HI IN THE BARRED SPIRAL GALAXIES NGC 1365 AND NGC 1097.

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In this paper we present preliminary results from 21-cm line observations with the Very Large Array (VLA) of the southern barred spiral galaxies NGC 1365 and NGC 1097. Despite a wealth of theoretical models describing the gas flow in a non-axisymmetric bar potential (see Prendergast this volume), few observations of the HI distribution and motions in barred spiral galaxies exist. A notable exception is NGC 5383 (Sancisi et al. 1979). The observations we performed with the VLA are described below. The velocity resolution is 25 km sec^{-1}. The angular resolution is 28"x20", p.a. 20° for NGC 1365 and 30"x25", p.a. 20° for NGC 1097. Velocities are heliocentric.

Figure 1 shows the HI column density distribution and velocity field of NGC 1365 superposed on a print from the SRC sky survey. We find a very good correspondence between the bright optical spiral structure and the neutral gas, with the largest concentrations of gas close

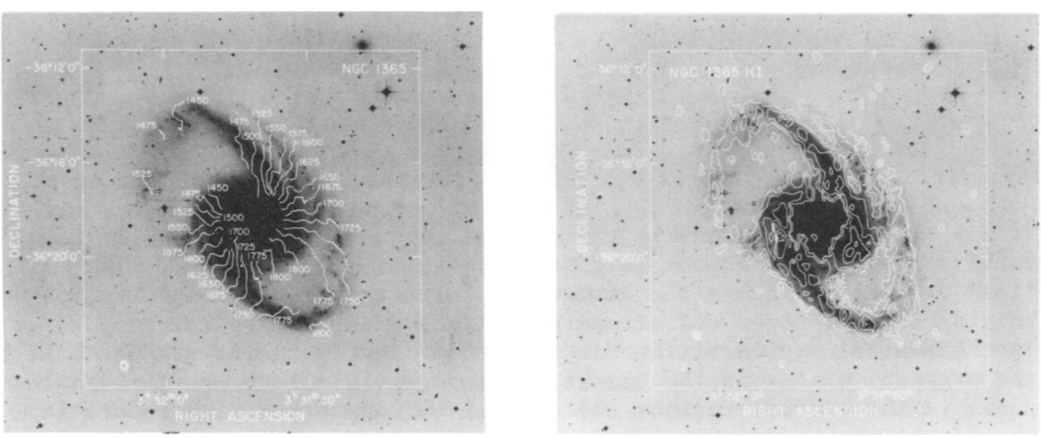

Figure 1. HI column density distribution (left) and velocity field (right) of NGC 1365. Column density contours are 1.7, 5.1, 8.5 and 11.9x10^{20} cm^{-2}. Velocity contours are labelled in km sec^{-1}. The beam is indicated by the ellipse in the lower left corner of each diagram.

E. Athanassoula (ed.), Internal Kinematics and Dynamics of Galaxies, 233–234.

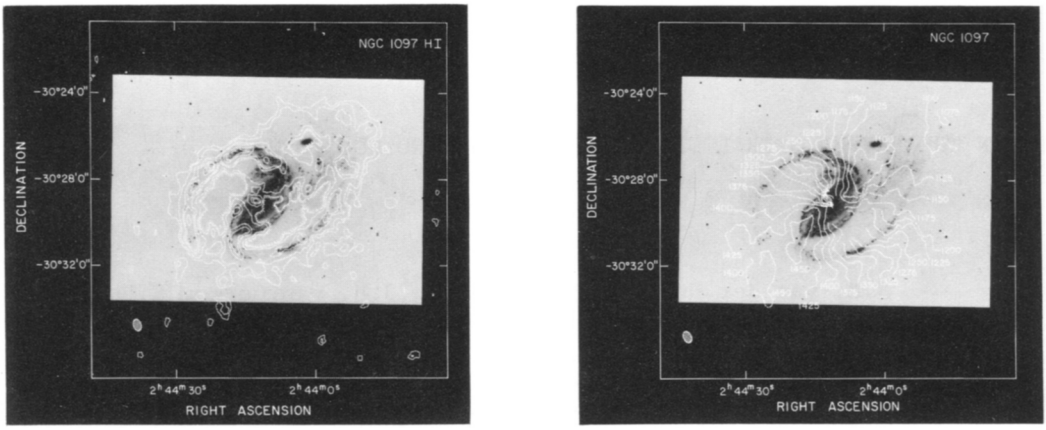

Figure 2. HI column density distribution (left) and velocity field (right) of NGC 1097. Column density contours are 4, 6, 10, 12, 15 and 17×10^{20} cm^{-2}. Velocity contours are labelled in km sec^{-1}. The beam is indicated by the ellipse in the lower left corner of each diagram.

to the edges of the bar. Peak column densities are $1.0-1.5 \times 10^{20}$cm^{-2}. In between the prominent spiral arms and in the bar region we do, however, not detect HI emission above our present sensitivity of 10^{20}cm^{-2}. The latter is particularly surprising because most models predict an accumulation of gas in the central part of the bar due to loss of angular momentum of the orbiting gas clouds. On the other hand, the HI column density is greatest at the leading edges of the bar, consistent with theoretical gasflow calculations. The velocity field is fairly symmetric and shows the gradual S-shape of the line of nodes characteristic for galaxies with a bar or an oval distortion (Bosma 1981).

Figure 2 shows the HI distribution and velocity field of NGC 1097 superposed on a photograph of Arp (see Lorre 1978). As in NGC 1365 there is a good correspondence between the dense HI and prominent optical features. Also the faint outer structures to the northwest, around the companion galaxy, coincide with an optical extension which is best seen in deep photographs of Arp processed by Lorre (1978). This faint asymmetric outer HI is possibly due to gravitational interaction of NGC 1097 and its companion galaxy. In NGC 1097 we do detect HI in the bar with a slight enhancement in the central region as expected from the various model calculations (e.g. Roberts et al. 1979). The velocity field of NGC 1097 shows the same characteristics of that of NGC 1365: a curving line of nodes and streaming motions along the spiral arms. In the central region of the bar we find a large velocity gradient. With the presence of gas in the bar it becomes possible to probe the gas response in the central regions and a detailed comparison with theoretical models will be undertaken.

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