A Panoramic Search for Ly-alpha Blobs at z=3

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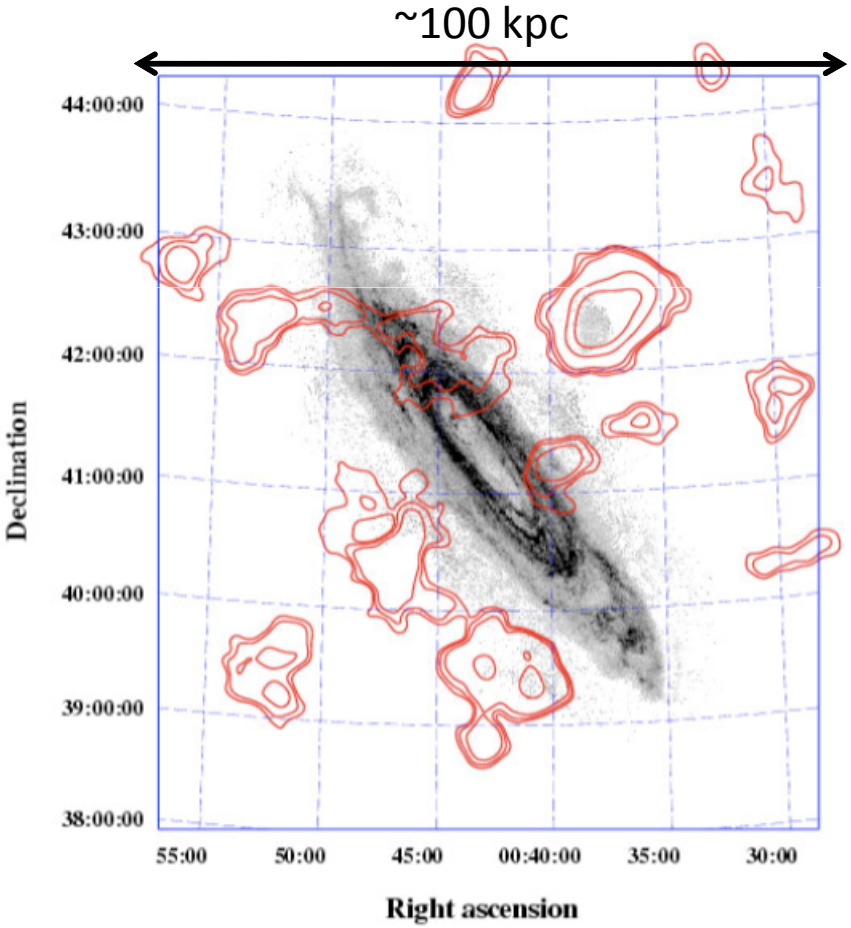
Introduction

- Galaxy halos: The interface between galaxies and the inter-galactic medium (IGM)



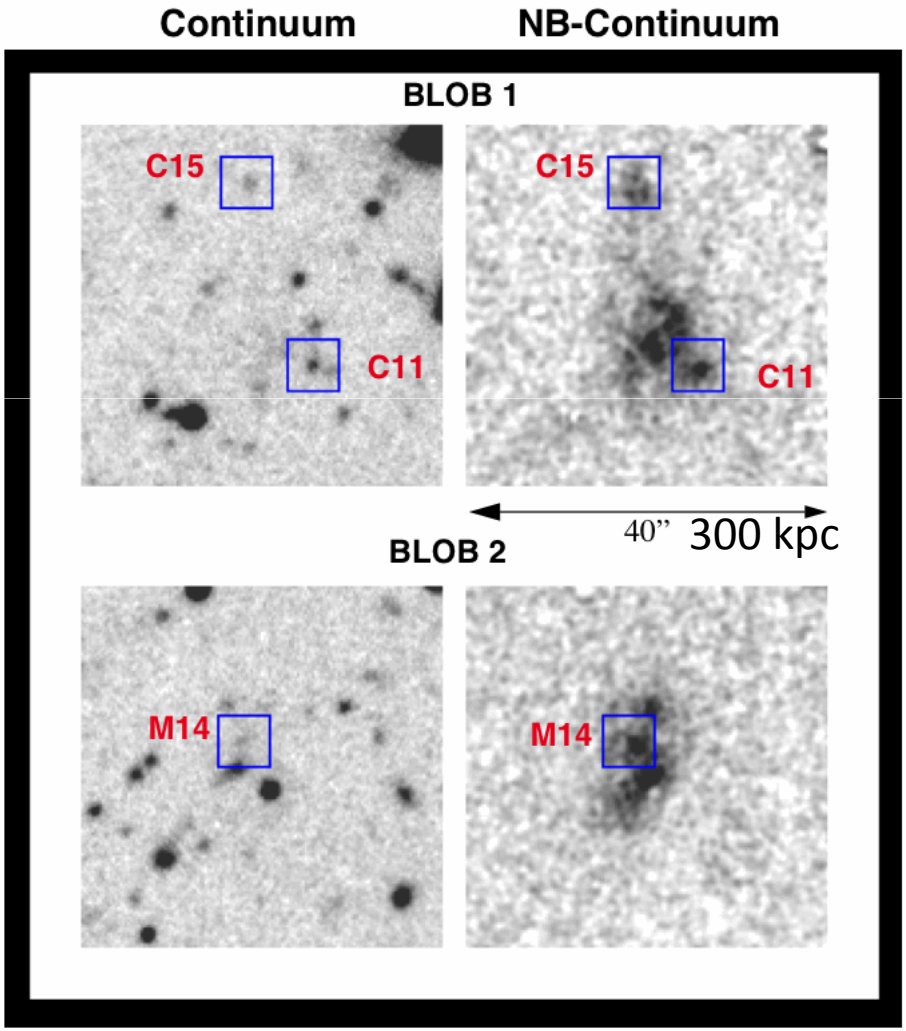
We can see many hydrogen gas clouds (circum-galactic medium) around local galaxies.

