M33 with JAST/T80

Izaskun San Roman
CEFCA
LoRCA, kick-off workshop 2016 - Granada, Spain

Antonio Marin-Franch (CEFCA)
Alessandro Ederoclite (CEFCA)
Javier Cenarro (CEFCA)
Hector Vazquez Ramio (CEFCA)
and the J-PLUS Team

- ☉ **J-PLUS Survey:**
  - ☉ **A large photometric survey at Observatorio Astrofisico de Javalambre in Teruel, Spain**
  - ☉ **Filter Set: 12 Broad-, intermediate- and narrow-band filters (330 - 1000 nm)**
  - ☉ **IFU-like capabilities**

Goals

- ☉ **Test the capabilities of T80, T80Cam and the filter set**
- ☉ **Perform a detailed photometric analysis of the resolved and unresolved stellar population of M33**
  - ☉ **Unresolved Stellar Population:**
    - ☉ **A 2-D analysis of the underlying population**
  - ☉ **Star Cluster System**
  - ☉ **M33-M31 Interaction**

⊙ **Hierarchical merging scenario:**

Large disk galaxies derive from the merger and accretion of smaller subsystems

| Where do dwarf spiral galaxies fit in the galaxy formation scenario? |
|---|

⊙ **Why M33?**

Distance = 870 kpc

The only nearby late-type spiral galaxy

Total mass ~ 20 times lower than the MW and only ~2 time greater than the Magellanic Clouds

Face-on view: study of its disk and halo populations

M33 provides a unique opportunity to test the Λ-CDM framework predictions in a regime different from the MW
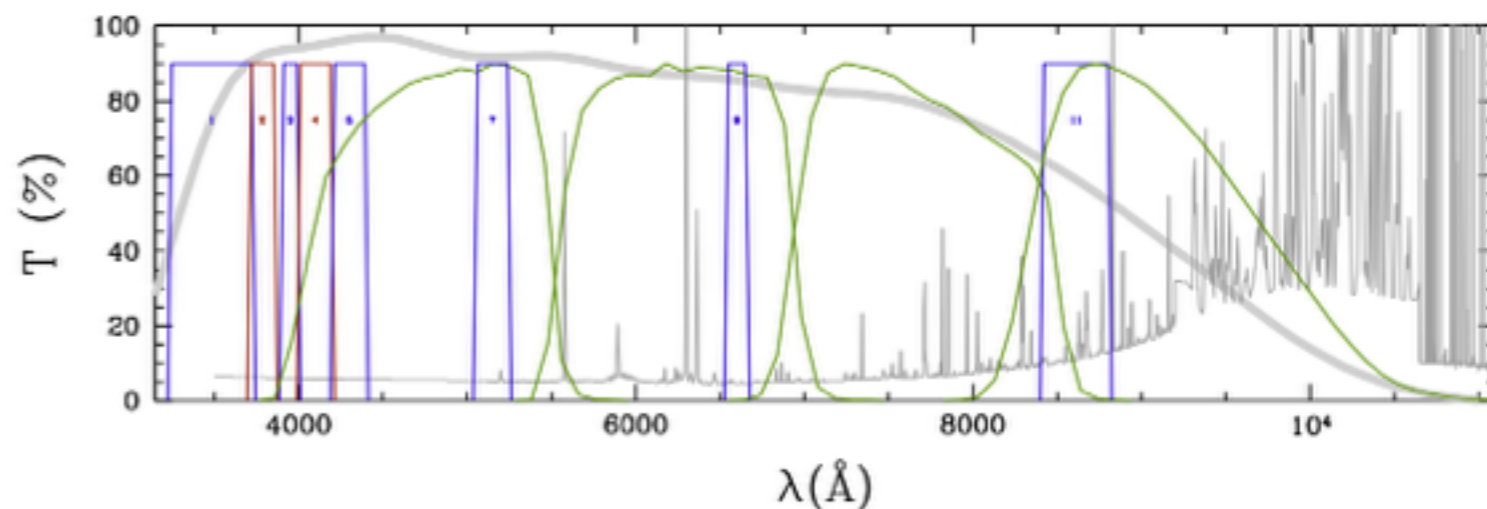
Filter Number	Name	Central Wavelength (nm)	FWHM (nm)	Comments
JPLUS-01	u$_J$	348.5	50.8	In common with J-PAS
JPLUS-02	F378	378.5	16.8	[OII]; in common with J-PAS
JPLUS-03	F395	395.0	10.0	Ca H+K
JPLUS-04	F410	410.0	20.0	Hδ
JPLUS-05	F430	430.0	20.0	G-band
JPLUS-06	g'	480.3	140.9	SDSS
JPLUS-07	F515	515.0	20.0	Mgb Triplet
JPLUS-08	r'	625.4	138.8	SDSS
JPLUS-09	F660	660.0	13.8	Hα; in common with J-PAS
JPLUS-10	i'	766.8	153.5	SDSS
JPLUS-11	F861	861.0	40.0	Ca Triplet
JPLUS-12	z'	911.4	140.9	SDSS

