From MAHALO to SWIMS-18 surveys
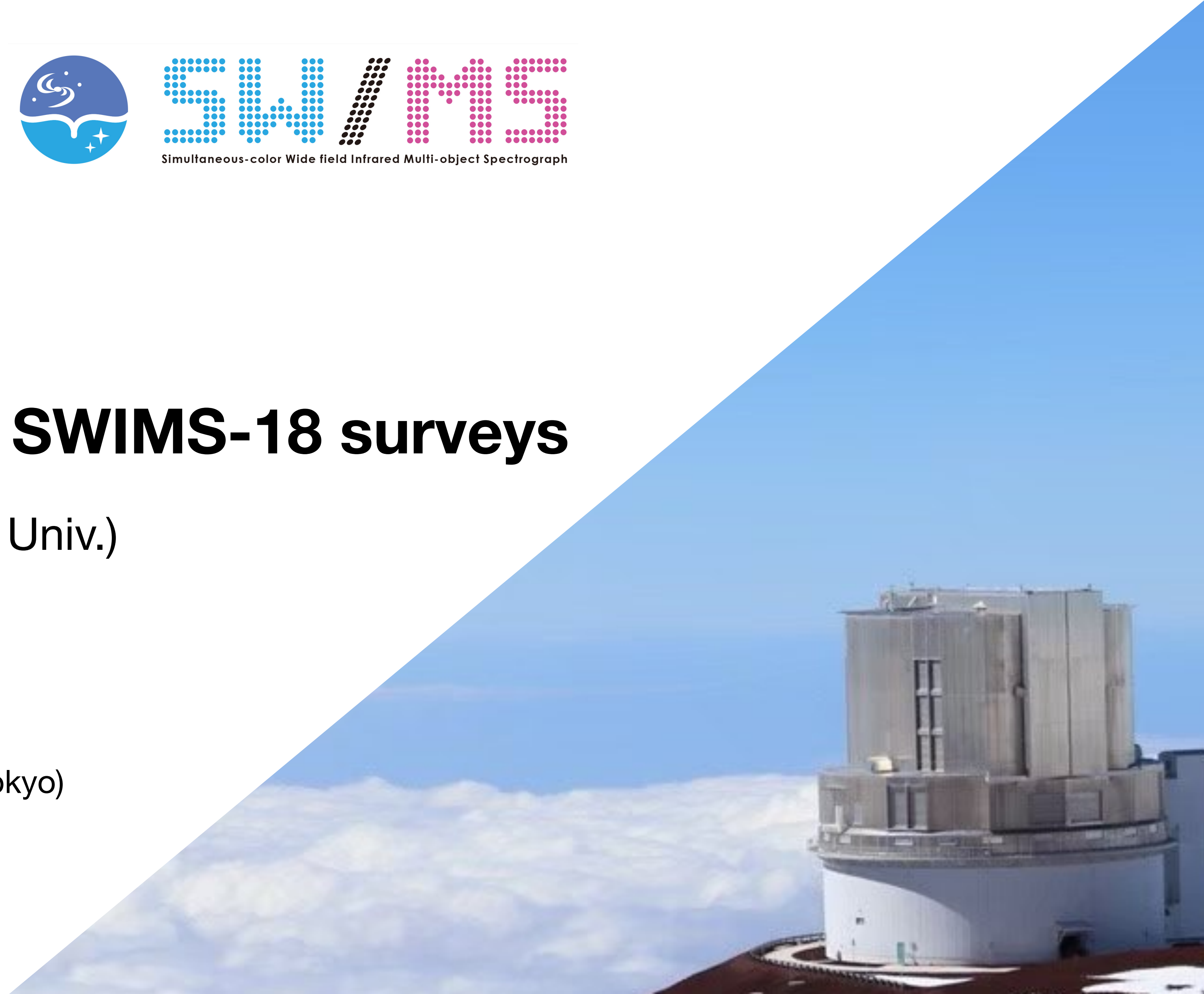
Kazuki Daikuhara (Tohoku Univ.)

