Stellar Populations as Building Blocks of Galaxies
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Stellar line-strength indices distribution inside the bar region

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Abstract. We present a detailed study of stellar line indices along the bar region for a sample of six early-type galaxies. We find positive gradients within the bar region in the metal indices in four of the six galaxies, and opposite trends in the other two. These latter two galaxies are classified as SAB and they present exponential bar light profiles. For all the galaxies, we find a positive gradient in the Balmer indices. There is a clear correlation between the position of morphological features inside the bar region with changes in the slope and value of the indices, which indicate, using stellar population analysis, changes in the stellar population. Therefore, it seems that the bar regions show a gradient in both age and metallicity, changing radially to younger and more metal rich populations for all the galaxies except for those two with exponential profiles. This is the first time such an analysis of the stellar populations in bars has been performed. The radial distribution of the indices is related to the star formation history of the bar, understanding these trends will help us to understand how bars are formed and how they evolve.

Keywords. Galaxies: abundances – galaxies: formation – galaxies: evolution –galaxies: stellar content – galaxies: structure

1. Discussion

We have obtained high S/N long–slit spectra for a sample of six barred galaxies with the Double Beam Spectrograph (DBS) on the 2.3m telescope at Siding Spring Observatory. The slit was placed along the bar major axis. We have derived radial profiles of the line-strength indices for the sample galaxies by measuring spectral indices of the Lick/IDS system Faber *et al.* (1985). All the details about the observations, data reduction, and analysis are presented in Pérez, Sánchez-Blázquez & Zurita (2007, in press).

Figure 1 shows the radial trends of two indices for NGC 5101 as an illustrative example of all the other sample galaxies and the rest of the metal and Balmer indices.

As a warning note, one should be careful deriving the Balmer indices affected with emission because the derived values are sensitive to the emission correction (increasing the value after the correction). We have tried several methods for the emission correction (even no correction at all) and the trends do not change (see Fig. 1). In Fig. 1 one can clearly see a different trend of the radial distribution of the indices with a change at the radius of the inner structure (in Fig. 1, the most inner vertical line). Within the bar region there is a clear gradient in both metal and Balmer lines that, when combined with stellar population models for all galaxies, gives a gradient in both, metallicity and age, indicating that outer parts of the bar are younger and more metal rich.

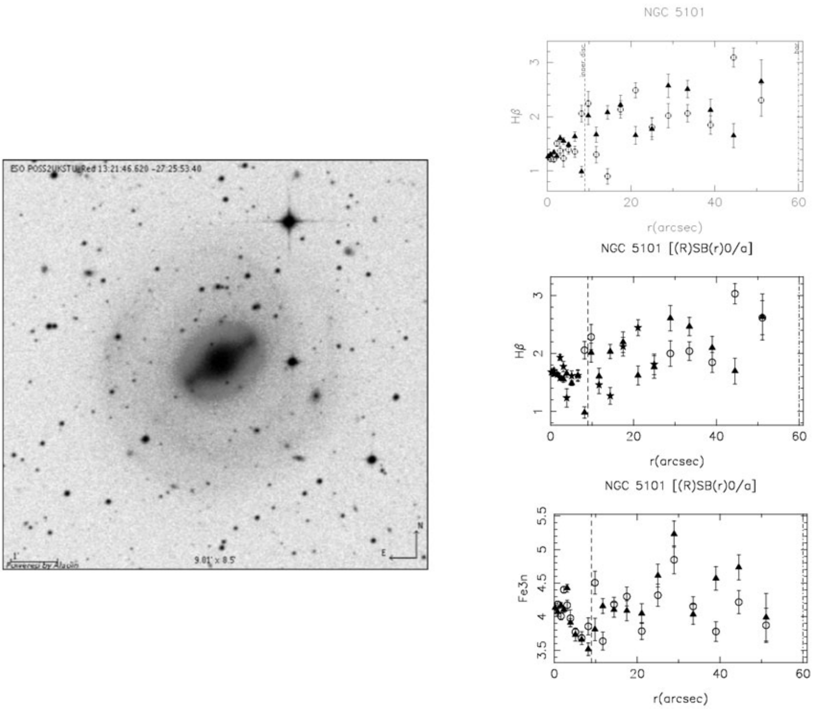

Figure 1. DSS image (9.8×8.5 arcmin), left panel, and radial distribution of two indices for NGC 5101 (a combined Fe index and the H_β), right panels. Right panels: the open circles and the filled triangles represent both sides of the bar. The top panel presents the H_β radial distribution, here the regions where there is emission have been substituted by a normalised template obtained in the calculation of the velocity dispersion. Middle panel, here we have marked all the points with detected emission with a star, where the detection threshold has been calculated with the prescriptions given in Sarzi *et al.* (2006). When the emission completely fills all the absorption Balmer lines, the correction is more uncertain. For those cases, we have marked the points with an arrow. Bottom panel, the combined Fe index. The vertical dashed lines represent the end-point of morphological features, meaning the inner bar or nuclear disk and the primary bar. Notice the general change in the indices for the two regions, the gradients in both, and the fact that the trends in the Balmer indices do not change with different emission line corrections.

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