

MAHALO-Subaru: A Panoramic H α imaging survey for the Abell851 cluster at z=0.41

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ABSTRACT

We present a wide-field H α imaging survey for the Abell851 cluster at z=0.41 with Suprime-Cam, using the narrow-band filter NB921. The survey is sensitive down to a dust-free SFR of 0.1 M \odot /yr over the observed 27' x 27' field, and we identify 445 H α emitters in total along the large-scale structures. Based on this unique, homogeneous, and nearly complete sample of star forming galaxies, we find that the fraction of H α emitters is a strong function of environment and that it shows a clear decline toward the cluster central region. We also find that the colors of H α emitters are clearly dependent on environment. The majority of the H α emitters have blue colors with B-I < 2, but we identify some H α emitters with red colors as well. Such red emitters are very rare near the cluster central regions, while they are most frequently seen in the group-scale environment located rather far away from the cluster center. These groups coincide with the "transitional environment", where we find a sharp change in the color distribution of galaxies. This suggests that the dusty star formation activity is involved in the process of galaxy transition and is probably related to the "pre-processing" that are effective in group environment.

1. MAHALO-Subaru for clusters

Mapping H α and Lines of Oxygen with Subaru

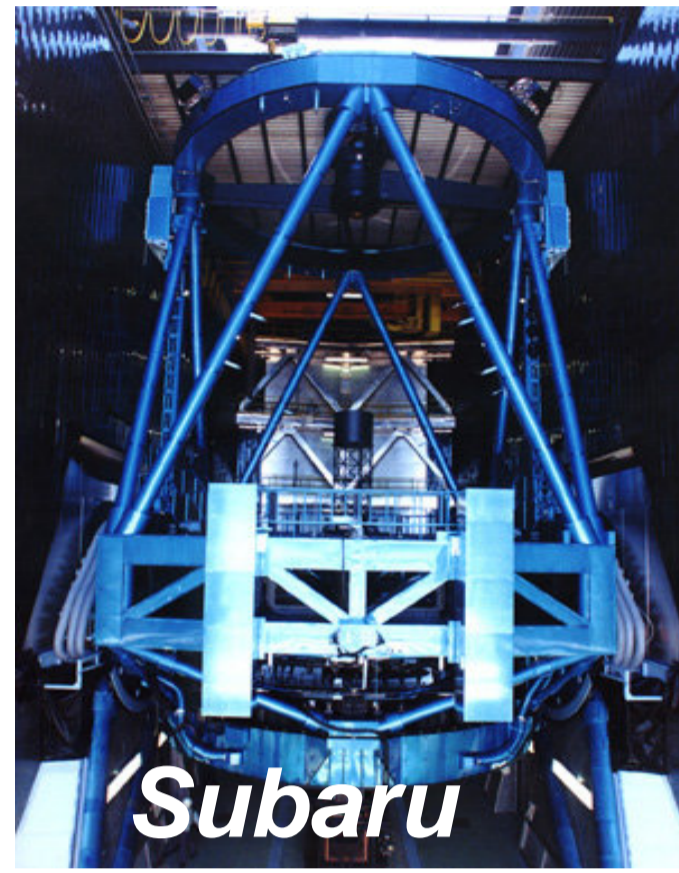
See also talk by T.Kodama (PI), posters by M.Hayashi and K.Tadaki (P19/P21)

