university of groningen

University Medical Center Groningen

University of Groningen

Neutral Hydrogen Emission Observations of MKN 171

Tolstoy, E.; Israel, F.P.

Published in:
Dynamics of Galaxies and Their Molecular Cloud Distributions

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
1991

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):
Tolstoy, E., & Israel, F. P. (1991). Neutral Hydrogen Emission Observations of MKN 171. In F. Combes, & F. Casoli (Eds.), *Dynamics of Galaxies and Their Molecular Cloud Distributions: Proceedings of the IAU* (pp. 451-452). (IAU Symposium), (International Astronomical Union Symposia; Vol. 146). Springer.

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment.

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Download date: 21-01-2023

NEUTRAL HYDROGEN EMISSION OBSERVATIONS OF MKN. 171

E. Tolstoy & F.P. Israel
Sterrewacht Leiden,
The Netherlands.

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 $2 - 12 \times 10^{20}$ 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 Hα 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 remanants 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.

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 451–452.
© 1991 *IAU. Printed in the Netherlands.*

Downloaded from https://www.cambridge.org/core. Rijksuniversiteit Groningen, on 26 Nov 2018 at 12:46:07, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0074180900244902

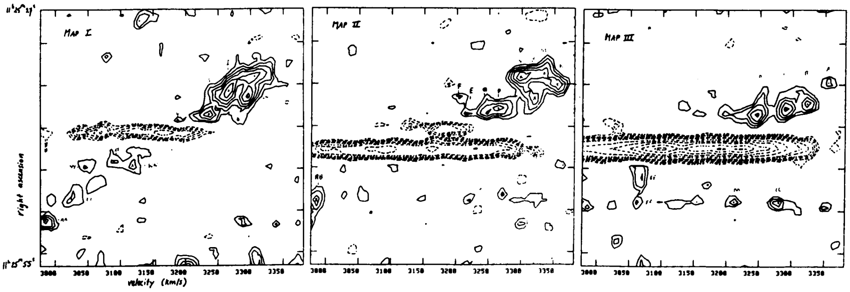

Figure 1. These are three independant position-velocity diagrams of the rotated (41°) original data cube. They are three slices in declination through this cube along the major axis of the emission region. I = 58°50′05″ , II = 58°50′15″ , III = 58°50′25″ . The contour levels are: -.035, -.030, -.025,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

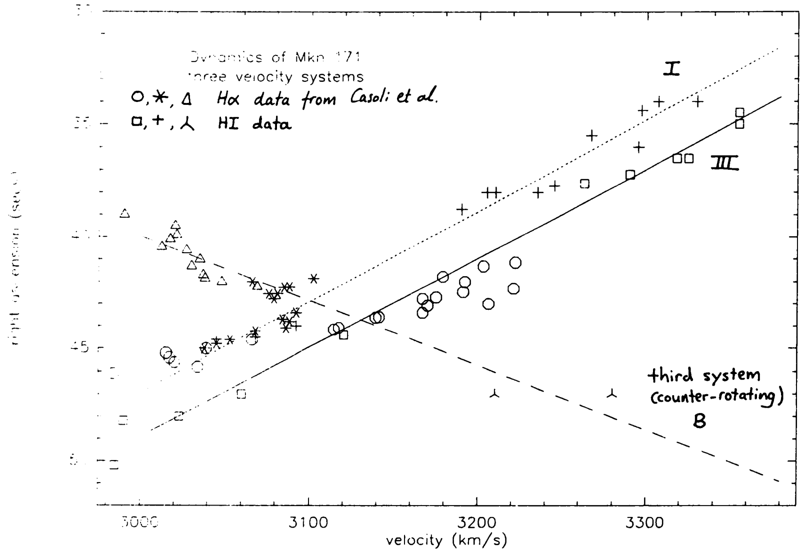

Figure 2. Here are three "rotation curves" for three velocity systems thus shown to be present in the data. The data consists of our HI data and optical spectroscopy of Casoli *et al.*. The straight lines represent least squares fits to the different data sets.

Downloaded from https://www.cambridge.org/core. Rijksuniversiteit Groningen, on 26 Nov 2018 at 12:46:07, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0074180900244902