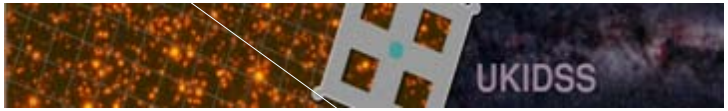

The IMF seen by the UKIDSS GCS

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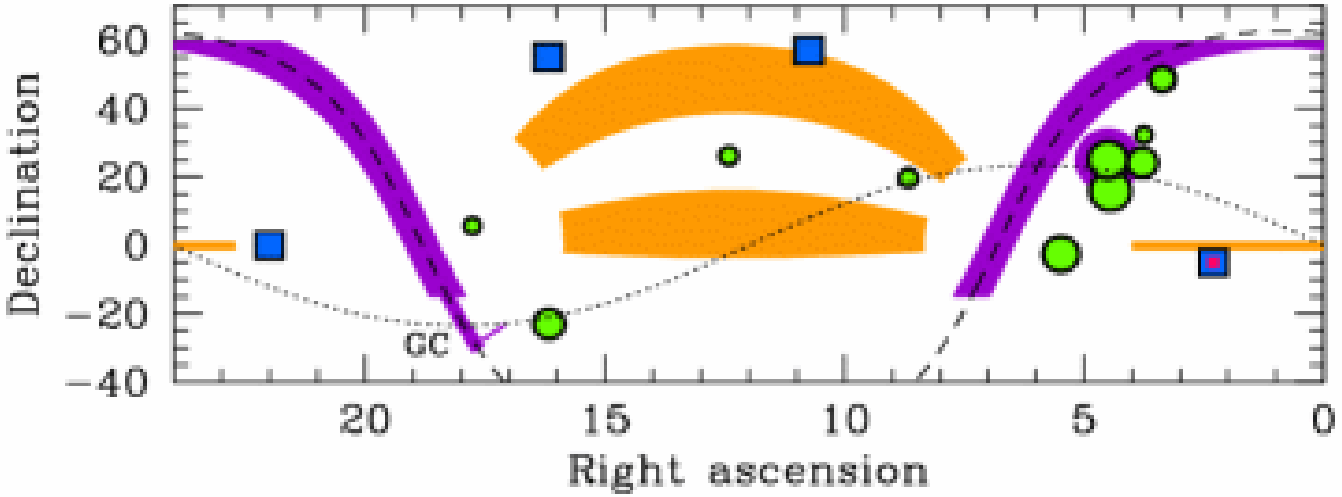
(3) Ramón y Cajal fellow

Wide Field Surveys, Baltimore 13-16 June 2011

UKIDSS

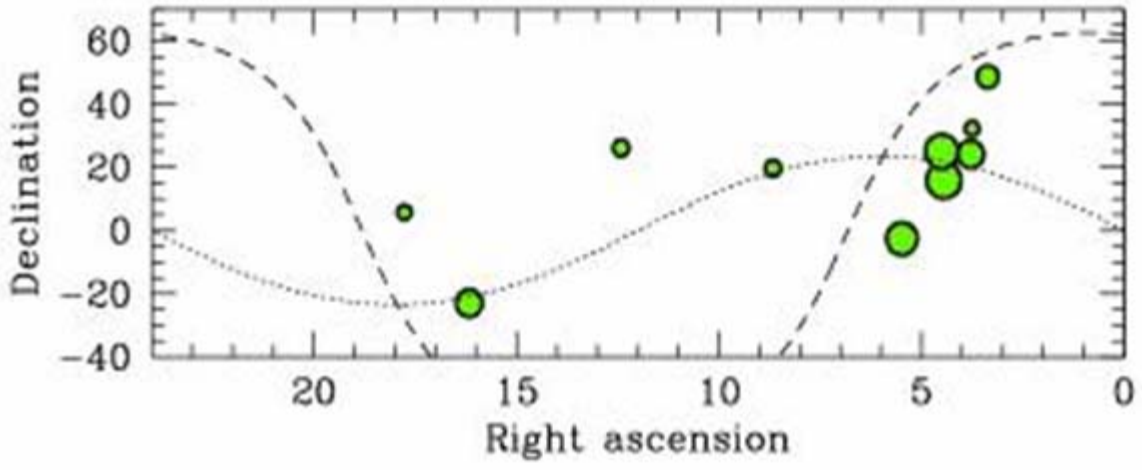
- Wide-field NIR survey with WFCAM on UKIRT *(Lawrence et al. 2007)*
- Pipeline-processed by CASU in Cambridge *(Irwin et al., in prep)*
- WFCAM Science Archive *(Hambly et al. 2008)*
- 5 components: LAS, GCS, GPS, DXS, and UDS
- Typical 5σ completeness limit is *K* = 18.1 mag (Vega)
- EDR, DR1-6 now WR6 since April 2011 *(Dye et al. 2006; Warren et al. 2007a)*
- DR7 (February 2010) and DR8 (September 2010)



