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Galaxies Étoiles Physique et Instrumentation

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Cluster detection in the Next Generation Virgo Cluster Survey (NGVS)

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Different techniques

The search of galaxy clusters is very challenging and there exist numerous methods to detect these massive structures.

Hot gas ($T \sim 10^8$ K) → X-ray, SZ

Dark matter → Gravitational lensing

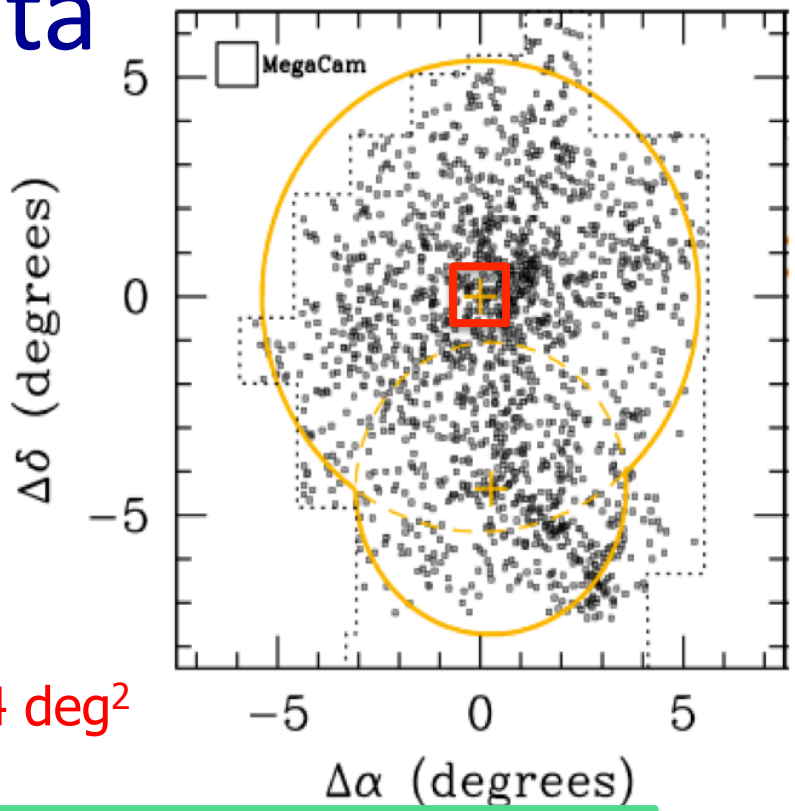
Cluster galaxies → UV, optical and IR light

FoF algorithm (Wen et al. 2012), Voronoi tessellation (Murphy et al. 2011), Matched filter (Grove et al. 2009)

But all have some bias!

NGVS data

We detect background galaxy clusters in the Next Generation Virgo Cluster Survey (NGVS) (Ferrarese et al. 2012), a large program on the Canada France Hawaii Telescope (CFHT), that covers the Virgo Cluster up to its virial radius (104 deg^2), in 5 optical bands (u', g', r', i', z').

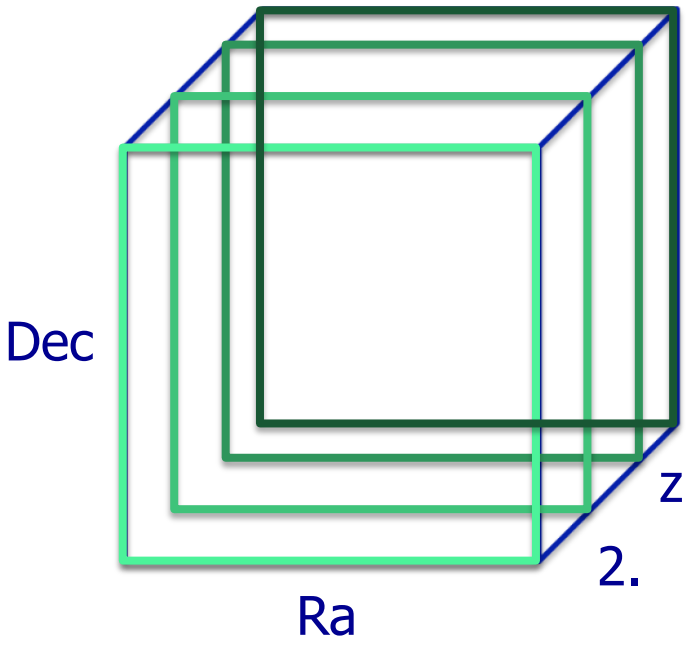


Pilote Program: ~ 4 deg^2

Survey	Total Area	# fields per deg^2	Depth (S/N=5) u'	g'	r'	i'	z'
NGVS	**104 deg^2**	**1x104**	**26.4**	**26.6**	**26.2**	**25.1**	**24.6**
SDSS	8400 deg^2	-	22.3	23.3	23.1	22.3	20.8
CFHTLS-Wide	165deg^2	1x64+2x43+1x14	26.4	26.6	25.9	25.5	24.8
KIDS	1500 deg^2	1x750+1x750	24.8	25.4	25.2	24.2	...
Pan-STARRS	30000 deg^2	1x30000	...	24.6	24.0	23.9	22.9
Pan-STARRS	84 deg^2	1x84	...	27.3	26.9	27.9	26.3