Tadayuki Kodama (Tohoku Univ.)
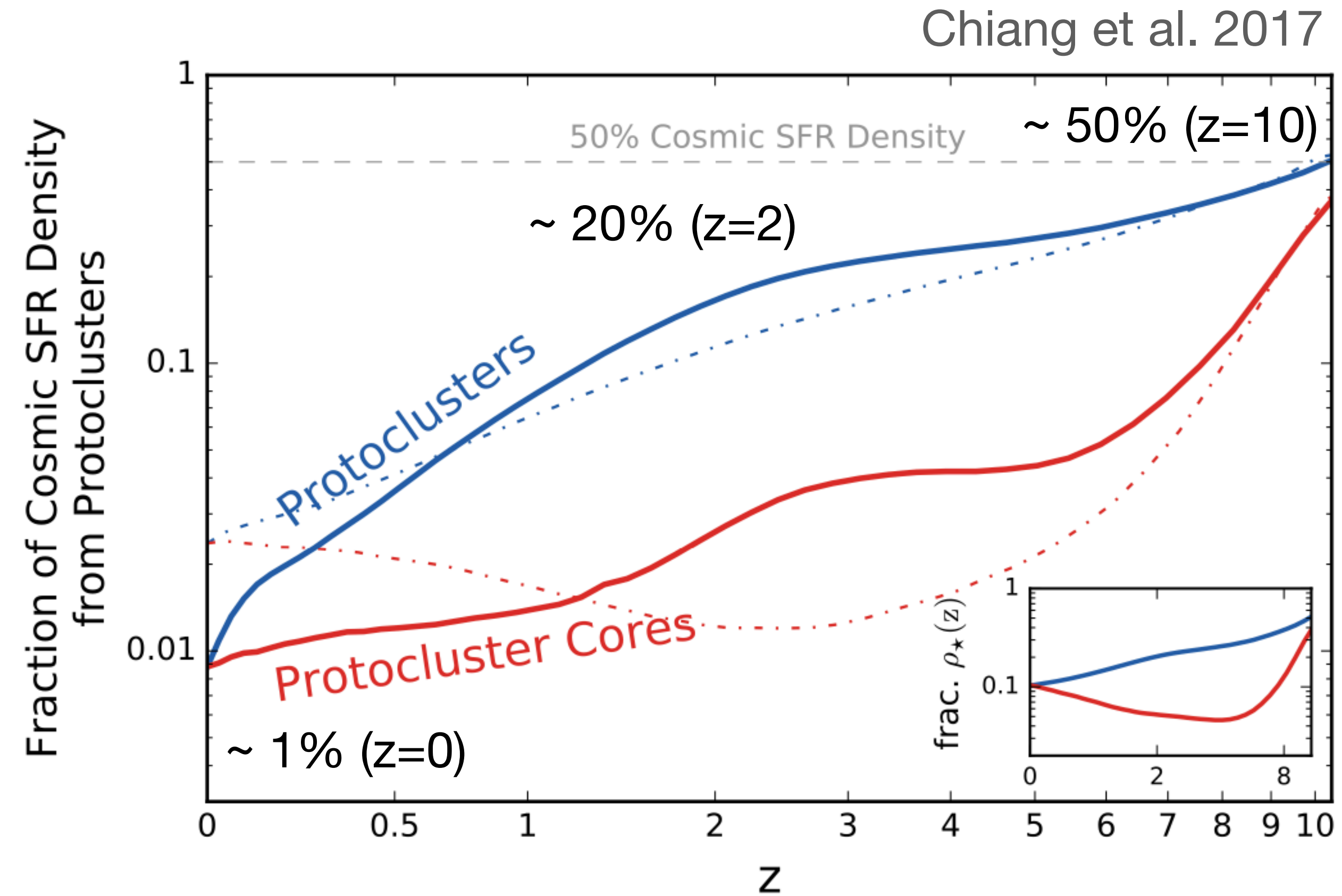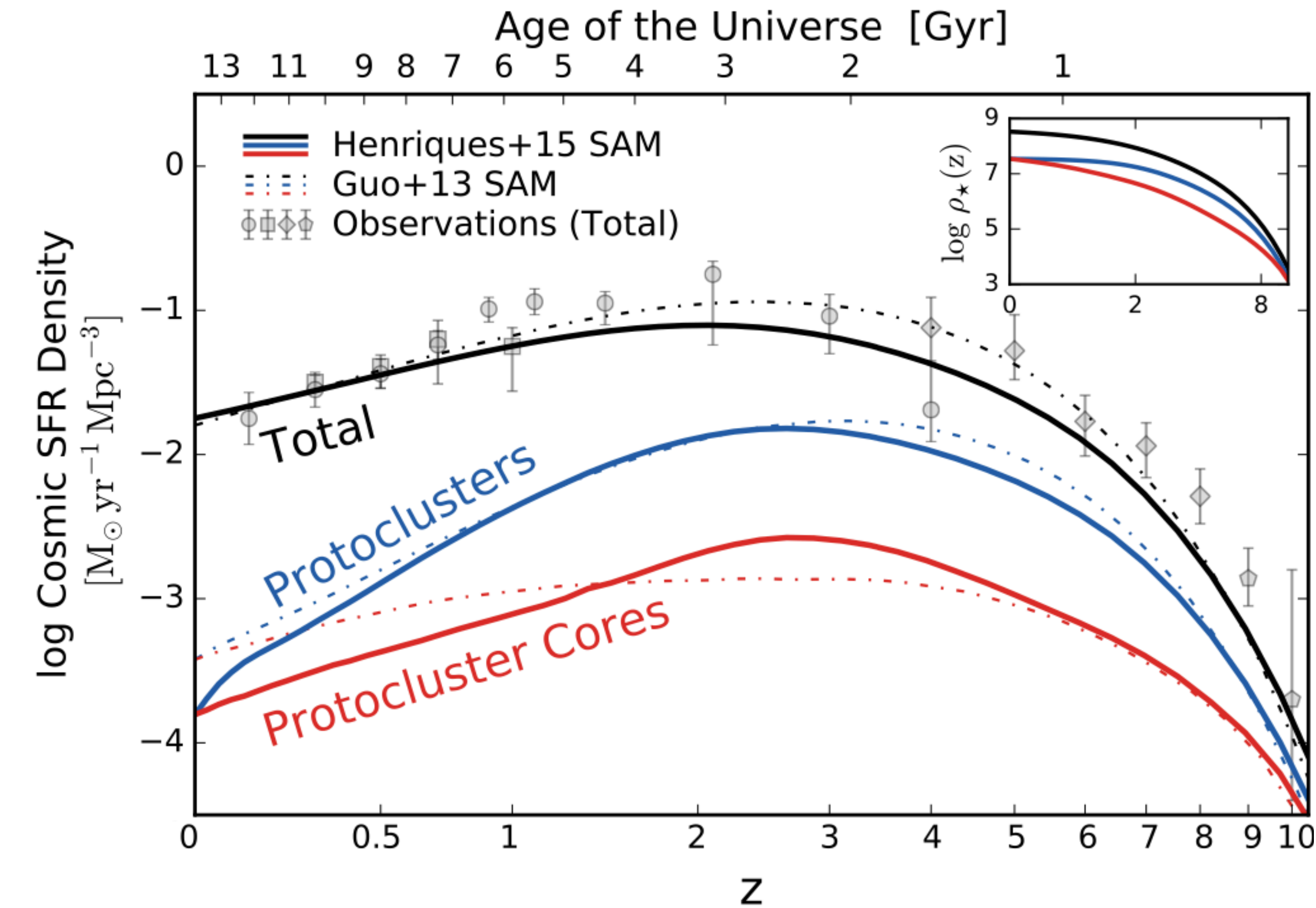Haruka Kusakabe (Univ. of Geneva)
Kentaro Motohara (NAOJ/Univ. of Tokyo)
Masahiro Konishi (Univ. of Tokyo)
and SWIMS-18 members