The UKIDSS Galactic Clusters Survey

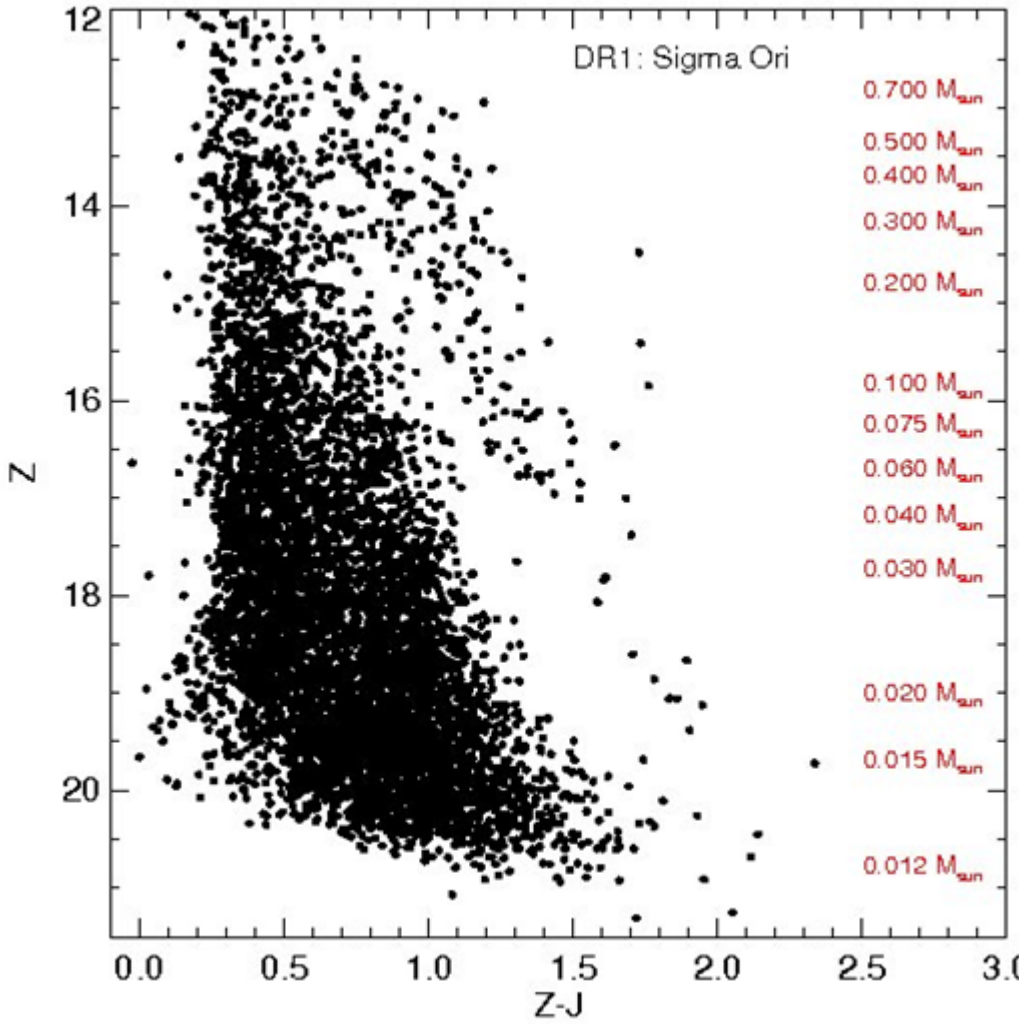
- ➔ *ZYJHK* observations
- ➔ 1000 square degrees
- ➔ 10 star-forming regions and open clusters
- ➔ Scientific Goal: Universality of the stellar and substellar IMF
- ➔ 2 epochs in the *K*-band for proper motions
- ➔ 5 sigma completeness limits: Z=20.4, J = 19.6, K = 18.2 mag

