Planetary mass brown dwarfs in young clusters

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How do stars & brown dwarfs form?

Initial Mass Function

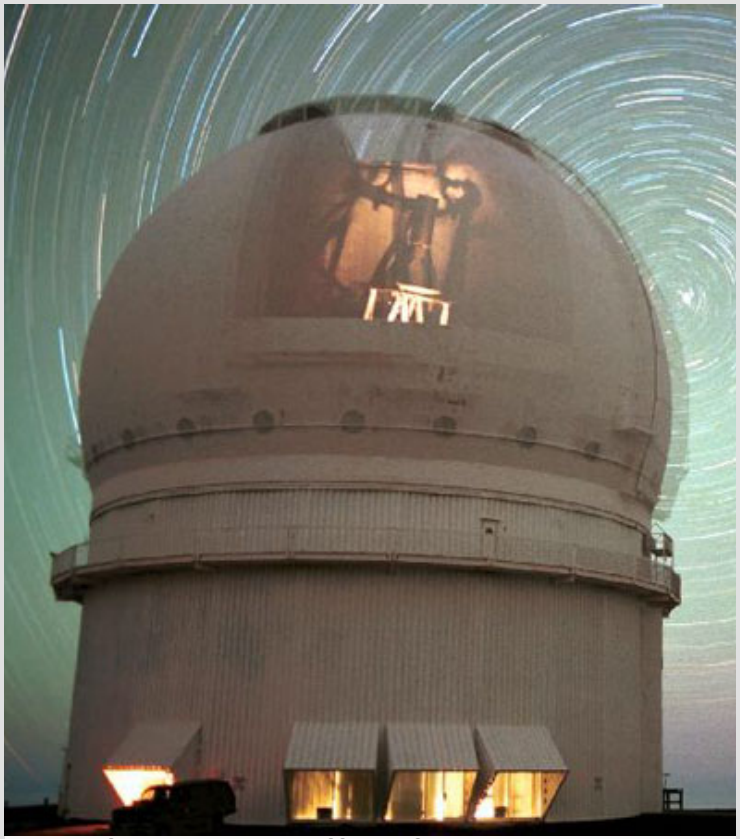
Wide-field IR surveys

Complete census of young clusters

Accretion | Discs | Multiplicity | Kinematics | X-rays

Where can planets form?

CFHT survey



Credit: J.-C. Cuillandre, CFHT

CFHT, 3.6m telescope, Mauna Kea

WIRCam, near-IR camera (YJHKs)
MegaCam, optical camera (z)

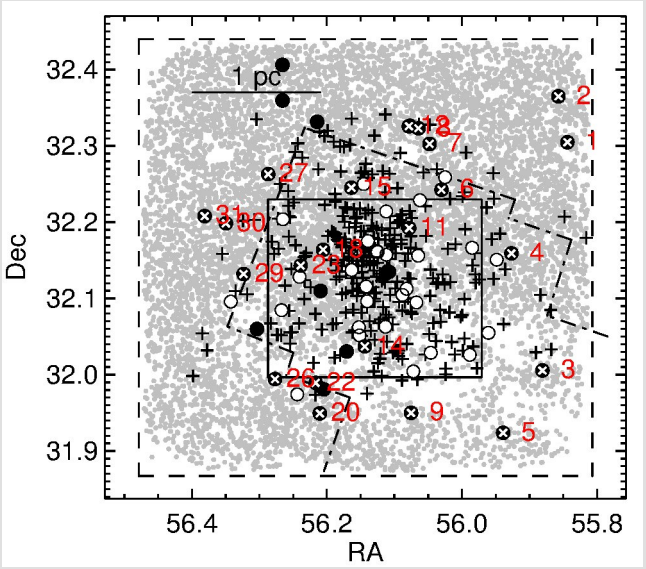
Survey of nearby clusters with deep exposures over large fields:

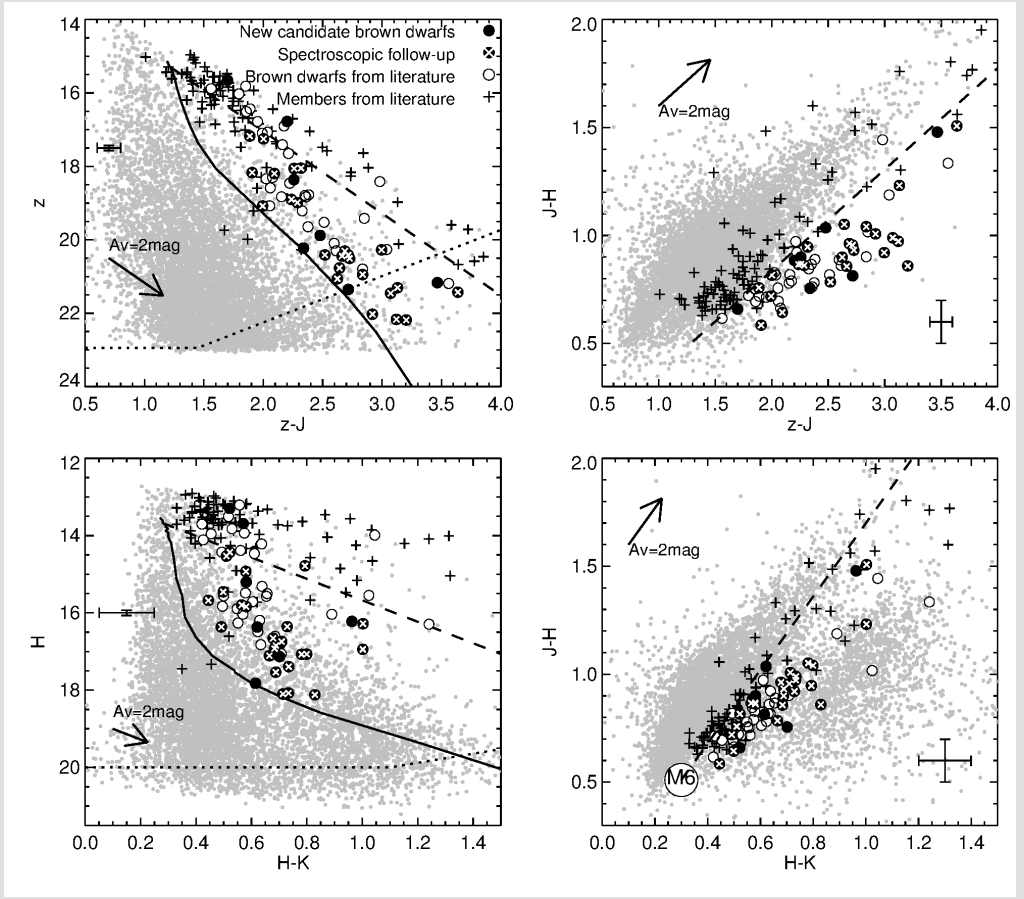
- IC 348
- Rho Oph

CFHT survey

2 Myr
316 pc
345 members (30 brown dwarfs)

CFHT-photometric survey:
31 substellar candidates

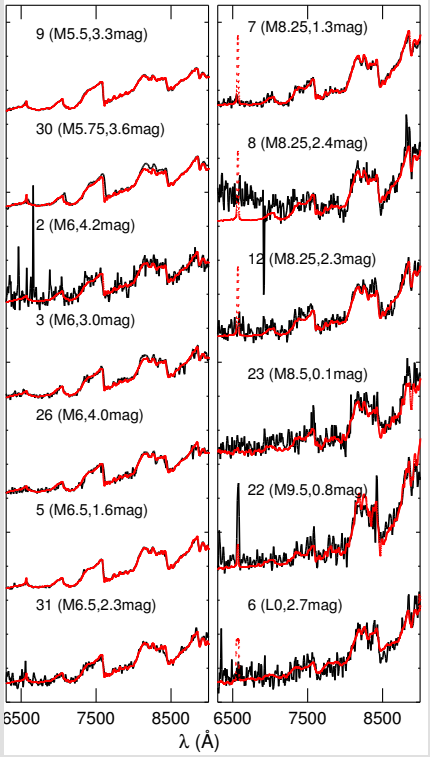




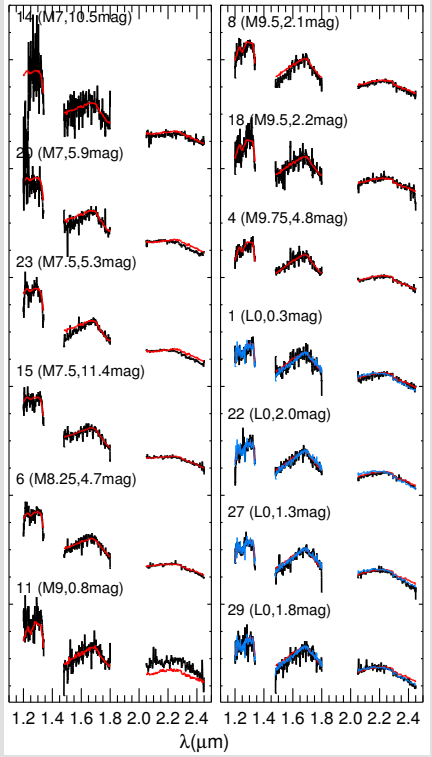
IC 348

Alves de Oliveira et al. 2013 (A&A, 549, 123A)

