Massive Starburst at high *z*

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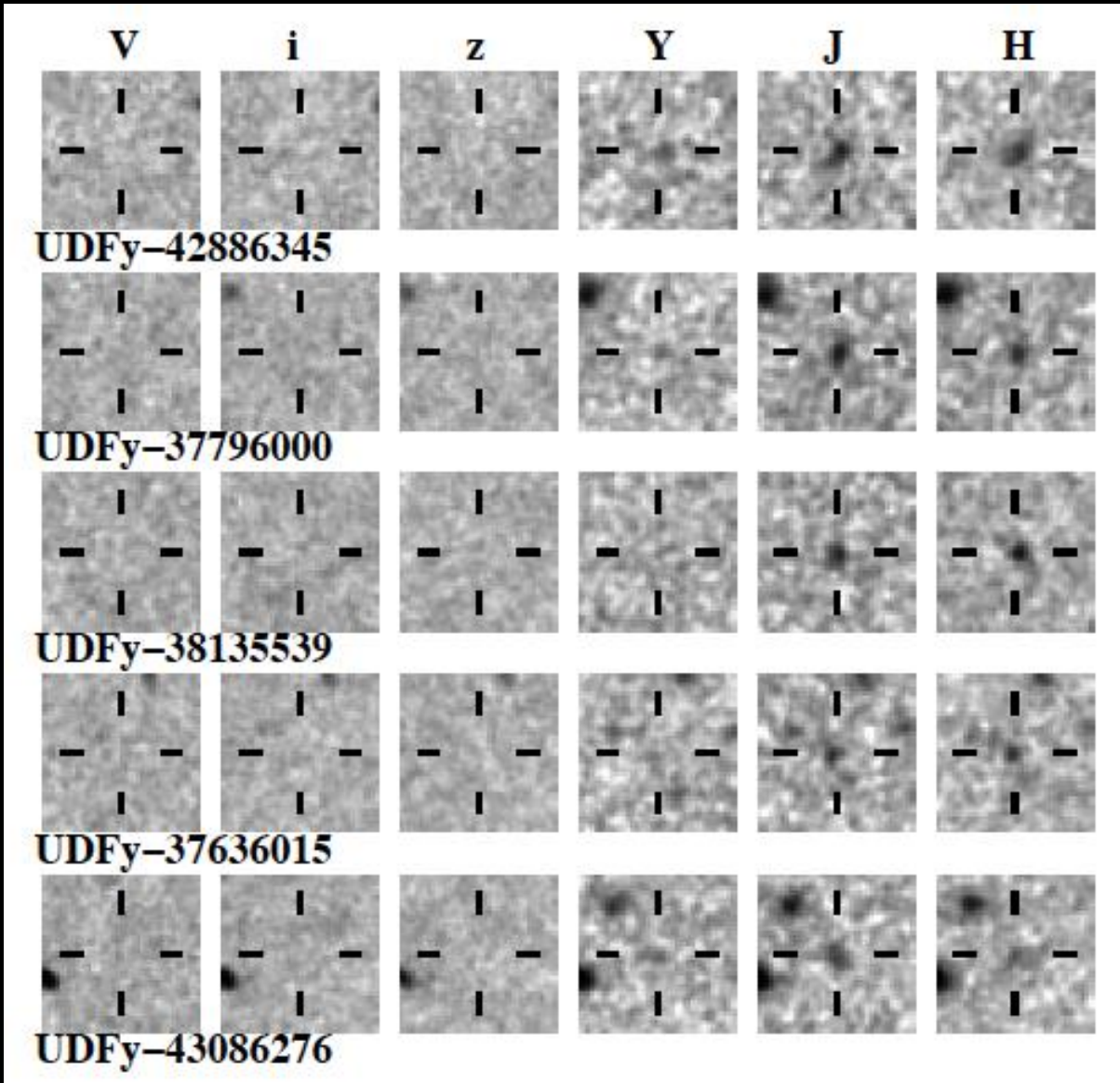
Introduction

- Most massive galaxies at high-z are Star forming galaxies
- Most of them are Ly_{α} emitters
  - Detected through the Ly-break drop out techniques

