STELLAR POPULATIONS IN BRIGHTEST CLUSTER GALAXIES

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ABSTRACT:

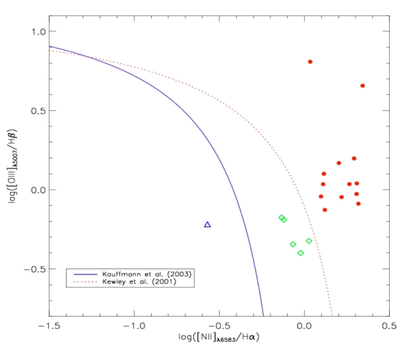
We study the interplay between stellar population of the Brightest Cluster Galaxies (BCG) and cluster global properties. We use X-ray properties from Chandra, ROSAT and ASCA observations and BCGs spectra from SDSS-DR7.
Using STARLIGHT we determined the star formation history of the BCGs and look for relations with the intra-cluster gas properties. Our first results point to a greater percentage of young stellar population in BCGs of more dynamically relaxed cool core clusters, and this new stellar population has metallicity comparable to intra-cluster gas metallicity.

INTRODUCTION:

Previous studies have found evidence for recent star formation in the central galaxies of cool core clusters, but there is an uncertainty about the relation with its environment or the origin of the cold gas. Our aims are either quantifying the recent star formation in BCGs and studying how this is linked to global cluster properties.

THE SAMPLE:

Our sample is defined from three X-ray Galaxy Clusters catalogs: HIFLUGCS[1], RASS-SDSS galaxy clusters survey[2] and Maughan et al. 2008[3].
We selected 117 clusters and groups in the area covered by Sloan Digital Sky Survey DR7 whose BCG have spectral observations to determinate its star formation history.
The redshift interval is $0.003 < z < 0.59$.
We exclude AGNs of our sample by BPT diagram[4].



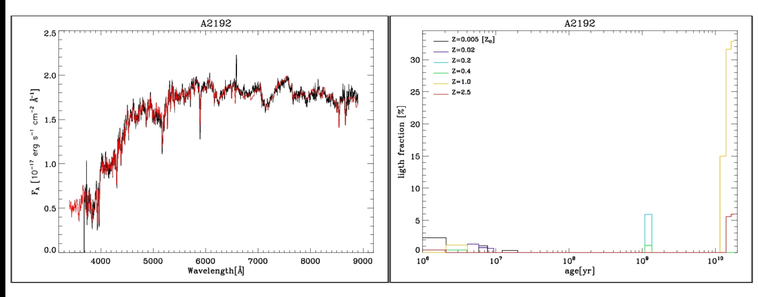
Two Seyferts and 11 LINERs were excluded.

SPECTRAL ANALYSIS OF BCGs:

To obtain the star formation history of BCGs, we use the public spectral synthesis code, STARLIGHT[5] with a base of 150 SSPs from Bruzual & Charlot, 2003[6], with six metallicities and 25 different ages.

We define young stellar population as:

$$\text{Age} \leq 5 \times 10^7 \text{ yr}$$



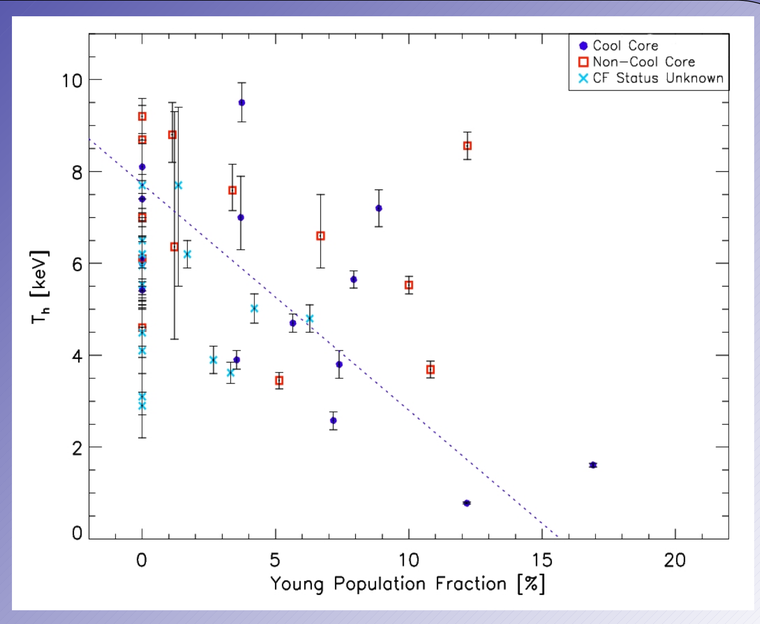
Left: Example of spectral fit by Starlight of the central galaxy in A2192 cluster. Right: Star formation history in the center of this galaxy determined from Starlight fit.

