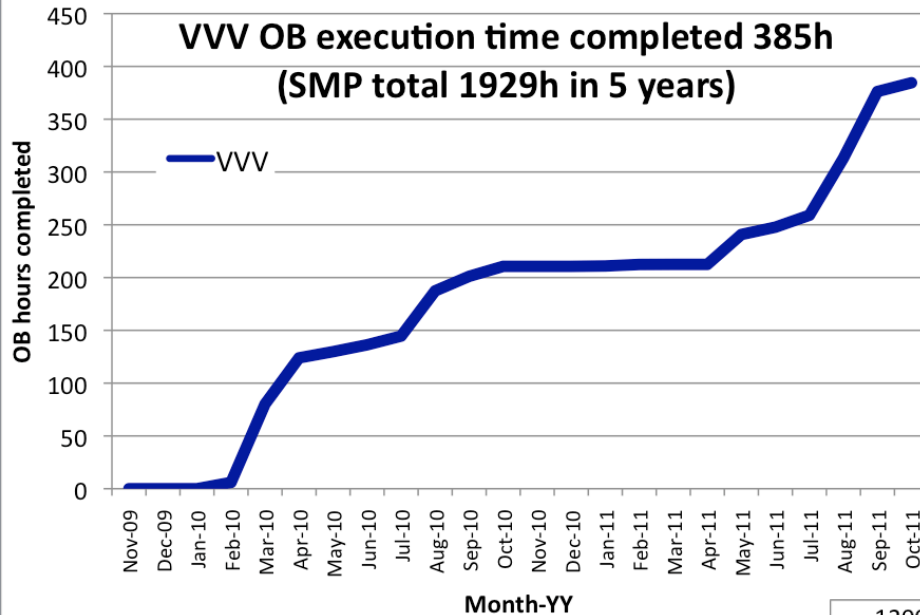
■ VHS (PI: R. McMahon)

- low mass stars, merger history of the Galaxy, Dark Energy through large-scale structure to a $z \sim 1$, hunt for high redshift quasars and physics of the epoch of reionization
 - Entire Southern Hemisphere $\sim 20,000 \text{ deg}^2$ (+ VVV, VMC, VIKING)
 - J and K_S to $\sim 4 \text{ mag}$ deeper than 2MASS & DENIS
 - DES area ($\sim 5000 \text{ deg}^2$) - JHKs
 - Galactic caps: YJHKs to combine with VST ATLAS





VISTA Wide Surveys Data

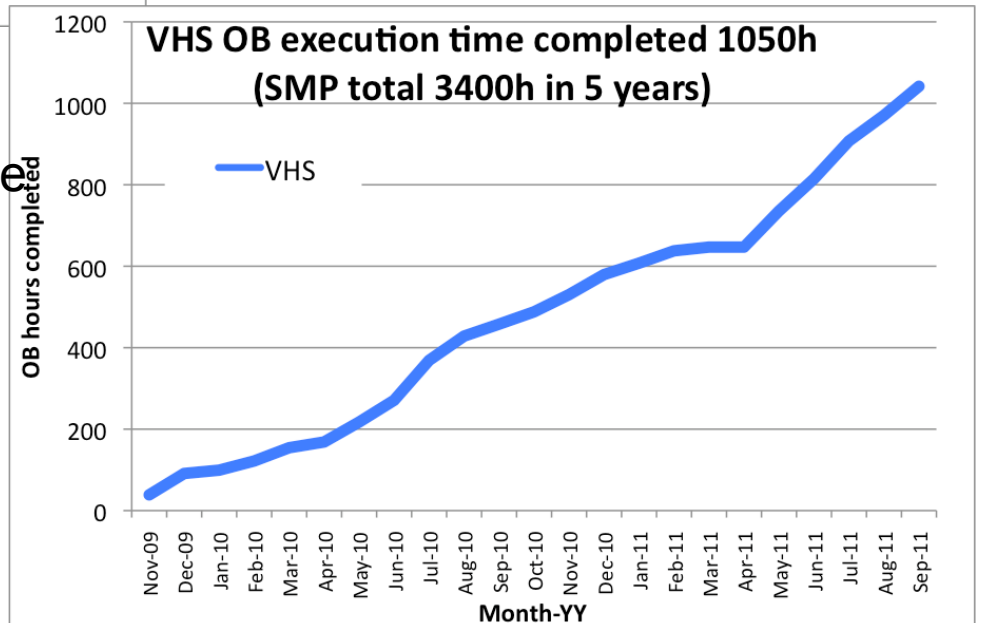


VVV Data Products:

- Tiles, single band source lists ZYJHKs
- Published at ESO: 25.7.2011
- Area: ~520 deg² (348 tiles)
- 1.5 TB (7980 files)
- Includes observations taken between: Feb 2010 – Sep 2010

