



MUSE observations of magnified star-forming galaxies

A complete census of sources responsible for the
reionization

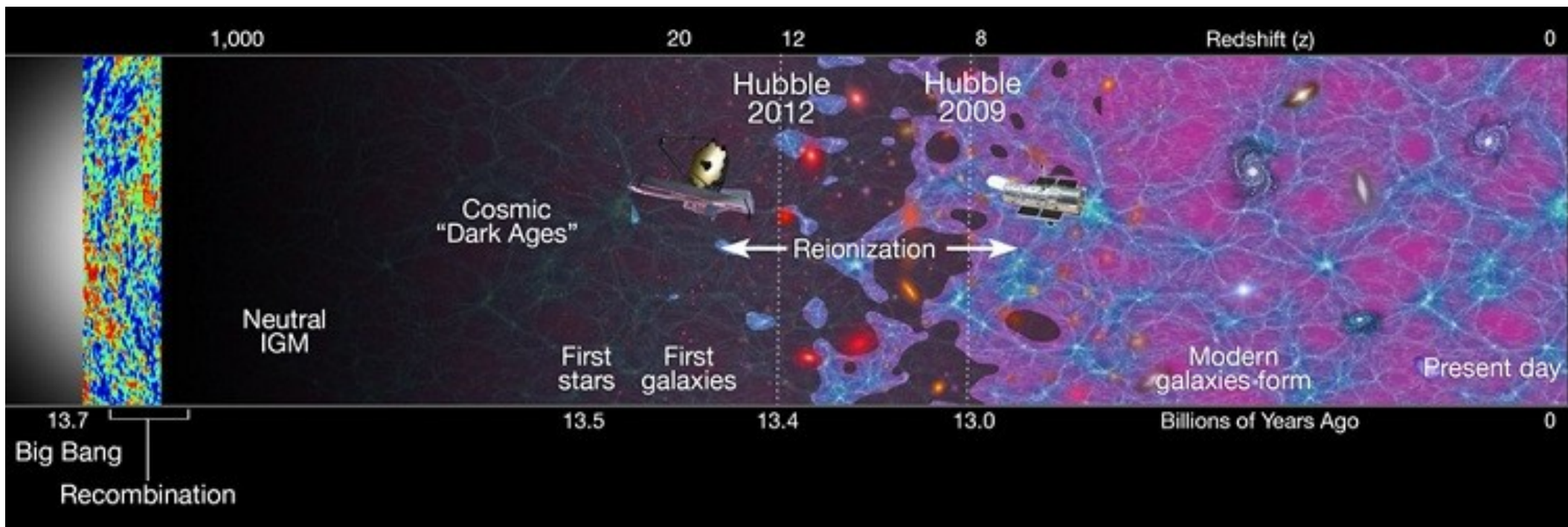
David BINA (IRAP)
Supervisor : Roser Pello (IRAP)

zSurvey Meeting
9 december 2015

Context

Science goals : investigate the birth of the **first objects** out from the dark ages
get constraints on **reionizing sources** (LF, SFR, stellar mass etc.)

