A OSIRIS/GTC EMISSION-LINE SURVEY OF THE RICH CLUSTER CL0024+1654 AT Z=0.4

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Introduction

In the framework of the GLACE project, we have carried out a mapping of emission lines (Hα+[NII], Hβ and [OIII]) in the rich cluster Cl0024+1654 at z=0.4 using the red tunable filter of OSIRIS at the GTC. The observations have been designed to detect, with S/N≥3, emission-line galaxies (ELGs) whose fluxes correspond to SFR up to 2M☉/yr, with a spatial coverage of at least 2 virial radii. Here, we describe the design of the observations and processing steps and present preliminary results corresponding to the Hα+[NII] line.

Observations

Aiming to recover the fluxes of sampled lines, we have prepared the observations determining the best sampling and FWHM combination for the OSIRIS TF:

	Hα+[NII]	Hβ	[OIII]
FWHM (Å)	12	18	20
Sampling (Å)	6	10	10
N° slices	50	22	27

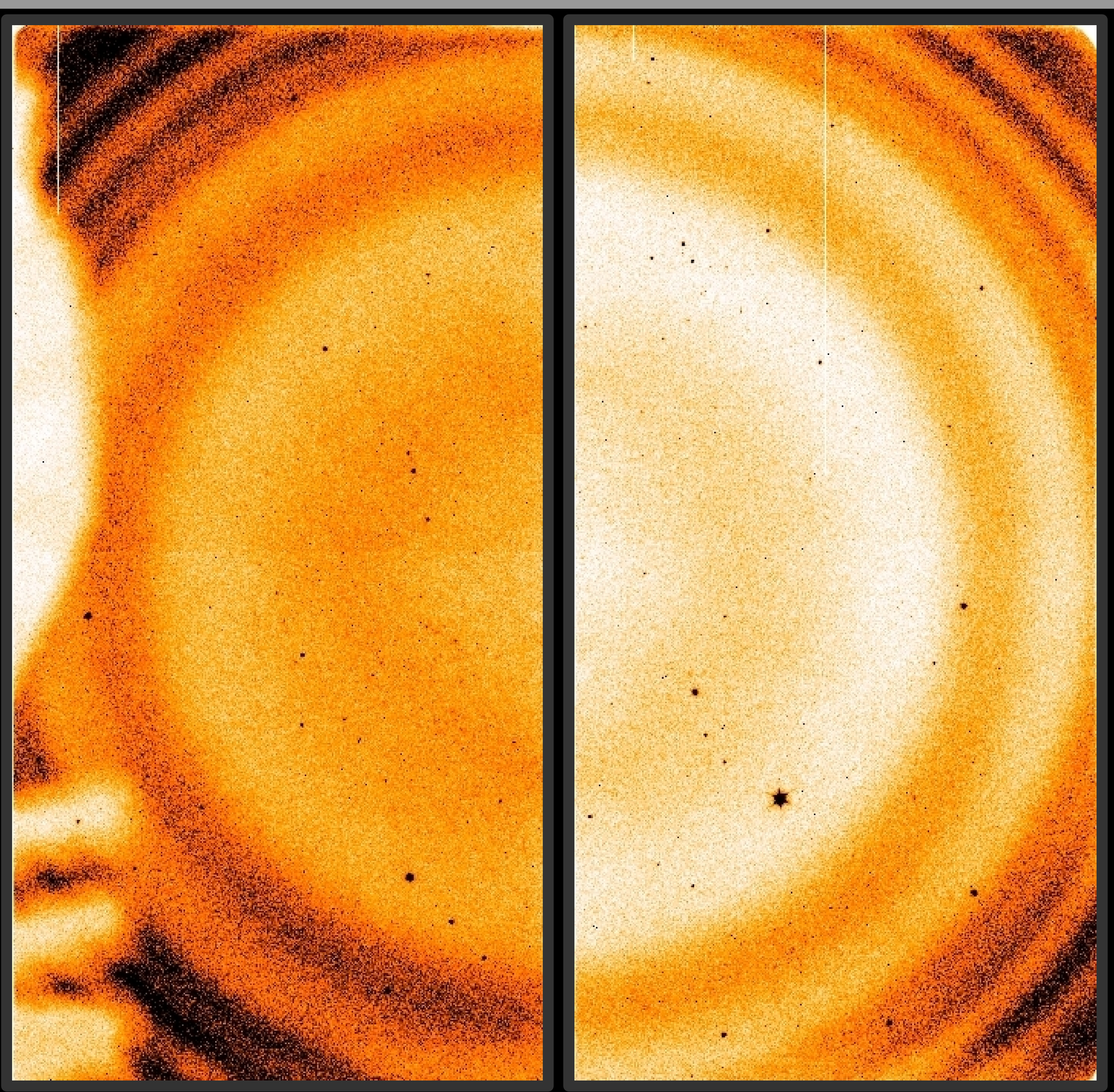

Figure 1. *Raw images from both CCDs. Sky rings can be seen clearly.*

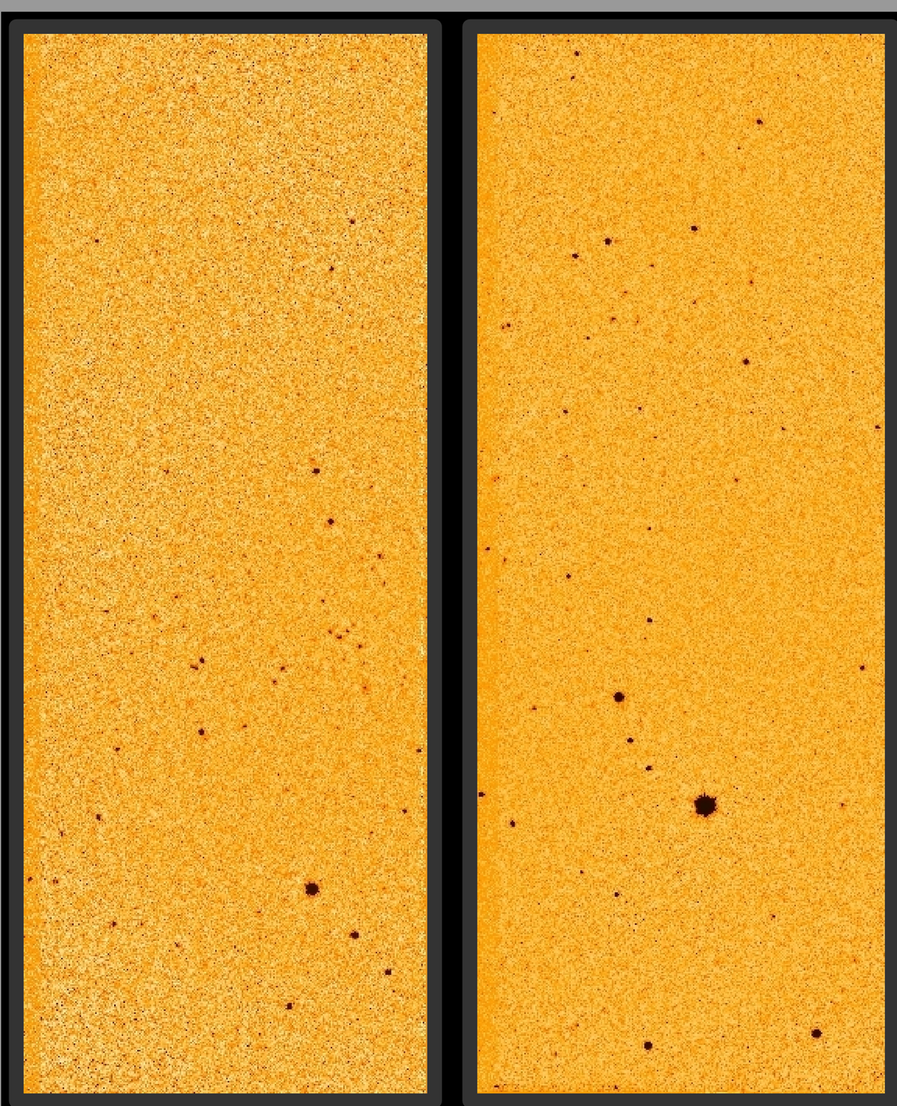

Figure 2. *Resulting images after sky rings subtraction and combination based on the wavelength, in this example 9095.4 Å.*