★ Motivation

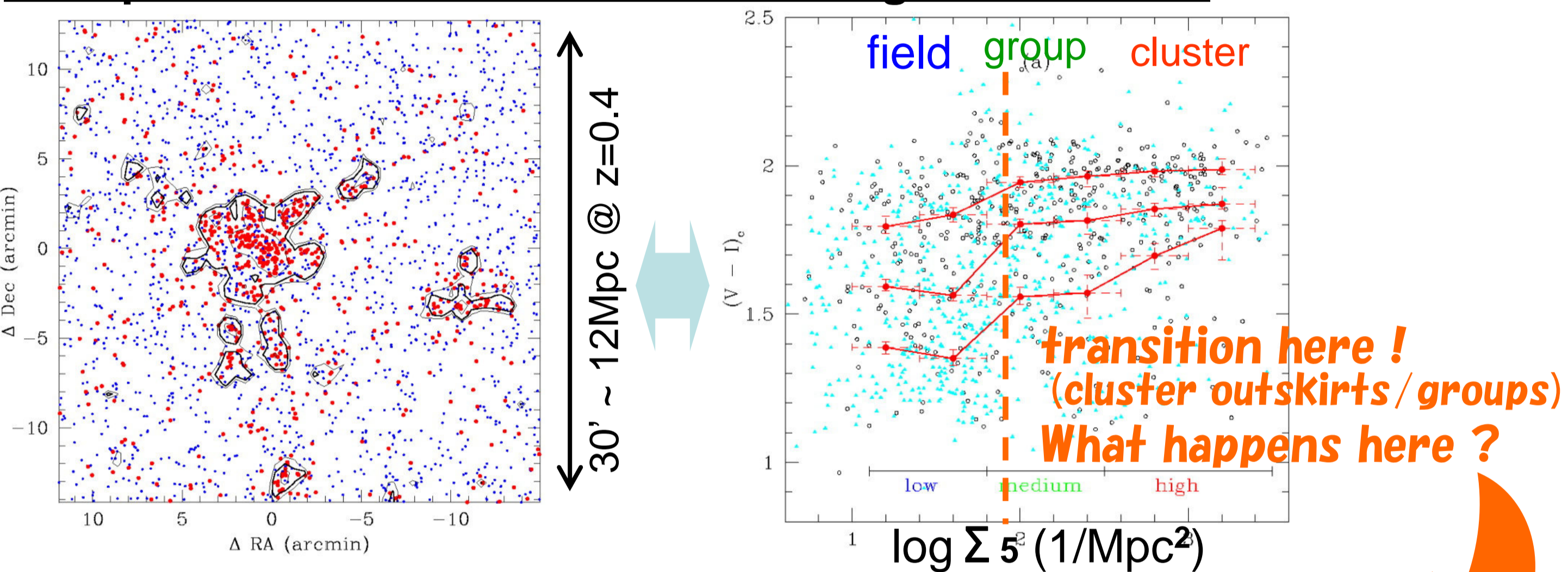
To understand the origin of the environmental dependence of galaxy properties by investigating various environments at various redshifts.

★ Advantages of Subaru

Wide-field of views of Subaru (Suprime-Cam: optical 34' x 27', MOIRCS: NIR 4' x 7')
→ complete census of SF activities with narrow-bands

