GEE5— Observations meet simulations and theory

ABSTRACT BOOKLET

SIMONE BIANCHI

Dust in galaxies of the local Universe

We will present DustPedia, a project aimed at studying the properties of large (>1'), nearby (v < 3000 km/s) galaxies observed by the Herschel Space Observatory. A dedicated, aperture-matched, UV-to-submm photometry has been carried out for the 875 galaxies of the sample, for an average coverage of 25 bands per object. We will show preliminary results on galaxy's colour, gas scaling laws, average SEDs and SED fits, obtained using the novel dust model THEMIS. For the largest 18 spirals, we have revealed that the dust distribution is flatter than the stellar, and that the emission gradients are compatible with dust heating by diffuse sources. Radiative transfer fits are being conducted for the same objects, with the aim of determining the parameters of the stellar and dust geometries, and the main agents in the UV-to-submm energy budget. Imagery and photometry are currently being released to the public.

ANDREA BIVIANO

WINGS: how ellipticals, S0s and spirals populate different phase-space regions in regular and irregular clusters

We use the dataset for 67 clusters from the Wide field Nearby Galaxy clusters Survey (WINGS) to investigate the spatial and velocity distribution of different morphological populations of cluster members. We build the 'Reg' (resp. 'Irr') stack from 53 regular (resp. 14 irregular) clusters. The spatial distribution concentration increases from the S to the S0 and to the E populations, in both the Reg and the Irr stacks, reflecting the well known morphology-radius relation. Reg clusters have a more concentrated spatial distribution of E and S0 galaxies than Irr clusters, but a similar spatial distribution of S galaxies. The velocity dispersion profiles become steeper and with a higher normalization from E to S0 to S galaxies, reflecting different orbital shapes for these populations. The S0 velocity dispersion profile is close to that of E galaxies in Reg clusters, and intermediate between those of E and S galaxies in Irr clusters. Our results suggest that S galaxies are a recently accreted cluster population, that will evolve into S0 galaxies after accretion, and in doing so, will also modify their phase-space distribution, approaching that of cluster ellipticals. Regular and irregular clusters display different phases of this evolutionary sequence.

MARCELLA BRUSA

Molecular outflow and feedback in an obscured Quasar at z~1.5 revealed by ALMA

We imaged with ALMA and ARGOS/LUCI the molecular gas and the dust and stellar continuum in XID2028, an obscured QSO at z=1.593, where the presence of a massive outflow in the ionized gas component traced by the [O III]5007 emission has been resolved up to 10 kpc. This target does represent a unique test case to study QSO `feedback in action' at the peak epoch of AGN-galaxy coevolution. The QSO has been detected both in the CO(5-4) transition and in the 1.3mm continuum, with emissions confined in the central (<4 kpc) radius area.

Our analysis suggests the presence of a fast rotating molecular disc (~400 km/s) on very compact scales, and well inside the galaxy extent seen in the rest-frame optical light (~10 kpc, as inferred from the LUCI data). Adding available measurements in additional two CO transitions, we could derive a total gas mass of ~10^10 M_sun, thanks to a critical assessment of CO excitation and the comparison with Rayleigh-Jeans continuum estimate. This translates into a very low gas fraction (<5%) and depletion time scales of 35-80 Myr, reinforcing the result of atypical gas consumption conditions in XID2028, possibly due to feedback effects on the host galaxy.

Finally, we observe an asymmetric profile of the CO(5-4) line, which suggests the presence of high velocity gas up to 700 km/s. An image of the blueshfited and redshifted CO wings provides the first detection of a spatially resolved, galaxy-scale molecular outflow at high-z, extended in opposite directions with the approaching component spatially coincident with the ionised gas outflow. The resolved, molecular outflow appear to be cospatial with the component observed int the ionised gas. XID2028 therefore represents the first example of molecular and ionised kpc scales outflows at high-z.

ANNALISA CITRO

Investigating the star-formation quenching across cosmic time

Understanding the bimodality between star-forming (blue) and quiescent (red) galaxies is one of the key question in the current studies of galaxy evolution. We are investigating this issue by proposing an innovative method to identify galaxies in the exact moment when they begin to quench their star-formation (SF), based on high- to low-ionization emission line ratios. In particular, we focus on [O III] 5007/Halpha and [Ne III] 3869/[O II] 3727, studying them with simulations obtained with the CLOUDY photoionization code. We find that these two emission line ratios are able to trace the quenching on very short time-scales (i.e. 10-90 Myr). We adopt the [N II] 6584/[O II] 3727 ratio as metallicity diagnostic to mitigate the metallicity degeneracy affecting our method. We validate our method by applying it to a Sloan Digital Sky Survey DR8 galaxy sample. We identify 10 extreme quenching candidates within the [O III] 5007/Halpha vs. [N II] 6584/[O II] 3727 plane, characterized by blue dust-corrected spectra and (u-r) colours, as if the quenching occurred in the recent past. Moving at higher redshift, I will also present the results of a complementary study, in which we are studying the origin of the galaxy bimodality by mapping the star formation rate (SFR)-mass plane of VANDELS (co-PIs: R. McLure, L. Pentericci) galaxies at $z > 1$. We look for the presence of trends in the galaxy ages, metallicities and star formation histories (SFHs) as a function of the star formation level and mass. We estimate the evolutionary properties of the selected galaxies by means of the full-spectral fitting performed with the STARLIGHT code (Cid Fernandes et al. 2007, Citro et al. 2016).

