Properties of star forming galaxies and LAE's at different redshift

S. de Barros[1], D. Schaerer[1,2]
[1] Geneva Observatory, University of Geneva, 51 Ch. Des Maillettes, CH-1290 Versoix, Switzerland
[2] Laboratoire d'Astrophysique de Toulouse-Tarbes, Université de Toulouse, CNRS, 14 Avenue E. Belin, 31400 Toulouse, France

Photometric redshift code HYPERZ (Bolzonella, Mirales & Pello 2000) does standard SED fitting using a number of modelling parameters. The spectral templates used here are the 2003 GALAXEV synthesis model from Bruzual & Charlot (2003), covering three differents metallicities (1, 1/5 and 1/20 solar metallicity) and a range of star formation history (burst, exponentially decreasing or constant star formation). We choose Calzetti reddening law (Calzetti et al 2000). We developped a modified version of the code where we have included nebular emission in a simple manner: the lines are added using the empirical relative line intensities compiled by Anders and Fritze-v. Alvensleben (2003) from galaxies grouped in our three metallicity intervals. Since the emission lines contribution to photometric filters increases with (1+z) (Schaerer & Pello 2005), we can evaluate its impact on the determination of the galaxies properties extract from SED fits. Furthermore, we have created tools to explore parameters space (star formation rate, stellar mass, age, extinction, equivalent width (EW)).
Here, we reanalyse two galaxies samples: 10 z≈6 galaxies studied in Eyles et al 2007 (E07) and 14 z≈4.5 LAEs studied in Finkelstein et al 2009 (F09).

Sample at z≈6

In this sample, we have 10 star-forming galaxies from the GOODS-South field. We use the *i'*, *z'*, J, K_S, 3.6 µm and 4.5 µm from HST/ACS, VLT/ISAAC and Spitzer/IRAC. Four of these objects have spectroscopic redshift determined from their Lyα emissions and the others have been selected via the Lyman-break technique(*i'*-band dropout).

When nebular emission is not take in account, our results are consistant with the E07 results.
Fits including nebular emission have similar or better χ^2 values.
Nebular emission can mimick Balmer break which is a signature of old stars population(200-500 Myr), which implies in this case, a high redshift formation(z~10).
This can lead to suggest that galaxies have an overestimated age formation and induce a misinterpretation on their participation to the reionization.
Galaxies are not only youngers but also contains more dust with nebular emission.
For more details see Schaerer & de Barros 2009.

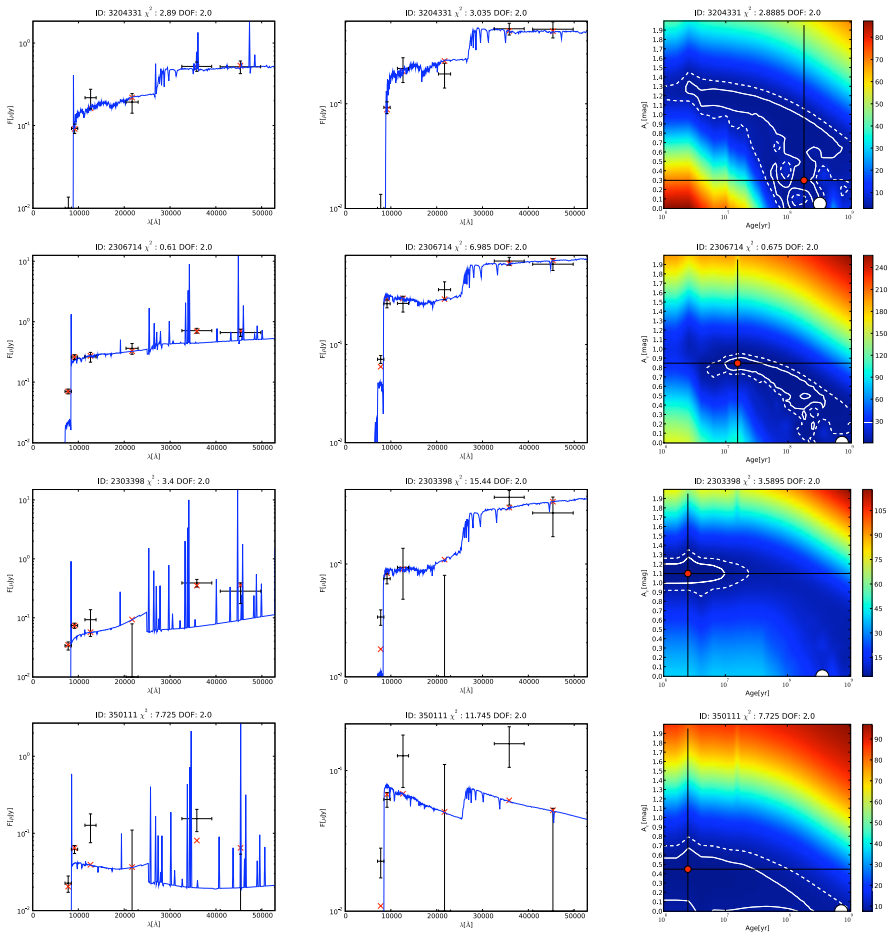

Fig. 1: Examples of comparison between SED fitting with and without nebular emission, respectively in first and second column. In the third column, χ^2 distributions of age and extinction for the best fits, with overlaid white contours indicate the 68% per cent (solid line) and 95% (dashed line) confidence limits. Red spots indicate ours best fits and white spots indicate E07.

