MOS capabilities on the 4 and 10m La Palma telescopes

(Optical Validation of Planck SZ-sources)

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    2. OSIRIS/GTC MOS
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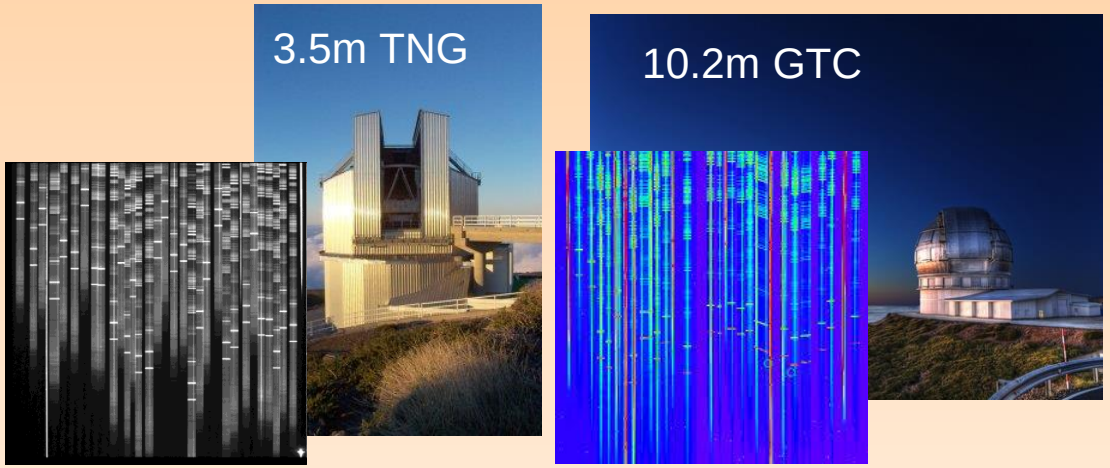
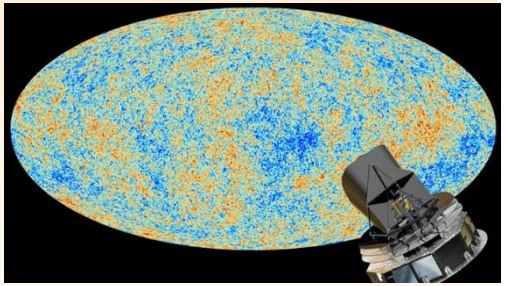
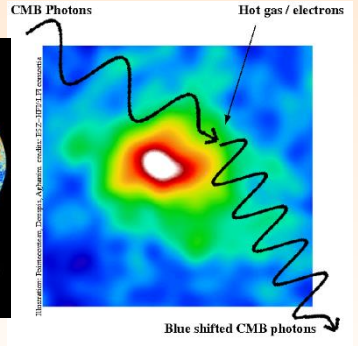
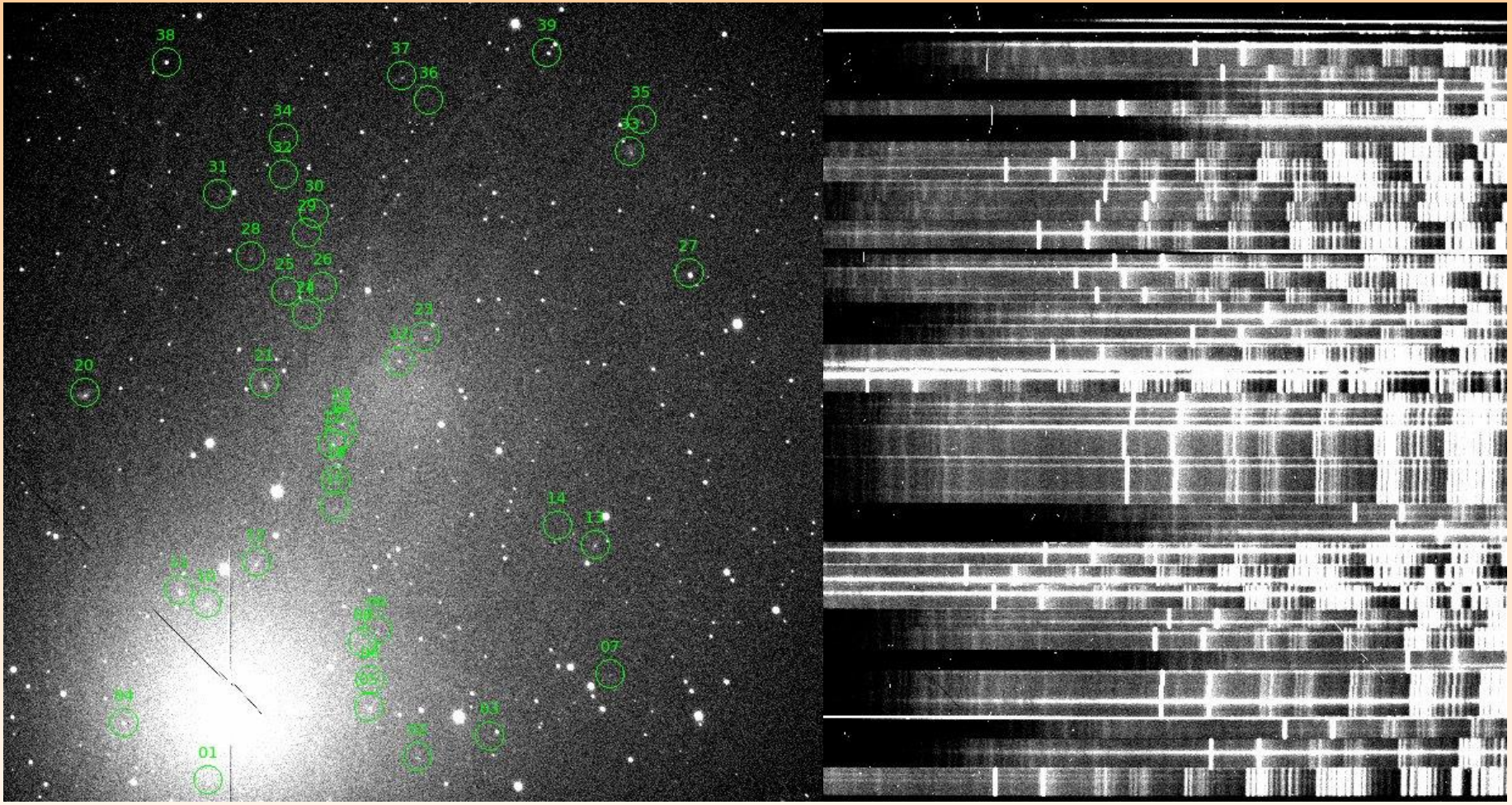


