

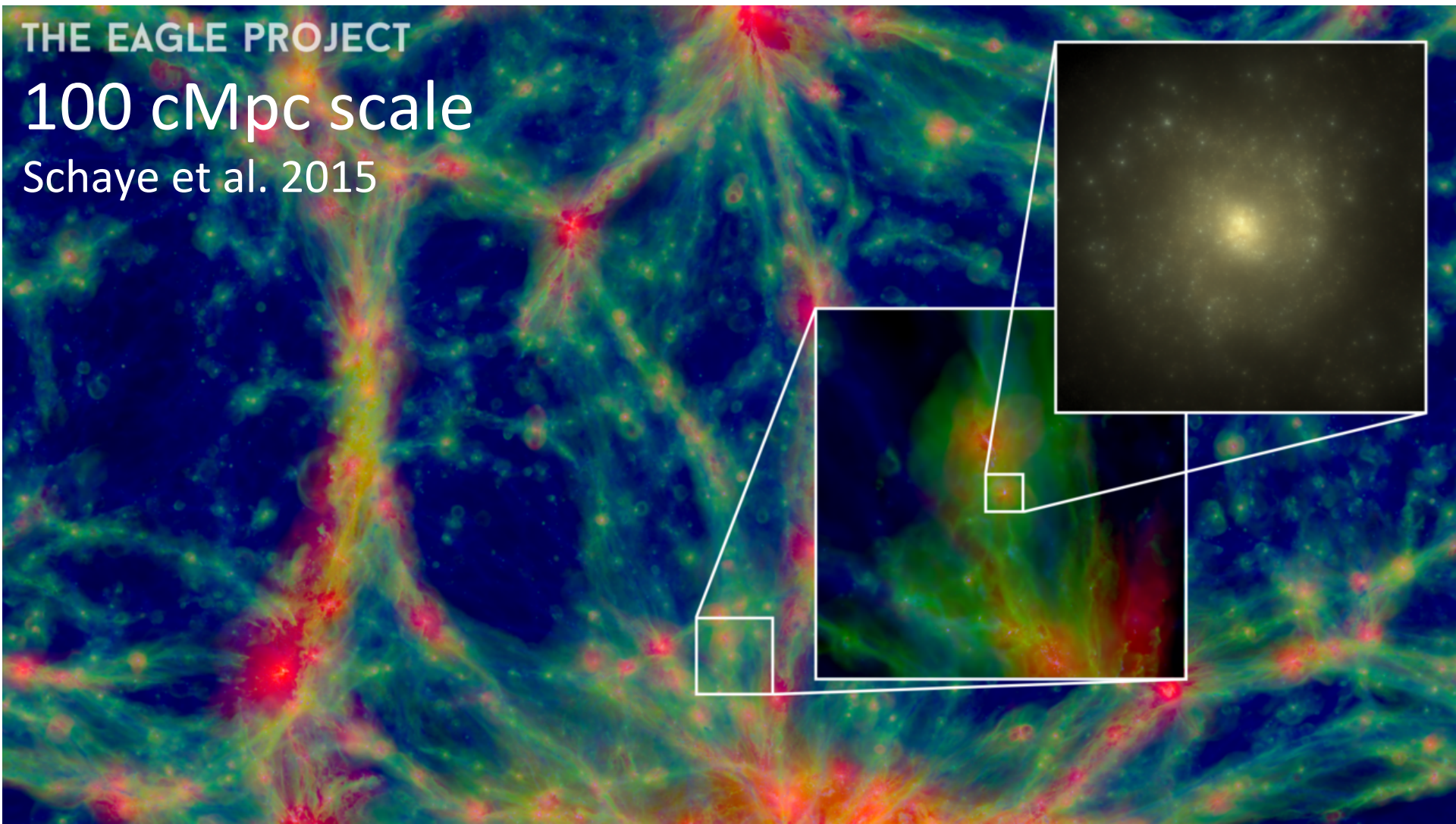
# **Galaxy formation along the high- $z$ cosmic web**

Yuichi Matsuda (NAOJ)