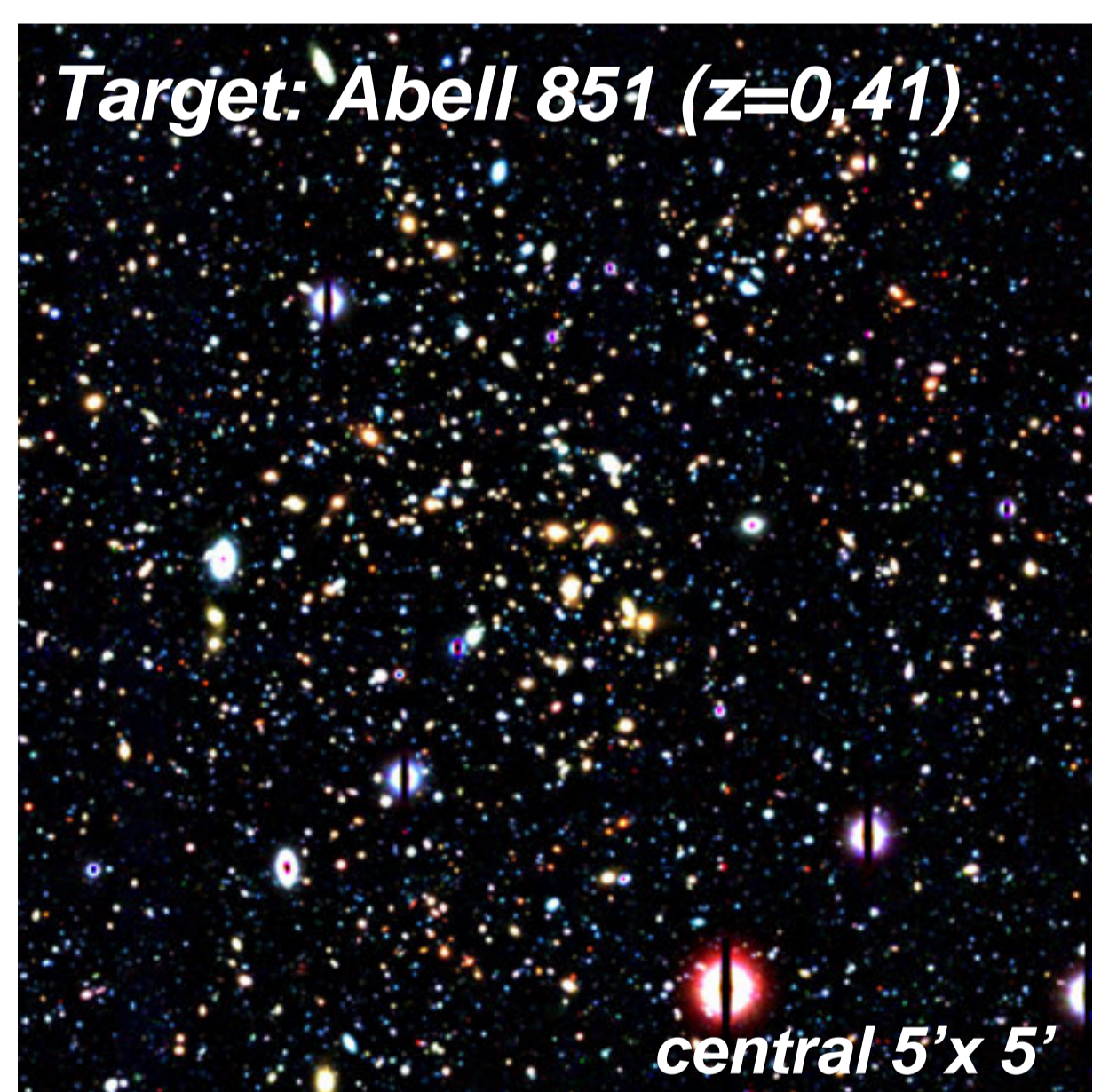


★ Important role of cluster surrounding environment

