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LOW LUMINOSITY AGN CANDIDATES IN SDSS

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RESUMEN

En una muestra de 476931 galaxias con líneas de emisión agostas del Sloan Digital Sky Survey Data Release 5, identificamos y estudiamos galaxias de las cuales algunas importantes líneas de emisión usadas para determinar la naturaleza de su actividad ([OIII]λ5007Å, Hβ, o ambas) no están presentes. Este fenómeno afecta al 22% de las galaxias con líneas de emisión y no esta relacionado con una baja razón de señal a ruido. En el diagrama comparando el ancho equivalente EW([NII]λ6584) con la razón de línea [NII]λ6584/Hα, la mayoría de estas galaxias se clasifica como AGN. El FWHM de la línea Hα es del orden de 400 km s^{-1} y la luminosidad mediana es 5.6×10^{39} erg s^{-1}, lo cual justifica la clasificación de estas galaxias como AGN de baja luminosidad. Un estudio en sus historias de formación estelar usando STARLIGHT revela que no existe formación estelar en el último Giga año. Las galaxias anfitrionas de las LLAGNs son de tipo morfológico temprano con bulbos más masivos que los de AGN luminosas.

ABSTRACT

In a sample of 476931 NELGs obtained from the SDSS DR5 data we find that in 22% of the galaxies the emission line [OIII]λ5007, Hβ, or both, are missing. The nature of the activity in these galaxies was determined using a diagnostic diagram comparing the equivalent width of [NII]λ6584 with the ratio [NII]λ6584/Hα. The majority of these galaxies are AGN. The Hα emission lines have a mean FWHM of 400 km s^{-1} and mean luminosity of 5.6×10^{39} erg s^{-1}, which justify their classification as LLAGN. A study of their star formation histories using STARLIGHT reveals no trace of star formation over the last Gyr period. The hosts of the LLAGNs are early-type, $T \leq 2$, with bulges more massive than those of the luminous AGNs.

Key Words: galaxies: active

1. INTRODUCTION

Many galaxies show narrow emission lines in their spectra. We call them Narrow Emission Line Galaxies (NELGs). Following the seminal studies of Baldwin, Phillips, & Terlevich (1981) and Veilleux & Osterbrock (1987) various spectroscopic diagnostic diagrams were devised to determine the nature of their ionization sources. The majority of NELGs traces a sequence in ionization consistent with OB stars, which categorizes them as Star Forming Galaxies (SFGs). A smaller fraction shows an excess of ionization that cannot be explained by star forming activity. It is usually assumed that their source of ionization is non thermal. These galaxies are generally classified as Active Galactic Nuclei (AGNs). Galaxies falling in between SFGs and AGNs are then classified as Transition Type Objects (TOs).

In a sample of 476931 NELGs from the Sloan Digital Sky Survey Data Release 5 (Adelman-McCarthy et al. 2007) we find three different cases of NELGs where the most important emission lines used in standard diagnostics diagrams are missing. We count 68491 galaxies without Hβ, 27985 without [OIII] and 10926 without both lines. This represents 22% of the whole sample. Discarding NELGs with S/N < 3 (S/N > 10 in the continuum) leaves 224846 galaxies (47% of the original sample). We now count 34307 galaxies without Hβ, 12455 without [OIII], and 2840 without both lines, again amounting to 22% of the sample. This shows that the absence of emission lines is not a phenomenon related to low S/N.

Using the spectral synthesis code STARLIGHT (Cid Fernandes et al. 2005) the fluxes and EW in Hα and [NII]λ6584 were measured and compared to determine the activity type of the NELGs with emission lines missing (Coziol et al. 1998). We summarize our results in Figure 1. The majority of NELGs with emission lines missing fall on the AGN side of the diagram. This is particularly true for the galaxies without Hβ. The median Hα luminosity ranges between 1.7×10^{40} erg s^{-1} for the galaxies without [OIII], and 5.6×10^{39} erg s^{-1} for the galaxies without Hβ. The low luminosity justifies the classification of these galaxies as Low Luminosity AGNs (LLAGNs).

The NELGs with emission lines missing have broader line profiles than the SFGs. After correc-

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