

UNIVERSIDAD DE GUANAJUATO
DIVISIÓN DE CIENCIAS NATURALES Y EXACTAS
DEPARTAMENTO DE ASTRONOMÍA



STUDY OF THE TIDAL INTERACTIONS AND MORPHOLOGY
TRANSFORMATION OF SPIRAL GALAXIES IN CLUSTERS

TESIS PRESENTADA PARA OBTENER EL GRADO DE:
DOCTORADO EN CIENCIAS (ASTROFÍSICA)

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Guanajuato, México.
2019

Dedicated to: My family

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Acknowledgements

This research thesis would not have been impossible without a scholarship. I would like to thank the Consejo Nacional de Ciencia y Tecnologia (CONACyT) for the scholarship I received from the period of January 2014 to December 2017.

I would like to express my profound gratitude to my supervisor, Dr. Hector Bravo, who played the central role while making this achievement a reality through his scientific contributions, encouragement and professional advice. Above all, he receives my sincere gratitude for giving me confidence and encouragement during my downtimes, and sharing positive thoughts through the journey of this research project.

A special thanks to Dr. Catarina Lobo for her academic support and unceasing help during the Ph.D. process. I am grateful for her assistance in the photometry studies and helping me to learn different astronomical software, etc.

I further thank Dr. Florence Durret and Dr. Dario Fadda for their optical and NIR images. I have used their wide-field images in my chapter 4 and I would like to thank them for their kindness to share their data with me.

I acknowledge with gratitude the moral support of Dr. Solai Jayakumar rendered during my stay. I am grateful to Dr. Divakara Mayya, who brought me to Mexico and helped me in this project. I extend my thanks to the faculty and staff members at the Department of Astronomy and the University of Guanajuato for their warm welcome and tremendous support.

From bottom of my heart I want to thank Dr. Ce'sar Augusto Caretta and his wife Dra. Elcia Margareth Souza Brito without their support and encouragement, none of this would have been possible. Thanks for their help, for allowing us to stay at their house and supporting me and my family in every way. They have shared their knowledge and experience with us and taught me so much!

I further express my heartfelt gratitude to my friends, Jacqueline Yez, Elena Doate, Gabriel Cobielles, Luzma Munoz De Cote, Jane Ashley and Reginald Robotham in Mexico. Many thanks for their continuous input and support.

I wish to thank My Indian friends, Dr. Solai Jayakumar, Dr. Senthilkumar D. K. Dr. Jayaram, Priya, Yamini, John Danial, and Sathish, Muruganantham, for their love, care and moral support on this journey in Mexico. Especially, Thanks to Dr. Velayudam Ramadoss, my brother, who was there for me when I was in trouble or worried. Even without a call, he was always there to help me during the happy and hard moments to push me and motivate

me. Many thanks for being such a good-hearted person.

Furthermore, I would like to extend my thanks to all my colleagues and friends of the Astronomy Department of Gunajuato University.

Last, but not at all least, I would like to thank my family: my parents N. Venkatapathy and Indirani Venkatapathy, my brother V. Balaji and my sister-in-law B. Sathiya, and sister B. Vasanthi. Their constant love supports me throughout my studies and my life. A very special thanks to my better half, Y. Sunganya, and my little one Amizhdna for their patience and understanding always.

ABSTRACT

The present study is focused on one of the key problems of galaxy evolution occurring in the last giga-years: the origin of the morphology-density relation and the mutation of spirals into S0s during their infall and arrival to the cluster environment. In particular, we devoted this work to quantify the role played by tidal interactions in this process, as they constitute one of the most important physical mechanisms affecting galaxies, either by galaxy harassment or through pre-processing mechanisms. Our observational strategy is mainly based on a series of near infrared (NIR) images of the nearby Abell clusters: A1367, A496, and A85. We used these frames as tracers of the old stellar distribution: since NIR does not suffer from contaminating light from star-forming regions. We study the morphology of selected samples of galaxies in the three clusters mentioned above, taking into account that distortions shown in the old stellar disks are a good tracer of tidal interactions. In this work we propose a new asymmetry index, α_{A3} , which is more sensitive to low surface brightness features present in the galaxy outskirts. In addition, we developed a software package to measure this asymmetry index in wide-field images containing several hundreds of galaxies, processed in a semi-automatic way. By applying these tools to measure the degree of asymmetry of selected samples of galaxies we are able to quantify the role played by tidal interactions in galaxy evolution. Globally, we found that gravitational pre-processing is particularly active in the clusters A85 and A1367, while individual objects in A496 seem to be under strong galaxy harassment.

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