Is the IMF universal?
Latest results from the UKIDSS GCS

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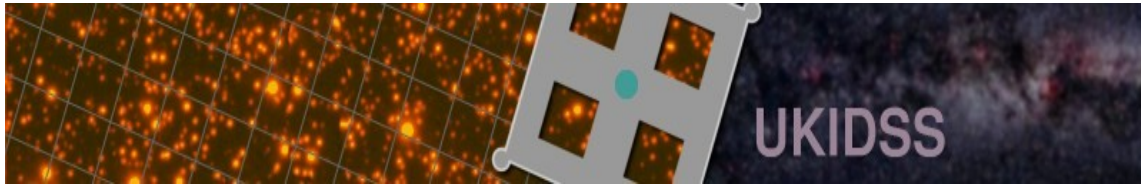*(2) Ramón y Cajal fellow*

# The UKIRT Infrared Deep Sky Survey

www.ukidss.org

*Lawrence et al. 2006, MNRAS, 379, 1599*

UKIDSS

- ➜ New wide-field NIR survey with WFCAM on UKIRT *(Lawrence et al. 2007)*
- ➜ Pipeline-processed by CASU in Cambridge *(Irwin et al. 2008, in prep)*
- ➜ WFCAM Science Archive *(Hambly et al. 2008)*
- ➜ 5 components: LAS, GCS, GPS, DXS, and UDS
- ➜ Typical 5 sigma completeness limit is K = 18.1 mag (Vega)
- ➜ EDR, DR1-3 in 2006 now WR3 *(Dye et al. 2006; Warren et al. 2007a)*
- ➜ DR4 (July 2008) and DR5 (April 2009)
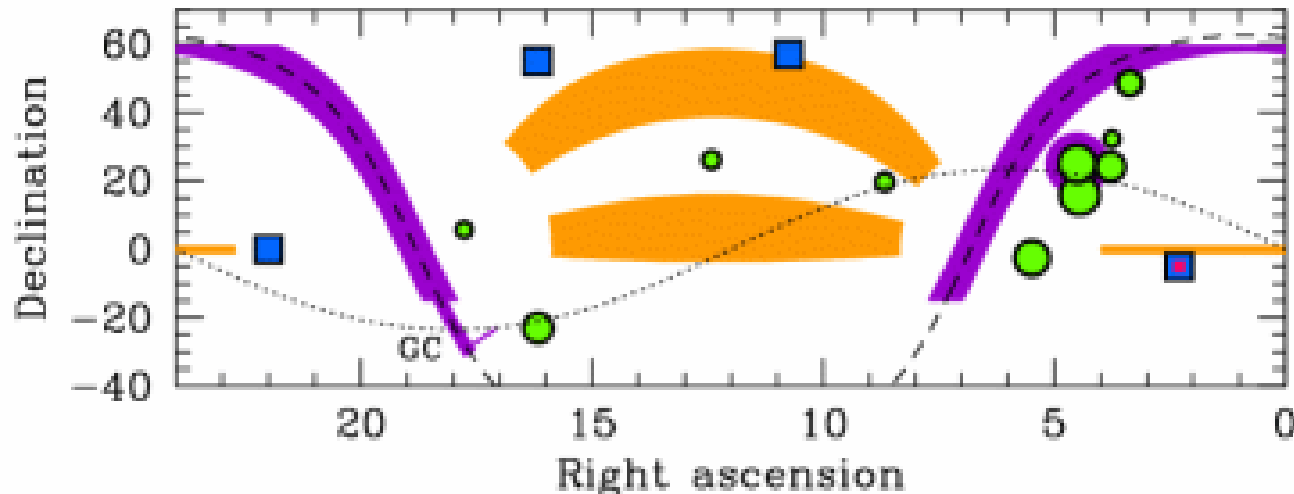
The UKIDSS Galactic Clusters Survey