- **M33: Extended Object**
  - **Unresolved Component**
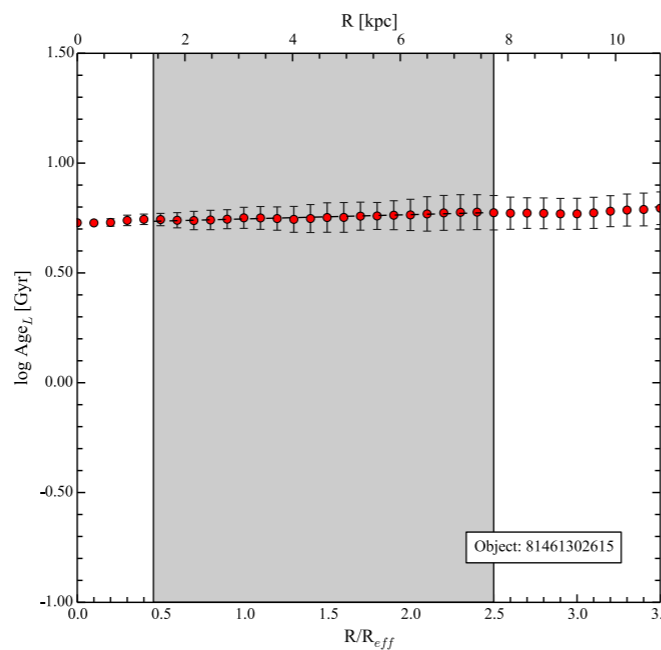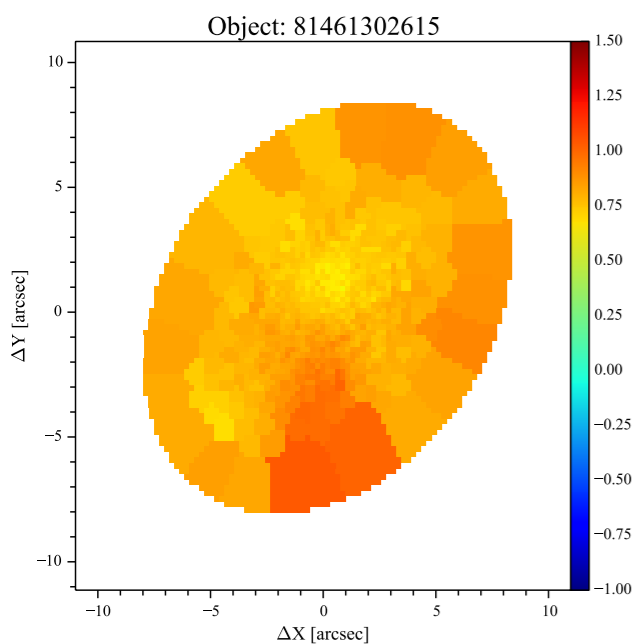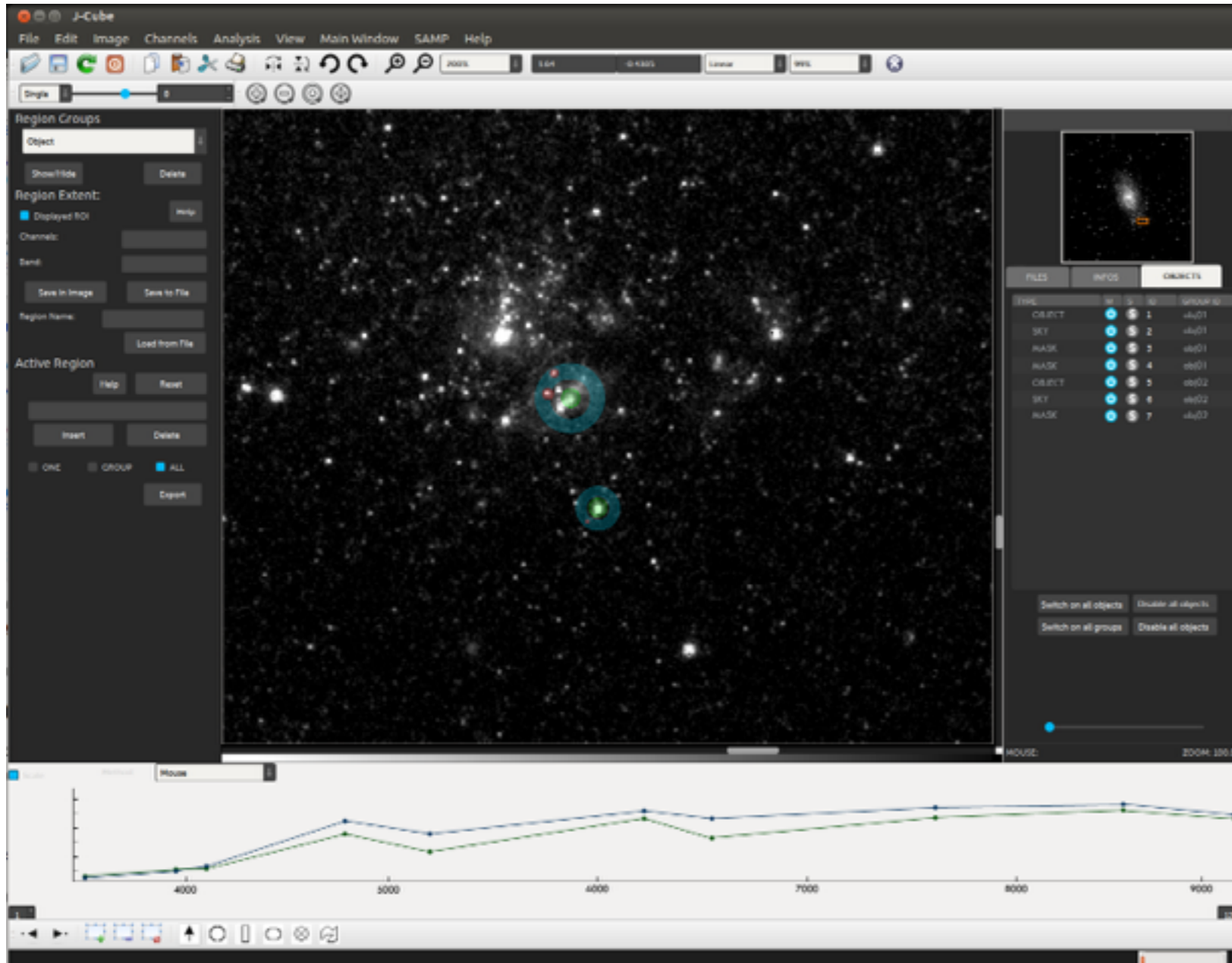
  ↓