GIOVANNI CRESCI

The MUSE view of He~2-10: no accreting black hole but a sparkling starburst

I will present the physical and dynamical properties of the ionized gas in the prototypical local HII galaxy Henize 2-10, using MUSE integral field spectroscopy. The large-scale dynamics of this local starburst is dominated by extended outflowing bubbles, probably the results of massive gas ejection from the central star forming regions. Such a massive outflow (mass loading factor $\eta \sim 0.4$) has a total kinetic energy that is sustainable by the stellar winds and Supernova Remnants expected in the galaxy. We use classical emission line diagnostic to study the dust extinction, electron density and ionization conditions all across the galaxy, confirming the extreme nature of the highly star forming knots in the core of the galaxy, which show high density and high ionization parameter. We measure the gas phase metallicity in the galaxy taking into account the strong variation of the ionization parameter, finding strong variation across the galaxy.

We find no sign of AGN ionization in the galaxy, despite the recent claim of the presence of a super massive active Black Hole in the core of He 2-10. We therefore reanalyze the X-ray data that were used to propose the presence of the AGN, but we conclude that the observed X-ray emission can be better explained with sources of a different nature, such as a Supernova Remnant. The detailed characterization of this unique class of galaxies represents a unique test bench to study in detail the physical mechanisms that drive star formation and galaxy evolution in nearly pristine environments, resembling those in high-z galaxies.

OLGA CUCCIATI

The many manifestations of environment

Quite a number of recent extragalactic redshift surveys have been designed with primary goals different from the environmental studies. This is also true for future missions, like Euclid. In some cases, when environment is taken into account in the survey strategy, it is mostly related to cosmological studies rather than galaxy evolution. Nevertheless, we can exploit the strength of each survey (its depth, or its volume, etc) to perform environmental studies on specific kind of environments and/or on specific galaxy populations.

At the same time, from different kinds of surveys/environments we can obtain different constraints for models of galaxy evolution. I will show some examples from the surveys VIPERS ($0.5<z<1.$) and VUDS($2<z<4.5$), and some forecasts for the Euclid mission.

MIRKO CURTI

The KLEVER Survey: Spatially resolved gas excitation properties and metallicity gradients in high redshift galaxies

We will present the first results from KLEVER, an ESO Large Programme aimed at investigating dynamics, gas excitation properties and chemical abundances in high redshift galaxies, by means of near-IR spatially resolved spectroscopy. Exploiting KMOS multi-IFU observations in the J,H and K bands we aim to map multiple optical rest-frame nebular diagnostics in a sample of ~150 galaxies between $1.2 < z < 2.5$, allowing a full, detailed characterisation of the properties and excitation mechanism of the ISM in these objects on a spatially resolved basis. Here we discuss the results of the analysis of the first available observations, mostly targeting strongly lensed galaxies in CLASH and Frontier Fields clusters. By studying spatially resolved versions of diagnostic diagrams such as BPTs, we discuss the nature of the physical processes contributing

for the observed offset of high-z star forming galaxies in these diagrams with respect to local ones. We also investigate the chemical evolution in our sample by consistently inferring oxygen and nitrogen abundance from our diagnostic emission lines, assessing the presence and shape of metallicity gradients and the evolution of the N/O relation.

MAURO D'ONOFRIO

The BCG-cluster connection

We discuss the connection between the brightest cluster galaxies (BCG) properties and the clusters that host them. We will show that the two systems are very similar under several points of view.

FEDERICA DURAS

Looking for the feedback in place: studies on the relationship between star formation and nuclear activity in galaxies

The latest models of AGN-galaxy co-evolution suggest a crucial influence of the quasar on the host, being the former capable to drive energetic outflows from the inner to the outer regions, thus acting on the dust content and so on both the star formation and the black hole accretion.

I will present the results obtained from the WISSH project, aimed at investigating the presence of outflows in the most luminous quasars known, which are the best places to hunt for feedback mechanism. Indeed, in such objects the coupling between the central engine output and the host galaxy is expected to be at its extreme. We studied the SED of ∼90 type I AGN through multi component fitting decomposition. The 16 WISSH quasars for which a broad-band coverage is available up to the FIR show extremely high values of star formation activity, even when accounting for the quasar contribution to the infrared emission.

