Co-Evolution of Central Black Holes and Galaxies
Proceedings IAU Symposium No. 267, 2009
B. M. Peterson, R. S. Somerville, & T. Storchi-Bergmann, eds.

doi:10.1017/S1743921310006794

GMOS IFU Observations of the Gas Kinematics in the Radio Galaxy Arp 102B

Guilherme d. S. Couto[1], Thaisa Storchi-Bergmann[1], Rogemar A. Riffel[1], D. J. Axon[2], and A. Robinson[2]

[1]Universidade Federal do Rio Grande do Sul, IF, CP 15051, Porto Alegre 91501-970, RS, Brazil
Email: guilherme.couto@ufrgs.br

[2]Physics Department, Rochester Institute of Technology, NY 14623, USA

Keywords. galaxies: nuclei, galaxies: active, galaxies: individual (Arp 102B), radio continuum: galaxies, galaxies: kinematics and dynamics

The goal of this work is to map the gas excitation and kinematics in the inner ~ 2 kiloparsecs of the radio-galaxy Arp 102B. Though being classified as an E0 galaxy, Arp 102B shows a nuclear gas spiral (Fathi *et al.*, in preparation). Previous studies of the gas kinematics in nuclear spirals have led to the conclusion that these structures usually trace gas inflows (Fathi *et al.* 2006; Storchi-Bergmann *et al.* 2007; Riffel *et al.* 2008). We have used integral field spectroscopy obtained with GMOS instrument of the Gemini North telescope to investigate the nature of the nuclear spiral arms. The spectra cover the wavelength range 4400–7300 Å over a field of view of $5.''5 \times 3.''9$ (2.7 kpc × 1.9 kpc). The Hα flux map from our IFU spectroscopy shows that the spiral arms extend up to at least 1 kpc from the nucleus. We note the presence of the spiral arms in emission-line maps of Hα, Hβ, [O III] λ5007, [O I] λ6300, [N II] λ6585, and [S II] λ6717, with the eastern arm better defined and extending farther from the nucleus than the one to the west. Contours from a 8.4 GHz radio image (Caccianiga *et al.* 2001) show that the radio structure correlates with the flux distributions of the eastern spiral arm. The highest Hα/Hβ flux ratios (i.e., the highest reddening) are observed $\sim 0.''3$ southwest of the nucleus and to the west (at the location of the less-extended spiral arm), while no reddening is observed along the eastern spiral arm. The [N II] λ6584/Hα flux ratio is almost constant at ~ 1 along the spiral arms. The ratio of the [S II] emission lines give peak density values of $\sim 900\,\mathrm{cm}^{-3}$ around $0.''3$ southwest of the nucleus (at the location of the highest reddening). The [O III] λ5007/Hβ flux ratio shows values typical of AGN (LINERs) with peak values of ~ 4 at the nucleus and towards the southwest and west, and lowest values of ~ 1.3 to the northeast and east, suggesting some contribution from star-formation at the latter location. Velocity dispersion maps show high dispersions ($\sim 270\,\mathrm{km\,s}^{-1}$) $\sim 0.''3$ southwest of the nucleus at the location of highest density and reddening, decreasing outwards to $\sim 150\,\mathrm{km\,s}^{-1}$. Velocity centroid maps show redshifts approximately to the west and blueshifts approximately to the east. The radio structure seems to correlate with the blueshifted [O III] emission, suggesting that the blueshifts are due to outflow along the eastern spiral arm. Further details of the present study will be published in a forthcoming paper (Couto *et al.* 2010, in preparation).

References

Caccianiga, A., March, M. J. M., Thean, A., & Dennett-Thorpe, J. 2001, *MNRAS*, 328, 867
Fathi, K., *et al.* 2006, *ApJ*, 641, L25
Storchi-Bergmann, T., *et al.* 2007, *ApJ*, 670, 959
Riffel, R. A., *et al.* 2008, *MNRAS*, 385, 119