➔ *ZYJHK* observations

➔ 1000 square degrees

➔ 10 star-forming regions and open clusters

➔ 2 epochs in the *K*-band for proper motions

➔ 5 sigma completeness limits: *Z*=20.4, *J* = 19.6, *K* = 18.2 mag

Priority	Name	Type	RA	Dec	Area
			J2000		sq. degs
1	Pleiades	open cluster	03 47	+24 07	79
2	Alpha Per	open cluster	03 22	+48 37	50
3	Praesepe	open cluster	08 40	+19 40	28
4	IC 4665	open cluster	17 46	+05 43	0.8
5	Taurus-Auriga	SF assoc.	04 30	+25 00	386
6	Orion	SF assoc.	05 29	-02 36	314.2
7	Sco	SF assoc.	16 10	-23 00	154
8	Per-OB2	SF assoc.	03 45	+32 17	12.6
9	Hyades	open cluster	04 27	+15 52	292
10	Coma-Ber	open cluster	12 25	+26 06	78.5
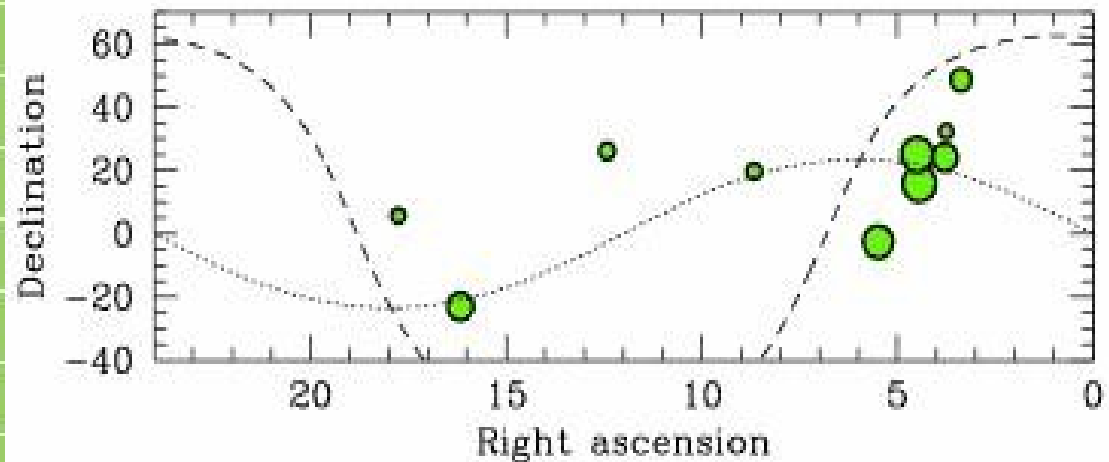
The sigma Orionis cluster

