Introducing VICS: The Virgo IntraCluster Survey

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(Williams et al 2006 in prep; Durrell et al 2006 in prep)

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See Posters 80.04, 80.05, 80.06 (Tuesday) for more detailed information
Why should we study Intracluster Starlight? (ICL)

Zwicky (1951)
Detection of individual intracluster stars:


- **Intracluster Red Giants** – hundreds of candidates found in Virgo (Ferguson, Tanvir, and von Hippel 1998; Durrell et al. 2002)

- **Intracluster HII regions, Intracluster Novae and Intracluster Supernovae** – Found in Virgo, Fornax, and more distant clusters and groups(Gerhard et al. 2002; Ryan-Weber et al. 2004; Gal-Yam et al. 2003; Neil, Shara, & Oegerle 2005)

Surface Brightness observations of many more distant clusters:


10 – 20% of all starlight in galaxy clusters is in an intracluster component.
Two important questions:

- What is the mean age of the intracluster stellar population?

- What is the mean metallicity of the intracluster population?
A Solution: Color-Magnitude diagrams of the red giant branch in intracluster space

Intracluster light comes predominantly from dwarf galaxies - $[\text{Fe/H}] \sim -1$

Intracluster light comes from "harassed" giant galaxies - $[\text{Fe/H}] \sim -0.4$, dispersion of 0.3 dex, weak metal-poor tail
Surprise #1 – A small dwarf galaxy!
Unknown dwarf parameters:

$M_v = -10.3 \pm 0.2$

~ 1 kpc in size

This allows us to have the first direct look at the stellar population of a dwarf galaxy within a galaxy cluster.
Preliminary CMD (about 250 stars), with an expected contamination rate of ~ 10%

Using Padova isochrones, 12 Gyr – [Fe/H] = -0.4, -0.7, -1.3, -2.3

There appears to be little AGB stars, so we estimate this galaxy to be older than 8 Gyr.
Surprise #2 – four very interesting objects.
Intracluster globular cluster candidates in the VICS field.

Note the small number of resolved stars around each one!
The candidates have “normal” core radii, but seem to have larger tidal radii – perhaps due to their “empty” environment?

$M_v = -7 \text{ to } -9$
What about the original goal?

- Preliminary results show the mean metallicity to be low, $[\text{Fe/H}]=-1.3$, but with significant intrinsic scatter.

- A very metal-rich stellar population cannot be completely ruled out by the data.

- Many tests and simulations are still needed to confirm this result.
Conclusions

- VICS has successfully observed a portion of Virgo’s intracluster space, and has detected:
  - One unknown dwarf galaxy
  - Four intracluster globular cluster candidates
  - Several thousand intracluster red giants
  - Several V-band dropouts, both resolved and unresolved

More to come!