Priority	Name	Type	RA	Dec	Area sq. degs
			J2000		
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

Age = 1-8 Myr; d = 352 pc; coverage ~ 5 deg^2



Observations:

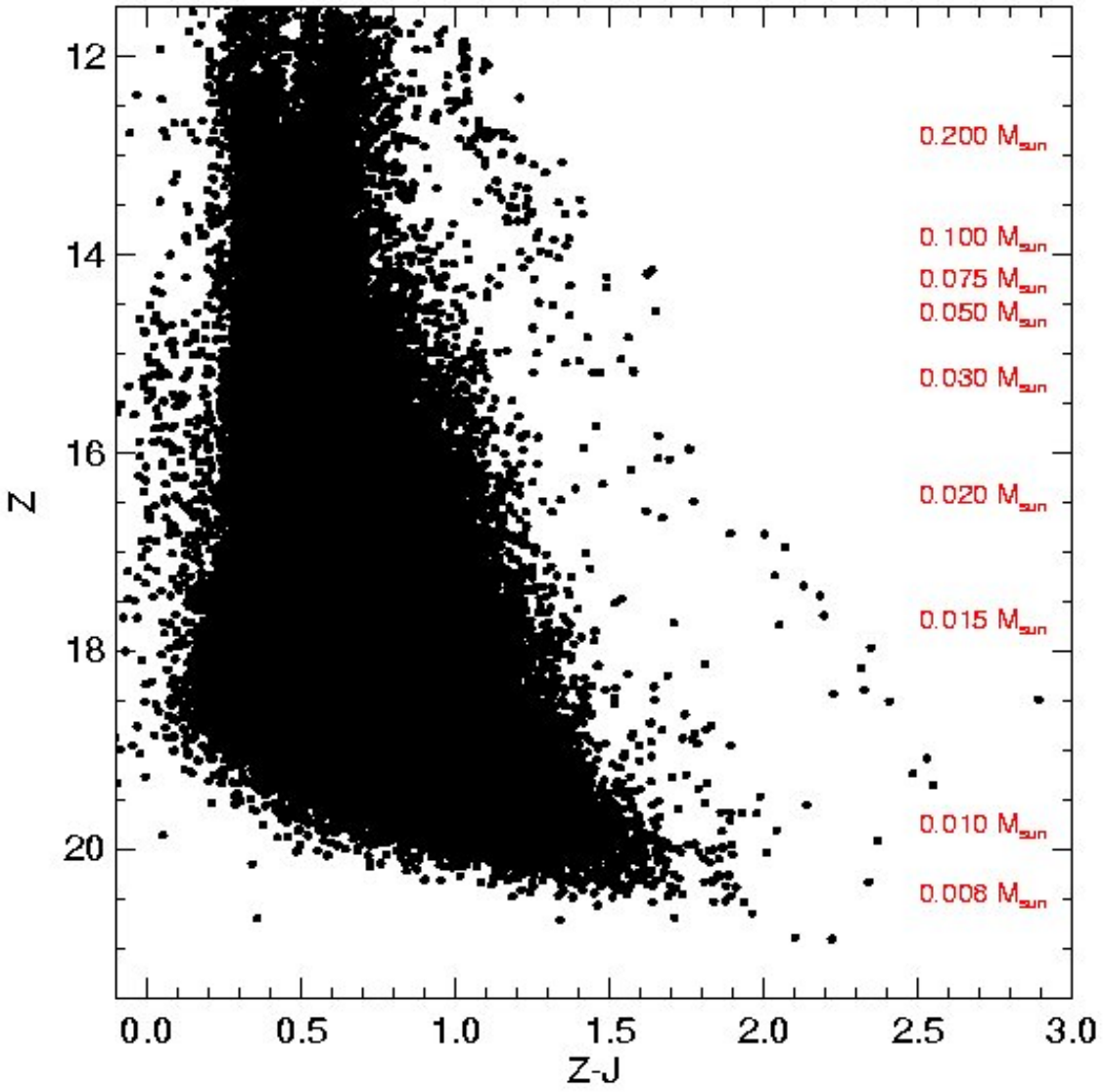
- *ZYJHK* survey in central 30 arcmin
- 46884 sources with Z=12.2-20.2 mag
- Mayrit catalogue for bright members

Selection procedure:

- Photometric selection in 5 filters and in the central 30 arcmin from centre
- Proper motions for J≤15.5 mag
- Cross-match with Mayrit catalogue and earlier studies
- New faint candidates detected in *YJHK* and *JHK*-only
- Variability of low-mass stars: ≤20%
- New candidates beyond 30 arcmin

The USco association

Age = 5 Myr; d = 145 pc; coverage = 6.5 deg^2



Observations:

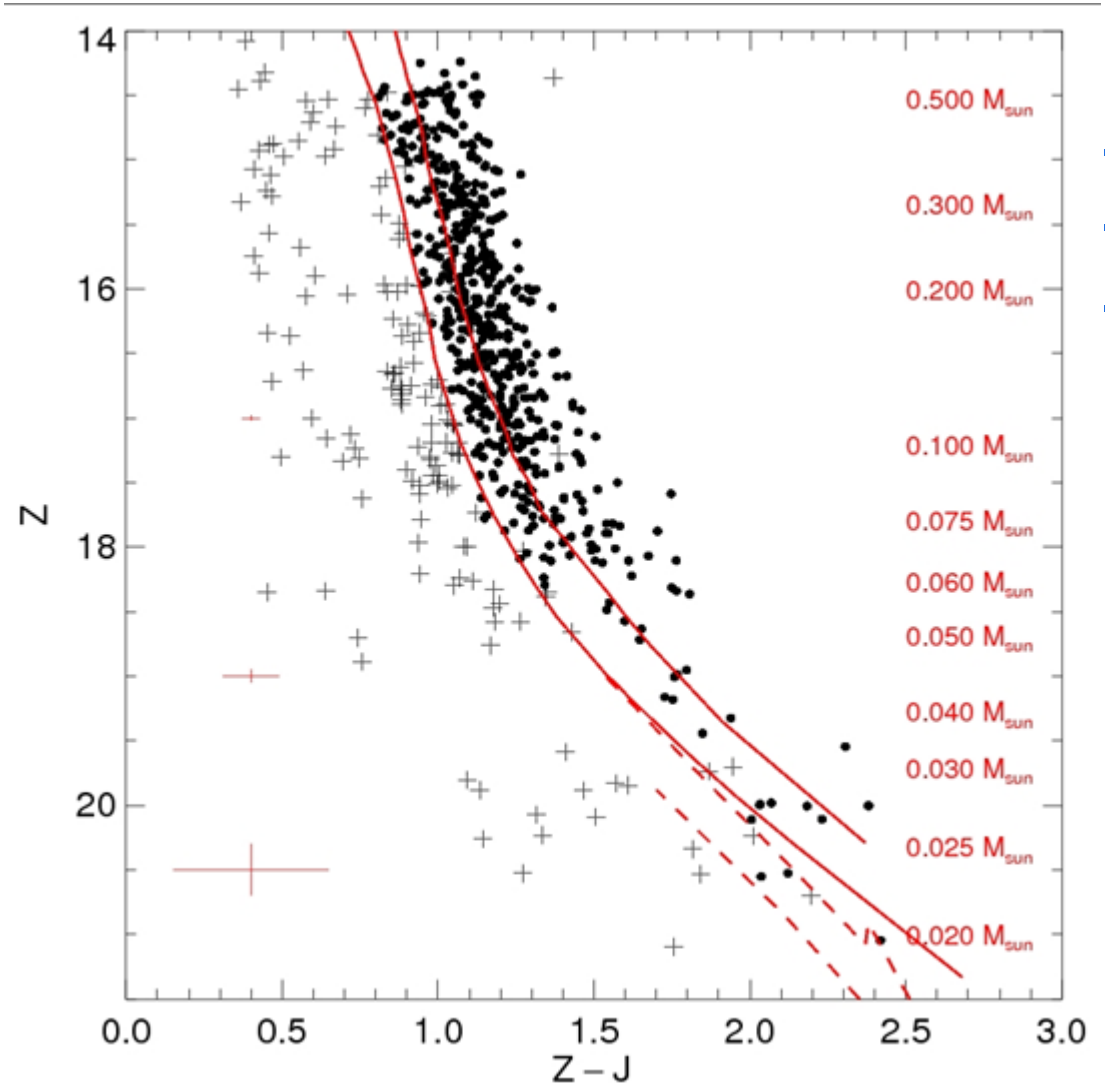
- GCS Science Verification
- Survey depth *J* ~ 18.7 mag
- 6.5 sq. deg. Imaged in *ZYJHK*
- 30% coverage in USco in DR8