The photometric selection (I)
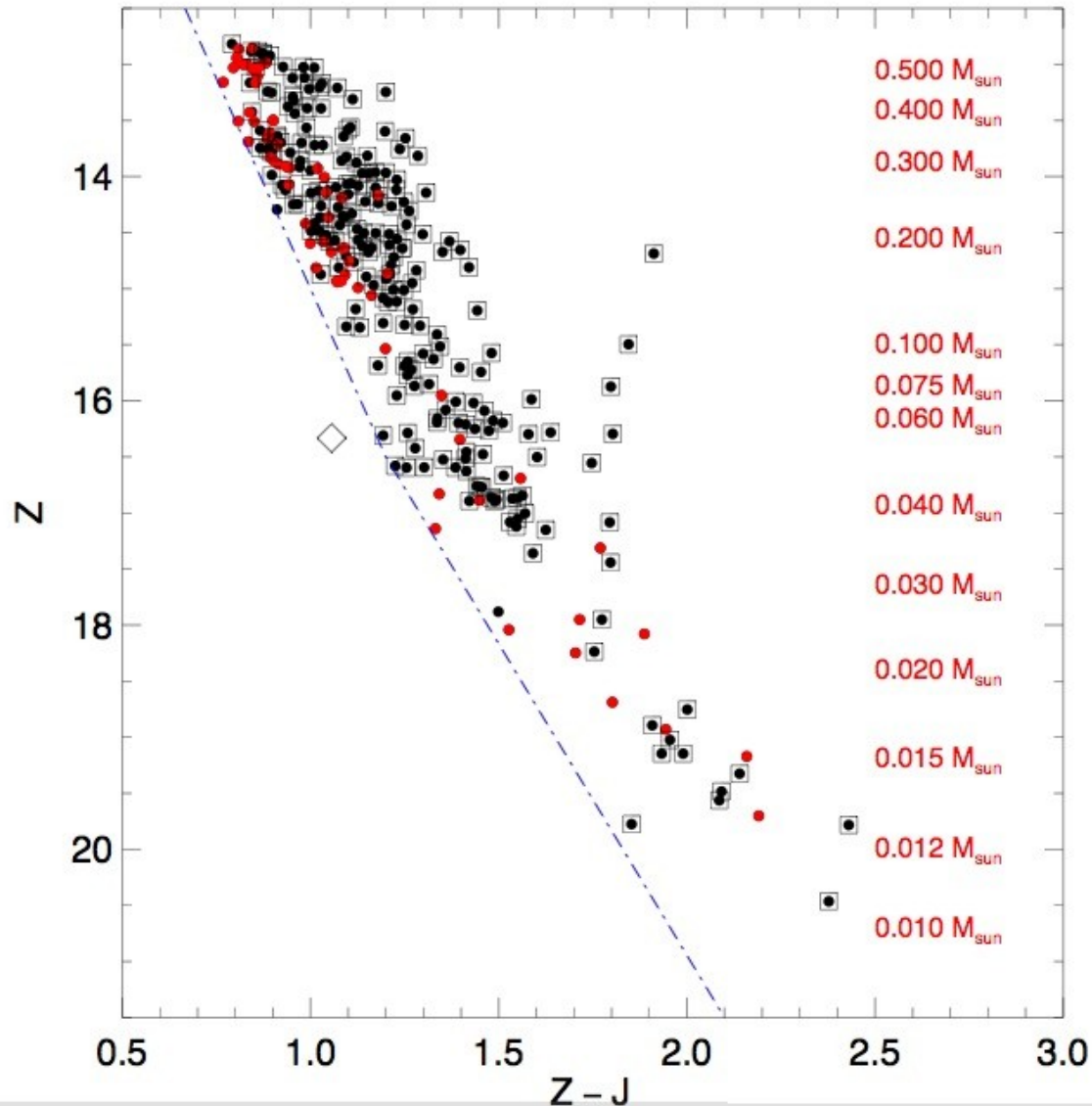