ESO Conference, Garching, Germany
16–20 October 2023

A Decade of ESO Wide-field Imaging Surveys

Scientific Legacies and Benchmarks for Future Facilities

Abstract Booklet

1 Survey Summaries

1.1 VST

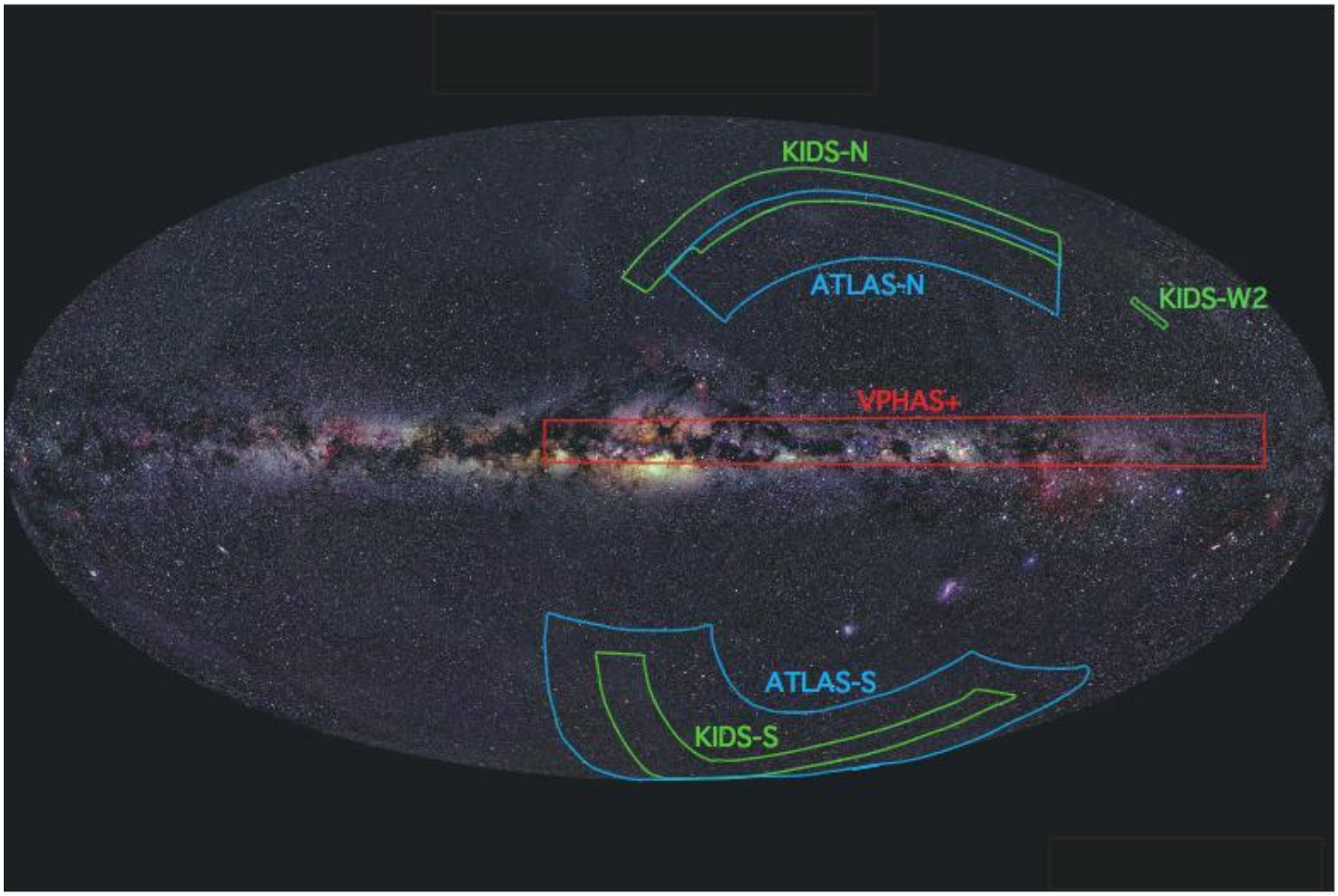

Figure 1*: *The footprints of the public VST surveys.

1.1.1 KIDS - The Kilo-Degree Survey

PIs: Konrad Kuijken

Website: https://kids.strw.leidenuniv.nl/

Main reference: Data release 4: Kuijken et al (2019)
https://ui.adsabs.harvard.edu/abs/2019A%26A...625A...2K/abstract
The Data release 5 publication: (Wright et al. submitted) will be released at the same time as the ESO data release of the survey. This is targeted to happen before Christmas.

Papers to cite when using the data

DR4 Data Release: Kuijken et al (2019) :
https://ui.adsabs.harvard.edu/abs/2019A%26A...625A...2K/abstract

DR5 Data Release: Wright et al (submitted)

Acknowledgements to use when using the data: *"Based on observations made with ESO Telescopes at the La Silla Paranal Observatory under programme IDs 177.A-3016, 177.A-3017, 177.A-3018 and 179.A-2004, and on data products produced by the KiDS consortium. The KiDS production team acknowledges support from: Deutsche Forschungsgemeinschaft, ERC, NOVA and NWO-M grants; Target; the University of Padova, and the University Federico II (Naples)."*

Survey Data Access (link):

KiDS website (DR4): https://kids.strw.leidenuniv.nl/DR4/access.php

ESO Archive (DR4):
https://archive.eso.org/scienceportal/home?data_collection=KIDS&publ_date=2019-02-28

Data release 5 information will become available on the same websites upon release, and will similarly be available within the ESO archive.

Survey area (size):

DR4:

- 1006 tiles (each ~1 sqdeg)
- 1006.0 square degrees

DR5:

- 1347 tiles
- 1331.0 square degrees after removing overlaps between pointings
-

Survey field (if any specific):

Two patches in the Northern and Southern Galactic caps:

- North spans RA=[129.0,140.0] degrees, Dec=[-4,4] degrees
- South spans RA=[-32.0, 54.0] degrees, Dec=[-36.0,-26.0] degrees

The northern field includes observations of COSMOS (at {RA,Dec}={150.1,2.2})
The southern field includes CDFS (at {RA,Dec} = {53.0,-27.6}).
The GAMA and 2dFGRS redshift surveys are almost entirely contained in the KiDS fields.

Additional observations as part of the KiDZ campaign cover legacy spectroscopic fields:

- VIPERS W1 (RA=[31,38] Dec=[-5.5,-4])
- VIPERS W4 (RA=[330,335.5] Dec=[-0.5,2.5])
- DEEP2 23hr (RA=[351.5,353.5] Dec=[-0.5,0.5])
- DEEP2 02hr (RA=[36.7,37.7] Dec=[0,1])
- VVDS f14 (RA=[209,211] Dec=[4.5,5.5])
- VVDS f10 (RA=[150.5,151.6] Dec=[1.5,2.5])

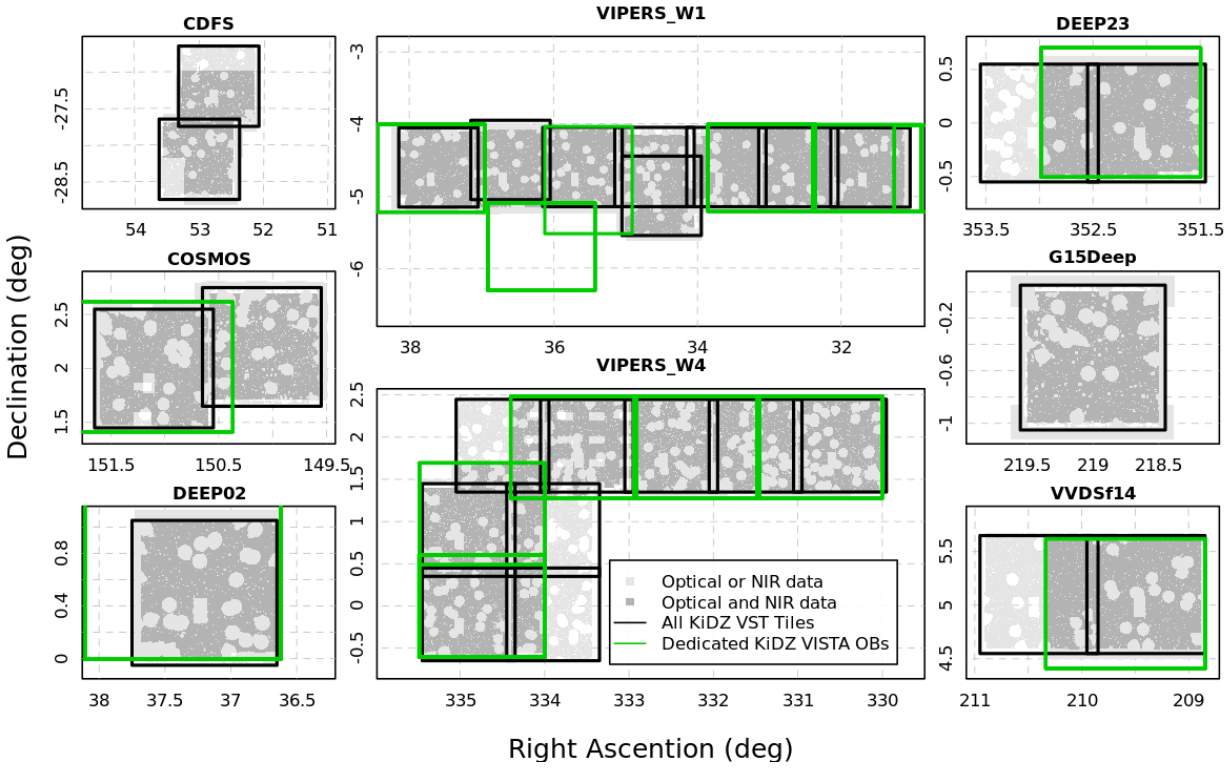

Figure 2: The on-sky distribution of the KIDZ fields. Black squares are the VST images taken in these fields.

Filters: u, g, r, i

Zeropoints/depth:

Image zeropoints are calibrated nightly to be approximately zero in all filters. Deviations from zero are given in the image headers by the "DMAG" keywords, and come from the fine-tuning of the zeropoints via stellar locus regression.

DR5 seeing and magnitude limits (5\sigma in a 2 arcsecond aperture) in each of the {u,g,r,i}-filters (including the two i-band passes) are listed here. Uncertainties show the variation between the 1347 1-square degree tiles.

- Seeing:
  - u: 1.01 ± 0.17
  - g: 0.88 ± 0.15
  - r: 0.70 ± 0.12
  - i (first pass): 0.81 ± 0.18
  - i (second pass): 0.81 ± 0.18
- Limiting magnitudes computed using random apertures (pixel RMS):
  - u: 24.17 ± 0.10 (24.26 ± 0.10)
  - g: 24.96 ± 0.11 (25.15 ± 0.12)
  - r: 24.79 ± 0.13 (25.07 ± 0.14)
  - i (first pass): 23.41 ± 0.26 (23.66 ± 0.25)
  - i (second pass): 23.49 ± 0.28 (23.73 ± 0.30)

Main science goals of the survey: The Kilo-Degree Survey (KiDS) was planned and implemented with the primary goal of producing accurate and precise gravitational weak lensing analyses. The design of the telescope and survey ensure that high fidelity imaging is produced with

minimal distortion to the point spread function (which is consistently $e \equiv 1-\frac{b}/{a} \leq 0.08$ for all KiDS imaging).
The depth of KiDS is such that useful weak lensing measurements can be obtained for galaxies with a mean redshift of ~0.7, at a density of about 6 galaxies per square arcmin. With over 1000 square degrees of data this enables the 'cosmic shear' signal due to the large-scale structure to be measured robustly, with a precision of ~3% in the amplitude of matter density fluctuations. Such measurements of the degree of clustering in the late-time Universe are a powerful test of the gravitational instability that is a fundamental part of the standard csmological model.
Because a weak lensing/photometric redshift survey such as KiDS involved obtaining sharp, multi-colour, deep images of wide areas of the sky, the data can be used for a multitude of other applications. Thus, KiDS has been used to study topics as diverse as the structural properties of galaxies, strong gravitational lenses, clusters of galaxies, high proper motion stars, and solar system objects.

Over roughly eight years of observations, KiDS observed 1347 square-degree tiles over the northern and southern galactic caps in four photometric bands, producing a catalogue of over 100 million sources (after removal of duplicates and stringent data quality cuts) in the final Data Release 5.
The survey includes a second pass over the full area in the i-band, providing increased depth as well as some variability and proper motion information.
During the survey, the collaboration has published over 200 papers, totaling over 9000 citations.

Main publications (science highlights):

Data Preparation:

Wright et al (submitted)
Kuijken et al (2019) https://ui.adsabs.harvard.edu/abs/2019A%26A...625A...2K/abstract
Wright et al (2018) https://ui.adsabs.harvard.edu/abs/2019A%26A...632A..34W/abstract
de Jong et al (2017) https://ui.adsabs.harvard.edu/abs/2017A%26A...604A.134D/abstract
de Jong et al (2015) https://ui.adsabs.harvard.edu/abs/2015A%26A...582A..62D/abstract

Cosmic Shear:

Hildebrandt et al (2017) https://ui.adsabs.harvard.edu/abs/2017MNRAS.465.1454H/abstract
Heymens et al (2020) https://ui.adsabs.harvard.edu/abs/2021A%26A...646A.140H/abstract
Asgari et al (2020) https://ui.adsabs.harvard.edu/abs/2021A%26A...645A.104A/abstract
Hildebrandt et al (2020) https://ui.adsabs.harvard.edu/abs/2020A%26A...633A..69H/abstract

Weak Lensing:

Viola et al. (2015) https://ui.adsabs.harvard.edu/abs/2015MNRAS.452.3529V/abstract
Van Uitert et al. (2016) https://ui.adsabs.harvard.edu/abs/2016MNRAS.459.3251V/abstract

Strong Lensing:

Petrillo et al (2019) https://ui.adsabs.harvard.edu/abs/2019MNRAS.484.3879P/abstract
Li et al (2020) https://ui.adsabs.harvard.edu/abs/2021ApJ...923...16L/abstract

Galaxy Clusters:

Maturi et al. (2019) https://ui.adsabs.harvard.edu/abs/2019MNRAS.485..498M/abstract
Lesci et al. (2022) https://ui.adsabs.harvard.edu/abs/2022A%26A...665A.100L/abstract

1.1.2 The VST ATLAS

In brief, VST ATLAS is designed to be a "Southern SDSS" covering the ugriz bands but featuring particularly deep u-band photometry and ≲1 arcsec imaging in all bands.