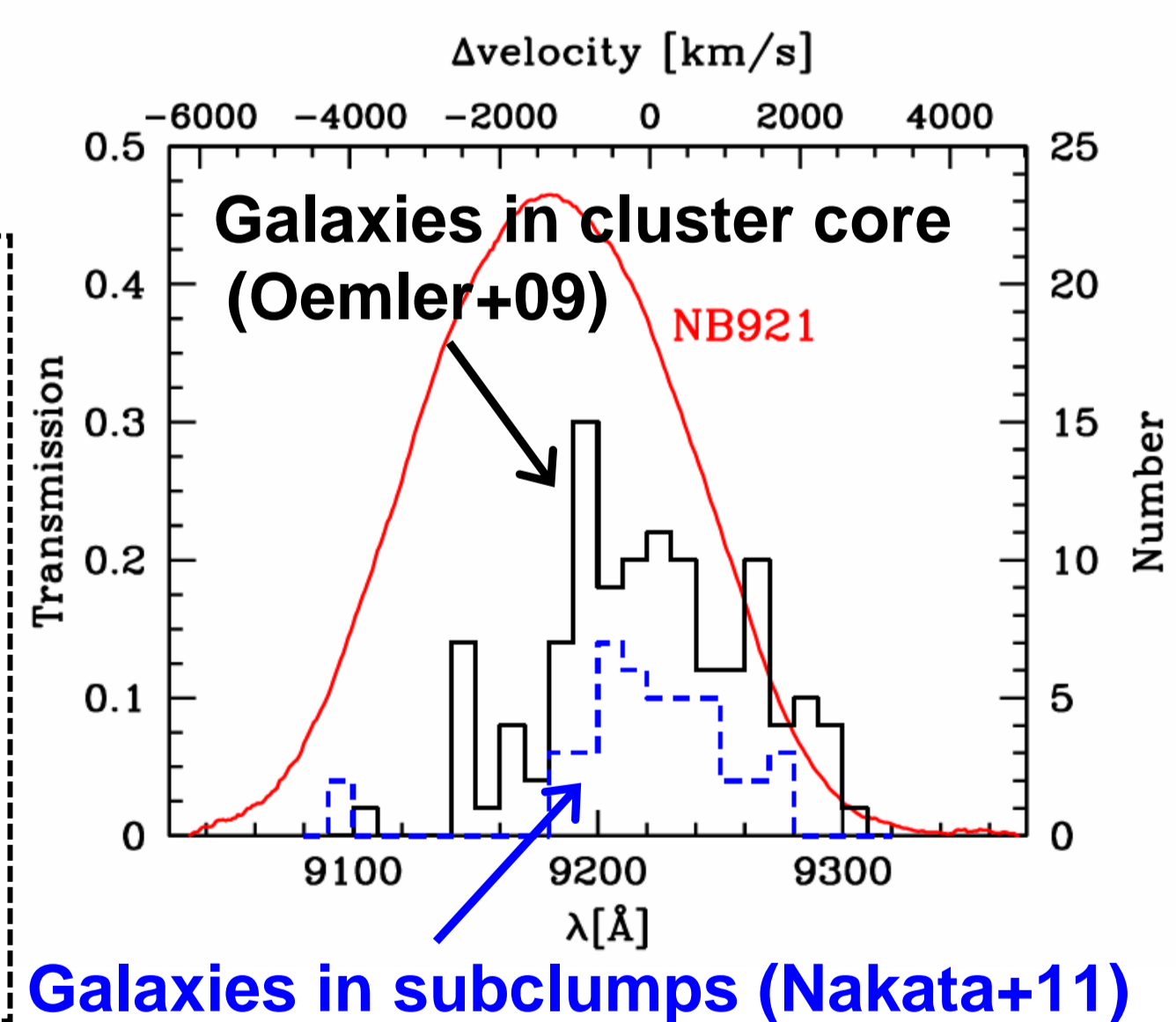
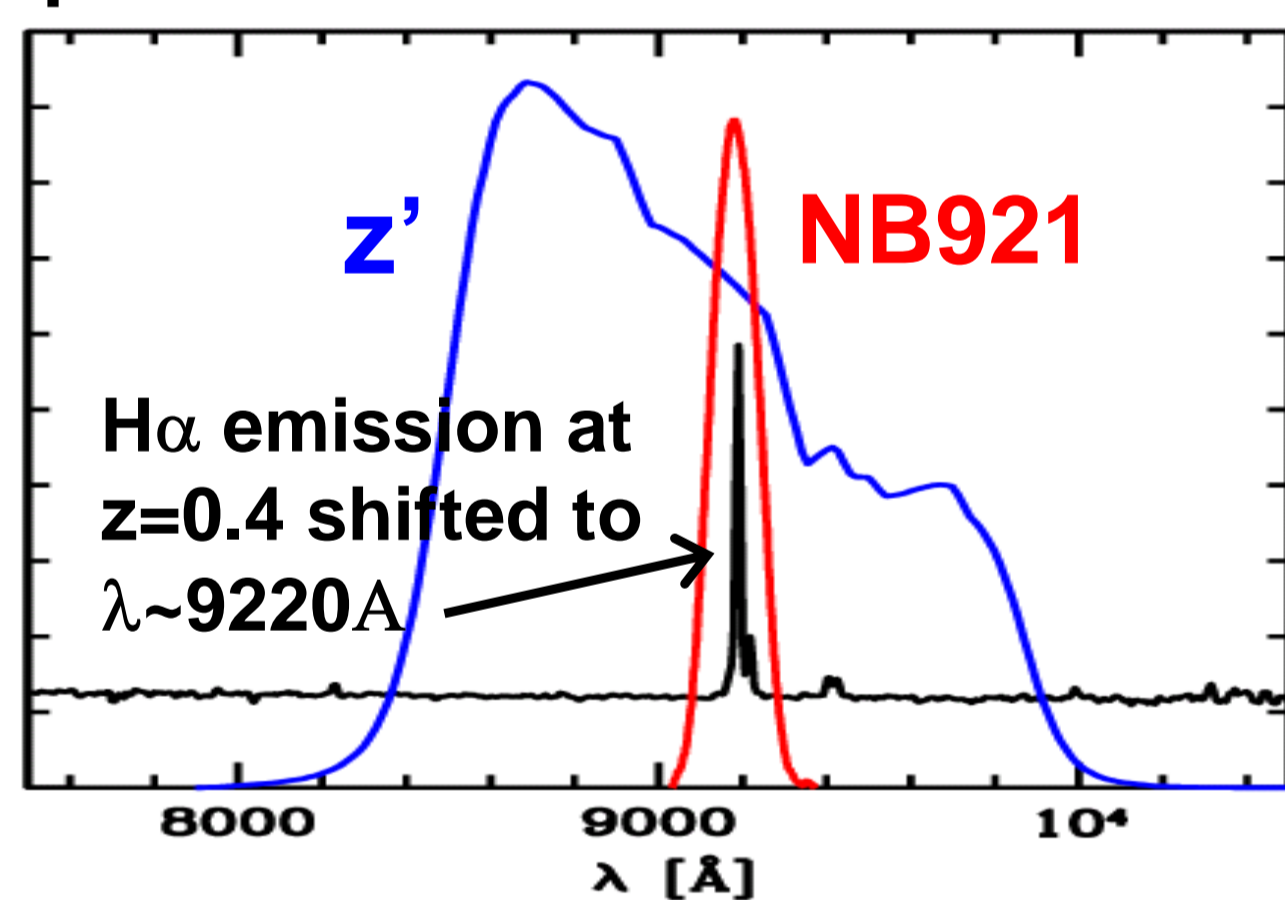