VHS Data Products:

- Tiles, pawprints, single band source lists YJHKs
- Published at ESO: Oct. 2011
- Area: ~1910 deg²
- 3.5 TB (96474 files)
- Includes observations taken between: Nov 2009 – Sep 2010





VISTA Public Surveys Observations Summary October 2011

Surveys	Area (deg ²)	Area Observed (Oct 2011)	Filters	Magnitude limit <small>5σ (AB), 10σ (AB) x VMC</small>	Observation hours taken (Oct 2011)
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	320
VHS	17800	4208	Y J H K _s	21.2, 21.1, 20.6, 20.0	1050
VIDEO	12.0	10	Z Y J H K _s	25.7 24.6 24.5 24.0 23.5	357
VVV	560	562	Z Y J H K _s	21.9 21.1 20.2 18.2 18.1	385
VIKING	1500	470	Z Y J H K _s	23.1 22.3 22.1 21.5 21.2	619
VMC	180	54.3	Y J K _s	21.9, 21.4, 20.3	296

Deep high z Whole Sky Galactic Extragalactic Resolved SFH



VISTA Public Surveys data releases Summary October 2011

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	ZYJKs	~520 (348 tiles)	Tiles, single-band source lists	1.5 TB	7980	2660	25.07.'11	
VIDEO	03.05.2011	Nov 2009 – Feb 2010	XMM-LSS field	YJKs	1.5	Tiles, single-band source lists	24 GB	291	97	25.07.'11	
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.'11	
VHS	15.09.2011	Nov 2009 – Sep 2010	VHS DES: 120secs in JHK VHS ATLAS: 60secs in YJKs VHS GPS: 60secs in YJKs	YJKs	~1910	Tiles, pawprints, single-band source lists	3.9 TB	96474	4560	Oct 2011	
UltraVISTA	06.10.2011	Dec 2009 – Apr 2010	Deep imaging of the COSMOS field	YJKs	1.5	Stacked images, SExtractor catalogues including Ks-selected multi-band catalogue	70 GB	15	4	tbd	
VIKING	10.10.2011	Phase 3 data submission to be closed						19 GB	6276		

Overview of ESO Phase 3 data releases resulting from VISTA public surveys

Date: 17.10.2011

Prepared by ASG for the ESO Survey Team.

eRosita, 20 October 2011





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



ESO Data Products VISTA Query Form

[Other data products query forms](#)

[Archive Facility HOME](#) [ESO HOME](#) [INFO](#) [FAQ](#)

This form provides access to **reduced images** released by the [VISTA public survey projects](#) and integrated into the ESO [Science Archive Facility](#) since April 2011, through the [Phase 3 process](#). To search for other ESO data products, please use the [Generic Data Products](#) and [Imaging Data Products](#) query forms.

Search ShowAll Default ShowNone

[query Help](#) [Status of Requests](#)

Observing programme

Programme..... : VVV VIDEO VMC VHS
 Collection... : VVV VIDEO_XMM3 VMC VHS
 Release version... : default: latest
 Run/Program ID..... : PPP.C-NNNN(R) (eg 080.A-0156) **Phase3 user**..... :

Target Information

Target name..... :
Coordinate System..... : **RA** **DEC** RA: sexagesimal=hours, decimal=degrees
Search Box..... : **Equatorial Output Format**
Input Target List..... :
 TL RA..... : **Tile RA [deg]** **TL DEC**... : **Tile Dec [deg]**
 TL OFFAN..... : **Tile rotator offset angle [deg]**
 EPS REG..... : VVV/BULGE VVV/DISK VIDEO/XMM3 VMC-LMC **ESO public survey region name**

Observation Parameters

OBSTECH... : IMAGE,JITTER
 Filter... : Z Ks J Y
 DATE OBS..... : **UT in YYYY-MM-DD HH:MM:SS format**

Done

VISTA: First Results



VVV: ESO Press Release 1128
96 Star Cluster Candidates in the Milky Way
Hidden by the Dust



VMC: ESO Press Release 1133
Tarantula Nebula in the LMC



Sculptor Galaxy NGC 253
VISTA Science Verification Image
ESO Press Release 1025

VVV vs. 2MASS

vvvsurvey.org

Globular Cluster Pal 6



VVV vs 2MASS



Extragalactic VST surveys

■ KIDS (PI: K. Kuijken)

- Primarily weak gravitational lensing survey
- Dark matter halos, dark energy, galaxy evolution, clusters, QSOs
 - 1500 deg² ugr_i ~ 2.5mag deeper than SDSS
 - KIDS-N: 10:24< α <15, -5< δ <+4; 15< α <15:50, -3< δ <+4; + 68 deg² CFHTLS-W2 + 2 deg² D2/COSMOS
 - KIDS-S: 22< α <3:30, -35< δ <-25
 - Complemented in NIR with VIKING – photo-z ugr_iZYJHK