The circum-galactic medium have information of the interactions between galaxies & IGM.

HI gas clouds around M31 (Thilker et al. 2004)

Introduction

- Ly-alpha halos at high-z (Ly-alpha blobs, LABs)



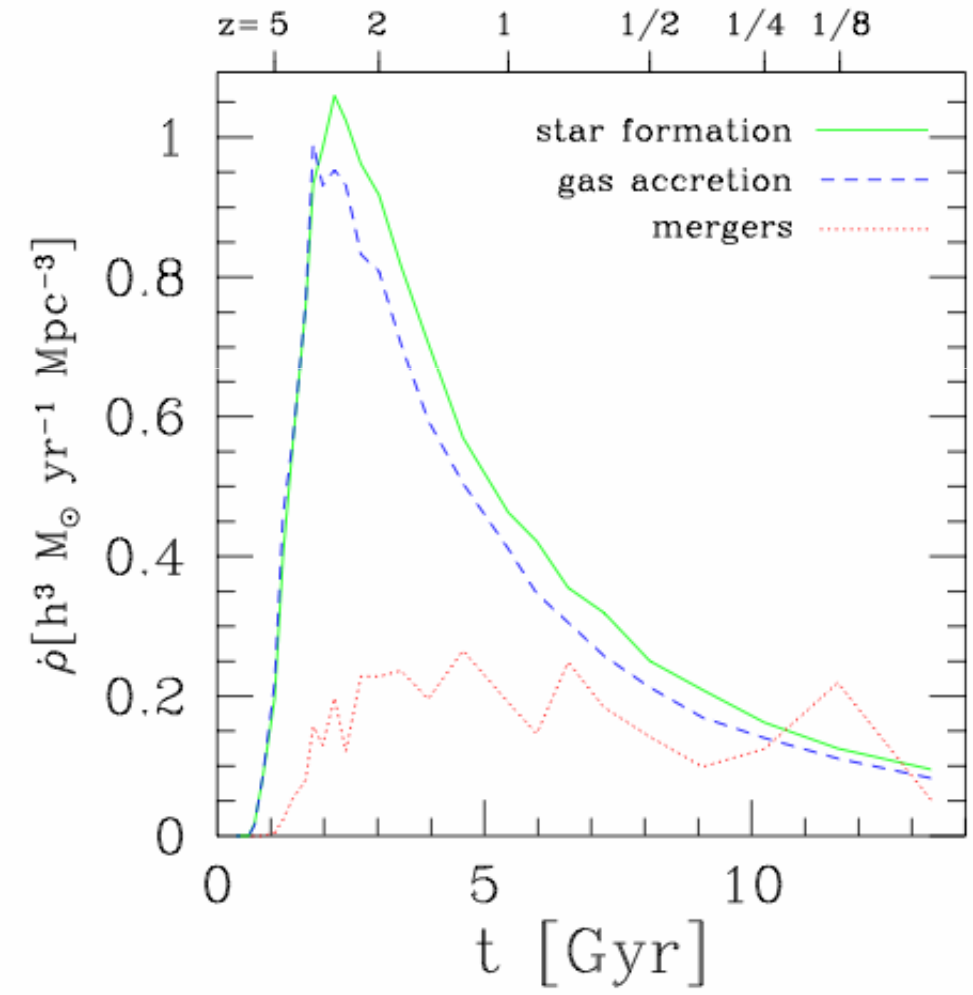
We can see the circum-galactic medium around high-z galaxies by Ly-alpha emission.

The Ly-alpha blobs may be evidence of strong interactions between galaxies & IGM at high-z.

Ly-alpha halos around galaxies at z=3 (Steidel et al. 2000)