Osiris/GTC



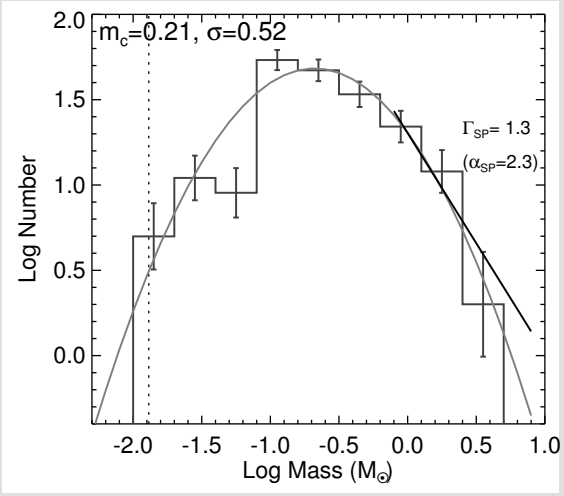
GNIRS/GEMINI



Confirmed spectroscopically 16 new members, including **13 brown dwarfs**

5 new members with L0 spectral type (according to models ~ 13M_{Jup})

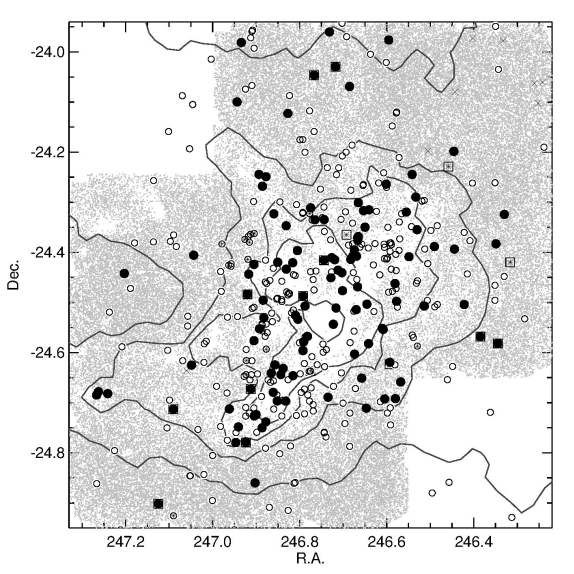
No indication for IMF variations

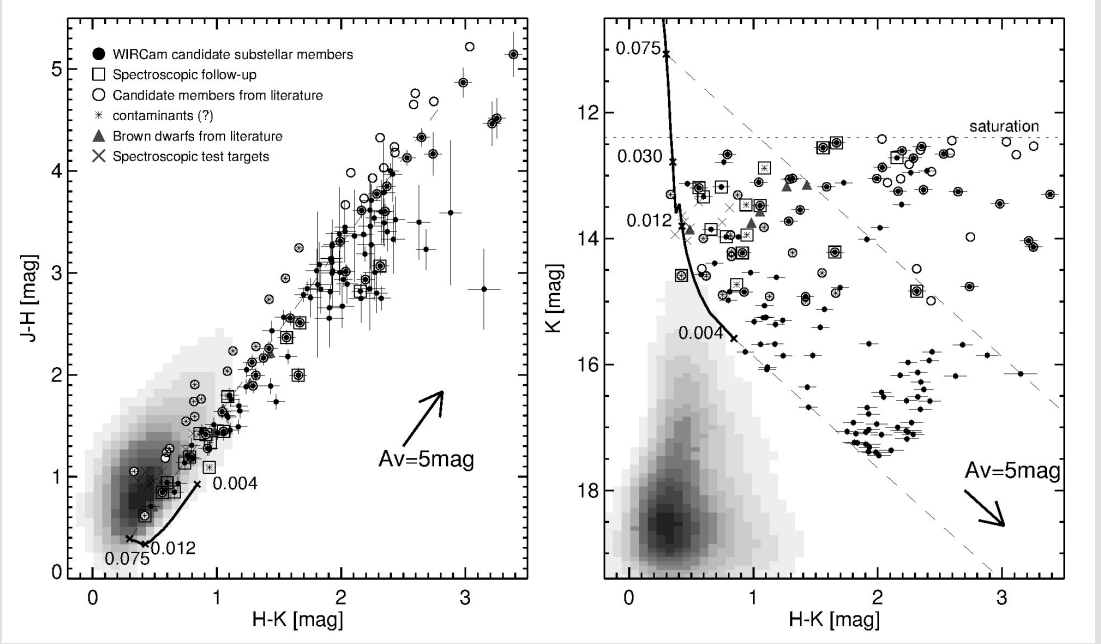


IC 348

1 Myr
120 pc
~300 members (11 brown dwarfs)

CFHT-photometric survey:
110 substellar candidates



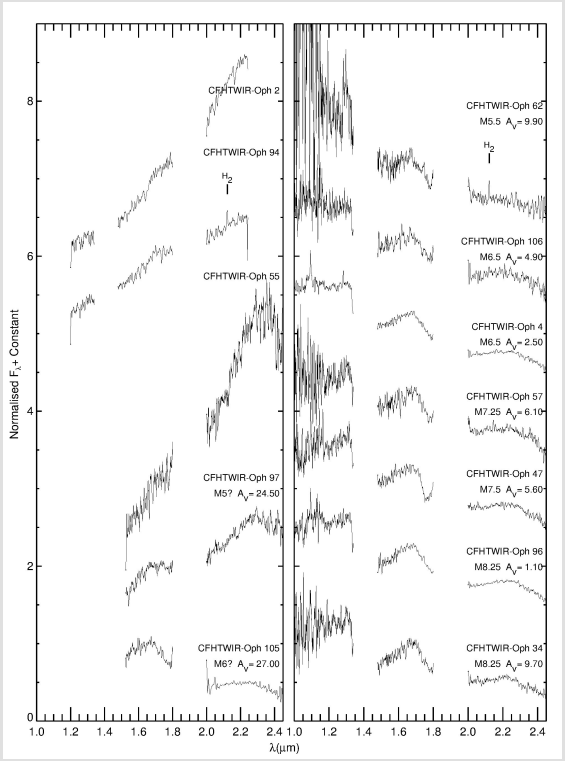


Rho Oph

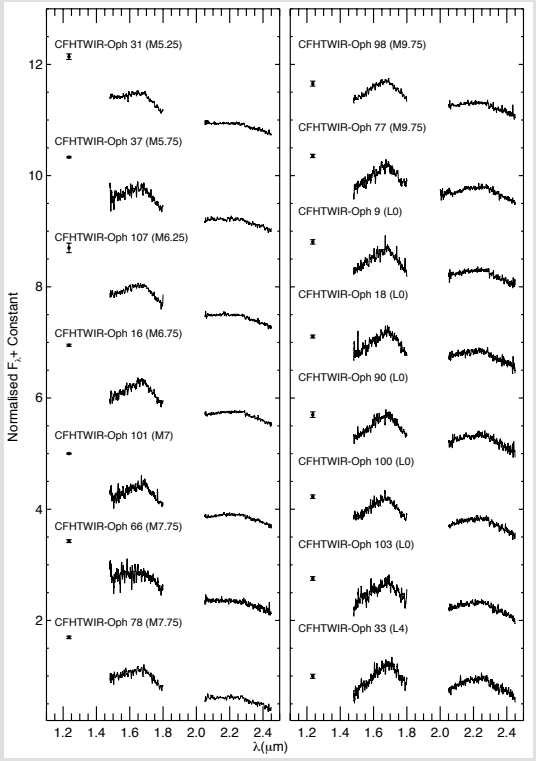
Photometry

Alves de Oliveira et al. 2010 (A&A, 515, 75A)
Alves de Oliveira et al. 2012 (A&A, 539, 151A)

SofI / NTT



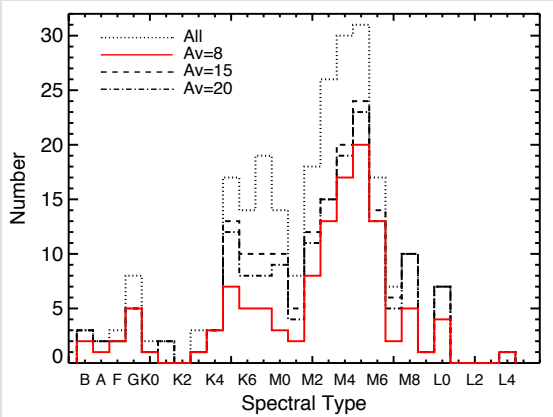
ISAAC / VLT



Confirmed spectroscopically 27 new members, including **20 brown dwarfs**

4 new L0 members and 1 L4 (according to models ~ 5-9M_{Jup})

