Clusters of galaxies arise from exceptionally high peaks of the primordial fluctuation density field. Their properties as a function of redshift, \( z \), are therefore highly sensitive to the nature of such cosmic fluctuations. It is therefore very important to have a sample of galaxy clusters covering as wide a redshift range as possible.

Recently, Olsen et al. (1999) and Scodeggio et al. (1999) have identified clusters in 2D from the I-band images of the ESO Imaging Survey (EIS, see Renzini & da Costa 1997), using the matched filter algorithm of Postman et al. (1996). Very little is known on the performance of this algorithm at \( z \geq 0.5 \), and many of the cluster candidates may not be real. The spectroscopic redshifts and confirmation of cluster candidates in the range \( 0.5 \leq z \leq 0.7 \) is possible with 4m-class telescopes.

Here we report on preliminary results of new spectroscopic observations of six EIS candidate clusters. A complete description of our survey and results will be published in Ramella et al. (in preparation). The selected cluster candidates have estimated redshifts (from the matched filter algorithm) \( 0.5 \leq z_{mf} \leq 0.7 \). We observed these cluster fields with EFOSC2 at the 3.6 m ESO telescope at La Silla, in Multi-Object Spectroscopy mode, during two nights in February 1999, in average weather conditions and partial moonlight.

In total we determined redshifts for 67 galaxies, covering the range \( 0.09 \leq z \leq 0.79 \) (plus a redshift for a serendipitously found QSO at \( z = 3.2 \)), with an average \( \bar{z} = 0.38 \). Magnitudes of these galaxies span the range \( 17.0 \leq m_I \leq 21.3 \), where \( m_I \) is the apparent magnitude in the \( I_c \) band (Nonino et al. 1999).
At the average estimated redshift of our candidate clusters, $z \sim 0.6$, the EFOSC2 field-of-view covers $1.9 \times 1.3 \, h_{75}^{-2} \text{Mpc}^2$, roughly matching the typical size of clusters. Therefore, in searching for the redshift-space system that should correspond to the 2D EIS cluster, we consider the whole EFOSC2 field.

We start by defining as candidate galaxy systems, any set of two or more galaxies in an EFOSC2 field, contained within a suitable redshift range, $\Delta z$. We use $\Delta z = 0.01 \times (1+z)$ (the $(1+z)$ factor is the usual cosmological correction – see Danese et al. 1980). Then, we estimate the likelihoods of the detected systems. We compare the observed number of galaxies within each system against the number of system galaxies expected for a uniform galaxy distribution within our magnitude range. The luminosity function we use is that of Postman et al. (1996), which, for our purposes, should be close enough to the luminosity function of the EIS survey. Since field galaxies are inhomogeneously distributed, we calibrate the likelihoods of our systems by comparison with a real field galaxy sample (the Canada-France Redshift Survey, Lilly et al. 1995).

We find 4 real systems (at the 94 % confidence level) among the six EIS candidate clusters. Note that the non-detection of two of the candidate clusters does not prove the clusters do not exist. We may simply have not been observing deep enough. For the confirmed clusters, only in two cases the spectroscopic mean redshift, $\bar{z}$ is in agreement with the matched-filter estimate ($\bar{z} = 0.673$ vs. $z_{mf} = 0.6$, and $\bar{z} = 0.445$ vs. $z_{mf} = 0.5$). In the other two, the spectroscopic redshift is significantly smaller ($\bar{z} = 0.129$ vs. $z_{mf} = 0.5$, and $\bar{z} = 0.236$ vs. $z_{mf} = 0.5$). Our spectroscopic results are supported by independent evidence coming from the analysis of the colour-magnitude diagrams of galaxies in these same cluster fields.

From our analysis we conclude that 2/3 of the candidate clusters we have observed are real, and half of them have $\bar{z} \simeq z_{mf}$. Our sample is extremely small, but if we take our results at face value, they imply that the EIS sample contains $\simeq 50$ clusters at $0.5 \leq \bar{z} \leq 0.7$.

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