Introduction

- Interactions between galaxies & IGM

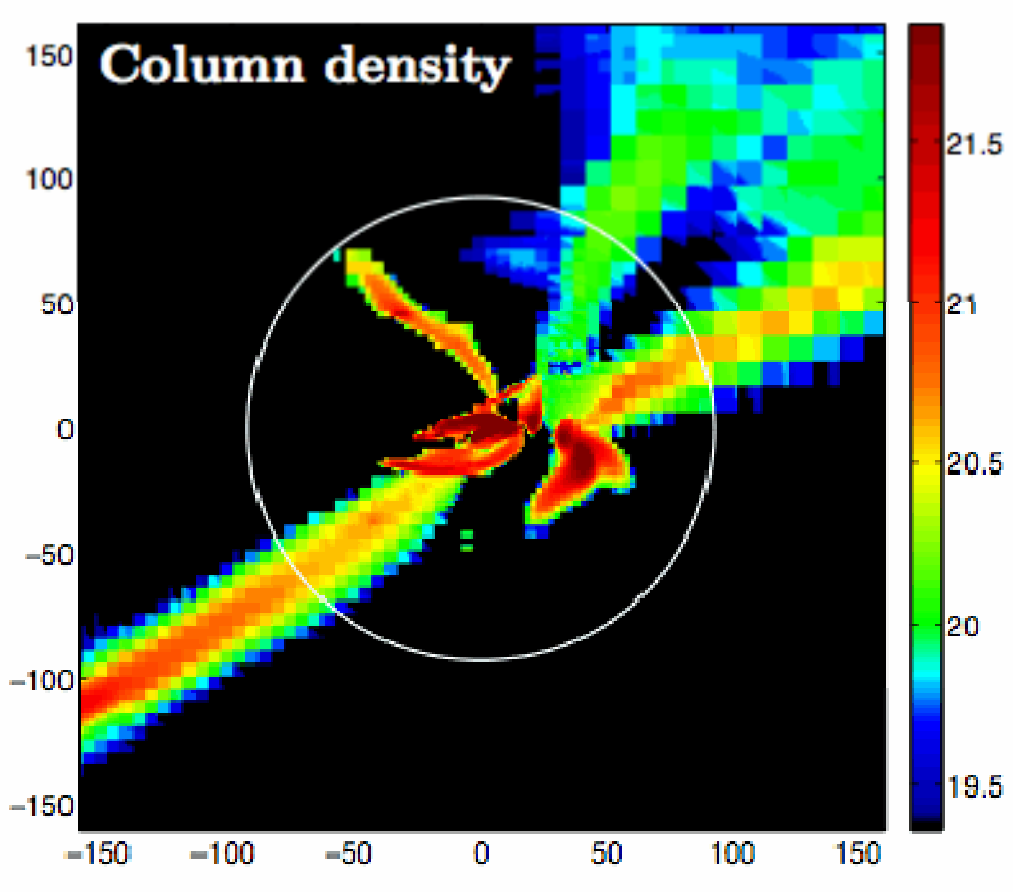


The interactions between galaxies & IGM at high-z should be ~10 x stronger than at the present day.

Cosmic star-formation rate & expected cosmic gas accretion rate (Keres et al. 2005)

Introduction

- Interactions between galaxies & IGM



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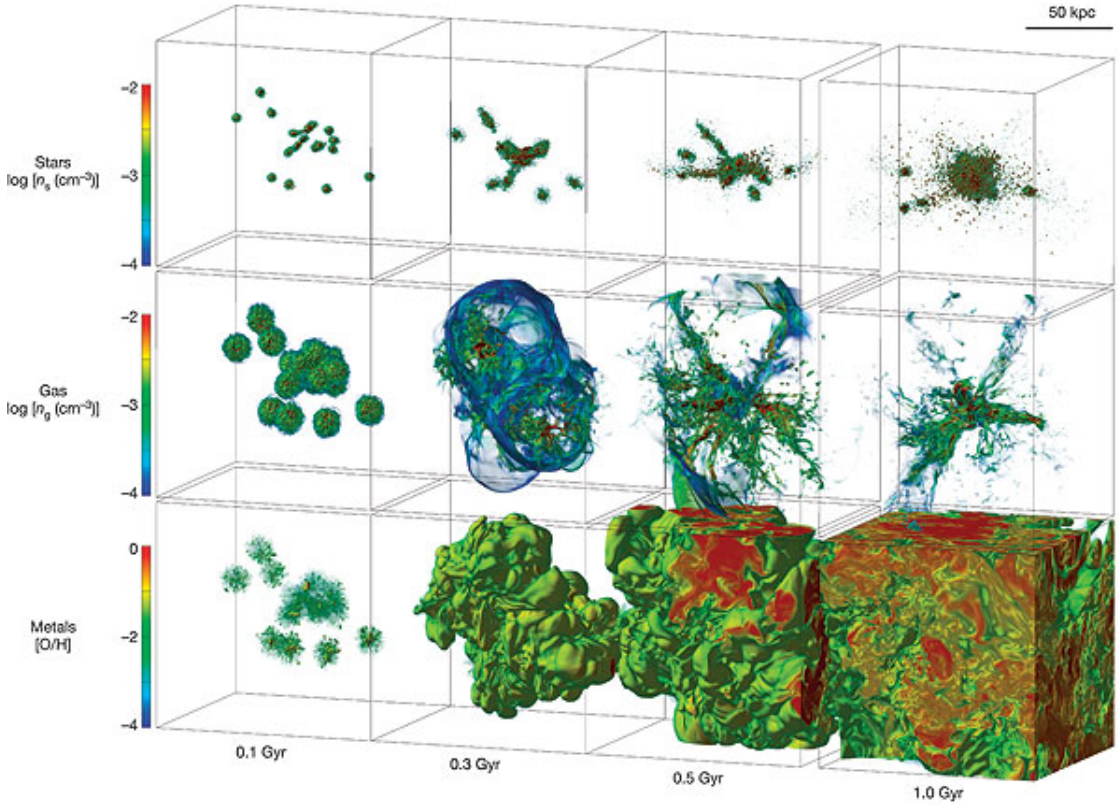
Gas accretion from IGM (Dekel et al. 2009)