Moreover, I will present preliminary results on a study of a complementary sample of Swift/BAT local Type II AGN, highlighting the possible similarities and differences between these two opposite classes of objects within the context of BH-galaxy co-evolution.

ANDREA FERRARA

The Interstellar Medium of High redshift Galaxies

In the last decade, we have explored the cosmic depths and found a statistically significant number of galaxies well into the Epoch of Reionization. However, our physical knowledge of these pristine objects remains very scant. Investigating the internal structure, interstellar medium and evolution of early galaxies is the next challenge to understand key processes as the cosmic history of baryons, feedback, reionization and metal enrichment of the intergalactic medium. This ambitious plan can be tackled by combining a new generation of physically-rich, high resolution, zoom simulations with data in the sub-mm bands provided by ALMA. This approach will be soon strengthened by the forthcoming JWST power. I will review the present status and the open questions in the field.

FABIO FONTANOT

Strong Stellar-driven Outflows Shape the Evolution of Galaxies at Cosmic Dawn

We study galaxy mass assembly and cosmic star formation rate (SFR) at high redshift ($z \gtrsim 4$), by comparing data from multiwavelength surveys with predictions from the GAlaxy Evolution and Assembly (GAEA) model. GAEA implements a stellar feedback scheme partially based on cosmological hydrodynamical simulations, which features strong stellar-driven outflows and mass-dependent timescales for the re-accretion of ejected gas. In previous work, we have shown that this scheme is able to correctly reproduce the evolution of the galaxy stellar mass function (GSMF) up to $z \sim 3$. We contrast model predictions with both rest-frame ultraviolet (UV) and optical luminosity functions (LFs), which are mostly sensitive to the SFR and stellar mass, respectively. We show that GAEA is able to reproduce the shape and redshift evolution of both sets of LFs. We study the impact of dust on the predicted LFs, and we find that the required level of dust attenuation is in qualitative agreement with recent estimates based on the UV continuum slope. The consistency between data and model predictions holds for the redshift evolution of the physical quantities well beyond the redshift range considered for the calibration of the original model. In particular, we show that GAEA is able to recover the evolution of the GSMF up to $z \sim 7$ and the cosmic SFR density up to $z \sim 10$.

MATTEO FOSSATI

A panoramic look at gas stripping phenomena in local clusters of galaxies with MUSE and CFHT.

The advent of large panoramic cameras on ground- and space-based observatories recently allowed us to obtain a multi-wavelength view of local clusters of galaxies. These surveys caught a large fraction of star forming galaxies in the act of losing their cold gas reservoirs while moving at high speed in the hot intracluster medium. This phenomenon, called ram-pressure stripping, produces show spectacular tails of ionized gas (emitting the hydrogen recombination line Halpha) trailing up to 100 kpc behind the optical disc of these galaxies. We are currently undergoing a deep and blind, large area survey of the Virgo Cluster in Halpha to perform a complete census of environmental effects in one of the most active nearby clusters. These results are nicely complemented by deep and detailed spectroscopic follow-ups of the most spectacular cases with integral field spectroscopy which we observed with MUSE at VLT. I will present our most recent results on the kinematics and ionization conditions of the stripped gas in the Virgo, Norma, and A1367 clusters and what can be learned about the physics of this important hydrodynamical process.

ANNA GALLAZZI

Evolution of galaxies' stellar content since z~1: prospects from deep spectroscopic surveys

The population of massive galaxies in the local Universe is dominated by quiescent, spheroidal systems. This population has grown in number and mass density over the last 8-10 Gyr, at the expense of the star-forming population. The properties of galaxies stellar populations and how they relate to galaxy mass, structure and kinematics can constrain the past star formation history and the possible mechanisms that suppress star formation. Linking this information with the evolution of galaxy populations at higher redshift is complicated by the so-called progenitor bias. Tracing the evolution with redshift of the physical and kinematic properties of stars in galaxies for both quiescent and star-forming galaxies can alleviate this problem and better constrain the possible evolutionary paths. Time is ripe to pursue this kind of studies at intermediate redshift with ongoing and upcoming deep spectroscopic surveys in the rest-frame optical on large galaxy samples, such as the VIMOS LEGA-C public survey which is collecting high-S/N spectra of a mass-selected sample of ~3000 galaxies.

GIUSEPPE GAVAZZI

Turbulent clusters under the Subaru and MUSE lens: the case of A1367

Owing to the large field of view of the SUPRIME cam at the Subaru telescope we have covered a large area of the A1367 (and Coma) cluster with sensitive Halpha imaging observations. We have detected faint extended gaseous trails behind approximately 40% of all LTG in these clusters. These are unambiguous manifestations of ram pressure stripping acting on a large fraction of star forming cluster members that are caught in their first infall into the clusters. We have followed up half dozen examples in A1367 with (VLT) MUSE mosaics, revealing spectacular cinematic patterns and evidence for turbulence behind galaxies under the action of ram pressure stripping.