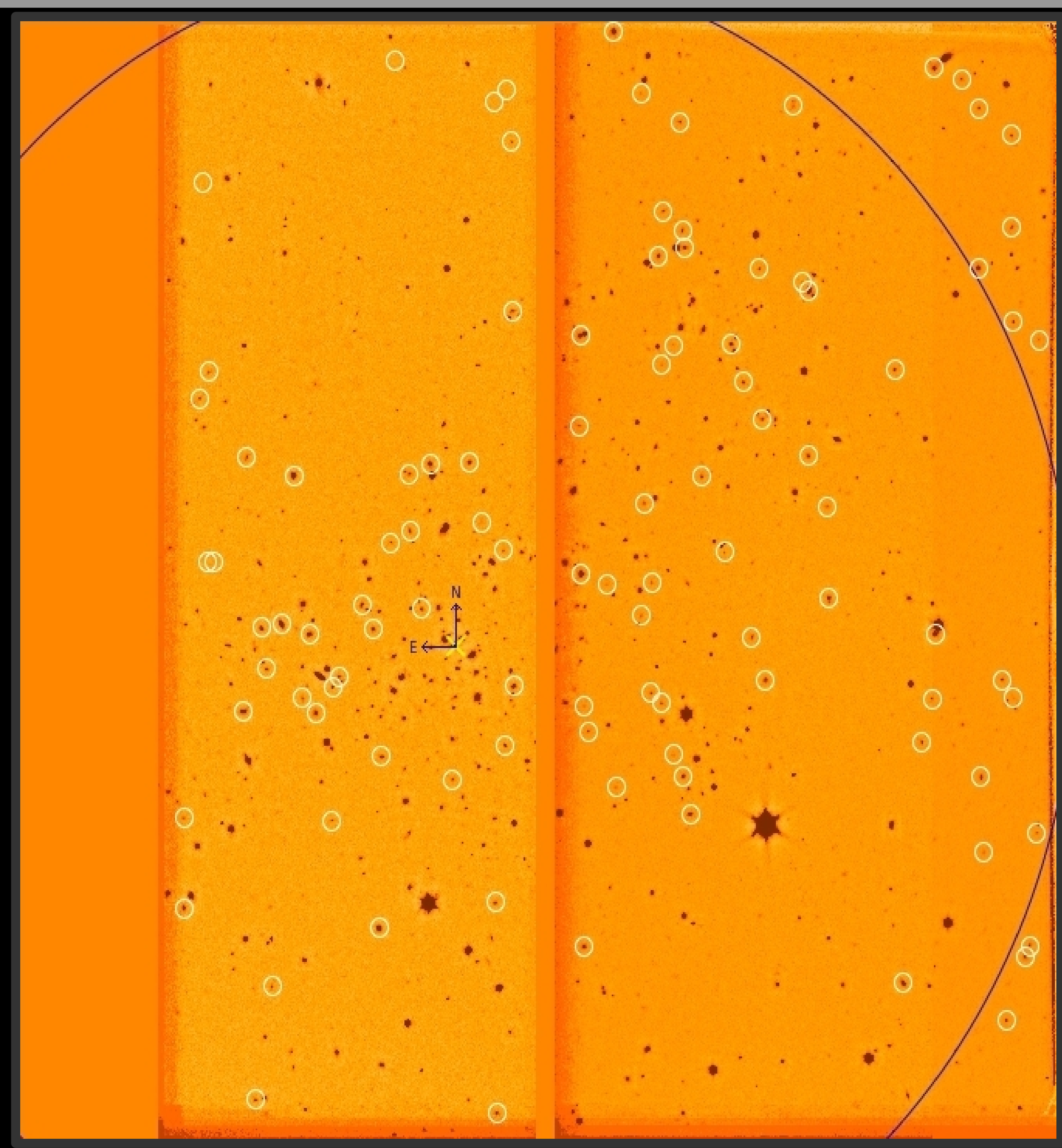

Figure 3. *Deep image of Cl0024+1654. White open circles mark emission-line candidates. The virial radius (1.7 Mpc) is shown by the blue line.*

Data Processing Scheme

The data reduction has been carried out within the framework of IRAF using a set of TFred tasks*. We have also used Sextractor and IDL for source extraction and flux calibration.
The data reduction consists of three stages:

- Basic reduction:
  - Bias, flatfield and dark corrections.
  - Sky rings subtraction (task *tringSub2*).
  - Alignment (tasks *geomap* and *geotran*) and convolution to the 'worst' seeing (task *tgauss*).
  - Combination of sets of images according to their tuned wavelength.
  - Creation of mosaics merging data from both CCDs. It is essential to keep knowledge of the optical center position across the whole processing to perform a proper wavelength shift correction.
  - Creation of a deep image and summed, cleaned and convolved images.
  - Astrometry (task *ccmap*).
- Detection and pre-selection of candidates:
  - Detection of objects in the deep image and measurement of fluxes in the convolved ones (task *tsex*).
  - Combination of the detections in each wavelength slice into pseudo-spectra (task *tespect*).
  - Creation of a catalog of cosmic-ray/ghost pixel locations (task *tpull*).
  - Creation of a catalog of emission-line candidates (task tscale). The output catalog is filtered for CR/ghost artifacts. Also, double detections are removed.
- Flux calibration:
  - Calculation of the total efficiency of the telescope, optics and detector, $\varepsilon(\lambda)=F_m(\lambda)/F_p(\lambda)$, this is the ratio of the measured-to-published flux from the standard.
  - For each single observation, conversion from observed flux to true flux in erg s^{-1} cm^{-2} $band^{-1}$ (total flux within the passband) using the efficiency derived in the previous step.