Introduction

- Interactions between galaxies & IGM



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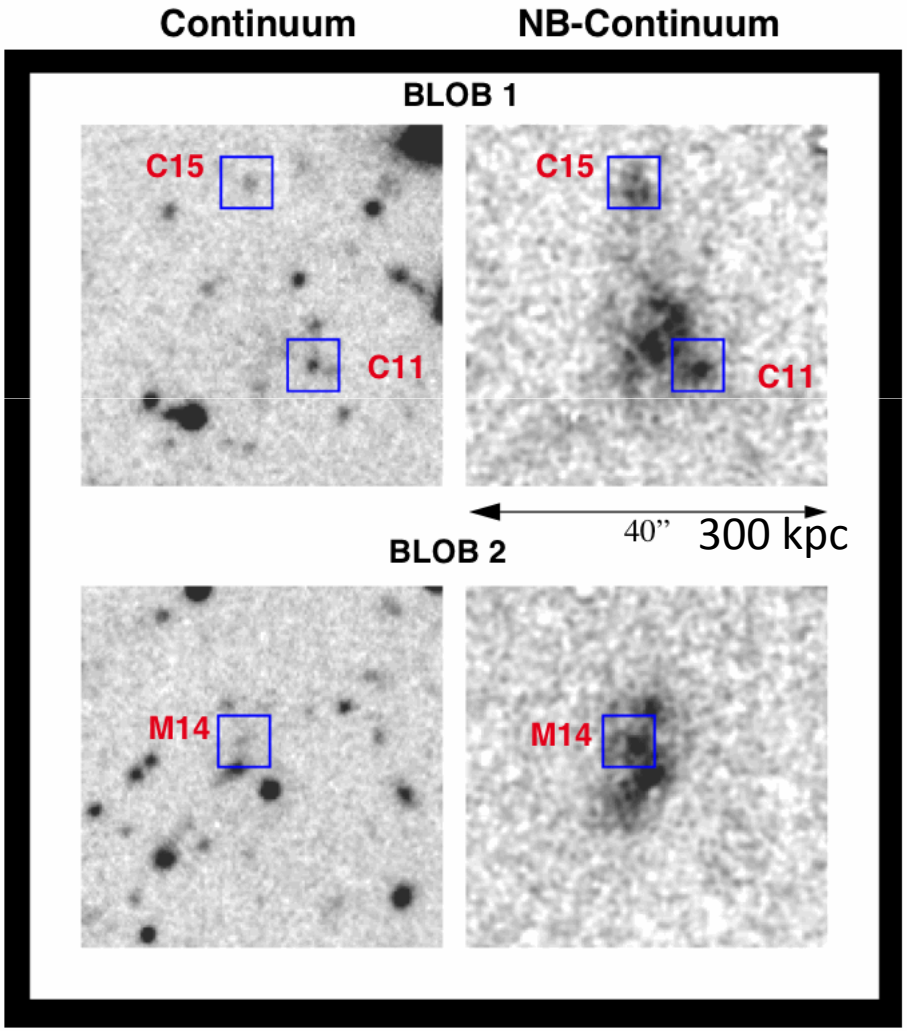
Gas outflow by Superwind (Mori & Umemura 2006)

Introduction

- Ly-alpha halos at high-z (Ly-alpha blobs, LABs)



But because of their faintness & rareness of Ly-alpha blobs, the basic, statistical properties of Ly-alpha blobs are still unclear.

We need deep, wide-field Ly-alpha imaging observations.

Ly-alpha halos around galaxies at z=3 (Steidel et al. 2000)

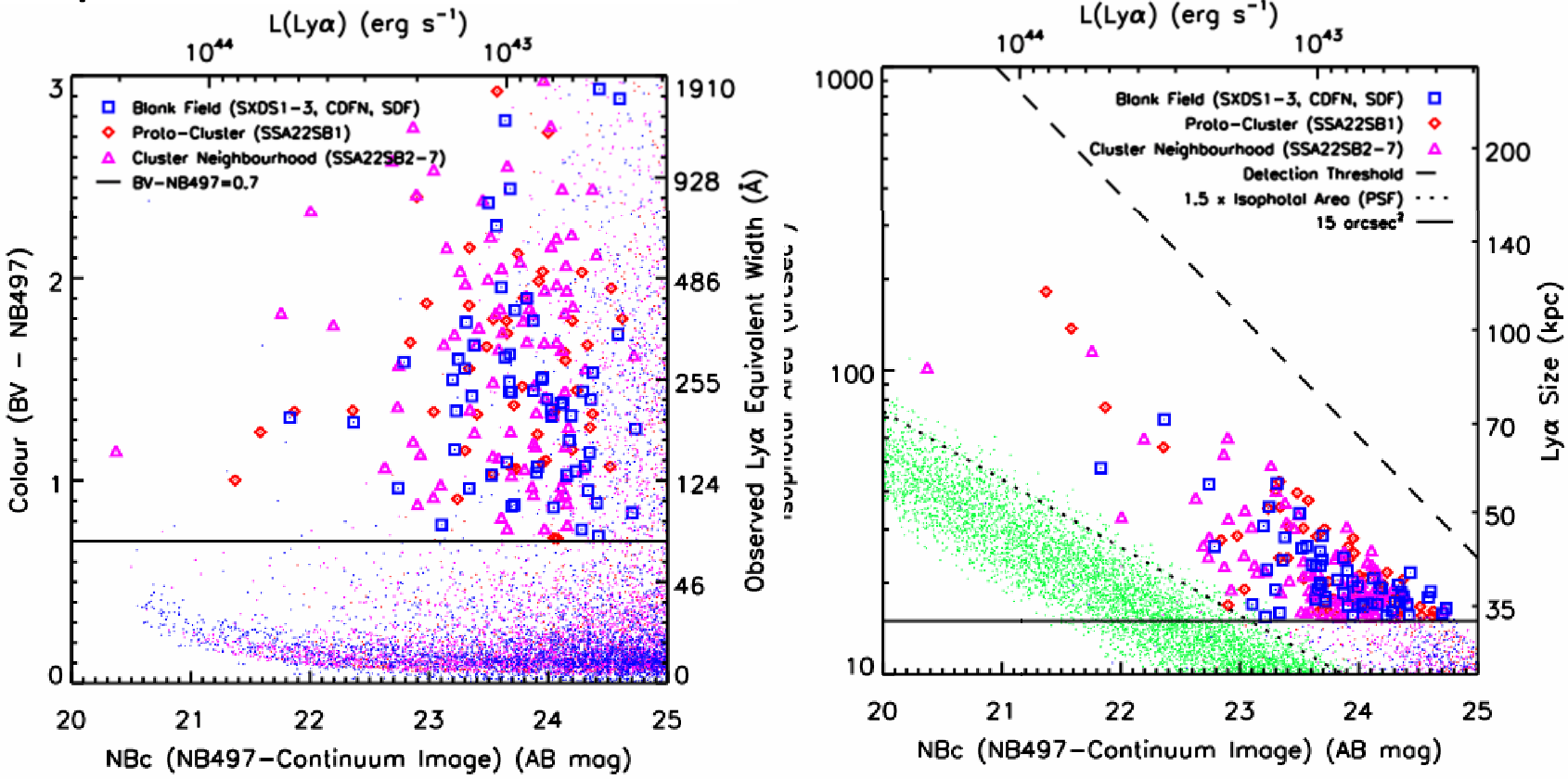
Ly-alpha blob survey at z=3 with Suprime-Cam/NB497