The ESO VST ATLAS covers 4700deg^2 of the Southern sky in the *ugriz* photometric bands to depths similar to SDSS in the North. It covers ~2700 deg^2 in the Northern Galactic Cap (NGC) and ~2000deg^2 in the SGC (see Fig. 1). ATLAS features excellent ≲1arcsec seeing in all bands and *u*-band photometry to a depth rare for a Southern Hemisphere survey (see Table 1). ATLAS was observed using the 2.6-m VLT Survey Telescope at Cerro Paranal during the period 2011-2020 (see Shanks, T et al 2015 MNRAS 451, 4238). The imaging data was reduced by CASU and the band-merged catalogues were produced by WFAU. Calibration and quality control was done at Durham University. The latest data release is DR4. The final DR5 release, which includes the *ugr* bands in the 700deg^2 of the NGC at Dec<-20deg, is imminent.

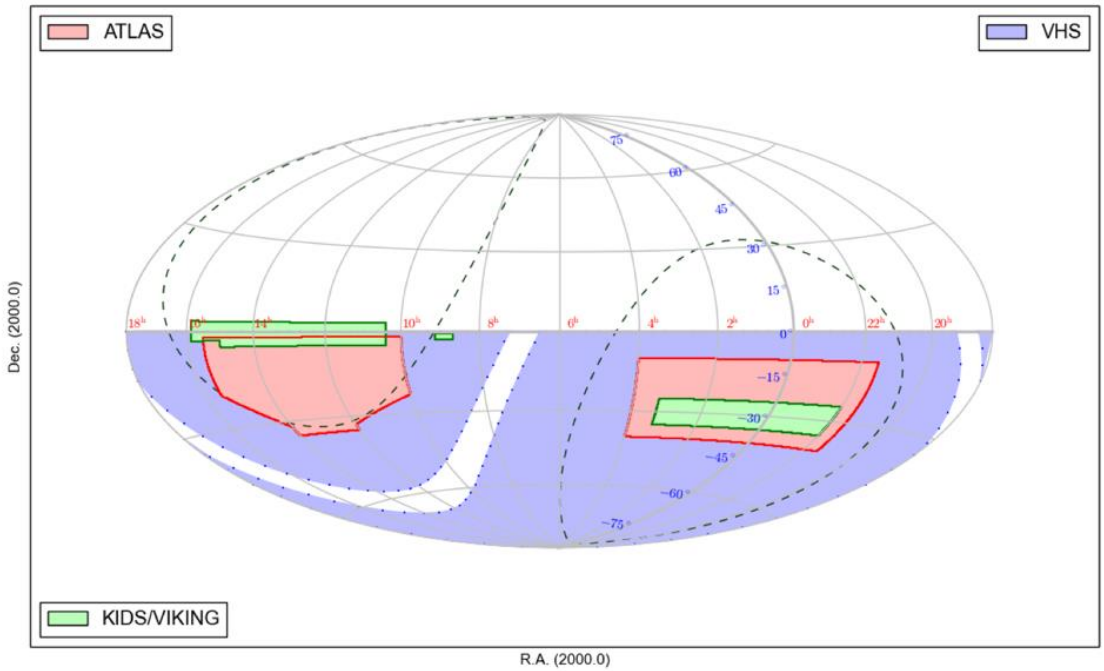

Figure 3: ATLAS footprint (red) compared to VHS (purple) and KIDS (green). VHS surveys the whole hemisphere except at ±5 deg. from the Galactic plane.

The photometric quality of the catalogue is high with a calibration based on Gaia BGR photometry in the *griz* bands and tile edge overlaps in the u-band. Tests in the 300deg^2 overlap with SDSS shows that the ATLAS *ugriz* zeropoints are close to the SDSS AB bands. The sub-arcsecond seeing is well sampled with ~0."21 pixels. Images and band-merged catalogues are available at the ESO Science Archive, WFAU and CASU. All-sky catalogues are available to download from the Virtual Observatory using apps such as TopCat (see links below).

Table 1 – Basic VST ATLAS summary					
	u	g	r	i	z
Exposure (s)	2-4x60s	2x50s	2x45s	2x45s	2x45s
Median Mag Lim.	22.05	23.19	22.64	21.92	20.83
Median Sky Bri.	22.45	21.99	20.96	19.87	18.86
Median Seeing	1."09	0."97	0."95	0."83	0."87

The ATLAS Chilean Extension survey (PI F. Barrientos) also observed using VST also covers the ATLAS area, doubling the u-band exposure time to 240s. The VST ATLAS survey area also has

JHK photometry available provided by its sister ESO VISTA Hemisphere (VHS) and VIKING Surveys. The WISE satellite also provides MIR photometry in the W1 (3.6um) and W2(4.5um) bands to comparable depths. The combination of good seeing, u-band combined with WISE MIR photometry makes the survey particularly good for quasar surveys and also Galactic White Dwarf surveys. But the ~170 ATLAS papers cover most areas of extragalactic and Galactic astronomy.

The data quality of ATLAS has now been thoroughly tested, not just in formal comparisons with SDSS in overlap areas etc but in tests arising in a range of applications addressing real-world problems in extragalactic and Galactic science. For example, in the latest of these Eltvedt et al have used the lensing of ATLAS QSOs to measure the halo masses of ATLAS galaxies and galaxy clusters. These results have then been compared with halo mass estimates of these same galaxies and clusters by cross-correlating CMB Lensing Maps from Planck and excellent consistency is found. Many other similar examples supporting the robustness of the ATLAS photometry and calibrations can be found in the literature.

Accessing VST ATLAS data

The full VST ATLAS DR4 is available through the VO TAP in TopCat - search for atlas_er4_ugriz_catMetaData_fits_V3

DR4 is also available at:

https://www.eso.org/sci/publications/announcements/sciann17211.html
http://surveys.roe.ac.uk/vst/osa/index.html
http://casu.ast.cam.ac.uk/vstsp/imgquery/search

The DR4 Release Description is at

https://www.eso.org/rm/api/v1/public/releaseDescriptions/131

(See in particular Appendix I for catalogue column descriptions in atlas_er4_ugriz_catMetaData_fits_V3)

Many tests of the ATLAS photometry calibrations can be found at http://astro.dur.ac.uk/cea/vstatlas/tests/

1.1.3 VPHAS+ - The VST Photometric Hα Survey of the Southern Galactic Plane and Bulge

PIs: Janet Drew (j.drew@ucl.ac.uk)

Website: https://www.vphasplus.org/

Main reference: Drew J. E. et al. 2014, MNRAS, 440, 2036

Papers to cite when using the data: Drew J. E. et al. 2014, MNRAS, 440, 2036

Acknowledgements to use when using the data: *"Based on data products from observations made with ESO Telescopes at the La Silla Paranal Observatory under programme ID 177.D-3023, as part of the VST Photometric Hα Survey of the Southern Galactic Plane and Bulge (VPHAS+, www.vphasplus.org)."*

Survey Data Access (link):

DR2: http://cdsarc.u-strasbg.fr/viz-bin/Cat?II/341

DR3 and DR4: ESO query interface

Survey area (size): ~2000 sq-deg

Survey field (if any specific): The southern Galactic plane within $-5^o < b < +5^o$ and the bulge within $-10^o < b < +10^o$, but missing some of the most southerly plane pointings in the 4th quadrant.

Filters: u, g, r, i, Hα. A particular feature of the survey is that u/g/r and r/i/Ha data were collected in separate contemporaneous groups in order that the resultant colour-colour diagrams would suffer minimally from displacements due to variability

Zeropoints/depth: At least 20 mag (Vega system) at 5σ in all bands. Deeper than this in g and r.

Main science goals of the survey: 5-band photometric SEDs of Galactic plane stellar sources able to support high quality selection of a wide range of object classes, e.g. for wide-field massive-multiplex spectrographs. Emission line stars, OB stars, A stars, extreme giants, accreting binaries, white dwarfs are particularly well-served. Ha imagery for ionized gas science.

Main publications (science highlights):

Raddi, R. et al., MNRAS, 457, 1988 (white dwarfs in clusters);
Mohr-Smith, M. et al 2017, MNRAS, 465, 1807 (Carina OB stars);
Chen, B.-Q. et al., 2019, MNRAS, 487, 1400 (OB stars and spiral structure);
Vioque, M. et al, 2020, A&A, 638, A21 (HAeBe catalogue).

Anything else: A uniform calibration, referenced to Gaia for both photometry and astrometry, is being prepared by Robert Greimel (rgreimel@gmail.com) and Janet Drew.

1.2 VISTA

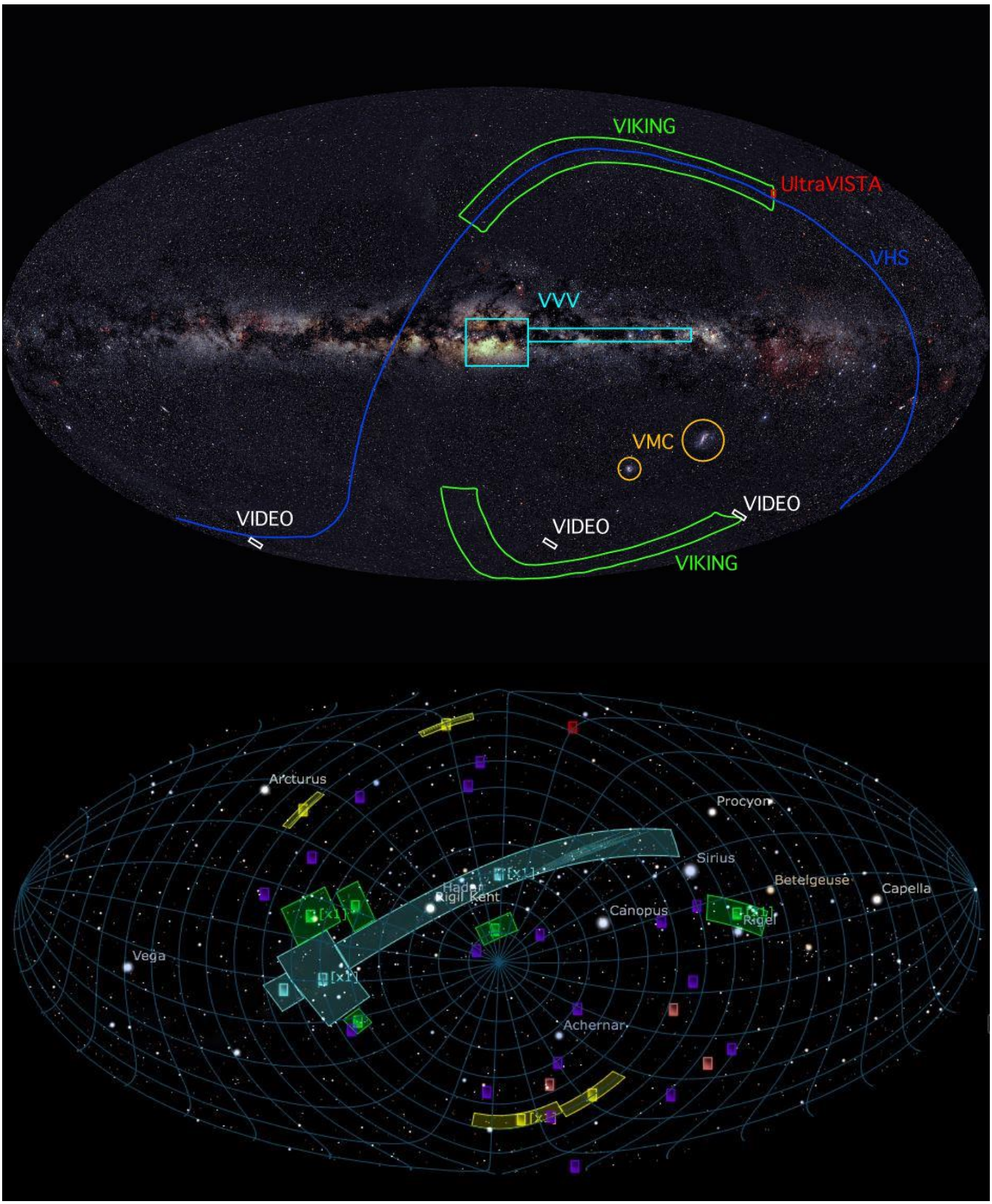

Figure 4: The footprints of the public VISTA surveys, 1st generation (top) and 2nd generation (bottom)

1.1.4 GCAV - VISTA Deep Extragalactic Observations Survey

Survey name: G-CAV: Galaxy Clusters at Vircam
PIs: M. Nonino
Website: https://sites.google.com/a/inaf.it/vista-gcav/home
Main reference: Mercurio, Rosati et al. in preparation.
Papers to cite when using the data: Mercurio et al. in preparation.
Acknowledgements to use when using the data: *"Based on VISTA ESO Public Survey (ESO programme 198.A-2008, P.I. M. Nonino). Based on data obtained from the ESO Science Archive Facility with DOI(s): https://doi.eso.org/10.18727/archive/26. The work has made use of the CANDIDE Cluster at the Institut d'Astrophysique de Paris and made possible by grants from the PNCG and the DIM-ACAV."*
Survey Data Access (link):
http://archive.eso.org/scienceportal/home?data_collection=GCAV&publ_date=2023-02-21
Survey area (size): The total area covered by the observations is ~38 deg^2.
Survey field (if any specific): The 20 observed galaxy clusters are: Abell 370, Abell 1300, Abell 2163, Abell 2744, ACT-CLJ0102-49151, EMMS0451-0306, MACSJ0416.1-2403, MACSJ0553.4-3342, PLCKG004.5-19.15, PLCKG287.0+32.9, RCS2J2327.6-020437, RXCJ0600.1-2007, RXCJ1347.5-1145, RXCJ1514.9-1523, RXCJ2129.6-0005, RXCJ2211.7-0350, RXCJ2248.7-4431, SMACSJ0723.3-7327, SPTCLJ0254-5857, WHLJ243324-8.477.
Filters: Y, J, Ks
Zeropoints/depth: The tile images reach a typical sensitivity in AB magnitude of ~23.5 in Y, ~23.3 in J, and ~22.4 in Ks.
Main science goals of the survey: The main aim of the survey is to investigate the interplay between galaxy mass and environment (e.g., disentangle and quantify the relative impacts of mass-quenching and environmental-quenching).
Galaxy clusters and filaments host a rich variety of galaxy types and environments and are ideal testbeds in which to study the role of nature versus nurture in galaxy evolution.
G-CAV observed 20 massive galaxy clusters (0.7−4×10^15M_sun) at intermediate redshift (0.2≤z≤0.9). The cluster sample has also been designed to exploit the wealth of ancillary, ground and space based multi-band data associated with completed and ongoing HST cluster surveys, including CLASH, Frontier Fields (FF), and RELICS.
VIRCAM @ VISTA Field of View (1.5×1.5 deg^2, i.e.≈30×30Mpc^2 at the median redshift of Gcav) covers ≈8−15 times the virial radius across the cluster sample and therefore a wide dynamic range in density, from the field to highly overdense regions in cluster cores.
The sample also includes merging clusters, with dynamical configurations where it is interesting to study SF and AGN activity, a scenario which becomes more common in high redshift clusters to be discovered in upcoming wide area space missions. Euclid, for example, will extend cluster searches up to z≈2, in an epoch when galaxy clusters are likely still far from virialization and in an active merger phase (e.g. Muldrew et al. 2015). Clusters in G-CAV sample, at the median redshift, the same rest frame bands sampled by Euclid. The correlation between cluster mass and cluster richness (or luminosity) and the respective scaling relation obtained from G-CAV will provide an important mass calibration for high redshift Euclid counterparts.
Legacy Science:
The G-CAV areas and depths also enable the search for high-redshift QSO and cool L,T dwarfs, as well as the study of infrared galactic star counts and colours to be compared with theoretical predictions.