2. Optical Validation of Planck SZ-sources (ITP13-08)



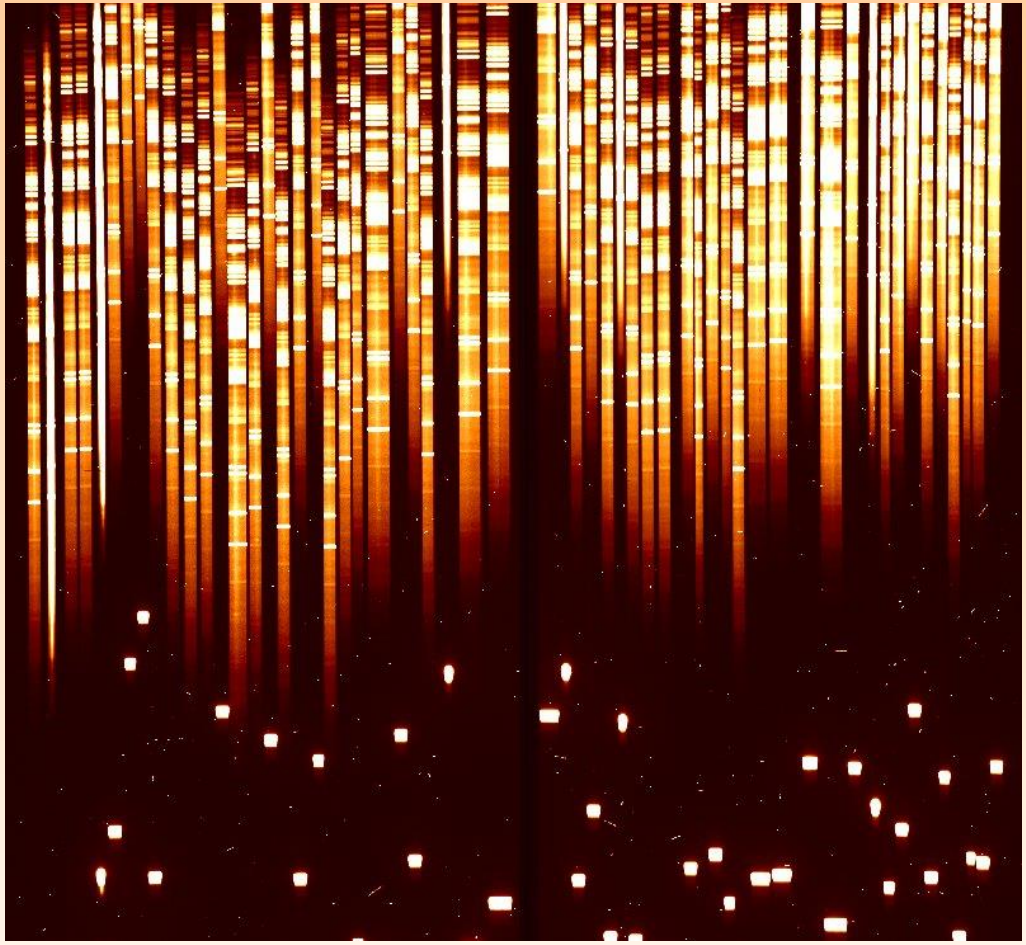


DOLORES/TNG 3.5m



FOV=8x8 arcmin; up-to 40 slitlets
Low resolution: R~600 (1” slits) with full λ coverage
Medium Resolution R~2000-5000

OSIRIS/GTC 10m



- FOV=7.5x3 arcmin (Low-R)
- Up-to 55 slitlets
- Low resolution: R~350-1000
- Medium Resolution R~2000-2500

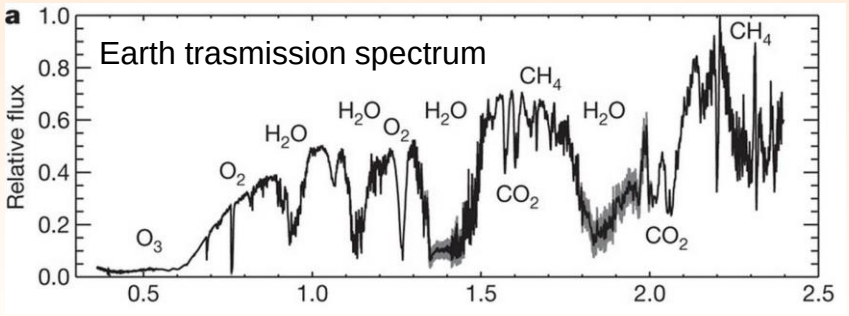
MOS at 4.2m WHT

LIRIS (NIR)

FOV=3.8x3.8 arcmin
Up to 30 slitlets
Resolution=600-3000
λ coverage = 1.0-2.5 μm
Mag limit: J=19.5 (Texp=1h, R=600)

Grism, resolutions, and λ coverage

LIRIS Grisms			
Grism	**Resolution**	**Spectral Range**	**Scale**
lr_zj	700	0.887-1.531 μm	6.1 Å/pix
lr_hk	700	1.388-2.419 μm	9.7 Å/pix
mr_k	2500	K	low efficiency
hr_j	2500	1.170-1.356 μm	1.8 Å/pix
hr_h	2500	1.520-1.783 μm	2.6 Å/pix
hr_k	2500	2.053-2.416 μm	3.5 Å/pix

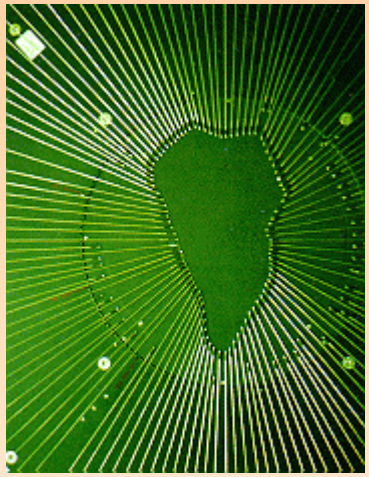


Palle et al. 2009 (Nat, 458, 814)

Autofib2 (Visible, fibers)

FOV=40x40 arcmin
Up to 150 fibers
Resolution = 200-4000
λ coverage = 3800-9000 Å
Mag limit: r=19 (Texp=1h, R=500)

Very suitable for clusters at z<0.15

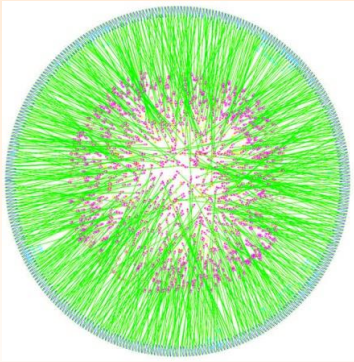


WEAVE (Visible, fibers)

(expected 2017)

FOV=2x2 degs
IFU FOV =3x3 arcmin
Up to 1000 fibers + IFU unit
Resolution = 5000 and 20000
λ coverage = 3800-10000 Å
Mag limit: r=20 (Texp=1h, R=5000)