Reionization : $z \sim 6 - 10$

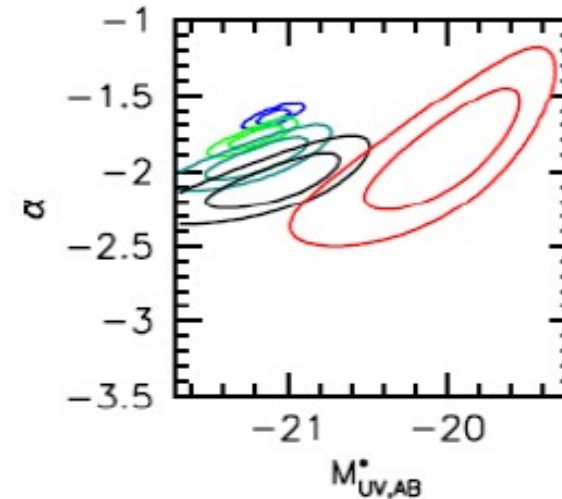
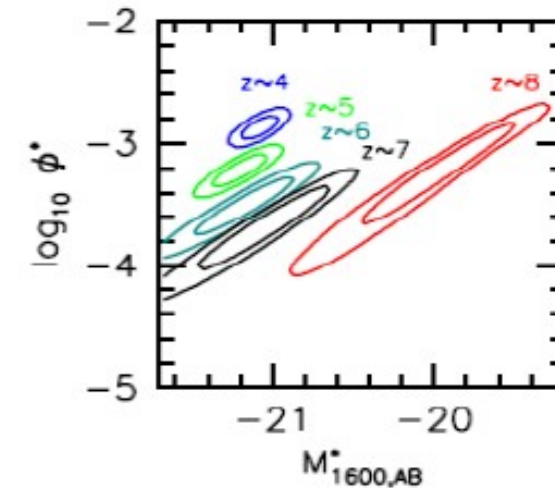
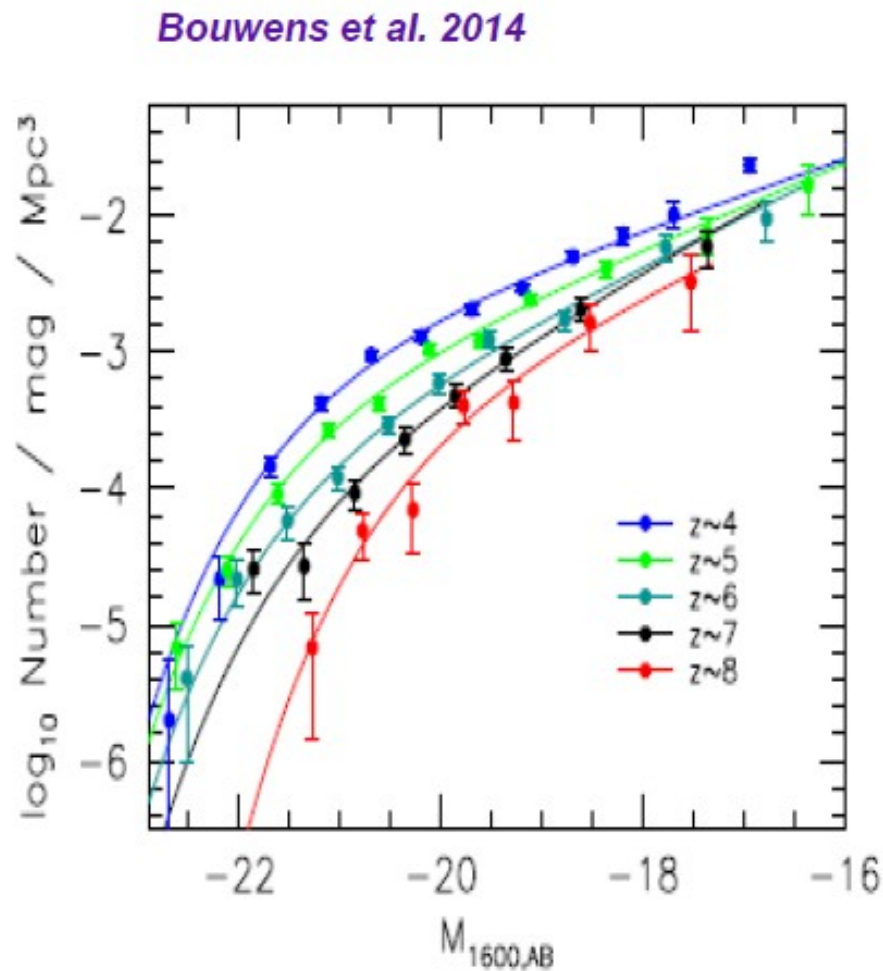


Luminosity function of high-redshift galaxies

LF:
$$\Phi(L) = \frac{\Phi^*}{L^*} \left(\frac{L}{L^*} \right)^\alpha \exp \left(-\frac{L}{L^*} \right)$$

