SF2A 2002
F. Combes and D. Barret (eds)

MOLECULAR GAS IN THE 3-RINGED SEYFERT/LINER GALAXY NGC 7217

Combes F.[1], García-Burillo S.[2], Boone F.[3], Hunt L.K.[4], Leon S., Eckart A.[5], Baker A.J., Tacconi L.J., Englmaier P.P.[6], Schinnerer E.[7] and Neri R.[8]

Abstract. We present CO(1-0) and CO(2-1) maps of the Seyfert galaxy NGC 7217, obtained with the IRAM interferometer, at 3" and 1.5" resolution respectively. The nuclear ring (at r=10"=0.8kpc) is predominant in the CO maps, with a remarkable density gradient between the depleted region inside the ring and the inner border of the ring. The CO nuclear ring is significantly broader (200-300pc) than the dust lane ring. The CO(2-1)/CO(1-0) ratio is around 1, typical of optically thick gas with high density. The overall morphology of the ring is quite circular, with no evidence of non-circular velocities. In the CO(2-1) map, a central concentration might be associated with the circumnuclear ring of ionised gas detected inside r=3" and interpreted as a polar ring by Sil'chenko and Afanasiev (2000). Our interpretation is more in terms of a bar/spiral structure, in the same plane as the global galaxy but affected by non-circular motions, which results in a characteristic S-shape of the isovels. This nuclear bar/spiral structure, clearly seen in a V-I HST colour image, is essentially gaseous and might be explained with acoustic waves.

1 Introduction

NGC 7217 is one of the first galaxies observed from the NUGA (NUclei of GAlaxies) sample of about 20 spirals with AGN, which are being mapped at high resolution with the IRAM interferometer to explore their molecular content, and to

[1] LERMA, Observatoire de Paris, France
[2] Observatorio Astronomico Nacional, Madrid, Spain
[3] LERMA, Observatoire de Paris, France
[4] Instituto di Radioastronomia/CNR Firenze, Italy
[5] I. Physikalisches Institut, Universitaet zu Koeln, Germany
[6] MPE, Garching, Germany
[7] Caltech, Pasadena, California, USA
[8] IRAM, Grenoble, France

determine their possible fueling mechanisms (primary or nuclear bars, spiral waves, warps, or m=1 perturbations).

NGC 7217 is an (R)SA(r)ab galaxy classified as a LINER/Seyfert. It is particularly axisymmetric, and possesses nuclear, inner and outer rings, at 8, 31 and 77" (Buta et al. 1995). Dominated by a massive and extended bulge, the spiral structure is flocculent, and a possible oval distortion might be the vestige of an ancient bar, which was responsible for the formation of the three rings.

We have observed in 2001 this galaxy with the IRAM interferometer in the CO(1-0) and CO(2-1) lines, with resolution of 3.2"x2.8" and 1.6"x1.4" respectively.

2 Preliminary results

Fig. 1 shows in contours the particularly regular nuclear ring observed in the CO(1-0) line. The ring is wider in the southern part, and has strikingly steep contours at its inner edge. No CO(1-0) emission is detected inside the ring, while there is a spot of CO(2-1) emission towards the nucleus. HST colour pictures reveal a red nuclear ring coinciding with the CO(1-0) ring. The extinction also delineates a central spiral structure, with which the CO(2-1) appears associated.

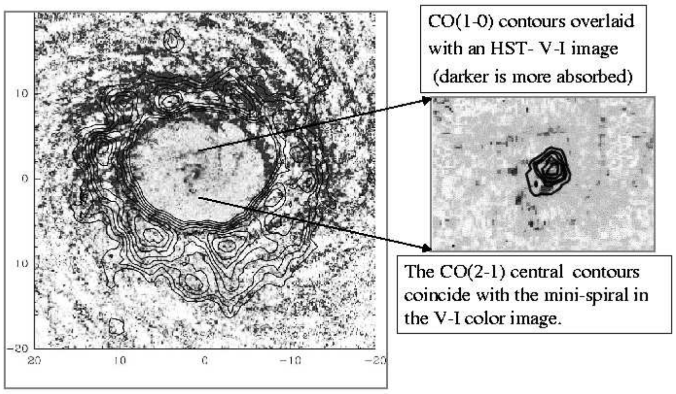

Fig. 1. CO(1-0) contours superposed on the HST color image (*left*), and a zoom into the center showing the CO(2-1) contours (*right*).

The CO(2-1)/CO(1-0) ratio has been computed across the map, by comparing only the same uv-frequencies and obtaining the two maps with the same spatial resolution. The ratio is consistent with 1 in most of the clumps, as for optically thick CO clouds. The velocity field is very regular, corresponding to rotation, with no signature of streaming motions.

References

Buta, R., van Driel, W., Braine, J., Combes, F., Wakamatsu, K., Sofue, Y., Tomita, A.: 1995, ApJ 450, 593

Sil'chenko O.K., Afanasiev V.L.: 2000, A&A 364, 479