

HST/NICMOS Observations of Brown Dwarfs in NGC 1333.

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The study of young brown dwarfs in clusters has implications for several fundamental questions of star formation. Is there a low-mass cut-off for the Initial Mass Function (IMF) in clusters? If so, does it vary with cluster characteristics? Does the cluster IMF trace the field star IMF even to very low masses? Does the IMF exhibit a characteristic mass?

The shape of the IMF and its connection to initial physical conditions in the cloud remains one of the fundamental questions regarding star formation today. While compelling evidence has been presented that the IMF is universal above $0.1 M_{\text{Sun}}$ [1], [2] have found that the Taurus star-forming region exhibits a dearth of brown dwarfs compared to more massive star-forming regions such as the Orion Nebula. Thus it is important to conduct studies of cluster mass functions down to low masses. As a region intermediate in stellar density between Taurus and Orion, NGC 1333 can provide a test bed for the universality of the IMF.

We present an analysis of deep spectroscopic and photometric NICMOS observations of the embedded young cluster NGC 1333. The goal is to probe the cluster IMF to the minimum mass for opacity-limited fragmentation in typical molecular clouds ($\sim 5\text{-}10 M_{\text{jup}}$) which should depend strongly on the initial conditions of formation.

Our survey covers 4 fields of $51.2'' \times 51.2''$, centered on brown dwarf candidates previously identified in [3]. This survey doubles the number of previously detected sources. The fields are located in the region of high extinction, which makes contamination from background sources minimal. Observations were obtained in F110W (J-band) and F160W (H-band), as well as with the grism G141 (1.1 – 1.9 microns).

Spectral types were derived for the 12 brightest objects using a water vapor index, which has no significant surface gravity dependence, similar to the methods developed in [3]. The assigned spectral types cover a range of M0 – L0. These data were used in conjunction with temperatures and luminosities derived from the spectra to assign masses and ages to the brown dwarfs. Two

new companions were discovered, one around a brown dwarf of spectral type L0, with a brightness difference of 4 mag in the H band.

We also present an analysis of the color-magnitude diagram (CMD) using the models of [4] and [5] and present preliminary results on the ratio of stars to sub-stellar objects in the cluster.

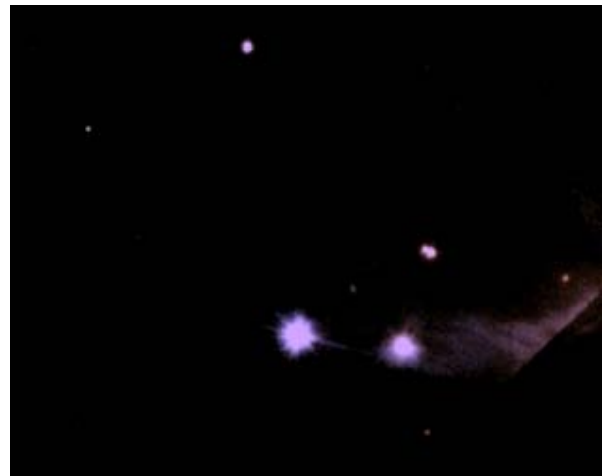


Figure 1 *Two-color image of one of our fields.*

References: [1] Meyer, M. R. et al. (2000), PPIV, 121. [2] Luhman, K. (2000), ApJ, 544, 1044. [3] Wilking, B.A. et al. (2004), AJ, 127, 1131. [4] D'Antona, F. and Mazzitelli, I. (1994), ApJS, 90, 467. [5] Baraffe, I., et al. (1998), A&A, 337, 403.