The successor of AF2

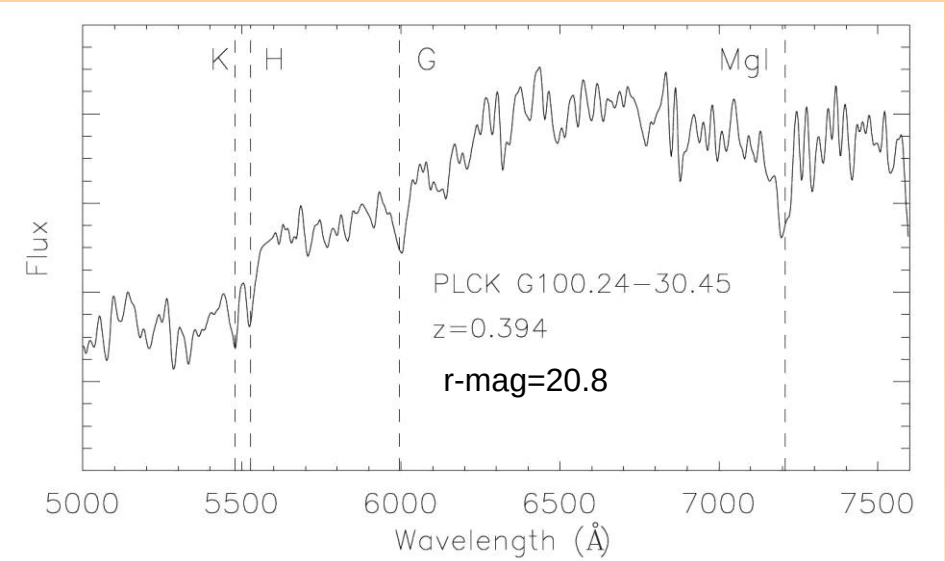


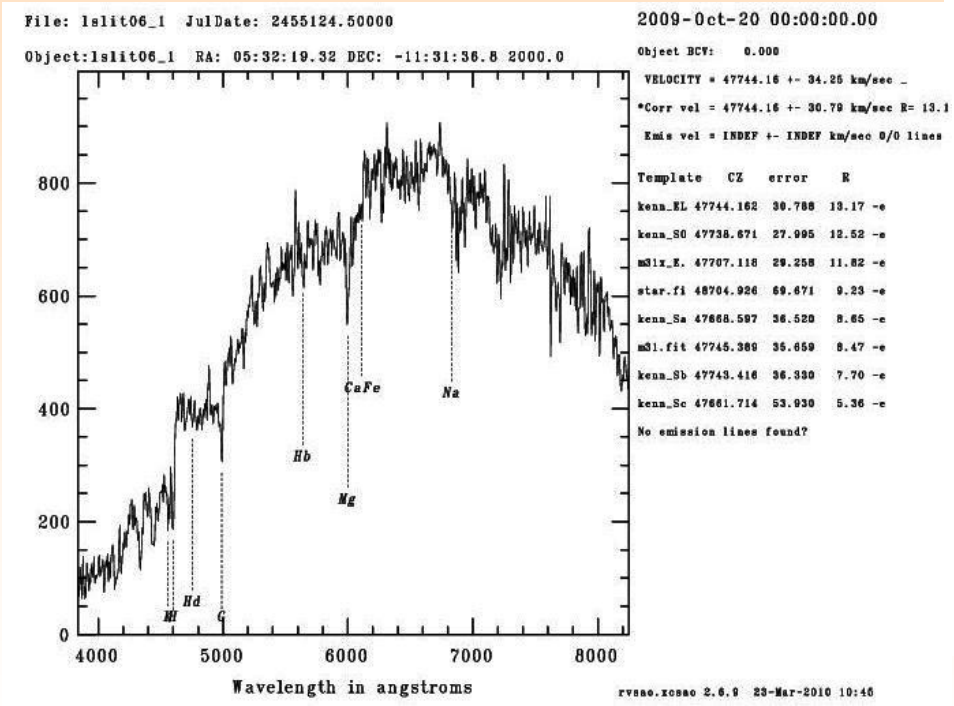
Galaxy Clusters are ideal targets for MOS at the **DOLORES**/TNG and **OSIRIS**/GTC

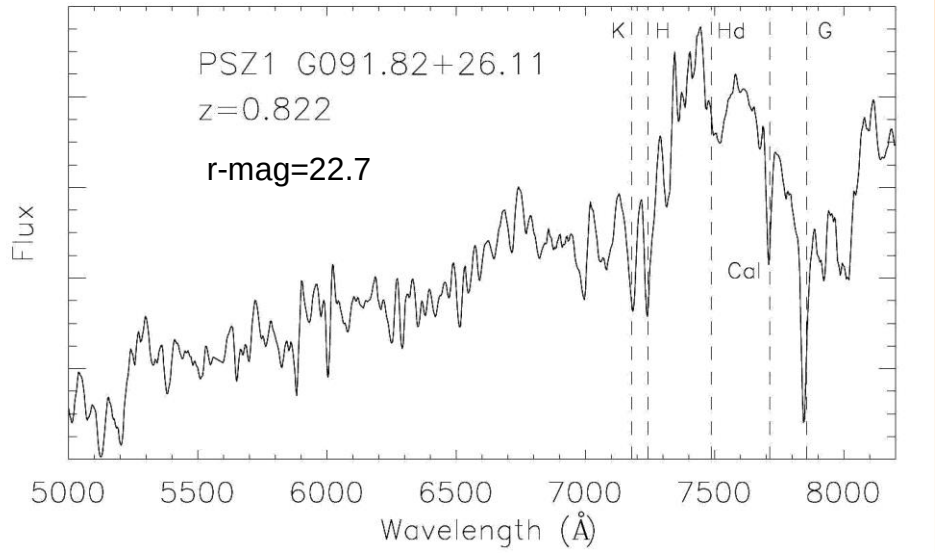
Texp~3000s, we obtaing spectra with:

TNG: S/N~5 and r-mag~21
GTC: S/N~5 and r-mag~23

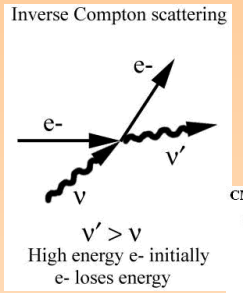
- Absorption lines (K and H of Ca, G-band, Hδ and MgI) in E-type galaxies
- R~500
- Δv=100 km/s