Main publications (science highlights): Estrada, Mercurio, et al., 2023, A&A, 671, 146

Anything else:

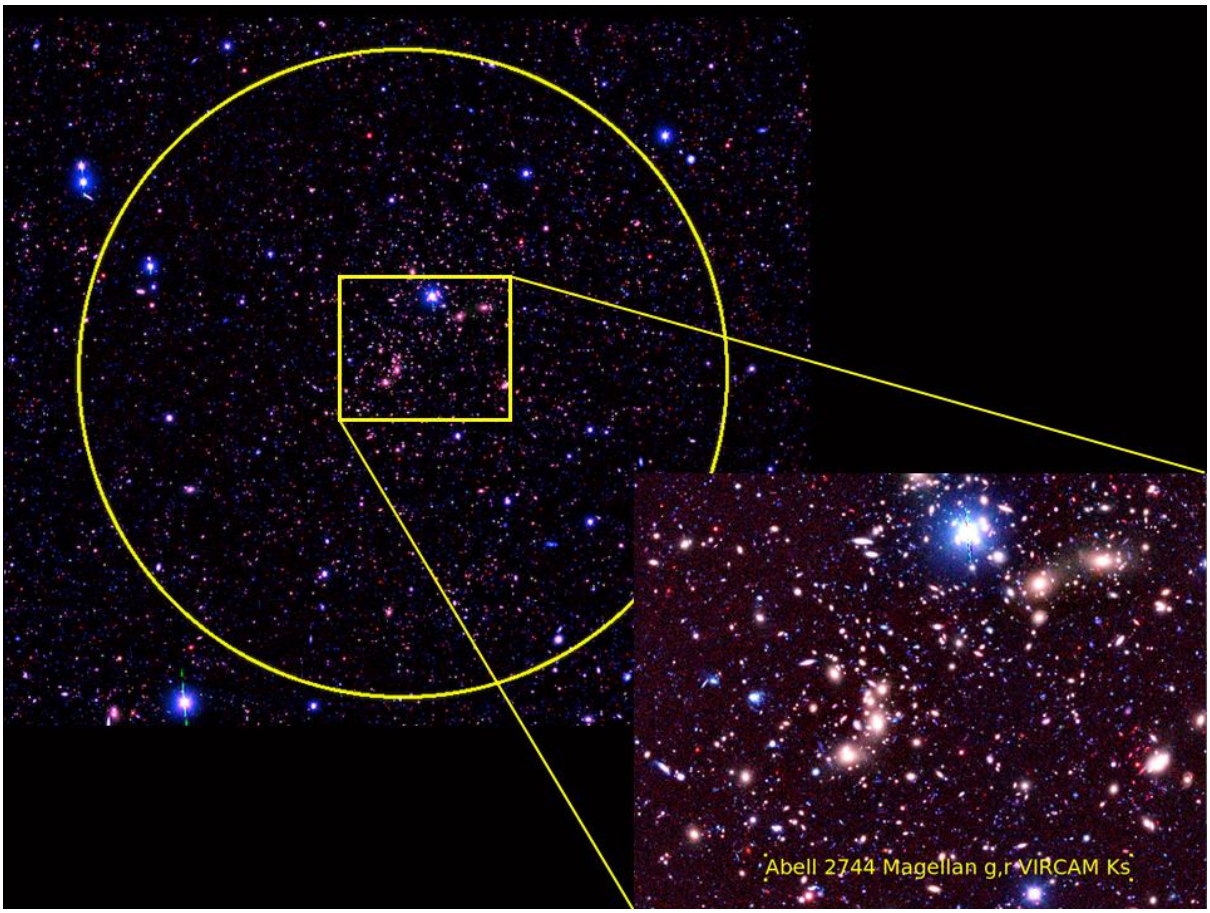

Figure: Combined g, r and Ks image of A2744 (z=0.308) covering only a fraction of the VIRCAM FoV (1.5x1.5 deg = 25x25 Mpc at the cluster redshift). The yellow circle indicate the virial radius of 2.3Mpc, corresponding to about 8.5'. On the right a zoom of the central region of A2744 highlighting the diversity of cluster galaxies. North is up and East to the right.

1.1.5 SHARKS - Southern H-ATLAS Regions Ks-band Survey

1.1.6 UltraVISTA/UltraVista+

Survey name: UltraVISTA

PIs: James Dunlop + co-PIs Marijn Franx, Olivier Le Fevre, Johan Fynbo, Bo Milvang-Jensen, Henry McCracken

Website: https://ultravista.org

Main reference: McCracken, H.J., et al., 2012. A&A, 544, A156

Papers to cite when using the data: McCracken, H.J., et al., 2012. A&A, 544, A156

Acknowledgements to use when using the data: "Based on observations collected at the European Southern Observatory under ESO programme ID 179.A-2005 and 198.A-2003 and on data products produced by CALET and the Cambridge Astronomy Survey Unit on behalf of the UltraVISTA consortium.."

Survey Data Access (link):

DR5 available at https://eso.org/rm/publicAccess#/dataReleases

Survey area (size): 1.5 deg^2

Survey field (if any specific): COSMOS

Filters: Y, J, H, K_s, NB118

zeropoints/depth: Y=25.7, J=25.8, H=25.5, K_s=25.2 (AB mag, 5-sigma, 2-arcsec diameter aperture)

Main science goals of the survey:

In the original UltraVISTA proposal (179.A-2005), we aimed to obtain a deep (212 hr) Y, J, H, K_s image of the COSMOS field, an Ultra-Deep (1408 hr) 0.73 deg^2 Y, J, H, K_s survey over 4 deep strips within the same field, and an Ultra-Deep narrow-band (NB118) survey (180 hr). The primary science goal of the UltraVISTA survey was to open up the large-scale study of the Universe beyond redshifts z ~ 6. But clearly, by providing the deepest ever degree-scale ground-based near-infrared imaging, UltraVISTA was capable of enabling a wealth of extragalactic studies over a wide range of redshifts. This has indeed proved to be the case, with ~270 published journal papers now based on UltraVISTA data.

In 2016 we successfully proposed a three-year extension, aimed at "Completing the Legacy of UltraVISTA" by delivering the deepest homogeneous degree-scale near-IR imaging of the sky, within the unparalleled COSMOS survey field (198.A-2003). This three-year program (198.A-2003) was designed to bring the J, H, K_s imaging across the full 1.5-deg^2 footprint of VIRCAM to the same depths as achieved within the 'ultra-deep' strips of the original UltraVISTA program at DR4; i.e. J = 26.0, H = 25.7, K_s = 25.3 (AB mag, 5-σ, 1.8-arcsec diameter apertures). This is well matched to the depths of the optical imaging from the new Subaru Hyper Suprime-Cam (HSC) deep survey, and to the depths of the Spitzer IRAC imaging from SPLASH. This 750-hr VIRCAM imaging program delivered new results on the galaxy UV luminosity function out to redshifts z ~ 8 and the galaxy stellar mass function out to z ~ 6. It is also proving to be a key resource for the study of dust-enshrouded star-forming galaxies, and for identifying spectroscopic targets for JWST. This project maximizes the value of the VISTA time already invested in the COSMOS field, and helps to secure the long-term legacy of VISTA for studies of the distant Universe.

Finally, in Spring 2019, we successfully proposed a two-year Large Program to homogenize the ultra-deep VISTA Y-band imaging over the full 1.5 x 1.2 deg VIRCAM field-of-view (1104.A-0643). This last additional investment in UltraVISTA only extended the survey by just over one year, but has enabled us to i) deliver a complete and coherent legacy dataset, ii) double the area in the field available for searches for luminous Lyman-break galaxies at z ~ 7 - 8 (for follow-up with JWST), iii) take advantage of the subtle differences between the VIRCAM Y-band and HSC y-band filters to estimate the prevalence of Ly-alpha emission from galaxies at z ~ 7 (a key indicator of the progress of cosmic reionization), iv) improve the accuracy of photometric redshifts in the COSMOS field across a broad range of cosmic time, and

significantly enhance the already recognized value of the COSMOS/UltraVISTA field as a key calibration field for the *Euclid* Deep Survey.

Main publications (science highlights):

Over 270 publications have used UltraVISTA data to date, with science highlights in the high-redshift evolution of the galaxy luminosity function, the cosmological evolution of the galaxy stellar mass function (and hence stellar mass density), the discovery and study of massive quenched galaxies over cosmic time, the discovery and study of massive dust enshrouded star-forming galaxies, and many many more. In addition, the long timeline provided by the 14 seasons of UltraVISTA observing has enabled unique variability studies of AGN.

The original survey definition paper (McCracken et al. 2012) has been cited 616 times, while the COSMOS 2015 (Laigle et al. 2016) and COSMOS 2020 (Weaver et al. 2022) catalogue papers have now been cited 813 and 138 times respectively.

UltraVISTA data are now being used in tandem with *JWST* imaging in the COSMOS field (PRIMER, COSMOS-Web, JELS) and will also play a crucial role in *Euclid* calibration and exploitation, as it is one of the key *Euclid* Deep Fields.

1.1.7 VEILS - The VISTA Extragalactic Infrared Legacy Survey

1.1.8 VHS - VISTA Hemisphere Survey

1.1.9 VIDEO - VISTA Deep Extragalactic Observations Survey

Survey name: **VIDEO** (The VISTA Deep Extragalactic Observations Survey)
PIs: Prof. Matt Jarvis
Website: http://www-astro.physics.ox.ac.uk/~video/public/Home.html
Main reference: Jarvis et al. 2013
Papers to cite when using the data: Jarvis et al. 2013, Häußler et al. 2022 (for DR5)
Acknowledgements to use when using the data: "This work is based on data products from observations made with ESO Telescopes at the La Silla Paranal Observatory under ESO programme ID 179.A-2006 and on data products produced by the Cambridge Astronomy Survey Unit on behalf of the UltraVISTA and VIDEO consortia."
Survey Data Access (link): https://archive.eso.org/wdb/wdb/adp/phase3_vircam/form
Survey area (size): 12 deg^2
Survey field (if any specific): Elais-S1, XMM-LSS, ECDF-S
Filters: Z,Y,J,H,Ks
zeropoints/depth (5 sigma, somewhat depending on field): ~26.4 (Z), ~26.1 (Y), ~25.55 (J), ~25.05 (H), ~24.65 (Ks)
Main science goals of the survey:

The VIDEO survey is a 12 sq. degree, Z,Y,J,H,Ks survey specifically designed to enable galaxy and cluster/structure evolution to be traced as a function of both epoch and environment from the present day out to z=4, and AGN and the most massive galaxies up to and into the epoch of re-ionization. With its depth and area, VIDEO fully probes the epoch of activity in the Universe, where AGN and starburst activity were at their peak and the first galaxy clusters were beginning to virialise. VIDEO therefore offers a unique data set with which to investigate the interplay between AGN, starbursts and environment, and the role of feedback at a time when it is most crucial.

The multi-band nature of the survey ensures many key science drivers can be tackled using the survey alone, without recourse to data from other wavebands. However, the survey fields have been carefully selected to ensure a good RA spread and mix of fields with existing multi-band data thereby enhancing the usefulness of the survey to the whole of the astronomical community, and with an eye to future use of other ESO facilities such as APEX and ALMA. The area and depth means that VIDEO fits naturally between the VIKING and Ultra-VISTA surveys, and has been allocated >200 nights over the next five years.

Main publications (science highlights):

- Adams et al, 2023: "The total rest-frame UV luminosity function from 3<z<5: a simultaneous study of AGN and galaxies from -28<M_{UV}<-16", 2023, MNRAS, 523, 327
- Hatfield et al., 2023: "Hybrid photometric redshifts for sources in the COSMOS and XMM-LSS fields", 2022, MNRAS, 513, 3719
- Adams et al., 2021: "Evolution of the galaxy stellar mass function: evidence for an increasing M* from z = 2 to the present day", 2021, MNRAS, 506, 4933
- Hatfield et al, 2020, "Augmenting machine learning photometric redshifts with Gaussian mixture models", 2020, MNRAS, 498, 5498
- Hatfield et al, 2018, "The environment and host haloes of the brightest $z\tilde{}$ 6 Lyman-break galaxies", 2018, MNRAS, 477, 3760
- Hatfield et al, 2016: "The galaxy-halo connection in the VIDEO survey at 0.5 < z < 1.7", 2016, MNRAS, 459, 2618
- White et al.: "Radio-quiet quasars in the VIDEO survey: evidence for AGN-powered radio emission at S_{1.4 GHz < 1} mJy", 2015, MNRAS, 448, 2665

- Johnston et al, 2015: “The evolving relation between star formation rate and stellar mass in the VIDEO survey since z = 3”, 2015, MNRAS, 453, 2540
- Zwart et al.: “The star formation history of mass-selected galaxies from the VIDEO survey”, 2014, MNRAS, 439, 1459
- McAlpine et al.: “Evolution of faint radio sources in the VIDEO-XMM3 field”, 2013, MNRAS, 436, 1084

1.1.10 VIKING - VISTA Kilo-Degree Infrared Galaxy Survey

1.1.11 VINROUGE - VIsta Near-infraRed Observations Unveiling Gravitational wave Events

Survey name: VINROUGE (VISTA Near infra-Red Observations Uncovering Gravitational wave Events)
PIs: Nial R. Tanvir
Website: https://www.star.le.ac.uk/nrt3/VINROUGE/
Main reference: Tanvir et al. (2017), ApJ, 848, L27
Papers to cite when using the data: Tanvir et al. (2017), ApJ, 848, L27
Acknowledgements to use when using the data: N/A
Survey Data Access (link): N/A
Survey area (size): 48 deg^2
Survey field (if any specific): localization regions of gravitational wave events
Filters: *Y*, *J*, K_s
zeropoints/depth: variable
Main science goals of the survey:
VINROUGE (for "VISTA Near infra-Red Observations Uncovering Gravitational wave Events") was a program specifically designed to discover near-infrared counterparts of gravitational wave (GW) sources. Since the discovery of GWs of cosmic origin in 2015 by the LIGO interferometers [1], locating their electromagnetic counterparts has been crucial to fully understand the physics of these systems. It is also a formidable task, since GW localizations are notoriously poor (tens to thousands of deg^2). Of special interest are the mergers of binary compact object systems where at least one component is a neutron star. The resulting explosion (the so-called "kilonova", KN) is the site of heavy element nucleosynthesis via the rapid neutron capture process [2,3]. These elements, particularly lanthanides, provide a large opacity, making the emission strongly absorbed and peaking in the near-infrared. Thanks to its large field of view, infrared sensitivity, and flexible operations, VISTA has thus been the ideal tool to look for these transients.
Besides the interest in their own, KNe are especially significant as they may be the primary formation site of r-process heavy elements, whose origin is still uncertain. Detailed observations of their light curve and spectra can confirm, or disprove, their role in cosmic chemical enrichment. Furthermore, in-depth studies of KNe allow us to probe their physics, testing the energetics, ejected mass, geometry. An accurate localization also opens the way to studying the KN host, which informs us on the parent stellar population. A direct redshift measurement can be also compared with the GW-derived luminosity distance, which provides a novel method to measure the Hubble constant.

