

IntraCluster Light at $z \sim 0.5$: the MUSE and CFHT view

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**X
X
L**

**The ultimate
XMM extragalactic survey**

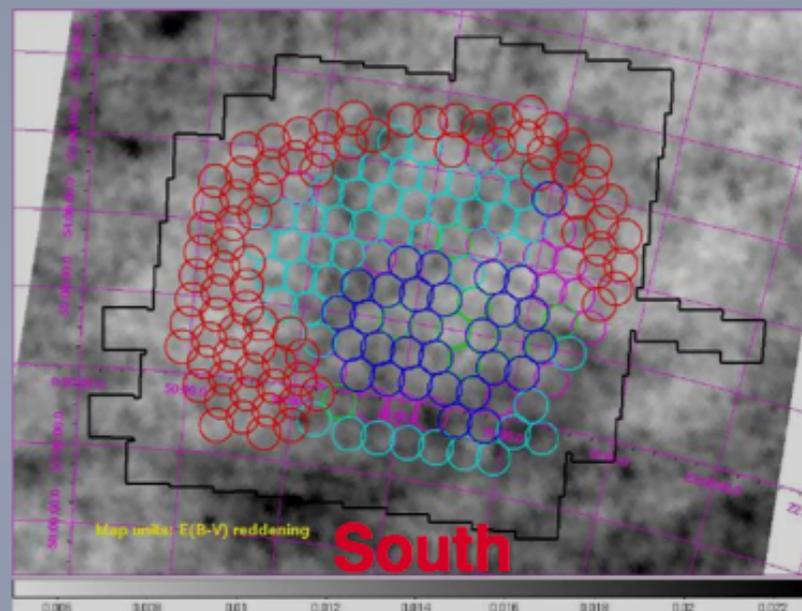
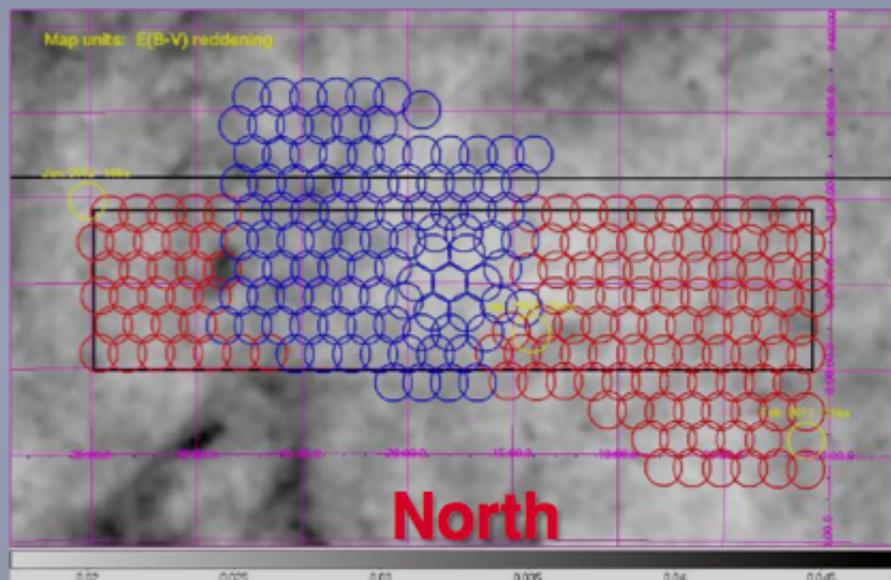
*die Kunst
über
in der Wissenschaft*

XMM-XXL project

PI: M. Pierre

<http://irfu.cea.fr/xxl>

- 10ks XMM survey / 50 deg² divided in two fields



- Expected > 500 clusters and 20000 AGNs
- XMM VLP (3 Ms over AO10 / AO11)
- World-wide collaboration of ~100 scientists
mainly from Europe and US, Canada, Australia

Intracluster Light (ICL)

- It is composed both of gas and stars;
- It *may* become the site of intra-cluster/group star formation
- It is a tracer of types and frequency of the physical processes at work in a cluster or in a group

○ **BUT**

- It is difficult to disentangle ICL from halo emission;
- It is difficult to observe it outside our local Universe.

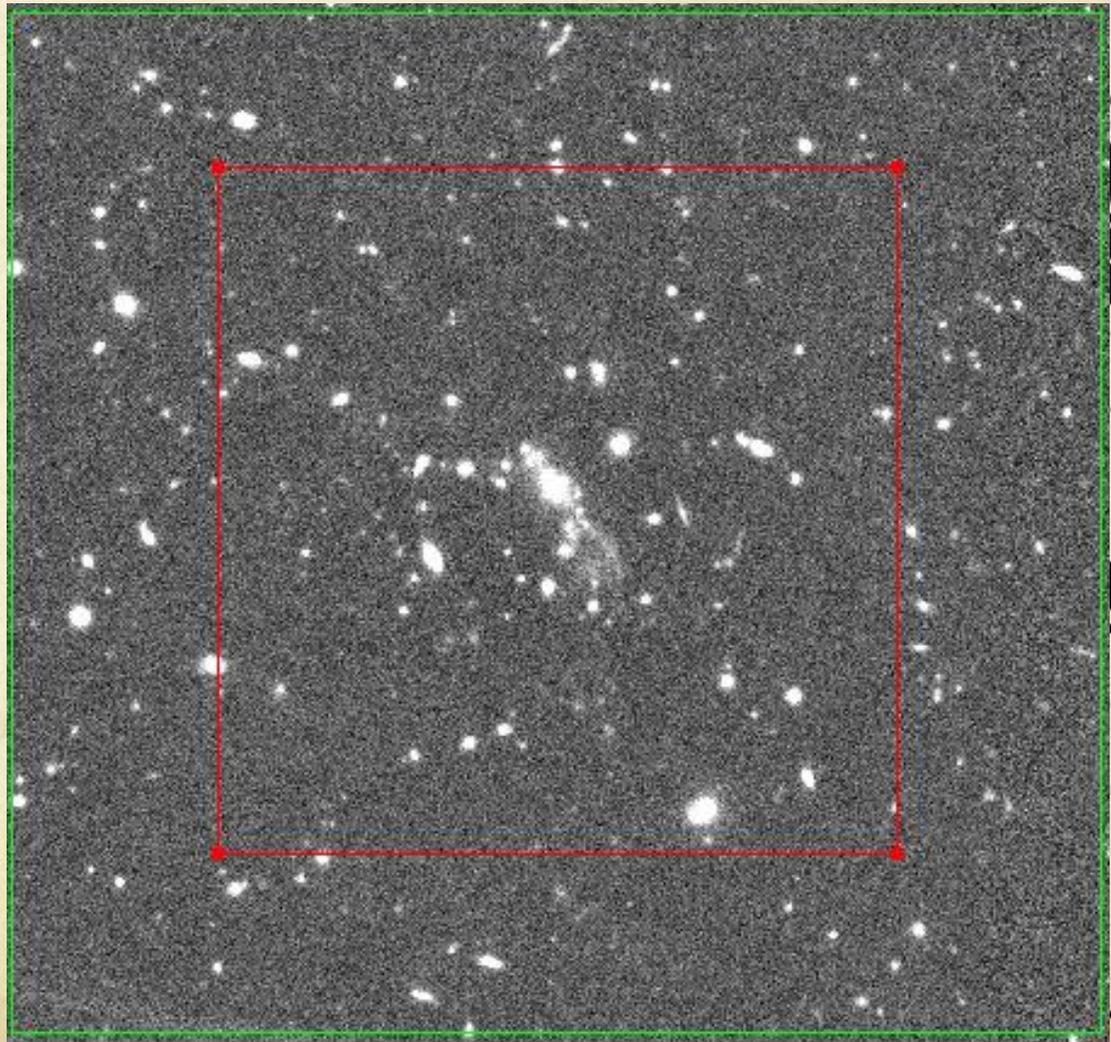
XLSSC 116: an unusual cluster

C2 cluster;