$$\alpha < 0$$

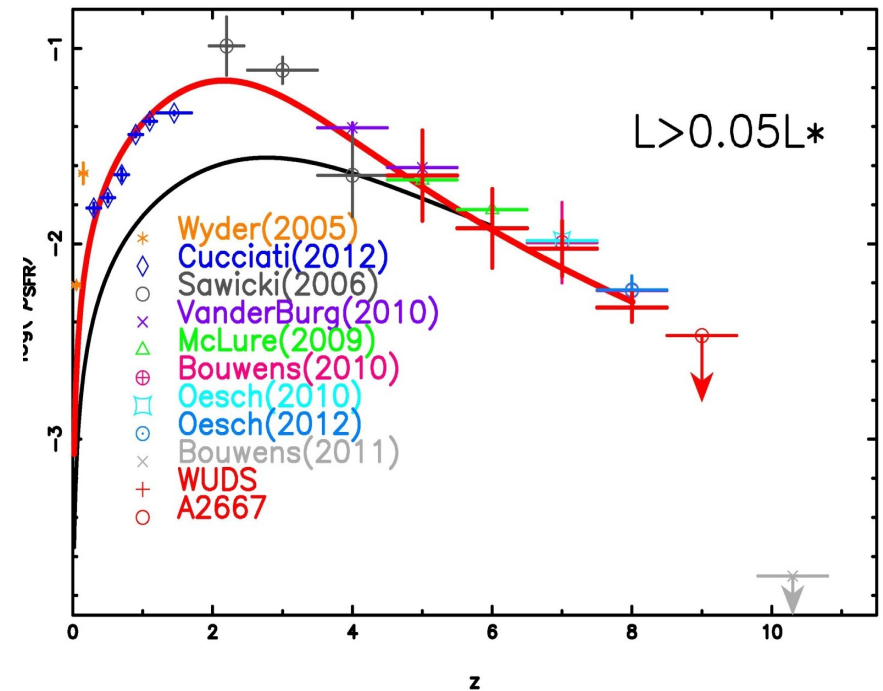
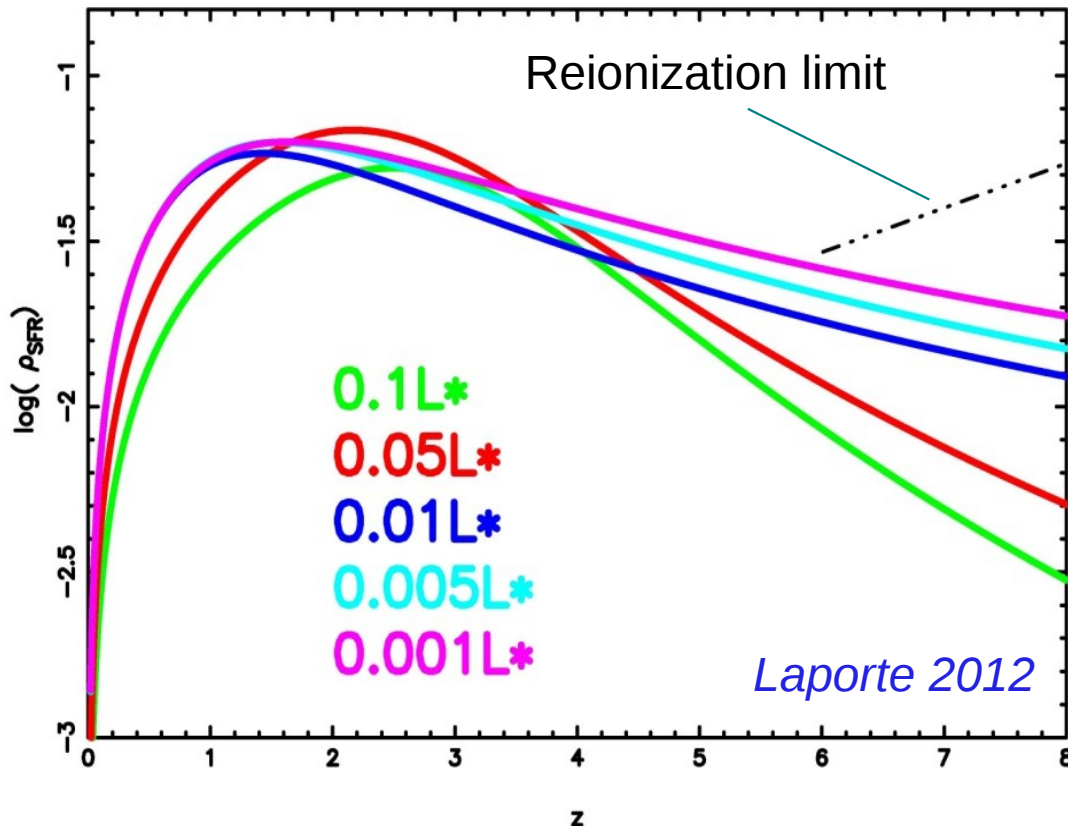
Evolution of the LF with the redshift :



One question about the reionization

- Which sources are responsible for the reionization ?