* some of the TFred procedures had to be adapted to OSIRIS and to the number of slices.

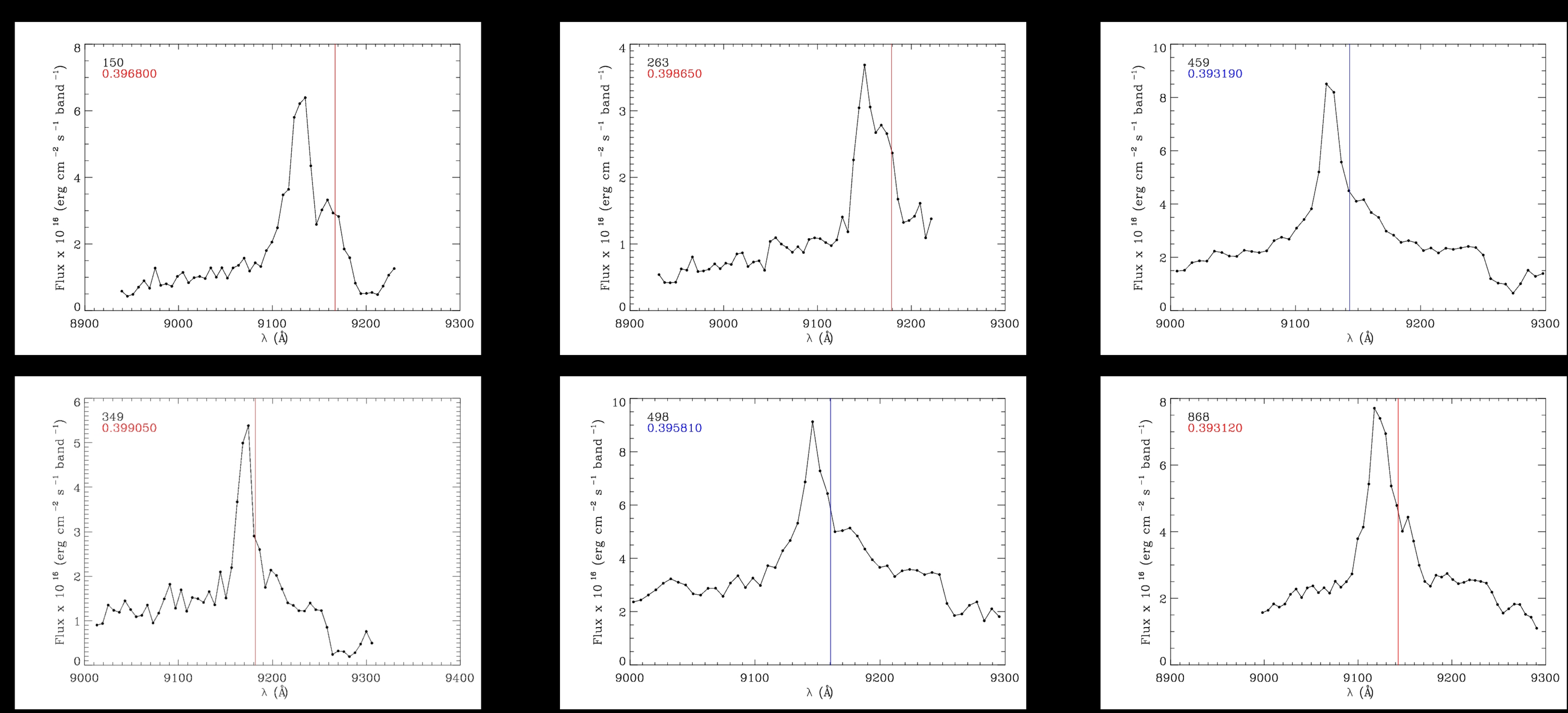

Figure 4. *Sample of pseudo-spectra obtained after flux calibration. The vertical lines represents the Hα position according spectroscopic redshift (Moran et al 2005) from DEIMOS spectroscopy (blue) and others (red).*