Main publications (science highlights): The VINROUGE survey has followed up suitable GW events during the O2 and O3 LIGO/VIRGO observing runs, between 2017 and 2020. The key result has been the NIR detection of the KN AT 2017gfo [4,5], the counterpart to the first binary neutron star merger ever detected in gravitational waves, GW 170817 [6]. This event marked the birth of GW/EM multi-messenger astronomy. The VISTA campaign provided the most complete and detailed NIR light curves of this KN, which is crucial for modelling these events and their nucleosynthetic yields. AT 2017gfo delivered much of the promised science: Heavy elements from both the first (Sr, Y) and second (Te) peak of the r-process have been identified in spectra of this object [7,8,9], and global yields could be derived by modelling the NIR light curves. A host galaxy was identified and its (old) stellar population studied in detail [10]. Even if based on a single event, the host galaxy redshift allowed a measurement of the Hubble constant [11].

After AT 2017gfo, progress has been somehow slow due to the low detection rate (detectable binary neutron star mergers are rare objects). In 2019, VISTA participated to the observing campaign looking for a counterpart to GW 190814, a likely neutron star / black hole merger (with an especially skewed mass ratio). No counterpart could be located for this target, which, in

concert with multi-wavelength observations, has allowed to constrain the mass ejected from this very peculiar system, likely indicating that the neutron star was not disrupted but directly swallowed by the black hole [12].

References:

[1] Abbott et al. 2016, PRL, 116, 061102 – [2] Li & Paczyński, 1998, ApJ, 507, L59 – [3] Metzger et al. 2010, MNRAS, 406, 2650 – [4] Tanvir et al. 2017, ApJ, 848, L27 – [5] Coulter et al. 2017, Science, 358, 1556 – [6] Abbott et al. 2017, PRL, 119, 161101 – [7] Watson et al. 2019, Nat, 574, 497 – [8] Sneppen & Watson 2023, A&A, 675, A194 – [9] Hotokezaka et al. 2023, MNRAS, 526, L155 – [10] Levan et al. 2017, ApJ, 848, L28 – [11] Abbott et al. 2021, ApJ, 909, 218 – [12] Ackley et al. 2020, A&A, 643, A113.

1.1.12 VISIONS - VISTA Star Formation Atlas

Survey name: **VISIONS / The VISTA Star Forma2on Atlas**

PIs: João Alves, Stefan Meingast, Hervé Bouy, Monika G. Petr-Gotzens, Verena Fürnkranz, Josefa E. Großschedl, David Hernandez, Alena RoLensteiner, Magda Arnaboldi, Joana Ascenso, Amelia Bayo, Erik Brändli, Anthony G.A. Brown, Jan Forbrich, Alyssa Goodman, Alvaro Hacar, Birgit Hasenberger, Rainer Köhler, Karolina Kubiak, Michael Kuhn, Charles Lada, Kieran Leschinski, Marco Lombardi, Diego Mardones, Laura MasceT, Núria Miret-Roig, André MoiWnho, Koraljka Muzic, MarWn Piecka, Laura Posch, Timo PrusW, Karla Pena Ramirez, Ronny Ramlau, SebasWan Ratzenböck, Germano Sacco, Cameren Swiggum, Paula Stella Teixeira, Vanessa Urban, Eleonora Zari, Catherine Zucker

Website: visions.univie.ac.at

Main reference: https://ui.adsabs.harvard.edu/abs/2023A&A...673A..58M

Papers to cite when using the data:

https://ui.adsabs.harvard.edu/abs/ 2023A&A...673A..58M

https://ui.adsabs.harvard.edu/abs/2023A&A...673A..59M

Acknowledgements to use when using the data: Above references and ESO program ID 198.C-2009

Survey Data Access (link): archive.eso.org/scienceportal

Survey area (size): 650 deg^2

Survey field (if any specific): Star-forming regions Chamaeleon, Corona Australis, Lupus, Ophiuchus, and Orion

Filters: J/H/Ks

zeropoints/depth: variable, sensitivity limit up to approximately 22 mag, 21 mag, and 20 mag in J, H, Ks, respectively

Main science goals of the survey:

- Proper motions of young stars and low-mass objects
- YSO identification and characterization
- Star cluster formation and the initial mass function
- 3D maps and motion of the interstellar medium
- properties of dense cores
- dust properties and reddening law.

1.1.13 VMC - VISTA Magellanic Clouds Survey

Survey name: **VMC** (The VISTA near-infrared YJKs survey of the Magellanic System)
PIs: Maria-Rosa L. Cioni
Website: https://star.herts.ac.uk/~mcioni/vmc/
Main reference: Cioni et al. 2011, A&A, 527, A116
Papers to cite when using the data: Cioni et al. 2011 (A&A, 527, A116); Rubele et al. 2018 (MNRAS 478, 5017 – for the PSF photometry)
Acknowledgements to use when using the data: "Based on data products created from observations collected at the European Organisation for Astronomical Research in the Southern Hemisphere under ESO programme 179.B-2003."
Survey Data Access (link): http://horus.roe.ac.uk/vsa/login.html and http://archive.eso.org/cms.html
Survey area (size): 170 deg^2
Survey field (if any specific): Large Magellanic Cloud, Small Magellanic Cloud, Magellanic Bridge, and a few fields in the Magellanic Stream
Filters: Y,J,Ks
zeropoints/depth: YJK_s=22 mag (5σ Vega)
Main science goals of the survey:

- The spatially resolved star formation history
- The three-dimensional structure using multiple tracers

Main publications (science highlights):

- Bell, C. P. M., Cioni, M.-R. L., Wright, A. H., et al. (2022) "The intrinsic reddening of the Large Magellanic Cloud as traced by background galaxies - III. The Large Magellanic Cloud," MNRAS, 516, 824
- Niederhofer, F., Cioni, M.-R. L., Schmidt, T., et al. (2022) "The VMC survey - XLVI. Stellar proper motions in the centre of the Large Magellanic Cloud," MNRAS, 512, 5423-5439
- Schmidt, T., Cioni, M.-R. L., Niederhofer, F., et al. (2022) "The VMC survey. XLV. Proper motion of the outer LMC and the impact of the SMC," A&A, 663, A107
- Miller, A. E., Cioni, M.-R. L., de Grijs, R., et al. (2022) "The VMC survey - XLVII. Turbulence-controlled hierarchical star formation in the Large Magellanic Cloud," MNRAS, 512, 1196-1213
- Ripepi, V., Chemin, L., Molinaro, R., et al. (2022) "The VMC survey - XLVIII. Classical cepheids unveil the 3D geometry of the LMC," MNRAS, 512, 563-582
- Mazzi, A., Girardi, L., Zaggia, S., et al. (2021) "The VMC Survey - XLIII. The spatially resolved star formation history across the Large Magellanic Cloud," MNRAS, 508, 245-266
- Choudhury, S., de Grijs, R., Bekki, K., et al. (2021) "The VMC Survey - XLIV: mapping metallicity trends in the large magellanic cloud using near-infrared passbands," MNRAS, 507, 4752-4763
- Tatton, B., van Loon, J. Th., Cioni, M.-R. L., et al. (2021) "The VMC Survey XL. Three-dimensional structure of the Small Magellanic Cloud as derived from red clump stars," MNRAS, 504, 2983
- Cusano, F., Moretti, M. I., Clementini, G., et al. (2021) "The VMC Survey - XLII. Near-infrared period-luminosity relations for RR Lyrae stars and the structure of the Large Magellanic Cloud," MNRAS, 504, 1-15
- El Youssoufi, D., Cioni, M.-R. L., Bell, C. P. M., et al. (2019) "The VMC Survey - XXXIV. Morphology of stellar populations in the Magellanic Clouds," MNRAS, 490, 1076-1093
- Groenewegen, M. A. T., Cioni, M.-R. L., Girardi, L., et al. (2019) "The VMC Survey. XXXIII. The tip of the red giant branch in the Magellanic Clouds," A&A, 622, A63
- Sun, N.-C., de Grijs, R., Cioni, M.-R. L., et al. (2018) "The VMC Survey. XXIX. Turbulence-controlled Hierarchical Star Formation in the Small Magellanic Cloud," ApJ, 858, 31

- Rubele, S., Pastorelli, G., Girardi, L., et al. (2018) "The VMC survey - XXXI: The spatially resolved star formation history of the main body of the Small Magellanic Cloud," MNRAS, 478, 5017-5036
- Zivkov, V., Oliveira, J. M., Petr-Gotzens, M. G., et al. (2018) “The VMC Survey – XXXII. Pre-main sequence populations in the Large Magellanic Cloud,” A&A, 620, A143
- Ripepi, V., Cioni, M.-R. L., Moretti, M. I., et al. (2017) "The VMC Survey - XXV. The 3D structure of the Small Magellanic Cloud from Classical Cepheids," MNRAS, 472, 808-827
- Subramanian, S., Rubele, S., Sun, N.-C., et al. (2017) "The VMC Survey - XXIV. Signatures of tidally stripped stellar populations from the inner Small Magellanic Cloud," MNRAS, 467, 2980-2995
- Piatti, A. E., Ivanov, V. D., Rubele, S., et al. (2016) “The VMC Survey – XXI. New star cluster candidates discovered from infrared photometry in the Small Magellanic Cloud,” MNRAS 460, 383

1.1.14 VVV/VVVX - VISTA Variables in the Via Lactea, and its extension

PIs: Dante Minniti & Philip W. Lucas

Website: vvvsurvey.org

Main reference: Minniti, D., Lucas, P. W., Emerson, J. P., et al. 2010, New Astronomy, 15, 433 (arXiv:0912.1056)

Papers to cite when using the data: Saito , R. K., Hempel, M., Minniti, D., et al. 2012, Astronomy & Astrophysics, 537, A107 (arXiv:1111.5511)

Acknowledgements to use when using the data: *"We gratefully acknowledge data from the ESO Public Survey programs VVV (ID 179.B-2002) and VVVX (198.B-2204) taken with the VISTA telescope, and products from the Cambridge Astronomical Survey Unit (CASU) and VISTA Science Archive (VSA)."*

Survey Data Access (link):

archive.eso.org/scienceportal/home
http://casu.ast.cam.ac.uk/vistasp/
http://vsa.roe.ac.uk/dbaccess.html
(see also vvvsurvey.org for updated information)

Survey area (size): ~562 sq.deg.

Survey field (if any specific): Galactic bulge and Southern plane

Filters: Z,Y,J,H,Ks

Zeropoints/depth: yes / >3 mag deeper than 2MASS (depth depends on crowding, typical magnitude limits are Ks=18 in the disk and outer bulge, and Ks=16 in the Galactic center region)

Main science goals of the survey:

- To map the 3D structure of the inner Galaxy
- To find RR Lyrae in the bulge
- To identify variables belonging to known clusters
- To search for new star clusters
- To map star forming regions along the plane
- To discover and characterize eruptive YSOs
- To find eclipsing binaries and planetary transits
- To search for microlensing events
- To study rare variable sources
- To monitor the variability around the Galactic Center
- To find variable stars in the Sgr dSph galaxy
- To identify background QSOs
- To find high proper motion objects and KBOs
- To search for SN Light Echoes

Main publications (science highlights):

2023A&A...669A.1362G023: *Gaia-IGRINS synergy: Orbits of newly identified Milky Way star clusters*; Garro, Elisa R.; Fernández-Trincado, José G.; Minniti, Dante and 11 more

2023MNRAS.520.5925002 B3/04: AGN candidates in the VVV near-IR galaxy catalogue; Baravalle, Laura D.; Schmidt, Eduardo O.; Alonso, M. Victoria and 7 more

2021A&A...651A..472A021 : *Variable stars in the VVV globular clusters. II. NGC 6441, NGC 6569, NGC 6626 (M 28), NGC 6656 (M 22), 2MASS-GC 02, and Terzan 10*; Alonso-García, J.; Smith, L. C.; Catelan, M. and 18 more

2021ApJ...908L..42F2021: *VVV CL001: Likely the Most Metal-poor Surviving Globular Cluster in the Inner Galaxy*; Fernández-Trincado, J. G.; Minniti, D.; Souza, S. O. and 11 more

2021A&A...650L..11M2021: *Discovery of a new nearby globular cluster with extreme kinematics located in the extension of a halo stream*; Minniti, Dante; Fernández-Trincado, José G.; Gómez, Matías and 3 more

2021MNRAS.504..8320G21, *Analysis of physical processes in eruptive YSOs with near-infrared spectra and multiwavelength light curves*; Guo, Zhen; Lucas, P. W.; Contreras Peña, C. and 11 more

2021MNRAS.505.1929022S1, *VVV-WIT-08: the giant star that blinks*; Smith, Leigh C.; Koposov, Sergey E.; Lucas, Philip W. and 11 more

2021A&A...652A.1292M021: *An intriguing globular cluster in the Galactic bulge from the VVV survey*; Minniti, D.; Palma, T.; Camargo, D. and 7 more

2020PASA...37...54G2020, *A hundred new eclipsing binary system candidates studied in a nearinfrared window in the VVV survey*; Gramajo, L. V.; Palma, T.; Minniti, D. and 4 more

2020MNRAS.491.3424082P0, *High-energy gamma-ray sources in the VVV survey - I. The blazars*; Pichel, Ana; Donoso, Laura G.; Baravalle, Laura D. and 8 more

2020MNRAS.492.4824072L0, *VVV-WIT-01: highly obscured classical nova or protostellar collision?*; Lucas, P. W.; Minniti, D.; Kamble, A. and 18 more

2019MNRAS.489.3519C; *The Milky Way bar/bulge in proper motions: a 3D view from VIRAC and Gaia*; Clarke, J. P.; Wegg, C.; Gerhard, O.; Smith, L. C.; Lucas, P. W.; Wylie, S. M.

2019MNRAS.485.4520021C9, *Search for exoplanetary transits in the Galactic bulge*; Cortés, C. C.; Minniti, D.; Villanova, S.