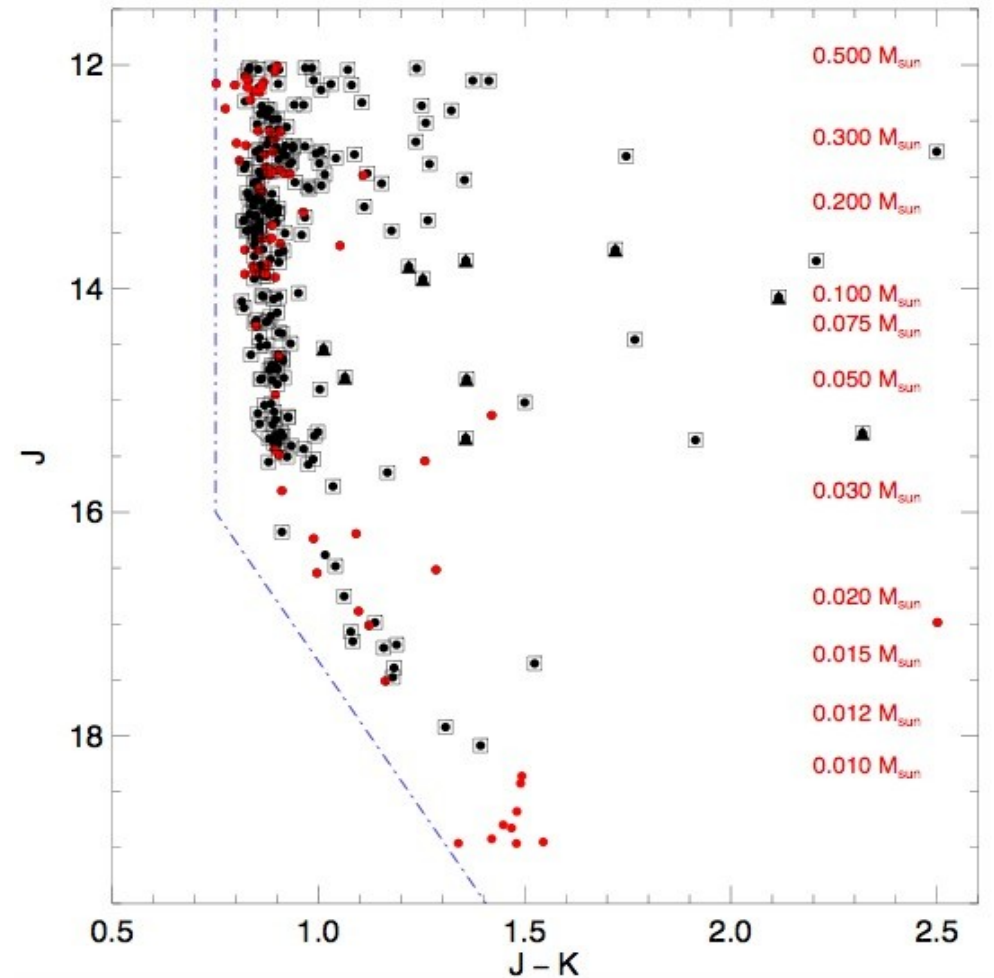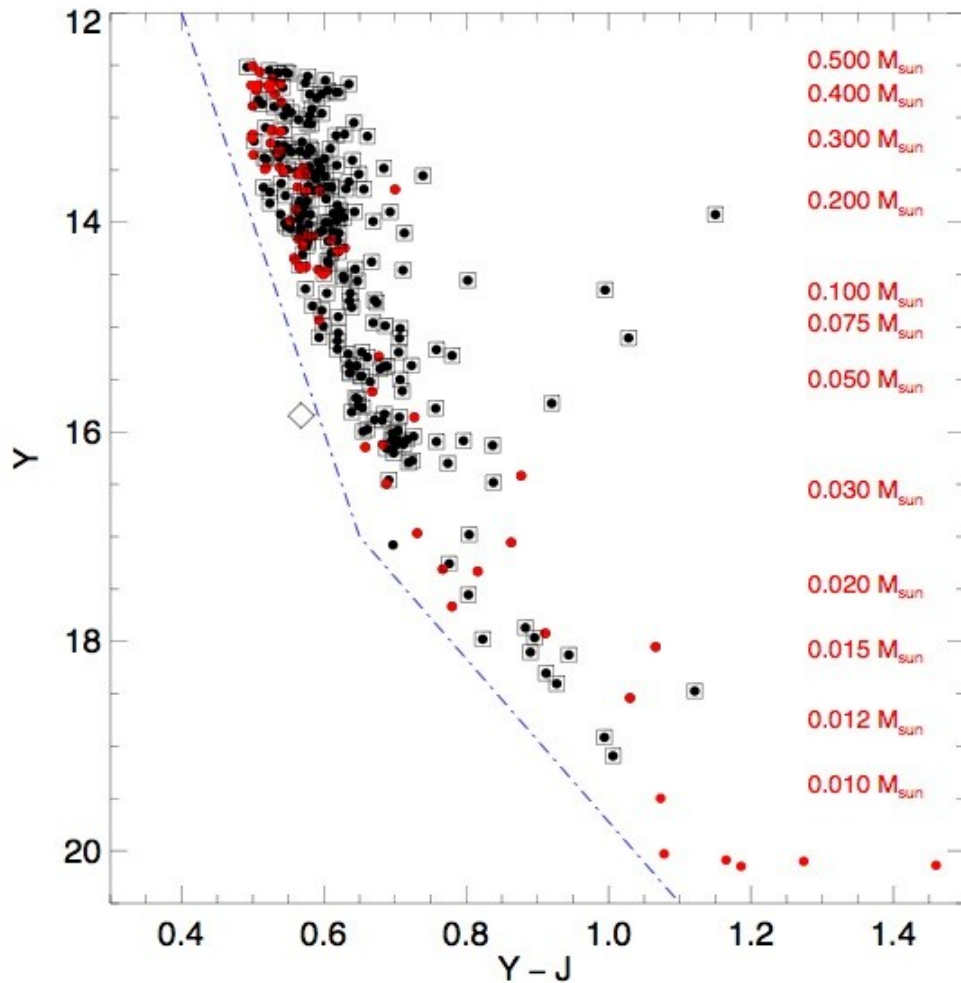

