SF2A 2008
C. Charbonnel, F. Combes and R. Samadi (eds)

MASS ASSEMBLY AND CHEMICAL EVOLUTION OF GALAXIES ALONG COSMIC TIME WITH THE MASSIV SURVEY

Queyrel, J.[1], Contini, T.[1], Epinat, B.[2], Garilli, B.[3], Lamareille, F.[1], Le Fèvre, O.[2], Vergani, D.[4], Kissler-Patig, M.[5], Lemoine-Busserole, M.[6], Perez-Montero, E.[1] and the MASSIV collaboration[7]

1 Introduction

Nowadays, powerful telescopes allow to have deep insight into formation and evolution of galaxies since very early epochs. Thanks to these new instruments it is possible to acquire a very good knowledge of the dynamical, physical and chemical properties of high redshift galaxies, putting strong constraints on galaxy evolution models. Here we present first results of the MASSIV (Mass Assembly Survey with SINFONI in VVDS) project, an ESO-VLT Large Program with the 3D NIR spectrograph SINFONI, aimed at observing a representative sample of about 100 star-forming galaxies in the redshift range $z \sim 1 - 2$, picked-up from the VVDS (VIMOS VLT Deep Survey). The measurement of nebular emission-lines (Hα, [OIII], [NII], etc) in the datacubes gives access to dynamical and chemical properties of galaxies through velocity and emission-line ratios maps. This allows to follow the evolution with cosmic time of the fraction of rotating disks, spheroids and mergers as well as of fundamental scaling relations such as the Tully-Fisher and Mass-Metallicity relations.

2 Sample selection and observations

For this ESO Large Programe (PI: T. Contini), a sample of 140 galaxies has been selected from the VVDS. They are chosen to be star forming galaxies at $1 < z < 2$ – a crucial period in the evolution of the universe – so that they present emission-lines giving acces to their physical properties. Selecting galaxies in the VVDS allows to build a statistical and representative sample of galaxies at high redshift.

The VIMOS VLT Deep Survey (Le Fèvre et al. 2005) aims at following the evolution of galaxies, AGNs and large-scale structures with spectroscopic redshifts and multiwavelength dataset. It is a purely I-band apparent magnitude limited survey which makes it the least biased survey of the distant universe available today. About 150 galaxies meet the constraints – star-forming, right redshift to avoid bright OH sky lines, bright star close enough for AO/LGS observations – defined for the MASSIV project.

In the J and H bands ($R \sim 2000$) the IFU technology gives acces to a spectrum with nebular emission-lines for each pixel in the FoV. Data reduction is performed with the SINFONI pipeline which substracts the sky background, flat-fields the images, calibrates in wavelength and recontructs the final datacube. Each observation block is spatialy centered considering an offset of the telescope from a bright star. With the assistance of the AO-LGS we are able to study very accurately the properties of the galaxies over their spatial extent.

[1] Laboratoire d'Astrophysique de Toulouse - Tarbes, France
[2] Laboratoire d'Astrophysique de Marseille, France
[3] INAF, Milano, Italy
[4] INAF, Bologna, Italy
[5] ESO, Germany
[6] Oxford University, UK
[7] http://www.ast-obs-mip.fr/massiv

3 Kinematics, physical and chemical properties

Deep insights in galaxies properties are made possible by 3D-spectroscopy. The spectra in each spaxels allow to produce velocity maps and flux (ratio) maps, in order to derive the rotational and dispersion velocities, dynamical mass, SFR, chemical abundances, etc. In association with the morphology deduced from HST and CFHTLS images, it will be possible to disentangle rotating disks, spheroids, clear mergers, etc. Figure 1 shows an example of such an analysis performed on a galaxy at $z \sim 1$ observed in April 2008 in the J band. Comparisons with simulated datacubes (produced by cosmological simulations, e.g. Horizon) are also foreseen.

