

CONFIRMATION OF A MIR SOURCE NEAR SGR A*

A. S. COTERA, M. W. WERNER, P. P. PLAVCHAN
Jet Propulsion Laboratory/California Institute of Technology
4800 Oak Grove Dr. Pasadena, CA 91109-8099

1. Introduction

The nature of the nonthermal source Sgr A* has been the subject of extensive debate, with evidence mounting that it is in fact a $\sim 2 \times 10^6 M_{\odot}$ black hole (e.g. Eckart & Genzel 1997). Although previous Mid-Infrared (MIR, $\sim 5\text{-}40 \mu\text{m}$) observations (Gezari 1992; Telesco, Davidson & Werner 1996) have established upper limits on the flux of a potential source at Sgr A*, they were unable to differentiate a point source at the location of Sgr A* from the background. Stolovy et al. (1996) reported the first detection of a compact source coincident with Sgr A* to $\pm 0.3''$, which they measured to have a flux value of 25 ± 5 mJy. The existence of this source, and a better understanding of its flux and spectral characteristics are needed. We present here confirmation of a MIR source near Sgr A*.

2. Observations and Results

Observations were made at $8.7 \mu\text{m}$ using the MIRLIN (Mid-InfraRed Large-well Imager) developed at JPL, on the Hale 200-inch telescope 21 and 22 April 1997. Total on source time was 1608s. To improve our registration, we subdivided the pixels which resulted in a scale of $0.055 \pm 0.009''/\text{pixel}$. We constructed three images from the data: one from data obtained the first night, another from the second night, and a final image combining all the data. In Figure 1 we present a subset of the combined image, enlarged to show more clearly the region around Sgr A*: the contours have been spaced to show what we believe to be a MIR peak near Sgr A*. We have also deconvolved the data but the results are not yet conclusive.

To determine the position of Sgr A* we used the offsets of Menten et al. (1996) from IRS 7. The error of our registration of the position of IRS 7 is ± 0.026 arcsec in RA and ± 0.054 arcsec in Dec. Our resulting calculated

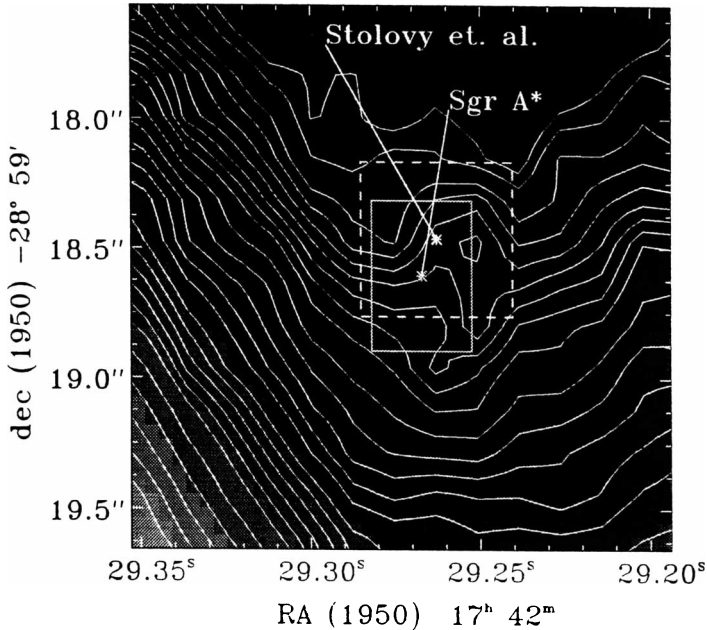


Figure 1. Grayscale image with contour overlays of the combined data from both nights, 1608s total integration time. We have overlaid the position and error box (dashed line) from Stolovy et al. (1996) paper. The new positions of Menten et al. (1997) indicate that Sgr A* is slightly to the south and east of the MIR peak.

position of Sgr A* is shown as a solid line box in Figure 1. The error bars are the result of propagating the above errors and assuming an array rotation angle of < 2 deg. The identified peak is very similar in relative flux and position to the peak identified by Stolovy et al. (1996).

We have successfully reproduced some of the results of the Stolovy et al. (1996) paper, having detected a MIR source at $8.7 \mu\text{m}$ in the vicinity of Sgr A*. Whether the peak identified in the image is in fact emission from a source at the location of Sgr A* is questionable. Although the peak does lie within 1σ error bars, the quality of the measured distance from Sgr A* to IRS 7, combined with our high resolution images, seems to indicate that Sgr A* is located southeast of the MIR source. Additional work on both the plate scale and rotation angle of these images will enable us to further constrain the position of Sgr A*.

References

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