185.05 Mid-Infrared Emission from the High Mass Protostar IRAS 18089-1732

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Abstract

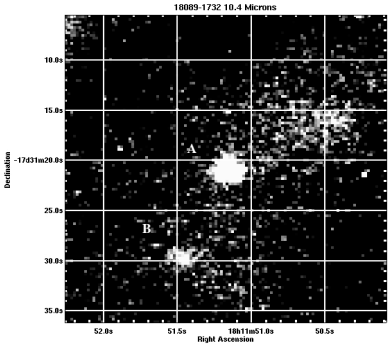
We have detected emission at 10.4 μm (N band) and at 24.8 μm from the high mass protostar candidate IRAS 18089-1732 with the MIRSI camera on the IRTF. Emission was detected within an arcsecond of a mm and sub-mm dust continuum peak at which there are an H_2O maser and an hypercompact HII region (HC HII). This source was also detected by IRAC on Spitzer in the GLIMPSE survey.

Two sources, A & B, were detected in both MIRSI filters, and all IRAC bands. The brighter N band source, A, was registered to the IRAC 8 μm position for astrometry. It is at the approximate position of an MSX source, 10″ NW of the H_2O /HC HII/submm position. The fainter N band source, B, is within an arcsecond of the H_2O/HC HII/submm position. It is brighter than A at 24.8 μm.

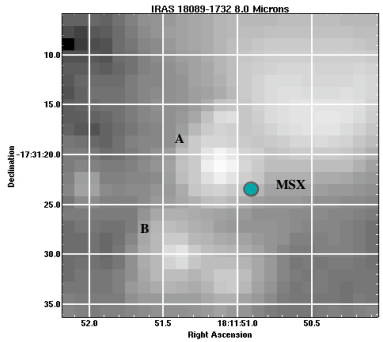
The 24.8 μm emission of source B is offset east of the N band emission, and is extended about 2.5 ″ north-south (marginally resolved on the IRTF). The extension is roughly parallel to the SiO outflow axis. The CH_3OH maser located 1.5″ to the southwest is apparently outside the mid-ir peak. The SED of source B rises from 3.4 mJy at 3.6 μm to 13.4 (+/- 7) Jy at 24.8 μm, with an apparent 10 μm silicate absorption band, suggesting that the source is deeply embedded.

Discussion

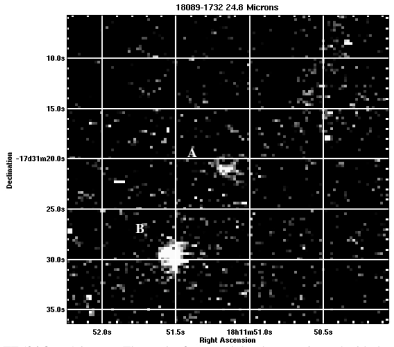
- The high resolution mid-ir images give a completely different scenario from the lower resolution MSX images.
- The MSX source is resolved into two compact sources, A and B, and diffuse emission to the NW.
- Source B is apparently the more important source because of its close association with the masers, the SMA cold dust peak, the HC HII region, and the SiO outflow.
- Source B is within an arcsecond of the cold dust peak mapped by the SMA, the H_2O maser and the HC HII region. Although B's center is slightly south of the H_2O maser, at 10.4 and 24.8 μm, it appears more closely associated with it than the CH_3OH maser. The 8 μm peak is closer to the CH_3OH maser, however.
- The IRTF photometric points show that the sources have spectra that dip at 10 μm probably due to silicate absorption, and then rise to longer wavelengths.
- Source B has a deeper apparent silicate absorption a steeper rise at 24.8 μm than A, suggesting that B is more deeply embedded.
- Source B has a distinctive temperature gradient, cooler to the east.
- Source B appears to be heated from the west. It may be a clump of warm dust on the eastern side of the protostar whose disk and jet are mapped in $HCOOCH_3$ and SiO(5-4).