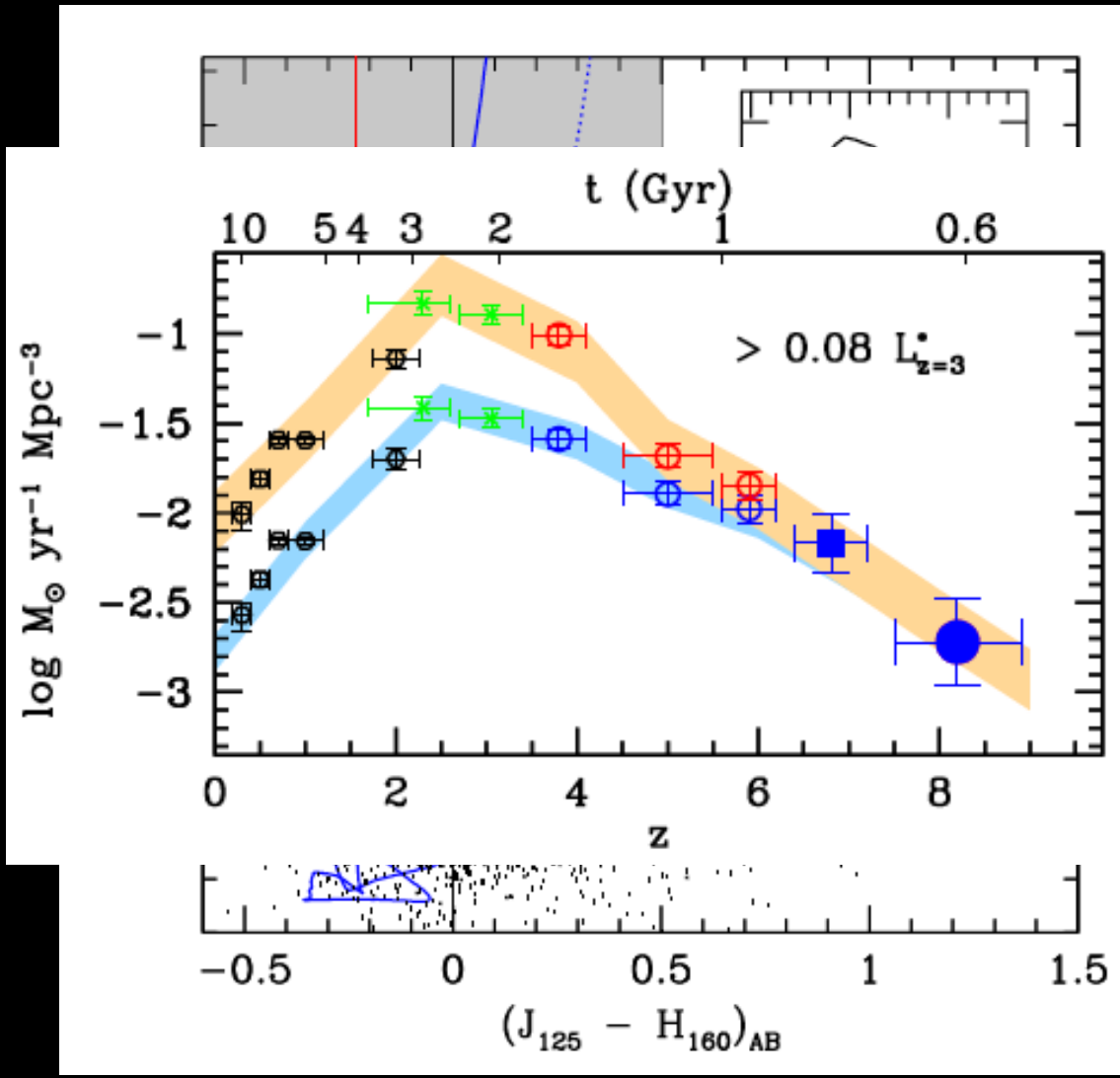


Bouwens et al. 2009

Z≈8 candidates

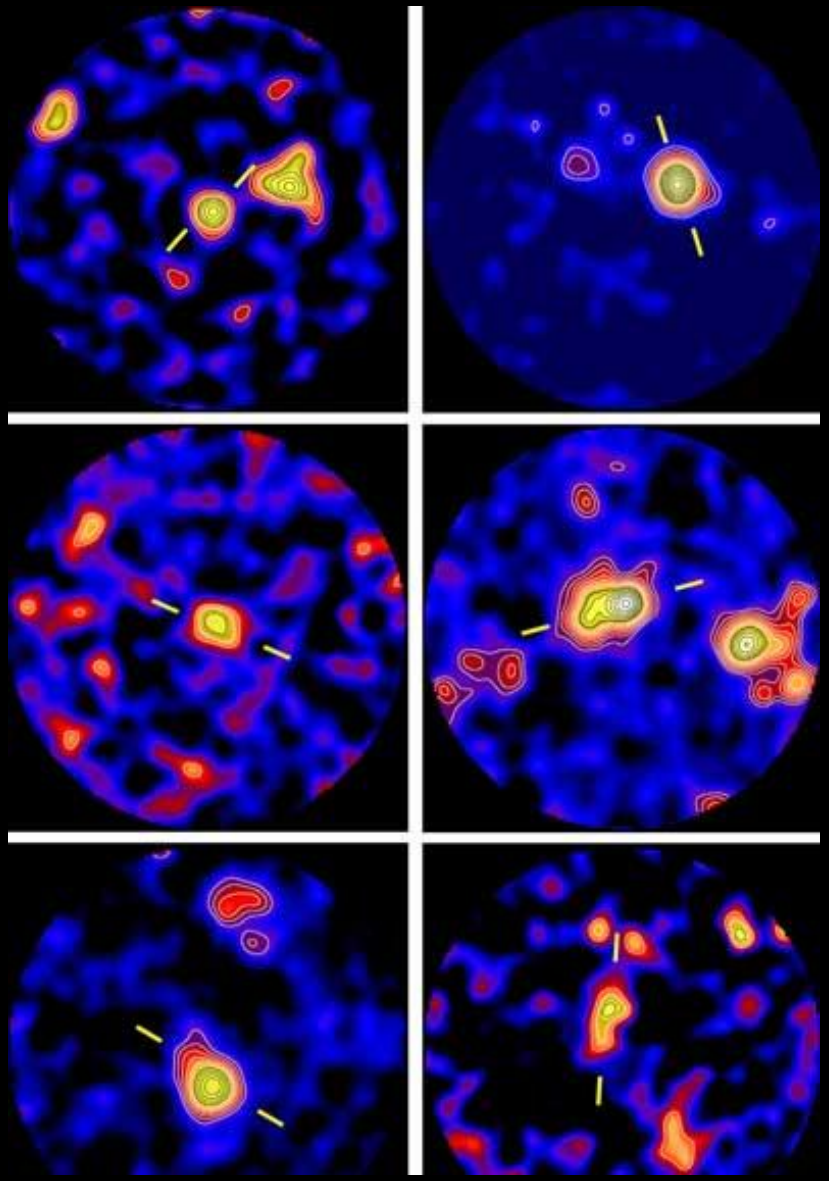
These z≈8 candidates show
- Blue J-H colours corresponding to very blue rest frame UV
- i.e. essentially dust free, young age/low metallicity

Bouwens et al. 2009



SCUBA SM sources

- Many high-z sources are both Ly_α emitters and SCUBA SMG
- Sub-millimetre continuum good tracer of Star Formation
- Molecular CO lines yield the amount of mass available for SF