MICHELE GINOLFI

Molecular gas accreting onto massive high redshift galaxies

Massive galaxies in the early Universe accrete a large amount of cold gas from the intergalactic medium (IGM), mostly through filamentary structures, to sustain their prolonged and vigorous star formation. This scenario is predicted by models, but observational evidence for such cold flows is still sparse and indirect. I will present ALMA observations showing evidences for such streams feeding a massive galaxy at z~3.5, located in a protocluster, where the IGM chemical enrichment is enhanced by the overdensity of galaxies. ALMA revealed structures of accreting molecular gas both in the vicinity of the galaxy (~40 kpc) and on larger scales (~250 kpc), traced by CO(4-3) transition. This is the first clear, direct evidence of large scale streams of cold gas feeding a primordial massive galaxy.

GIANLUIGI GRANATO

BCG Mass Evolution in Cosmological Hydro-Simulations

We will present and discuss the history of star formation and mass assembly of Brightest Cluster Galaxies formed in a relatively large sample of massive simulated galaxy clusters. With respect to previous realizations of our simulations, starting from the same initial conditions, and featuring an overproduction of the BCG stellar mass bya factor of 2 to 3, our last runs are in better agreement with available data. Also, the increase of assembled mass in the last ~8 Gyrs is compatible with observational estimates.

LUCA GRAZIANI

Star formation and Galaxy evolution as traced through cosmic space and time

The increasing number of galaxies recently discovered in the high redshift Universe and the formidable amount of details provided now by observational facilities such as ALMA or MUSE, open the possibility of constraining models of star formation though cosmic times, in the context of galaxy evolution. A deep theoretical knowledge of the various feedback processes closely linking the evolution of stars, their interstellar medium (ISM) and the intergalactic medium (IGM), is essential to unveil the intricate interplay between enrichment by atomic metals and dust, cosmic reionisation and hydro-dynamical processes.

Hydro-dynamical, semi-analytic, and radiative transfer simulations are then required, because of their combined capability of exploring feedback on different astrophysical scales, to interpret the spectral properties of observed galaxies at various redshifts.

In this talk I will briefly review dustyGadget, CRASH (Graziani et al. 2013, MNRAS; 2016 in prep) and GAMESH (Graziani et al 2015, MNRAS), three tools jointly developed by the ERC-First group in Rome, and the Max Planck institute for Astrophysics (MPA), to investigate the many feedback processes described above, in the context of galaxy formation and evolution. The results of high-resolution simulations will be then shown, to discuss the interplay between feedback, cosmic star formation and Pop III to Pop II population transition in a cosmological scenario including inhomogeneous chemical enrichment, dust evolution and IGM reionisation. Many key quantities, both theoretical and observed, will be discussed, as the cosmic star formation rate, the evolution of dust mass in collapsed structures and the temperature evolution of the IGM.

VALENTINA GUGLIELMO

X-ray groups at intermediate redshifts from the XXL survey

Studying the properties of galaxies within groups and clusters and comparing them with the field is crucial to determine how environment affects galaxy evolution. The possibility of using X-ray data for groups and clusters (G&C) together with spectroscopic and photometric information is a powerful tool for environmental studies, being these structures classified on the basis of the potential well traced by their halo. In this talk a complete characterization of galaxy properties within spectroscopically confirmed G&C in the XXL survey (Pierre et al. 2016) is presented by means of a catalog that is going to be released at CDS with Paper XXII of the second series of XXL papers (Guglielmo et al. 2017, submitted to A&A). As first exploitation of the catalog, galaxy stellar mass function is investigated as a function of global environment (field vs G&C) and within the G&C environment as a function of X-ray luminosity. Moreover, spectral properties of galaxies within a massive supercluster identified in Adami et al. 2017 in prep. (XXL Paper XX) are derived by means of a spectrophotometric fitting code able to recover star formation properties of galaxies, spectral types, and the most interesting parameters for an environmental systematic study of galaxy populations.

MARCO GULLIEUSZIK

The discovery of a ram-pressure stripping/AGN connection

We report the discovery of a strong connection between severe ram-pressure gas stripping and the presence of AGN activity in cluster galaxies. The result is based on the GASP ESO Large Programme, a survey of stripping candidate galaxies observed with MUSE at the VLT selected in a wide range of galaxy mass and environment (from sparse groups to massive low-redshift clusters). We selected all extreme cases of jellyfish galaxies in GASP, i.e. those objects with stripped ionized gas tails at least as long as the galaxy diameter. We found that 7 out of 8 galaxies in this sample host an AGN. Most of them show evidence of gas outflows and two of them have AGN large-scale ionization cones. The extraordinary high fraction of AGN among jellyfish galaxies is a clear indication of a physical connection between ram-pressure stripping mechanism and AGN activity.