- Suprime-Cam, NB497(4977A/77A), B, V
- Total Survey Area: 2.1 sq deg
  (1.6x 10^6 co-moving Mpc^3)
- Ly-alpha Image Depths (1σ):
  0.7-1.2 x 10^{-18} erg s^{-1} cm^{-2} $arcsec^{-2}$
- CDFN, SDF, SXDS (1.1 sq deg – blank field)
- SSA22 (1.1 sq deg – proto-cluster &
  cluster neighborhood)

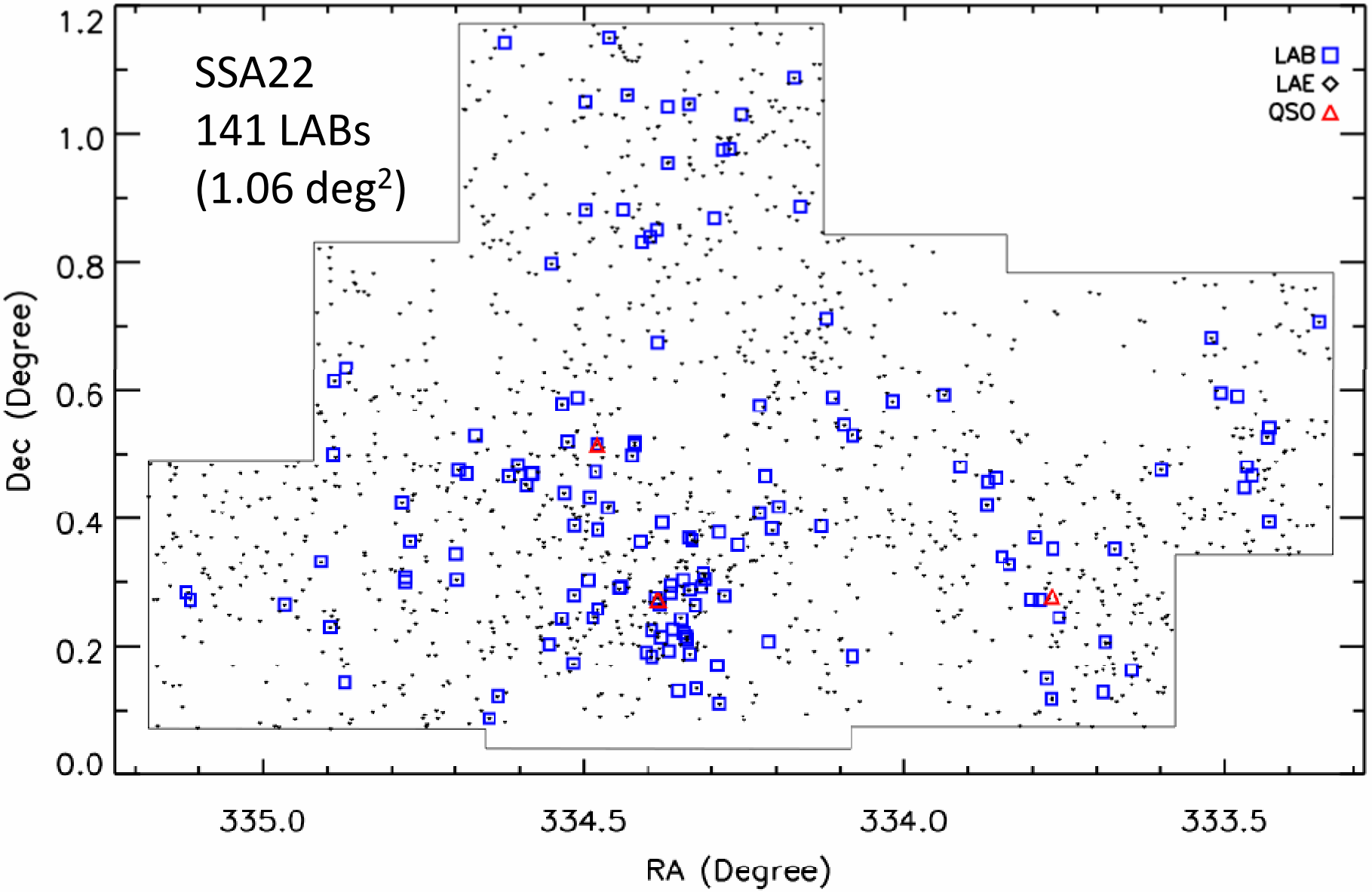
Selection Criteria of Ly-alpha blobs:

- Detection Threshold: 1.4 x 10^{-18} erg s^{-1} cm^{-2} $arcsec^{-2}$
- Size: Isophotal Area>15 $arcsec^2$ & >1.5 x PSF
- Equivalent Width: EWobs>80A

