Multiband photometric calibration and classification of galaxies in S-PLUS

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ABSTRACT

This project aims to study all galaxies from the third internal Data Release (iDR3) of the Southern Photometric Local Universe Survey project (S-PLUS, *Mendes de Oliveira et al., 2019*) that have an estimated photometric redshift. The methodology involves fitting the S-PLUS multiband photometry with the spectral energy distribution fitting code *Alstar* to estimate the parameters related to the physical properties of the galaxies, allowing the classification and documentation of galaxies in the Local Universe. As S-PLUS is covering most of the southern hemisphere sky, it will be a study of great importance for the astronomical community interested in the extragalactic area.

I. INTRODUCTION

Multiband photometry measures the energy output of an astronomical object in different wavebands, fitting the multiband photometry has some advantages over spectral fitting: more than one galaxy at a time can be observed and larger areas can be explored. Using the 12 bands of S-PLUS we can employ the multiband fitting to extract physical parameters, such as mass, age and star formation history of iDR3 galaxies.

II. DATA

In this study we aim to analyse galaxies from the internal data realease 3 of S-PLUS (iDR3) and a few restrictions are imposed when choosing the data. All galaxies must have an estimated redshift (*Vinicius-Lima et al., 2021*) and the probability of the source being a galaxy is choosen to be bigger than 0.9 (*Nakazono et al., 2021*) . The resulting galaxies from S-PLUS are also crossmatched with other surveys, such as GALEX, WISE and 2MASS.

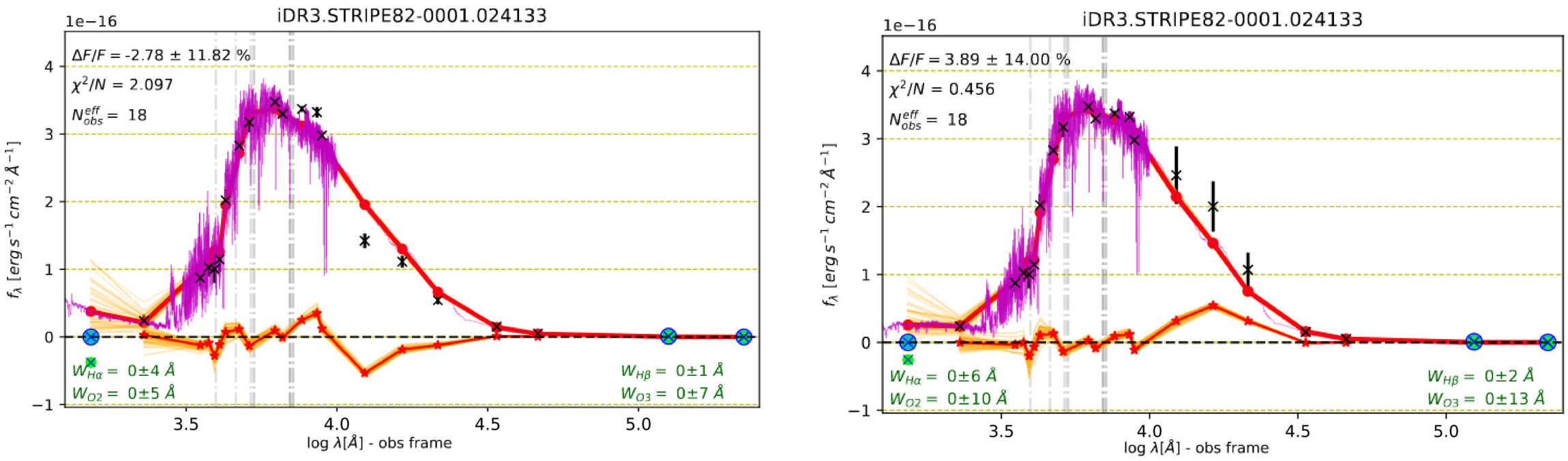

Figure 1. The multiband photometry fitting for one galaxy in the STRIPE82 region, using GALEX, S-PLUS, 2MASS and WISE. (a) On the left, the fitting using 2MASS point sources catalog and WISE data. (b) On the right, the fitting using 2MASS extended sources catalog and WISE data.

III. METHODS

The main method is the multiband photometry fitting for galaxies. The fitting code *Alstar* is based on the Starlight code for spectral fitting (*Cid Fernandes et al., 2005*). The code uses convoluted spectral models of Bruzual & Charlot (2003) for S-PLUS photometry and using chi square minimization finds the best combination of models that represent the data. From this combination, physical quantities such as age, mass and metallicity are extracted, which can then be used to determine the evolutionary history of galaxies. Figure 1 shows the fitting for a galaxy in the STRIPE82 region, with 2MASS and WISE, it is visible that the data from both surveys are not improving our model. After many tests we decided to remove 2MASS and WISE (W3 & W4) crossmatches from our data, but continue with the ultraviolet data from GALEX.

IV. NEXT STEPS

There are still many refinements that can be done to our data, for example add a S/N and proximity criteria for the selected galaxies. Also, compare the resulting models of the complete STRIPE82 sample to the observed spectra and analyze the compatibility between the two methods. In the future we aim to estimate area density of galaxies and assign a probability that a galaxy belongs to some group/cluster. Then, it will be possible to analyze the evolutionary environment of galaxies of the southern hemisphere sky.

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