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THE FORMATION AND EARLY EVOLUTION OF BROWN DWARFS VIEWED THROUGH THE ORION DISPERSED POPULATIONS

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RESUMEN

Presentamos un resumen de los últimos resultados de un sondeo fotométrico y espectroscópico en curso, a gran escala, de estrellas de muy baja masa y enanas marrones con masas hasta $M \sim 0.02\ M_{\odot}$, en las poblaciones dispersas de región de formación estelar de Orion OB1. El sondeo se basa en la combinación de observaciones fotométricas multi-época en las bandas R e I, obtenidas con la cámara Quest-I del Observatorio Astronómico Nacional de Venezuela, con datos en el cercano infrarrojo de los sondeos VISTA y 2MASS, abarcando un área total de $\sim$200 gd^2. El sondeo fotométrico está siendo complementado con observaciones espectroscópicas de seguimiento realizadas con el instrumento Hectospec del telescopio MMT de 6.5 m, resultando hasta el momento en la confirmación espectroscópica de enanas marrones jóvenes con masas hasta $\sim$0.05 $M_{\odot}$ cubriendo 6 gd^2. Un resumen de los resultados basados en la muestra espectroscópicamente confirmada de miembros estelares y subestelares de Orion, así como en aquellos objetos que permanecen como candidatos se discuten con énfasis en la función inicial de masa, la dependencia de la distribución espacial como función de la masa, los excesos en el cercano infrarrojo y las fracciones de objetos con características tipo T-Tauri clásica o débil. Estos resultados se presentan y discuten en términos de las predicciones de los modelos de formación de enanas marrones en Downes, J. J., et al. (2011, en preparación).

ABSTRACT

We present an overview of the latest results of an ongoing large-scale, optical photometric and spectroscopic survey of very low mass stars and brown dwarfs down to $M \sim 0.02\ M_{\odot}$ in the dispersed, off-cloud populations of the Orion OB1 star forming region. The survey is based on the combination of multi-epoch optical photometry in R and I bands obtained with the Quest-I camera at the Venezuela National Astronomical Observatory, with near-IR data from the VISTA and 2MASS surveys, spanning a total area of $\sim$200 deg^2. The photometric survey is being complemented with follow up optical spectroscopy on the Hectospec instrument on the 6.5 m MMT, which so far has provided spectroscopic confirmation of young brown dwarfs down to $\sim$0.05 $M_{\odot}$ over 6 deg^2. An overview of the results on the sample of stellar and substellar objects spectroscopically confirmed as members of Orion and those that still remain as photometric candidates are presented, focus on the initial mass function, the mass dependence of the spatial distribution, the near infrared excesses and the fraction of objects with Classical or Weak T Tauri-like characteristics. These results will be extended and discussed in terms of the predictions from brown dwarf formation models in Downes, J. J., et al. (2011, in preparation).

Key Words: brown dwarfs — stars: formation — stars: low mass

1. INTRODUCTION

One of the main goals of contemporary astrophysics is understanding the processes of star and planet formation. Because brown dwarfs are objects with masses intermediate between those of stars and planets, understanding how they form can provide important constraints on the origin of stars and planetary bodies. The main problem in understanding the processes of the formation of brown dwarfs is that their masses can be two orders of magnitude lower than the Jeans mass in a typical star forming region. Several theoretical scenarios have been proposed in order to explain the processes that allow molecular clouds to reach the mass densities necessary to form brown dwarfs or the mechanisms for the interruption of mass accretion from the surroundings into a stellar core, resulting in an object with a mass lower than the substellar mass limit. The available models are generally classified in the five scenarios reviewed by Whitworth et al. (2007): (*i*) turbulent fragmentation of molecular clouds (e.g., Bate 2009), (*ii*) gravitational fragmentation (e.g.,

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