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PAH LINES AT HIGH REDSHIFT AS GALAXY EVOLUTION MARKER

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Based in chemodynamical models for galaxy evolution, we studied the formation of PAH lines at high redshifts. The model considers carbon and silicon grains, and also PAH molecules. It distinguishes diffuse ISM the molecular clouds associated to star forming regions. The PAH lines provide a good signature of the evolutionary stage of galaxies, star formation rate, in addition to allowing the assessment the relative importance for of AGN and stellar emission on the output of the galaxy. In particular, the line ratio 11.3/7.7 μm is a good marker of the age of high redshift galaxies. We expected that our calculations provide some benchmarks both for future observations both with ground and satellite instruments. The ages derived in this way for high redshift objects could be used to test dark energy models. In addition to the cosmological applications, the observations of the PAH features could be used to check the charge state of PAHs. Apparently, anions and neutrals are favored over cations.

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THE MASS–METALLICITY–STAR FORMATION RATE RELATION UNDER THE STARLIGHT MICROSCOPE

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The correlation between stellar mass and gas-phase oxygen abundance (M–Z relation) has been known for decades. The slope and scatter of this trend is strongly dependent on galaxy evolution: Chemical enrichment in a galaxy is driven by its star formation history, which in turn depends on its secular evolution and interaction with other galaxies and intergalactic gas. In last couple of years, the M–Z relation has been studied as a function of a third parameter: the recent star formation rate (SFR) as calibrated by the Hα luminosity, which traces stars formed in the last 10 Myr. This mass–metallicity–SFR relation has been reported to be very tight. This result puts strong constraints on galaxy evolution models in low and high redshifts, informing which models of infall and outflow of gas are acceptable. We explore the mass–metallicity–SFR relation in light of the SDSS–STARLIGHT database put together by our group. We find that we recover similar results as the ones reported by authors who use the MPA/JHU catalogue. We also present some preliminary results exploring the mass–metallicity–SFR relation in a more detailed fashion: starlight recovers a galaxy's full star formation history, and not only its recent SFR.

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MAGAL: A NEW TOOL TO ANALYSE GALAXIES PHOTOMETRIC DATA

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On galaxy spectra, one can find mainly two features: emission lines, which tell us about the ionised gas content, and the continuum plus absorption lines, which tell us about the stellar content. They thus allow us to derive gas-phase abundances, the main radiation sources, chemical enrichment and star formation histories. Braad-band photometry, on the other hand, is much more limited and hinders our ability to recover a galaxy's physical properties to such a degree of detail. However, with the recent development of redshift surveys using the technology of ultra-narrow filters ($\approx$ 100 Å), such as ALHAMBRA, J-PAS and DES, it will be invaluable to be able to retrieve information on physical properties of galaxies from photometric data.

Motivated by this data avalanche (which goes up to the petabyte scale), we decided to build our own SED-fitting code: Magnitudes Analyser (MgAl), which has three modules. 1) A template library generation module: generates empirical and theoretical template libraries. 2) Bayesian fitting module: calculates probability distribution functions (PDFs) for given observed and library template data. This is

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similar to the method to measure photometric redshifts by Benitez (2000). 3) A result-analyser module: streamlines data analysis from the large output PDFs files. A fourth module to manage 3D data is being developed and a few preliminary tests are also shown.

To investigate the reliability of results obtained by MagAl, we have created a mock galaxy sample for the ALHAMBRA survey filter system (http://alhambrasurvey.com) and tried to recover their physical properties. We show that for our sample of simulated galaxies we can measure stellar ages, metallicities and extinctions with a precision of less than 0.3 dex. Also, we apply the code to the ALHAMBRA survey catalog and show that we can measure stellar masses with an accuracy of 0.2 dex when comparing to previous results like COSMOS masses measured by Bundy et al. (2006).

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A DATA-DRIVEN APPROACH TO THE EMISSION LINE PROPERTIES OF STAR-FORMING GALAXIES

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We present a quantitative analysis of the correlations between the equivalent widths of optical emission lines for a sample of more than 70,000 star-forming galaxies with high S/N SDSS spectra and with spectral synthesis performed with the Starlight software. We show, using statistical tools such as the distance correlation and maximal information correlation, that there are indeed strong correlations between the most prominent emission lines usually detected in the optical region of galaxy spectra. We have done, also, a Principal Component Analysis (PCA) of the synthesized continuum spectra and used up to 10 components to train an artificial neural network to estimate the equivalent widths of the emission lines, with excellent results, demonstrating that there is a strong correlation between the continuum and equivalent widths. The same analysis was performed with the symbolic regression software Eureqa, which provided functional relations between the four principal components and the equivalent widths, with an accuracy between 0.12 and 0.24 dex for different emission lines. The main motivation behind this work is to produce realistic spectra for tests of data reduction pipelines of the new generation of galaxy surveys, like J-PAS and PFS/SuMIRe.

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THE NEBULATOM COOKBOOK

G. Stasińska[1] and C. Morisset[2]

We present a series of problems on nebular physics with detailed comments and solutions in python. Their aim is to lead the student to a better understanding of the respective roles of the different processes at play in ionized nebulae, and to use with proper insight some tools that have been developed for the analysis of nebulae. These problems have been proposed at the NEBULATOM workshop in Choroni (Venezuela, 3-16 March 2013), a capacity development workshop for Latin American astronomers on emission-line objects in the Universe. They can be downloaded from https://sites.google.com/site/nebulatomtools/

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PHYSICAL CONDITIONS OF A HII GALAXY WITH EXTRAORDINARILY DENSE NUCLEUS: MRK996

E. Telles[1], T. X. Thuan[2], Y. I. Izotov[3], and E. R. Carrasco[4]

We present an integral field spectroscopic study with the Gemini Multi-Object Spectrograph (GMOS) of the unusual blue compact dwarf (BCD) galaxy Mrk 996.

We show through velocity and dispersion maps, emission-line intensity and ratio maps, and by a new technique of electron density limit imaging that the ionization properties of different regions in Mrk 996 are correlated with their kinematic properties. From the maps, we can spatially distinguish a very dense high-ionization zone with broad lines in the nuclear region, and a less dense low-ionization zone with narrow lines in the circumnuclear region. Four kinematically distinct systems of lines are identified in