RevMexAA (Serie de Conferencias), **44**, 16–16 (2014)

THE INTERNAL DENSITY STRUCTURE OF GIANT HII REGIONS

H. O. Castañeda[1], H. E. Caicedo Ortiz[2], and J. Pérez Oregón[1]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

Measuring the local density of the ionized gas, we study the internal structure of giant HII regions in the galaxies NGC 6822 and M 33. The data shows density gradients in restricted areas within the objects, a result that should be taken into consideration in the estimation of the chemical abundances of gaseous nebulae. The results will allow to separate different models of radial gas distribution within the objects.

A knowledge about the electron density in gaseous nebulae is necessary to estimate the mass of the ionized gas, to determine the ionization structure, and to calculate the chemical composition (Castañeda, Vilche, & Copetti 1992).

Generally, theoretical models assume an uniform density nebula. If the density is not constant the calculations could produce an erroneous determination of the age and IMF of the stellar cluster due to an overestimation of the hardness of the ionizing field (Luridiana & Peimbert 2001) or a wrong estimation of the helium abundance. The objetive of our program is to obtain density maps for a selected group of giant HII regions, and produce more realistic models of the internal structure of the objects.

Long slit spectroscopy data was available via the archive at the Cambridge Astronomical Survey Unit (CASU), based on spectra obtained by the ISIS spectrograph of the William Herschel Telescope at the Observatorio del Roque de los Muchachos (Canary Islands). The electronic density was obtained from the [SII]$\lambda\lambda$6717,6731 doublet. We used an analytical solution to the five level atom, with the aim to obtain a general equation for the electronic density and to be able to study analytical models for the density distribution within the region. For all the regions we determined the density point to point. Using the method of bidimensional interpolation of Renka-Cline we produced bidimensional maps for the density structure, based on the long slit spectroscopy (Caicedo Ortiz 2011).

[1]Departamento de Física, Escuela Superior de Física y Matemáticas, Instituto Politécnico Nacional, Ed. 9, Unidad Profesional Adolfo Lopez Mateos, Zacatenco, C.P. 07738, México D.F., México (castaneda@esfm.ipn.mx).

[2]Grupo de Ingeniería y Tecnologías Cuántica, Corporación Universitaria Autónoma del Cauca, Popayán, Colombia.

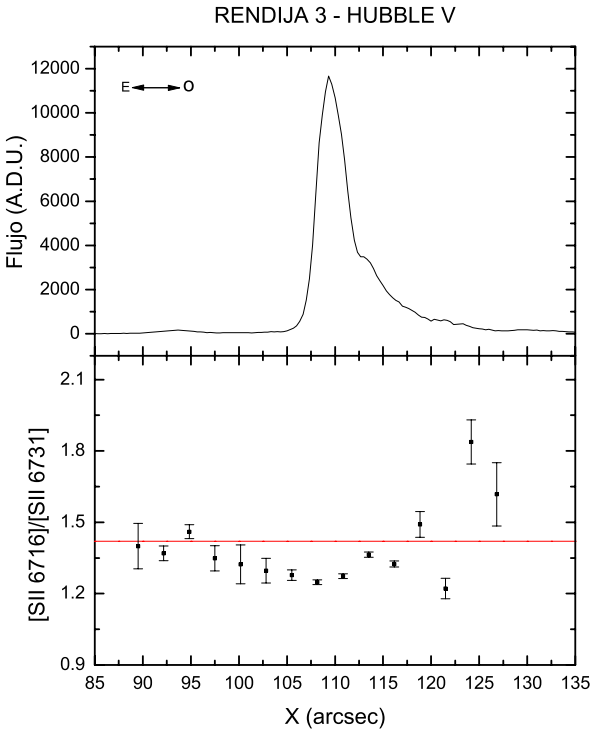

Fig. 1. Example of density variation along the slit position for a single position in the region Hubble V.

NGC 6822: for Hubble V densities are in the range 10-300 cm^{-3}, whereas that for Hubble X the range is 10-400 cm^{-3}. An examination of the variation of the density along the slit shows, in the case of Hubble V, the presence of gradients (see Fig. 1).

M 33: for NGC 604 we found changes in the density doublet that seems to be associated with a density gradient. We found that in some cases a peak in the surface brightness is not associated to a peak in density, that we understand are caused by large column densities, and not for local variations in the density. This behaviour is also observed in NGC 595, that does not show significant variations of the density within the region.

REFERENCES

Luridiana, V., & Peimbert, M. 2001, ApJ, 533, 633

Caicedo Ortiz H. E. 2011, Tesis de Maestría, Instituto Politécnico Nacional, Mexico

Castañeda, H. O., Vilchez, J. M., & Copetti, M. V. F. 1992, AA, 260, 370