4 Tully-Fisher and Mass-Metallicity relations

The relation between galaxy luminosity and maximal rotation velocity is well known in the local universe as the TF-relation. Investigating how it evolves with redshift is the goal of many studies (e.g. Flores et al. 2006). The use of rotation curves deduced from velocity maps, contrary to those produced with long-slit spectroscopy, is a far better way to estimate $V_{\rm rot}$ and derive the TF-relation at $1 < z < 2$.

Many physical processes have been evoked to explain the origin of the mass-metallicity relation (outflows, downsizing, etc), so that evolutionary models need to reproduce it. If this relation is well constrained at $z \sim 0$ (Tremonti et al. 2004; Lamareille et al. 2004), we need to precise its evolution with redshift. Recent studies show an evolution toward lower metallicities (Erb et al. 2006; Maiolino et al. 2008; Lamareille et al. 2008; Contini et al. 2008), but strong efforts are still to be made to ripen our knowledge (see fig 1).

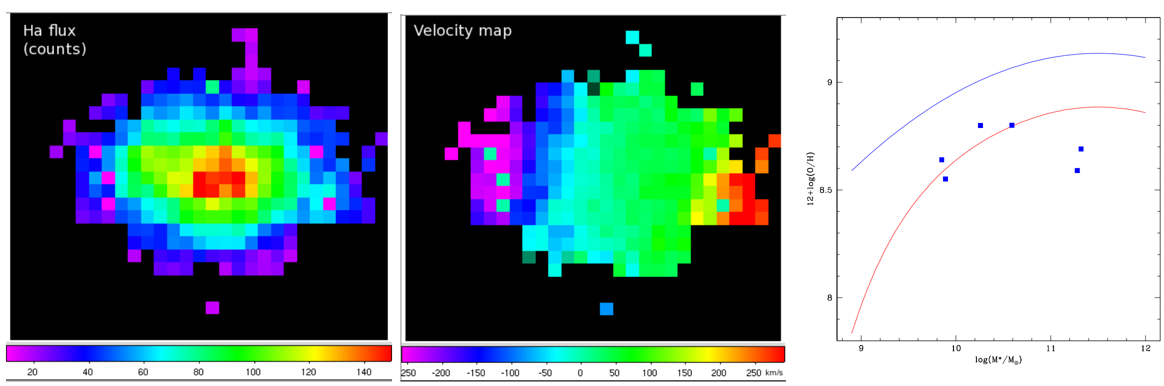

Fig. 1. Left and Middle. Hα flux and velocity maps of VVDS140217425 ($z = 0.9792$) obtained with SINFONI. **Right.** Mass-Metallicity relation of 6 VVDS galaxies (blue squares) at $z \sim 1.4$ (Queyrel et al. 2008). The relations at $z \sim 0$ in blue (Tremonti et al. 2004) and at $z \sim 2$ in red (Erb et al. 2006) are also shown for comparison.

References

Contini, T., Lamreille, F., Perez-Montero, E., et al. 2008, *in prep*

Erb, D. K., Shapley, A. E.,Pettini, M., et al. 2006, ApJ, 644, 813

Flores, H., Hammer, F., Puech, M., Amram, P., Balkowski, C. 2006, A&A, 455, 107

Lamareille, F.,Mouhcine, M.,Contini, T.,Lewis, I., Maddox, S. 2004, MNRAS, 350, 396

Lamareille, F., Brinchmann, J., Contini, T., et al. 2008 *submited to A&A*

Le Fèvre, O.,Vettolani, G.,Garilli, B., et al. 2005, A&A, 139, 845

Maiolino, R.,Nagao, T.,Grazian, A., et al. 2008, A&A, 488, 463

Queyrel, J., Contini, T., Lemoine-Busserolle, M., et al. 2008, *submited to A&A*

Tremonti, C. A., Heckman, T. M., Kauffmann, G., et al. , 2004, A&A, 613, 898