

High Resolution Mid-Infrared Observations of a Circumstellar Disk

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The Herbig Ae star, AB Aur, has been observed at wavelengths of 7.9 μm , 9.8 μm , and 11.7 μm , using the Cornell SpectroCam-10 imaging spectrometer on the 5-m Hale Telescope. Most of the observations were obtained at 11.7 μm wavelength, whereby the diffraction-limited resolution of a raw image (λ/D) corresponds to 0.48 arcsec. The images were deconvolved using a Bayesian estimator incorporating a positivity constraint, and a pointspread function (PSF) which was derived from observations of α Tau and β Gem. The use of prior knowledge (positivity) led to superresolution, giving a final spatial resolution of approximately 0.2 arcsec (30 AU at a distance of 150 pc). Uncertainties in the deconvolved images are dominated by uncertainties in the estimated PSF, and can be assessed by comparing the images resulting from the use of PSFs obtained from various subsets of the data. The object itself, AB Aur, belongs to a subset of Herbig Ae stars whose mid-infrared emission is believed to be dominated by the disk component, and whose physical characteristics are similar to 'T' Tauri stars except for the higher stellar temperature. Our deconvolved images show that the disk is extended, and may possess a central clearing. These results are consistent with predictions based on modeling of the object's spectral energy distribution.

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