A HIGH RESOLUTION CO MAP OF THE INNER REGION OF M51

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M51, the Whirlpool Galaxy, at a distance of $\approx 9,6$ Mpc and a systemic velocity of 465 km s^{-1}, is the closest "Grand Design" spiral galaxy. Its low inclination (20°) makes it an excellent target for structural studies, e.g. the formation of arms in response to a spiral density wave causing gas streaming motions. We have obtained a high resolution, sensitive map of the inner 2.5′ of M51 using the Caltech six-element OVRO array. The map consists of a 19-field mosaic, taken using three different telescope configurations. The resolution is 2.5″, (corresponding to 115 pc linear size) and 3.5″ for the robustly and naturally weigthed maps, respectively.

The molecular spiral arms appear with unprecedented clarity, and new structure on, and between, the main arms is revealed. For the first time in M51, we can see bifurcations in the molecular spiral arm structure — possibly as a result of an ultraharmonic resonance caused by the spiral potential (Artymowicz & Lubow 1992). The secondary arms (B1 and B2 in Fig. 1.) are fainter than the main arms and have a less clumpy appearance. Structures previously classified as discrete interarm clouds (I1,I2 in Rand 1993) are part of the continous secondary arm structure, B1. Low-dispersion clouds are found in between the main and secondary arms. Molecular spokes

Y. Sofue (ed.), The Central Regions of the Galaxy and Galaxies, 249-250.

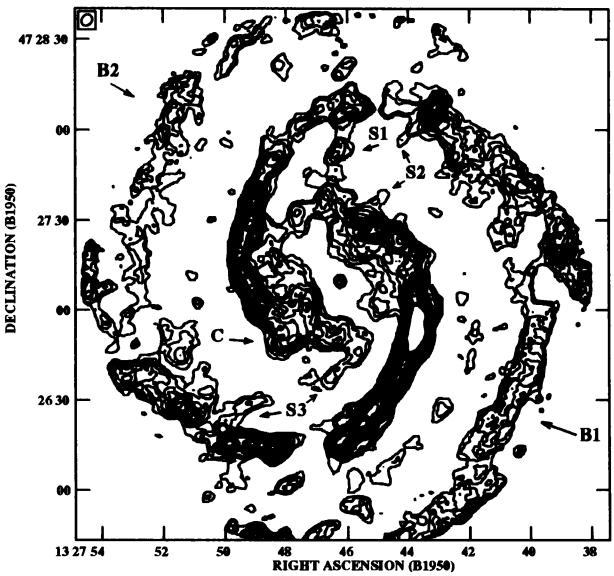

Figure 1. CO 1–0 naturally weighted map of the inner region of M51. The beam is indicated in the upper left corner.

extend out from spiral arms (S1,S2,S3). We find an anomalous structure, a flare-like feature (C) in the molecular arm southeast of the center. High dispersion gas is associated with this feature. Streaming motions can be studied in great detail and signs of streaming motions are also found in the faint B1 arm. There is close qualitative agreement of the streaming motions with predictions. We detect CO emission from molecular gas around the nucleus which has been classified as a low level AGN embedded in dust. The emission appears to be redshifted with respect to the systemic velocity by ≈ 40 km s^{-1}.

References

Rand, R. (1993), *ApJ*, **404**, 593
Artymowicz, P. & Lubow, S.H. (1992), *ApJ*, **389**, 129