293 photometric candidates

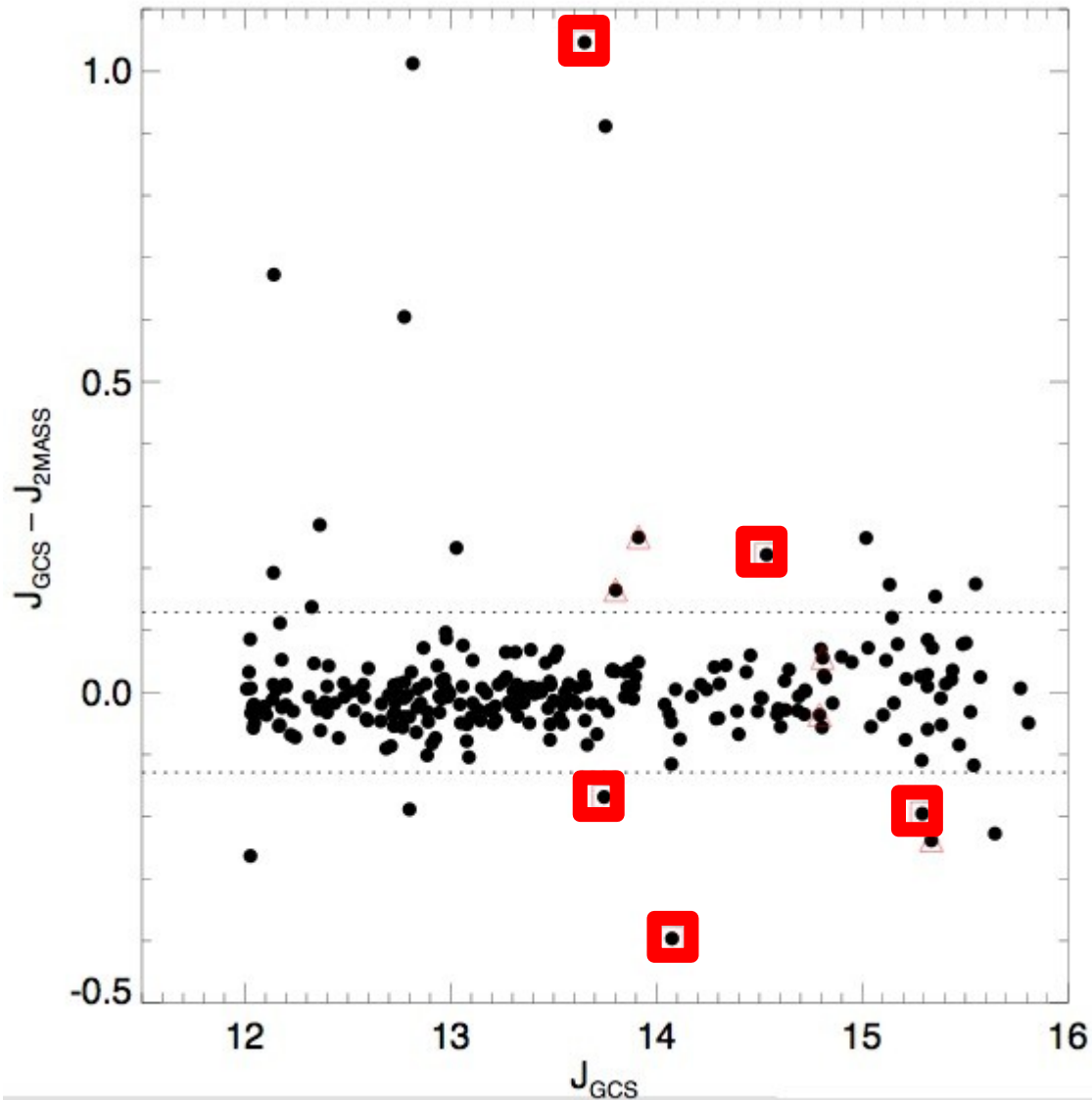Proper motions for brightest candidates ($J = 15.5$ mag)

75% of them are already known

Masses from the NextGen and DUSTY models (Lyon group)

The photometric selection (II)