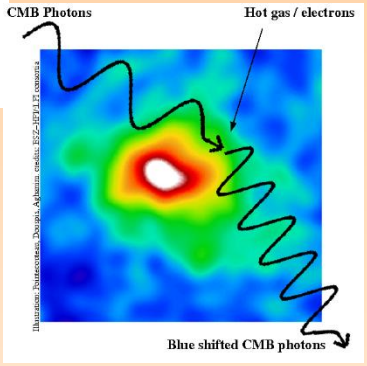


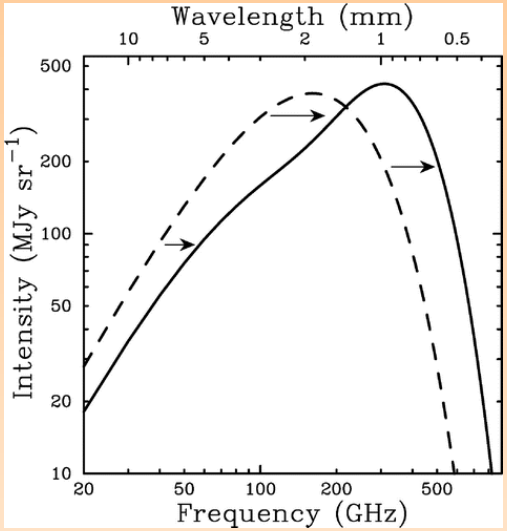


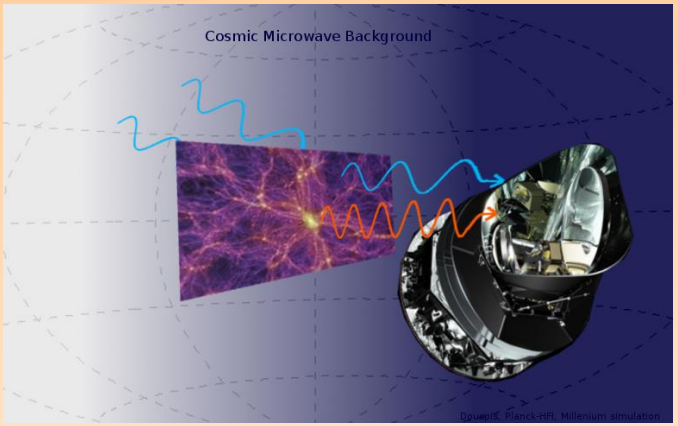


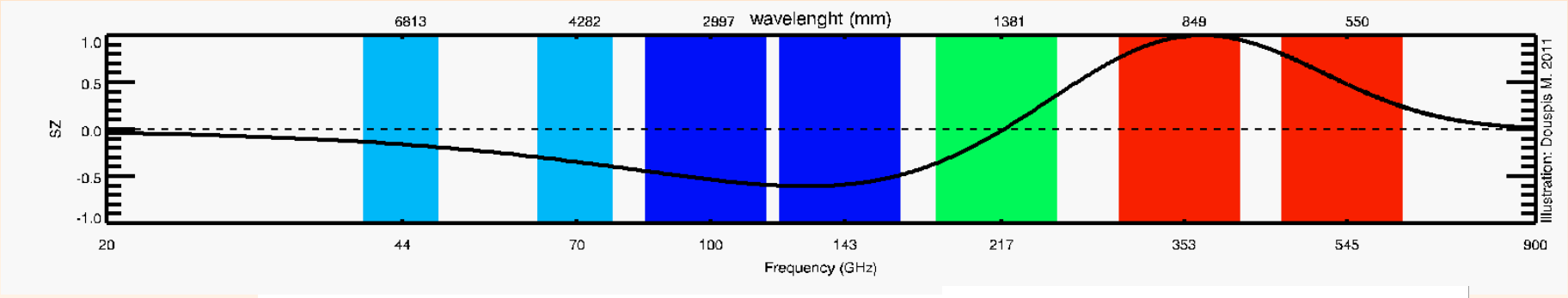
SZ cluster identification with PLANCK

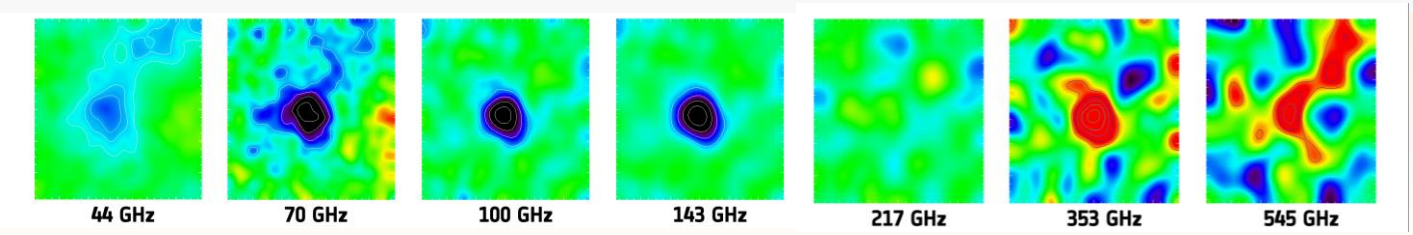






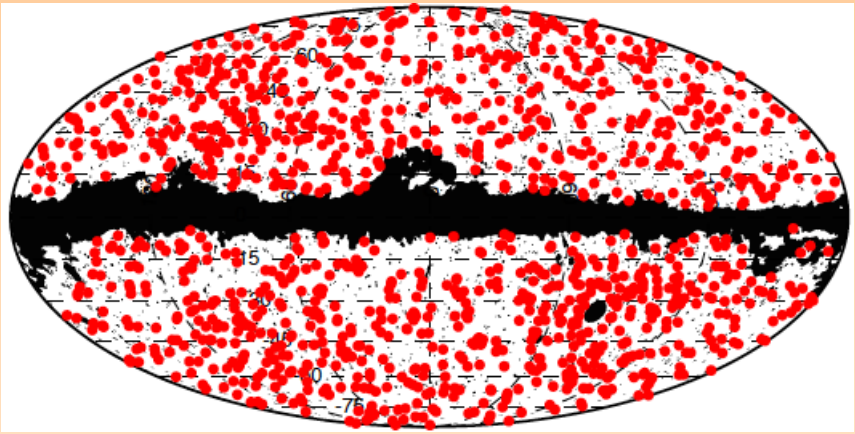




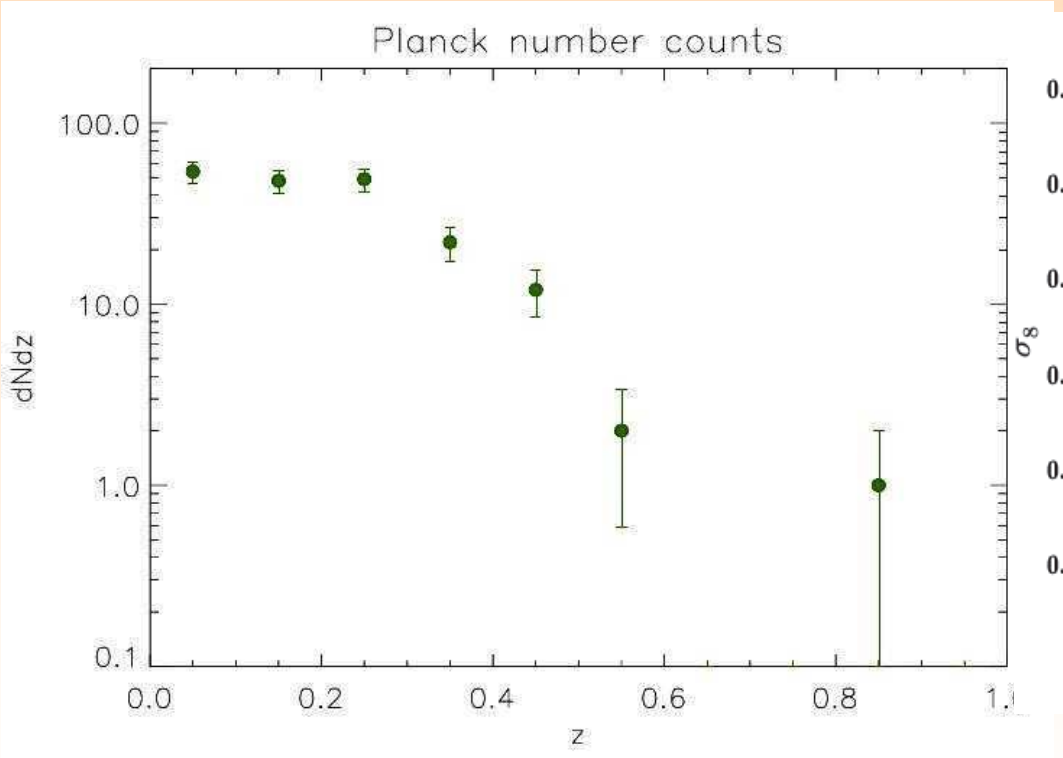


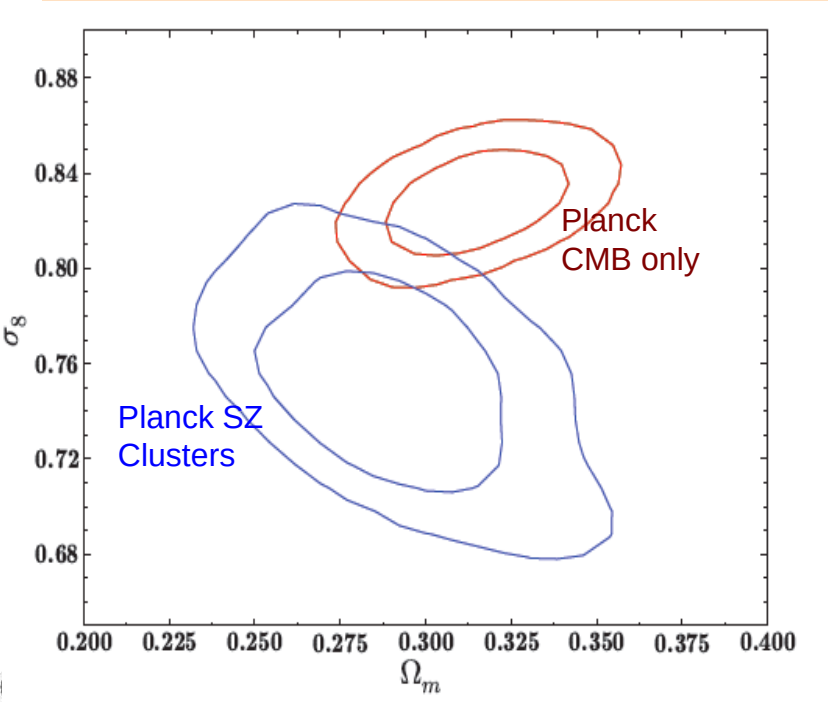
A2319 seen by PLANCK

Planck SZ cluster catalogue (PSZ1)



- Based on nominal mission data. Published in March 2013.
- New all-sky catalogue of 1227 SZ sources, the largest to date.
- Confirmed galaxy clusters: 861 (of which 178 are new).
- Candidate clusters: 366.
- Mass and redshift estimates for 813 clusters.