Importance of proto-clusters in the cosmological context

Chiang et al. 2017

In the cosmic noon (1<z<4), the universe and clusters form 50% and 75% of their total stellar masses, respectively.
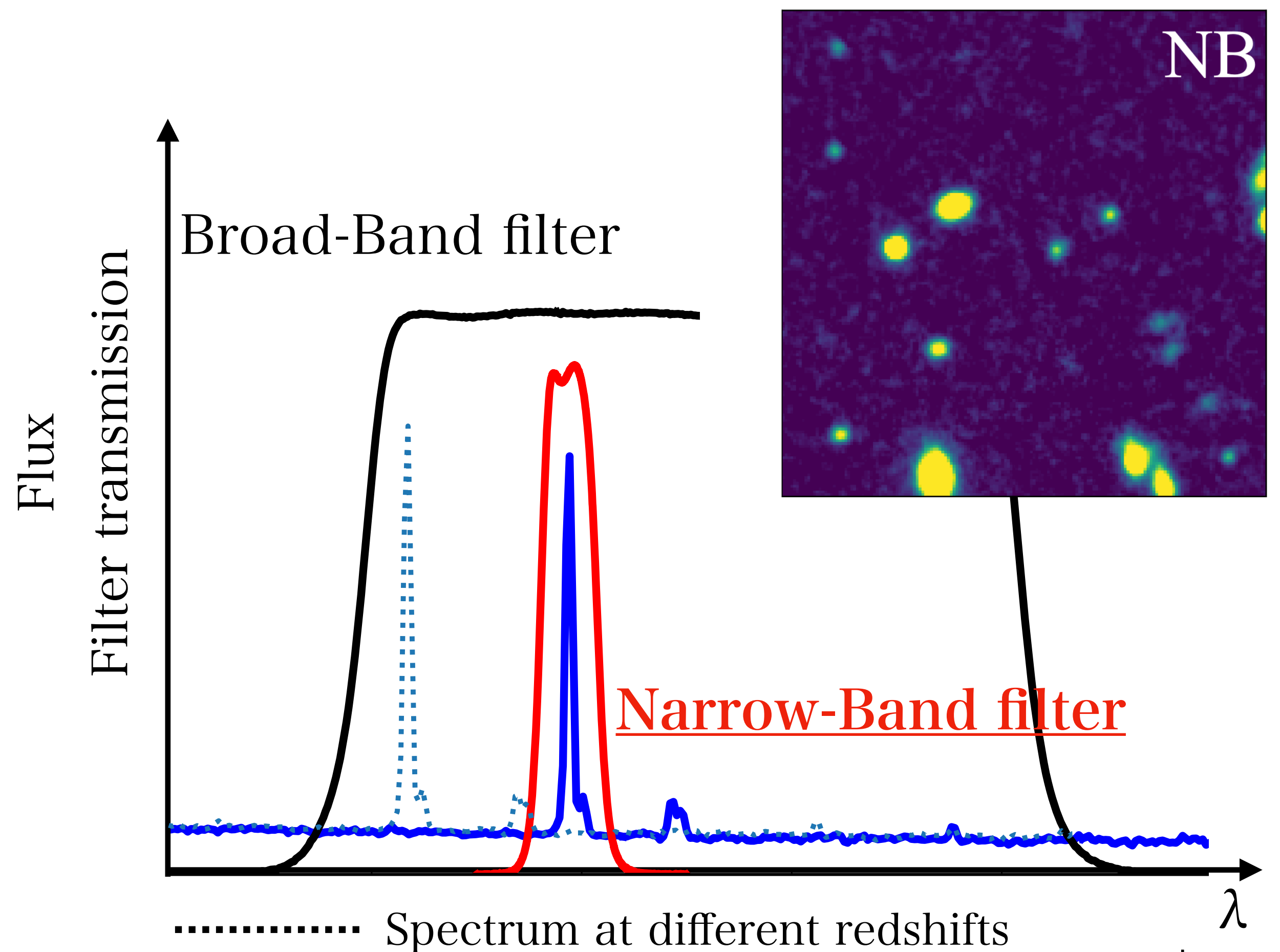
Proto-clusters are an important population at high redshifts.

MAHALO - **Subaru**

*M*apping *HA*lpha and *L*ines of *O*xygen with *Subaru*   PI : T. Kodama

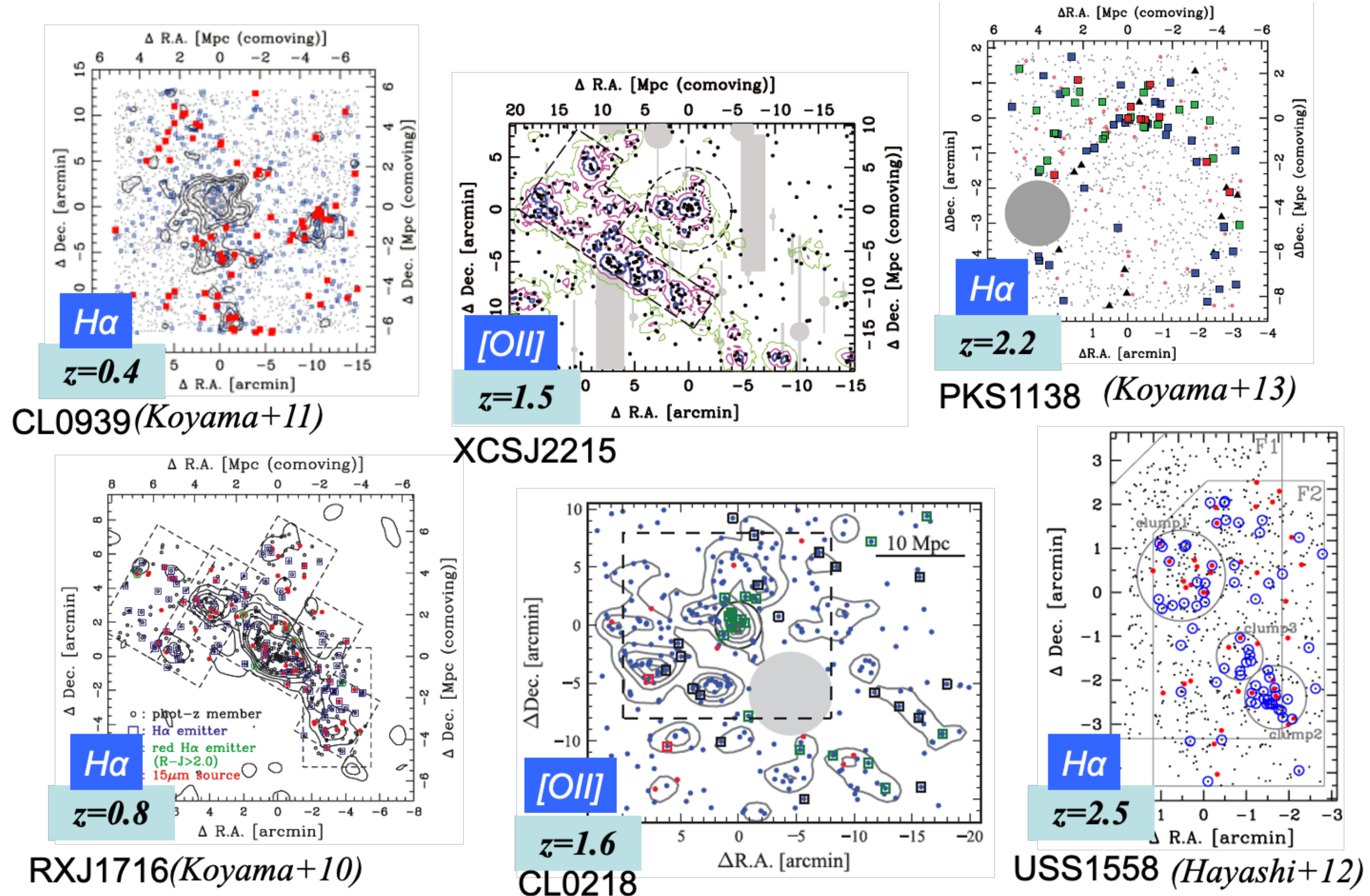## NB imaging surveys of clusters+field with Supreme-Cam, MOIRCS on Subaru

