WFMOS follow-ups of a HSC narrow-band BAO survey

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ABSTRUCT

- A wide-field (~1000 deg^2) narrow-band imaging of Lya emitters with HSC enable us to detect BAO at z~3 (~35 nights).
- The data will be useful for the study of galaxy formation.
  I. Halo mass & duty cycle of Lya emitters (number density & clustering properties)
  II. the candidates of rare objects & structures (~100 PopIII galaxies & ~100 proto-clusters)
- Spectroscopic follow-ups with WFMOS will be needed to confirm PopIII galaxies and to study proto-clusters.

BAO survey methods

- Spectroscopic surveys

  SDSS (Eisentein et al. 2005, Percival et al. 2006), 2dF (Cole et al. 2005), WiggleZ (Kerl's talk), FMOS FIRST SOUND, HETDEX (Gary's talk), Lyα forest (Patrick's talk, Daniel's talk), WFMOS

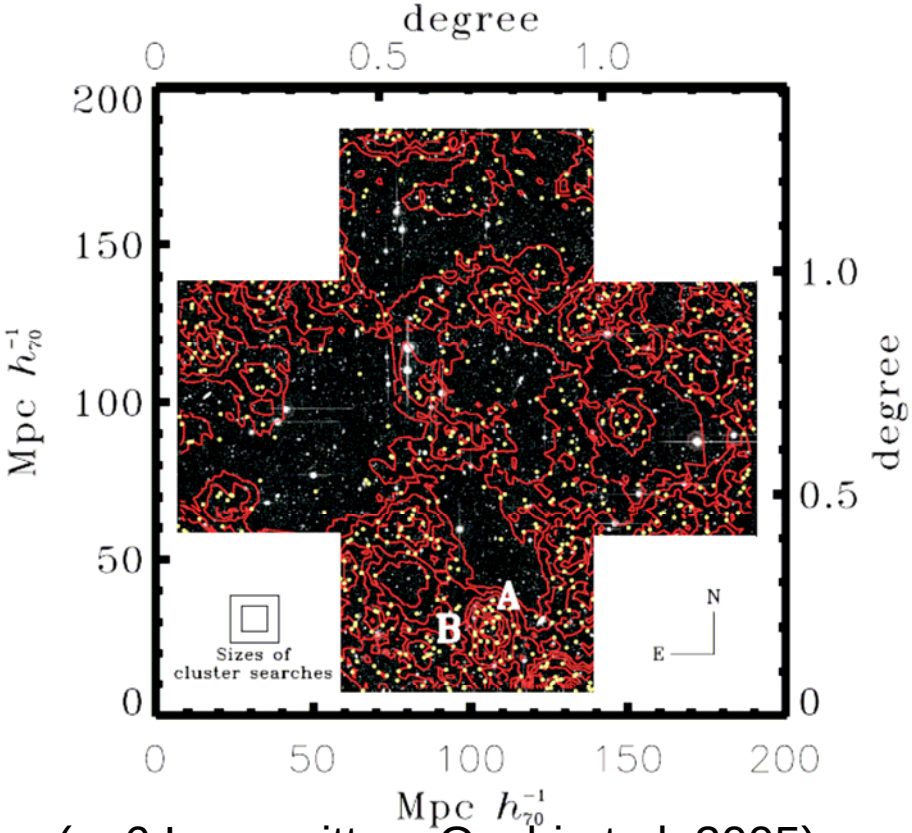
Narrow-band imaging

- Photometric surveys

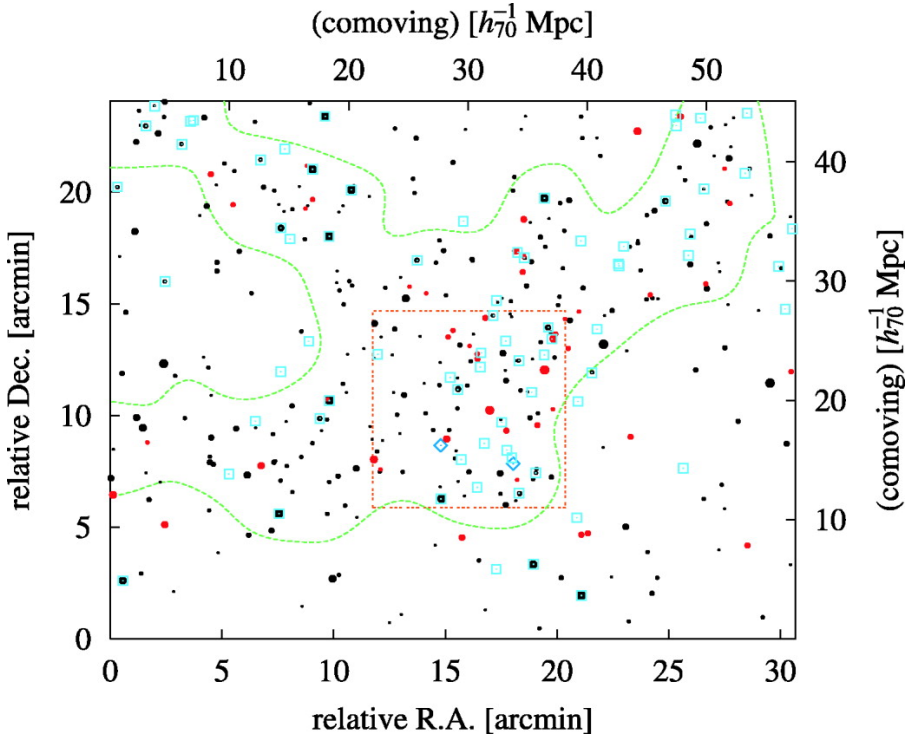
  SDSS (Padmanabhan et al. 2006), LBGs (Seo & Eisenstein 2003, Glazebrook & Blake 2005)

Narrow-band imaging

- Angular distribution of Lya emitters in redshift slices (dz=0.06, 50Mpc/h - 1/2 of the first peak of BAO) (e.g. Ouchi et al. 2003, 2005, 2008, Shimasaku et al. 2003, 2004, Havashino et al. 2004. Muravama et al. 2007)



(z=6 Lya emitters Ouchi et al. 2005)



(z=3 Lya emitters Hayashino et al. 2004)