# Galaxy formation along the high- $z$ cosmic web

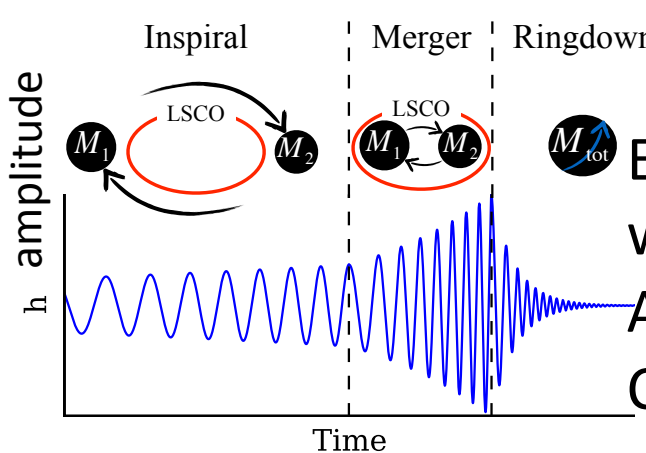
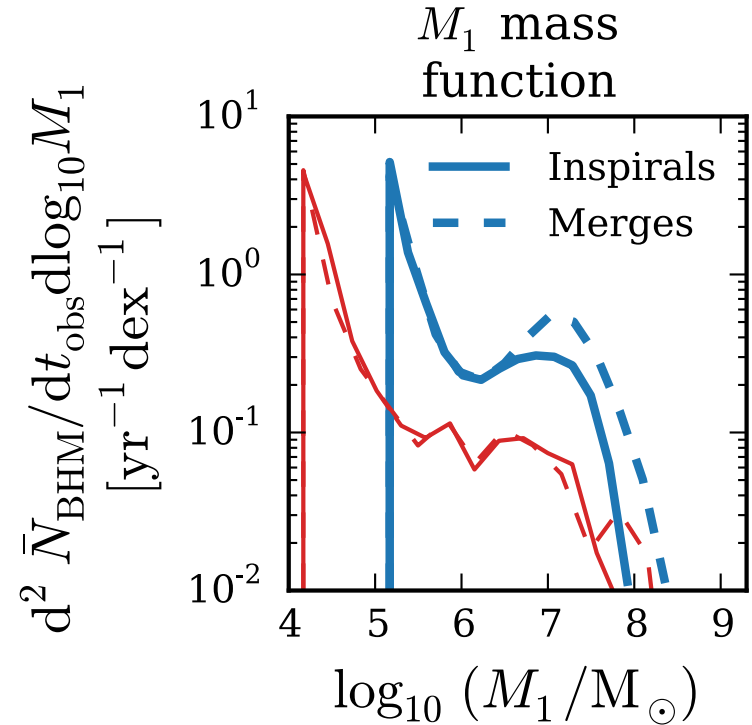
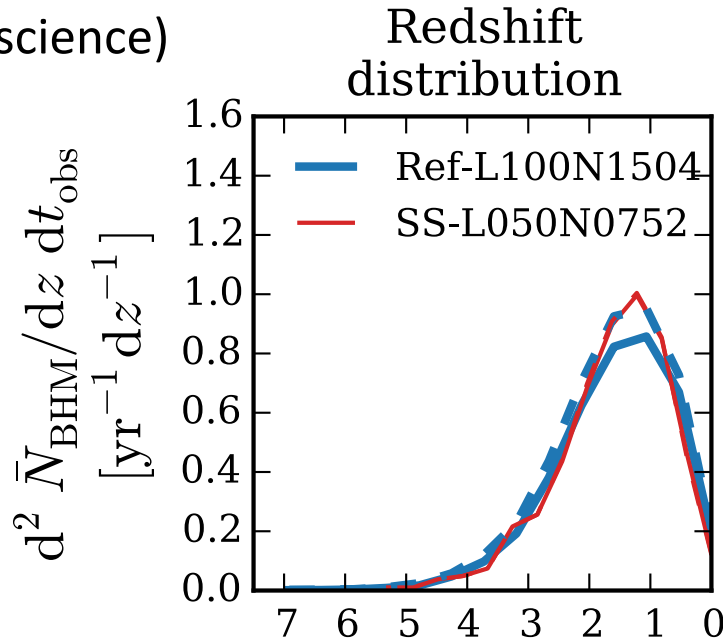
How do galaxies form and grow in the cosmic web?

How do galaxies get their gas?