  2-Dimensional Analysis
  +
  Spectral Fitting

- **Optimal set of filters: provides an adequate sampling of the galaxy SEDs.**
- **Uniform and non-biased spatial sampling: allowing environmental studies**
- **IFU-like capabilities: pixel-by-pixel investigation of the extended areas**
- **Large survey area: a diversity of galactic components in a single telescope pointing**
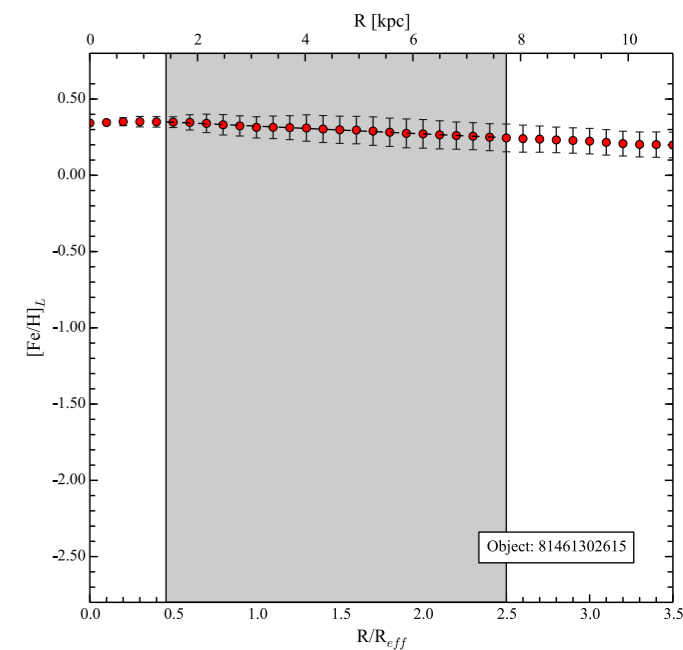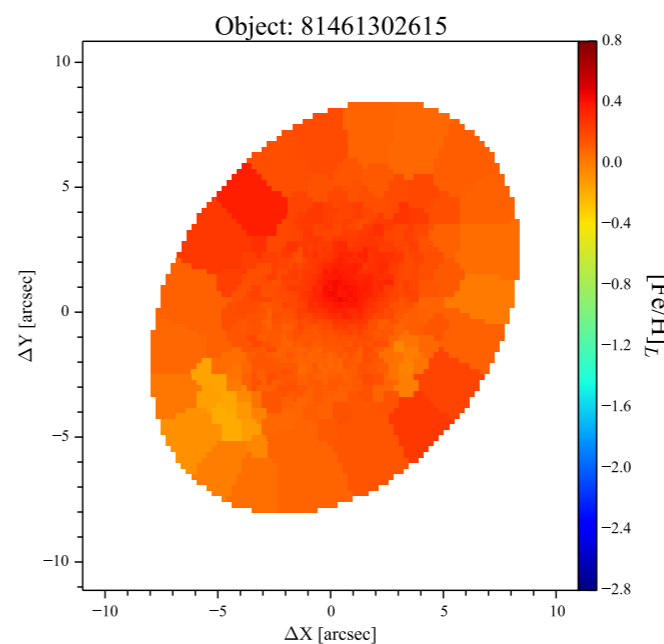
Distance: 870 kpc (m$_v$-M$_v$= 24.69)

