Planetary nebulae in NGC 300: the PNLF

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From [O III] 5007 on-band/off-band images we have detected a large number of PN candidates in a central field and an outskirts field in the spiral galaxy NGC 300. Instrumental magnitudes have been measured and calibrated with follow-up spectroscopical data. These data allow us to compute the [O III] 5007 Planetary Nebulae Luminosity Function and to discuss its characteristics.

PLANETARY NEBULAE IN NGC 300: the PNLF

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Abstract

From [OIII]5007 on-band off-band imaging obtained with FORS2 at the VLT, Paranal, Chile, in two zones on NGC300 (center and outskirt zones), more than a hundred PNe candidates have been detected. Instrumental magnitudes for these objects were calibrated using results from follow-up spectroscopy of some objects. The PNLFs were computed. The distance modulus derived with this method is 26.49±0.20 mag in close agreement with distances derived from Cepheid's and other wethode. and other methods.

. 300: a Sd spiral in iculptur group ance 2.1 Mpc. aeter ~ 20 Kpc tral abundance 12+log O/H~8.57. red squares should be served





Fig. 2. PN candidates in the central region, colored by magnitudes. Color code: cyan: 22 mag, red: 23 mag, blue: 24 mag, green: 26 mag, yellow, magenta and blue: fuller objects.

Observations and data reduction: [OIII] 5007 on-band off-band imaging was performed at the VLT, with FORS2, on 2006-07-04 (pre-imaging of program ID 077.B-0430). The central zone (RA: 00:54.49.00, DEC: -37:41:02.0) and an external zone (RA: 00:55:22.00, DEC: -37:43:00.0) were observed with total exposure time of 12.5 min each frame. The covered area is 6.8x6.8 arcmin in each case (see Fig. 1). Emission line objects were searched with the "blinking" technique. Planetary nebula candidates were selected as those stellar objects with no detection of a central star. In Fig. 2, we present the PN condidates detected in the particular provide the modular detected of the particular provide the modular detected of the particular providence were measured and we present the PN candidates detected in the central zone. Instrumental magnitudes were measured and transformed to [OIII] 5007 apparent magnitudes by using the follow-up spectroscopic data obtained with the same instrument, for a few tenths of objects (see Hernández-Martínez et al. 2009 for a complete description of the procedure). The relation between spectroscopic fluxes and instrumental magnitudes is shown in Fig. 3.

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- 44	00.54.55.09	37.4314.70	22.50			135.074	20.45	
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	10.54.58.48	37.41.14.59	22.14			-13.569	23.23	3.10
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	00-65-61-74						24.67	
		-37.33.04.68	23.05		-18.052		29.62	
- 22		-37.43.42.45	22.44			-13.003	20.43	0.20
	00.55.03.07	-37.43.53.53	20.05					4.4
	00.30.04.04	37.47.38.95	23.33			-18.006	20.38	
- 11	1015555445	-17-42-44-27				128.150	20.15	2.12
	00.55.05.51	37.5529.04				138.000	20.47	
-44	MC88.55.77	AC 82 11.88	40.58	1.0.04			23.34	
							29.17	
		-3741.02.01	23.34			14.064	26.43	
	00.55.06.11	3741.13.22	23.61			14.139	20.66	
	00.30.08.94	374548.98	22.78				23.78	
			23.88				10.72	
			62-35		15.527		25.22	
		-37.44.08.93						
-21		-11-44-12-03			14, 237	148.034	28.50	
- 61					-18.271	-18.133	20.53	
- 44	10.25.23.68	37.48.55.43	21.63		-35.273	155,340	24.63	
			10.03				22.42	
- 22		37.44.53.48	23.64		-18.023		20.60	
	80.55.33.34	37.45.15.68	20.23				23.34	
-01			21.13				24.11	
1.00		37.44.21.03	20.14			188.377		

In black, the PN candidates of the central zone. In red, those of the outskirts. Column 2 & 3: coordinates. Columns 4 & 5: instrumental magnitudes and errors Columns 7 & 8: calculated 5007 fluxes and magnitudes.

69 PN candidates were detected in the central zone and more than 30 in the external zone. They are presented in Table 1, where we include coordinates, instrumental and calibrated [OIII] 5007 magnitudes. Softner et al. (1996) reported 34 PN candidates in NGC 300; we detected all but their 6 faintest objects. From our data, the observed PNLF for the central and external zones were computed. Both PNLF resulted similar. The one corresponding to the central zone is shown as a histogram in Fig. 4. The bin for the observational PNLF was 0.78 mag. In this figure we include the fit of the expression proposed by, e.g., Clardullo et al. (1990) for the expected PNLF given by: N(M ~ exp(0.307 N) (1-exp(3.017 N) (1-syc[3.014*]) where M is the [OIII] 5007 absolute magnitude of PNe and M* is the magnitude of the brightest object. Fig. 4 shows the PNLF calculated for the apparent magnitudes m(5007), which are related to M through the distance modulus (µ). The fit to the observed PNLF allows to determine m* (the apparent magnitude of the brightest PN) and, after correcting by extinction, the distance modulus for NGC 300 can be estimated by considering a canonical value M*=4.47mag and a reddening A(5007) ~ 0.20 mag (Gieren et al. 2005), the distance modulus resulted to be 26.49±0.20, in close agreement with the value 26.37±0.08 derived from Cepheids (Gieren et al. 2005). modulus i e. et al. 2005).



Neterences
(*) Clardullo, F., Gieren, W., Kudritzki, R., et al. 2009, ApJ, 700, 309; (*) Clardullo, R., Jacoby, G.H., Ford, H.C., Neill, J.D., 1990 ApJ, 339, 53; (*) Gieren, W., Pietrzynsky, G., Soszynsky, I. et al. 2005, ApJ, 628, 695; (*) Hernández-Martínez, L., Peña, M., 2009, A&A, 495, 447; (*) Soffner, T., Méndez, R.H., Jacoby, G.H., et al. 1996, A&A, 306, 9