# Can ULTIMATE observe high-z BH mergers?

See Tanaka-san's talk tomorrow  
(time-domain science)



Redshift  $z$

$M_{\text{tot}}$  EAGLE simulation predicted eLISA (2034 launch) will detect GW from high-z BHs (Salcido+16)

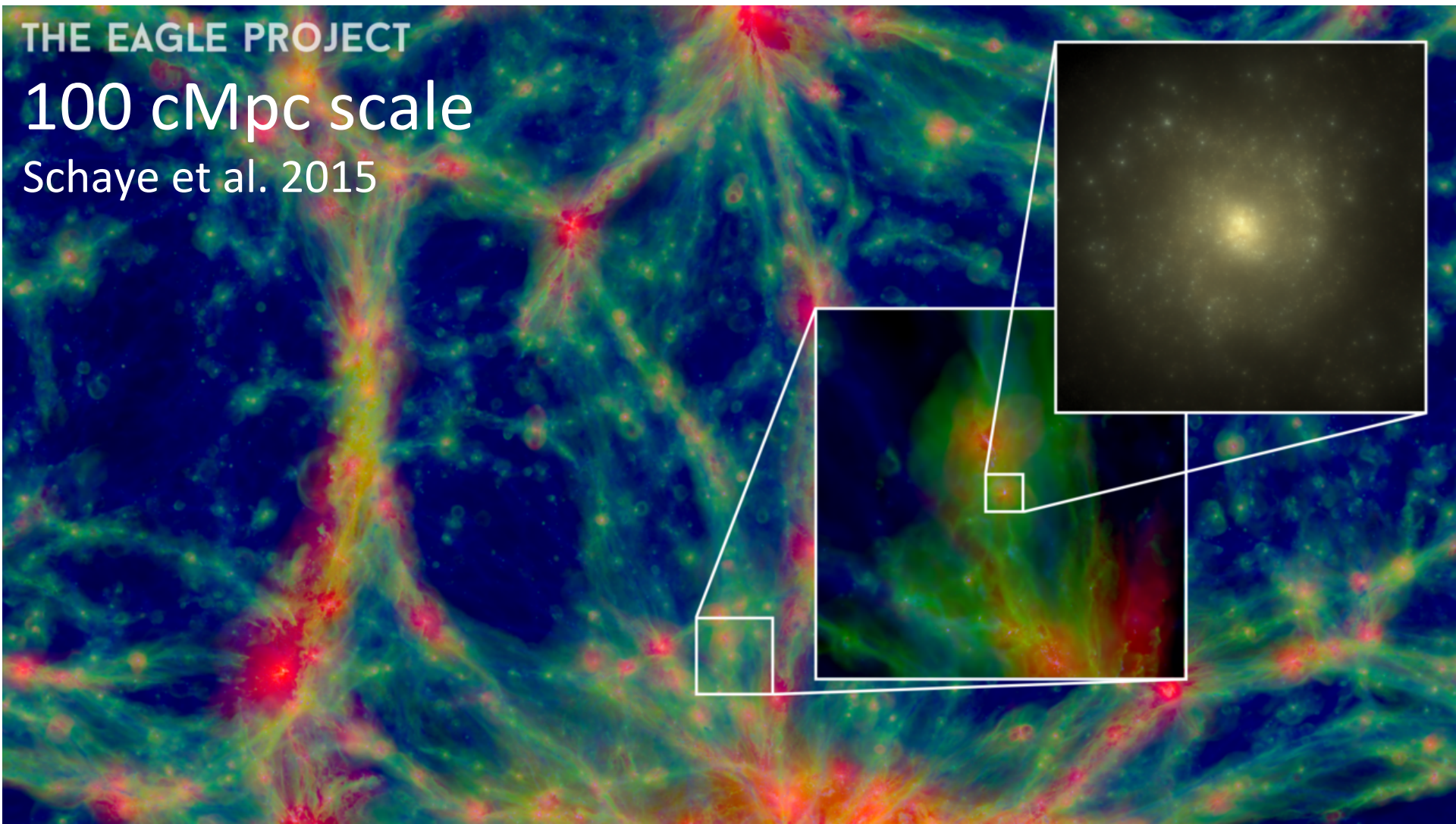
Angular resolution of eLISA is 10 deg<sup>2</sup>

Can ULTIMATE monitor 10 deg<sup>2</sup> field?

# Galaxy formation along the high- $z$ cosmic web

How do galaxies form and grow in the cosmic web?