Optical Follow-up of Planck clusters (ITP13-8)

Optical follow-up and validation programmes (>300 candidates) in:

- **Canary Islands Observatories (ITP13-8)**
- ESO - Palomar - RTT

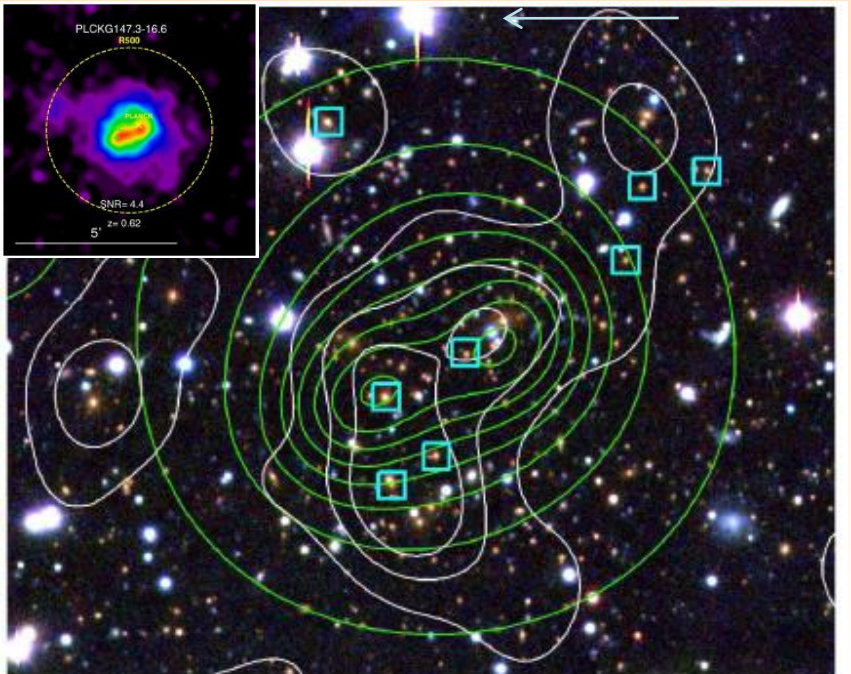
J. A. Rubiño (IP, IAC)
A. Streblyanska (Postdoc, IAC)
B. Ferragamo (Phd, IAC)
D. Tremonte (PhD, IAC)
R. Genova-Santos (Postdoc, IAC)

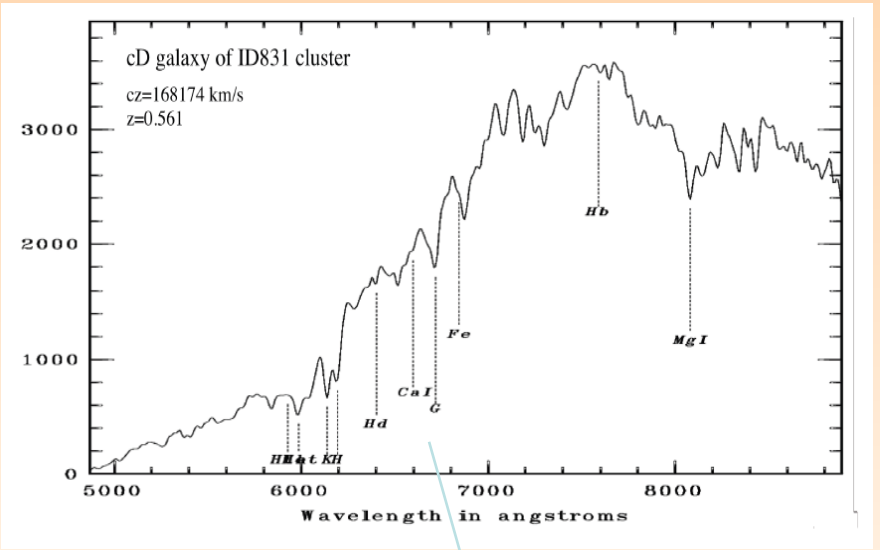
The ITP13-08 (Sep'13-Aug'15) includes:

- 22 night/telescope in the 2.5m INT, 3.6m TNG and 4.2m WHT
- 96 hours in GTC/OSIRIS

We have already observed more tan 220 clusters.

118 spec info → 90 Long-slit (ACAM/WHT and OSIRIS/GTC)
118 spec info → 31 MOS (TNG and GTC)