201 Ly-alpha blobs

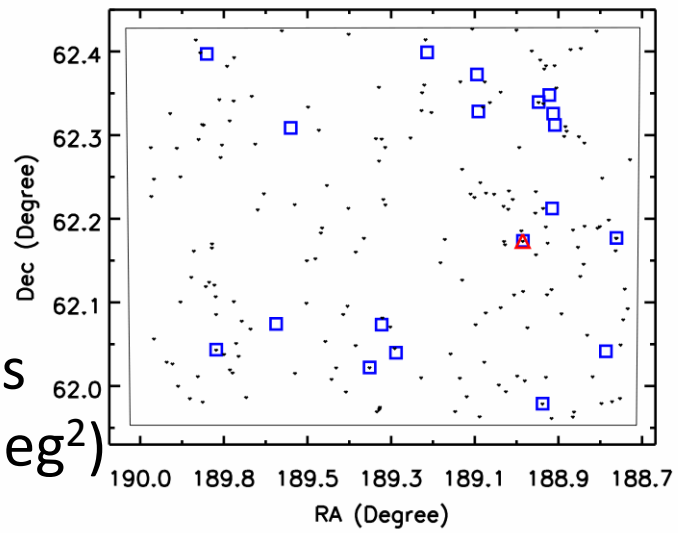


Sky Distribution of 201 Ly-alpha blobs at z=3.1

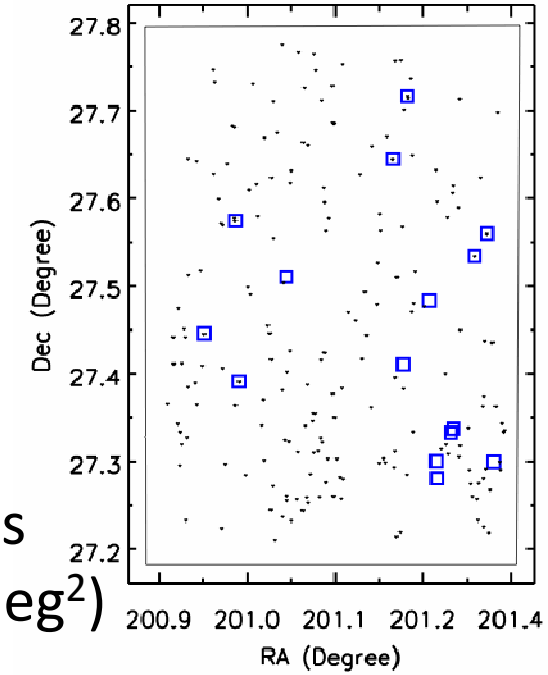


Sky Distribution of 201 Ly-alpha blobs at z=3.1

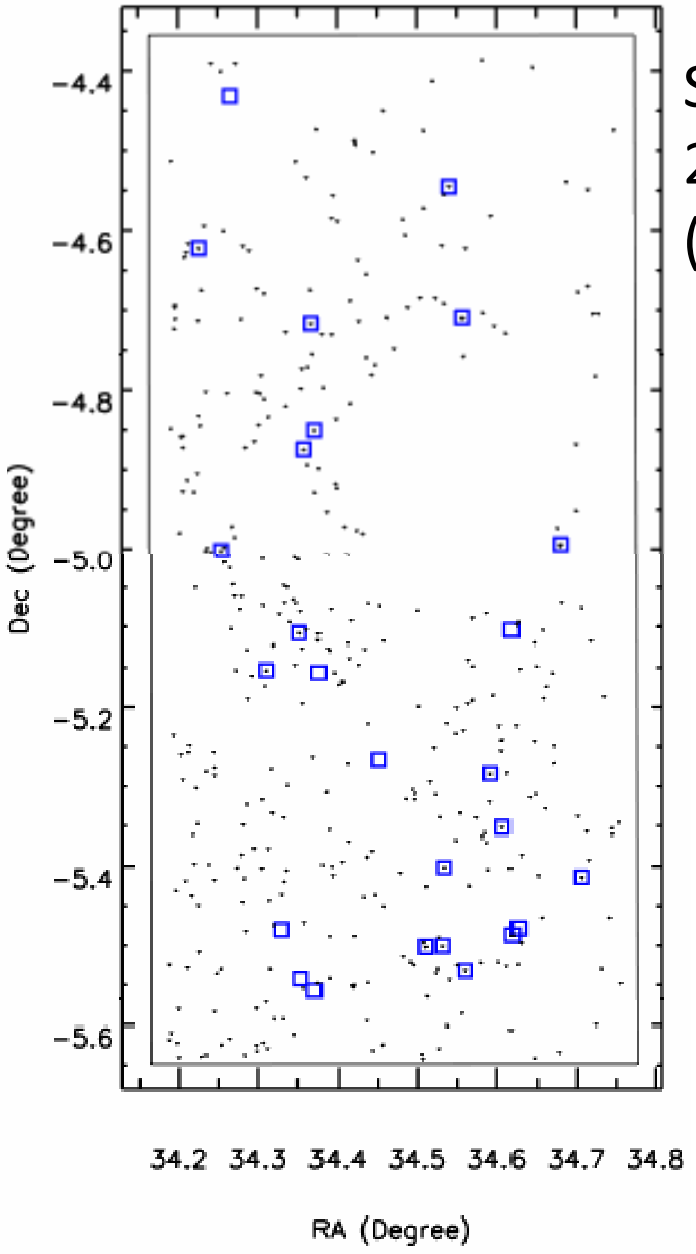
CDFN
19 LABs
(0.24 deg^2)