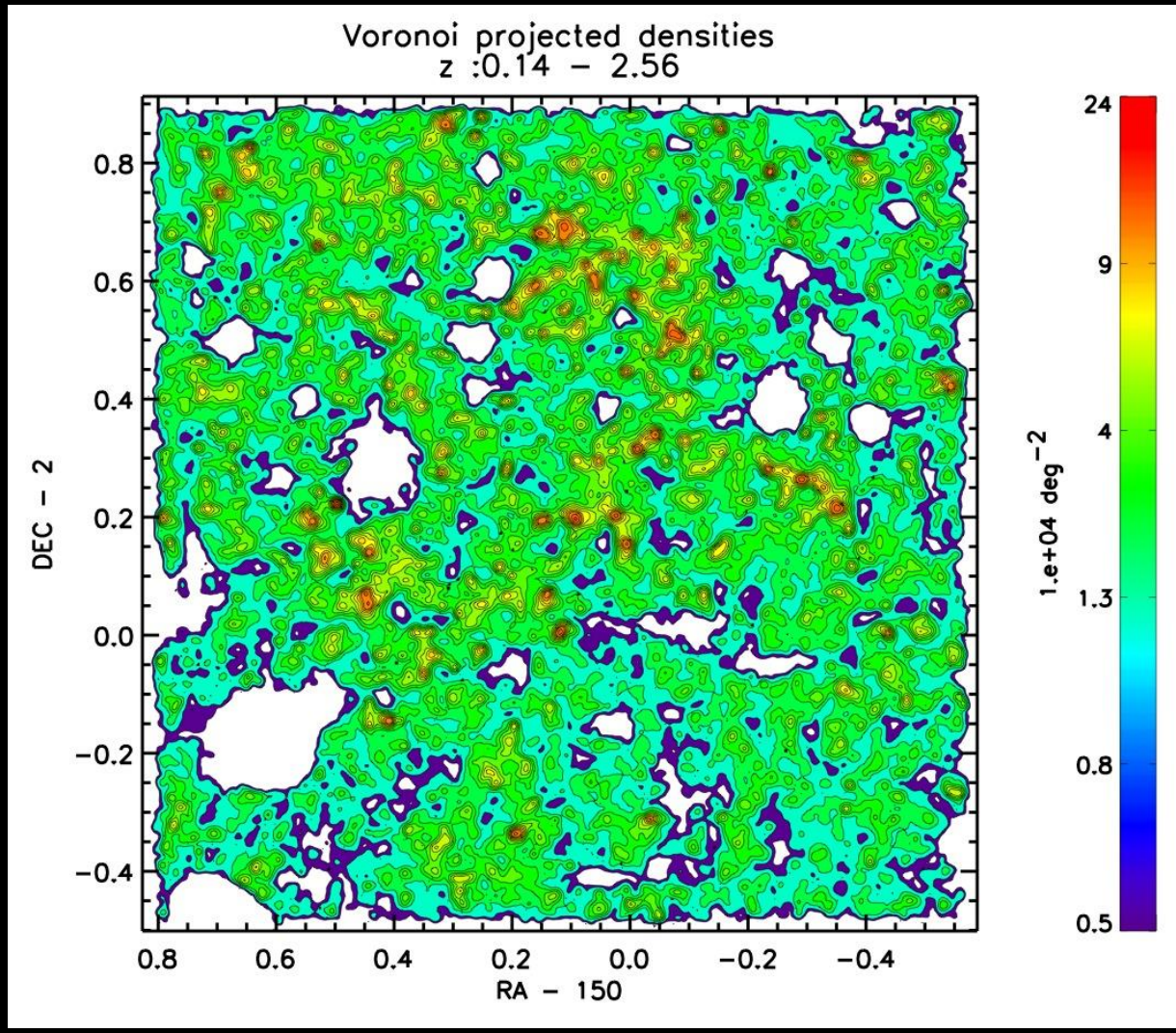


The Submillimetre Galaxies

- Submillimetre galaxies (SMGs) now being detected in blank field surveys with the new submillimetre arrays (AzTEC, MAMBO, etc)
- SMGs show FIR $\geq 10^{13} L_{\odot}$ ➔ SFR $\geq 1000 M_{\odot}$/yr
- SMGs responsible for the bulk of the star formation at $z \approx 2$
- SMGs dominate the submillimetre background
- SMGs phase lasts for ~ 50 to 100 Myr
- SMGs tend to be fairly compact (local ULIRGs)
- Central densities close to those of large ellipticals or massive bulges

How do these galaxies form

- Can we follow these sources from z~8 to z~2?
- Do they form in isolation?
- Do they rather form in overdense regions (rare 5σ fluctuations of the cosmic power spectrum)?