   Reaching the faint tail of the luminosity function

 Multi-filter approach: detect star clusters and characterize their stellar population

 Ages and Metallicities for a big sample extending the most updated catalog of M33 star clusters (San Roman et al. 2010)

Perform a statistically solid inter comparisons of MW, M31 and M33

- ⊙ **McConnachie et al. 2009 find a previously unknown prominent stellar structure surrounding M33.**
- ⊙ **An extension stretching ~ 2º (~30 kpc; projected) to the northwest, towards M31**

- ⊙ **Two regions (3.9 squared degrees):**
  M33-C: centered on M33 and covering the disk and the outskirts
  M33-S: covering the line connecting M33-M31 to map the stellar substructure
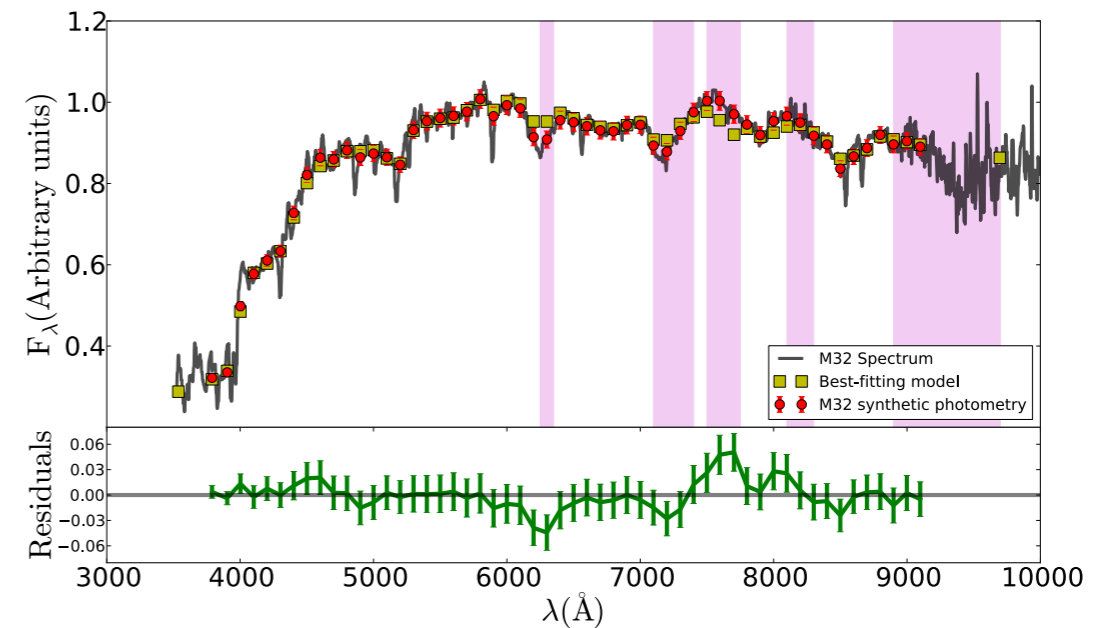