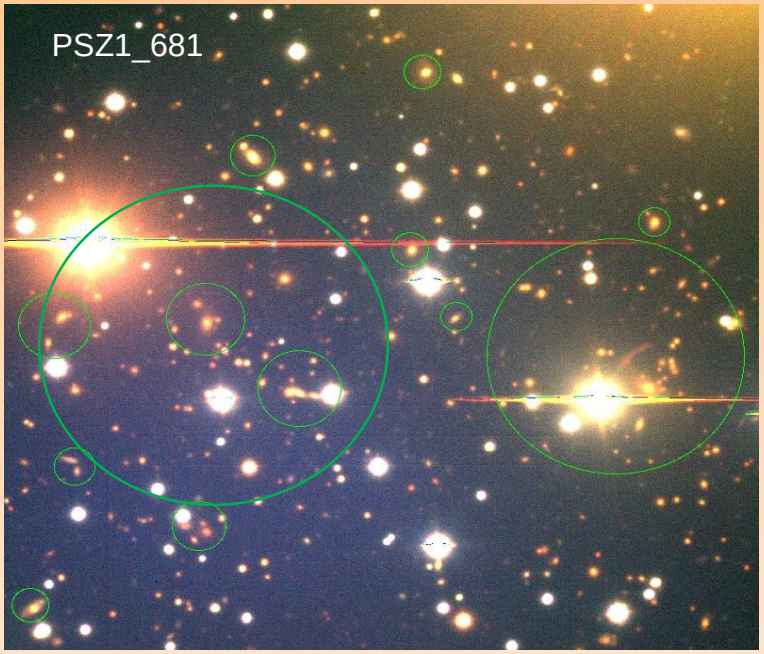




$z(Fe\ K) = 0.62$

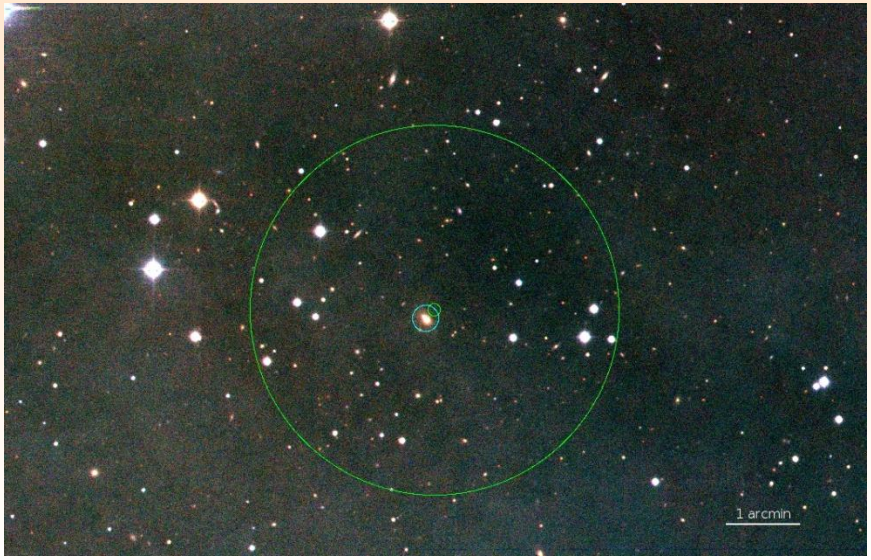
$z_{spec} = 0.660$

Multiple detections



Misidentifications

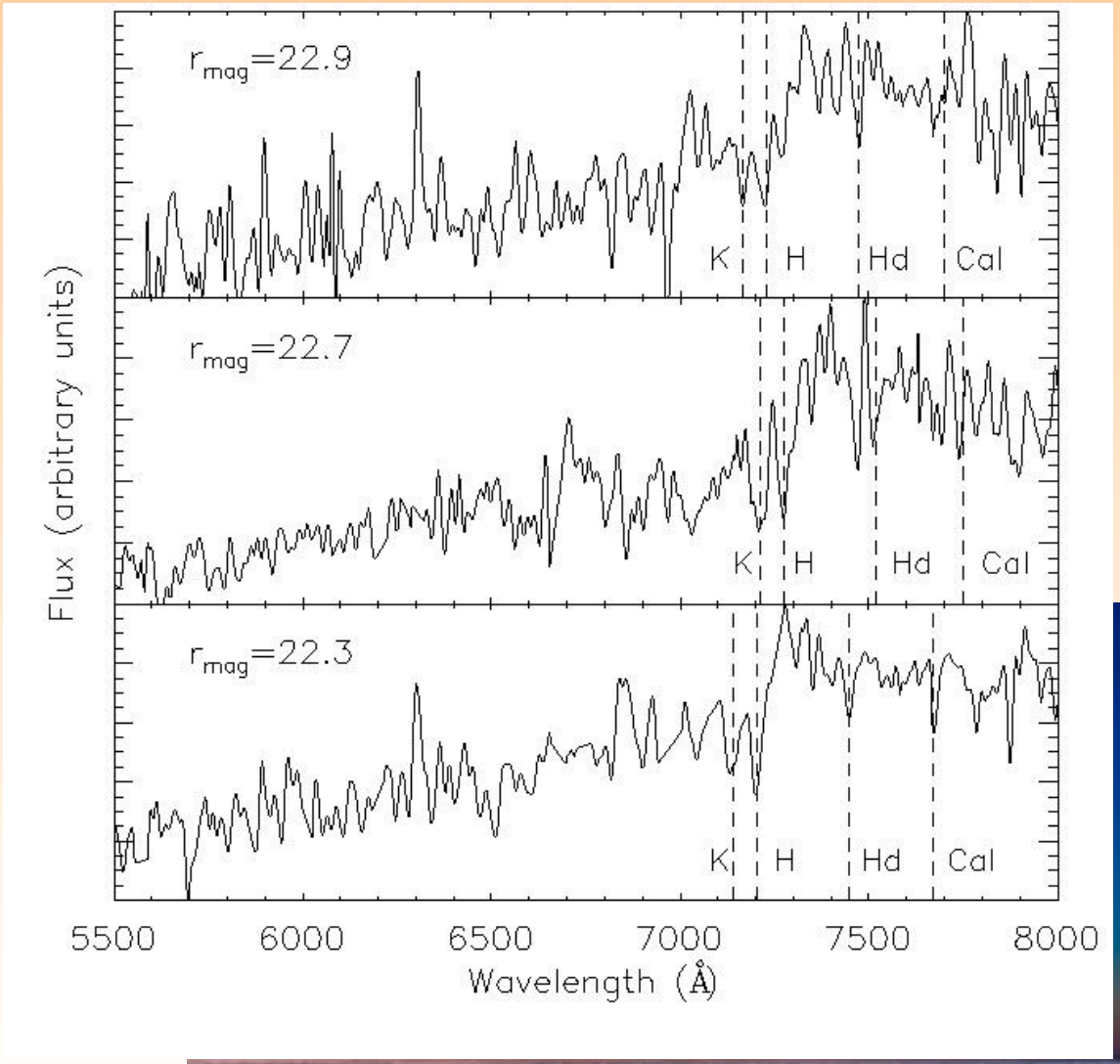
Fossil Clusters

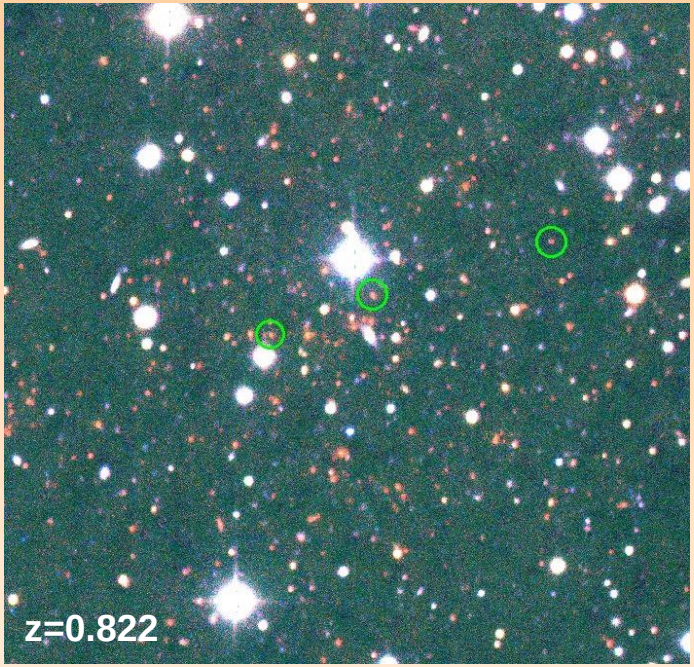


About 5% of the Planck SZ catalogue are misidentifications or non-detections

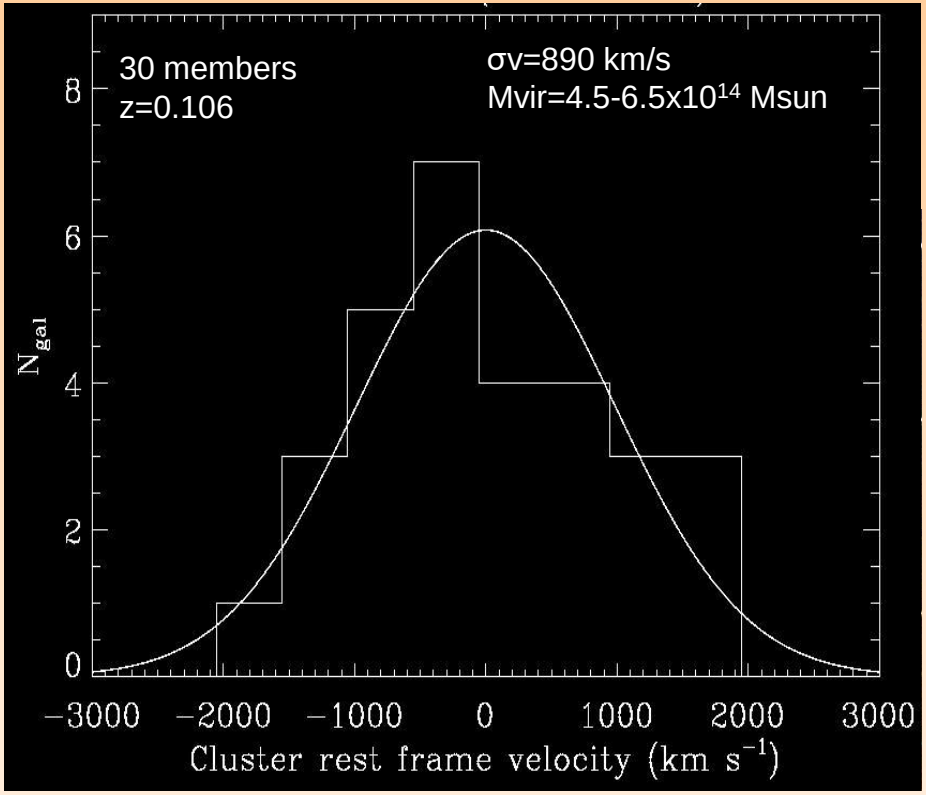
Optical Follow-up of Planck clusters (ITP13-8)