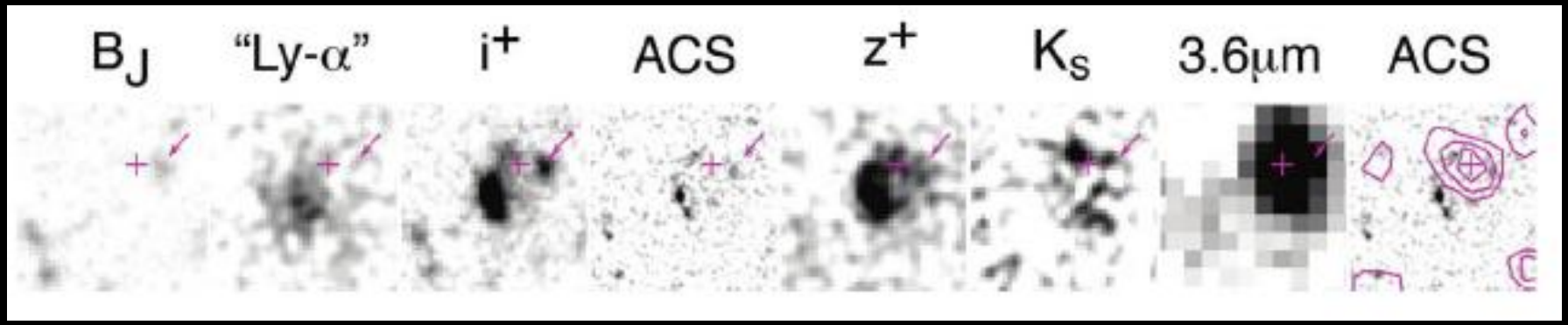


GTC Observing

- GTC observations of two trial sources from the COSMOS survey
  - The highest Ly_α confirmed emitter “Himiko”
  - A SMG at z= 4.547
- Perform deep imaging with the TF in Ly_α searching for companions Lyα emitters
- Also deep BB images for the rest UV stellar continuum

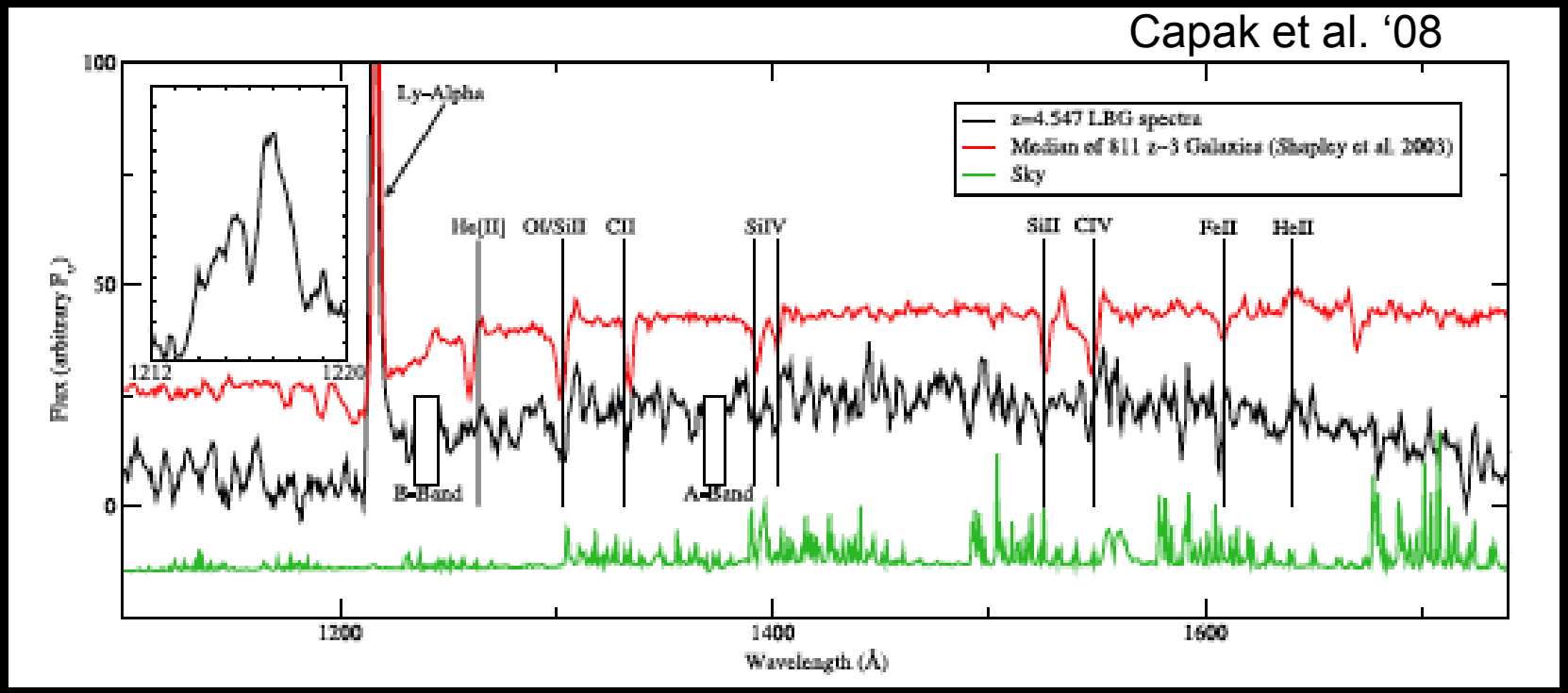
An example (J1000+0234)