Additional colour-magnitude diagrams used to (1) remove photometric non-members from the ZJ selection and (2) select fainter and lower mass candidates
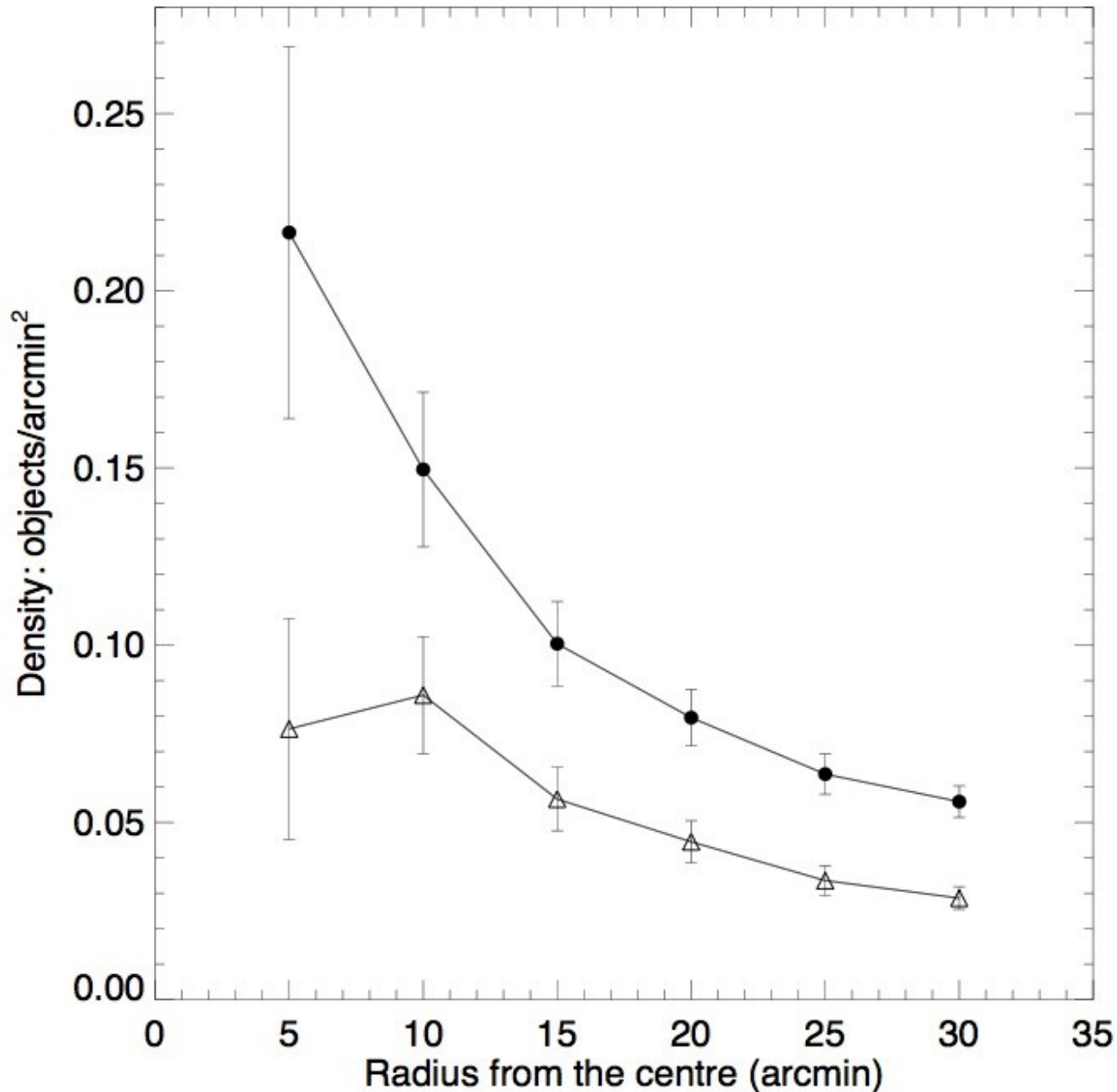
Variability of member candidates

Difference between the *J*-band magnitudes from 2MASS and the GCS as a function of *J* magnitude