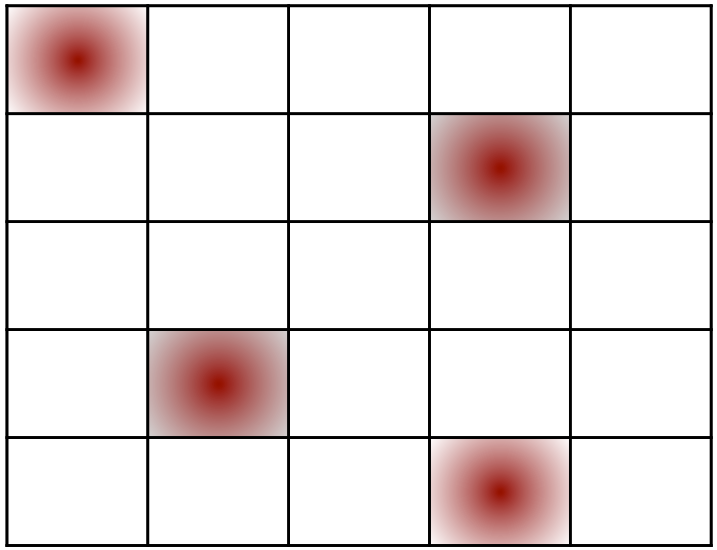
Detection technique

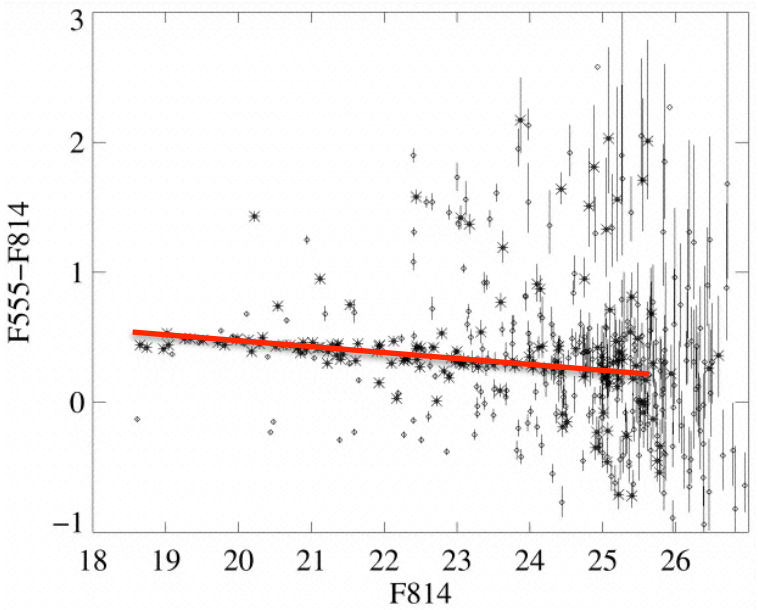
Magnitude cut: i' < 24



1. Redshift slices

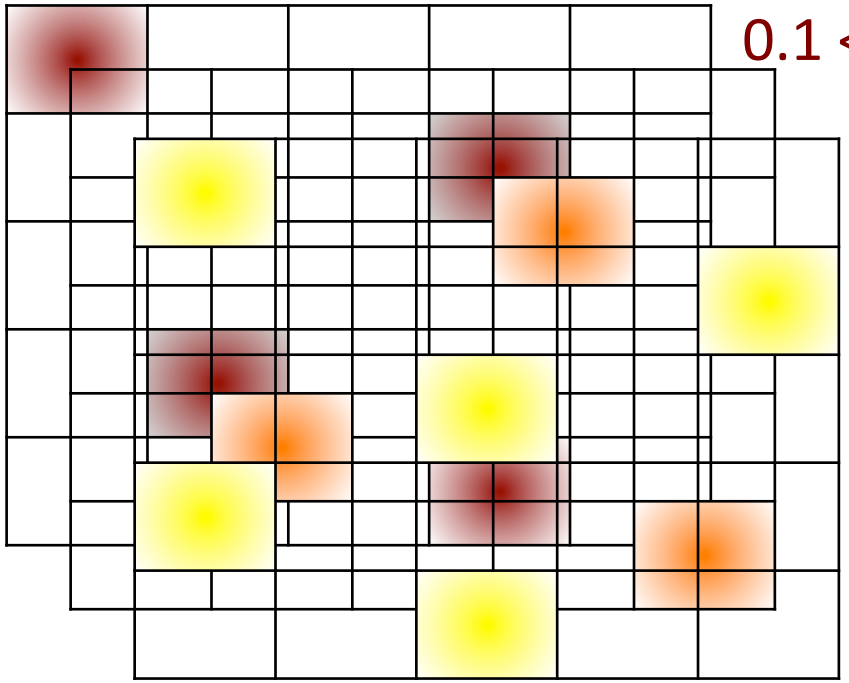
2. Overdensities in the coordinate space