- A SMG at z = 4.547
  - Independently selected as
    - a V drop-out & Lyman Break Galaxy (Lee et al. ‘08)
    - a millimetre & radio source (Carilli et al. ‘08)



J1000+0234

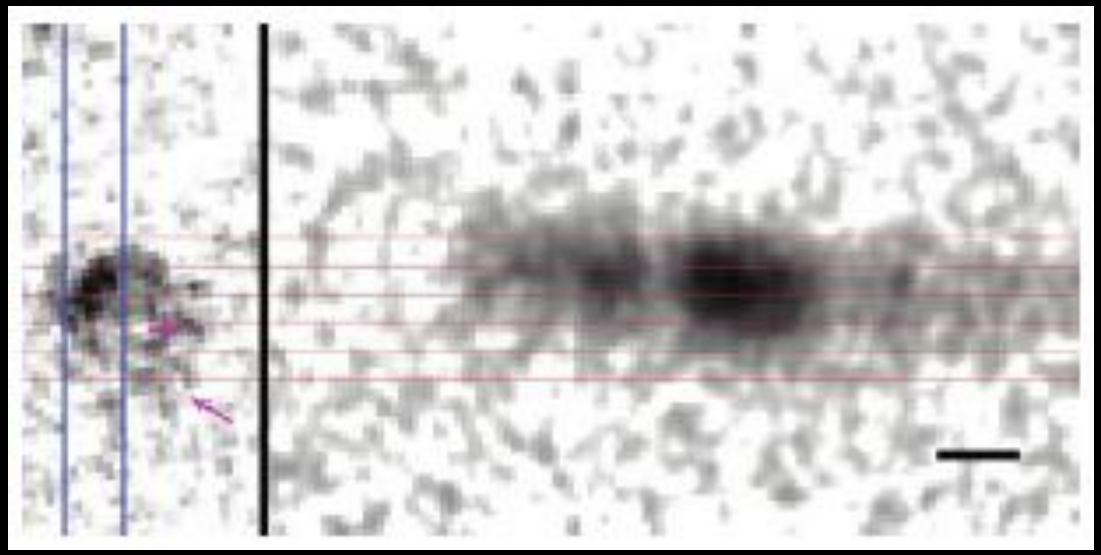
- The Spectrum shows ISM & stellar photospheric lines (OI, SiII, CII, FeII, CIV, SiIV & HeII)
  - SiIV1297Å & CIV 1549Å Pcyg profiles plus HeII 1640Å emission (Wolf-Rayet & O stars)