CHRIS HAINES

VIPERS: The decline and fall of the most massive star-forming galaxies since z~1

I present results from the recently completed VIPERS redshift survey which has obtained spectra for ~100,000 galaxies at z~0.5-1.2 over 24 square degrees. By combining VIPERS and SDSS datasets, we explore the relationships between star-formation history, stellar mass and galaxy structure and how these relationships have evolved from z~1 to the present day. We show how the high-mass limit of the blue-cloud population of star-forming galaxies has retreated steadily to lower stellar masses sincez~1, with the number density of the most massive star-forming galaxies(M*>10^11Msun) dropping by 80% between z=0.8 and z=0.5. We show that these massive star-forming galaxies at z~0.8 are the likely progenitors of local S0s.

LESLIE HUNT

Empowering SKA as a probe of galaxy evolution with HI

We will outline the broader science context of our recently accepted PRIN-SKA proposal, aimed at studying galaxy evolution through HI observations: Empowering SKA as a probe of galaxy evolution with HI (ESKAPE-HI). There are two main objectives to be accomplished over the two-year duration of the project: the first is to establish baryonic scaling relations for a "local benchmark" based on stellar content, dust, HI, and CO in nearby galaxies. The second is to set the stage for analogous higher-redshift studies by compiling vast multi-wavelength data sets for galaxy populations in the regions likely to be targeted by future SKA surveys. We will discuss the feasibility of our science goals, and how they relate to the SKA precursors and other available HI observational facilities.

FRANCESCO LA BARBERA

Constraints on the stellar IMF of early-type galaxies from optical and NIR spectral features

Understanding the stellar initial mass function (IMF) is a key aspect to obtain a complete picture of galaxy formation and evolution. In the last years, we have carried out a systematic census of the IMF in the unresolved stellar populations of early-type galaxies (ETGs), using optical and NIR spectroscopy from different surveys (e.g. SDSS, CALIFA) and dedicated observing programmes (OSIRIS@GTC, XSHOOTER and MUSE@VLT). I will show results on the non-universal IMF of ETGs, as a function of the environment where galaxies reside, and current constraints on the physical driver behind observed variations in the stellar IMF.

MARCELLA LONGHETTI

A2029 a relaxed cluster in a chaotic ambient: analysis of the dynamic and photometric properties of the galaxies

Galaxy clusters grow through the continuous merging and accretion of galaxies and groups of galaxies over cosmic time. These processes occur in the outer regions of local clusters (beyond 0.5R_{200}), which are currently poorly explored because of their low gas densities. The supercluster around the relaxed cool-core cluster A2029 (z~0.08) shows a striking ~ 18 Mpc long filament including at least 5 X-ray-detected structures. We present the dynamic analysis of these structures combined with the analysis of the spectro-photometric properties of their galaxies.

UMBERTO MAIO

The origins of first stars, galaxies and massive black holes.

State-of-the-art numerical simulations including self-consistently non-equilibrium atomic and molecular chemistry, star formation, stellar evolution and radiative transfer are employed to study the birth of primordial stars, galaxies and black holes, as well as the occurrence of the first heavy elements in the Universe. Results on the effects of mechanical, chemical and radiative feedback from different generations of structures will be presented and their implications for the onset of cosmic reionization, massive black-hole seeds and metal-induced CMB distortions will be discussed and compared to available data of high-redshift SFR determinations, GRB host properties, DLA chemical abundances and CMB measurements.

AMATA MERCURIO

The CLASH-VLT survey: RXJ2248, a spectrophotometric analysis from the core to the outskirts

The importance of cluster assembly processes in driving the evolution of galaxies as a function of galaxy mass and/or environment is still an open issue. It is still a matter of debate which physical mechanisms are responsible for the transformation of star-forming into passive galaxies and how the internal structure and dynamics of galaxies are affected by these mechanisms. I will present the results of a spectrophotometric analysis of the cluster RXJ2248-4431 (i.e. Abell S1063) at z ~ 0.35, which is also the southern-most Frontier Fields cluster. To perform this analysis we take advantage of the data set of the CLASH-VLT survey. The photometric coverage over a wide wavelength range [0.2-1.6] mu, from the HST observations combined with the integral field VLT-MUSE spectroscopy, allow to study in detail the internal structure and the spectral properties of member galaxies in the core. Furthermore, wide-field VLT-VIMOS spectroscopy and the WFI photometry of more than 1200 cluster members up to 5 h_70 ^-1 Mpc from the cluster center, offer the unique opportunity to investigate the galaxy properties up to the cluster outskirts and to link the cluster dynamical substructure with distinct galaxy populations, thus going beyond the simplistic concept of radial accretion and subsequent cluster formation through their building blocks.

