ARP 299 – TWO INTERACTING GALAXIES

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Arp 299 (Mrk 171), is an interacting system at 42 Mpc, comprising the galaxies IC 694 and NGC 3690. Interferometric CO maps at 6″ resolution (Sargent *et al.* 1987) showed compact molecular condensations at the nucleus of IC694 and in the overlap region of the galaxy disks [positions A and C – C′ in the terminology of Gehrz, Sramek, and Weedman (1983)].

A compact CO component at the nucleus of NGC 3690 (position B) has been detected in 2.5″ aperture synthesis maps of Arp 299 from the OVRO array. Several discrete CO components are now discernible at C – C′. The mass in all compact structures is 6×10^9 $M_\odot$, almost 80% of the total gas mass, 7.3×10^9 $M_\odot$ (Sanders *et al.* 1986).

Maps of the CO emission at different velocities show that the nucleus of IC 694 is dominated by an unresolved core source of mass 3.6×10^9 $M_\odot$, extending over 370 km s^{-1}. Assuming that 60% of the far-infrared luminosity of Arp 299, 5.3×10^{11} $L_\odot$, arises from position A, the ratio L_{IR}/M_{H_2} is high, 90 $L_\odot/M_\odot$. This, and the small core diameter, ≤ 500 pc, support the contention that a non-thermal energy source may be present (*c.f.* Gehrz, Sramek and Weedman 1983; Sargent *et. al.* 1987).

The mass of gas at the NGC 3690 nucleus, is 0.6×10^9 $M_\odot$, with velocity extent ≥ 170 km s^{-1}. Lack of resolution in the far infrared observations makes it impossible to calculate L_{IR}/M_{H_2}, but the CO emission is extended, 790×680 pc, consistent with expectations for a starburst.

At C – C′, 1.7 $M_\odot$ of gas is distributed over 1910×680 pc. Emission extends over only ≈ 90 km s^{-1} and breaks up into three unresolved components, each dominating at a different velocity. The small velocity dispersion and discrete structures argue against the hypothesis of Casoli *et al.* (1989) that this may be a *third* galaxy nucleus. Indeed, Arp 299 is reminiscent of another interacting system, NGC 4038/4039, with compact sources at the galaxy nuclei and clumpy structure in the overlap region (Stanford *et al.* 1990). In NGC 4038/4039, the clumps coincide with Hα, 10 μm, and radio continuum peaks, all signposts of star formation. Similar enhancements are discernible at C – C′ (Gehrz, Sramek, and Weedman 1983), and it seems likely that massive star formation has been stimulated by increased collisions between clouds as the galaxies merge.

References

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