CFHT W1 field
(Coupon et al., 2009)

$Z_{\text{phot}} = 0.47$
(Durret et al., 2011)

$z_{\text{spec}} = 0.53$
(WHT, Kolouridis et al.,
in prep)



XLSSC 116: an unusual cluster

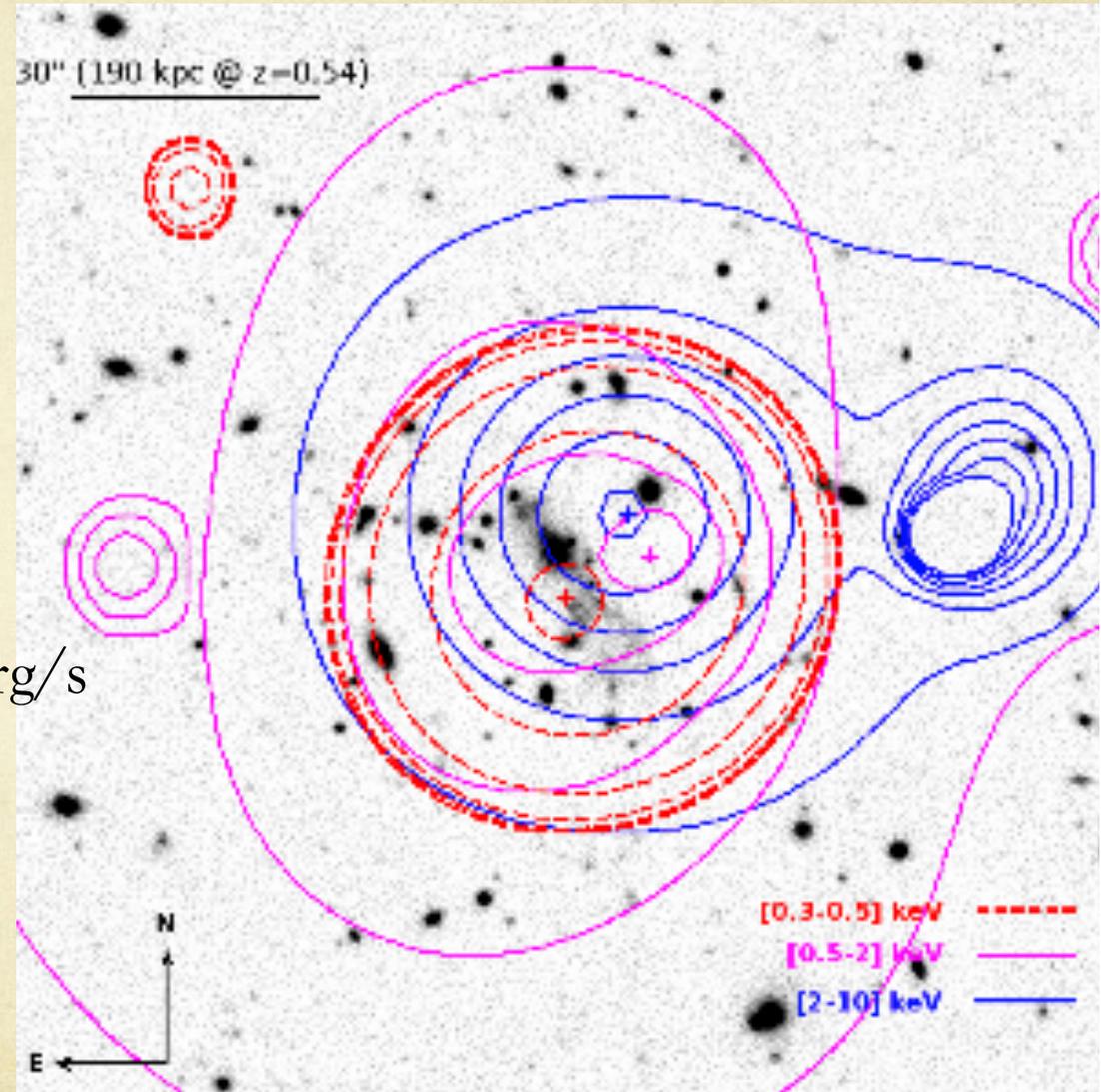
$$\Delta r ([0.5-2\text{keV}]-i) = 11'' (=70\text{kpc})$$

Bimodal (?) gas distribution:

$$T_1 = 0.3 \text{ keV}$$

$$T_2 = 2.1 \text{ keV}$$

$$L_{x,500}([0.5-2] \text{ keV}) = 4.7 \times 10^{43} \text{ erg/s}$$



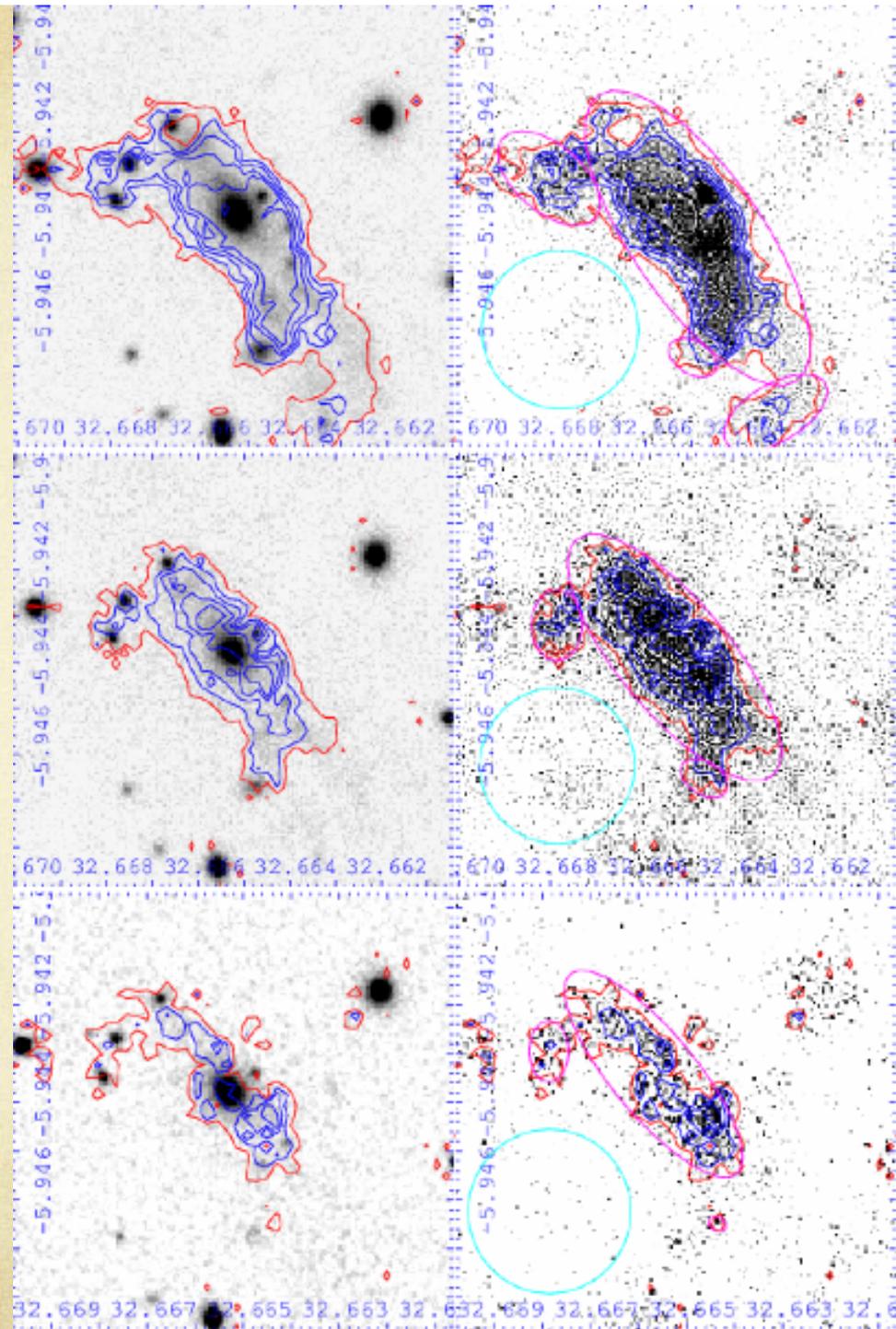
XLSSC 116: galaxies and ICL

★ ICL detection through OV_WAV method
(Pereira et al., 2003; Da Rocha & Mendes-Oliveira, 2005)

ICL

detection: 2.5σ above the sky
observed: out to 180 kpc from
the cluster center

$$L \cong 2 \times L_{\text{BCG}}$$



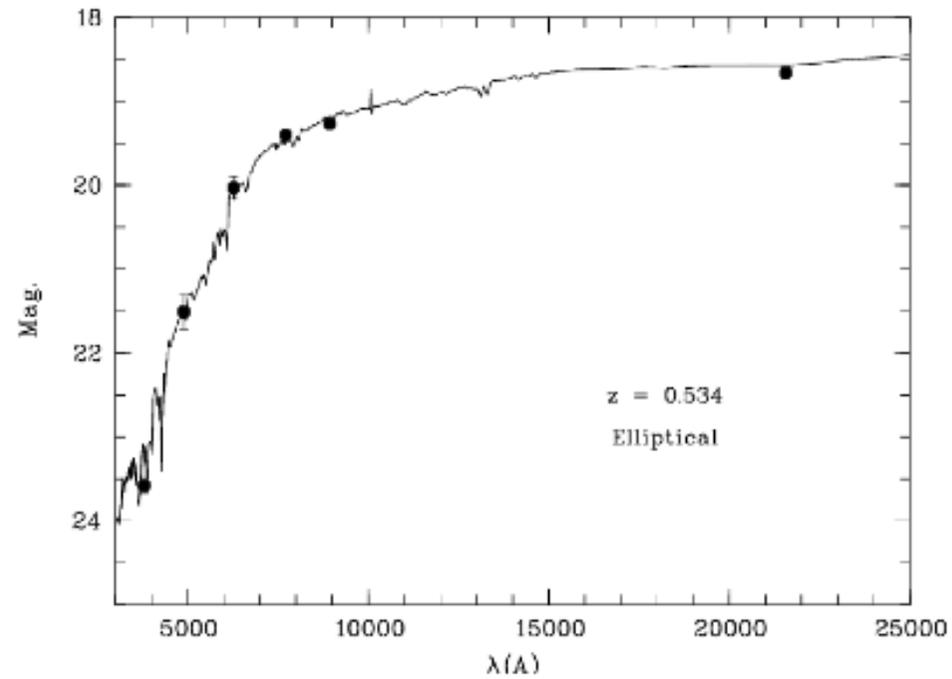
XLSSC 116: galaxies and ICL

- ★ ICL detection through OV_WAV method
(Pereira et al., 2003; Da Rocha & Mendes-Oliveira, 2005)
- ★ SED fitting of the main galaxies, including the main cluster galaxy and the ICL