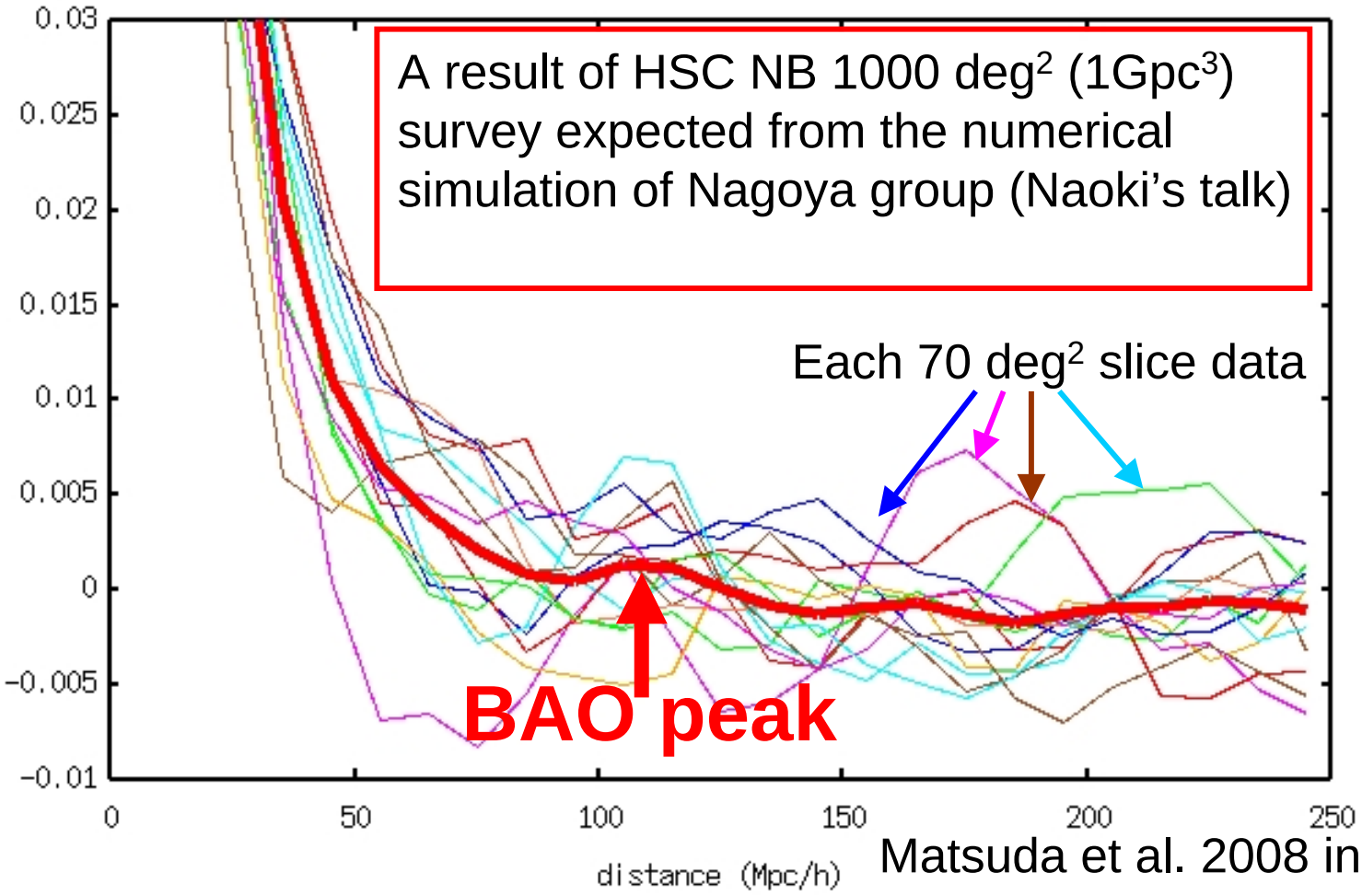
A plan of a HSC narrow-band BAO survey

- Target：z=3 Lya emitters (5000A)
- Width of the slice：50 Mpc/h
- Detection limit(5sigma)：L(Lya)>3x10^{42} ergs s^{-1}
- Number density：400 deg^{-2} (e.g. Ouchi et al. 2008)
- Survey area (volume)：1000 deg^2 ($1Gpc^3$)
- Required nights:

  1000 deg^2/ 1.8 deg^2 x 0.5 hours = 280 hours

~35 nights

An expected angular correlation function of Lya emitters at z=3