Large-scale structures around Abell851 at z=0.4 revealed by Subaru (left) and color-density plot (right) (Kodama+01)

2. H α imaging for Abell851 with Suprime-Cam



Important filters



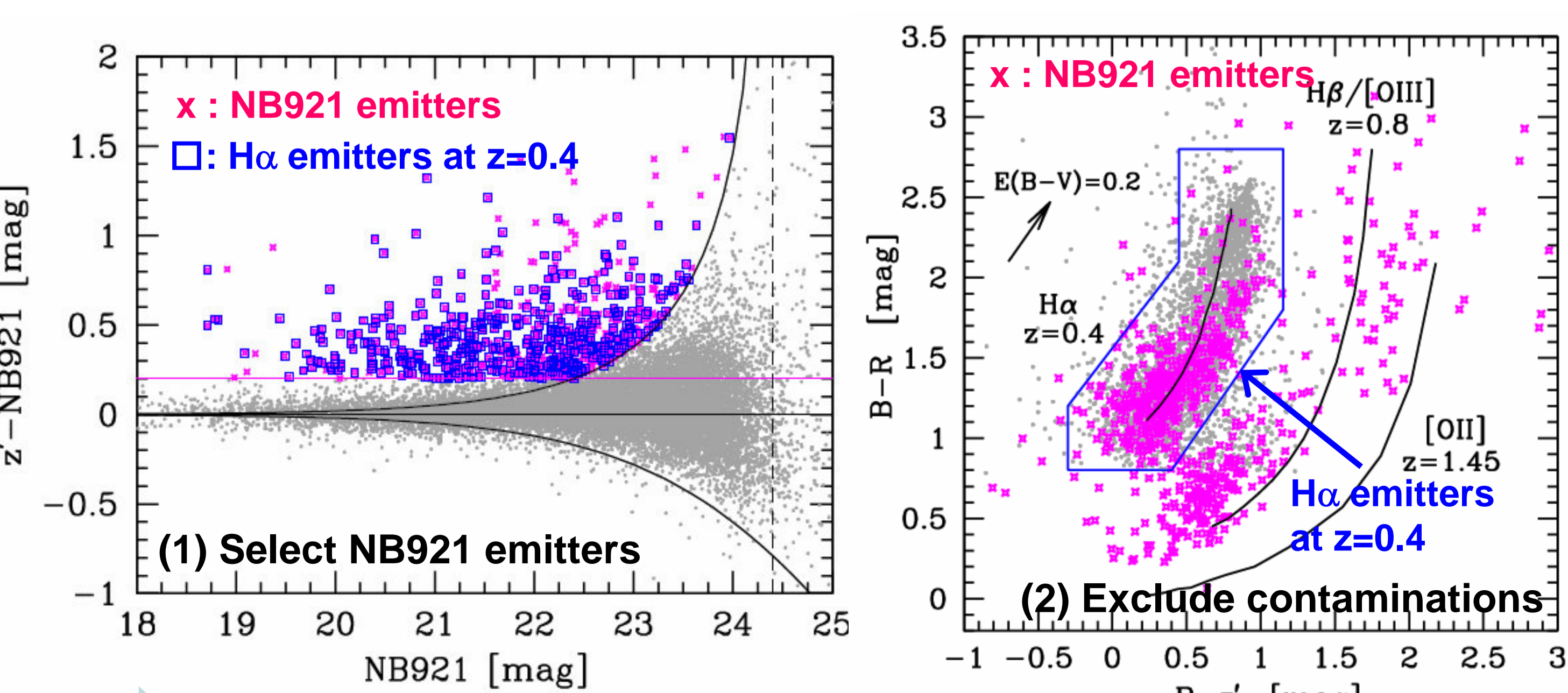
The data

B ~ 60min (26.0 mag)
V ~ 37min (25.6 mag)
R ~ 67min (24.6 mag)
I ~ 22min (24.9 mag)
z' ~ 30min (24.0 mag)
NB921 ~ 180min (24.4 mag)
[Magnitudes are all given in 3", 5 σ , AB]