No indication for IMF variations

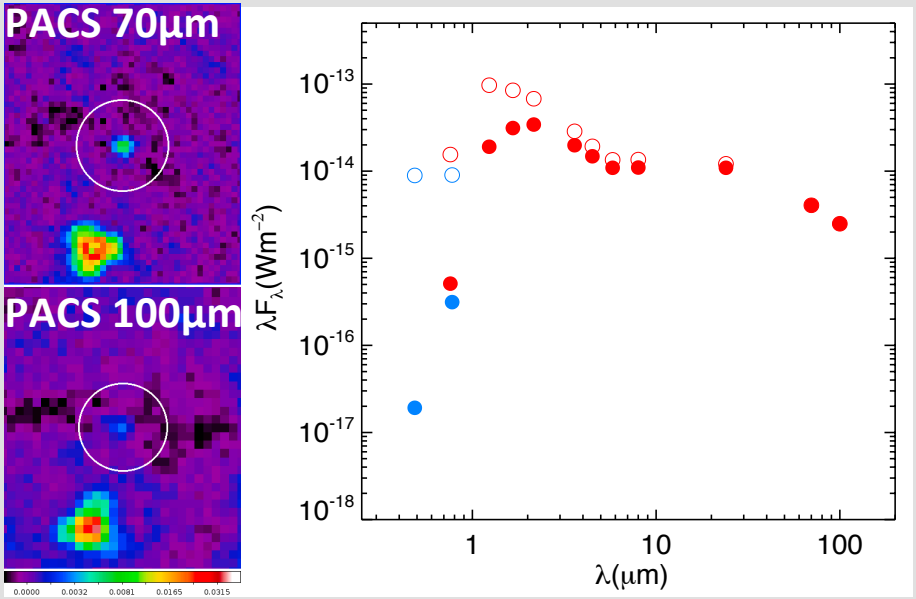


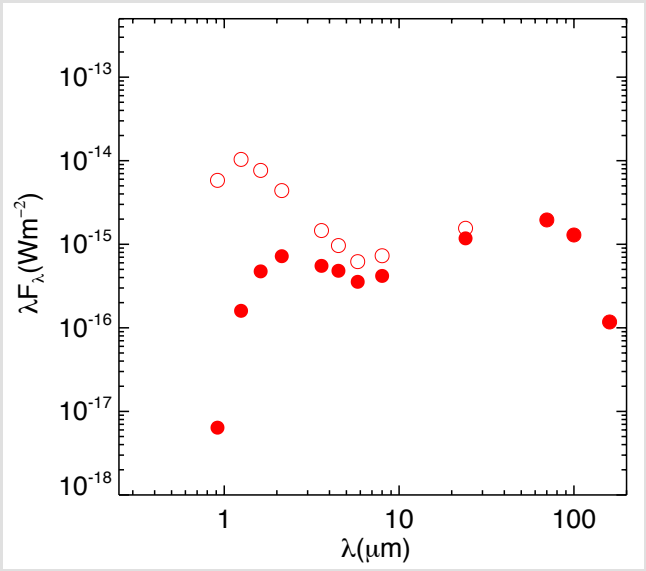
Rho Oph

Spectroscopy

Alves de Oliveira et al., *in prep:* ***Herschel* survey of brown dwarf disks in Rho Oph**

- Detect 12 brown dwarf disks (M6 < SpT < M8.5) at 70μm and 100μm (5 at 160μm)





Rho Oph

CFHT photometric survey of IC348 and Rho Oph uncovered several candidate brown dwarfs, and spectroscopic follow-up confirmed 13 new brown dwarfs in IC 348, and 20 in Rho Oph

Discovery of first L0 dwarfs in IC 348 (~13M_{Jup}) and Rho Oph (4 L0, 1 L4, 4-9M_{Jup})

No evidence for variation of the mass function in both clusters (down to ~13M_{Jup} in IC348, and ~4M_{Jup} in Rho Oph)

New census represents fundamental step for further studying properties of young brown dwarfs, e.g. disks in Rho Oph

Conclusions