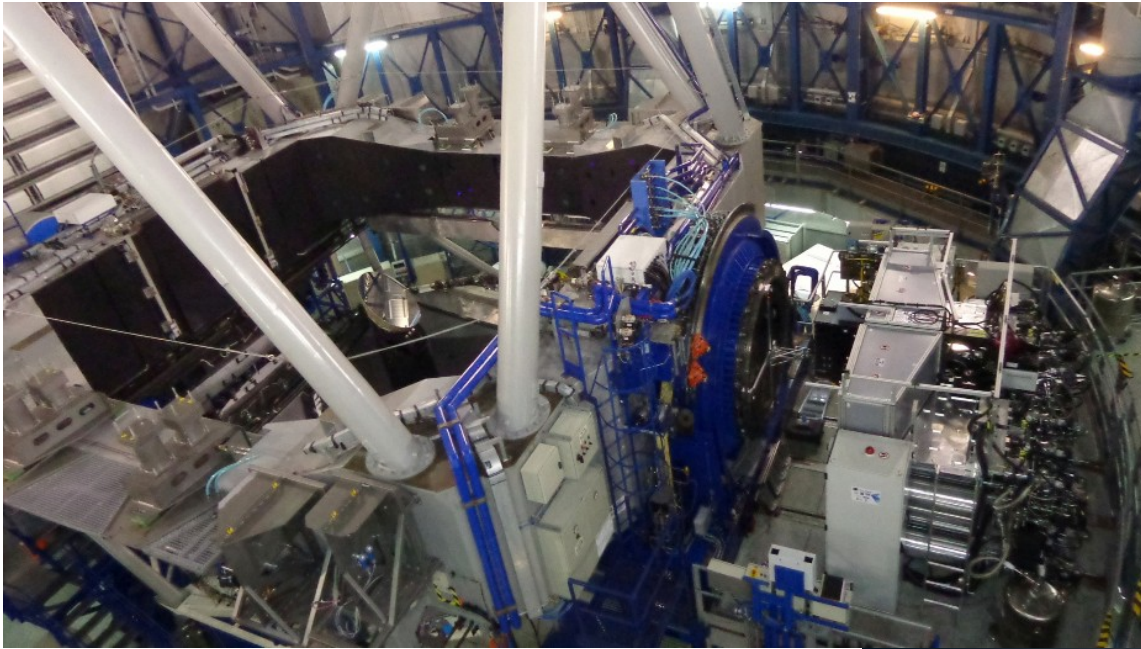
$$\dot{\rho}_{UV} = \frac{6.43 \times 10^{25} \text{ erg.s}^{-1} \cdot \text{Mpc}^{-3}}{f_{esc}} \left(\frac{1+z}{9}\right)^3 \frac{\Omega_b h_{70}^2}{0.0458} \frac{C}{5}$$



$$\rho_{UV} = \int_{0.05L_{z=3}^*}^{\text{inf}} L_{1500} \Phi(L_{1500}) dL_{1500}$$

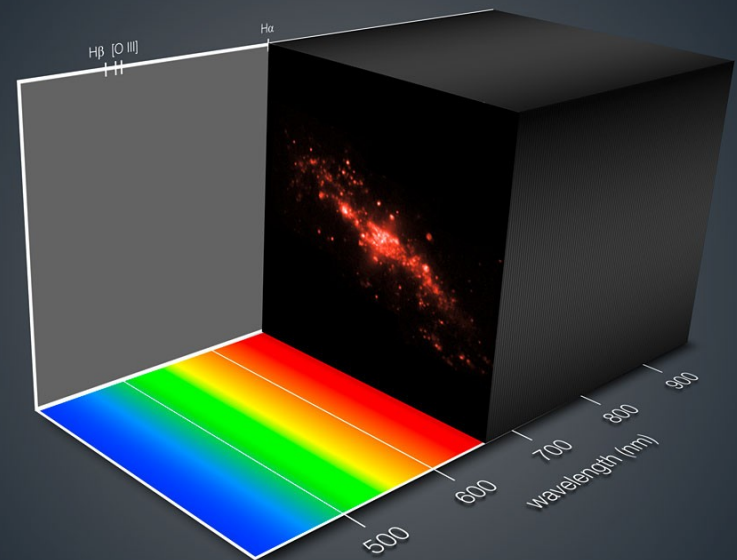
➡ Many fainter sources that we cannot observe for now ?