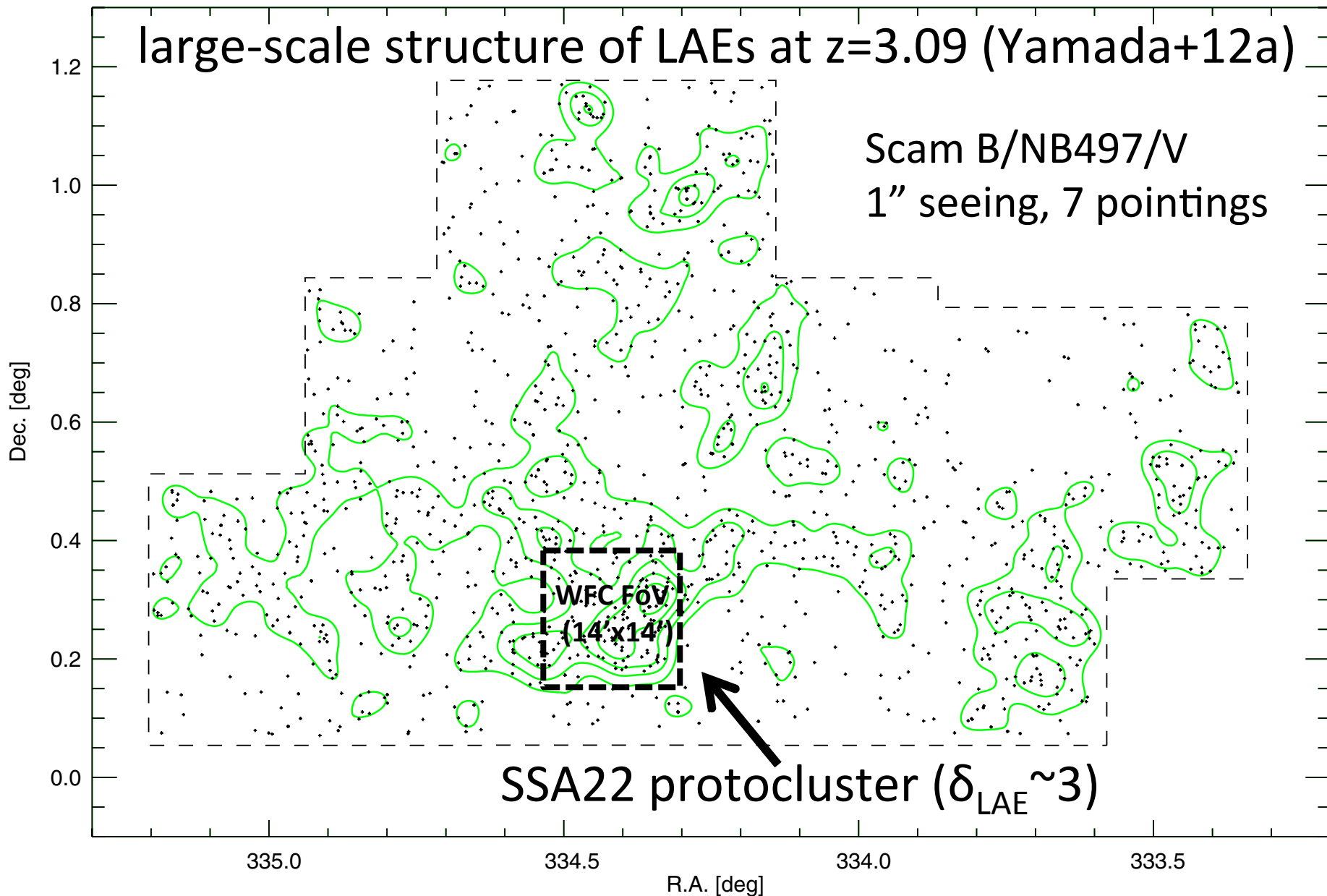
How do galaxies get their gas?



