

# Spectral synthesis of star-forming galaxies in the near-infrared

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# SPECTRAL SYNTHESIS OF STAR-FORMING GALAXIES IN THE NEAR-INFRARED

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**The near-infrared spectral region is becoming a very useful wavelength range to detect and quantify the stellar population of galaxies.**

Models are developing to predict the contribution of TP-AGB stars, that should dominate the NIR spectra of populations 0.3 to 2 Gyr old. When present in a given stellar population, these stars leave unique signatures that can be used to detect them unambiguously Maraston (2005).

However, to identify and quantify tracers of star formation in the NIR, we need galaxies known to have a significant fraction of star formation. With this in mind, we used the NIR sample of star-forming galaxies of Martins et al. (2013), which are known to have star formation from their optical observations. In this work we performed stellar population on these galaxies to understand how the star-formation tracers in the near-infrared can be used in practice.

Martins et al. (2013) compared emission line properties from the optical observations and from the NIR. They found that for a subsample of galaxies the emission lines in the NIR were much weaker than in the optical, sometimes even absent. They concluded that this was mainly due to the differences in aperture between these two sets of data - the aperture in the optical has 5 times the area than the aperture in the NIR. In many of these galaxies the star-formation is probably not nuclear, but circumnuclear, or located in hot spots outside the nucleus. Based on this comparisons, they classified the galaxy sample in four classes:

- Weak emission lines in the optical, no emission lines in the NIR, either at the nucleus or in the extended region (class 1).
- Strong emission lines in the optical, no emission lines in the NIR, either at the nucleus or in the extended region (class 2).
- Strong emission lines in the optical, evidence of weak to moderate-intensity lines in the NIR (nucleus or/and extended region - class 3).
- Strong emission lines in the optical, moderate to strong emission lines in the NIR (class 4).

The stellar population synthesis shows that all class 1 and class 2 objects have very old average age. For all objects the synthesis found a very old stellar population in the nucleus. The lack of emission lines in the NIR was interpreted by Martins et al. (2013) as a difference between the slit sizes of the optical observations and the ones done in the NIR. Since the slit used for the NIR observations was much smaller, the ionisation source was missed by these observations, and that agrees with the old ages found by the synthesis. Class 3 and 4 objects have in general much lower average ages. All class 4 and most of class 3 objects have significant contribution of a young stellar population. It is also very interesting that this contribution tends to be higher in the apertures where the emission lines are stronger. This young stellar population should be the responsible for the gas ionisation. We also found higher star formation rates in the last 100 Myrs in objects from classes 3 and 4. More details can be found in Martins et al. (2013b).

Although the stellar population synthesis method proved to be very effective to find the young ionizing population in these galaxies, no clear correlation between these results and the NIR spectral indexes were found. Thus, we believe that, in practice, the use of these indexes is still very limited due to observational limitations

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