MUSE : 3D spectrography



Installed in January 2014
on the VLT (Chili)

It consists in 24 IFUs for a 1
arcmin² field of view in the
range ~ 475 - 950 nm



Commissioning data paper

MUSE observations of the lensing cluster Abell 1689

D. Bina^{1,2}, R. Pelló^{1,2}, J. Richard³, J. Lewis^{1,2}, V. Patrício³, S. Cantalupo⁴, E. C. Herenz⁵, K. Soto⁴,
P. M. Weilbacher⁵, R. Bacon³, J. D. R. Vernet⁶, L. Wisotzki⁵, B. Clément³, J. G. Cuby⁷, D. J. Lagattuta³, G. Soucail^{1,2},
and A. Verhamme^{3,8}

Combination of **LSDCAT** and
Muselet for the detection of
sources

+ test with **CubEx**
+ manual check

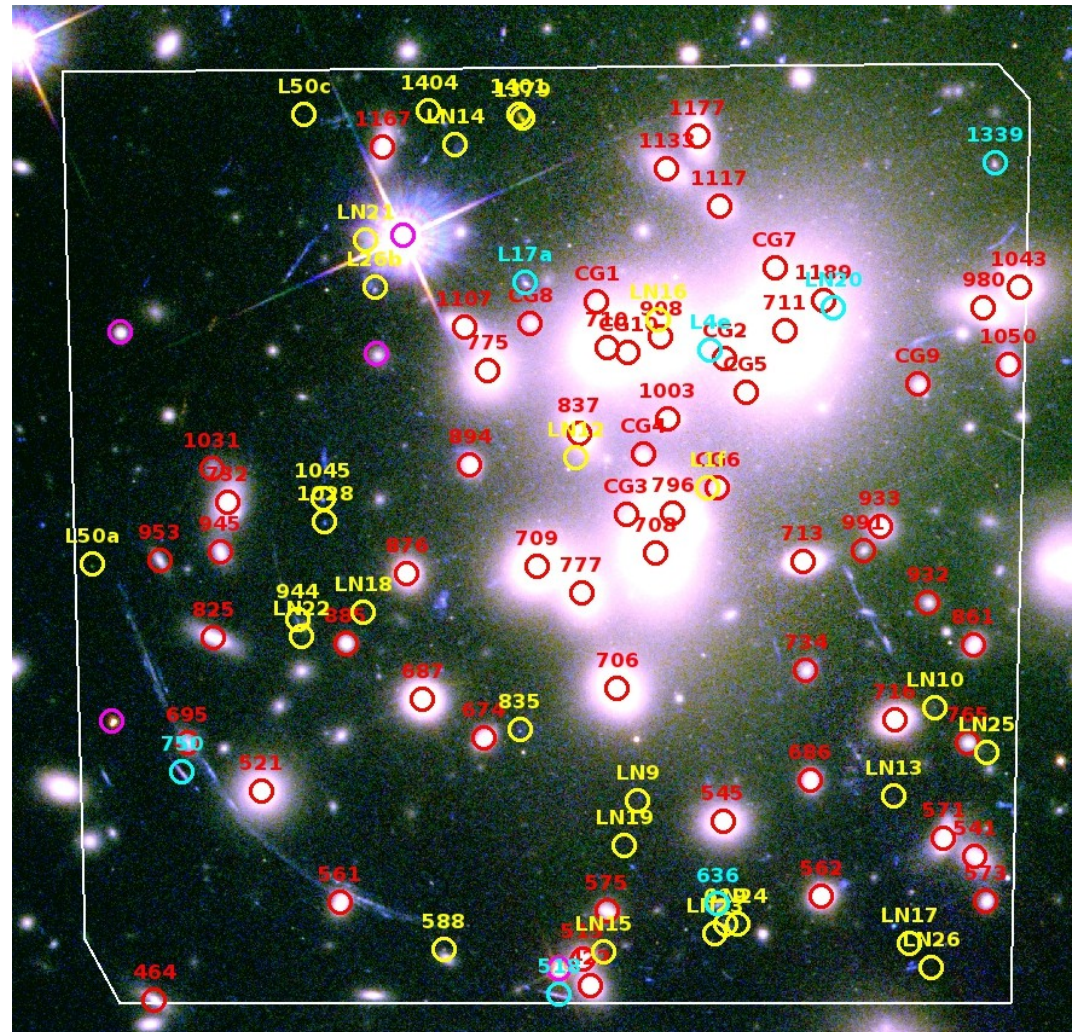
FOV : 1 x 1 arcmin²

6 exposures of 20min (~2h)

