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THE DIFFUSE IONIZED GAS IN GALAXIES

M. Rozas, J. A. López and M. Richer

Instituto de Astronomía, UNAM, campus Ensenada

J. E. Beckmanx and A. Zurita

Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain

RESUMEN

Investigar el gas difuso ionizado y sus procesos físicos subyacentes son el punto focal de este estudio. Proponemos analizar la prevalencia, morfología, distribución y luminosidad del gas difuso ionizado así como sus variaciones con morfología galáctica.

ABSTRACT

An investigation of the diffuse ionized gas (DIG) and its underlying physical processes is the focal point of this study. We aim to survey the prevalence, morphology, distribution, and luminosity of the DIG as well as its variations with galaxy morphology.

Key Words: **HYDRODYNAMICS — ISM: H II REGIONS**

1. INTRODUCTION

It has recently been shown that all nearby galaxies have gaseous haloes, and that a large fraction of these haloes are filled with diffuse ionized gas (DIG). This DIG appears to be the dominant component of ionized gas in terms of mass and perhaps also of the filling factor in galactic disks. Yet, despite its obvious presence, the origin and properties of this DIG are still not understood. The enormous energy required to mantain this ionization against energy losses through recombination and collisional cooling places serious restrictions upon the possible energy sources. Likewise, it is unknown whether the morphology of the DIG is smoothly distributed or filamentary, nor whether it is mainly distributed within or perpendicular to the disk. Furthermore, the fraction of the total Hα luminosity the DIG represents and any variations of these parameters as a function of morphological type or star formation rate remain unclear, though all are undoubtedly related to the porosity of the ISM.

2. THE STUDY OF DIFFUSE IONIZED GAS WITH OSIRIS

The use of the GTC with OSIRIS and its tunable filter capability provide many advantages over other spectroscopic techniques for the study of the DIG. This study involves observing a major sample of H II regions at a uniform distance covering the full face of each H II region and their radial distribution across face-on galaxies. Narrow and broad band images of a sample of nearby spiral galaxies spanning a variety of morphological subtypes, both with and without nuclear activity, are considered in this study. In this way, electron densities and temperatures, filling factors, reddening, photo- and shock-ionization, and galactic stellar populations will be determined in this survey. Thus, the information provided by the database will allow us to analyze the content and spectral properties of the ionized gas throughout the sample of program galaxies, thereby allowing determination of the extent and morphology of the DIG, as well as the physical mechanisms that generate and sustain it.

Tunable filters will deliver optimum S/N for two-dimensional imaging, allowing us to separate pairs of lines as close as the [S II] doublet. At the same, it will provide wavelength tuning flexibility to optimize transmission for the required emission line at an arbitrary recession velocity. Given the typical Hα surface brightness that must be attained ($\sim 10^{-19}$ erg s^{-1} cm^{-2} arcsec^{-2}), the GTC + OSIRIS combination will allow us to carry out this survey in a sensible amount of time.

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