J1000+0234

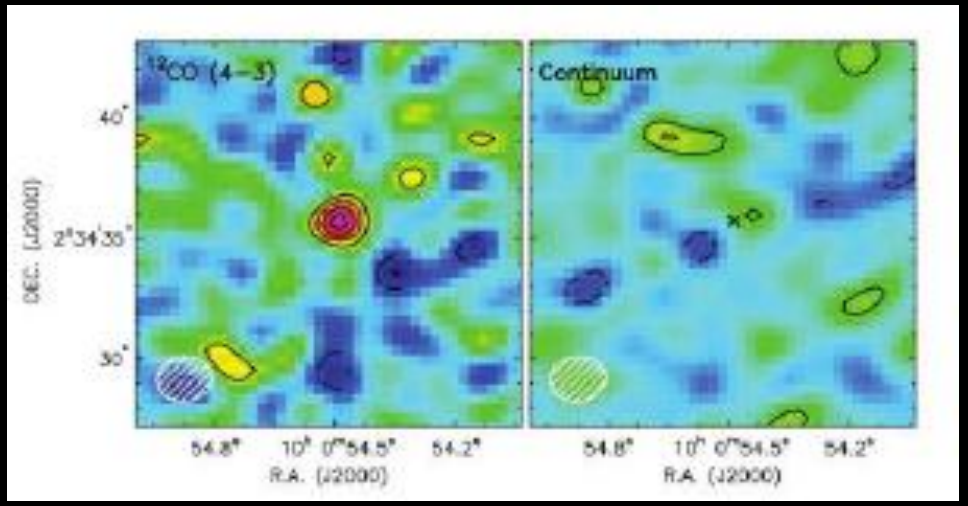
- Lyα detected both from the compact & extended regions
  - Strong velocity gradient across the slit
  - Diffused Lyα redshifted wrt to the compact source
  - Line asymmetry indicative of strong outflow winds (1800 Km/s)

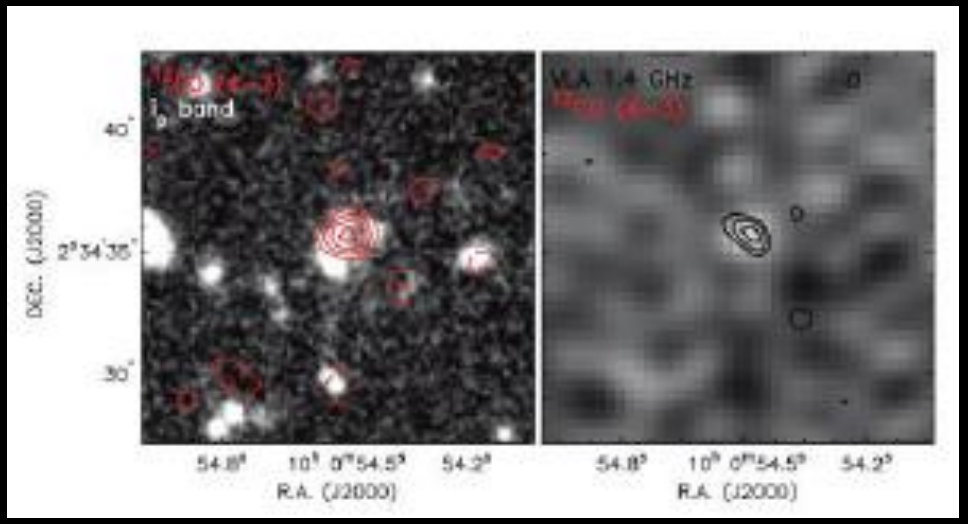
- SFR in excess of 1000 $M_\odot$/yr from radio, mm, 24μm & Hα data
- From SED fits: $>10^{10} M_\odot$ in a single burst of SF



