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Stellar Mass Maps for S^{4}G

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Abstract. We present stellar mass maps for the S^{4}G sample based on imaging at 3.6 μm that we correct for the presence of non-stellar emission using an ICA technique. Our dust-free images can be readily converted into stellar mass maps, and this important legacy dataset will be made public through IRSA.

Keywords. galaxies: photometry — galaxies: structure — galaxies: evolution

1. Context and method

The Spitzer Survey of Stellar Structure in Galaxies (S^{4}G) consists of imaging for 2352 nearby galaxies (D<40Mpc) in the 3.6 and 4.5 μm IRAC bands, an optimal window to trace stellar mass. However, contamination from non-stellar sources (PAH, hot dust) can be locally significant here, severely biasing the derived mass distributions (Meidt *et al.* 2012). We have developed an automatic strategy to identify the old stellar light, based on Independent Component Analysis (ICA), which retains full 2D structural information (Querejeta *et al.* 2014; Fig. 1). As shown by Meidt *et al.* (2014), this dust-corrected 3.6 μm flux can be accurately transformed into stellar mass with even a constant M/L, given the properties of stellar populations at this wavelength.

2. Results

Our final ICA-corrected sample excludes galaxies with low signal-to-noise ($S/N < 10$) and those with colors [3.6]−[4.5] < 0 (already consistent with old stellar populations). We find that the contamination from dust (which results in globally red colors [3.6]−[4.5] > 0) varies with Hubble type, reaching as high as 40%, and typically in the range 20-30% for spiral galaxies. This likely stems from the dependence of the dust emission on SFR and stellar mass: galaxies with high specific star formation rates (SSFR=SFR/Mass) are clearly associated with the highest dust contributions. With our final mass maps, we calibrate a first-order relationship between [3.6]-[4.5] and dust contamination fraction that can be used to determine stellar masses at 3.6 μm in the absence of more information.

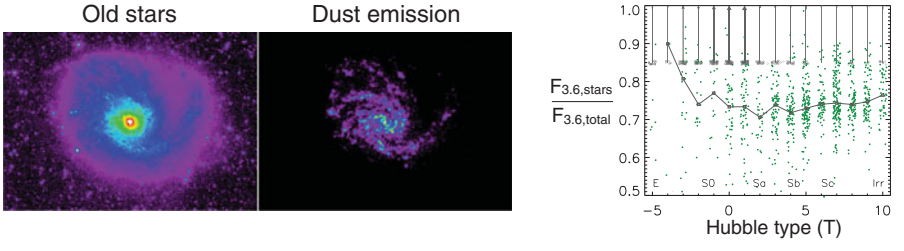

Figure 1. *Left:* ICA map of old stellar flux for NGC4254, next to the identified dust emission. *Right:* fraction of total flux contributed by old stars as a function of Hubble type.