ICL

$\log(M) \sim 10.7 M_{\odot}$

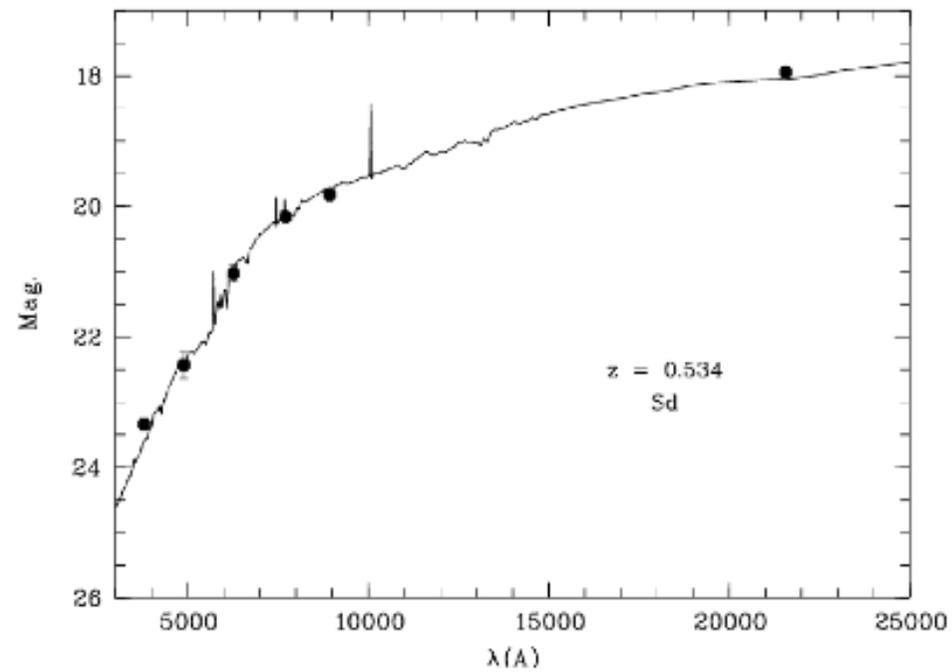
Age $\sim 2.3 \times 10^9$ yr



BCG

$\log(M) \sim 11.2 M_{\odot}$

Age $\sim 6.9 \times 10^9$ yr

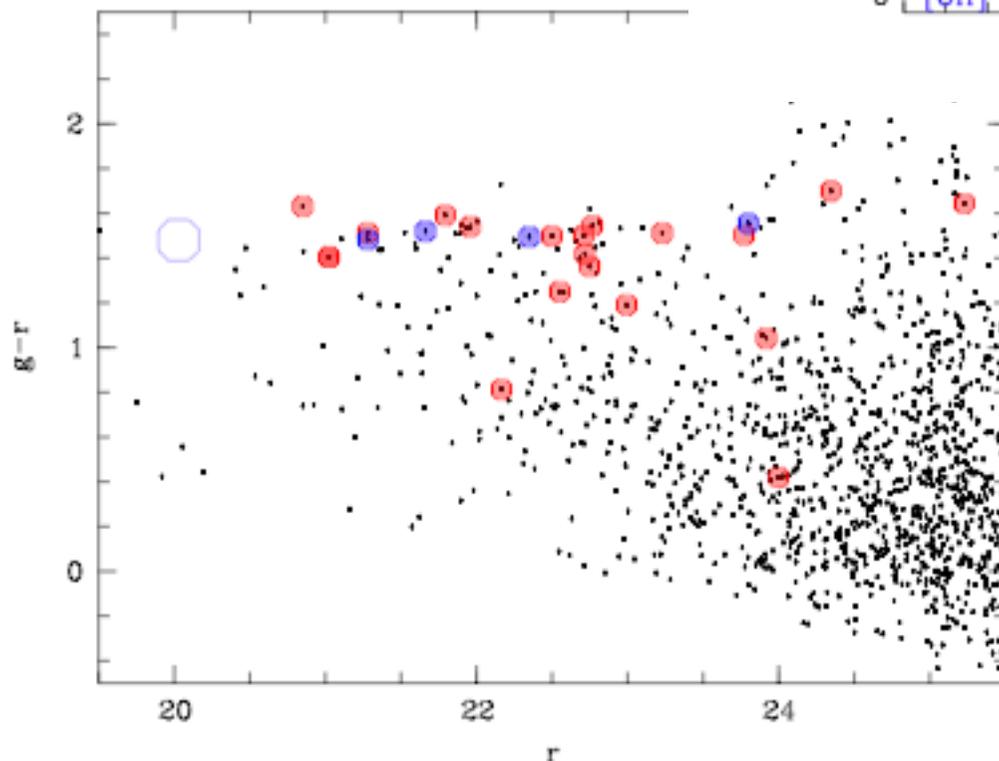
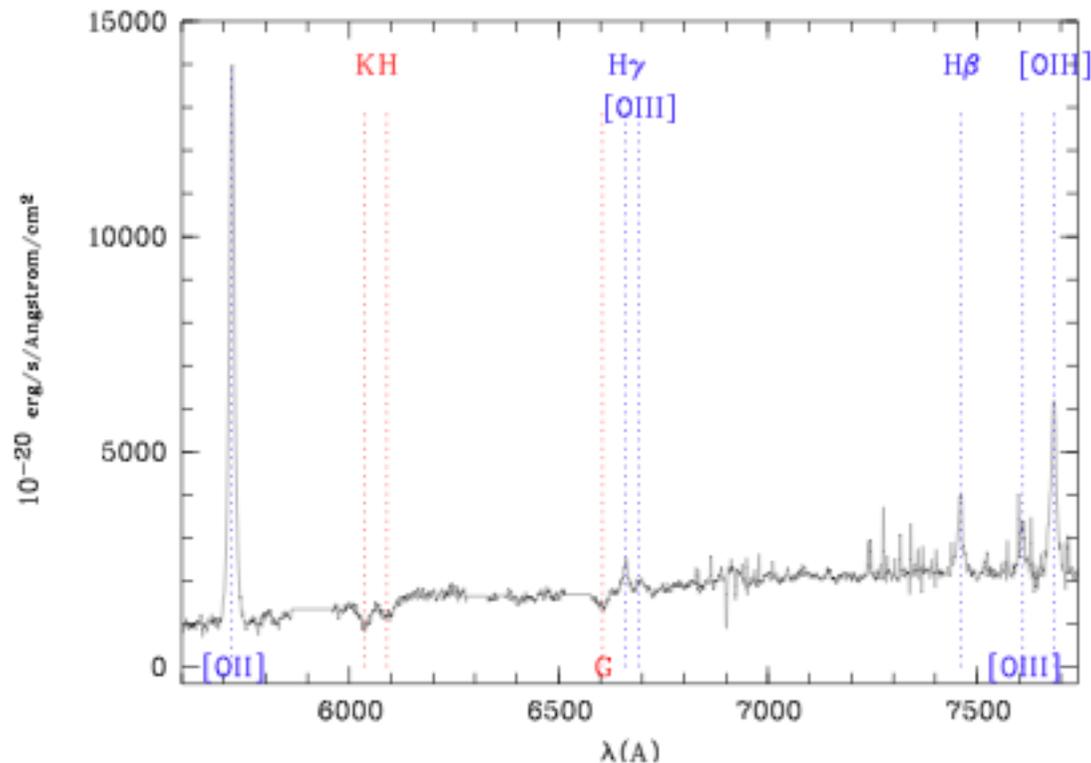


XLSSC 116: galaxies and ICL

- ★ ICL detection through OV_WAV method (Pereira et al., 2003; Da Rocha & Mendes-Oliveira, 2005)
- ★ SED fitting of the main galaxies, including the main cluster galaxy and the ICL
- ★ MUSE Science Verification data: 4h on target. Spectra of the cluster members and of ICL

BCG

$\text{SFR}([\text{OII}]) = 32.2 \pm 0.75 M_{\odot}/\text{yr}$
(Kennicutt 98 calibration)



Member galaxies and ICL:

★ Two structures:

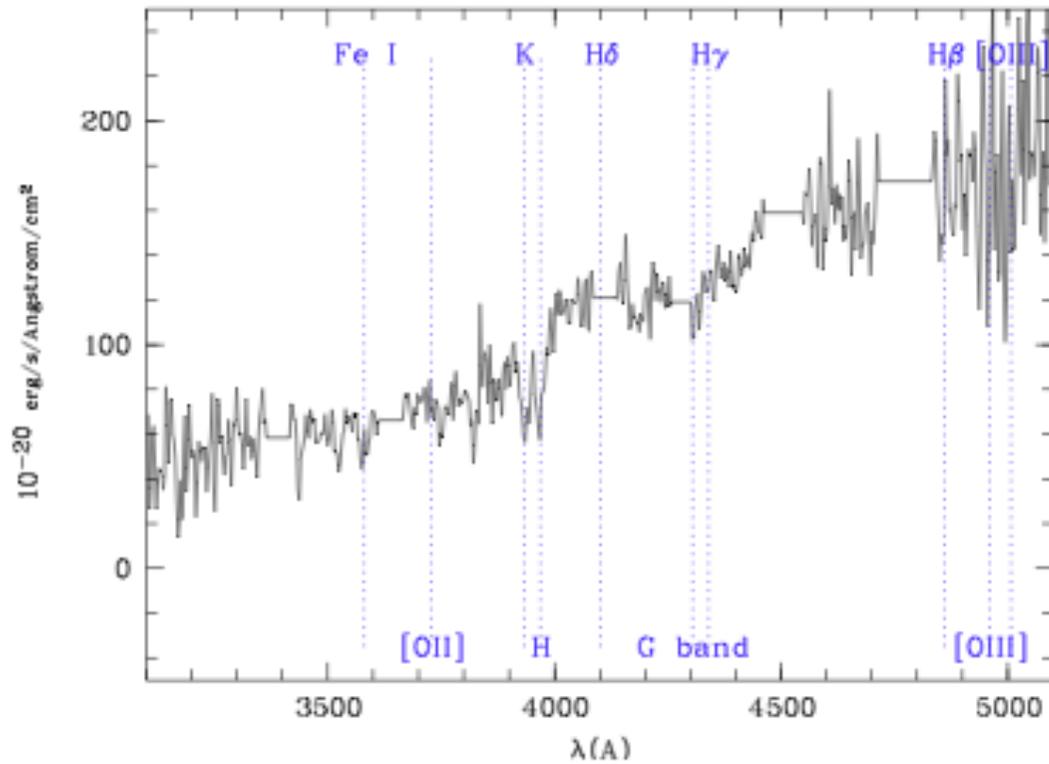
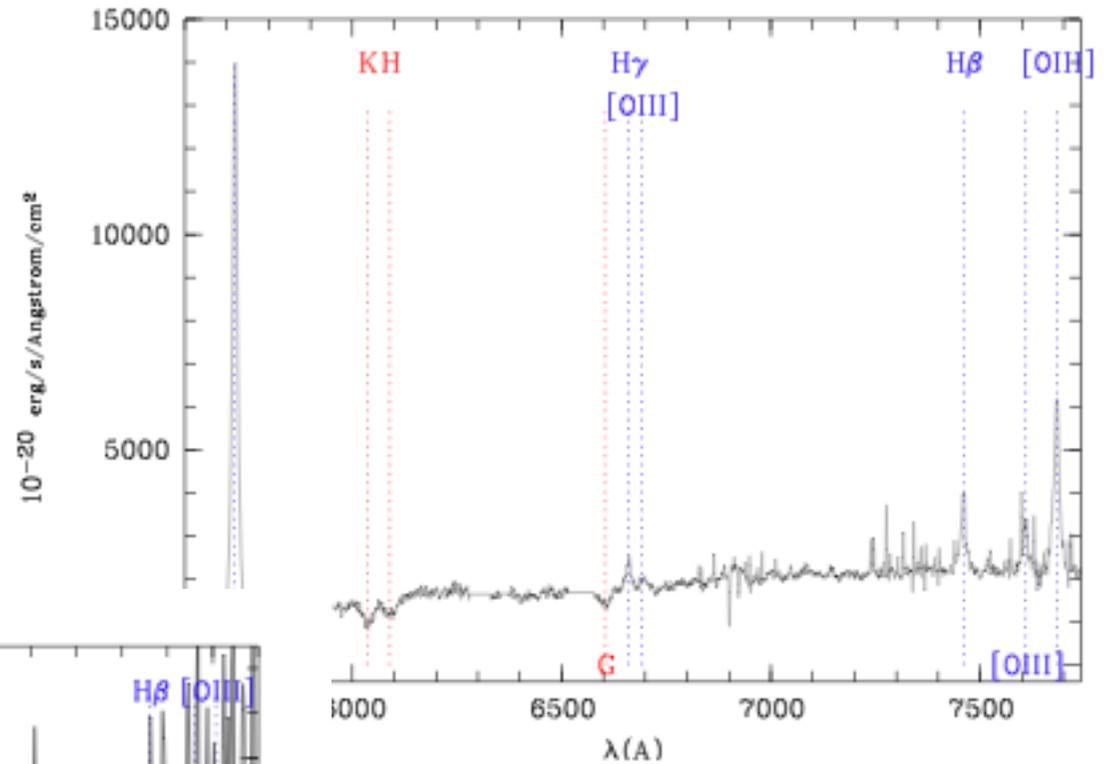
$$\sigma_1 = 570 \text{ km/s}$$