taken from Kodama+01
New data

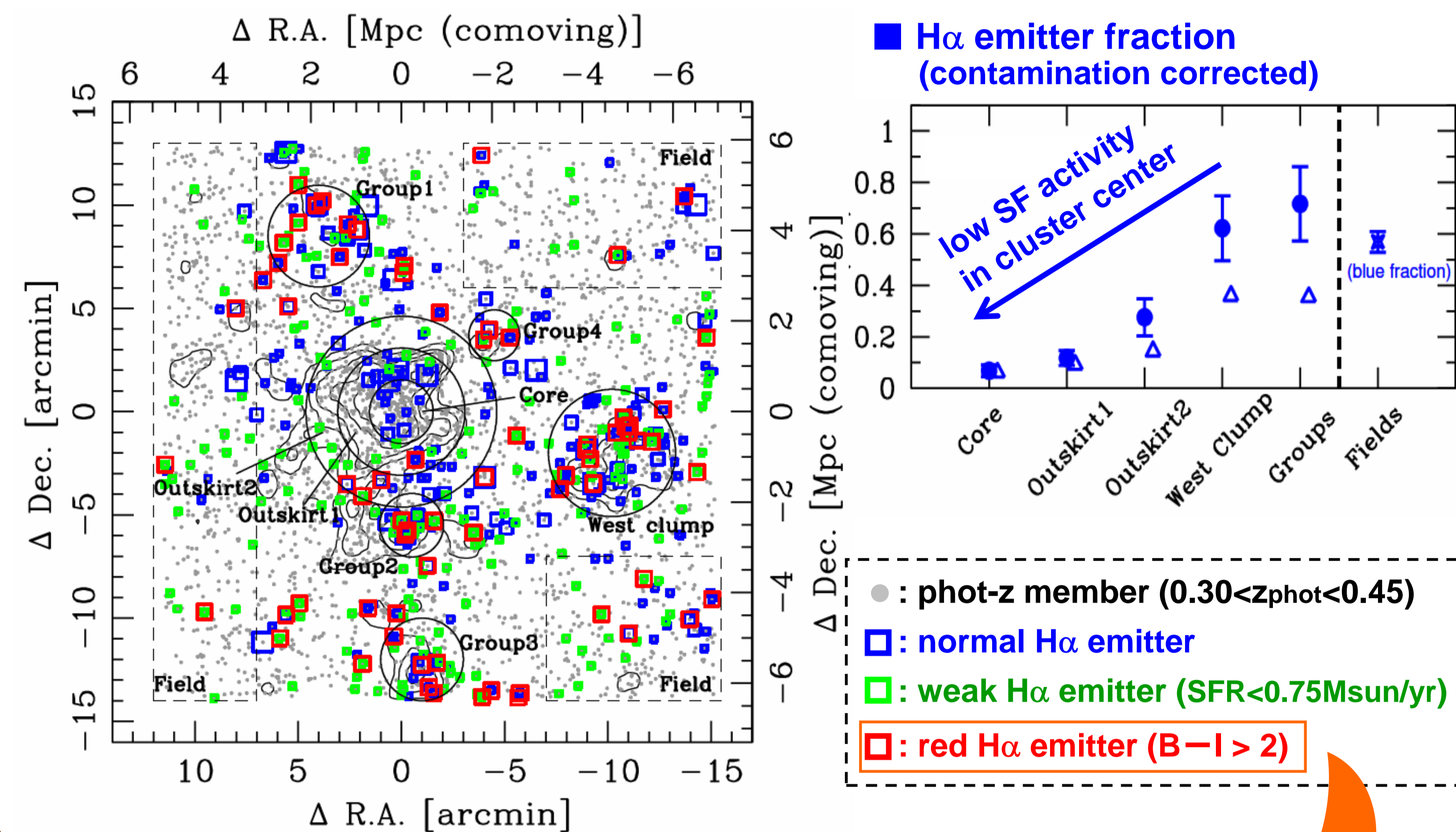
3. Selection of H α emitters at z=0.4

(1) z-NB921 color excess + (2) appropriate broad-band color



