

Photometric and spectroscopic studies of very low mass YSOs and young Brown Dwarfs in S106

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1. Introduction

Young brown dwarfs have been identified in a significant population in various star forming regions. Some deep surveys have yielded less massive objects with planetary-mass (e.g., Oasa *et al.* 1999; Lucas & Roche 2000). Nevertheless, it is not yet clear how abundant these very low-mass objects are formed. S106 is one of the nearest massive star-forming regions associated with prominent bipolar nebulae and an HII region. We have conducted near-infrared photometric and spectroscopic observations of very low-mass young stellar objects (YSOs) in the S106 region.

2. Observations and results

The photometric survey, whose limiting magnitude exceeds 20 mag in the *JHK'* band using the SUBARU telescope, is sensitive enough to provide a census of the stellar population down to objects below the deuterium-burning limit, a fiducial boundary between brown dwarfs and planetary-mass objects. Based on the color-color diagrams, nearly 600 embedded YSO candidates with near-infrared excesses have been identified in the area of about 25 arcmin². They are not uniformly distributed but are centrally concentrated. Combining the reddening-corrected luminosity of the YSO candidates with the theoretical evolutionary models (e.g. Baraffe *et al.* 2003), we suggest that there exists a substantial substellar population, including many potential isolated planetary mass objects (Oasa *et al.* 2006). The derived mass function appears to be similar to young clusters such as NGC1333 (Oasa 2003). However it is more abundant in young substellar objects compared to the mass functions obtained for other clusters such as Trapezium and IC348 (Hillenbrand & Carpenter 2000; Najita *et al.* 2000).

The spectroscopic observations of a part of above substellar YSO candidates have been subsequently carried out with SUBARU. Spectroscopy offers a means for more accurate assessment of membership and more precise measurement of the mass. We have constructed an index in the *K*-band to measure the strength of water. It is an indicator of low temperature although it depends on the surface gravity at cool temperatures. Using the reddening-independent water index, we confirm that some sources are cool, even if assuming they have any luminosity class. From these observations, it is considered that young brown dwarfs are formed in S106.

References

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