Sample at z≈4.5

We analysize 14 LAE's from the Chandra Deep South Field with B, V, *i'*, *z'*, J, H, K_S, 3.6 µm, 4.5 µm, 5.8 µm and 8.0 µm bands. The redshift information comes from MUSICS and FIREWORKS catalogues. Finkelstein et al(2009) include on their SEDs two emission lines: Lyα and Hα, and also a clumpiness parameter to fit their SEDs.

For this sample, the SED fitting includes, for all objects, nebular emission because this provide a better quality of fit.
We obtain similar χ^2 values than F09 and for the faintest objects the observed EWs become systematically larger than the maximum value predicted by the models, but are compatible with those within typically 2 sigma, which indicates a similar goodness of fit, whereas we don't use a clumpiness parameter.
We find in most cases a lower extinction than F09: our mean A_V=0.76 and F09 mean A_V=0.87 (both in mag).

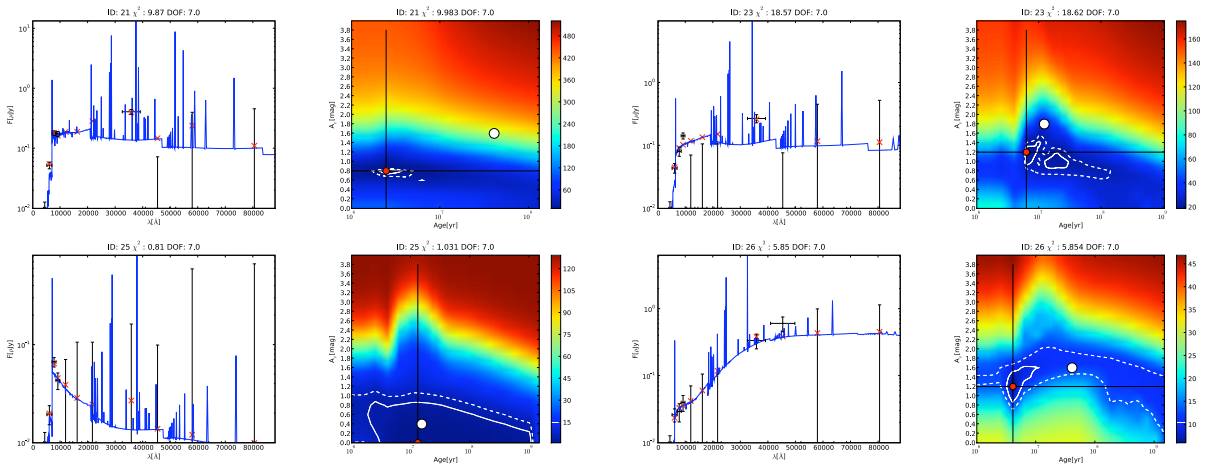

Fig. 2: Examples of SED best fits and associated χ^2 distributions of age and extinction, with overlaid white contours indicate the 68% per cent (solid line) and 95% (dashed line) confidence limits. Red spots indicate ours best fits and white spots indicate F09 best fits.

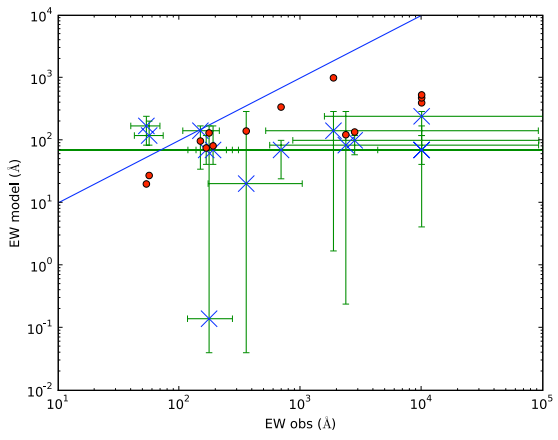

Fig. 3: comparison between observed EWs (Lyα) and modelized EW (Lyα). Our values are indicate by blue cross with 1σ error bar and F09 values are indicate with red spots. Some error bars for the observation are larger than the EWs values.

References:
•L. P. Eyles, A. J. Bunker, R. S. Ellis, M. Lacy, E. R. Stanway, D. P. Stark and K. Chiu. MNRAS, 2007, 374, 910
•D. Schaerer, S. de Barros. arXiv:0905.0866
•S. L. Finkelstein, J. E. Rhoads, S. Malhotra and N. Grogin. ApJ, 2009, 691, 465
•M. Bolzonella, J.-M. Piralles and R. Pello, 2000, A&A, 363, 476