Field	Redshift	Instrument
CL0024+1652	0.395	Suprime-cam (SC)
CL0939+4713	0.407	SC
CL0016+1609	0.541	SC
RXJ1716.4+6708	0.813	SC / MOIRCS
RXJ0152.7-1357	0.837	SC
XCSJ2215-1738	1.457	SC
4C65.22	1.516	MOIRCS
CL0332-2742	1.61	SC
CIGJ0218.3-0510	1.62	SC
PKS1138-262	2.156	MOIRCS
4C23.56	2.483	MOIRCS
USS1558-003	2.527	MOIRCS
MRC0316-257	3.130	MOIRCS
SXDF	2.16 - 3.63	MOIRCS
COMSOS	2.19, 3.17, 4.6	MOIRCS
GOODS-N/S	2.19, 3.17	MOIRCS

Broad-Band filter

Narrow-Band filter

NB

Flux

Filter transmission

λ

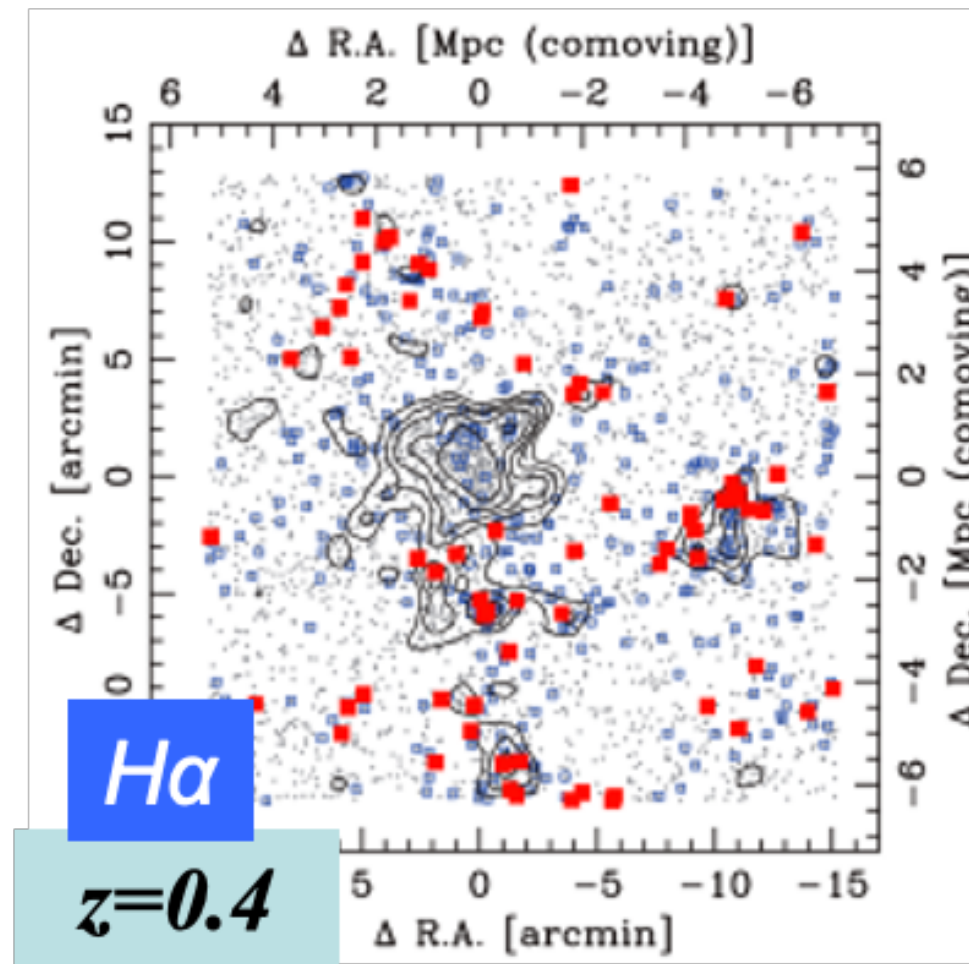.......... Spectrum at different redshifts

$f_{NB} > f_{BB}$ => emitter (star-forming gal.)