Selection procedure:

- Cluster sequence well defined
- Various colour cuts applied
- Proper motion selection
- Optical and NIR spectroscopy for 94+20 sources: 105 members
- Spectral types: M4-L2
- Teff = 3350-1800 Kelvins
- Mass = 0.4-0.005 Msun

The IC4665 cluster

Age = 27 Myr; d = 350 pc; coverage ~ 4.3 deg^2



Observations:

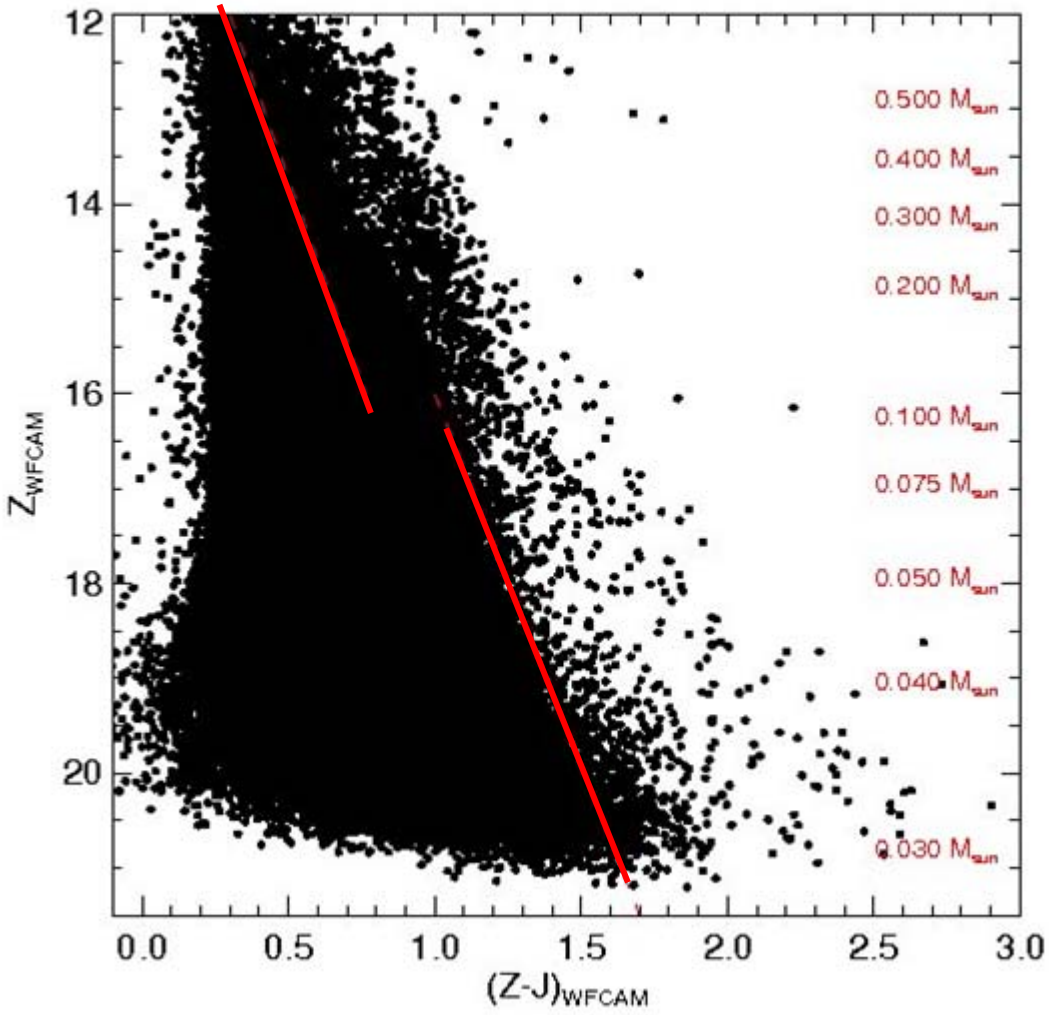
- *ZYJHK* survey of the full cluster
- 303978 sources with Z≥11.5 mag
- CFHT *I,z* survey of 3.8 deg^2

Selection procedure:

- Photometric selection optical and infrared filters from both surveys
- Proper motions for J≤15.5 mag
- 493 optical candidates confirmed
- New candidate members outside optical coverage
- Optical band at low galactic latitude
- Level of contamination: 55-65%