2018ApJ...865L...5N2018, *VVV Survey Microlensing: The Galactic Longitude Dependence*; Navarro, María Gabriela; Minniti, Dante; Contreras-Ramos, Rodrigo

2017AJ....153..179M2017, *Characterization of the VVV Survey RR Lyrae Population across the Southern Galactic Plane*; Minniti, D.; Dékány, I.; Majaess, D. and 14 more

2017ApJ...849L..23M2017, *The Emergence of the Infrared Transient VVV-WIT-06*, Minniti, D.; Saito, R. K.; Forster, F. and 20 more

2017MNRAS.464.1224071K7*, VVV high proper motion stars - I. The catalogue of bright KS ≤ 13.5 stars*; Kurtev, R.; Gromadzki, M.; Beamín, J. C. and 14 more

2017A&A...605A.1002B017, *Galactic bulge population II Cepheids in the VVV survey: period-luminosity relations and a distance to the Galactic centre*; Bhardwaj, A.; Rejkuba, M.; Minniti, D. and 7 more

2013A&A...554A.1232S013, *A near-infrared catalogue of the Galactic novae in the VVV survey area*; Saito, R. K.; Minniti, D.; Angeloni, R. and 7 more

2013MNRAS.432.2829051H3, *Tracing the structure of the Milky Way with detached eclipsing binaries from the VVV survey - I. The method and initial results*; Hełminiak, K. G.; Devor, J.; Minniti, D. and 1 more

2013ApJ...776L..19D2013, *VVV Survey Near-infrared Photometry of Known Bulge RR Lyrae Stars: The Distance to the Galactic Center and Absence of a Barred Distribution of the Metal-poor Population*; Dékány, I.; Minniti, D.; Catelan, M. and 4 more

A complete list of papers can be found here on the website

Anything else:

VVV PhD Theses: 15 from Chile, 5 from Argentina, 4 from UK, 2 from Germany, 2 from Brazil, and 1 from Italy. A complete list can be found on the website

2 Abstracts in alphabetical order

2.1 Invited Overviews

2.1.1 Magda Arnaboldi - The ESO Science Archive Facility & its content: a scientific legacy from the ESO public surveys

The ESO Science Archive is a powerful scientific resource for the entire ESO astronomical community, contributing to about 40% of the overall ESO science output as quantified by refereed papers. It stores both the raw data generated by all ESO instruments, as well as selected processed data. These come from ESO public surveys, large programmes and from bulk processing of selected instruments. These science data are processed to a level where can be used directly for scientific measurements. An added service is also browsing and retrieval of ALMA data, conjointly with those of LPO. User access services and capabilities are provided to make this rich content discoverable to the science community in the face of the increasing volume and complexity of the archive holdings. In this contribution, the capabilities, archive user services, the diversified science data content and user community statistics, including scientific publications, of the ESO Science Archive are presented, with a specific focus on its role as a powerful resource in support of future multi-wavelength Surveys of the Southern Sky

2.1.2 Federica Bianco - LSST

2.1.3 Guadalupe Canas Herrera - The Euclid mission: a journey to understand the dark side of the universe

Euclid is an ESA-led medium class space mission selected in October 2011, with contributions from NASA, whose launch took place in July 2023. The Euclid mission aims to set some light on the nature of Dark Matter, which makes up to 27% of the energy content of the universe, and Dark Energy, which corresponding to approximately 70% and we believe is the responsible of the current accelerated expansion of the Universe. With these goals in mind, the Euclid mission expects to generate the most robust (and largest) 3D-map of the universe by observing 1/3 of the sky. To infer the nature of Dark Energy and Dark Matter Euclid data will be compared to cosmological models using two complementary cosmological probes: weak lensing; and galaxy clustering. In this talk, I will explain the status of the Euclid mission since its launch, its main science goals, the structure of the Euclid Consortium, how we construct the theoretical predictions of the primary observables, and I will show forecasts of cosmological parameters.

2.1.4 Nick Cross - Processing and archiving WFCAM, VISTA and VST imaging data by CASU and WFAU.

Imaging data on WFCAM and VISTA and for a few surveys on VST have been processed and archived by the Cambridge Astronomy Survey Unit (CASU) and the Wide Field Astronomy Unit (WFAU) in Edinburgh. I will give an overview of the processing, with more emphasis on the archive side, and how this has changed over the years. I will also discuss plans for legacy products now that observations on VISTA and VST have completed and the final public releases are imminent.

2.1.5 Helmut Dannerbauer - Exploring galaxy evolution through wide, deep near-infrared imaging via the ESO Public Survey SHARKS

Near-infrared imaging is a vital ingredient in multi-wavelength studies aiming to understand galaxies at both low and high redshifts. New wide-area surveys in the far-infrared and radio promise to revolutionize the field of research, but currently we lack equivalent deep, wide-area Ks-band imaging (at 2.2 micron) to link the radio/far-infrared sources to the optical and near-infrared. We are conducting the ESO Public Survey SHARKS (Southern H-ATLAS Regions Ks-band Survey) with the VIRCAM camera at the ESO 4 m VISTA telescope, comprising 300 square degrees of deep imaging at 2.2 micron (Ks-band). We note that the SHARKS data are complemented by an excellent existing multi-wavelength dataset including Spitzer, ALMA, ASKAP, LOFAR, Subaru HSC, DES and HST observations. Furthermore, in the future the SHARKS fields will be covered in the optical/NIR by LSST and Euclid, the later the scientific driver of this meeting. The first data release of the survey, comprising 5% of the data, was published via the ESO database on 31 January 2022. We describe the strategy, the status and present the data products of the first data release. We

show results based on the exploration of the SHARKS data, focusing on the evolution and formation of galaxies in the distant universe. Finally, we will give an outlook on the future exploration of the SHARKS data (in combination with multi-wavelength observations), especially in light of the Euclid mission.

2.1.6 Jim Dunlop - Ultra-VISTA

2.1.7 Alastair Edge - VIKING

The Vista VIKING Survey Contributed talk abstract: The VIKING Survey covers 1350 sq.deg. of high Galactic latitude sky in five infrared bands (zYJHK) and complements the VST KiDS Survey to provide a unique combination of broad band coverage to a depth to detect galaxies on the knee of the luminosity function at z=1.5. I will review the results from the VIKING Survey that primarily exploit the NIR detections, such as z>6 QSOs and distant, dusty galaxies, and look forward to potential spectroscopic follow-up with MOONS.

2.1.8 Maren Hempel - Stories of 4745 nights: the VVV and VVVX survey

For almost exactly 13 years the combined VVV and VVVX survey collected data of the Milky Way Bulge and its adjacent Disk. Now, with the completion of both surveys, and in combination with other NIR programs we are just beginning to mine that treasure trove of data. During this meeting we will hear about the wide range of questions that were tackeled, using either specific data sets or taking advantage of the complete FOV of the VVV /VVVX survey. Here I will focus on the data itself, what is available, photometric depth, cadence, and data quality and how those parameters connect to the different science goals of the surveys. I will also have a brief look at different data reduction options, since those might affect the use of sais data.

2.1.9 Matt Jarvis - VIDEO

2.1.10 Vincenzo Mainieri - 4MOST and WST

In the context of the legacy of ESO imaging surveys, I will describe the synergies with two future facilities.

4MOST is a high multiplex (2400 fibers) and wide field (4 deg2) multi-object spectrograph which will soon be in operations at the VISTA telescope in Paranal. In its first five years of operations 4MOST will perform a wide range of surveys covering a very broad range of scientific topics (cosmology, extra-galactic, galactic). I will summarize the main characterizistic of this new facility and the science surveys approved.

WST is currently a concept for a future dedicated wide field spectroscopic facility on a >10 m telescope. A large consortium of international institutes is studing a preliminary concept of such a facility which would included both a multi-object spectrograph and a monolitic integral field spectrohraph. I will describe this concept and the science that it would be able to tackle.

2.1.11 Richard McMahon – VHS

2.1.12 Stefan Meingast - VISIONS

2.1.13 Amata Mercurio - G-CAV

2.1.14 Paolo Padovani - CTA -The Cherenkov Telescope Array: surveying the sky at TeV energies

I will describe the main science cases of the Cherenkov Telescope Array (CTA) and then give some examples of the surveys it will carry out, highlighting the multi-messenger connections.

2.1.15 Roberto Raddi - VPHAS+

The VST Photometric H-alpha Survey of the Southern Galactic Plane and Bulge (VPHAS+) is a five-band photometric survey that covers most of the southern Galactic plane regions between -5 deg < b < 5 deg, and it extends up to -10 deg < b < 10 deg towards the Galactic Bulge. Data collection ended in 2018. It took broad-band u, g, r, and i, as well as narrow-band H-alpha photometry at ~1 arcsec angular resolution, reaching down to ~20th mag at a 5 sigma level. New homogeneous photometric and astrometric calibrations tied to Gaia are ongoing. A variety of scientific applications of VPHAS+ data has been published and we will highlight some of those results,

ranging from the identification of massive OB stars, low-mass young stars, and the oldest stages of stellar evolution.

2.1.16 Elham Saremi - VEILS

2.1.17 Tom Shanks - VST-ATLAS

2.1.18 Vincenzo Ripepi - VMC

2.1.19 Daniele Malesani - VinRouge - Capturing the electromagnetic counterparts of gravitational wave events

One of the most prominent sources of gravitational waves (GWs) is the coalescence of a binary neutron star system. In the ensuing explosion, heavy elements are synthesized, and their decay powers a so-called kilonova (KN). Due to the high opacity, KNe shine prominently in the infrared. Unfortunately, localization of GW sources is rather poor (to areas of tens-hundreds of deg^2). With its large field of view and infrared sensitivity, VISTA is thus an ideal tool to search for KNe. In 2017, via the VINROUGE program, VISTA successfully recovered AT 2017gfo, the first and only KN with both electromagnetic and GW detection. The discovery of AT 2017gfo and its subsequent, intensive follow-up constitute a milestone in both the fields of GWs and cosmic chemical enrichment, with the identification of the formation site of several rapid-process elements.

2.1.20 Angus Wright - Kilo Degree Survey: Achievements and Data Release 5

The fifth (and final) data release of the Kilo-Degree Survey (KiDS) provides significantly more than just an increase in survey area. Instead, additional observations couple with improvements in data quality, data reduction, and in value-added data-products, to enable new and more robust science from time-domain astronomy to cosmology. This talk will provide an overview of KiDS, highlight key science published by the consortium, detail the new data release, and outline the science being undertaken with the KiDS-DR5.

2.2 Contributed Talks

2.2.1 Hedieh Abdollahi - The role of LPVs in And IX, from star formation to dust production

The photometric results of And IX, the closest satellite, and one of the metal-poor dSph satellites of M31 with a distance modulus of 24.56+0.05
−0.15 mag based on the tip of the red giant branch
(TRGB) are scrutinized in this paper. The observations by the Isaac Newton Telescope (INT) were designed to monitor the asymptotic giant branch (AGB) stars as a luminous population in the late evolution stage. We reconstruct the star formation history (SFH) to study the evolution of this dwarf from ∼ 13 Gyr ago (log t = 10.1) to 500 Myr (log t = 8.67) ago through long-period variable (LPV) stars. In more metal-poor estimation (Z = 0.0001), the SFR reached a maximum of 8.2 ± 3.1 × 10−4 M⊙ yr^−1 in 6 Gyr ago, 57% higher compared to the peak of star formation rates (SFRs) in more metal-rich estimation at Z = 0.0003. Our findings suggest an outside-in galaxy formation scenario for And IX with a quenching occurring 3.65+0.13
−1.52 Gyr ago
with the SFR in the order of 2.0 × 10−4 M⊙ yr−1 at redshift < 0.5. The total stellar mass within two half-light radii was estimated ∼ 3.0 × 105 M⊙ at Z = 0.0001. By employing the spectral energy distribution (SED) fitting for observed LPVs in And IX, we evaluate the mass-loss rate in the range of 10−7 ≤ Ṁ ≤ 10−5 M⊙ yr^−1 . Also, we calculated the total mass returned rate to the ISM by LPVs ∼ 1.0-2.4×10−4 M⊙ yr^−1 depending on the adopted metallicity.

2.2.2 Javier Alonso-García - Pulsating stars in the inner Galactic VVV globular clusters

The globular clusters in the innermost regions of the Galaxy are heavily affected by severe extinction. Their physical parameters are therefore not as reliably measured as their counterparts of the outer halo. Extinction effects are highly diminished in near-infrared observations, like the ones provided by the Vista Variables in the Via Lactea (VVV) survey and its extension, the VVV-X. More than 50 known Galactic globular clusters located towards the inner Milky Way lie in the

region surveyed by the VVV and the VVV-X. Their multi-epoch observations allow us to search and characterize the pulsating stars contained in these star clusters. The tight near-infrared period-luminosity-metallicity relations of these variable stars allow a better parametrization of the globular clusters to which they belong. In my contribution, I will present our current, ongoing analyses of the pulsating stars in some of these poorly known objects within the framework of the VVV and VVV-X.

2.2.3 Nicola Bellucco - Low surface-brightness galaxy population in the Centaurus Cluster from the VEGAS survey

Low surface-brightness (LSB) dwarf galaxies and the subgroup of ultra-diffuse galaxies (UDGs) are interesting classes of objects as their abundance, formation scenarios, and dark matter content are still poorly constrained.

The study of LSB galaxies allows us to test the galaxy formation theories in a so far unexplored and unique parameter space. It also allows us to test gravity models because LSB galaxies have the lowest stellar mass content and are strongly affected by tidal forces.
A complete census of LSB galaxies is needed to test cosmological models and, in particular, to investigate the missing satellite problem.

The Euclid telescope will be launched soon and the first light of V.Rubin Telescope is expected in 2024.
The upcoming large-sky surveys are going to explore the mu_g>30 mag/arcsec2 regime providing a notable boost in the study of galaxy structure down to the LSB regime.

Using the deep imaging data from the VST Early Type Galaxy Survey (VEGAS), I developed a new detection tool to identify and analyse LSB galaxies. First promising results have been already obtained for the Centaurus cluster of galaxies, where I detected more than 20 new LSB galaxies, including UDGs. This work is part of my PhD project, which aims at applying the detection tool on the entire VEGAS sample.

In this talk, I would like to briefly illustrate the detection tool and the preliminary results, and how it could be implemented for the future deep imaging surveys.

2.2.4 Bahar Bidaran - The effect of pre-processing on the stellar population content of early-type dwarf galaxies in Virgo

It is still a fundamental challenge for observers to distinguish between the possible role of present-day host halos and previous ones in the transformation of galaxies. Dwarf early-type galaxies (dEs) are regarded as relevant testbeds for investigating environmental effects mainly due to their high number density and shallow potential well. To study the imprint of pre-processing on the stellar population content of dEs, we analyzed a sample of nine Virgo dEs that, based on their distribution on the projected phase-space diagram (PSD) and predictions from N-body simulations, have been accreted to Virgo as gravitationally bound members of a massive galaxy group, about 2-3 Gyr ago. We derived stellar population properties of these dEs using their MUSE data. We found that our pre-processed candidates are considerably [α/Fe] enhanced (at an 8$\boldsymbol{\sigma}$ level) and metal-poorer (at a 2-3$\boldsymbol{\sigma}$ level) than equally-massive dEs of the Coma and Virgo clusters that have similar or even larger exposure to their host clusters. We also noted that 6 out of 9 dEs had experienced enhanced star formation (SF) at their accretion time or later, possibly due to shocks and thermal instabilities exerted by ram pressure inside Virgo. The other 3 dEs were accreted onto Virgo already quenched (i.e., pre-processed). In this talk, I will discuss how pre-processing may affect the present-day properties of cluster dEs and suggest possible solutions for observers to find pre-processed galaxies in groups and clusters.

