

spatial distribution of stellar populations inside galaxies. We are using *ugriz* magnitudes and principal component analysis (PCA) to obtain pixel-by-pixel proxies of the stellar populations and their distributions inside each galaxy. The distribution of these populations are then investigated with a variety of statistical tools, including Gini Indices and the Euler-Poincaré characteristic. Our approach aims to be a step forward with respect to the conventional profile fitting, allowing to obtain quantitative estimates on how the different stellar populations are distributed within a galaxy, bringing hints on how galaxies grow and evolve. The pixel-by-pixel analysis of a small sample of 15 galaxies of different types show that the stellar populations tend to evolve from inside to out in spiral and late spiral galaxies, while elliptical galaxies seem to have young stellar populations in the center. This first results show that this approach is effective and will be explored and improve in future works.

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LOW-REDSHIFT COMPACT UV LUMINOUS STARBURSTS: A DOOR TO UNDERSTAND HIGH-REDSHIFT LYMAN-BREAK GALAXIES

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Lyman-break galaxies (LBGs) are a population of distant objects ($z \sim 3$) selected at rest-frame UV that represent the typical starburst galaxy at a time when the universe was going through its peak in star formation activity. The star formation rates of LBGs suggest that these galaxies may be the progenitors of a large part of the massive galaxies in the local universe, making them important objects of study. However, detailed studies of the morphology and kinematics of these distant galaxies are limited by the sensitivity of current instruments. We study a sample of low-redshift UV-selected supercompact starbursts that share many properties (morphology, surface brightness, luminosity) with high-redshift LBGs and are hence denominated as Lyman-break Analogs (LBAs). These UV luminous galaxies (UVLGs) were recently uncovered by the Galaxy Evolution Explorer (GALEX) satellite. At significantly lower redshifts ($z < 0.2$) than LBGs, they provide us with a unique opportunity to draw analogies

with their high-redshift counterparts and study in great detail the astrophysical conditions that lead to the star formation activity we observe in the distant universe. We have undertaken the near-IR photometric analysis of a sample of LBAs based on observations taken with the Fourstar instrument on the 6.5m Baade Telescope (Las Campanas Observatory, Chile). We now extend this work to the wider population of compact UVLGs, with surface brightness one or two orders of magnitude than normal galaxies, but less extreme than supercompact UVLGs. Based on J, H, Ks, and optical photometry for 40 compact and supercompact UVLGs we are in the process of analyzing the spectral energy distribution (SED) of each individual galaxy to derive stellar masses and ages in order to explore the similarities and differences between these two populations relative to normal galaxies in the local universe and to LBGs in the distant universe.

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AN APPROACH TO MEASURING THE DENSITY OF THE ENVIRONMENT OF GALAXIES: RESULTS AND COMPARISONS WITH OTHER MEASUREMENTS

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With the aim of obtaining a homogeneous and reliable measurement of the density of the environment of a large sample of galaxies, we developed a code that counts the number of neighboring galaxies around a target galaxy. As targets, we selected a large sample of 666,387 galaxies from the spectroscopic catalogue of the SDSS-DR7 with redshifts between 0.03 and 0.30 and more luminous than absolute magnitude of -19 in the SDSS *r* band. The photometric catalogue of the SDSS-DR7 was used to extract and count the neighboring galaxies from, including about 24M objects, also more luminous than an *r*-band absolute magnitude of -19, for which a photometric redshift was available to serve as a distance estimate. The code counts all galaxies within an absolute distance of 1.5 Mpc around the target (translated to an apparent radius and a redshift range around that of the target). We avoid galaxies close to the survey edges, leaving 527,074 target galaxies for which we have a measurement of environmental density.

We present our results and compare them to other measurements of the density of the environment of galaxies, such as those in the MaxBCG catalogue of brightest cluster galaxies. As a control of our method, we apply it to a sample of galaxies from the 2MIG catalogue of isolated galaxies, and also to a sample of galaxies from a compilation of members of Abell clusters. We aim to use our results to test the morphology–local density relation and to study the relationship between the different types of emission-line activity of galaxies and their ambient density.

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GALAXY MODEL IN INFRARED

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We present in this work a new approach to the derivation of galactic parameters via the star counts method. It uses a modern version of the model of Ortiz & Lépine (1993) and the 2MASS data in J, H and K_S to estimate, based on a regular grid of lines-of-sight over the whole sky, the most important structural parameters of the Galaxy. It is the first time that the star counts method is used in the whole sky, including the complex region of the galactic plane. We have used a conservative approach to derive parameter values and their uncertainties, and also investigate the effects of using several limiting magnitudes over the best set of parameters which describes the Galaxy. Since the landscape for the figure of merit of a model can be pretty complex when we have a number of free parameters in excess of a dozen, the Markov Chain Monte Carlo method looks like ideal for an overview of the parameter space, to constrain regions of interest for further exploration and to provide realistic uncertainties. The pinpointing of the best parameter values is carried out with the Nested Sampling method, very robust in terms of progression to the optimum solution of a multi-parameter model.

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BAR AND SPIRAL ARMS DYNAMICS IN NUMERICAL SIMULATIONS

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We present the results of SPH simulations with multi-million particles models. The models were constructed with an exponential disk, Spitzer's isothermal sheet in the vertical direction and a NFW halo. In models having a bulge, a spherical Hernquist profile was used. The models were evolved for approximately 5 Gyr using Gadget 2. We present 1D and 2D Fourier analysis to quantify bar characteristics as length, strength, and pattern speeds. Fourier 2D analysis is also applied to show the effects of the swing amplification mechanism. Indeed, the density waves begin to be amplified as tightly wound leading spirals and unwound to open leading structures. Afterwards, the waves wound into trailing patterns, reach their maximum amplitude and finally, fade away as tightly wound trailing spirals. The timescale for each wave packet is of the order of some 10^8 years.

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PHYSICAL PARAMETERS OF GALAXIES WITH STAR FORMATION THROUGH MID-INFRARED SED MODELS

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We present a mid-infrared study of a sample of 19 Starburst galaxies in the local ($z < 0.2$) universe. We derive physical parameters such as Metallicity, Interstellar Medium Pressure, Compactness Parameter C (related to the dust heating flux), PDR Fraction f_{PDR} and Extinction A_V by fitting the Spitzer-IRS spectra of these systems using state-of-the-art radiative transfer models and Bayesian techniques. Our results are fundamental in the understanding of massive star formation in the local counterparts of intermediate and high redshift Ultra Luminous Infrared Galaxies (ULIRGs). We reconstruct the star forming histories of these systems by obtaining posterior probability distribution functions (PDFs) for the star formation rates in different epochs an estimate the contribution to the bolometric luminosity from very recent (< 1 Myr) star formation events, and the contribution of Polycyclic Aromatic Hydrocarbons, which is significant in some cases. By comparing the derived PDFs with particular spectral