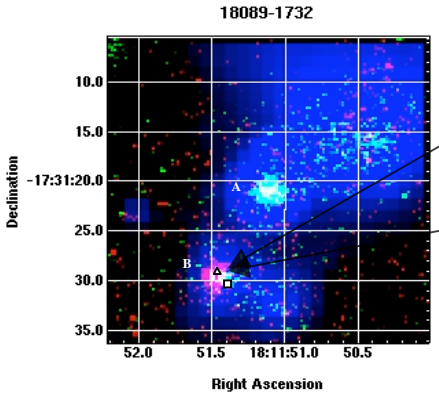
IRTF N (10.4 μm) image. The peak of source A has been registered with the peak of the bright source in the IRAC 8 μm image shown below. Diffuse emission is clearly shown to the NW. The fainter source B coincides with the submm peak, HC HII region, and H_2O maser.



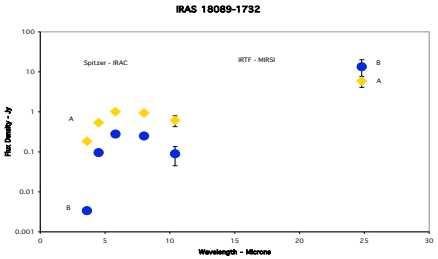
IRAC 8 μm image from the GLIMPSE survey. The MSX position (shown as a green circle) is offset from source A because of the diffuse emission and multiple sources in this field. The IRAC peak of source A has been used for astrometry here. Source B coincides with the submm peak, HC HII region, and H_2O maser.



IRTF (24.8 μm) image. The peak of source A has been registered with the peak of the bright source in the IRAC 8 μm image shown below.. The brighter source B is just southeast of the submm peak, HC HII region, and H_2O maser, as shown in the color image below.

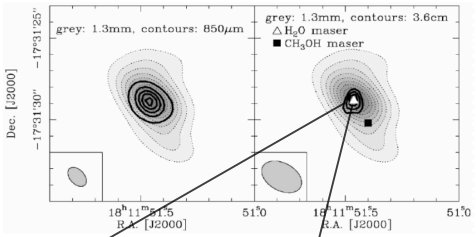


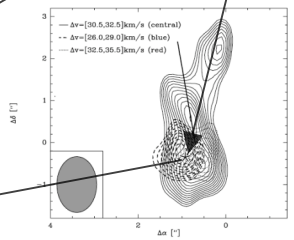
Color composite image with IRAC 8 μm image shown in blue, IRTF 10.4 μm image in green and IRTF 24. 8 μm in red. All images are registered to source A in the IRAC frame. The IRAC 8 μm image has been adjusted to eliminate diffuse emission across the field. Logarithmic intensities are used to emphasize the temperature gradient of source B, cooler toward the east. The triangle shows the H_2O maser/HC HII/submm position, and the square shows the CH_3OH maser.



SED's for sources A and B shown as yellow diamonds and blue circles, respectively. Quick photometry with IRAF limits the accuracy of the IRAC points to 10%. Variable weather caused overall systematic accuracy of the IRTF data of 50%. Source B is clearly redder than source A, and has a deeper depression at 10 μm. The depression is probably silicate absorption.

Below: Gray scale (with dotted contours) showing the SMA 1.3 mm dust continuum emission in both panels. *Left:* Heavy contours show the SMA 850 μm dust continuum emission. *Right:* Centimeter (free-free) emission, and H_2O maser *(triangle)* and CH_3OH maser *(square)* positions (Beuther et al. 2004, ApJ 616, L23)





Disk signature in $HCOOCH_3$. Dashed and dotted lines show the blue and red disk emission, respectively. The full lines present the emission at intermediate velocities. The bold line marks the outflow direction observed in SiO(5-4). The star shows the submm continuum position. The 0,0 position is 18:11:51.4, -17:31:28.5 (2000). (Beuther, et al. 2005 ApJ, 628, 800).

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