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FORMATION OF STELLAR INNER DISKS AND RINGS IN SPIRAL GALAXIES THROUGH MINOR MERGERS

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Recent observations show that inner disks and rings (IDs and IRs) are not preferentially found in barred galaxies, pointing to the relevance of formation mechanisms different to the traditional bar-origin scenario. Nevertheless, the role of minor mergers in the formation of these inner components (ICs), while often invoked, is still poorly understood. We have investigated the capability of minor mergers to trigger the formation of IDs and IRs in spiral galaxies through collisionless N-body simulations. Our models prove that minor mergers are an efficient mechanism to form rotationally-supported stellar ICs in spirals, neither requiring strong dissipation nor noticeable bars, and suggest that their role in the formation of ICs must have been much more complex than just bar triggering.

We have run a battery of minor merger simulations in which both primary and satellite galaxies are modelled as disk-bulge-halo galaxies with realistic density ratios (Eliche-Moral et al. 2011). Different orbits (long and small pericenter orbits, direct and retrograde orbits) and mass ratios (1:6, 1:9, 1:18) are considered, as well as two different models for the primary galaxy (with $B/D = 0.5$ and 0.08).

All the simulated minor mergers develop thin rotationally-supported ICs out of satellite material. A wide morphological zoo of ICs has been obtained (including IDs, IRs, pseudo-rings, nested IDs, nuclear bars, and combinations of them), all with structural and kinematical properties similar to observations (see Figure 1). Their existence can be deduced through the features that they imprint in the isophotal profiles and kinemetric maps of the final remnant, as in many real galaxies.

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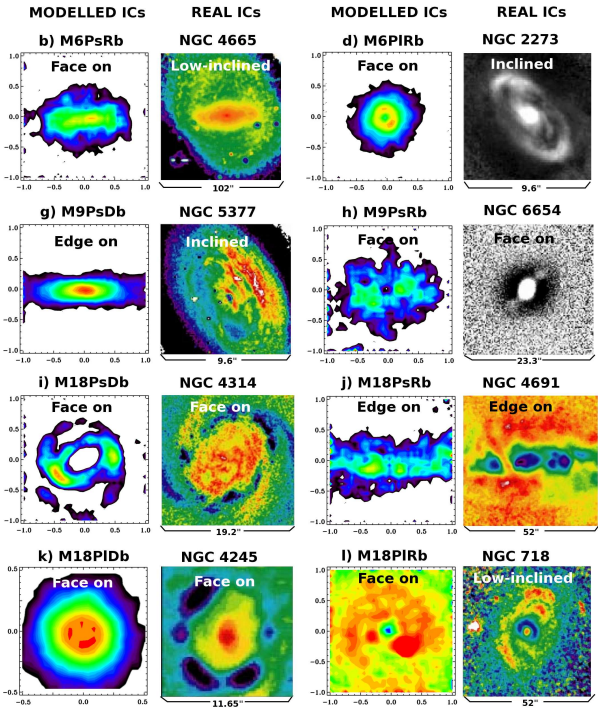

Fig. 1. Comparison of some ICs obtained in our minor merger experiments (first and third columns in the figure) to real observational examples with similar morphologies (second and fourth columns, respectively). We show the surface density maps of the ICs generated in the remnant center out of disrupted satellite material in our simulations. The observational examples are taken from the sample of spiral galaxies with inner components developed by Erwin & Sparke (2003), and are reproduced by permission of the American Astronomical Society (AAS) and of the original authors. Figure taken from Eliche-Moral et al. (2011).

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