2.2.5 Henri Boffin - Uncovering colossal relic filaments of star formation

Using OmegaCam on the VST, we conducted the ADHOC survey with the aim to perform a deep and homogeneous photometric study of pre-main sequence (PMS) stars in several close-by star forming regions, covering unprecedented wide areas of several tens of degrees. Complemented by the astrometric information from Gaia, ADHOC has allowed us to reveal multiple generation of stars in very wide star forming regions, prompting a need to revise the formation mode and early evolution of stars in clusters. In particular, we have shown that the Vela OB2 region hosts a complex constellation of sub-populations with ages in the range 10 to 50 Myr. Such populations might represent the best example of the outcome of clustered star formation in giant molecular clouds (GMCs). We could furthermore detect a filamentary structure of stars that bridges several clusters in the region. Given the extent of such structure (260 pc) and its young age (∼35 Myr), we propose that such structure represents the relic of filamentary star formation in a GMC. We will present here an update on these exceptional results, based on the latest Gaia data release, as well as a study of other outstanding regions that reveal similar structures.

2.2.6 Annalisa Calamida - A wide view of different stellar sub-populations and evolutionary phases in globular clusters

Combining wide-field ground-based photometry to HST data for the core of Galactic globular clusters (GGCs), is a powerful tool to investigate the spatial distribution of multiple stellar populations and stars in different evolutionary phases throughout their extension.

We analyzed Omega Cen and NGC2808 by using DECam and HST photometry, and employed color-color planes and proper motions to select clean samples of cluster stars.

Color indices were used to identify sub-populations with different chemical enrichment: our analysis revealed that most enriched stars are more centrally concentrated compared to the primordial ones in both GGCs, while showing a more extended spatial distribution in the outskirts. We also found a decreasing fraction of the hottest horizontal branch stars with increasing distance from the core.

To validate these results and better understand these GGC formation scenario, spectroscopy of stars in the outskirts with 4MOST-VISTA or MOONS-VLT will be crucial to measure their abundances and radial velocities.

We will extend our analysis to other massive GGCs, such as NGC1851, 47 Tuc, NGC362, NGC288, M2, and M15, using available DECam, Megacam and VST wide-field photometry and HST data.

These studies are important test-benches for the larger projects we will undertake with the Vera Rubin Observatory and the Roman telescope; these will enable detailed studies of other Local Group globular clusters, allowing comparison of their properties with those of GGCs.

2.2.7 Sarah Casura - Bulge-disk decomposition of KiDS and VIKING data in the near universe

I will present our recently completed catalogue of robust structural parameters for the components of ~13,000 galaxies with z<0.08 from the Galaxy And Mass Assembly (GAMA) survey. We treat each of the 9 bands provided by the KiDS and VIKING survey (ugriZYJHKs) independently, fitting three models to each galaxy in each band with a fully automated Markov-chain Monte Carlo analysis using ProFit. In analysing the VIKING data, we make use of ProFit's multi-frame fitting functionality for the first time (working at the pawprint level, fitting all exposures of the same galaxy in the same band simultaneously), thus avoiding point spread function uncertainties due to stacking. Such advancements in methods are vital to fully exploit the high-quality data of current and upcoming large imaging surveys. To this end, we also employ extensive post-processing, including model selection, the flagging of bad fits (mainly irregular galaxies), and a detailed characterisation of systematic uncertainties by comparing independent fits of galaxies in the overlap regions between KiDS tiles, as well as bespoke simulations. We find that our fit results are robust across various galaxy types and image qualities with minimal biases and realistic uncertainties (once corrected for systematics). The resulting catalogue allows us to study a variety of properties of galaxies and their components (bulges and disks) including, e.g., colours, luminosity functions, mass-size relations and dust attenuation.

2.2.8 Javier Cenarro - The Javalambre Physics of the Accelerating Universe Astrophysical Survey

The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) will scan thousands of square degrees of the northern sky with a unique set of 56 narrow-band (~14nm width) filters, using the Javalambre Panoramic Camera (JPCam) at the 2.55m Javalambre Survey Telescope (JST250) of the Javalambre Astrophysical Observatory. The fact that the J-PAS filters are contiguous in wavelength covering the whole optical range makes J-PAS a powerful machine to conduct low resolution (R~50) spectroscopy of every object in the sky, with no bias in object detection other than the depth of the survey (AB~22-23.5). In fact, J-PAS is expected to perform ultimately as an integrated field spectrograph for a large fraction of the Northern hemisphere.

J-PAS is primarily conceived as a cosmological survey aimed at observing several hundred million galaxies with 0.3% photometric redshift precision, to probe LSS with detailed BAO determinations. Nevertheless, J-PAS will provide an unprecedented 3D view of the Northern Sky with a very wide range of astrophysical applications not only in cosmology but also in galaxy evolution, QSOs, clusters of galaxies, the nearby Universe, resolved stellar populations, the structure and population of the Milky Way halo, transients, Solar System bodies, etc.

In this talk I plan to present a summary of the project status, a highlight of science results achieved with the first J-PAS data and some synergies with other large astronomical missions.

2.2.9 Avinash Chaturvedi - Utilizing ESO wide field imaging surveys to learn the mass-assmebly of Fornax cluster

The Fornax cluster provides an unparalleled opportunity to investigate the formation and evolution of early-type galaxies in a dense environment. Deep-field photometric surveys of the Fornax cluster, conducted using OmegaCAM and VirCAM/VISTA, have provided excellent data for studying the Fornax environment. A step further, we are using these photometric observations to conduct the Fornax Cluster Spectroscopic Survey (FVSS). As part of our FVSS observations, we used spectroscopic data obtained from the Visible Multi-Object Spectrograph at the Very Large Telescope (VLT/VIMOS) to kinematically characterize the globular cluster candidates detected photometrically in the cluster's core. Combined with previous literature, we have compiled the largest spectroscopic sample of globular clusters (GCs) in the Fornax environment, consisting of 2300 objects.

We used the radial velocity catalogue of GCs to perform dynamical mass modeling of brightest cluster galaxy NGC1399 up to 200 kpc ($\sim 6\, reff$) and examined the impact of intra-cluster GCs on the mass-modelling results. In this talk, I will present the kinematics of the GCs of the Fornax cluster core region and will discuss the distribution of baryonic and dark matter around NGC1399. I will discuss the kinematic substructure of the intra-cluster GCs, which indicates their accreted nature. I will also present the ongoing FVSS observations conducted with FLAMES and FORS2 to understand the mass assembly of the Fornax cluster.

2.2.10 Maria-Rosa Cioni - Deep VISTA observations of the Magellanic Clouds

The central regions of galaxies challenge observers with a high density of stars, gas and dust. The Large Magellanic Cloud hosts a dense stellar bar whereas the Small Magellanic Cloud hosts a dense core which have eluded even the most sensitive large-scale wide-field surveys of individual stars from the ground and from space. I will present first results from new observations with the wide-field near-infrared instrument VIRCam obtained under high-quality sky conditions. The aims of this project are to resolve stars fainter than the red clump and quantify features associated with the star formation, kinematics and structure of the inner regions of the galaxies. Furthermore, to establish how their mutual interactions and with the Milky Way have influenced the most gravitationally bound regions. These data will provide valuable complementary information to Gaia, eROSITA, Euclid and Rubin observatory sources as well as targets for spectroscopic studies using multi-fibre and integral field spectrographs.

2.2.11 Michele Cirasuolo - MOONS at the VLT: current status and planning for galactic and extragalactic surveys

MOONS is the new Multi-Object Optical and Near-infrared Spectrograph for the VLT. This remarkable instrument will allow large-scale spectroscopic campaigns needed to study the

formation and evolution of stars and galaxies over the entire history of the Universe. I will present the current planning for Galactic and Extragalactic large survey foreseen for MOONS. On a timescale of 5-6 years MOONS will provide radial velocities and detailed chemical abundances for several million stars in the obscured regions of the Bulge and Disk, and beyond our Galaxy; as well as spectra for millions of galaxies particularly at z>1 with all the key spectral diagnostics and environmental information, comparable to what SDSS has done in the local Universe. This will represent a unique data-mine for both for Galactic and Extragalactic studies for years to come. I will also present the current status of the instrument and possible synergies with the ELT.

2.2.12 Jessica Craig - Galaxy Clusters in the VISTA Magellanic Clouds Survey

The VISTA Magellanic Clouds Survey (VMC) covers 184 square degrees of sky, including the Small and Large Magellanic Clouds, Magellanic Bridge and Magellanic Stream. While its initial aim was to study the Magellanic Clouds, the survey's high resolution (0.8 arcsec) and sensitivity (20.3-21.9 Vega mag) allows galaxies behind the Magellanic Clouds to be studied at higher redshifts and in greater detail than in any previous survey in that part of the sky. By combining VMC photometry with early results of the GASKAP-HI survey- a high angular resolution radio survey of neutral hydrogen in the Magellanic Clouds and Milky Way- we account for dust reddening, and then compute photometric redshifts for galaxies in the VMC survey region. This allows us to map the 3D structure of galaxy clusters behind the Magellanic Clouds. For nearby clusters (z<0.1), we also study kinematics and interactions with the intergalactic medium using radio continuum observations from the ASKAP-EMU survey and our own spectroscopic observations with the SAAO 1.9m Telescope and Southern African Large Telescope. We aim to create a catalogue of galaxy clusters behind the Magellanic Clouds, which can be used with other catalogues in studies of large-scale structure. In the future, our techniques may be adapted for use in other dense stellar regions, such as the Milky Way galactic plane.

2.2.13 Alessandro Ederoclite - J-VAR: Observing the variable sky in 7 colours

Over the course of the last century, several projects aimed at time-domain astrophysics have been carried out. Yet, most of these efforts focus on one (or, at most, a few) broad-band photometric filters, thus somewhat limiting the amount of astrophysical information which can be extracted from the data.

J-VAR is a novel concept for a time-domain survey which is being carried out with the 80cm Javalambre Auxiliary Survey Telescope at the Observatorio Astrofísico de Javalambre (OAJ) on non-photometric nights. J-VAR observes in 7 filters, three broad band (g, r, and i from the SDSS system) and 4 narrow band filters. This allows for the study of the variation of the optical spectral energy distribution.

Here we present the preliminary results from the first data release of the project, covering 200 square degrees, focusing on the three pillars of our project: Solar System objects, optical transients, and variable stars. We also discuss the complementarity with other current and future photometric surveys.

2.2.14 Massimiliano Gatto - Revealing the Milky Way's Hidden Satellites: A KiDS Survey Exploration

In the past two decades, the exploration of Milky Way (MW) satellites has intensified due to the availability of wide-field deep panchromatic photometric surveys carried out with the new generation of telescopes. The application of high-performance overdensity detection techniques on extensive datasets has significantly increased our knowledge of stellar systems residing in the MW halo. These surveys have unlocked the exploration of the low-luminosity faint end of the galaxy luminosity function, which was previously inaccessible, encompassing dwarf galaxies and ultra-faint dwarf (UFD) galaxies. UFDs are not only renowned as the most dark-matter-dominated objects in the Universe but also as the oldest and least chemically evolved galaxies, making them invaluable probes for unraveling the MW's mass assembly history. To further expand the search for unidentified stellar systems, our study leverages the untapped potential of the Kilo-Degree Survey (KiDS), which has not yet been utilized in the quest for low-surface brightness satellites of

the MW. This presentation showcases the outcomes of an extensive investigation encompassing the entire KiDS star catalog.

2.2.15 Zohreh Ghaffari - The 2nd Data Release of the ESO Public Survey SHARKS

On 31 January 2022 the first data release (DR1) of the ESO Public Survey SHARKS was published via the ESO database. 5% of the data taken with VIRCAM-VISTA in the Ks band were released. The provided data products contained images and source catalogues based on the tool SExtractor. The total area is 20 sq. degrees divided into 10 tiles of 2 sq. degrees each. Four of them are contiguous and the remaining six non-overlapping tiles. The mean depth of the images reaches the expected depth at 5sigma of Ks=22.7 (AB), with a median seeing of 1 arcsecond. These catalogues are impacted by duplications and the presence of bright stars. These stars produce spikes and extended, faint emission. In the 2nd data release, we will provide ESO conform catalogues based on DR1. We have developed tools to remove duplications of sources from DR1. Furthermore, through an automatized procedure, we are able to remove "fake" sources, star spikes and sources with unreliable photometry (mainly close to bright stars and at the edge of the images). In addition, I will present efforts to preserve low surface brightness features in the SHARKS, being done for the first time in the near-infrared. The main motivation is that the current pipeline used for SHARKS data focuses on high redshift, point-like objects. Thus, the sky removal can result in an over-subtraction of the sky in the NIR, especially removing faint, extended emission of local galaxies. I will present first examples of newly revealed features.

2.2.16 Zhen Guo - Episodic accretion on young stellar objects - results from the VVV/VVVx survey

Throughout the pre-main-sequence evolution, most of the stellar mass is accreted during episodic accretion events, including rarely seen high-amplitude FUor-type outbursts. The decade-long near-infrared ESO Vista Variables in the Via Lactea (VVV) survey has significantly advanced our knowledge of eruptive events on young stellar objects (YSO). In this talk, I will summarize the key findings of the VVV survey team related to episodic accretion and report our latest results on the discovery of 15 new FUor-type events. Furthermore, we have identified a new category of long-duration eruptive events known as Emission Line objects, which exhibit signatures of magnetospheric accretion despite up to 6 mag enhancement in their Ks-band brightness. Comparison of pre-outburst spectral energy distributions (SEDs) between FUors and Emission Line objects reveals statistical differences, suggesting distinct formation mechanisms. These discoveries from the VVV/VVVX survey provide a great opportunity for the community to study the early mass gain of young stars during the first 1 Myr of evolution.

2.2.17 Nick Heesters - Dwarf galaxy properties and satellite planes beyond the Local Volume

Dwarf galaxies are regarded as the oldest and most numerous galaxy type in the Universe, responsible for the formation of the higher mass galaxies we see today. While we know a lot about the properties of dwarfs in the Local Group as well as selected nearby groups and clusters, it is important to answer the question of whether these dwarfs are representative of the population in the Universe at large. The planes-of-satellites problem remains an unsolved small-scale challenge to the ΛCDM paradigm and the subject of a controversial debate. Dwarf satellite galaxies in our Milky Way and different galaxy systems in the Local Volume (LV) appear to be arranged in thin, vast planes. It has been argued that these phase-space correlations cannot be explained to a satisfactory degree by ΛCDM but it is unclear whether these planes in our neighborhood are statistical outliers, or if they are a common phenomenon in the Universe. Recent deep imaging surveys have significantly increased the number of known dwarf galaxies and allow us to advance such tensions beyond the LV. I will present our study analyzing the spatial distribution of 2210 dwarf galaxies identified in the deep optical MATLAS imaging survey as well as radial velocities and stellar population properties of 56 MATLAS dwarfs from follow-up observations with the MUSE instrument. Furthermore, I will present preliminary results on our ongoing efforts to produce a catalog of dwarf galaxies in the 5000 deg^2 UNIONS/CFIS footprint.