Seeing ~ 0.6" at 7300Å

21 line emitters (7 known + 14 new)

17 LAEs

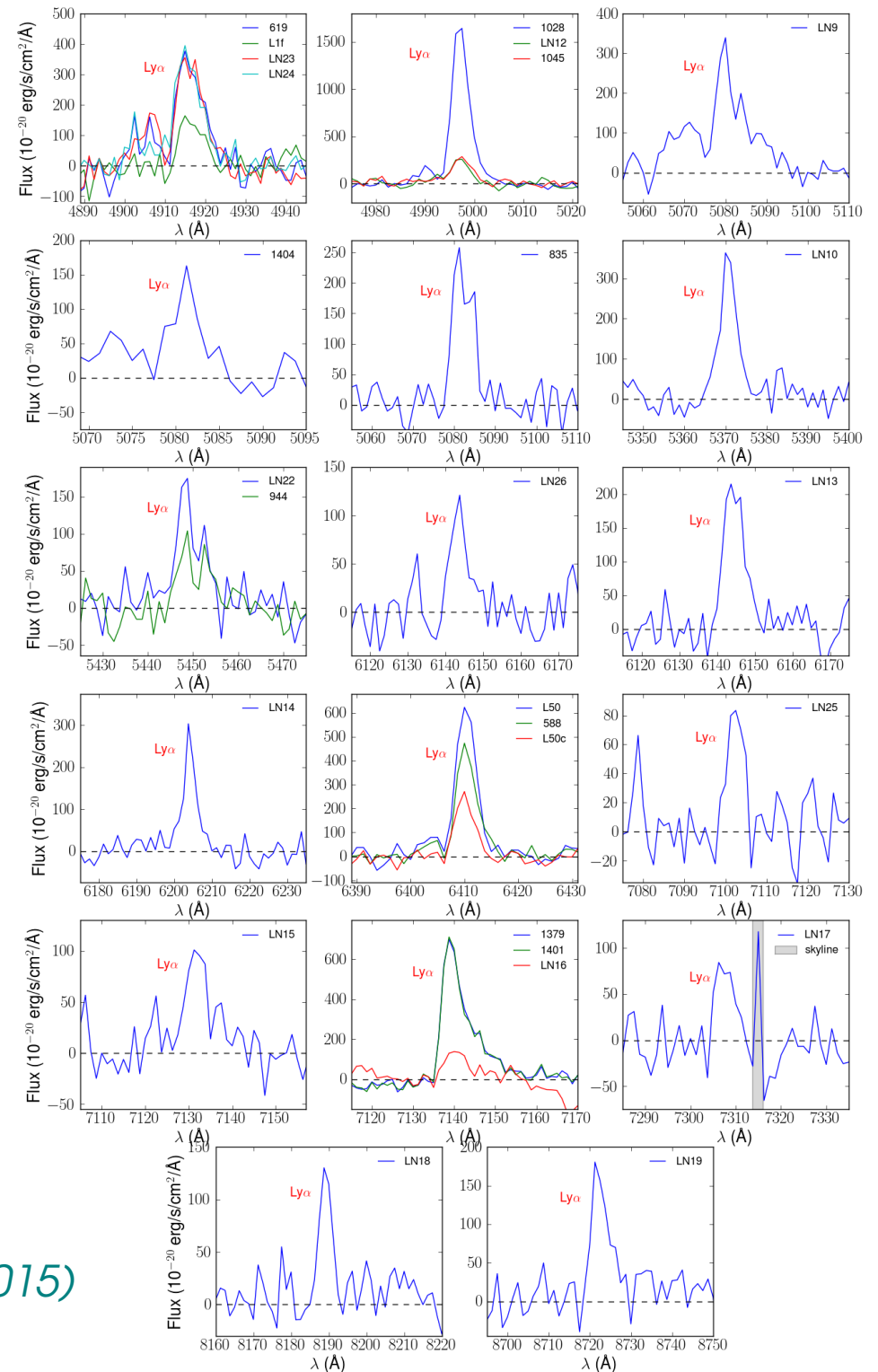


17 LAEs :

Redshift : $3 < z < 6.2$