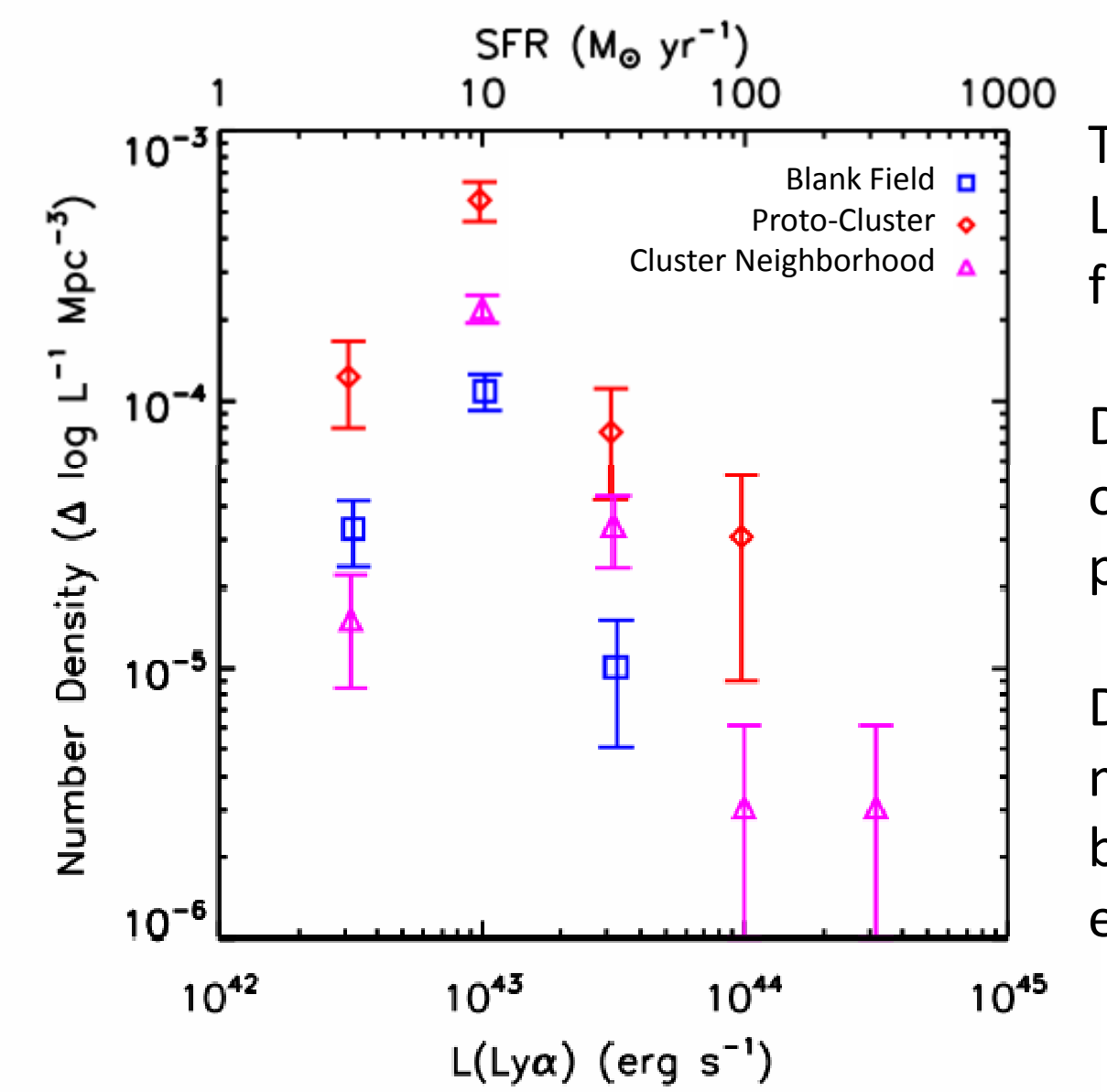
SDF
15 LABs
(0.22 deg^2)



SXDS1-3
26 LABs
(0.60 deg^2)