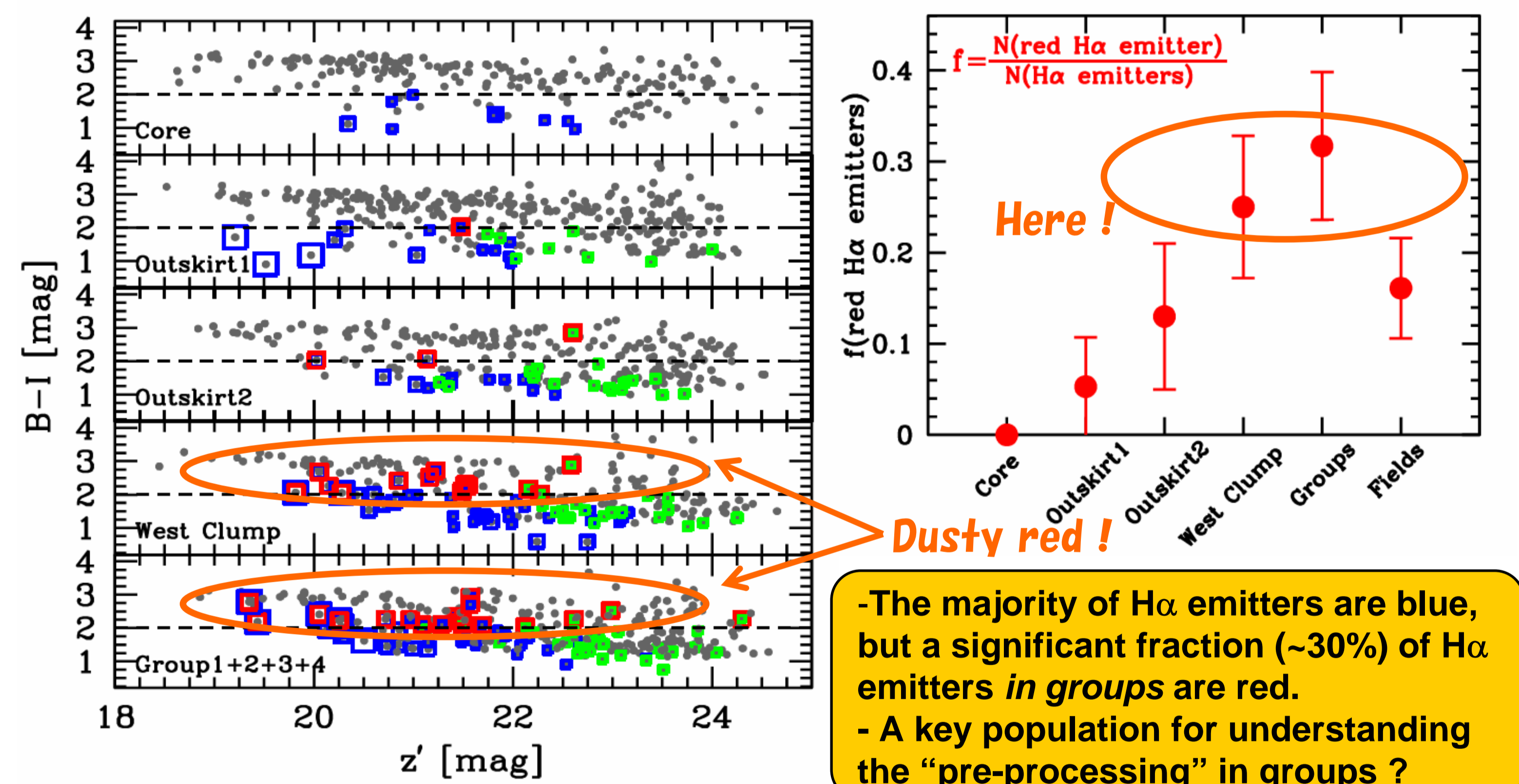
445 H α emitters are selected in total (SFR $_{H\alpha}$ > 0.1 M \odot /yr) (without dust extinction correction)