Magnification : $4.5 < \mu < 75 !$

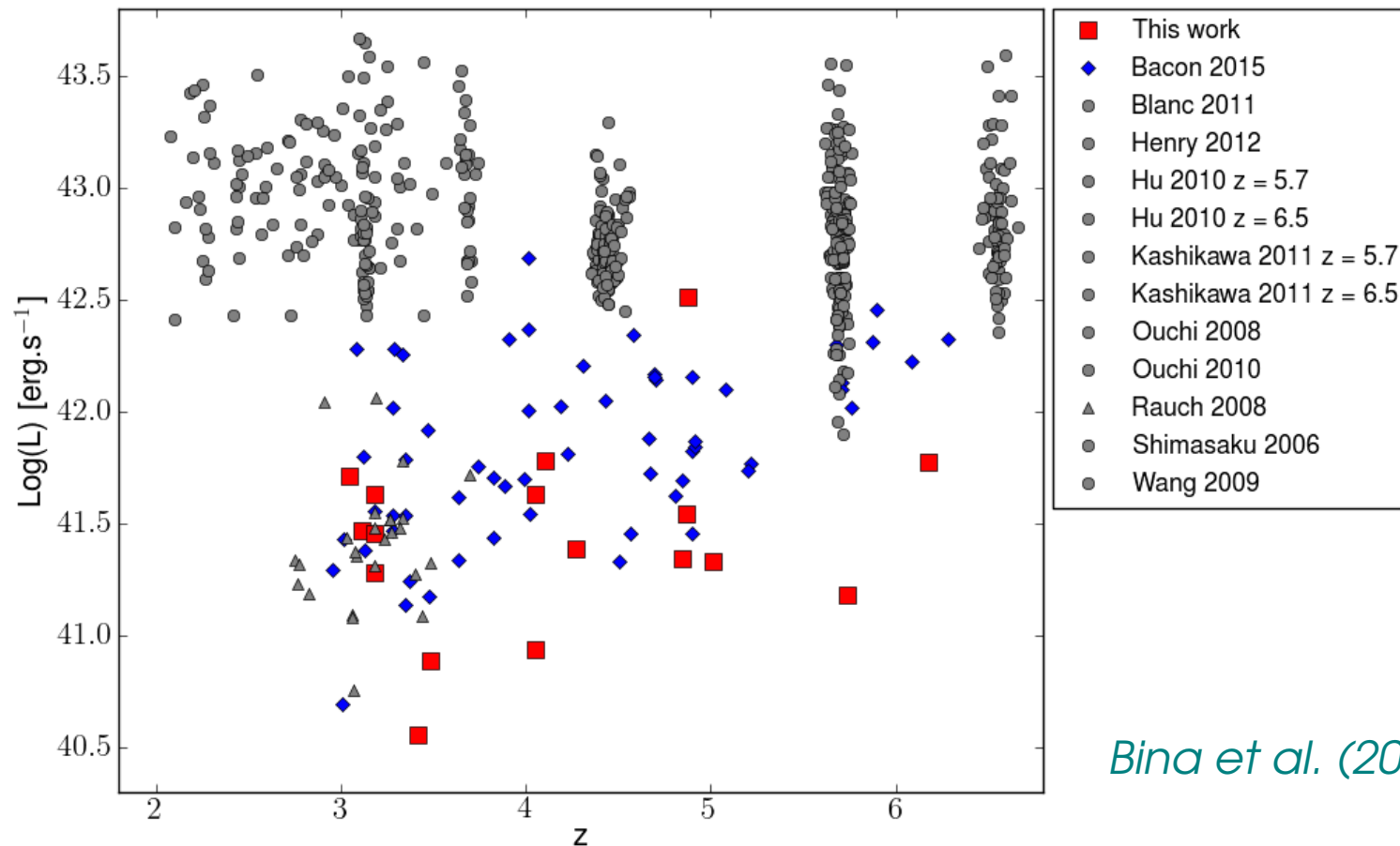
Flux : $40.5 < \log(\text{Ly}\alpha) < 42.5$



Bina et al. (2015)

What about the luminosity ?

