MODELLING THE DUSTY CIRCUMSTELLAR ENVELOPES OF AXISYMMETRIC POST-AGB STARS

A. M. Pérez-Estrada[1], Carlos A. Molina[1,2], and A. F. Pérez-Sánchez[3]

We studied the dust component of the dense circumstellar envelope (CSE) of two post-AGB sources known as Water Fountain nebulae: IRAS 16342-3814 and IRAS 18113-2503. The goal was to derive some of their physical properties and determine the dust temperature distribution of the sources. It has been proposed that axisymmetric post-AGB stars could be the progenitors of non-spherical planetary nebulae. The study of the structure and physical properties of the dusty CSE of these sources allows the assessment of this hypothesis, and casts light on the processes that occur during the last stages of evolution of low- to intermediate-mass stars.

We considered a model with a dust density distribution consisting of a spherical distribution in the external region of the CSE and a component with axial symmetry inside, as well as a set of physical parameters for each source. Then, we performed radiative transfer calculations using the RADMC-3D code, which is a software package that runs thermal Monte Carlo simulations to compute the dust temperature, images and spectra for a model in dust continuum. We compared synthetic infrared spectral energy distributions with those observed by telescopes such as Spitzer and ISO, in order to get the best fit possible. As a result, we found good fits for both sources and axisymmetric dust temperature distributions for each one. Therefore, we concluded that our model is a suitable approximation to describe the dusty CSE of these stars, and it might be proposed to model the other water fountain sources known to date.

[1] Instituto de Física, Universidad de Antioquia, Medellín, Colombia (carlos.molina@parqueexplora.org).
[2] Planetario de Medellín Jesús Emilio Ramírez González, Medellín, Colombia.
[3] Instituto de Radioastronomía y Astrofísica, Universidad Nacional Autónoma de México, Campus Morelia, Apartado Postal 3–72, 58090 Morelia, Michoacán, México.

SPECTRAL MONITORING OF AB AUR

Luisa F. Rodríguez Díaz[1] and Benjamín Oostra[1]

The Astronomical Observatory of the Universidad de los Andes in Bogotá, Colombia, did a spectral monitoring during 2014 and 2015 to AB Aurigae, the brightest Herbig Ae/be star in the northern hemisphere. The aim of this project is applying spectral techniques, in order to identify specific features that could help us not only to understand how this star is forming, but also to establish a pattern to explain general star formation processes. We have recorded 19 legible spectra with a resolving power of R = 11,0000, using a 40 cm Meade telescope with an eShel spectrograph, coupled by a 50-micron optical fiber. We looked for the prominent absorption lines, the Sodium doublet at 5890 Åand 5896 Å, respectively and Magnesium II at 4481 Å; to measure radial velocities of the star, but, we did not find a constant value. Instead, it ranges from 15 km/s to 32 km/s. This variability could be explained by means of an oscillation or pulsation of the external layers of the star. Other variabilities are observed in some emission lines: Hα, Hβ, He I at 5876 Å and Fe II at 5018 Å. It seems this phenomenon could be typical in stars that are forming and have a circumstellar disk around themselves. This variability is associated with the nonhomogeneous surface of the star and the interaction that it has with its disk. Results of this interaction could be seen also in the stellar wind ejected by the star. More data are required in order to look for a possible period in the changes of radial velocity of the star, the same for the variability of He I and Fe II, and phenomena present in Hα. We plan to take new data in January of 2017.

[1] Universidad de los Andes, Bogotá, Colombia (lf.rodriguez11,boostra@uniandes.edu.co).