UNIVERSIDAD DE GUANAJUATO

CAMPUS GUANAJUATO

DIVISIÓN DE CIENCIAS NATURALES Y EXACTAS

IDENTIFICATION AND CLASSIFICATION OF COMPACT RADIO SOURCES IN THE M17 REGION WITH VLA OBSERVATIONS

Tesis presentada al

POSGRADO EN CIENCIAS (ASTROFÍSICA)

como requisito para la obtención del grado de

MAESTRA EN CIENCIAS (ASTROFÍSICA)

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Guanajuato, Gto. - Agosto 2020

VANESSA YANZA LÓPEZ:
IDENTIFICATION AND CLASSIFICATION OF COMPACT RADIO SOURCES IN THE M17 REGION WITH VLA OBSERVATIONS
Master of Science (Astrophysics)

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LOCATION:
Guanajuato, Gto.
Mexico

TIME FRAME:
August 2020

For all the children who one day dreamed of being astronomers and admired the stars from the distance of society

RESUMEN

Esta tesis realiza un catalogo de radio fuentes compactas (RFC) no sesgado en la región de M17 con sus propiedades y analiza su naturaleza. Los datos fueron tomados usando el VLA actualizado en su configuración A y banda X ($8-12$ GHz), $\sim 0.2''$ de resolución, en tres épocas: 3,4 y 8 de Mayo del 2018. La calibración y autocalibración fueron aplicadas a los datos usando CASA para finalmente obtener un mapa de 5 μJy $beam^{-1}$ de nivel de ruido. Luego, las RFC fueron extraídas del mapa final usando tres software: Pybdsf, Aegean y BLOBCAT, obteniendo que este último daba los mejores resultados. Así obtuvimos un catálogo preliminar de 200 RFC. Después de esto, obtuvimos bajo inspección visual un total de 12 fuentes extendidas y un catálogo de 182 fuentes compactas. Para inspeccionar más a fondo su naturaleza, buscamos algunas de sus propiedades, como: contrapartidas en otras longitudes de onda, índice espectral, alta variabilidad rápida y polarización. Finalmente, su naturaleza fue discutida en dos grupos principales: fuentes térmicas y no térmicas, obteniendo un total de 26 fuentes térmicas y 63 no térmicas. Esto indica una predominancia de estrellas inesperadas de Clase III ($\sim$ 35%) dentro de la región, concluyendo que M17 contiene un cúmulo evolucionado. Por otro lado, la inspección de su distribución espacial deja en evidencia que no ha ocurrido ningún brote de formación estelar recientemente, y que ésta ha sido gradual a lo largo del tiempo de vida de la nube.

ABSTRACT

This thesis makes a compact radio sources (CRS) catalog not biased in the M17 region with their properties and analyzes their nature. The data were taken using the upgraded VLA in its A configuration and X band ($8-12$ GHz), $\sim 0.2''$ of resolution, in three epochs: May 3, 4 and 8 of 2018. The calibration and self-calibration were applied to the data using CASA to finally obtain a map of 5 μJy beam^{-1} of rms noise level. Then, the CRS were extracted from the final map using three software: Pybdsf, Aegean and BLOBCAT, obtaining that the latter give us the best results. Thus, we obtained a preliminary catalog of 200 CRS. After that, we obtained under a visual inspection a total of 12 extended sources and a catalog of 182 CRS. To further inspect their nature, we looked for some of their properties like: counterparts at other wavelengths, spectral index, rapid high variability and polarization. Finally, their nature were discussed in two main groups: thermal and non-thermal sources, obtaining a total of 26 thermal and 63 non-thermal CRS. This indicates a predominance of unexpected Class III stars ($\sim$ 35%) within the region, concluding that M17 is a evolved cluster. On the other hand, the inspection of their spatial distribution show that no outbreak of star formation has occurred recently, and this has been gradual throughout the lifetime of the cloud.

ACKNOWLEDGEMENT

This thesis was developed thanks to the financial support granted by CONACyT during my master's studies to obtain the degree of Master of Science in the specialty of Astrophysics. Likewise, I thank the University of Guanajuato for having opened the doors for me to study a master degree at a public and quality university.

I am infinitely grateful for all the support received by my supervisors Dr. Josep María Masqué and Dr. Sergio Dzib during this process. If this thesis has been successfully completed it is thanks to them. Thanks also to Prof. Dr. Karl M. Menten for giving me the opportunity to make an internship at the Max Planck Institute for Radio Astronomy in Germany during those two very knowledge-enriching months. I thanks collages at the Max Planck Institute, specially to Dr. Sac Nicté Medina for the knowledge she gave me.

Finally, thank all my close ones, family and friends, who supported me and were with me unconditionally. Specially my parents Liliana López and Enrique Yanza for their love and support despite the distance.

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