

NEUTRAL HYDROGEN EMISSION OBSERVATIONS OF MKN. 171

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Markarian 171 is a well known ultra-luminous far-infrared source, as discovered by the *Infrared Astronomical Satellite*, (IRAS). It is assumed to be undergoing a massive burst of star formation. Our HI observations are part of an effort to determine how merging galaxies might trigger star formation, by careful analysis of the information on the velocity and spatial structure of the gas provided by HI spectral line observations.

Our data consists of one 12 hour observation from the Westerbork Synthesis Radio Telescope (WSRT). The velocity resolution is 8 kms^{-1} , with a beam size of $13''$. Significant amounts of HI emission (column density ranging from $2 - 12 \times 10^{20} \text{ cm}^{-2}$) has been found across a large region extending from the north-west to the south-east of the central nuclei, at a distance of 10 - 12 kpc from the nuclei, as presented earlier (Tolstoy *et al.* 1989). The velocity structure of these features can, in general terms, be interpreted as a galactic rotation curve (Stanford & Wood 1989). However, the improved sensitivity and velocity resolution of our observations reveal the picture to be somewhat more complicated.

We made a spectral line cube, which we sliced in straight lines along the axis of the HI structure (north-west to south-east). From this we obtained the position-velocity diagrams shown in Figure 1. These diagrams appear to show two different velocity systems, that is to say the velocity structure in map I appears to be different from that in map III, with map II representing an intermediate mixture of the two systems. We then plotted the individual features belonging to the different systems as shown in Figure 2. Added to these were the data along three axes in the $\text{H}\alpha$ optical spectroscopy of Casoli *et al.* (1989). Looking at the distribution of these points it is apparent that there are three different velocity systems represented. Least squares fit lines are also plotted through the HI data (and through the optical data in the case of axes B). Two HI points which do not appear to fit in with the rest of the HI data are assumed to fit in with the optical data along the axes B.

These three different velocity systems may be galaxy rotation curves, or the remnants of such. It is interesting to note that one of the systems is apparently counter-rotating. This would greatly enhance the disruption in an interacting system, which may explain why Mkn 171 has been so difficult to interpret dynamically, and also how it produces excellent conditions for starburst phenomenon.

References:

- Casoli F., Combes F., Augarde R., Figon P., Martin J.M. (1989) *Astron. Astrophys.* **224**, 31
Stanford S.A. & Wood D.O.S (1989) *Astrophys. J.* **346**, 712
Tolstoy E., Dickey J.M., Israel F.P. (1989) "Interstellar Medium in External Galaxies", contributed papers, 2nd Wyoming Conference.

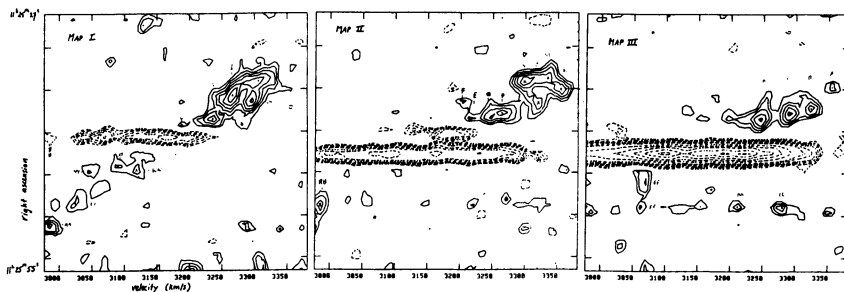


Figure 1. These are three independent position-velocity diagrams of the rotated (41°) original data cube. They are three slices in declination through this cube along the major axis of the emission region. I = $58^\circ 50' 05''$, II = $58^\circ 50' 15''$, III = $58^\circ 50' 25''$. The contour levels are: -.035, -.030, -.025, -.020, -.015, -.010, -.008, -.006, -.005, -.004, -.003, .003, .004, .005, .006, .007, .008, .009, .010 Jy/beam for each map.

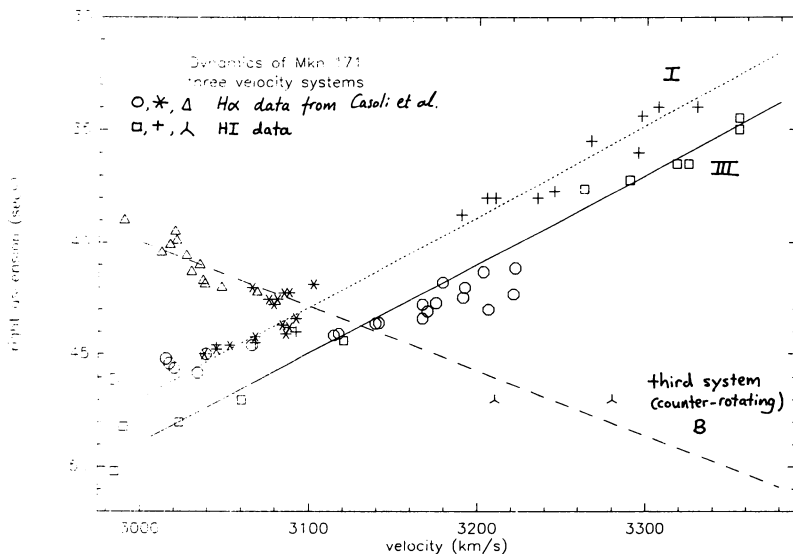


Figure 2. Here are three “rotation curves” for three velocity systems thus shown to be present in the data. The data consists of our HI data and optical spectroscopy of Casoli *et al.*. The straight lines represent least squares fits to the different data sets.