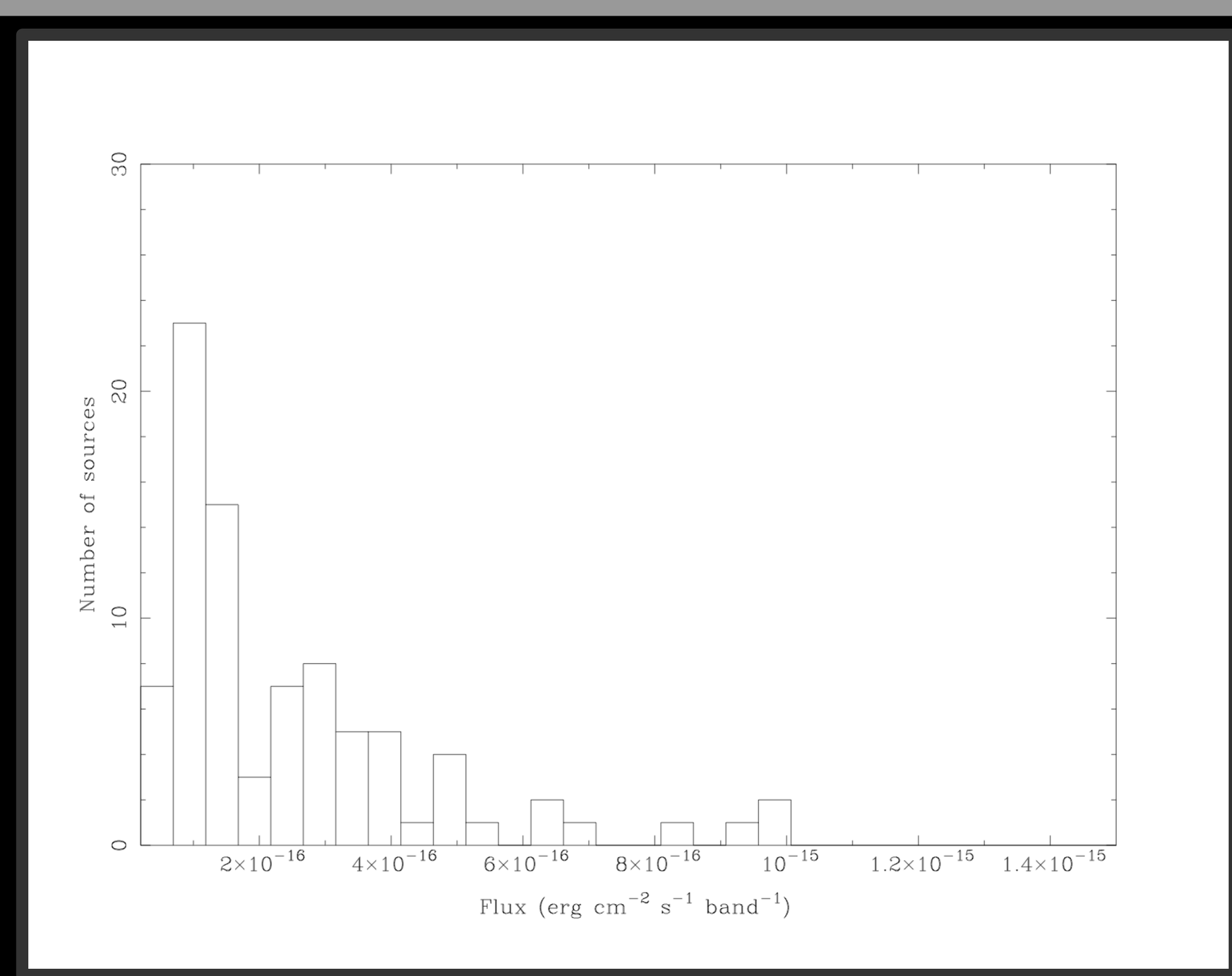

Figure 5. *Flux histogram of the 103 sources identified as ELGs. Our completeness limit is about 10^{-16} erg s^{-1} cm^{-2} $band^{-1}$.*

Results

From our Hα+[NII] maps we have obtained a raw catalog of 1076 sources. From these, 103 ELG candidates have been extracted. The completeness limit of this sample is ~10^{-16} erg s^{-1} cm^{-2} $band^{-1}$ as shown in *Fig.5.* The distribution of star forming galaxies maps the presence of a structure falling from the NW onto the cluster core. This structure has been already reported by other authors (Moran et al 2007; Kneib et al 2003).
Work in progress includes a precise deblending of Hα and [NII] lines, and an accurate determination of the line wavelengths. This information will in turn allow us to establish cluster membership, galaxy dynamics and star formation rate.