GTC spectroscopic confirmation of a cluster at z=0.822 (16 cluster members have been detected using MOS/OSIRIS).

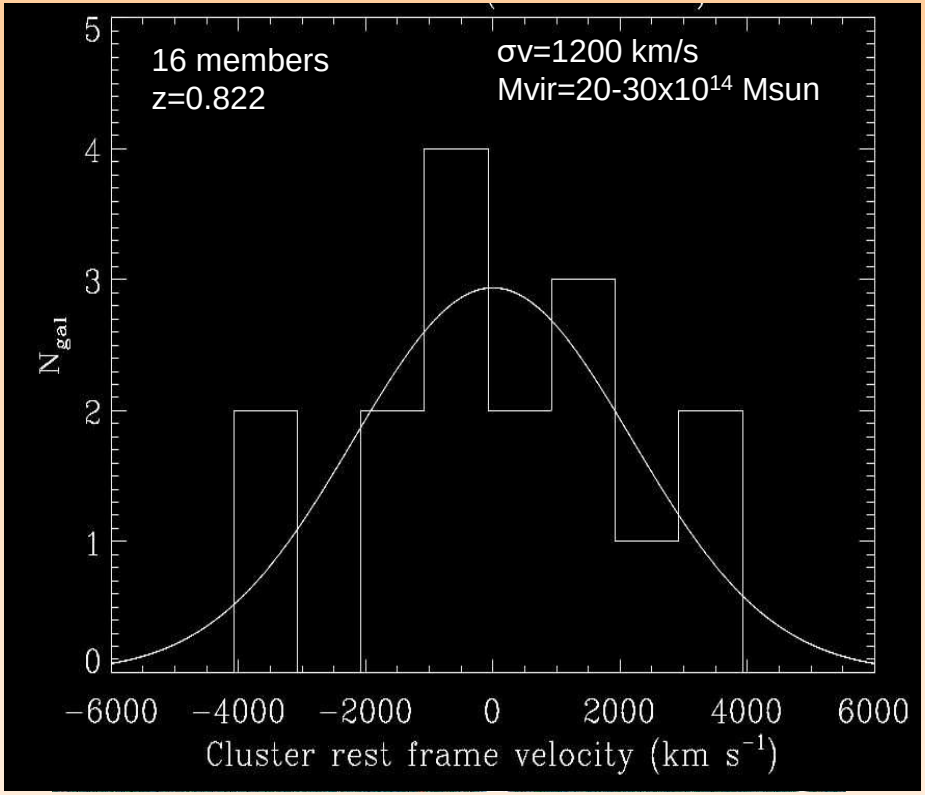




Optical Follow-up of Planck clusters (ITP13-08)



TNG/DOLORES (z=0.106)



OSIRIS/GTC (z=0.822)

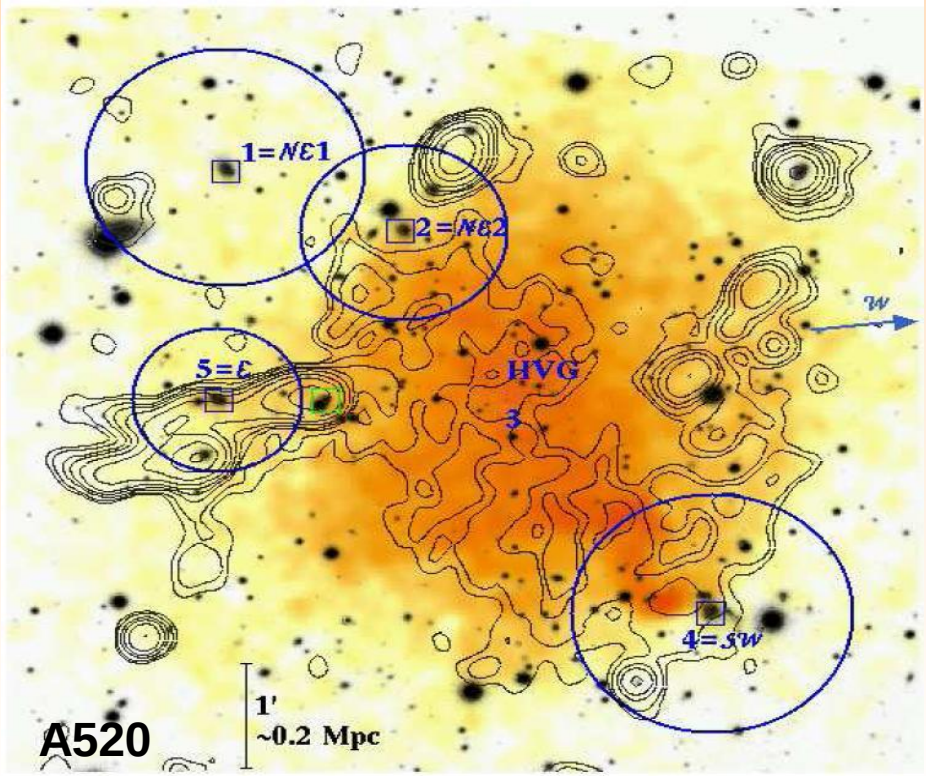
	N	# Members	Redshift	σv (km/s)	Mvir (x10^{14} Msun)
TNG/MOS	20	15-30	0.1-0.4	600-1200 km/s	1-30
GTC/MOS	3(+8)	15-30	0.4-0.85	600-1200 km/s	4-30