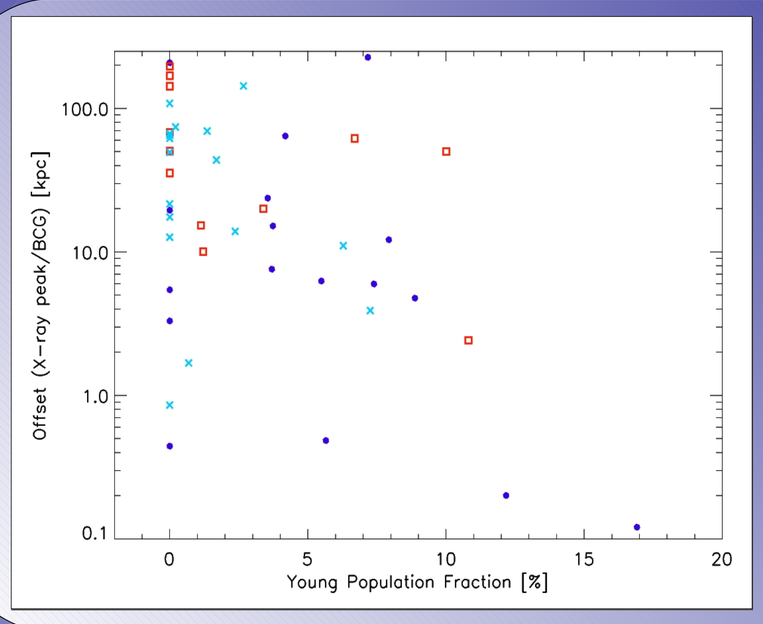
RESULTS:

A) INTRA-CLUSTER GAS TEMPERATURE:

We use gas temperature as a estimator of the cluster mass, then we use the hotter component (Th) of two-temperature fit, accepting a small and cold component in central region of cooling core clusters.

Spearman ρ_{CC}=-0.55 : Less massive clusters has a BCG with a greater percentage of young stellar population





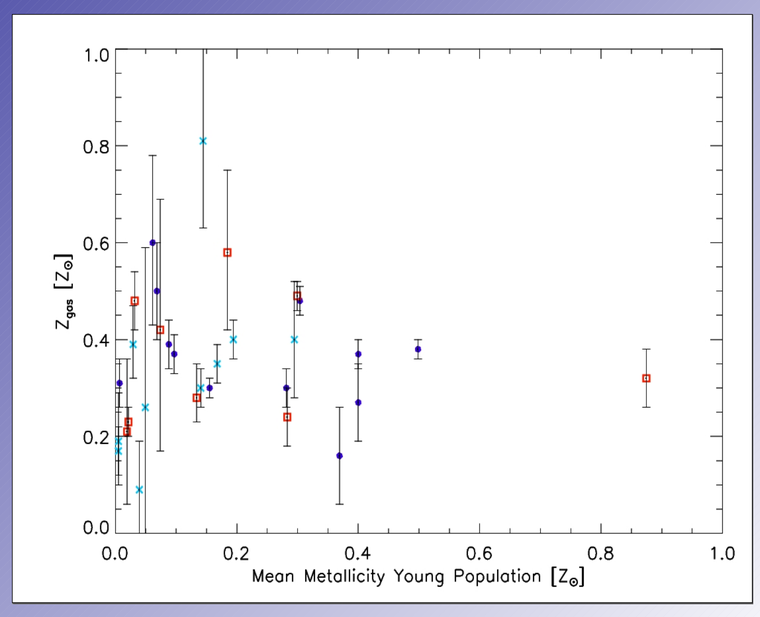
B) OFFSET X-RAY PEAK/ BCG:

Distance between X-ray peak (from CHANDRA observations) and BCG center. We use $\Omega_m = 0.25$ and $\Omega_\Lambda = 0.75$

ρ_{CC}=-0.44 : in cool core clusters exist an absence of high star formation when BCG is far from X-ray peak.

C) INTRA-CLUSTER GAS METALLICITY:

We found that the metallicity of young population is lower than expected from the metalicity of all stellar population in the BCG.
Maybe recent star formation has not relation with gas coming from the galaxy and other external gas source is necessary to fuel star formation in BCGs.
A possible source is the intra-cluster gas falling by cooling flow.



CONCLUSIONS:

BCGs with high percentage of young stellar population are present in low mass and dynamically relaxed cool core galaxy clusters.
The metallicity of this young population is lower than expected.

REFERENCES:

[1] Reiprich & Böhringer, 2002, ApJ 567, 716
[2] Popesso et al. 2004, A&A 423, 449
[3] Maughan et al. 2008, ApJ 174, 117
[4] Baldwin, Phillips & Terlevich, 1981, PASP 93, 5
[5] Cid Fernandes et al. 2005, MNRAS 358, 363
[6] Bruzual & Charlot, 2003, MNRAS 344, 1000