3

High-z structures revealed by *MAHALO* - Subaru

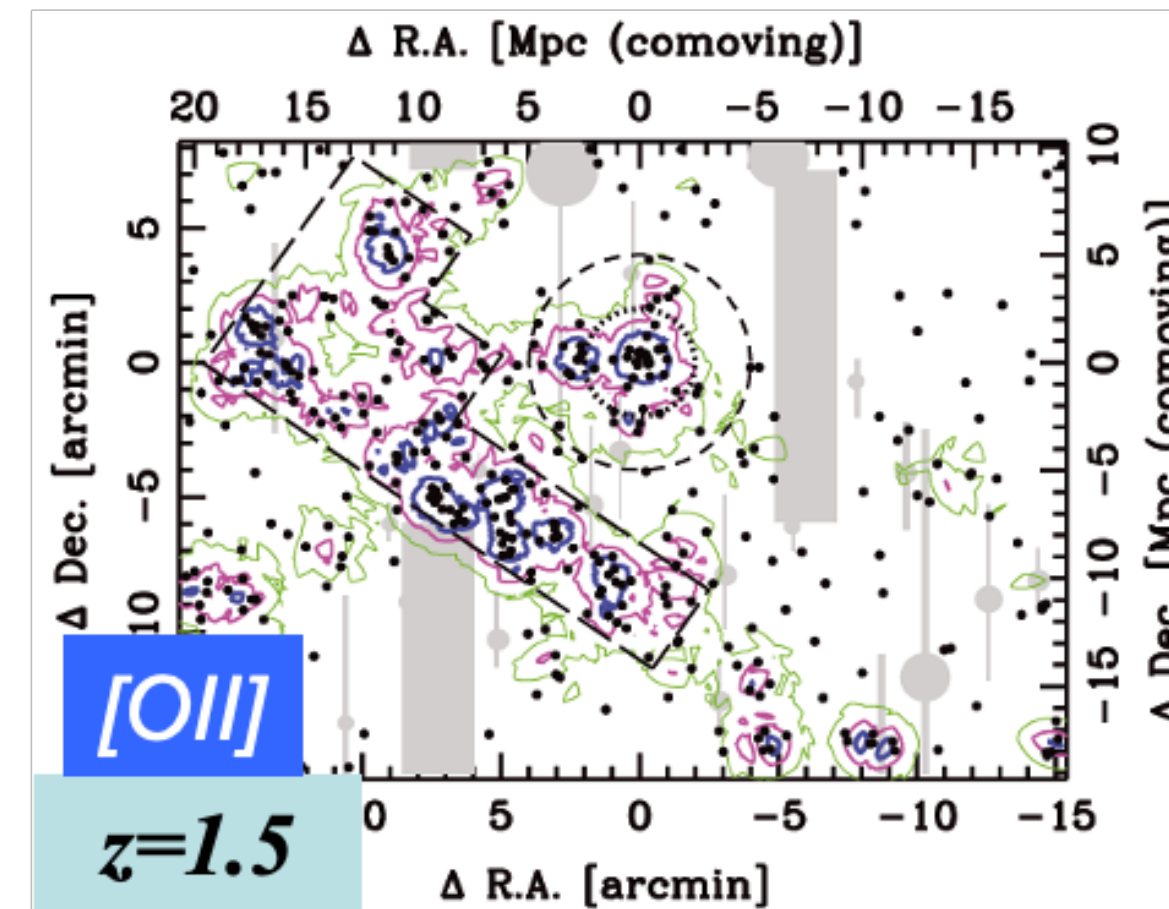## NB imaging surveys of clusters+field with Supreme-Cam, MOIRCS on Subaru