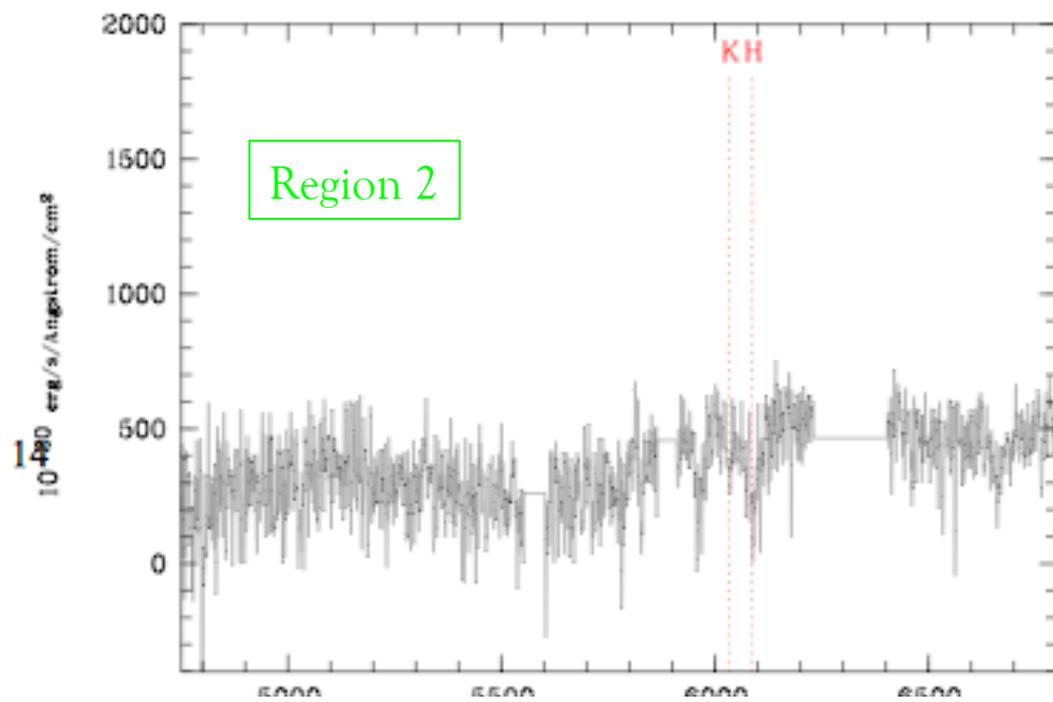
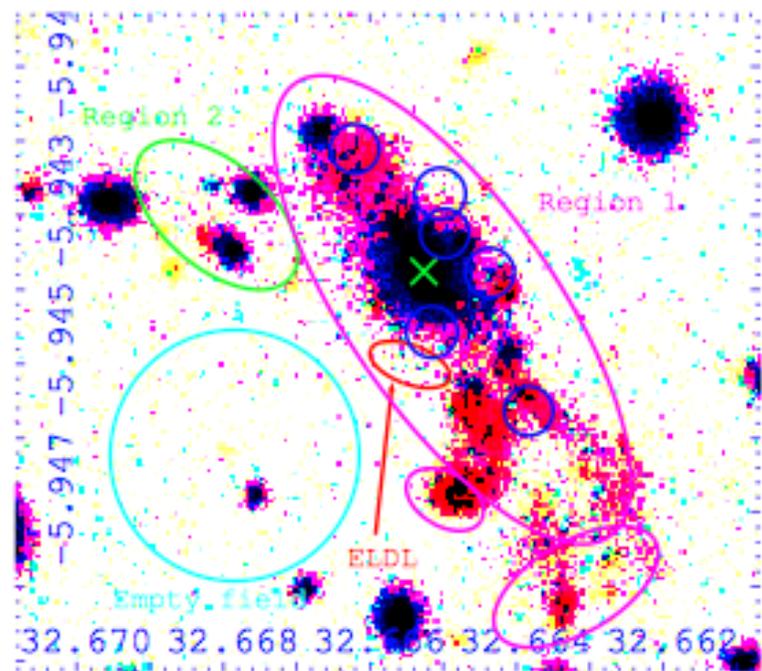
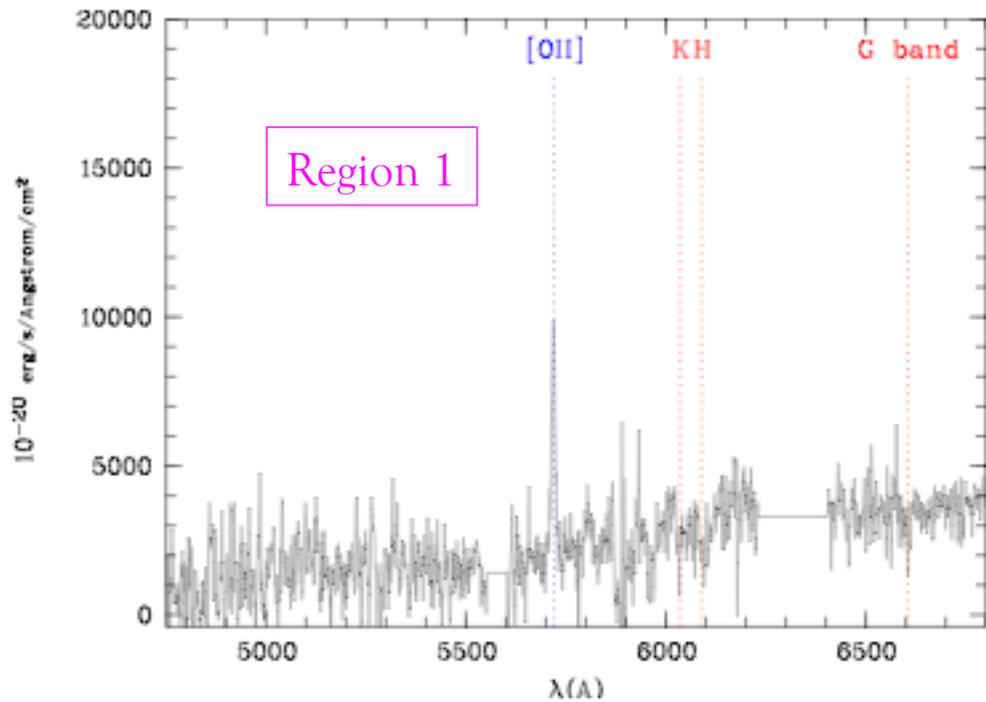
$$\sigma_2 = 170 \text{ km/s}$$

$$\Delta v = 2000 \text{ km/s}$$

BCG

SFR([OII]) = $32.2 \pm 0.75 M_{\odot}/\text{yr}$
(Kennicutt 98 calibration)