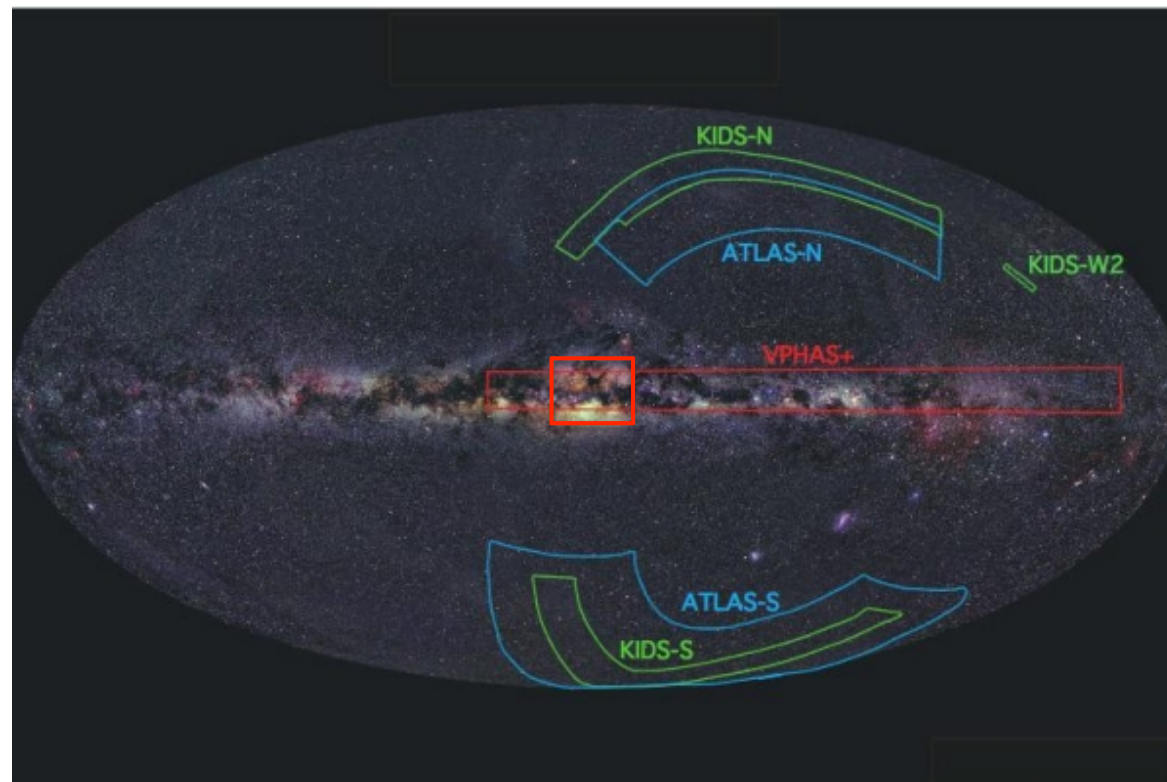
■ VST-ATLAS (PI: T. Shanks)

- High redshift galaxy clusters and quasars
- Large scale structure – dark energy equation of state
 - ~4700 deg² ugr_iz to depth comparable to SDSS
 - NGC: 10< α <15:30, -20< δ <-2.5; 10< α <15, -30< δ <-20
 - SGC: 21:30< α <4, -40< δ <-10
 - Complemented in NIR with VHS – photo-z ugr_iz(Y)J(H)K

Galactic VST Public Survey

■ VPHAS+ (PI: J. Drew)

- The VST Photometric H α Survey of the Southern Galactic Plane
- H α and broadband u'g'r'i' filters (point sources 21-22 mag)
- Area: 1800 deg²; entire Southern Galactic Plane; $|b| < 5^\circ$ + Bulge
- extinction mapping of the Galactic Plane, Galactic structure and SFH





VST Surveys Summary

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	4700	u' g' r' i' z'	22.0, 22.2, 22.2, 21.3, 20.5	10 σ (AB)
VPHAS+	~1800	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



Public Spectroscopic Surveys

■ ESO-Gaia (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 April 2012](#)
- Follow up of ~150 transient objects in an unbiased sample of nearby galaxies drawn from ongoing surveys
- SN explosion physics, SN progenitors



Public Surveys at ESO

■ ESO

- Provides observing facilities: telescopes, instruments
- Service mode observing for imaging surveys
- Delivers raw data and makes them immediately public
- Archives data products and makes them available to the astronomical community

■ Public survey teams

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