

NEUTRAL HYDROGEN MAPPING OF THREE SO GALAXIES

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Synthesis maps of HI in three SO galaxies are discussed. In one case several companions are observed. An evolutionary sequence based on accretion is suggested.

Neutral hydrogen in three SO galaxies has been mapped using the Westerbork Synthesis Radio Telescope. Each galaxy was observed for one 12-hour period during 1978-79 using the digital back-end and with a system temperature of 90 K. The bandwidth after Hanning smoothing was 33 km/s, and the maximum baseline was 1500 m. Before presentation, the maps were convolved to a larger beam. The galaxies are listed in table 1. A Hubble constant of 100 km/s/Mpc has been assumed.

NGC 2655: The HI extends well beyond the prominent optical halo and shows a chaotic ring-like structure with many fragments and little correlation with the optical picture. The velocity field indicates rotation (east side approaching) but is also very irregular (figure 1 left). The global line profile is quite asymmetric.

NGC 4138: Again the HI extends well beyond the optical image. It is distributed roughly in two concentric rings, both apparently seen more face-on than the optical galaxy. The velocity field is quite regular; the rotational velocity decreases from the inner to the outer ring (figure 1 right). The lowest velocities were not observed.

Table 1. List of observed galaxies

Name	Type	B_T^0 (from 2RCBG)	V(HEL) (km/s)	M_H ($10^8 M_\odot$)	M_H/L_B (M_\odot/L_\odot)
NGC 2655	SAB(s)0/a	10.49	1374	8.5	0.035
NGC 2859	(R)SB(r)0+	11.36	1670	>1.2	>0.01
NGC 4138	SA(r)0+	11.97	875	>2	>0.09

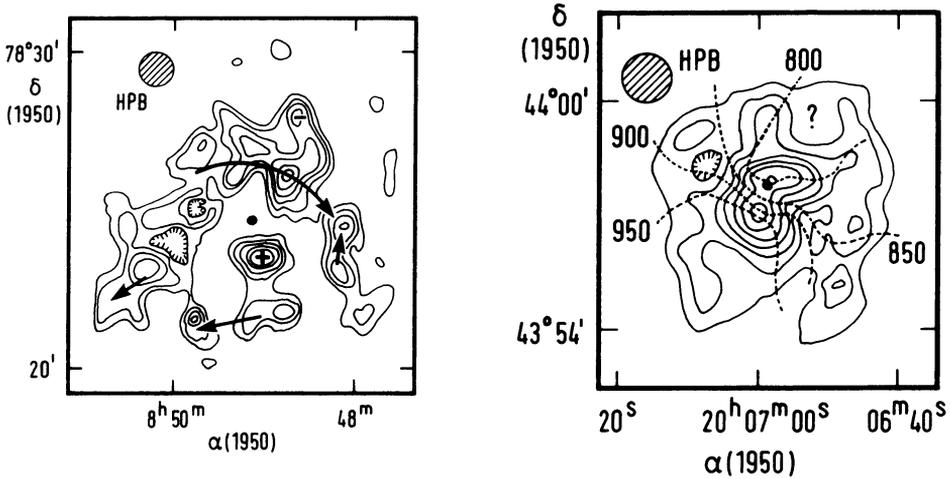


Figure 1. (left) Column density map of NGC 2655 with contour levels 1.8, 2.7, 3.7, ... $\times 10^{20} \text{ cm}^{-2}$. The arrows indicate positive velocity gradients, the + and - regions of exceptional velocity and the dot the optical center. (right) The same for NGC 4138 with contour levels 0.4, 0.9, 1.3, ... $\times 10^{20} \text{ cm}^{-2}$ and with isovelocity contours added. The question mark indicates the incompletely observed region.

NGC 2859: The two HI peaks (n and f) lie on the optical ring but may be part of a more diffuse cloud. Many known companions and two HI clouds are detected (table 2). Some require confirmation (:).

Attributing the HI in these galaxies to accretion events, the following evolutionary sequence is suggested: A dwarf galaxy or HI cloud is captured and fragmented (NGC 2655); the gas settles into a disk or rings (NGC 4138); the denser regions are depleted by star formation and produce an outer optical ring (NGC 2859).

Table 2. Objects in the field of NGC 2859

Name	HI Mass ($10^6 M_{\odot}$)	Velocity (km/s)	Velocity width	Name	M_H	V	ΔV
:Cloud 1	160	1754	50	:UGC 5011	>150:	>1848	>50:
:UGC 4988	70	1535:	50:	:Cloud 2	180	1725	100:
NGC 2859 n	40	1668	40	:UGC 5014	>400:	>1820	>120
NGC 2859 f	80	1573	65	UGC 5015	380	1644	120
UGC 5004	>90	>1836	>80	UGC 5020	520	1635	200

Positions (1950): Cloud 1 = 9 19.8, +34 46; Cloud 2 = 9 22.3, +34 33.