Hα
z=0.4
CL0939 *(Koyama+11)*

[OII]
z=1.5
XCSJ2215

Hα
z=2.2
PKS1138 *(Koyama+13)*

Hα
z=0.8
RXJ1716 *(Koyama+10)*

[OII]
z=1.6
CL0218

Hα
z=2.5
USS1558 *(Hayashi+12)*

4

High-z structures revealed by *MAHALO* - Subaru

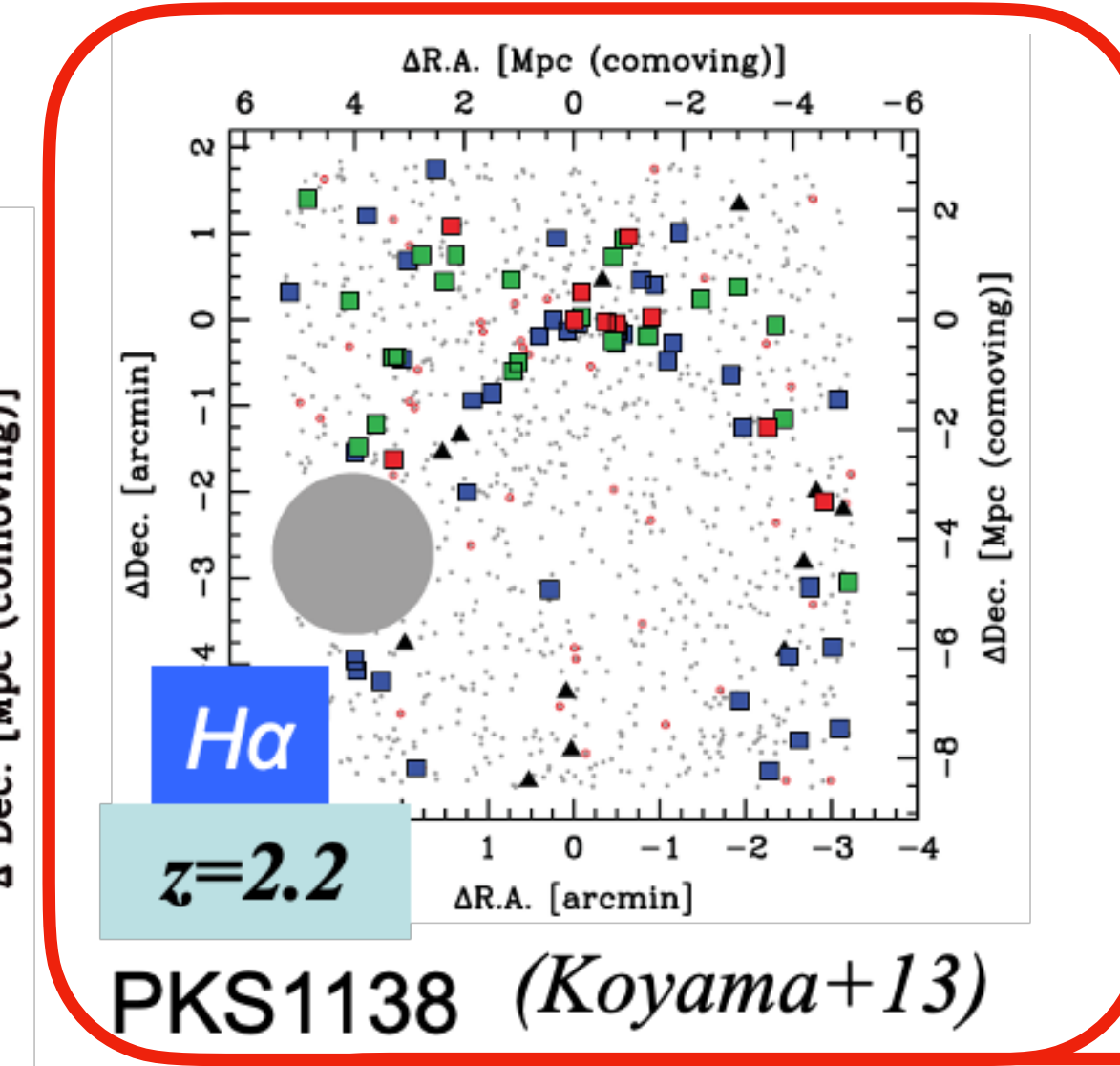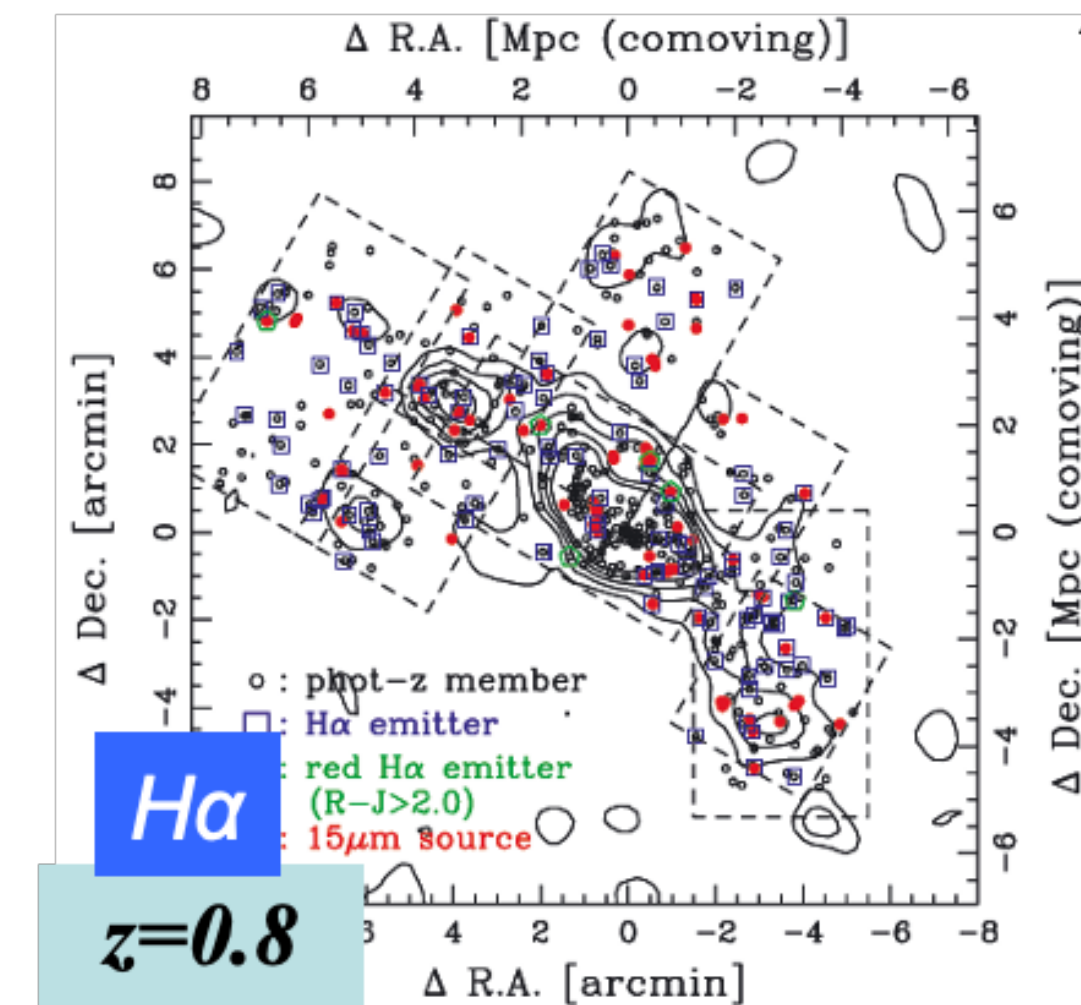NB imaging surveys of clusters+field with Supreme-Cam, MOIRCS on Subaru