# 100 cMpc-scale

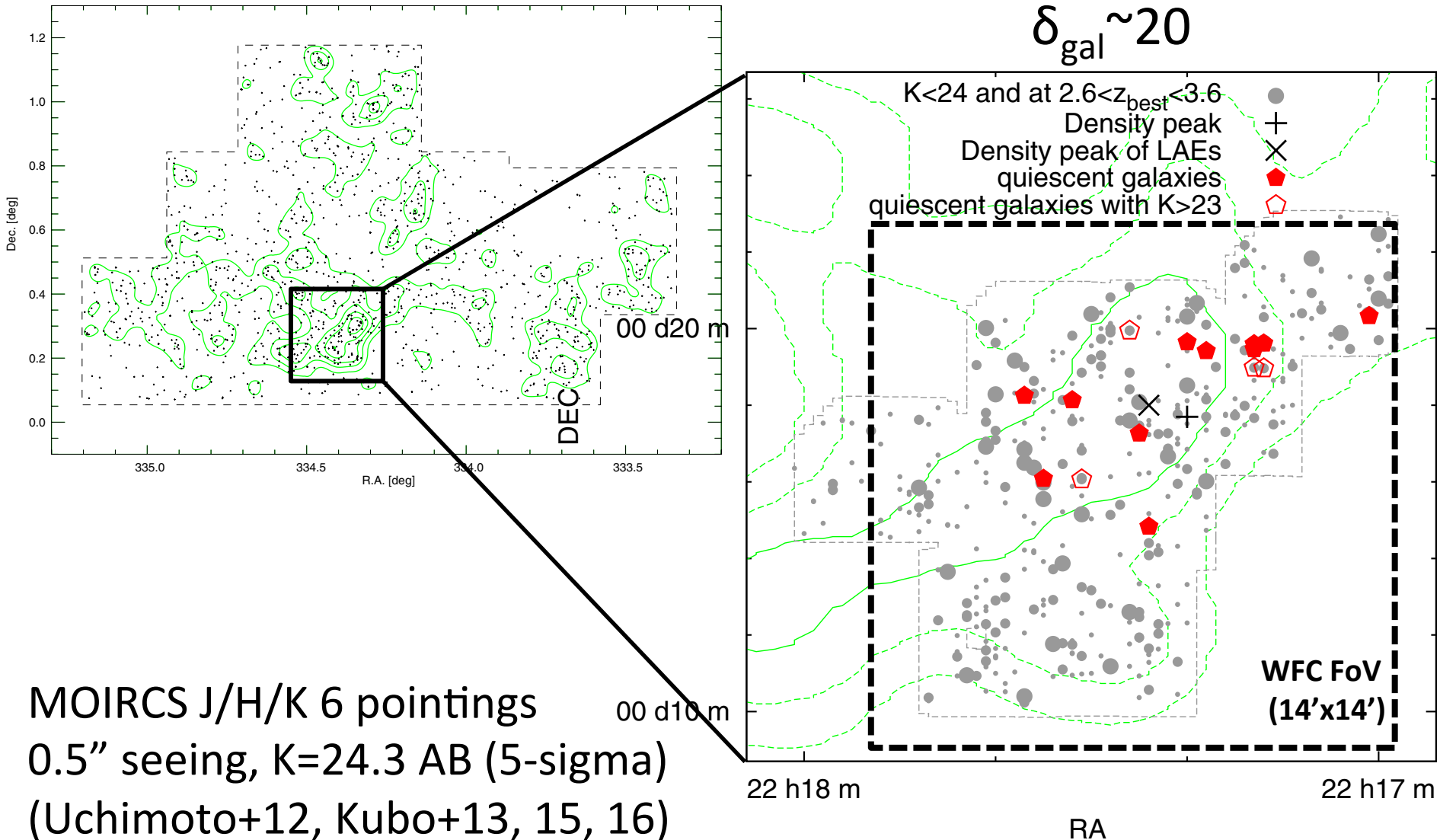
large-scale structure of LAEs at  $z=3.09$  (Yamada+12a)

Scam B/NB497/V  
1" seeing, 7 pointings



# 10 cMpc-scale

$$\delta_{\text{gal}} \sim 20$$



MOIRCS J/H/K 6 pointings  
0.5" seeing, K=24.3 AB (5-sigma)  
(Uchimoto+12, Kubo+13, 15, 16)

ULTIMATE/WFC can observe the protocluster with 0.2" in 1 pointing

# Wide-field imager (WFC)

- HSC surveys will map  $z=2-4$  large-scale structure, protoclusters and Ly $\alpha$  filaments on 1-100 Mpc scales.
- I prefer WFC and survey design A (BBs+NBs) or B (K+NBs). WFC K and [OIII]/Ha mapping can reveal spatial distribution and morphologies of high- $z$  massive galaxies including dusty starbursts along the cosmic filaments (see also Suzuki+15, Tadaki+11, 14, 15, Koyama+10, 11, 13, 14, 15)
- Sensitive NB survey ([OIII]/Ha mapping) can be started with GLAO+MOIRCS

# Requirements for WFC

- Many NB filters will be a strong point for WFC (cf. Subaru/Scam & HST/WFC3)
- Tunable filter sounds attractive.
- But sensitive NB observations would be essential for high-z galaxy studies...

# Summary

- HSC surveys will map  $z=2-4$  large-scale structure, protocluster and Ly $\alpha$  filaments on 1-100 Mpc scales.
- ULTIMATE/WFC K-band and [OIII]/Ha will reveal spatial distribution and morphology of high- $z$  massive galaxies including dusty starbursts along the cosmic filaments.
- WFC is the 1<sup>st</sup> prioritized instrument.