3. Red-sequence galaxies

Contamination effects



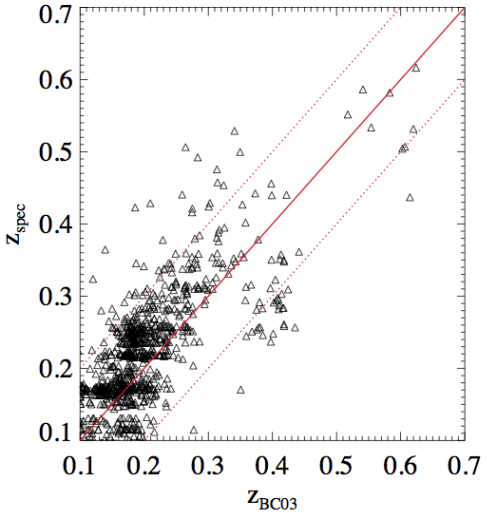
0.1 < z < 0.3

0.2 < z < 0.4

0.3 < z <0.5

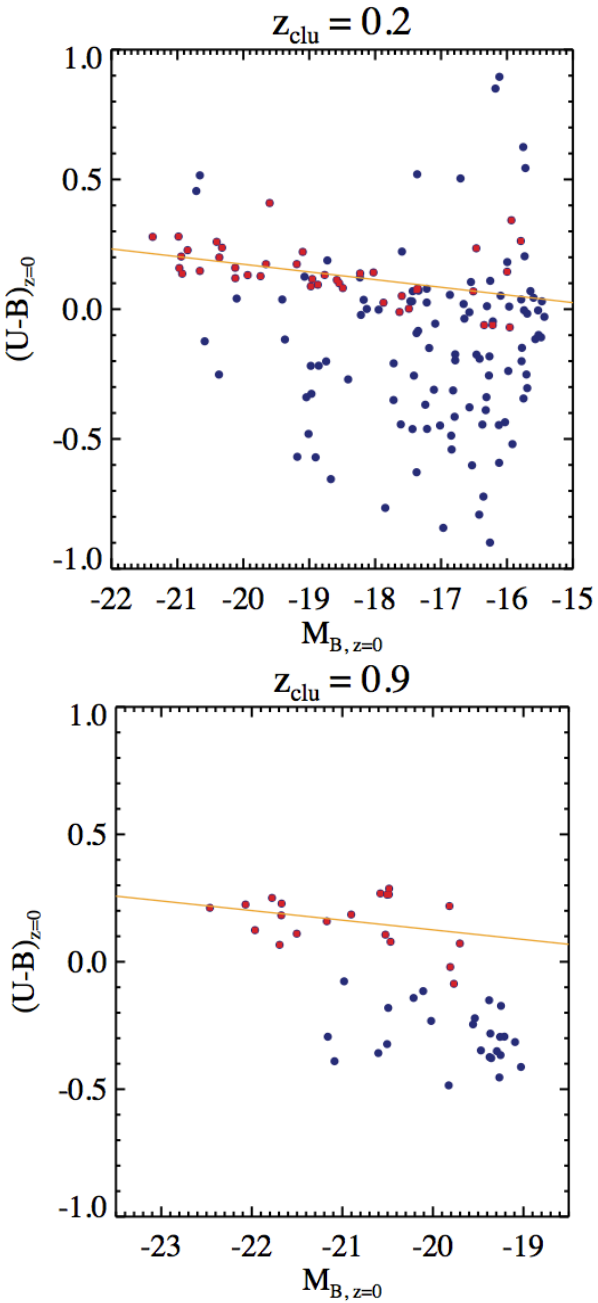
Multiple detections

Projection effects → False detections



Purity & Completeness → Empirical calibration → ~ 60-70 %

Preliminary results and future works



We find about 40 galaxy clusters per square degree up to z=1.

K-band data

Completeness and purity estimates

Mass estimates

Stellar population properties