The Pleiades cluster

Age = 125 Myr; d = 130 pc; coverage = 12 deg^2



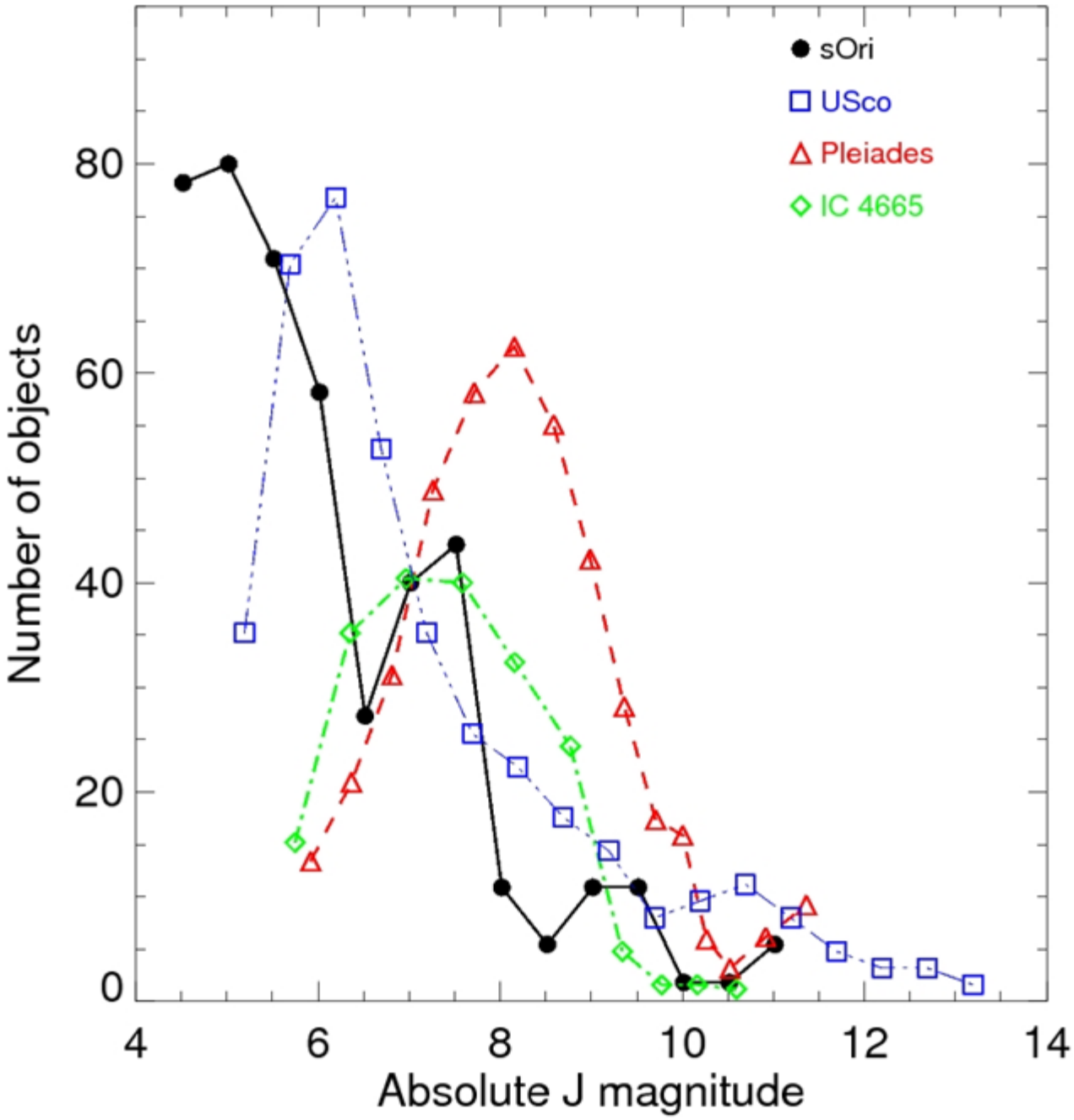
Observations:

- *ZYJHK* photometry over 12 deg^2
- 105092 sources w/ Z=12-21.5 mag
- CFHT+INT *I*,*z* photometry

