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Searching for emission-line objects in external galaxies *

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Abstract. We are carrying on several surveys in nearby galaxies aiming to find, catalogue and study old and young emission-line objects as H II regions, Planetary Nebulae, Symbiotic stars, SNRs to unprecedent levels. In particular, we are interested in extragalactic PNe and Symbiotic stars with subsequent spectroscopic study of each individual candidate. In this paper, we will show our recent studies on PNe belonging to three nearby galaxies: the spiral galaxies M 33 and M 81 and the dwarf irregular galaxy Sextans B.

Key words. ISM: planetary nebulae: general – galaxies: individual: M33, M81, Sextans B

1. Introduction

Planetary nebulae (PNe) are outstanding components of the intermediate stellar population and are present in galaxies of different morphological types and in different chemical environments. They are the best tracers of the kinematic properties of basic morphological components of galaxies (disks, bulges, haloes). They can also be used as tracers of the metallicity in nearby galaxies, where the relevant emission lines for abundance determination can be measured directly in individual nebulae. Our aim is to search for them with the usual on-band off-band technique and then to study spectroscopically individual candidates. In the following sections, we briefly present our recent results.

2. Spectroscopy of planetary nebulae in M 33

In November 1998, we observed M 33 with the Isaac Newton 2.6-m telescope and using the on-band off-band technique, we discovered 131 new planetary nebulae (Magrini et al. 2000). We are now investigating with spectroscopy their nature (ob-

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* Based on observations obtained at the 4.2-m WHT and 2.6-m INT telescopes operated on the island of La Palma by the Isaac Newton Group in the Spanish Observatorio del Roque de Los Muchachos of the Instituto de Astrofísica de Canarias

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servations at the 4.2-m William Herschel Telescope, October 2001). Our aim is to quantify the degree of contamination with compact H II regions and SNRs due to our detection criteria. We observed 39 PNe and we could have useful spectra for 36 of them. We analyzed the position of our candidates in the Cantò diagnostic diagram (Hα/[S II] vs Hα/[N II]) and we confirmed that 26 of the observed 36 candidate PNe with reliable spectra are very likely genuine PNe. Thus, these spectra confirm the overall reliability of the two criteria we adopted to select candidate PNe in galaxies of the Local Group from ground-based narrow-band imaging: *i)* they should appear both in the [O III] and Hα+[N II] images but not in the continuum frame, and *ii)* they should have a stellar point spread function. The degree of contamination with compact H II regions found for M 33 is approximately 19%, and with SNRs is 9%.

At the moment, we are investigating the possibility to have chemical abundances and electron temperature and density determinations from the spectra we have collected. In spite of non-optimal weather conditions during the observations, the faint [O III] 4363Å line has been detected in six PNe, allowing us to obtain their electron temperature and He, O, N, S, Ar chemical abundances. A paper about these results is in preparation (A&A submitted).

3. Planetary nebulae in Sextans B

During our Local Group Survey, a narrow- and broad-band imaging survey of all the norther galaxies of the Local Group obtained with the Wide Field Camera at the 2.6-m Isaac Newton Telescope as a part of the Isaac Newton Group's Wide Field programme, five PNe have been discovered in the nearby irregular galaxy Sextans B. This is a notable result considering the limited number of PNe known in the other dwarf galaxies of the Local Group. Given its distance, the PN census in Sextans B may be expected to be less deep than that in the LMC. However, the two fall on the same line in the diagram showing the number of PNe versus the $V-$band luminosity of the galaxy, in solar units (see Magrini et al. 2002). This could be explained if Sextans B has a large portion of intermediate-age stars, with a significant fraction of star formation over the past 5 Gyr, compared to LMC: a younger population has a higher death rate and will produce more PNe.

4. Planetary nebulae in M 81

In total, we have discovered 171 candidate PNe in M 81 (Magrini et al. 2001), 117 of which are new, while 54 coincide with those found by Jacoby et al. (1989) in the central $4' \times 4'$ bulge. The behaviour of the PNe excitation across the galaxy was examined, finding no evidence for substantial differences in excitation between bulge and disk PNe, nor variations along the galaxian disk. The ratio R=I([O III])/I(Hα+[N II]) is a good indicator of the temperature of the central star but also depend on the properties of the nebula like its geometry, electron density and temperature. The distance to M 81 has been estimated using the bright cutoff of the planetary nebulae luminosity function. The resulting distance is 3.84 ± 0.41 Mpc in good agreement with previous determination using Cepheids (Huterer et al. 1995).

References

Huterer, D., Sasselov, D. D., & Schechter, P. L. 1995, AJ, 110, 2705
Jacoby, G. H., Ciardullo, R., Holland, C. F., & Booth, F. 1989, ApJ, 344, 704
Magrini, L. et al. 2000, A&A, 355, 713
Magrini, L., Perinotto, M., Corradi, R. L. M., & Mampaso, A. 2001, A&A, 379, 90
Magrini, L. et al. 2002, A&A, 386, 869