PAOLA MERLUZZI

Witnessing the birth of an extended emission-line region powered by an active galactic nucleus at redshift z ~ 0.05

Looking out for galaxies in the process to be transformed in the Shapley supercluster, we discovered the peculiar system ShaSS 073-622 which consists of two interacting galaxies at their first, probably dramatic, encounter which can be classified as a minor or intermediate merger. The analysis of the complex gas kinematics and the photoionization modelling point out in the main galaxy the presence of a central outflow produced by an AGN whose existence is confirmed both by the SED and the spectroscopic analysis. The latter also reveals an ionization cone in the companion galaxy powered by the AGN in the main galaxy. In our case, we have all the ingredients to build up an extended emission line region and galaxy interaction, which is clearly ongoing, plays a fundamental role to provide the gas reservoir and probably to power the AGN. This rare event can shed light on the AGN short scale variability being related to the "green beans" galaxies (Schirmer et al. 2013) and Hanny's Voorwerp-like galaxies (Keel et al. 2012) where the observed highly ionized regions reflect a previous more energetic phase of the now faded AGN, i.e. the light echo scenario.

MATILDE MINGOZZI

An accurate analysis of the ISM gas physical properties in AGN with the MAGNUM survey

AGN have a strong influence on their host galaxies, as they are capable of ionising large fractions of the interstellar medium (ISM) and of accelerating fast outflows. I will present our results from the MAGNUM (Measuring Active Galactic Nuclei Under MUSE Microscope) survey, whose main goal is to deeply investigate the properties of the gas in nearby AGN and the interplay between nuclear activity and star formation. Specifically, I will concentrate on the study of the physical conditions of the ISM and its ionisation mechanisms in the ionised gas, both in visible with VLT/MUSE and in X-rays with Chandra, and in the molecular gas with ALMA. Up to now, data have been obtained for ten local galaxies (D < 30 Mpc), including the well-known Centaurus A, NGC 1068 and NGC 4945.The combination of the high spatial resolution (∼50 pc), due to the proximity of the sources of our sample, the large field of view of MUSE (1'x1') and its wide spectral coverage (4800–9300 Å) has allowed us to construct spatially resolved line diagnostic diagrams. Hence, we can disentangle the ionising source dominating in each part of the galaxies (i.e. star formation, AGN or LINER) and constrain the gas physical properties, in terms of reddening, density, temperature, ionisation potential, shock excitation, etc.

ALESSIA MORETTI

Ram Pressure Stripping in local clusters: the GASP perspective

Galaxy formation and evolution are strictly linked both to the intrinsic galaxy properties (i.e. the mass) and to the environment where galaxies live. In particular, the cluster environment is a unique laboratory where different mechanisms can shape galaxy properties by quenching their star formation. Among the various mechanisms at work, ram pressure stripping can quickly remove gas from galaxies sometimes leaving an imprint also on their optical morphology (the so-called jellyfish galaxies).

I will present the GASP (GAs Stripping Phenomena in galaxies with MUSE) Large Program, that is currently been carried out with the MUSE spectrograph at the VLT. Its main goal is to investigate in detail gas removal processes for a large sample of galaxies with different masses and across a wide range of environments. GASP is the only existing IFU survey covering both the main galaxy body and the outskirts and surroundings, where the IFU data can reveal the presence and the origin of the outer gas.

MARI POLLETTA

Multi-wavelength study of Planck high-redshift proto-cluster candidates

High redshift proto-clusters might contain clumps of intensively star forming galaxies and thus appear as bright and red sub-millimeter sources. In order to find such proto-structures, the multi-frequency Planck all sky maps have been inspected yielding about 2100 proto-cluster candidates, the Planck high-redshift (PHz) sources. Multi-wavelength observations of these sources reveal over-densities of bright and red sub-millimeter sources associated with red IRAC sources. Spectroscopic near-infrared and millimeter observations confirm the presence of dusty star-forming galaxies at redshift ∼2 in several candidates, and photometric redshifts identify candidates up to redshift 3. Here, we review our current understanding of the PHz sources and of their galaxy members.

PAOLA POPESSO

The evolution of the galaxy Main sequence from z~0 to 2.5

The formation and assembly of the stellar content of galaxies remain at the heart of galaxy evolution studies. Recent advances have led to an emerging picture where most galaxies form stars at a "normal" level, dictated mainly by their stellar masses, and regulated by secular processes. The existence of a tight relation between the stellar mass and SFR for star forming galaxies suggests that prior to the shutdown of star formation, galaxy star formation histories are predominantly regular and smoothly declining on mass-dependent timescales. By using the SDSS spectroscopic sample of local galaxies and the available deep mid and far infrared surveys of distant systems, I will show how the MS evolves in the last 10 Gyrs at its high mass end. The relation does not evolve in slope and scatter as a function of the stellar mass but only in its normalization. The slope of the high mass end is relatively flatter with respect to the faint end obtained via stacking analysis. This indicates that the relations bands at stellar masses larger than 10^{10} solar masses up to z~2.5. The evolution of the sSFR for massive galaxies is slightly faster (~(1+z)^3.3) than for lower mass galaxies (~(1+z)^2.7) as expected from the different star formaiton histories as a function of stellar mass.