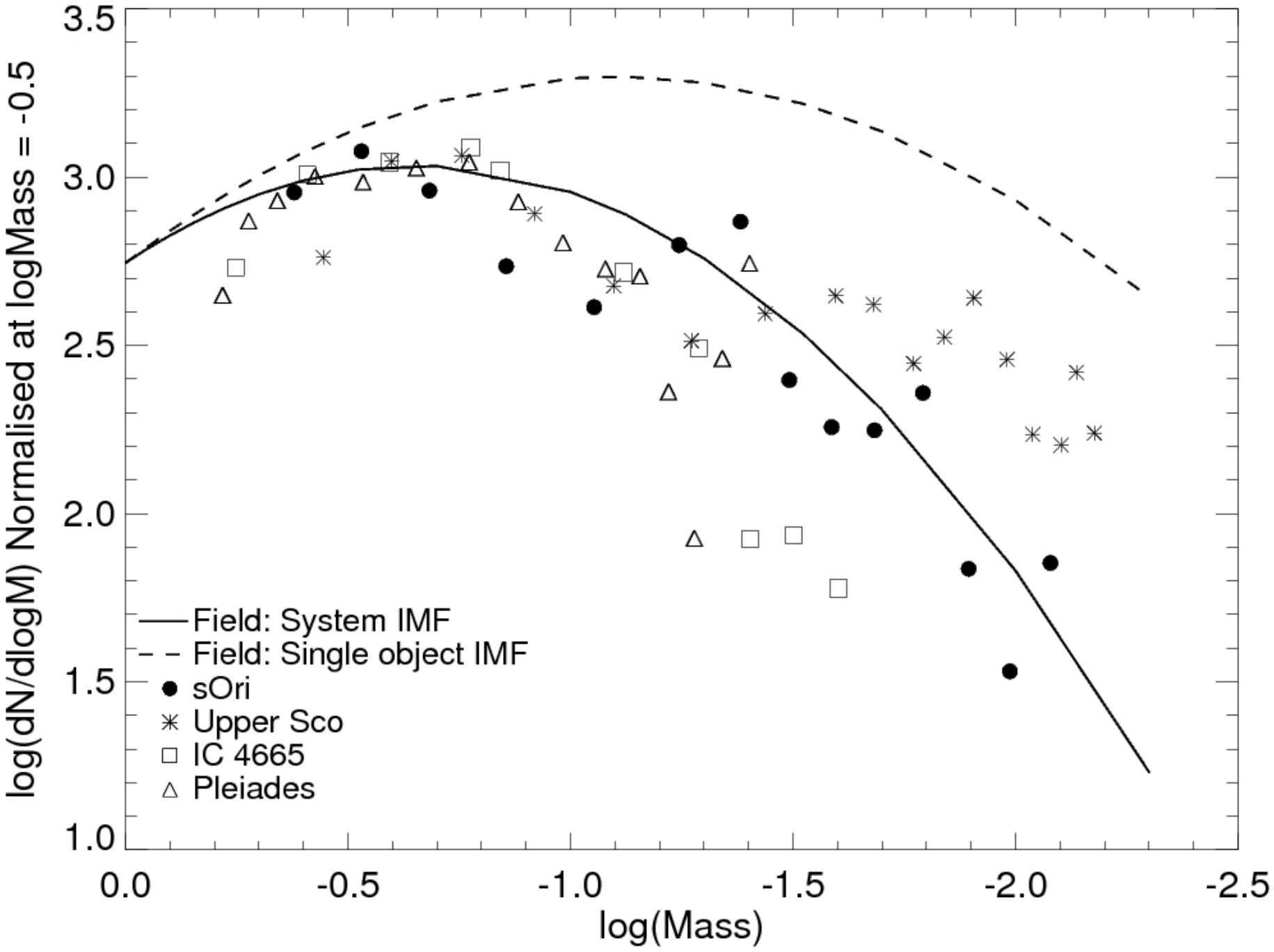
Selection procedure:

- Conservative photometric selection
- Derive proper motions from 2 epoch observations
- Bright sample: 2MASS vs GCS
- Faint sample: (CFHT+INT) vs GCS
- Determine membership probabilities
- Select high probability members
- Derive LF and MF

The Luminosity Function



Number of objects vs absolute *J* magnitude

	Age (Myr)	Dist (pc)
sOri	1-8	352
USco	5±2	145
Pleiad	125±8	130
ic4665	27±4	350

The Mass Function