Sub-Arcsecond Resolution 2μm Imaging of W51

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We report results of our JHK imaging observations of the highly luminous obscured H II region W51 using a 256 x 256 NICMOS array. To first order, we find excellent agreement between the morphologies of the extended emission at 6 cm and 2 μm. W51 IRS2 is resolved into a dense, compact cluster of at least 40 stars surrounded by an envelope of extended emission 40" in diameter.

Comparison of narrow-band Brackett-γ filter and K-band images indicates that the extended continuum emission visible across our 1.5 x 1.5 arcminute field is dominated by a combination of free-free and bound-free emission from ionized hydrogen and helium, without any contribution necessary from PAH or any other kind of heated dust grains. Comparison of our K-band images to 6 cm continuum radio maps shows the extinction to W51 to be quite uniform across the source, and about the value one would expect for normal galactic extinction. This leads us to suspect that the ionized gas associated with IRS 1 and IRS 2 is in front of the W51 molecular cloud. We do note, however, the presence of several narrow obscuring dust lanes which seem to correspond to absorption features seen in 6 cm H₂CO maps by Kogut et al. 1989.

We have separated the field stars from those probably associated with W51 on the basis of H-K colors, and have tentatively identified the stars providing the ionizing flux for the HII region. A small number of very luminous stars appear sufficient to provide the bulk of the luminosity for both IRS 1 and IRS 2. Finally, several very red objects have been detected that appear to be associated with W51. One new object, with H-K > 6, is not associated with any masers or compact radio sources. Another may be associated with the 8 μm and 20 μm sources seen in IRS 2 by Genzel et al. 1982, and is only a few arcseconds from the copious masers in that region.