2.2.18 Carlos Hernandez-Monteagudo - Science with 3,000 square degrees of the Javalambre Photometric Local Universe Survey (J-PLUS)

The Javalambre Photometric Local Universe Survey (J-PLUS) is being conducted at the Javalambre Astrophysical Observatory, located about 2,000 m in Eastern continental Spain. J-PLUS is built upon JAST80 and T80Cam, a 83 cm diameter, wide-field optics covering 2 sq.deg. per pointing, with an optical system combining five broad, SDSS-like ugriz filters with 7 additional, medium-narrow width (200-400 AA) bands. The latter cover critical spectral features like the Halpha and [OII] lines, or the Ca and Mbg triplets, among others, accurately describing local stellar populations while enabling the identification of strong line-emitters at distinct redshifts. In December 2022 J-PLUS published its third data release, containing 1642 fields amounting to 3182 sq.deg, in which ~30 million objects with r < 21 mag were identified, with ~338 million detections in the full catalogue. J-PLUS has provided unprecedented insight on the stellar populations of our Galaxy, with particular emphasis on the white dwarf and extremely metal-poor samples. J-PLUS is also a superb tool to identify extra-galactic globular clusters, while its narrow Halpha filter has enabled an accurate description of the local Star Formation main sequence. J-PLUS' narrow band filters have also unveiled the brightest tail of the Lyman-alpha Luminosity function, and the accurate photo-zs derived thereof are paving the way to unprecedented clustering and cosmic web studies in the local universe (z<0.3).

2.2.19 Valentin Ivanov - How many hidden supermassive star clusters are there in the Milky Way?

The majority of stars in the Milky Way form in clusters, before evaporating into the field. Yet, the cluster population is well known only away from the galactic plane or in the disk within a few kpc from the Sun, because the dust extinction renders invisible the clusters in the inner disk and the bulge. The crowding and confusion also contribute to the incomplete cluster census.

We address the question how many supermassive clusters, similar to the known ones, may remain undiscovered in our galaxy. To minimize the dust extinction we resort to the mid-infrared wavelengths and to minimize the crowding and confusion – to the GLIMPSE survey because of its better pixel sampling with respect to other mid-infrared surveys. We take known clusters like Westerlund 2, move them to a range of larger distances, subject them to additional extinction and reddening, and insert multiple realizations of them into the GLIMPSE catalog. Then we try to recover them with various cluster search algorithms. Based on these simulations we derive completeness limits and detection probabilities for clusters at different distances and extinctions.

2.2.20 Enrichetta Iodice - The assembly history of the Hydra I cluster of galaxies

In this talk I would like to present the study of the Hydra I cluster, at z∼0.012, based on deep images and integral-field (IF) spectroscopy.

Deep images, obtained with VST, allowed to map the galaxy structure out the regions of the stellar halos (down to mu_g~28 mag/arcsec^2), to detect the diffuse intra-cluster light components and the population of low-surface brightness (LSB) galaxies (i.e. dwarfs and ultra-diffuse galaxies). In particular, we studied how the LSB galaxies are distributed in the cluster, in order to map the mass assembly of the Hydra I cluster.

This study motivated a spectroscopic follow-up with MUSE@VLT, entitled "Looking into the faintEst WIth muSe (LEWIS)", which has been approved as a large program in P108. With LEWIS we obtained the first homogeneous IF spectroscopic survey of LSB and ultra-diffuse galaxies (UDGs) in a cluster environment.

To date, due to their LSB nature, similar studies are available only for about 30 UDGs in total, mainly in the Coma cluster, and only few UDGs have IF spectroscopy. By doubling the number of spectroscopically studied UDGs and obtaining a homogeneous survey of these extreme LSB galaxies in the Hydra I cluster, the LEWIS project aims at addressing the open actively debated issues on the nature and formation of these systems in a cluster environment. The LEWIS project, and preliminary results, are also presented in this talk.

2.2.21 Tereza Jerabkova - Multi-burst star formation in the Orion Nebula Cluster: Insights from the ADHOC Survey and Gaia DR3

The conventional understanding of star-cluster formation in young star clusters (YSCs) is rooted in a model of single-burst formation, subsequently curtailed by stellar feedback. Yet, the discovery of three distinct age-separated populations within the Orion Nebula Cluster (ONC) has disrupted this paradigm, hinting at the intriguing possibility of multiple bursts of star formation.

This breakthrough discovery emerged from the ADHOC survey, conducted using OmegaCam on the VST. The survey aimed to perform an extensive and homogeneous photometric study of pre-main sequence (PMS) stars across several nearby star-forming regions, spanning remarkably wide areas of several tens of degrees. Such meticulous photometry, especially within densely packed regions like the ONC, has been invaluable.

Our current work builds upon this foundation, augmenting the rich ADHOC survey data with the latest Gaia DR3 data. The integration of these resources promises to provide deeper insights into the unique stellar populations within the ONC and their potential multi-burst formation processes. Additionally, we propose a theoretical model marrying these observations to stellar feedback and cluster dynamics, offering a comprehensive perspective on star-cluster formation processes in the ONC.

2.2.22 Venu Kalari - Identifying and studying pre-main sequence stars using optical-infrared surveys

We present studies of pre-main sequence stars, identified using a combination of the optical VPHAS+ survey (based on excess emission due to accretion), near-infrared surveys (from excess due to the presence of a disc), and GAIA. With a combination of such data, the evolutionary history of star-forming regions where these stars are formed can be studied, as well as pre-main sequence evolution.

2.2.23 Emanuela Luongo - On the Oosterhoff dichotomy and the formation of the Galactic Halo

This project is in progress and is the topic of my master's thesis. The final aim is to investigate the origin of the Oosterhoff dichotomy in the context of new results on the formation history of the Galactic halo, made possible by the Gaia mission's astrometry and photometry data releases. Recent discoveries of ancient merging episodes with galaxies of various sizes, such as Gaia-Enceladus, Sequoia, among others, led to new insights on the formation history of the Galactic halo. The project proposes to use the pulsational, photometric, kinematic, and chemical information provided by Gaia's Data Release 3 (DR3) to associate the presence of the Oosterhoff dichotomy with the past merging episodes. Both RR Lyrae variables in the Galactic Globular Clusters (GGCs) and the Galactic field will be adopted to carry out this investigation. The outcome of this study will contribute to a better understanding of the formation history of the Galactic halo and its constituent structures. Here we present some preliminary results.

2.2.24 Amy Miller - A Novel Method for Detecting Marginally-Resolved Star Clusters

The Large Magellanic Cloud (LMC)'s proximity, active star formation, and face-on orientation make it a unique laboratory for young star clusters. The VISTA Magellanic Clouds (VMC) survey covers 116 square degrees of the LMC in YJKs. The near-IR nature of the VMC data is essential to locate the youngest dust-shrouded embedded star clusters. At the VISTA resolution and distance to the LMC, many star clusters are marginally-resolved. This makes them very difficult to detect in images; in the LMC, M31, and M33, they have been found by-eye. These studies are impacted by subjective human perception and show a need for an automatic, objective detection algorithm. We present a novel method for automatically detecting marginally-resolved star clusters in the LMC. Our method removes resolved Milky Way and LMC stars from images, allowing for the detection of star clusters that are semi-resolved and are larger than the point spread function. In this talk, I demonstrate our method on one VMC tile.

2.2.25 Marco Mirabile - Role of Extragalactic Globular Clusters in Shaping Galaxy Formation: from VST/VEGAS and beyond

To understand the formation and evolution mechanisms of galaxies, data must be collected from various observable and accurately interpreted by models or by comparison with reference objects with known properties. Extragalactic globular clusters (GCs) are a particularly effective way to

study galaxies. This is because of different features of these objects. Considering that they host a (relatively) simple stellar population, GCs are undoubtedly among the most basic astronomical objects after stars. The GC system in the Milky Way is an excellent comparative term for systems in other galaxies.
They are often exceedingly numerous (up to tens of thousands in some galaxies), very old (age t ≥10 Gyr), and luminous (so they may be observed out to large distances).
Last but not least, research on the GC system in different galaxies has un- covered plenty of information that may be used to examine a variety of aspects of the host environment.
I'll provide a summary of the characteristics of GC systems and the results from research on them during my talk. These results were primarily made possible in recent years by the availability of wide-field imaging data from observing campaigns such as the VST Early Type Survey on Galaxies (VEGAS).

2.2.26 Chayan Mondal - Deep field imaging using Ultra-Violet Imaging Telescope onboard AstroSat

The Ultra-Violet Imaging Telescope onboard AstroSat is capable of simultaneous FUV and NUV imaging with an angular resolution of ~1.2 arcsec and a circular field of view of 28 arcmin. We used UVIT's FUV and NUV filters to conduct deep imaging observations of the GOODS-South and GOODS-North fields. The deep UVIT images of both fields are used to produce photometric UV source catalogs. Utilizing the UVIT catalogs combined with available HST and other ancillary data, we studied the UV continuum slope of 465 selected galaxies (covering a luminosity range -21 < M$_{1500}$ < -15 mag) between redshift 0.40 and 0.75 and added a unique measurement in a least-explored redshift regime which further reinforces the gradual dust enrichment in galaxies with cosmic time. We determined the UV luminosity function in seven redshift bins within the same range by pushing the detection ~2 mag fainter with UVIT than the other surveys. We employed UVIT's F154W and N242W broad filters to detect Lyman continuum leaking galaxies at redshift beyond 0.97 and 2.29, respectively. In the GOODS-north field, we have identified multiple LyC leakers in the redshift range of ~ 1.2 - 3.0. We used UVIT photometry and multi-band archival images and spectra to analyze the properties of these leakers in terms of escape fraction, mass, metallicity, star formation history, etc. I will also discuss the synergies between UVIT and ESO deep extra-galactic surveys.

2.2.27 Dante Minniti - What is this? WIT objects and other serendipity discoveries in the VVV/VVVx survey

The VVV survey and its extension the VVVX survey have been monitoring the Galactic bulge and southern disk in the near-IR using the VISTA telescope at ESO Paranal Observatory since year 2010. Massive searches for variable stars have been carried out in this vast database, resulting in the discovery of many many thousands of eclipsing binaries, RR Lyrae, Miras/LPVs, delta Scuti stars, classical Cepheids, type 2 Cepheids, novae, microlensing events, etc. Interestingly, within our database we have also found some objects that defy classification, and therefore we labeled them as WIT objects (short for What Is This?). Upon closer inspection, in the end some of these WITs turn out to be observational glitches, or to fit into the previously known kinds of objects, but that are observed through extreme conditions like very high extinction. However, a few of them appear to be new astrophysical phenomena. I will discuss some specific cases of previously unclassified variable sources that have been discovered by the VVV near-IR survey. These represent a wide variety of extreme or rare astrophysical phenomena, including light echoes, eruptive YSOs, protostellar colissions, dusty novae, Tabby stars, eclipses by a dark disk, violently variable AGNs, etc. I will not only describe the searches but also the different follow-up observations that are needed to properly properly characterize these sources, and how to take into account serendipity in future surveys. One thing is clear to placate some critics: these are not mere fishing expeditions, because new science is emerging.

2.2.28 Oliver Müller - Planes of satellites in the nearby Universe

Deep, wide field surveys have increased the sample of known dwarf galaxies by orders of magnitudes. Today, it is possible to study the dwarf galaxy satellite systems of dozens of galaxy groups in the nearby universe. This is important, because observations of the dwarf galaxy system of our own Milky Way show some strong tensions with predictions from cosmological simulations. In my talk, I will present our survey efforts to find hitherto undiscovered dwarf galaxies in different

surveys, such as KiDS, and discuss one of the most debated tension in near-field cosmology: the plane-of-satellite problem.

2.2.29 Camila Ordenes-Huanca - Unveiling the structural content of NGC 6357 via kinematics abd NIR variability

NGC 6357, a star-forming region located at approximately 1.7 kpc, is composed of giant molecular clouds as well as three star clusters. It also hosts three HII regions and more than a thousand YSOs in different evolutionary stages. Due to accretion episodes and because of the presence of cool spots on their surface, these objects are known to be highly variable in terms of brightness. In this work, we use VVVX data, which observed this zone for approximately eight years, to study their flux changes. A unique follow-up of these stars in this region. Using the K_s-band, we can overcome its extreme levels of extinction and compile, for the first time, a catalog of 775 K_s-light curves associated to young stars. In addition, we obtained rotation periods for a part of them, which remained very stable in the entire baseline. However, most of the stars in our catalog presented aperiodic flux changes, associated to the presence of disks, which can introduce accretion and extinction related brightness changes. Additionally, we present proper motions for our catalogue stars which divide them into two populations kinematically linked. These could be related to a triggered star formation process developed in the molecular material of the region and powered by the expansion of the ionized gas.

2.2.30 Cristian Romero - Evolution of operations for the Survey Telescope at Paranal, lessons learned from a TIO perspective

Since 2009, operations began at the Survey Telescopes at Paranal Observatory. The surveys aimed to observe using a large field of view targeting much fainter sources and covering wide areas of sky quickly. The first to enter operations was VISTA (Visible and Infrared Survey Telescope for Astronomy) and then the VST Telescope (VLT Survey Telescope). The survey telescopes introduced a change into the operational model of the time. The observations were wholly conducted by the telescope and instrument operator without the aid of a support astronomer. This prompted the gradual and steady improvement of tools for the operation of the observatory both generally and in particular for the Survey Telescopes. Examples of these enhancements include control systems for image quality, selection of OBs, logging of evening activities, among others. However, the new generation instruments at the Very Large Telescope (VLT) posed a new challenge to the observatory from a scientific and operational point of view. Therefore, the objective of this talk is to show the experiences in the development and optimization of the Survey telescope operations, which provided greater operational flexibility with respect to the new generation instruments. In addition, to show how the redeployment of telescope operators during periods of increased demand from other VLT telescopes was was possible during this period thanks to the changes made in the operational model of the Surveys Teslescopes.

2.2.31 Bogdan Adrian Pastrav - Dust and inclination corrected star-formation and ISM scaling relations in nearby galaxies

We present a detailed analysis of dust and star-formation scaling relations, done on a representative sample of nearby galaxies. Hα images are analysed in order to derive the integrated flux & luminosity for each galaxy, used as a more instantenous and accurate star-formation rate (SFR) tracer, and the relevant photometric and structural parameters. Dust and inclination corrected Hα luminosities and SFRs are subsequently determined using a method that circumvents the assumption of a dust attenuation curve and the use of Balmer decrements (which have been shown to be affected by various biases or being inconsistent between different types of galaxies) or other hydrogen recombination lines in order to estimate the dust attenuation. We investigate the extent to which dust and inclination effects bias the specific parameters of the relations, the scatter and degree of correlation between the parameters, and which relations are fundamental or are just a consequence of others. Our results are consistent within errors with many similar studies. By comparing the B band optical and Hα (star-forming) disc scalelengths, we found on average, the distribution of star-formation to be more extended than the stellar continuum emission one, this difference increasing with stellar mass. Similarly, more massive galaxies have a more compact stellar emission surface density than the star-formation one. The method proposed can be applied in larger scale studies of star-formation and ISM evolution.