● Narrow band surveys vs MUSE :



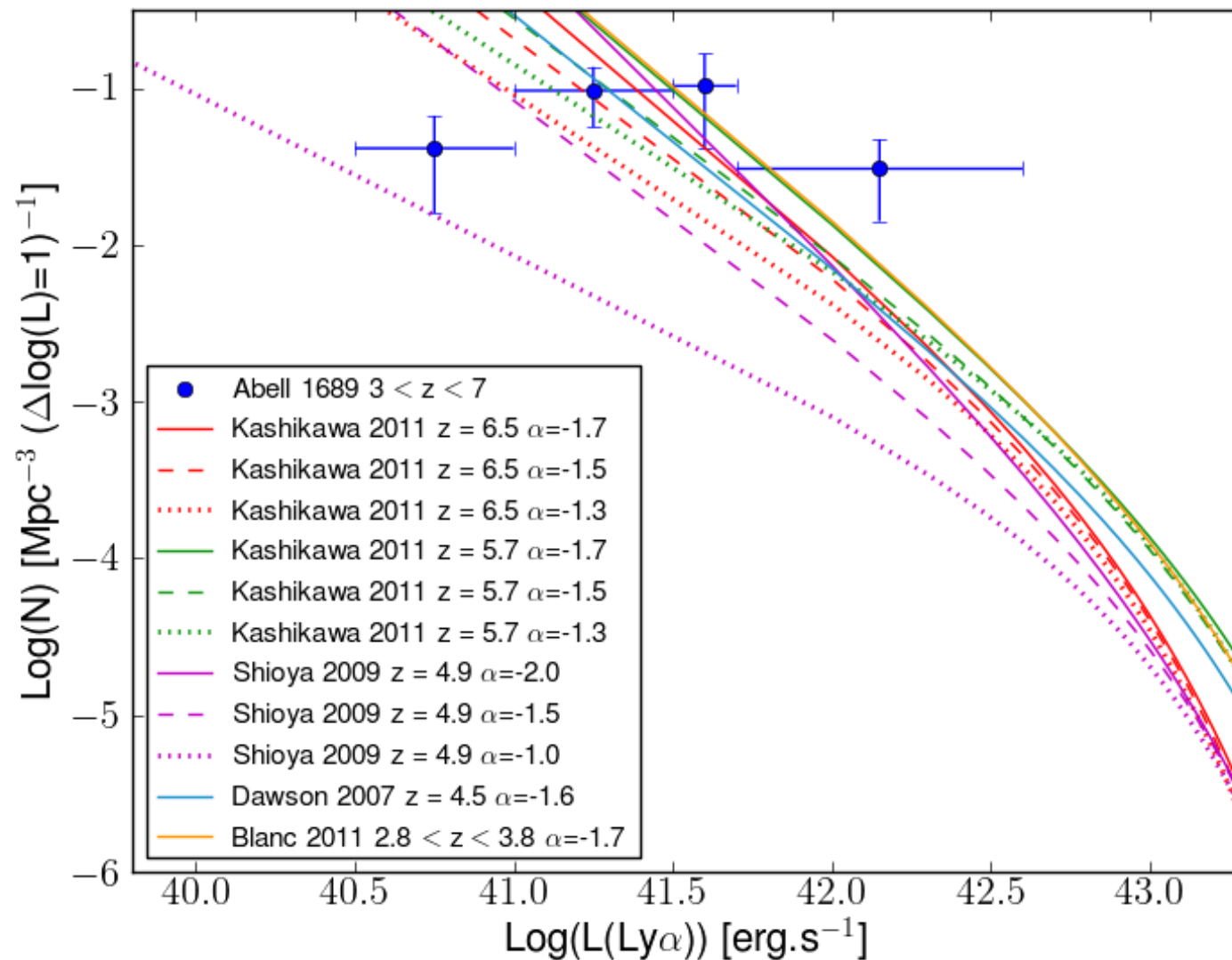
Bina et al. (2015)

➡ More scattered sources

➡ Fainter sources

What about the luminosity function ?

Our 17 LAEs : slope of the LF steeper than -1.5 ?
+ completeness incoming...



Bina et al. (2015)

Next steps

- Do the same work on other clusters : A2390, A2744, A2667...
- Constrain the faint-end of the LF with a robust sample of LAEs
- Work out properly the completeness and take it into account for the LF
- Calculate the number of ionizing photons of our LAEs and compare with needed ones to reionize entirely the Universe

Thank you !