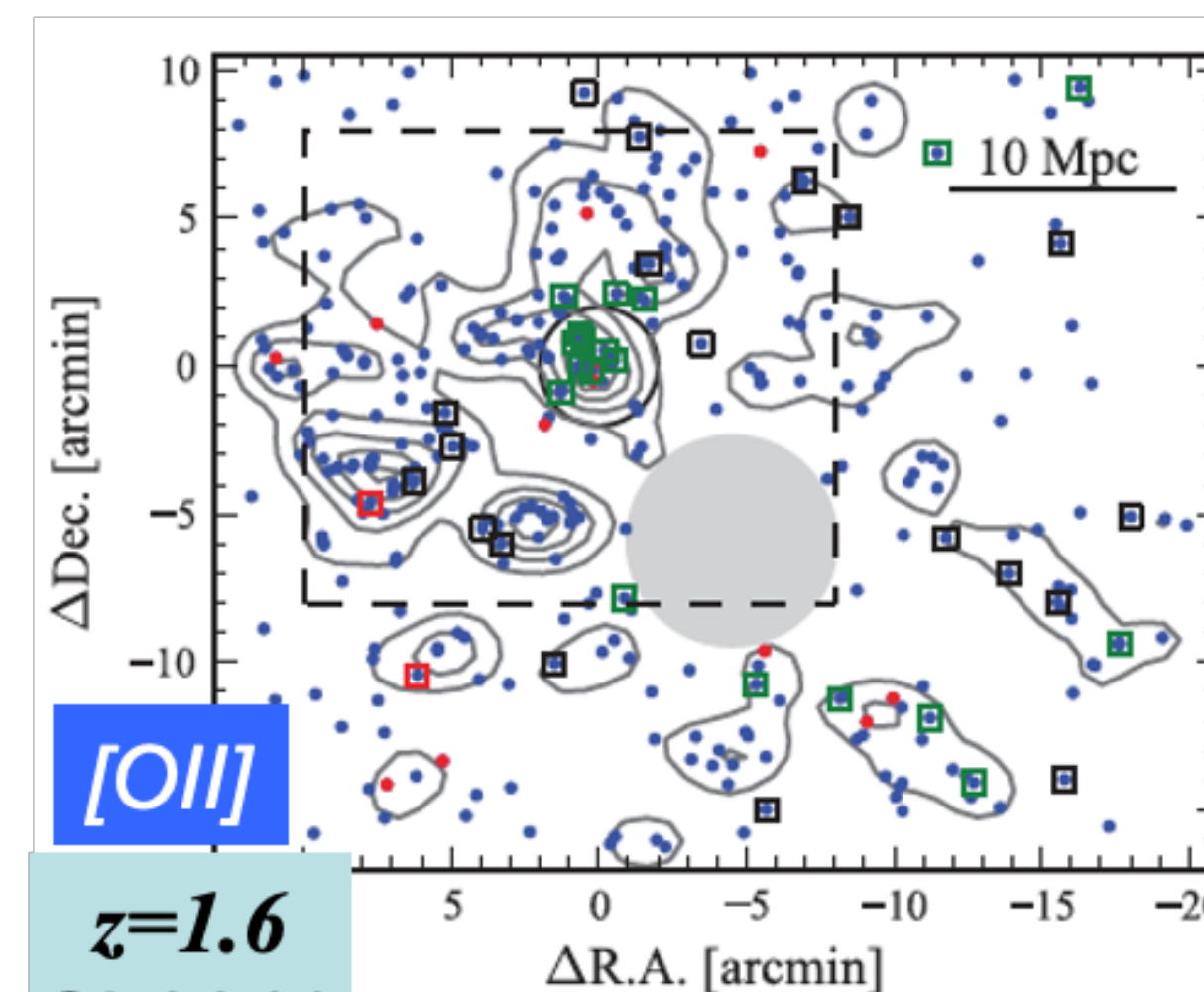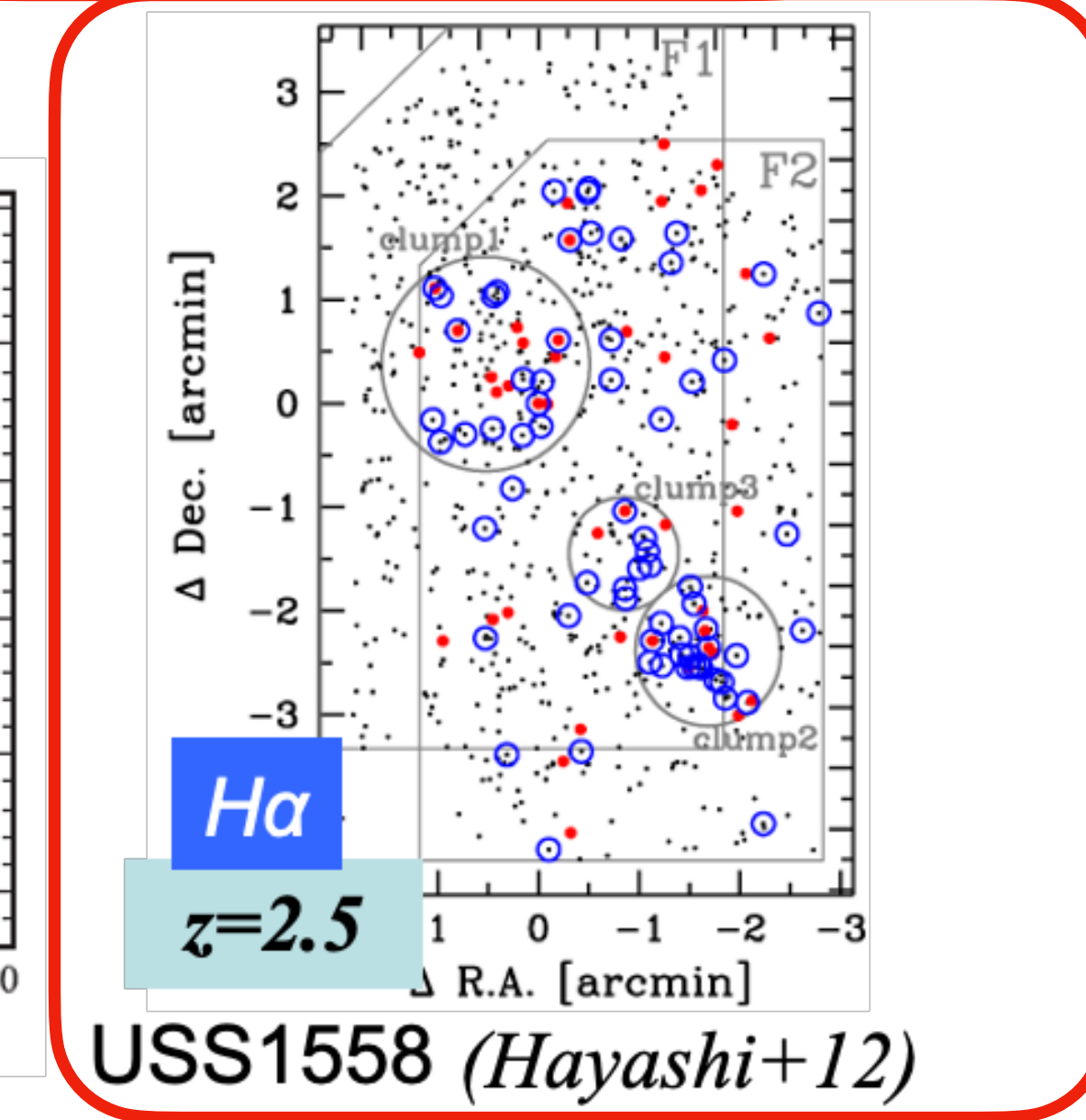*Hα* z=0.4 CL0939 *(Koyama+11)*