Ly-alpha Luminosity Function

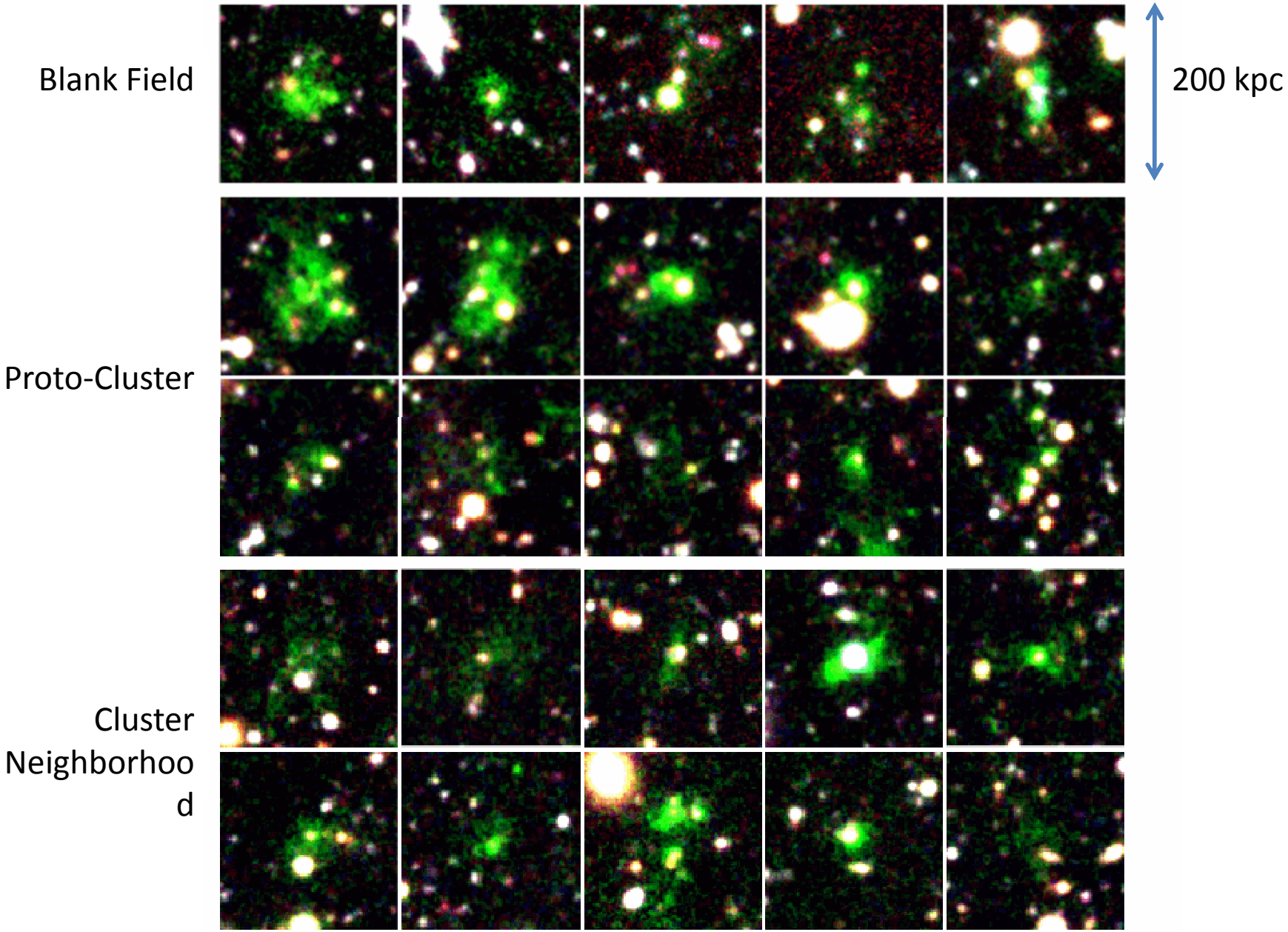


The number density of Ly-alpha blobs in blank field is ~8 x 10^{-5} Mpc^{-3}

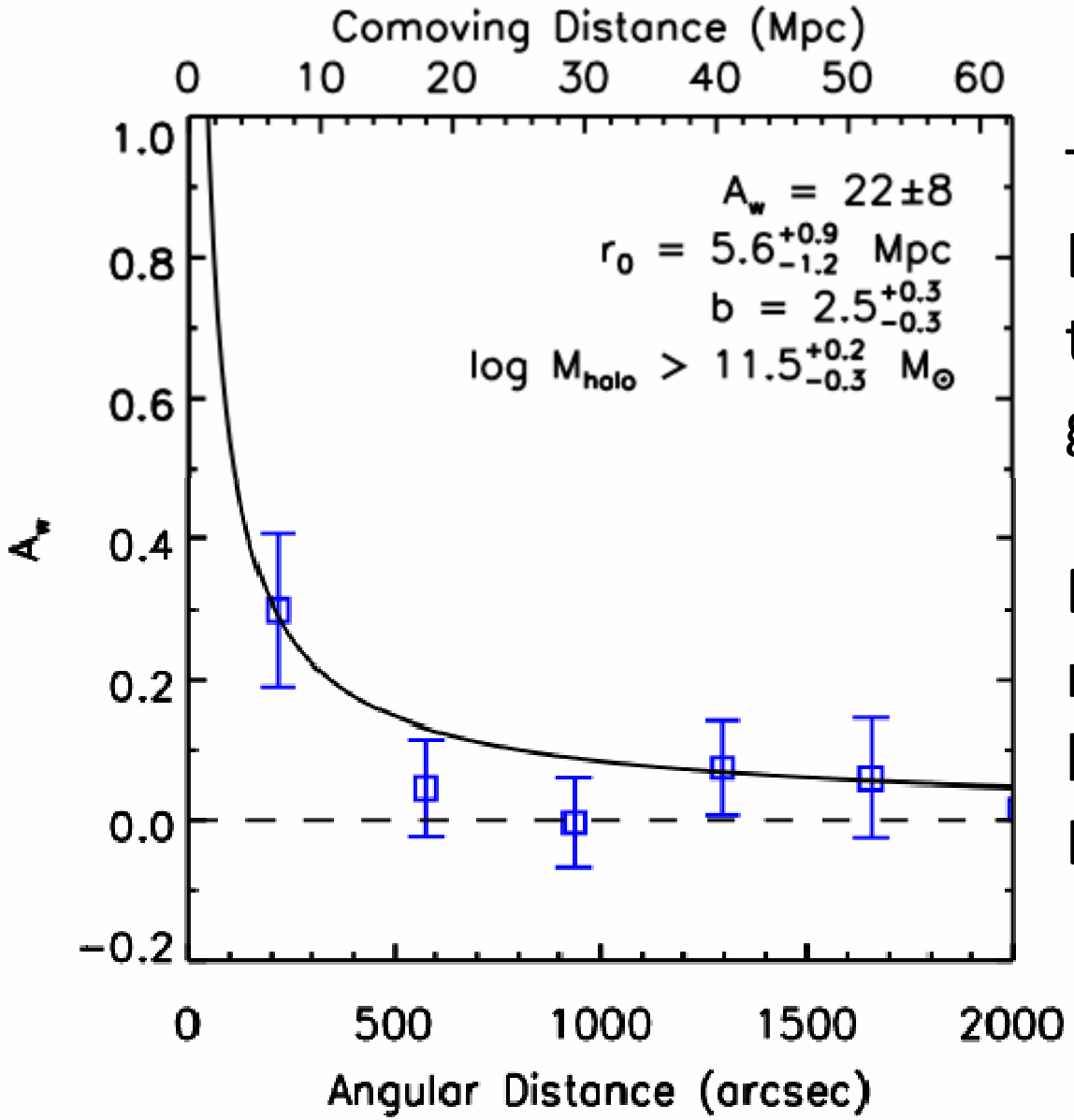
Different shapes of LFs of blank field and proto-cluster?

Different formation mechanism of Ly-alpha blobs in different environments??

Example of Ly-alpha blobs



Angular Correlation (blank field only)



The host halo mass of Ly-alpha blob is similar to that of Lyman break galaxies?

But it is 10 x more massive than the host halo mass of compact Ly-alpha emitters…

Summary

- Ly-alpha blobs – evidence of strong interactions between galaxies & IGM at high-z
- We are undertaking deep, wide Ly-alpha blob surveys at z=3 with Suprime-Cam
- Characteristic Phenomena in overdense environments
- Average Number Density is ~8 x 10^{-6} Mpc^{-3}
- The suggested host halo mass is >$10^{11.5}$ $M_{\odot}$