LUCIA POZZETTI

The number density of high-z Halpha emitters for future near-IR spectroscopic survey

The future space missions Euclid and WFIRST-AFTA will use the Hα emission line to measure the redshifts of tens of millions of galaxies. The Hα luminosity function at $z > 0.7$ is one of the major sources of uncertainty in forecasting cosmological constraints from these missions.

I will review empirical models and last observations of Halpha emission galaxies from HST and FMOS spectroscopy. I further compare these observations to Semi Analytical models and to an HOD galaxy mock constructed within the Euclid collaboration. I also consider the implications of empirical models for the total Hα luminosity density of the Universe, and the closely related cosmic star formation history.

SALVATORE QUAI

A sample of star-forming galaxies just after the Quenching of the star formation in the local Universe

We present a method to select galaxies in the critical phase when the star formation is rapidly suppressed ('Quenching'). These objects were spectroscopically searched, in the local Universe ($0.04 \leq z < 0.21$), by exploiting the dust-corrected [OIII]λ5007/Hα ratio that is quite sensitive to the ionization parameter. We identified roughly 300 quenching candidates amongst 174000 SDSS star-forming galaxies. We analysed their fundamental properties (such SFR, colours, mass) and the Quenching timescale and we found that they stopped the star formation no more than a few Myrs before. Therefore, they can give precise information about the mechanism driving the Quenching, in particular, the role of galaxy mass and halo mass, the role of environment and the role of stars and AGN feedback.

ROBERTO RAMPAZZO

Investigating early-type galaxy evolution with a multi-wavelength approach

GALEX detected a significant fraction of early-type galaxies (ETGs), in particular S0s, showing Far-UV bright structures, sometimes involving an entire galaxy out to its outskirts. These features suggest the presence of either recent, ongoing and/or prolonged star formation episodes, shedding new light on the evolution of these systems.

We present the investigation of 11 ETGs, selected because nearly passively evolving in their nuclear region (Rampazzo+ 2013), performed with SWIFT, using both XRT and UVOT (Rampazzo+ 2017). We discuss UV vs. optical morphologies and luminosity profiles. We find that Sersic indices in UV are usually lower (n=2-3) with respect to optical ones (n=3-4), suggesting that a disk underlying structure emerges in the short wavelength range. This implies a dissipative effect in their recent evolutionary phases.

These SWIFT data-set plus ancillary data in the literature are used to constrain our SPH silulations with spectro-photometric implementation highlighting the evolutionary path[s] of these ETGs and the mechanisms at the origin of their UV-bright structures.

FEDERICA RICCI

The BH mass - galaxy scaling relations in the local Universe: what is the role of type 2 AGN?

Coevolutionary models that link the growth of supermassive black holes (BHs) and of their host galaxies are based on the observations of tight scaling relations between the BH mass and some properties of the host bulge. These relations have been calibrated thanks to the direct measurements of the BH mass in local

galaxies and are extremely important, used to measure BH masses at high redshift and to determine the distribution of accreted mass, i.e. the black hole mass function.

However, these relations seem to be biased in favour of the more massive BHs, due to a bias in the resolution of the BH sphere of influence. Hence, there is urgent need to explore the full distribution of BH masses, accumulating sources below 1e+7 solar masses.

We here present the results from a systematic study performed using deep NIR (VLT and LBT) spectroscopy of a sample of ~40 type 2 active galactic nuclei (AGN), drawn from the complete SWIFT/BAT 70-month hard (14-195 keV) X-ray selected sample. Thanks to our new virial relation based on unbiased physical quantities, i.e. hard X-ray luminosity and Paβ emission line FWHM, we have been able to measure for the first time in a virial way the supermassive black hole mass of type 2 AGN, whose values have been up today estimated using indirect proxies (e.g. from scaling relations). With direct virial masses for type 2 AGN, we discuss, for the first time, if the BH-host galaxy scaling relations hold for our type 2 AGN, thus putting a missing piece to the AGN/galaxy co-evolution puzzle.

NÚRIA SALVADOR RUSIÑOL

Young stellar populations in early-type galaxies from BOSS spectra

Early-Type galaxies (ETGs) lock most of the stellar mass in the Universe and are considered to be the end-product within a hierarchical galaxy formation framework. ETGs are found to be metal-rich, very old and with the bulk of their stellar populations formed in less than 1 Gyr, with these properties depending primarily on galaxy mass but also on their environment. We performed a detailed study of the stellar content of ETGs in the unexploited UV spectral range by analysing line-strength indices of very high-SNR BOSS stacked spectra at z~0.3 of different velocity dispersion bins. Comparing line-strength indices with the newly extended stellar population models is a more powerful and accurate technique than using UV color-color diagrams. The UV range provides a unique capability for disentangling tiny (smaller than 1%) contributions from young stellar components that almost do not shine in the visible. Therefore, we have constrained the numerical fraction of young stellar population of high velocity dispersion ETGs. This has an important impact on the evolution of these galaxies, as they show a residual fraction of star formation, although they are very evolved objects.