Five objects exhibit variability over yearly timescales with a 99.55 confidence in *JHK*
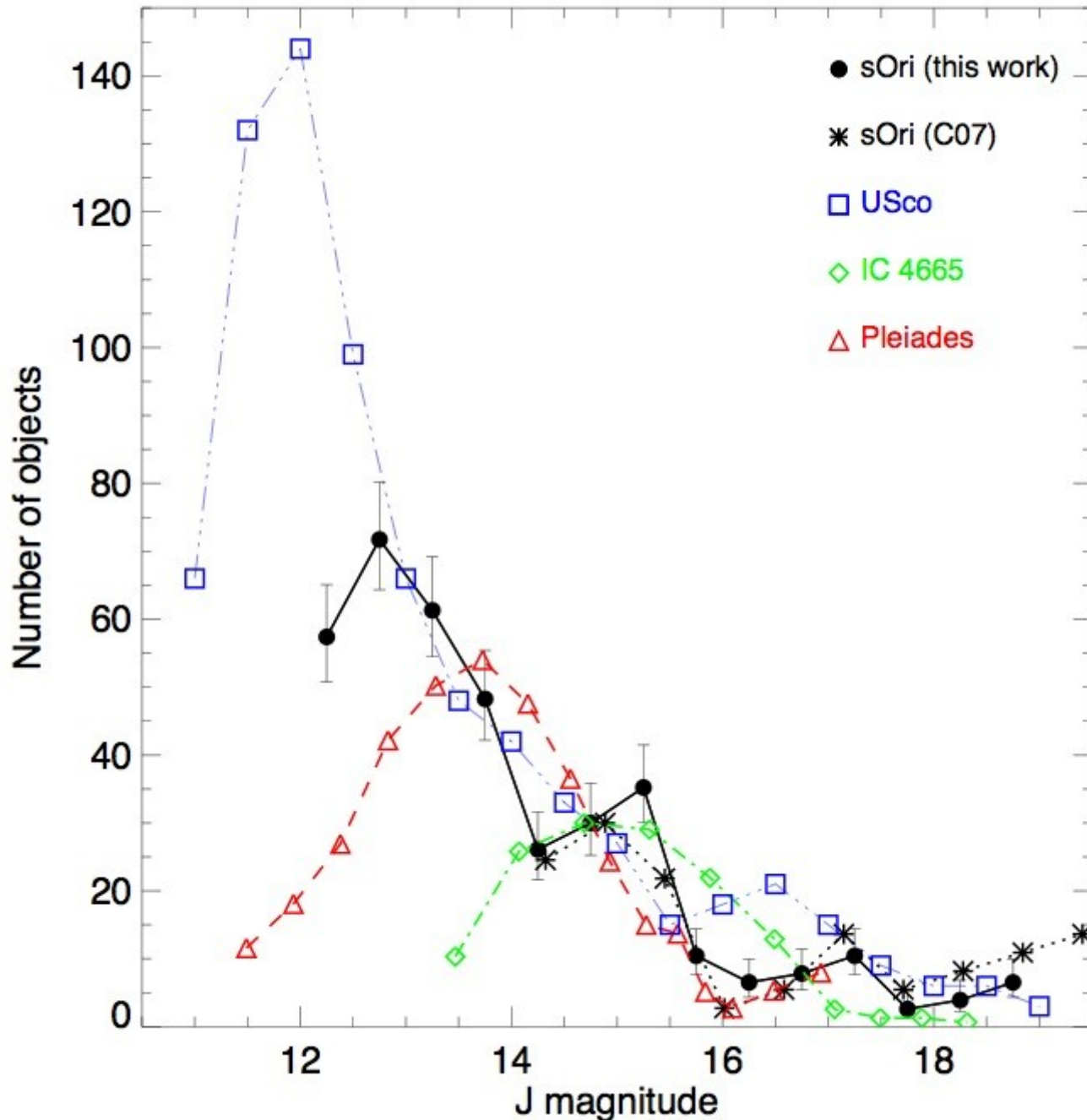
Dearth of BDs in the centre?

