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Self-consistent population spectral synthesis with FADO: an exploration of galaxy evolution in the ELTs era (Jean Michel Gomes)

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Astronomical observatories with large aperture telescopes, greater or equal to 20 meters in diameter, the so-called extremely large telescopes (ELTs), will provide high-quality data for applying spectral synthesis codes in order to accurately derive the star formation history (SFH) and Chemical Enrichment History (CEH) of galaxies. Therefore, extragalactic astronomy is on the verge of experiencing a leap in our understanding of galaxy formation and evolution.

Despite significant progress over the past decades, all state-of-the-art population synthesis (PS) codes suffer from deficiencies limiting their potential of gaining sharp insights into the SFH and CEH of galaxies, i.e. the neglect of nebular continuum and, the lack of a mechanism to ensure consistency between the best-fitting SFH and the observed nebular characteristics (ONC; Balmer-lines, Balmer/Paschen jumps). These introduce biases in their recovered physical properties (stellar mass M* and sSFR).

FADO (Gomes & Papaderos 2017) is a novel self-consistent PS code employing genetic optimization, publicly available (http://www.spectralsynthesis.org), capable to identify the SFH & CEH that best reproduce the ONC of a galaxy, alleviating degeneracies in the spectral fits.

The current version of FADO (V1.B) uses standard BPT emission-line ratios for the classification of low redshift (z) galaxies. Whereas this permits a reliable distinction between star-forming, Composite, Seyfert and LINERs, it is inapplicable to many high-z galaxies. We present an adaptation of FADO (version V1.C) to classify high-z galaxies employing the "Blue Diagram" (e.g., Lamareille 2010) for which the most prominent blue emission-lines (<~[OIII]5007) are observable while the Halpha and [NII] are inaccessible.

FADO V1.C was applied to synthetic spectra simulating the evolution of galaxies formed at higher-z with different SFHs. FADO can recover the physical and evolutionary properties of galaxies, such as M* and mean age/metallicity, with an accuracy significantly better (~0.2 dex) than purely-stellar codes.

An outline of FADO V1.C and applications to local and higher-z galaxies will be presented with an emphasis on ELTs.

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Track Classification: Galaxy Stellar Populations and star-formation histories