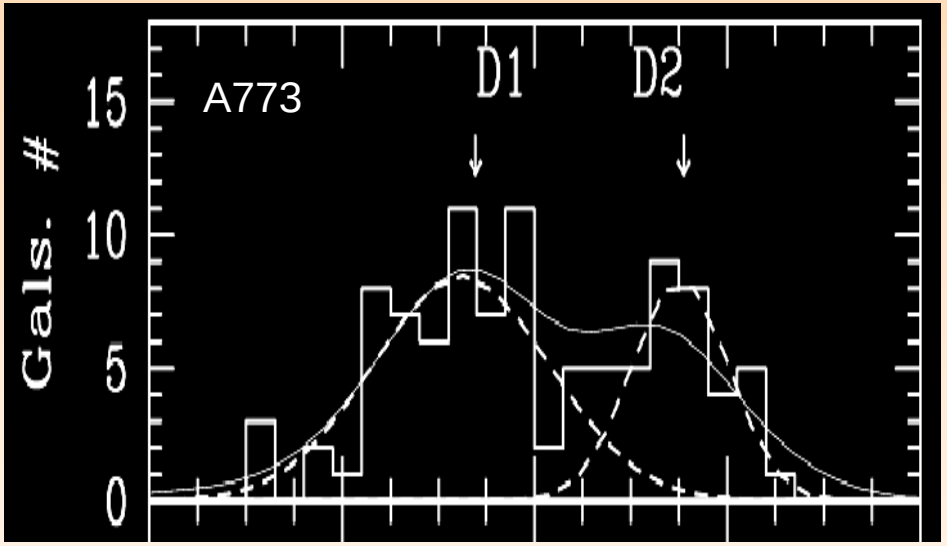
Dynamics of galaxy clusters with diffuse radio emission and X rays (The DARC project)

- Are rich clusters really virialized?
- What's the **origin of diffuse radio emission**?
- How to explain **X-ray enhancement**
- Difference between radio halos and relics?

We develop MOS observations to sample the velocity field of clusters, identify substructures, determine masses and analyze the dynamical status of clusters.

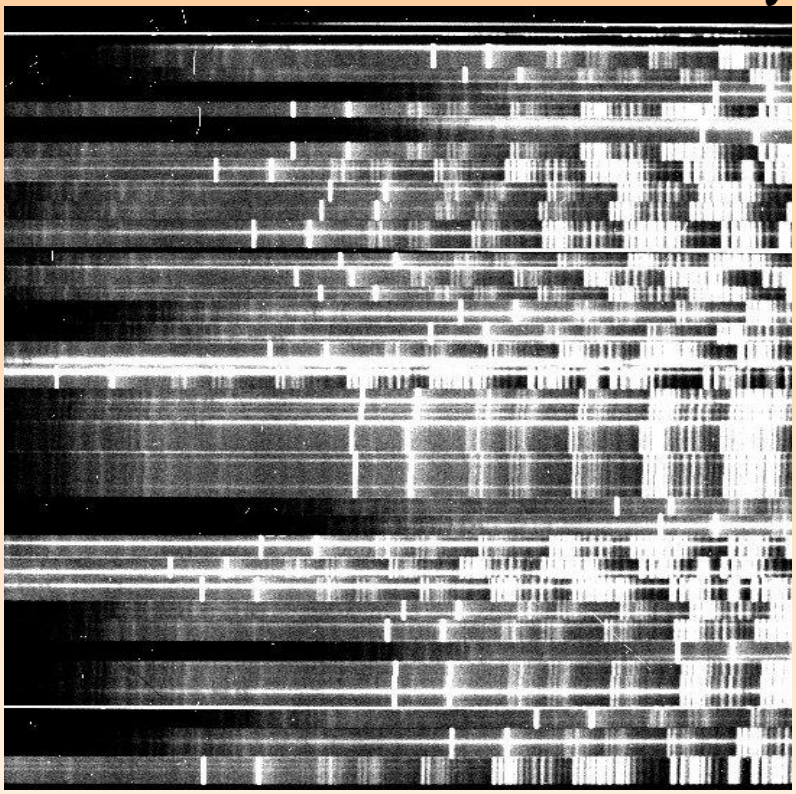
1.- Magnetic fields are really strong in these clusters
2.- There is a huge population of relativistic electrons
What is the meganism for accelerating electros?





M. Girardi – Osservatorio Astronomico di Trieste
R. Barrena – Instituto de Astrofisica de Canarias
W. Boschin – Telescopio Nazionale Galileo
Colaboradores – L. Feretti, E. Ellingson (OAB)

Conclusions



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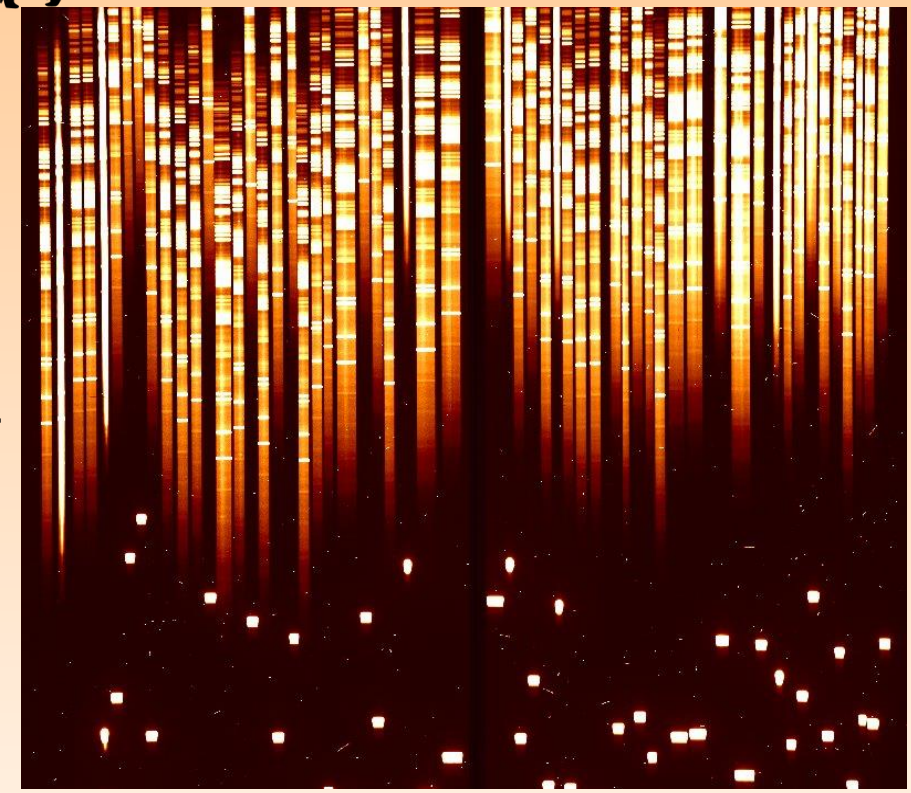

DOLORES/TNG & **OSIRIS**/GTC
are the ideal couple to investigate Galaxy Clusters
at 0.1<z<0.4 & 0.3>z>0.85