

Universal mass-size for bulges and disks

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Quiescent galaxies have significantly smaller and concentrated light profiles than actively star-forming ones at fixed stellar mass. That suggest a link between the quenching process and the morphological structure of the galaxies. The reason of that duality, the role of the growth of the bulge in this morphological change, and which are the main quenching mechanisms, are still open questions that need to be investigated. Here we present the analysis of the structural properties of bulges and disks within galaxies.

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The high resolution, multi-wavelength coverage, of the CANDELS survey allows us to make an accurate bulge-to-disk decomposition of the surface brightness profile of ~17000 galaxies (GalfitM, Haeussler et al 2014). All galaxies in the sample are selected with magH<23. This limit is estimated through simulations to ensure the reliability of final the models.



Profile selection

We introduced a new approach based on unsupervised feature learning) to select the best model to fit a galaxy, a-priori, instead of looking at the output results or at the residual maps. That allows us to have a better control of the systematics and to build clean samples of bulges and disks.

Mass-size for bulges/disks





RESULT: The position of bulges and disks in the mass-size plane does not depend on whether the host galaxy is forming stars or not, nor on its morphology.

RESULT: The evolution of bulges and disks does not depend on whether the host galaxy is forming stars or not, nor on its morphology.



- Galaxies without bulge are mostly in the main sequence
- Galaxies with B/T > 0.2 are equally distributed between the quiescent and
 - star forming region

CONCLUSION

- Bulges and disks follow different mass-size relations at all redshifts: At fixed stellar mass bulges are smaller than disks.
- The mass-size relation of bulges/disks agree well with the mass-size relation of the passive/star forming population : the mass-size relation is guided by the dominant component, bulge for the quiescent galaxies, disk for the star forming one.
- The position of bulges and disks in the mass-size plane does not depend on the morphology: it suggests that the mechanisms of bulge growth are the same for all galaxy morphologies. Or if different, they do not leave any imprint on the structure of the bulge.
- The evolution of the median sizes of bulges and disks, at fixed stellar mass, is independent of the morphology of the host galaxy and its star- \bullet formation activity
- Bulges and disks living in quenched and star-forming galaxies have the same structural properties: A possible interpretation is that quenching does not seem to impact the structural properties of bulges and disks
- Quiescent galaxies without bulge do not exist, in the limit of our analisys : The presence of a bulge is a necessary but not sufficient condition for quenching.