J1000+0234

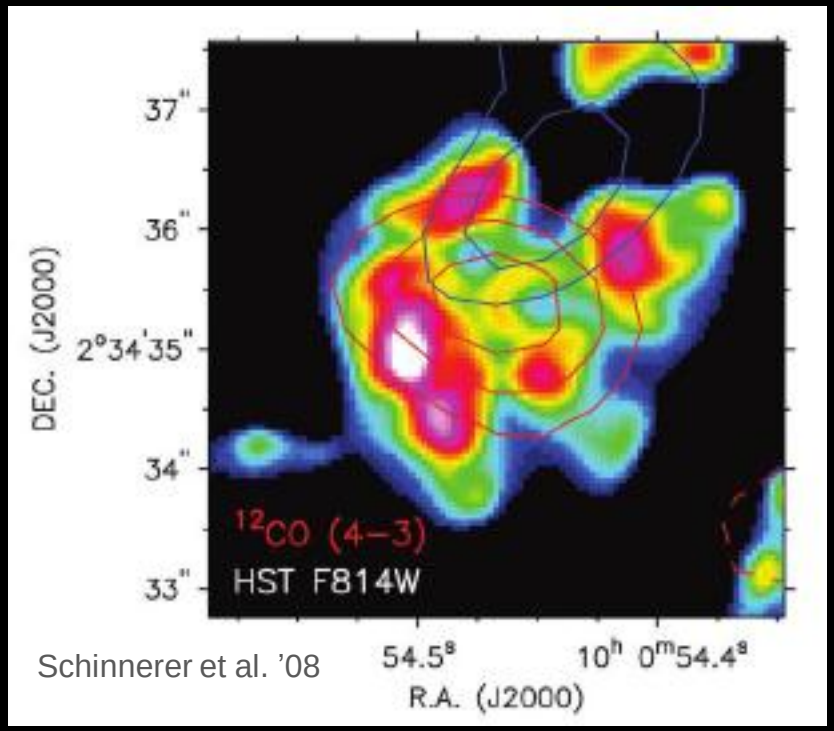
- CO(4-3) & CO(2-1) line emission detected (Schinnerer et al '08)
- 1.2mm cont. also detected
- CO(4-3) aligned with the rest frame NIR & Radio positions (Capak et al '08)
- CO line emission fairly compact (6.6 Kpc)
- CO(4-3)/CO(2-1) ≈ 4 → thermalized gas → $M_{gas} \approx 2.6 \times 10^{10} M_{\odot}$
- A dynamical mass of $10^{11} M_{\odot}$ is estimated





J1000+0234

- Similar properties to the z = 2 SMGs
- M_{gas}/SFR ≈ 30 Myr (for a SFR ≥ 1000 $M_{\odot}$)
- An important fraction of the mass of a massive elliptical can be produced
  - These stars evolve passively to become a red elliptical at z = 2 (2Gyr after z =4.5)

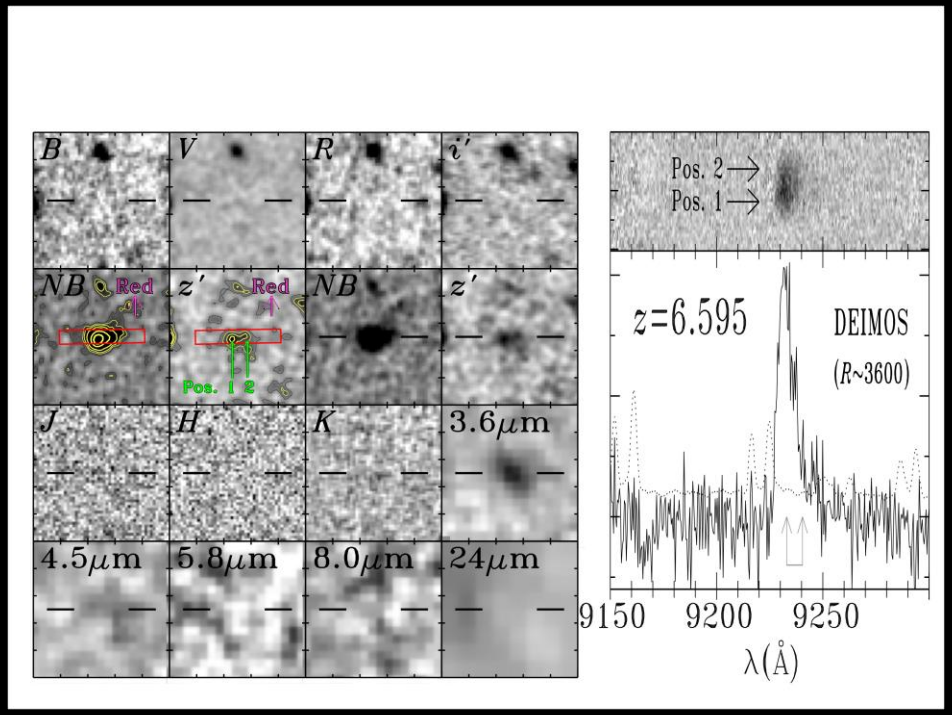


Schinnerer et al. '08

- Objects like this may be the connection between LBGs at high z and the SMGs at z = 2

Himiko

- Ly α source at z= 6.59
- Discovered with SUBARU through the use of especially designed NB filters
- Confirmed with Keck spectroscopy



Final slide

- So far no luck with the observations
  - Time awarded in B band priority
  - No observations done at the end