RGB: −2.5 < [Fe/H] < −0.2 dex

η (degrees)

ξ (degrees)
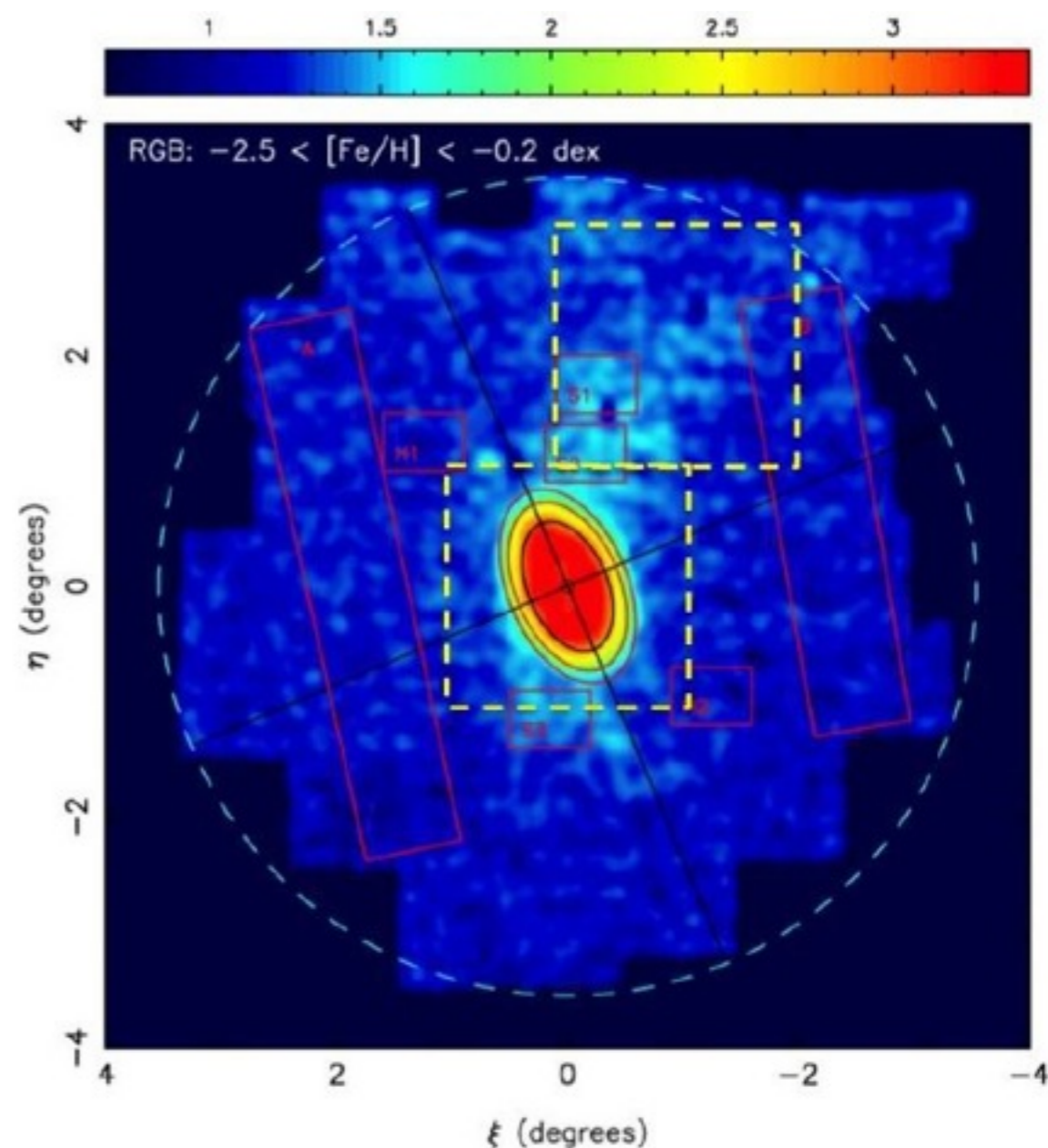
McConnachie et al. 2010

- **2D study of stellar population**
  - **J-PAS will permit the 2D study of stellar population in a very large sample of nearby galaxies**
  - **J-PAS photometry is the perfect anchor for the flux calibration of integral field surveys**

- **Environment Effect**

  Contiguous coverage of the northern sky:
  detailed studies of environmental effects