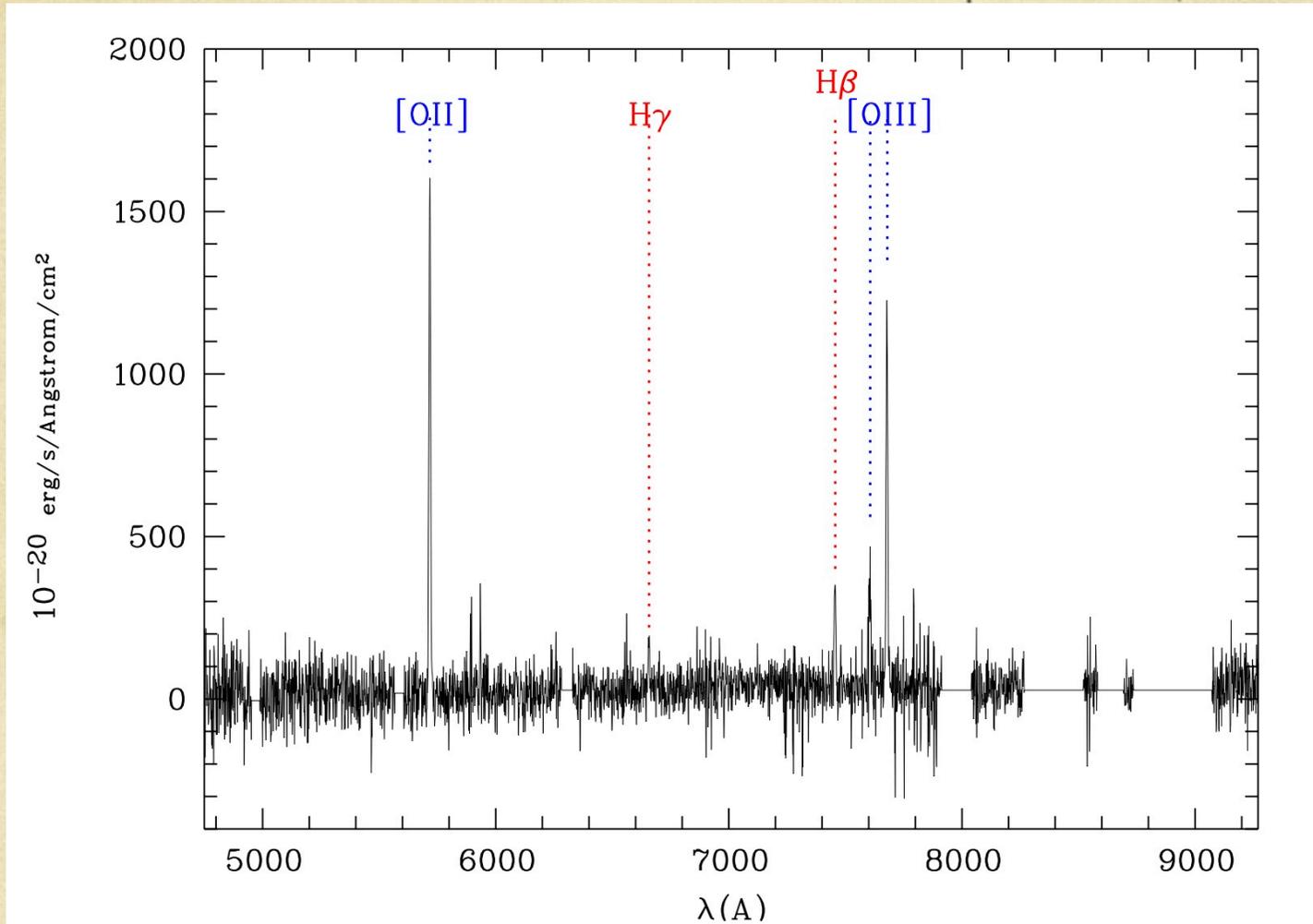




...and a surprise



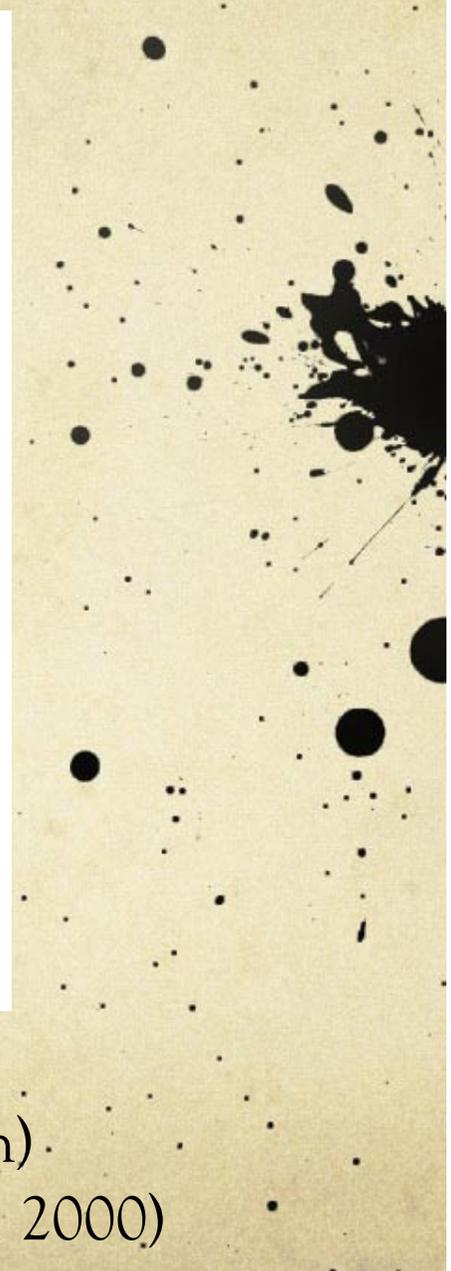
....and a surprise



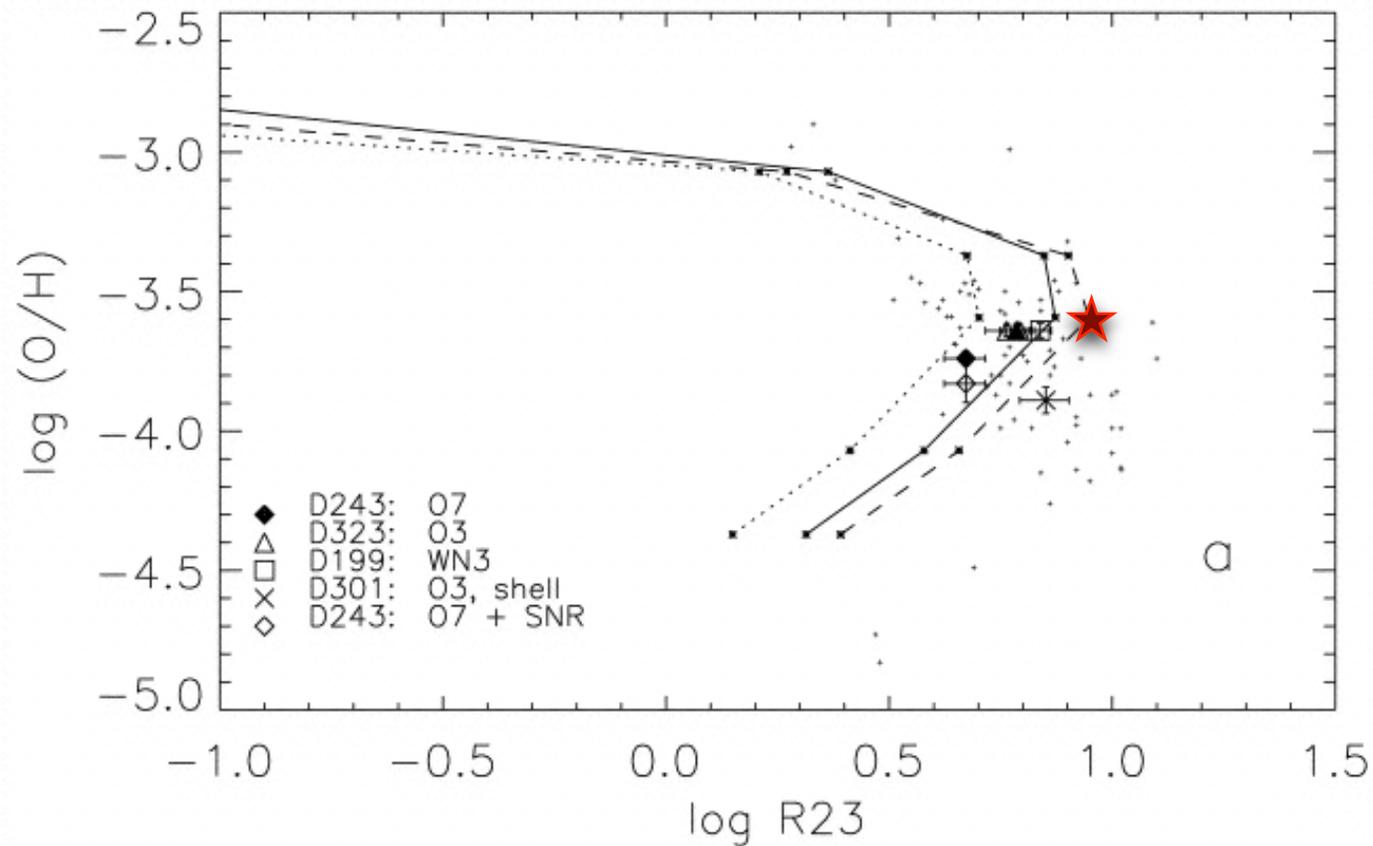
Size = 13 x 6 kpc

SFR([OII]) = $2.2 \pm 0.2 M_{\odot}/\text{yr}$ (Kennicutt 98 calibration)

R23 = 9.8 $Z=0.3-0.5 Z_{\odot}$, $\log(U) \sim -2$ (Oey & Shields, 2000)