2.2.32 Zdenek Prudil - 7D mapping and timing of the Milky Way bar

The Milky Way Galactic bulge is a vital setting for studying stellar evolution and galaxy formation. It is one of the oldest and most metal-rich components of the Galaxy, exhibiting a diverse metallicity distribution. There are two types of galactic bulges: classical and pseudo-bulges, distinguished by their formation mechanisms. Our research aims to differentiate between classical and pseudo-bulge stars through comprehensive chemodynamical analysis. We utilized ancient standard candles (older than 10 billion years) identified within the Galactic bulge. Our study employed spectroscopic data from the BRAVA-RR survey and APOGEE, covering the visual and near-infrared spectra. We have devised specialized procedures tailored to the data available for the Galactic bulge, enabling the derivation of distances, reddening values, and systemic velocities for individual RR Lyrae stars. Consequently, we have obtained distance and systemic velocity information for over 7000 RR Lyrae stars, both above and below the Galactic plane. Combining Gaia astrometry with our data products successfully distinguishes between halo interlopers and the bulge RR Lyrae population, subsequently examining their associations with classical or pseudo-bulge morphologies. Lastly, our work presents re-calibrated photometric metallicity estimates for the entire Galactic bulge RR Lyrae population, along with initial estimates of spectroscopic [Fe/H] and [alpha/Fe] ratios for a subset of the analyzed RR Lyrae stars.

2.2.33 Roberto Saito - Mapping the innermost Milky Way structure using VVV/VVVX red clump stars

Studying the Milky Way structure is key for understanding the formation and evolution not only of our Galaxy but for galaxies in general. Because of their narrow range of intrinsic luminosity and colour, red clump (RC) stars are prime distance indicators widely used in studies of Galaxy structure. RC stars are numerous in the near-IR data gathered by the ESO VISTA Variables in the Vía Láctea (VVV) survey. VVV observed the inner Milky Way in five near-IR filters during years 2010-2016, with its complementary project VVV eXtended (VVVX) increasing the original area of 562 sq deg to 1700 sq deg. The latest VVVX observations occurred earlier this year, setting the end of the VVV/VVVX observation campaign.

RC stars are easily detectable in the VVV/VVVX colour-magnitude diagrams (CMDs). The analysis of the VVV CMDs in combination with proper-motion data allowed us to investigate the structure of the innermost Milky Way bulge and disk, including disk quadrants III and IV, by selecting low extinction regions within Galactic latitudes $|b|<1$ deg across the VVVX covered area. In this talk we will summarize our results on Galactic structure with VVV/VVVX in this innermost Milky Way area as well as to discuss the legacy of VVV-X in the context of ongoing and future near-IR projects designed to survey our Milky Way galaxy.

2.2.34 Nick Seymour - Ultra-high redshift radio galaxies: Finding the high redshift needle in a haystack

The obscured radio galaxies at the highest redshifts are very rare. Indeed, the most powerful are unlikely to be found in the narrow, deep surveys like COSMOS. These sources have to be found from wide-area surveys. I will present the discovery of candidate redshift greater than six powerful radio galaxies from both VIKING and SHARKS. Using the selection of bright radio sources (150MHz flux density greater than 0.1 Jy) and compact radio morphology (less than 5 arcseconds) we examined sources over both VIKING and SHARKS, finding around a dozen sources without K-band counterparts (after deeper HAWKI observations of the VIKING subset). All these sources are undetected to K-band flux densities of 1-2 uJy. Given that the strong radio emission indicates the presence of a massive black hole these must be either (a) powerful radio galaxies at redshifts five to seven with stellar masses of log(M/Msun)=10-11, or (b) lower redshift luminous radio galaxies, but hosted by low mass galaxies. Either possibility is highly exciting as both options push unprecedented parameter space. There is also tension between the potential stellar mass of these galaxies and the mass of the black holes required to power the jets, i.e. these could be active galactic nuclei in underweight host galaxies. I will present current efforts to determine the redshift of these sources as well as present the future potential of surveys such as Euclid.

2.2.35 Teresa Sicignano - The distance scale of Type II Cepheids in the Magellanic Clouds

One of the most debated issues is the Hubble tension. In this context it is possible to use old standard candles such as RRLyr, type II Cepheids and TRGB, to provide independent constraints and thus verify the possible presence of systematic errors in the extragalactic distance scale based on classical Cepheids. Particular relevance is assumed by LMC and SMC,fundamental anchors of the extragalactic distance scale. Hosting Classical, Type II,Anomalous Cepheids and RRLyr,they are the ideal laboratory to compare the distance scales obtained for each standard candle. In this work, we exploit the time-series photometry in the near-Infrared bands Y, J and KS for a sample of type II, comprising more than 350 objects and located both in the LMC and SMC.These data were acquired in the context of the ”The VISTA near-infrared YJKs survey of the Magellanic System” (VMC, P.I. MR Cioni) which has been carried out with the VIRCAM@VISTA instrument.We determined the intensity-averaged magnitudes for all the stars in our sample by using a template technique,building multi-band templates from our own data. Our NIR photometry was complemented with optical one from OGLE and Gaia.We built a variety of PL, PLC and PW relationships.We investigated the behaviour of the slope and zero point as a function of wavelength:become steeper and tighter going from blue to NIR.We calculated the distances of 24 GGCs and found out that our distances are smaller (~ 0.3%) than literature ones.

2.2.36 Marilena Spavone - Stellar halos & Intracluster light from deep photometry: the contribution of the VEGAS survey

The study of galaxies stellar halos and diffuse intracluster light (ICL), historically hampered by the faintness of these components, has been fostered by the advent of deep imaging surveys, which allow to study faint features and galaxies structures out to their outskirts. In this context, the VST Early-type GAlaxies Survey (VEGAS) is producing competitive results.
Taking advantage of the long integration time and large area of the VEGAS images, we are able to map the galaxy outskirts and ICL down to $\mu g \geq 29$-30 mag arcsec-2 and out to hundreds of kpc.

Therefore, we can address the build up history of the stellar halo by comparing the surface brightness profile and the stellar mass fraction with the prediction of cosmological galaxy formation. The deep observations can be directly compared with the predictions from the up-to-date theories for the stellar halo formation and the relation with the galaxy environment. By combining extended deep imaging and integral-field spectroscopy we can simultaneously map the structure, kinematics, and population properties of the central in situ and outer ex situ stellar galaxies' components.

Moreover, using deep VST images, we have been able to expand the sample of ICL measurements, doubling the previous measures available from the literature for $z \leq 0.05$.

In this talk I will show the results of studies of galaxies' stellar halos and ICL performed by using both VST deep images and MUSE integral field spectra of ETGs.

3 Conference Program

	Day 1 - Monday Oct. 16		
09:00	**Welcome and Anouncements**		
		The inner Milky Way	
09:10	Invited overview	Stories of 4745 nights: the VVV and VVVX survey	Maren Hempel - in person
09:50	Contributed	Mapping the innermost Milky Way structure using VVV/VVVX red clump stars	Roberto Saito - in person
10:10	Contributed	Pulsating stars in the inner Galactic VVV globular clusters	Javier Alonso-García - in person
10:30		On the Detection of Planetary Transit Candidates Using VVV/VVVX Data	Vitor Fermiano - in person
10:50	**Coffee/Tea-break**		
11:15	Invited overview	VHS	Richard McMahon - in person
11:55	Contributed	7D mapping and timing of the Milky Way bar	Zdenek Prudil - in person
12:15	Contributed	How many hidden supermassive star clusters are there in the Milky Way?	Valentin Ivanov - in person
12:35	Contributed	Science with 3,000 square degrees of the Javalambre Photometric Local Universe Survey (J-PLUS)	Carlos Hernandez-Monteagudo - in person
12:55	**Lunch Break**		
14:10	**DISCUSSION: The inner Milky Way**		
		The environment and evolution of galaxies	
14:40	Invited overview	G-CAV	Amata Mercurio - in person
15:20	Contributed	The effect of pre-processing on the stellar population content of early-type dwarf galaxies in Virgo	Bahar Bidaran - in person
15:40	Contributed	Planes of satellites in the nearby Universe	Oliver Müller - in person
16:00	Contributed	A Novel Method for Detecting Marginally-Resolved Star Clusters	Amy Miller - in person
16:20	**Coffee/Tea-break**		
16:45	Invited overview	SHARKS	Helmut Dannerbauer - in person
17:25	Contributed	The 2nd Data Release of the ESO Public Survey SHARKS	Zohreh Ghaffari - in person
17:45	Contributed	Dwarf galaxy properties and satellite planes beyond the Local Volume	Nick Heesters - in person

	Day 2 - Tuesday Oct. 17		
	The environment and evolution of galaxies		
09:00	Invited overview	KiDS	Angus Wright - in person
09:40	Invited overview	VST-ATLAS	Tom Shanks - in person
10:20	Contributed	Stellar halos & Intracluster light from deep photometry: the contribution of the VEGAS survey	Marilena Spavone - remotely
10:40	**Coffee/Tea-break**		
11:05	Contributed	The assembly history of the Hydra I cluster of galaxies	Enrichetta Iodice - in person
11:25	Contributed	Utilizing ESO wide field imaging surveys to learn the mass-assmebly of Fornax cluster	Avinash Chaturvedi - in person
11:45	Contributed	Low surface-brightness galaxy population in the Centaurus Cluster from the VEGAS survey	Nicola Bellucco - in person
12:05	Contributed	A wide view of different stellar sub-populations and evolutionary phases in globular clusters	Annalisa Calamida - in person
12:25	Contributed	Role of Extragalactic Globular Clusters in Shaping Galaxy Formation: from VST/VEGAS and beyond	Marco Mirabile - in person
12:45	**Lunch**		
14:00	**DISCUSSION: The environment of galaxies**		
	Milky Way satellites and Magellanic Clouds		
14:45	Invited overview	VMC	Vincenzo Ripepi - in person
15:25	Contributed	Galaxy Clusters in the VISTA Magellanic Clouds Survey	Jessica Craig - in person
15:45	Contributed	The distance scale of Type II Cepheids in the Magellanic Clouds	Teresa Sicignano - in person
16:05	Contributed	Revealing the Milky Way's Hidden Satellites: A KiDS Survey Exploration	Massimiliano Gatto - in person
16:25	**Coffee/Tea-break**		
16:50	Contributed	Deep VISTA observations of the Magellanic Clouds	Maria-Rosa Cioni - in person
17:10	Contributed	On the Oosterhoff dichotomy and the formation of the Galactic Halo	Emanuela Luongo - in person
17:30	**DISCUSSION: Milky Way Satellites and Magellanic Clouds**		

	Day 3 - Wednesday Oct. 18		
	Future and recent surveys		
09:00	Invited overview	EUCLID	Guadalupe Canas Herrera - remotely
09:40	Invited overview	LSST	Frederica Bianco - remotely
10:20	Contributed	The Javalambre Physics of the Accelerating Universe Astrophysical Survey	Javier Cenarro - in person
10:40	**Coffee/Tea-break**		
11:05	Contributed	MOONS at the VLT: current status and planning for galactic and extragalactic surveys	Michele Cirasuolo - in person
11:25	Invited contribution	4MOST and WST	Vincenzo Mainieri - in person
11:55		Conference Photo	
12:05		**Lunch**	
	Archival tools and operations		
13:30	Invited overview	WFAU/CASU	Nick Cross - in person
14:10	Contributed	Evolution of operations for the Survey Telescope at Paranal	Cristian Romero - remotely
14:40	Invited overview	The ESO Science Archive Facility & its content: a scientific legacy from the ESO public surveys	Magda Arnaboldi - in person
15:20	**DISCUSSION: Future surveys, facilities and ESO's strategy**		
16:20	**Hands-on sessions, tutorials**		

	Day 4 - Thursday Oct. 19		
		Galaxies at high redshift	
09:00	Invited overview	VIDEO	Matt Jarvis - remotely
09:40	Invited overview	VEILS	Elham Saremi - in person
10:20	Contributed	Ultra-high redshift radio galaxies: Finding the high redshift needle in a haystack	Nick Seymour - remotely
10:40	**Coffee/Tea-break**		
11:05	Invited overview	Ultra-VISTA	Jim Dunlop - in person
11:45	Contributed	Deep field imaging using Ultra-Violet Imaging Telescope onboard AstroSat	Chayan Mondal - in person
12:05	**DISCUSSION: Galaxies at high redshift**		
12:40		**Lunch**	
		Star formation in our galaxy	
13:55	Invited overview	VPHAS+	Roberto Raddi - in person
14:35	Contributed	Uncovering colossal relic filaments of star formation	Henri Boffin - in person
14:55	Contributed	Identifying and studying pre-main sequence stars using optical-infrared surveys	Venu Kalari - remotely
15:15	Contributed	Multi-burst star formation in the Orion Nebula Cluster: Insights from the ADHOC Survey and Gaia DR3	Tereza Jerabkova - in person
15:35	**Coffee/Tea-break**		
16:00	Invited overview	VISIONS	Stefan Meingast - in person
16:40	Contributed	The role of LPVs in And IX, from star formation to dust production	Hedieh Abdollahi - remotely
17:00	Contributed	Unveiling the structural content of NGC 6357 via kinematics abd NIR variability	Camila Ordenes-Huanca - in person
17:20	**DISCUSSION: Star formation in our galaxy**		

	Day 5 - Friday Oct. 20		
		Variable Stars and transient science	
09:00	Invited overview	VinRouge - Capturing the electromagnetic counterparts of gravitational wave events	Daniele Malesani - in person
09:40	Contributed	J-VAR: Observing the variable sky in 7 colours	Alessandro Ederoclite - in person
10:00	Contributed	What is this? WIT objects and other serendipity discoveries in the VVV/VVVx survey	Dante Minniti - in person
10:20		**Coffee/Tea-break**	
10:50	**DISCUSSION: Variable stars and transient science**		
		Multi-Messenger astronomy	
11:20	Invited Contribution	The Cherenkov Telescope Array: surveying the sky at TeV energies	Paolo Padovani - in person
11:50		**Lunch**	
14:10	Contributed	Episodic accretion on young stellar objects - results from the VVV/VVVx survey	Zhen Guo - remotely
		Galaxy evolution	
14:30	Invited overview	VIKING	Alistair Edge - in person
15:10	Contributed	Bulge-disk decomposition of KiDS and VIKING data in the near universe	Sarah Casura - in person
15:30	Contributed	Dust and inclination corrected star-formation and ISM scaling relations in nearby galaxies	Bogdan Adrian Pastrav - in person
15:50	**Coffee/Tea-break**		
16:15	**DISCUSSION: Galaxy evolution - local galaxies**		
16:50	Closing remarks		