[OII] z=1.5 XCSJ2215

Hα z=2.2 PKS1138 *(Koyama+13)*

Hα z=0.8 RXJ1716 *(Koyama+10)*

[OII] z=1.6 CL0218

Hα z=2.5 USS1558 *(Hayashi+12)*

5

Enhanced low-mass star-forming galaxies

Daikuhara et al. in prep
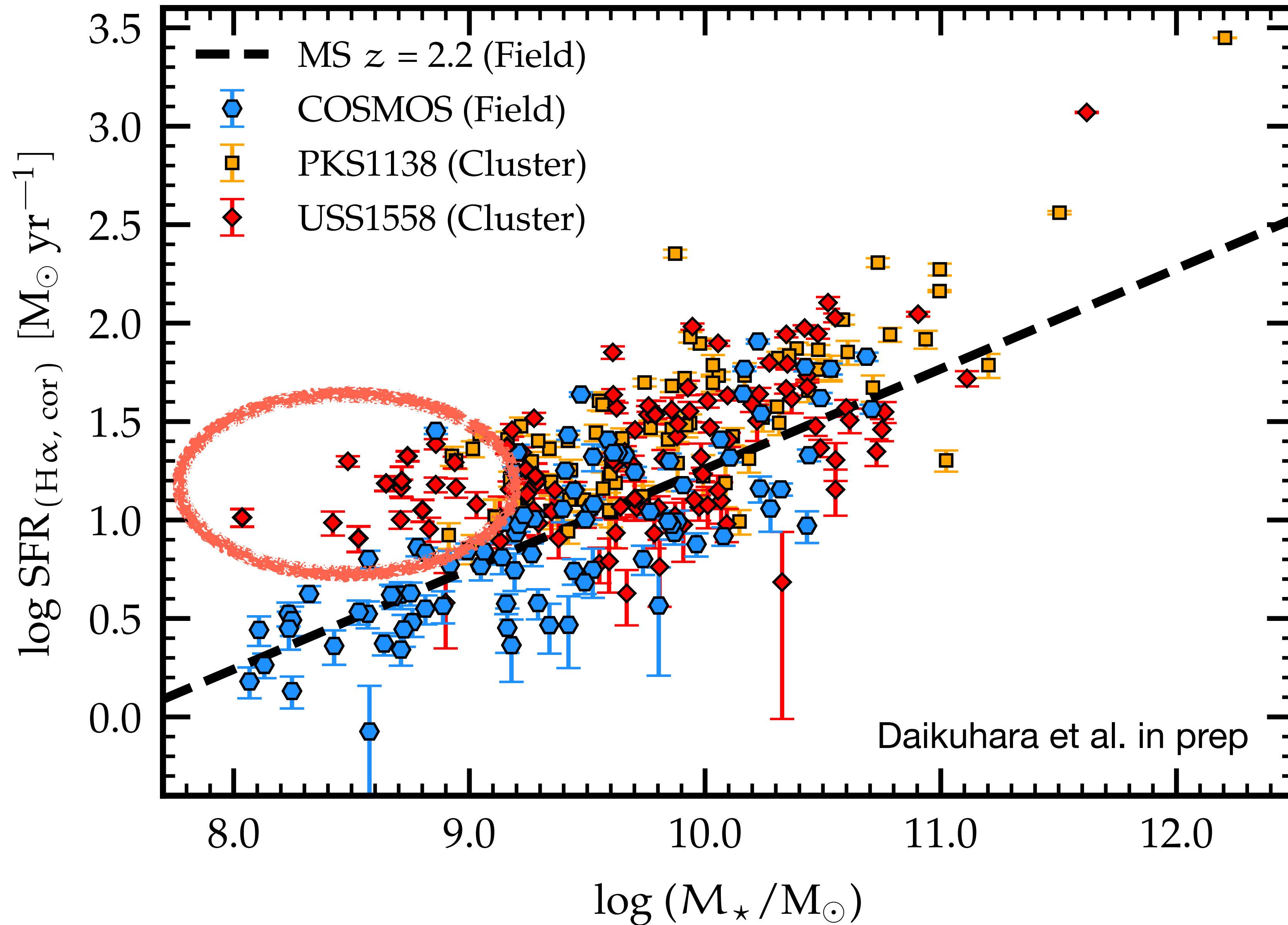
SWIMS - 18

Superb Wide-field Imaging Multi-colour Survey with 18 Filters

PI : T. Kodama

- 6 Narrow-Band Filters (NBF)
  SFR limited sample of SFGs and AGNs at z=0.9, 1.5, 2.3, 3.3.
  Ha & [OIII] dual emitters with pair NBFs.
  Coordination with Lya NB imaging (e.g. HSC)

- 8 Medium-Band Filters (MBF)
  Stellar mass limited sample at 1<z<5 with improved
  phot-z ($\Delta z/(1+z) \sim 0.01$).
  Hunting massive quiescent galaxies at z>4 (field + cluster)

- 4 Broad-Band Filters (BBF)

→ Tracking the cosmic histories of "mass assembly" and
  "star formation/AGN activities" over 1<z<5.

SWIMS-18 pilot surveys on Subaru (S21A - S22B)

(1) Ruby-Rush: MB survey of massive galaxies in proto-clusters (PCs) at z~5
K1,K2,K3 imaging of 10 r-drop PCs at z~5 (Gold-Rush), 5 SWIMS nights
(including a northern field ELAIS-N1: must be done on Subaru)

Tadaki-san's talk

(2) Field Survey: MB survey of massive galaxies in the general field at z~5
K1,K2,K3 imaging of the general field, 3.5 nights

(3) Balmer decrement (Hα/Hβ) imaging of a super-cluster at z~1
CL1604 super-cluster (z=0.9), pair NB imaging (SWIMS-NB1244-Hα +
HSC-NB921-Hβ), 3 SWIMS nights + 0.4 HSC night
(Northern target: must be done on Subaru)

Liu (Tohoku Univ.)

(4) Triple NB imaging survey (Hα + [OIII] + Lyα) of a high-z cluster at z~2
HS1700+64 proto-cluster (z=2.3), pair NB imaging (Hα + [OIII]) + existing
Lyα imaging, 2.5 SWIMS nights
(Northern target: must be done on Subaru)

Haruka Kusakabe

Kazuki Daikuhara

(5) Pair NB imaging (Hα+Lyα) at z=2.23 in HiZELS-COSMOS (z=2.23)

(6) Triple NB imaging (Hα + [OIII]+[OII]) survey at z~1.5
HSC Deep2-3 (z=1.485), 2 SWIMS nights

HS1700+64 filament proto-cluster at $z = 2.3$

Preliminary

Summary

The near-infrared instrument **SWIMS** is suitable for large-scale surveys because of its wide field of view and two-band simultaneous observation capability.

The **SWIMS-18 survey** is a large multi-color imaging survey to construct an outstanding sample of distant galaxies that covered the peak of galaxy evolution.

SWIMS-18 enables us to investigate the nature of galaxies in various environments by discovering high-redshift proto-clusters through a large-scale survey.

TAO 6.5m

Unique points of SWIMS-18 NB survey :

Hα and [OIII] lines can be captured simultaneously.

The ionization state of star forming galaxies can be investigated without spectroscopic observations.

Star-forming galaxies and AGNs can be sampled as unbiased as possible.