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Deprojecting Edge-on Disk Galaxies

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Abstract. The results of a pilot study on the intrinsic 3D distribution of stars in edge-on disk galaxies are presented. The 3D disk structure of a sample of 12 edge-on galaxies has been reconstructed through a direct deprojection of the observed two-dimensional images. The deprojection method – which utilises the so called Fourier slice theorem and assumes axial symmetry – has been tested with a large set of artificial galaxy models seen under a variety of inclinations ($i = 80-90^{\circ}$) and with different spatial dust and optical depths distributions.

1. Method and Results

Deprojection is the most promising way to overcome the problem of parametric fitting of a complex 3D light distribution, caused by the line-of-sight integration for edge-on disk galaxies.

With the current deprojection method we perform two types of deprojections. With the first, we attempt to recreate the face-on view of a given galaxy by summing the light along the presumed axis-of-symmetry. As a result we obtain a face-on-equivalent radial profile for each edge-on galaxy. The main finding here is that the two views yield consistent results independent of the shape of the outer disk, i.e. the presence of a truncation or the exact shape of the outer disk region. For our pilot sample we are able to recover all three main classes of radial surface brightness profiles (not-truncated, truncated, antitruncated) recently found for complete samples of intermediate to face-on galaxies (Erwin *et al.* 2005, Erwin *et al.* 2006, Pohlen & Trujillo 2006). The scalelength and surface brightness parameters of the breaks in the radial light distribution are in agreement with those found in face-on galaxies. Consequently, one concludes that the classification introduced for face-on galaxies is independent of the geometry.

With the second type of deprojection, we derive deprojected radial profiles of several vertical slices that are parallel-to –and include– the major axis and reach several conclusions. Firstly, in the inner disk region (i.e., outside the bulge/bar, inside the break) a general increase of the radial scalelength with increasing distance from the plane is observed. This argues for a common radially flattened component above the disk (e.g. a thick disk). Secondly, the deprojection allows the study of the vertical distribution of the outer disk, i.e., beyond the break region. Here, we even find a much larger increase in the radial scalelength with distance from the plane. In other words, we observe a significant weakening of the truncation with vertical height, a phenomena that needs to be explained. For figures and more information see Pohlen *et al.* (2006).

References

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