Matsuda et al. 2008 in prep

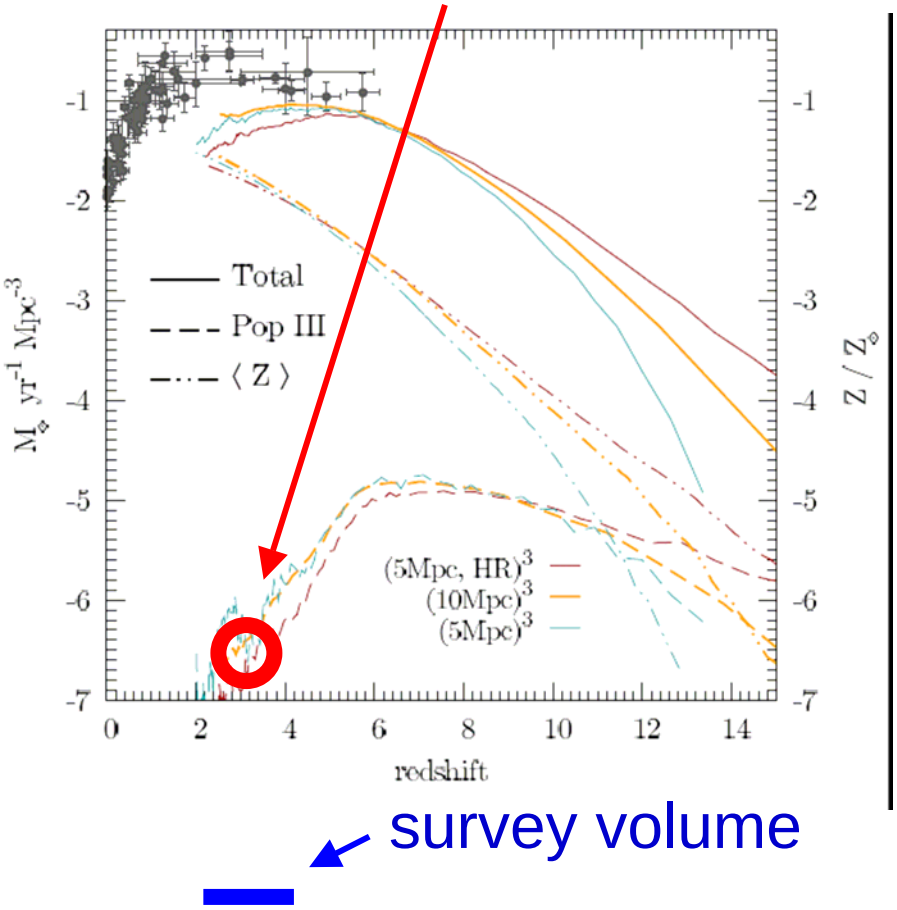
The study of galaxy formation with the survey data

- A sample of 400k Lya emitters over 1000 deg^2 ($1Gpc^3$) at z=3
- Halo mass & duty cycle of Lya emitters (number density & clustering properties)
- Rare objects & structures (~100 PopIII galaxies & ~100 proto-clusters)
- Spectroscopic follow-ups with WFMOS will be needed to confirm PopIII galaxies and to study proto-clusters.