Histogram of the numbers of stars (filled circles) and brown dwarfs (open triangles) per square arcmin as a function of radius (in arcmin) from the cluster centre
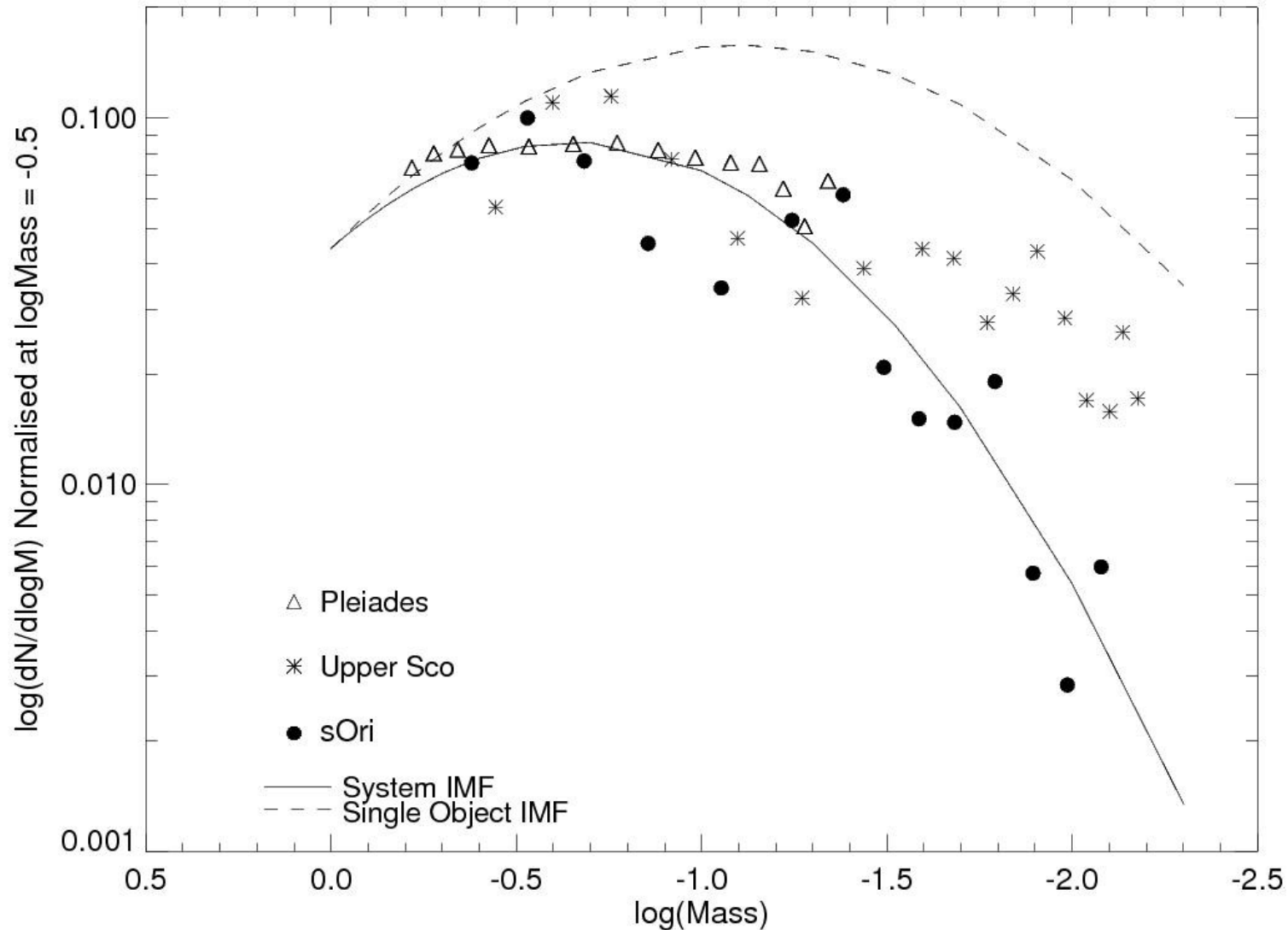
The luminosity and mass functions

The Luminosity Function

Luminosity functions in 4 clusters targeted by the UKIDSS GCS

The Mass Function

> Mass-magnitude relation

NextGen & DUSTY models from the Lyon group

> Results: MFs appear universal and well represented by the log-normal functions proposed by Kroupa (2002) & Chabrier (2003) down to 30 $M_{Jupiter}$

Conclusions & future work

Conclusions:

- ➢ Selection of stellar, substellar and planetary-mass members
- ➢ Full census of VLMs and BDs in sigma Orionis
- ➢ Proper motion measurements using 2MASS as first epoch
- ➢ Determination of the IMF down to 0.01 Msun

- ➢ Spectroscopic confirmation of the first L dwarfs in Upper Sco
- ➢ Photometric estimate of the Pleiades substellar binary fraction
- ➢ Revised mass function in IC4665

Outlook:

- ➢ Apply same procedure to the other 10 regions
- ➢ Extension of current GCS to find T dwarfs