....and a surprise



Size = 13 x 6 kpc

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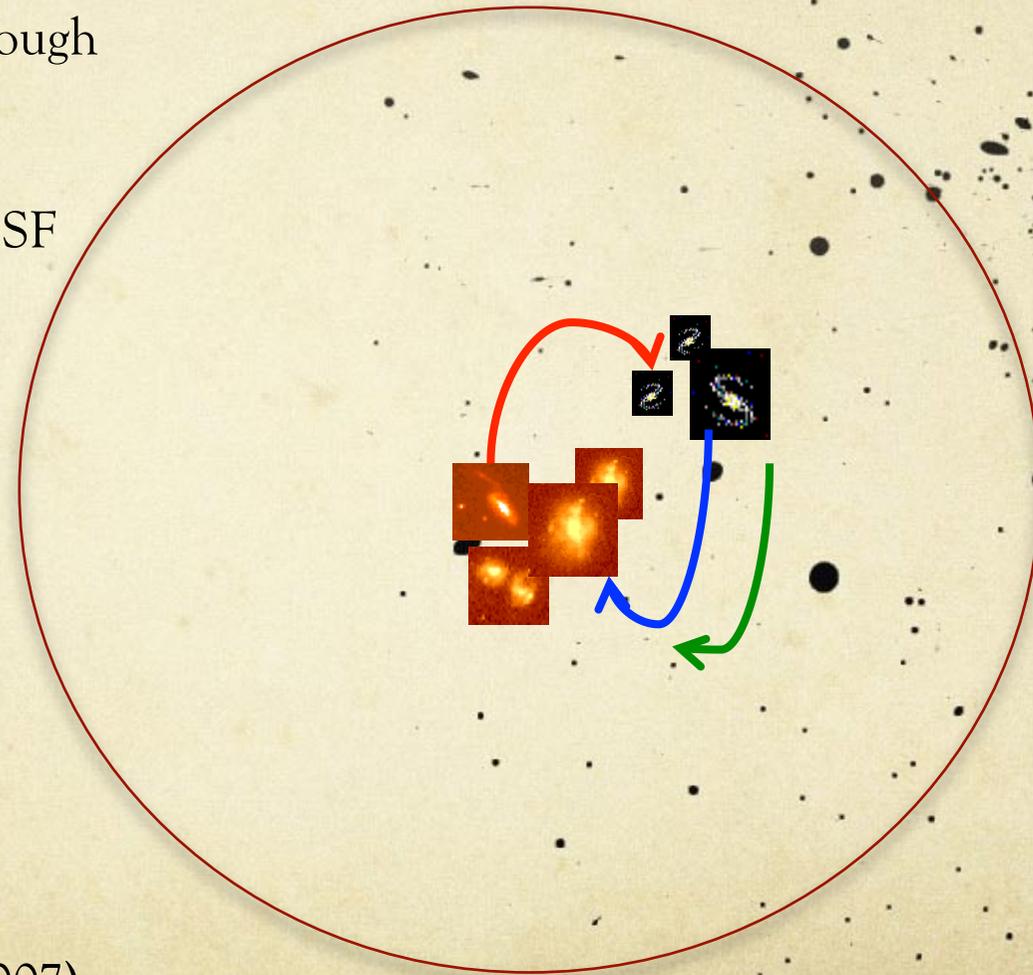
R23 = 9.8 $Z = 0.3 - 0.5 Z_{\odot}$, $\log(U) \sim -2$ (Oey & Shields, 2000)

Anatomist report

Incoming first approach
of the galaxy group through
the cluster center.
Gas loss through RAM
Stripping and onset of SF

The group falls back
and it is now seen as a
substructure of the
cluster.

we are now in second
pericenter approach.
(see also Poole et al., 2007)



Anatomist report

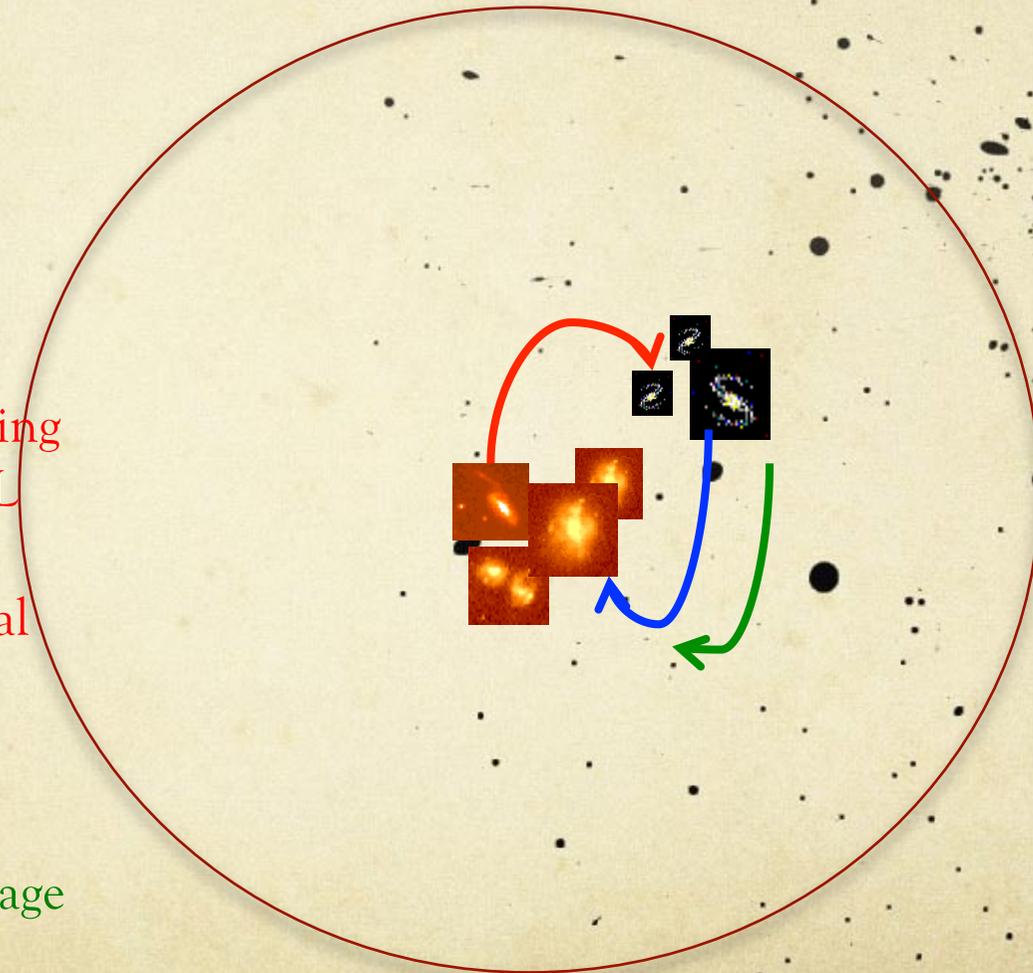
i) Elapsed time: ~ 2 Gyr



— Impact parameter ≤ 0.15
 $M_{\text{cluster}}/M_{\text{infall}} \sim 1$

— ★ RAM pressure stripping
generation of the ICL
tails
★ SF burst in the central
cluster galaxy

— Second pericenter passage



Dynamical modeling required!!