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HIGH SPATIAL-RESOLUTION IRAS IMAGES OF M 51.

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Abstract

High spatial-resolution ($\approx 30''$) images of M51 in the four IRAS bands (12, 25, 60, and 100 μm) have been obtained. The spatial variation in flux in all four bands is coincident with the spiral features seen in $\text{H}\alpha$ and 6 cm with a few exceptions. In the nuclear region ($4''$) the position of the peak of maximum intensity shifts in relation to the visual nucleus: it is coincident with the nucleus at 12 μm , shifts approximately $45''$ to south-southwest, and is $45''$ northwest of the nucleus at 60 and 100 μm .

Introduction

High spatial resolution images of M51 have been obtained from the Calibrated Raw Detector Data (CRDD) obtained by IRAS in its Additional Observation (AO) program. A general technique to process unevenly-spaced IRAS data has been developed by Hackwell, Friesen, Canterna and Grasdalen (1988) using the maximum entropy image reconstruction algorithm of Gull and Skilling (1984). Convergence to the final images is determined by the following criterion, which is dependent on a proper estimation of the noise of the CRDD: maximization of the entropy of the image and satisfying the chi-squared constraint.

Results

Contour plots of our final resolution-enhanced images are displayed in Figure 1. Resolution of $\leq 30''$ was achieved. A comparison with UV, 6 cm radio, CO and $\text{H}\alpha$ maps shows that major features in the structure of M 51 are coincident along the major spiral arms. Most notably the major H II region complexes are quite prominent along the arms. The most important result is the change in the position of peak radiation within the nuclear region of M 51. In Figure 2 we present the 12, 25, and 60 μm contours of the $5'$ region centered on the nucleus of M 51. For comparison, a contour plot of the $\text{H}\alpha$ radiation from Kennicutt (1988) degraded to $20''$ resolution. The 12 μm peak is coincident with the visual and $\text{H}\alpha$ peak. The 25 μm peak is positioned approximately $45''$ south-southeast from the 12 μm and optical center. The 60 and 100 μm peaks are offset approximately $45''$ north west from the visual nucleus. The offsets appear to be related to features seen in the CO and radio maps.

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References

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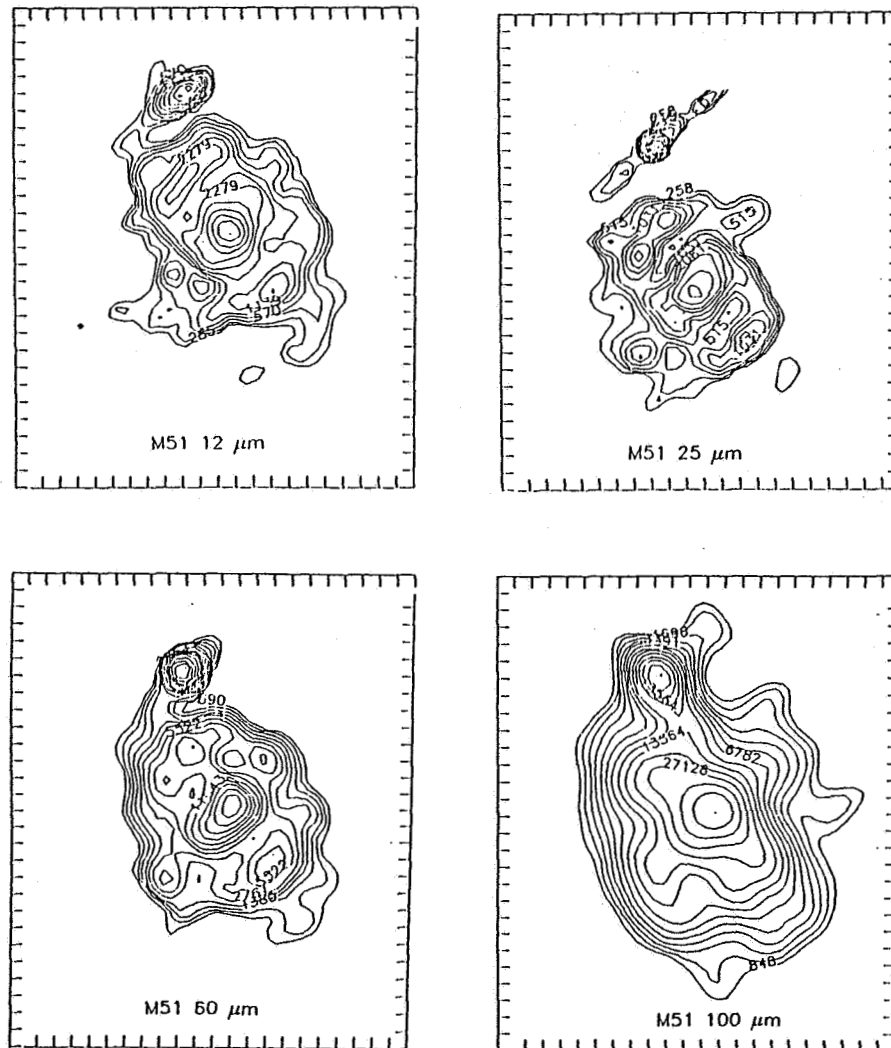


Figure 1. Contour plots of our high spatial-resolution images of M 51 from IRAS CRDD.

Figure 2. Contour plots of the nuclear region of M51 at 3 IRAS bands and H α (degraded to a resolution of 20").

