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Study of Neutral Gas in NGC3079

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Abstract.
We present an update to MERLIN HI absorption observations of the central $4 \times 3''$ region of the LINER/starburst galaxy NGC3079. Broad and deep absorption is seen over much of the region with column densities as high as 4.3×10^{22} atoms cm^{-2}. A velocity gradient consistent with motion about a central mass of $\sim 10^9$ M$_\odot$ is seen, however, significant non-circular motions are also present.

1. Introduction

NGC3079 is a spectacular nearby (15 Mpc), edge-on (i$\sim$85°) spiral galaxy and is classified as a starburst/LINER type AGN. It has two radio lobes extending out from its nucleus 1.7 kpc either side of the galaxy plane and also has a relatively luminous flat spectrum radio core with collimation along position angle $\sim$120°(Irwin and Seaquist, 1988), which is convincing evidence for an AGN. However, the compact radio source is embedded in non-thermal radio emission which may be due to a nuclear starburst.

The HI observations were taken in November 1993 with the complete MERLIN interferometer including the 76m Lovell Telescope. The angular resolution obtained was $0.52 \times 0.34''$ when the data was naturally weighted (Pedlar et al, 1996).

2. Results and Discussions

Neutral hydrogen absorption is present across the central $4 \times 3''$ region of NGC3079 with peak optical depths of $\sim$0.8 and linewidths of $\sim$300 km s^{-1}. These optical depths correspond to column densities of $\sim 4.3 \times 10^{22}$ atoms cm^{-2}. From the absorption spectra (see Fig 1) and moment analysis a predominately north-south velocity structure is seen close to the major axis. If the velocity gradient is interpreted as a circular rotation then the mass in the central 200 pc can be estimated to be $\sim 10^9$ M$_\odot$.

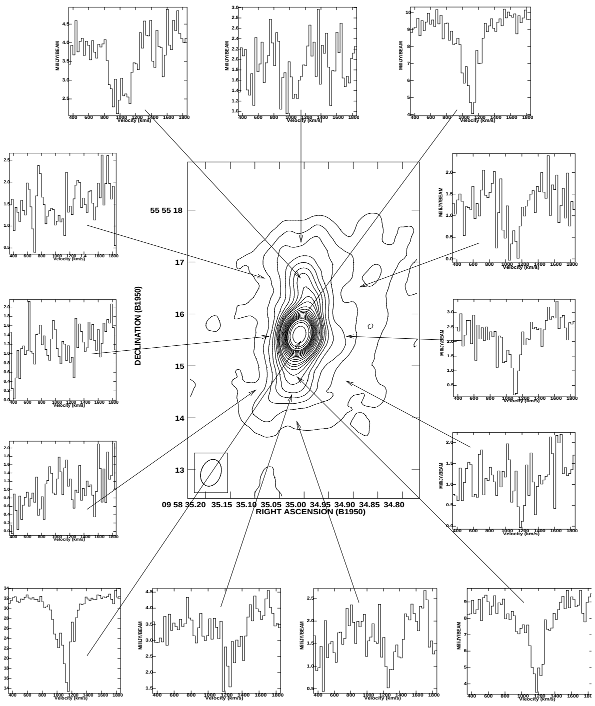

Figure 1. Naturally weight 21cm continuum map of NGC3079 with absorption spectra overlayed.

The absorption spectra shown in Fig. 1 contain complex features and seem to be made up of multiple components. The deepest absorption component is close to the systemic velocity and appears to be associated with gas at similar velocities $\sim 1''$ to the west of the nucleus. Thus, this gas may not be directly associated with the nuclear component. The remaining two absorption features differ from the systemic velocity by >100 km s^{-1}. The presence of blue and red-shifted components suggest that either very rapid rotation or significant non-circular motions are present. Blue and red-shifted components seen against the compact nucleus, can be traced over much of the region and hence the dynamics are not consistent with circular motions.

For more detailed results and discussions on the neutral gas and OH absorption in NGC3079 see the publications that are currently in preparation by Strong et al.

References

Irwin and Seaquist, 1988, ApJ, 335, 658

Pedlar, A. et al, 1996, Vistas, 40, 91