4. Panoramic H α view of the Abell851 cluster



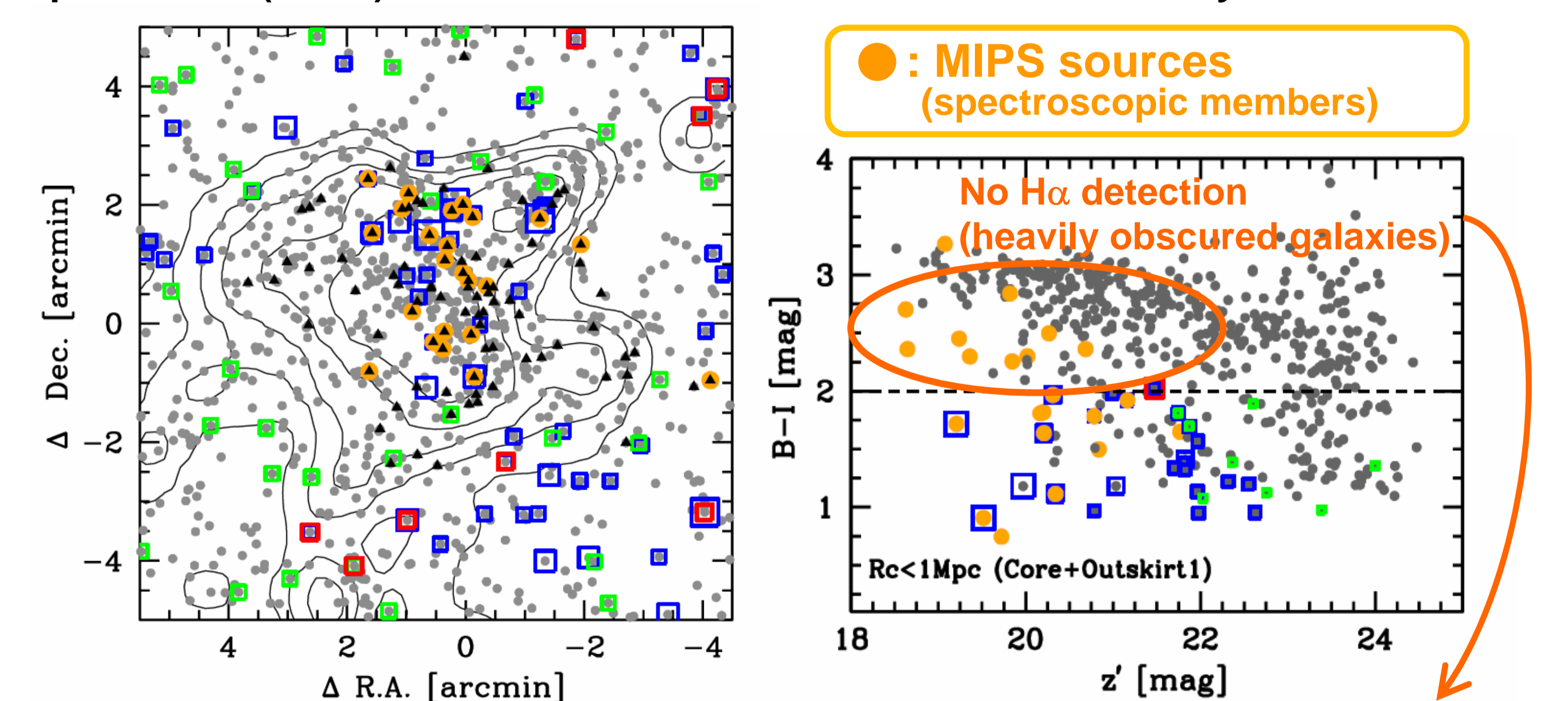
5. Red H α emitters in group environment

Color-magnitude diagram for each environment



6. MIR sources in the cluster central region

Spitzer MIPS(24um) observation for the central 5'x5' was made by Dressler+09.



★ Oemler+09	z _{spec}	class	B-I [mag]	EW _R (H α + [NII]) [Å]	SFR(H α) [M \odot /yr]	f _{24μm} ★ [Jy]	SFR(IR) [M \odot /yr]	H α emitter (yes/no)
H α -detected MIPS sources	0.4084	e(c)	1.11	34.52	3.51	3.05 × 10 ⁻⁴	10.2	yes
	0.4059	e(a)	1.78	29.04	1.98	1.63 × 10 ⁻⁴	5.0	yes
	0.3972	e(m)	0.75	147.31	22.93	7.96 × 10 ⁻⁴	30.1	yes
	0.4010	e(a)	1.92	30.84	1.48	1.30 × 10 ⁻⁴	3.8	yes
	0.3958	e(b)	0.91	145.75	27.45	1.04 × 10 ⁻³	40.3	yes
	0.3932	e(a)	1.64	28.90	3.35	2.12 × 10 ⁻⁴	6.8	yes
	0.4061	e(n)	1.72	69.79	19.24	3.98 × 10 ⁻³	165.5	yes
	0.3937	e(a)	1.97	38.64	4.02	4.82 × 10 ⁻⁴	17.2	yes
H α -undetected MIPS sources	0.4007	k+a	2.70	8.66	4.44	5.21 × 10 ⁻⁴	18.7	no
	0.4060	k+a	2.36	3.59	1.82	3.14 × 10 ⁻⁴	10.6	no
	0.4075	a+k	2.30	-2.57	-0.37	1.12 × 10 ⁻⁴	3.2	no
	0.4076	e(a)	1.65	21.00	0.59	8.13 × 10 ⁻⁵	2.2	no
	0.3938	k+a	2.30	14.27	3.69	5.78 × 10 ⁻⁴	21.1	no
	0.4083	k+a	2.50	0.91	0.10	1.49 × 10 ⁻⁴	4.5	no
	0.3960	k	2.84	0.40	0.07	7.32 × 10 ⁻⁴	27.4	no
0.4017	k	3.17	-0.50	-0.04	1.01 × 10 ⁻⁴	2.9	no	

Some k+a (post-starburst) galaxies are MIPS-detected!