Pop III galaxies at z~3

(cf Toru, Masami & Andrew's talks)

- Predicted number density of ~10^{-7} Mpc^{-3}



(e.g. Tornatore et al. 2007)

L(Lya)~3x10^{42} ergs/s corresponds to SFR(PopIII)~1Msun/yr (e.g. Schaerar et al. 2003)

~100 PopIII galaxies would be detected from the HSC (~1Gpc^3) narrow-band BAO survey

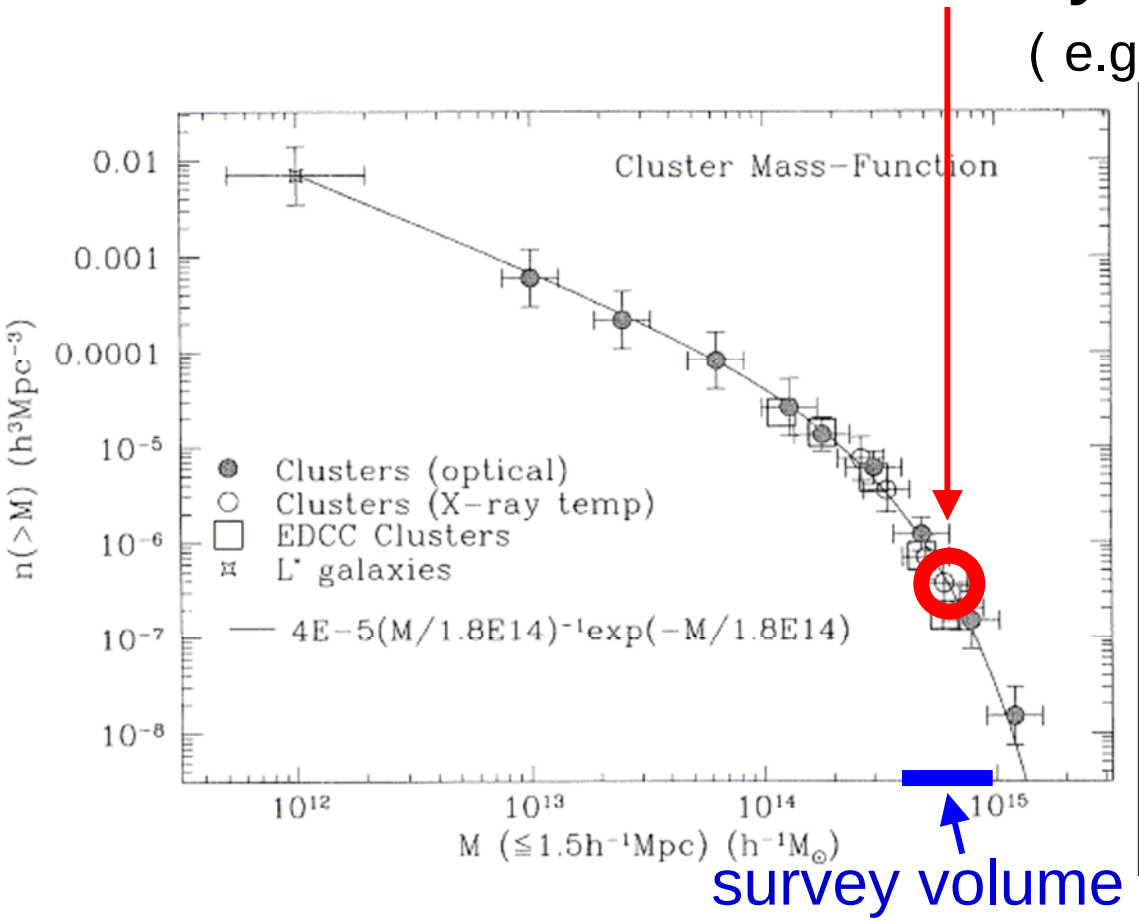
>10 hours exposures with WFMOS are required to detect HeII1640 emission line (~10% of Lya flux)

Proto-clusters at z~3

(cf Toru, Masami, Taddy, Arjun, Tomo's talks)

- Predicted number density of ~10^{-7} Mpc^{-3}

(e.g. Bahcall& Cen 1993)



~100 proto-clusters (progenitors of Coma-like clusters) would be identified from the HSC (~1Gpc^3) narrow-band BAO survey

~2hours exposures with WFMOS are required to examine the 3D structures

Measure the mass combining with the S-Z map (e.g. SCUBA2 survey)??

SUMMARY

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BAO can be detected with narrow-band imaging!