PAOLO SARACCO

Stellar populations and structural properties of cluster and field early-type galaxies at z~1.3: environment at play?

From the theoretical point of view, it is expected that field and cluster bulge-dominated galaxies display different structural and stellar population properties. Mergers, indeed, are expected to be more frequent in cluster environment than in the field. Consequently, the assembly of cluster early-type galaxies should be affected by this ex-situ mechanism of mass growth more than the assembly of field ETGs. The structure and the stellar population properties of field and cluster ETGs have to reflect this environmental effect if it is dominating. In this talk, I will present a comparison between the structural and stellar population properties of ETGs in cluster and field at z~1.3 and I will confront the results with model expectations.

CRESCENZO TORTORA

The last 6 Gyr of dark matter assembly in massive galaxies from the Kilo Degree Survey

I will discuss our analysis of the dark matter (DM) assembly in the central regions of massive early-type galaxies (ETGs) up to z = 0.65 in the Kilo Degree Survey (KiDS). We use a sample of about 3800 massive (log M*/Msun > 11.2) galaxies with photometry and structural parameters from 156 sq. deg. of KiDS and spectroscopic redshifts and velocity dispersions from SDSS--DR7 and BOSS--DR10@SDSS. We obtain central total-to-stellar mass ratios (Mdyn/M*), and DM fractions, by determining the dynamical masses, Mdyn, from Jeans modelling of SDSS aperture velocity dispersions and stellar mass, M*, from KiDS galaxy colours. We first show how the central DM fraction correlates with effective radius, Re, Sérsic index, n, velocity dispersion, sigma, stellar mass M*, stellar density, and dynamical mass, and demonstrate that most of the local correlations are still observed up to z = 0.65. We find that, at fixed M*, local galaxies have larger total-to-stellar mass ratio (Mdyn/M*), on average, than their counterparts at larger redshift. The main driver of this trend cannot be an IMF getting bottom-heavier at lower redshift, since a strong evolution in the IMF 'mass' seems to contrast independent observations and to be at odds with the effect of galaxy mergers. We interpret the larger DM fractions at lower redshift within the galaxy formation scenario, suggesting that in the case of a fixed IMF, the (stellar and dark) mass assembly can be explained, realistically, by mass and size accretion, which can be physically achieved by a series of minor mergers. We reproduce both the size-M* and Mdyn/M*-M* evolution taking into account that stellar and dark mass are changing at a different rate. This result suggests that the main progenitor galaxy is merging with less massive systems characterized by a smaller Mdyn/M*, consistently with results from halo abundance matching.

PAOLO TOZZI

The cycle of baryons in Brightest Cluster Galaxies

We discuss the constraints on the cycle of hot and cold baryons in Brightest Cluster Galaxies obtained by combining X-ray, Radio, optical and IR data. In particular, we show the correlation between the properties of the surrounding Intra Cluster Medium with radio and X-ray nuclear activity, and star formation events in the BCGs.

GIACOMO VENTURI

Ionized gas outflows in active galactic nuclei: a detailed study of their physical properties from the MAGNUM survey

AGN outflows are believed to play a major role in shaping the properties of host galaxies, by sweeping away the gas and completely quenching star formation.

In this talk I will present current results from our MAGNUM survey, focusing on the detailed study of the properties of AGN outflows and of their interaction with host galaxies, both in the ionized gas with VLT/MUSE and in the molecular gas with ALMA. Data have been obtained for about ten local galaxies so far including the famous Circinus, NGC 1365 and NGC 4945. Nearby galaxies are the ideal laboratories for such a detailed analysis, due to their vicinity.

Thanks to its unique combination of large field of view and spectral coverage, MUSE has allowed us to map ionized gas in several different emission lines revealing ubiquitous kpc-scale AGN-driven outflows having a clear kinematical and spatial structure related to the ionization cone, whose correlation with the molecular features from ALMA is also examined. The intrinsic outflow 3D shape and physical properties are then inferred with kinematical modelling. Finally, tentative evidence of star formation induced by AGN outflows ("positive feedback") is found.

STEFANO ZIBETTI

Spatially resolved stellar population of nearby galaxies: the overall age bimodality and the subtle nature of gradients in ETGs

I will review the statistical analysis of the bimodal age distribution on 1-kpc scales for a representative sample of local galaxies in CALIFA. Then I will focus on the properties of "old peak", by exploring the stellar population gradients of ETGs up to $\sim$2 effective radii. The degenerate effect of age and metallicity on the observables requires particular care, especially in deriving age gradients. While metal enrichment appears to be always more efficient in the central regions of ETGs than in their outskirts, we observe a variety of age gradients that reflect the complexity the star formation history of the central parts and is linked to AGN feedback and gas inflows.