Probing Outer Disk Stellar Populations

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Abstract We have explored radial color and stellar surface mass density profiles for a sample of 85 late-type galaxies with available deep (down to $\sim$27.0 mag/arcsec^2) SDSS g'- and r'-band surface brightness profiles. About 90% of the light profiles have been classified as broken exponentials, exhibiting either truncations (Type II galaxies) or antitruncations (Type III galaxies). Their associated color profiles show significantly different behavior. For the truncated galaxies a radial inside-out bluing reaches a minimum of $(g' - r') = 0.47 \pm 0.02$ mag at the position of the break radius, this is followed by a reddening outwards. The antitruncated galaxies reveal a more complex behavior: at the break position (calculated from the light profiles) the color profile reaches a plateau region–preceded with a reddening– with a mean color of about $(g' - r') = 0.57 \pm 0.02$ mag. Using the color to calculate the stellar surface mass density profiles reveals a surprising result. The breaks, well established in the light profiles of the Type II galaxies, are almost gone, and the mass profiles resemble now those of the pure exponential Type I galaxies. This result suggests that the origin of the break in Type II galaxies are most likely to be a radial change in stellar population, rather than being caused by an actual drop in the distribution of mass. The antitruncated galaxies on the other hand preserve their shape to some extent in the stellar surface mass density profiles. We find that the stellar surface mass density at the break for truncated (Type II) galaxies is $13.6 \pm 1.6\,M_\odot\,pc^{-2}$ and $9.9 \pm 1.3\,M_\odot\,pc^{-2}$ for the antitruncated (Type III) ones. We estimate that $\sim$15% of the total stellar mass in case of Type II galaxies and $\sim$9% in case of Type III galaxies are to be found beyond the measured break radii.

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