Massive Clusters in the Milky Way & the Magellanic Clouds

Chris Evans (UK ATC)
& Simon Clark (Open University)
Massive Clusters: Beyond the Galactic Centre

**Motivations**

Young clusters are primary site of high-mass star formation:

- Explore the high and intermediate mass IMF
- Investigate dynamical evolution, i.e. mass segregation

With additional discussions with:
  - Ben Davies (Leeds)
  - Mark Gieles (ESO)
  - Danny Lennon (STScI)
  - Ignacio Negueruela (Alicante)
  - Hugues Sana (Amsterdam)
Massive Clusters: Beyond the Galactic Centre

“Obvious” targets to include:

- Existing NACO data
- Wd 1
  - PI: Brandner
- Quintuplet
  - Stolte et al. (in prep)
- Arches
  - Espinoza, Selman & Melnick (arXiv:0903.2222)
“Obvious” targets to include: **Existing NACO data**

* **Wd 1**  
  PI: Brandner

* **Quintuplet**  
  Stolte et al. (in prep)

* **Arches**  
  Espinoza, Selman & Melnick (arXiv:0903.2222)

* Others...?

**VERY APPROXIMATE** time estimates in following slides...

Scaling from 30 Doradus (cf. Campbell talk)

- **K**: 50% complete (5σ) @ $\sim 19.5^m$ from 24 min
- **H**: 50% complete (5σ) @ $\sim 20.0^m$ from 12 min
MW: Westerlund 2

NGS = feasible
Total exp. (to $K<18$) $\sim$ 5 mins
Total (JHK) + overheads $<30$ mins

But, two stars with $K = 7.6/8.7$.
Saturated with 1s DIT
($K<9.6$, in NGC3603, Alves/Ascenso)

NTT-SOFI, 3.7x4.1 arcmin
Ascenso et al. (2007)
MW: G305 - Triggered star-formation

APEX-LABOCA
Clark et al.
(in prep)

MSX 6.8-10.8 μm, Clark & Porter (2004)
MW: G305 - Danks 1 & 2
MW: G305.3 +0.2

JHK AAT-IRIS2
Leistra et al. (2005), 8x8 arcmin
**MW: G305.3 +0.2**

Exp. time:
Danks 1, 2 & G305.3+0.2
5 MAD fields in 3 pointings
JHK ~ 2500s/field
Total ~ 3.5 hrs

JHK AAT-IRIS2
Leistra et al. (2005), 8x8 arcmin
MW: W51 GMC

Hodapp & Davis (2002), approx 15x15 arcmin
MW: W51 GMC

K-band + $^{13}$CO
Nanda Kumar et al. (2004)
Exp. time: Half a dozen MAD fields
JHK ~ 2500s/field, Total ~ 4 hrs
Broader and/or deeper than SV data?

- WFC3 Early Release Program: U to H-band
- Match with a K-band mosaic?
- Prob. not high-priority
SMC: NGC 346

NGC 346 - largest HII region in SMC

Deep VI ACS data, extensive studies of PMS population and sub-clumps of star formation

Not high priority
SMC: NGC 330

Slightly older cluster (~30 Myr)

Evidence for mass segregation
  Sirianni et al. (2002)
  Gouliermis et al. (2004)

Puzzling high number of evolved emission-line stars...

WFPC2
SMC: NGC 330

Slightly older cluster (~30 Myr)

Evidence for mass segregation
  Sirianni et al. (2002)
  Gouliermis et al. (2004)

Puzzling high number of evolved emission-line stars...

0.5 mag fainter than 30 Dor but with “Bright NGS”

$H$, $K$, $Br\gamma$

12/24/24 mins

+ overheads/slews ~ 3 hrs
Potential targets:

- Westerlund 2: 0.5 hrs
- G305: 3.5 hrs
- W51: 4 hrs
- NGC 330: 3 hrs

Total: ~11 hrs

Lots more if time permits, such as:
- W49 GMC (cf. Alves & Homeier)
- Embedded s-f regions in N11 (LMC)

Plus: Wd1, Arches, Quintuplet to complement/revisit NACO data?

Targets that were frustratingly just out of reach with MAD, now become extremely attractive with MAD-MAX!