- **Spatial Resolution**

  Expected resolution of J-PAS: ~ 1'' :
  smaller structures than local integral field surveys
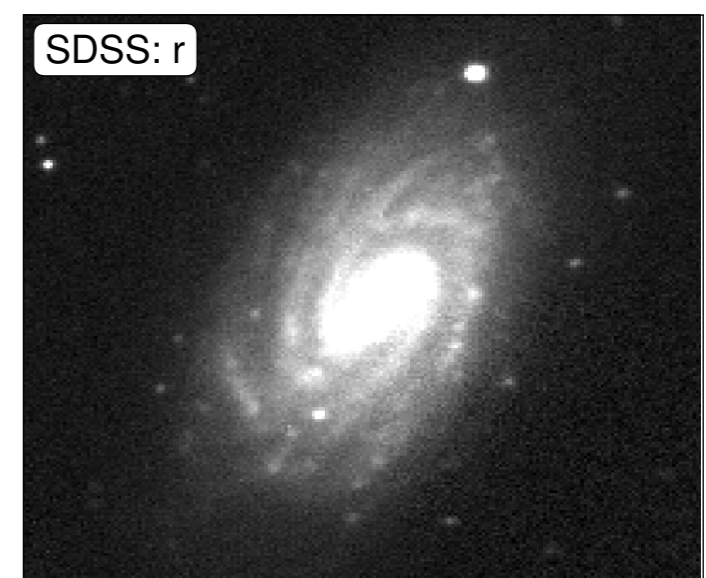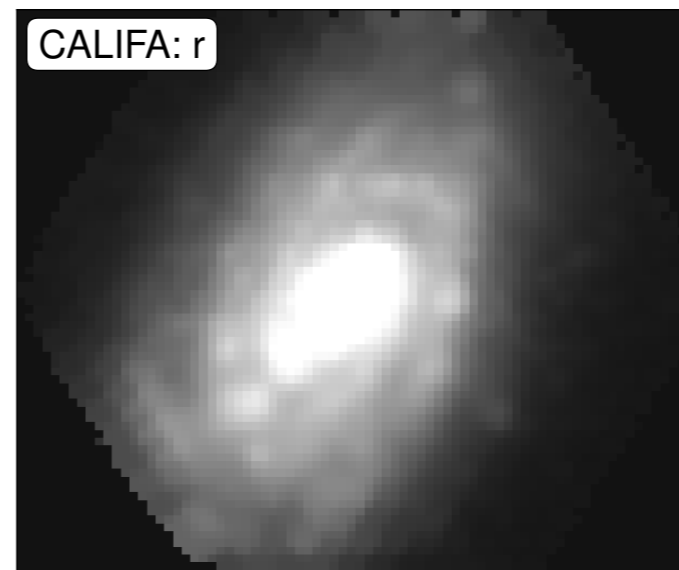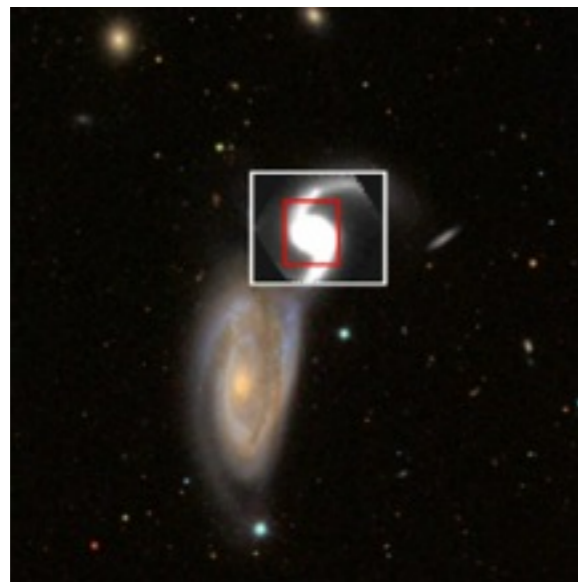
- Spectral fitting diagnostics of the resolved and unresolved populations will allow us to determine ages, metallicities and masses of the galactic disk, spheroidal component and cluster system:
  - Are there any indications of substructure in the disk and halo of M33?
  - Where is the disk/halo transition and how far out from the center can we trace the halo?
  - Does the disk metallicity gradient change slope at large galactocentric radii?
  - Do the identified tidal streams have clusters associated to them?

> The combination of the number of filters, the sky coverage and the depth of this survey will make this project an unprecedented experiment for stellar population studies.

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