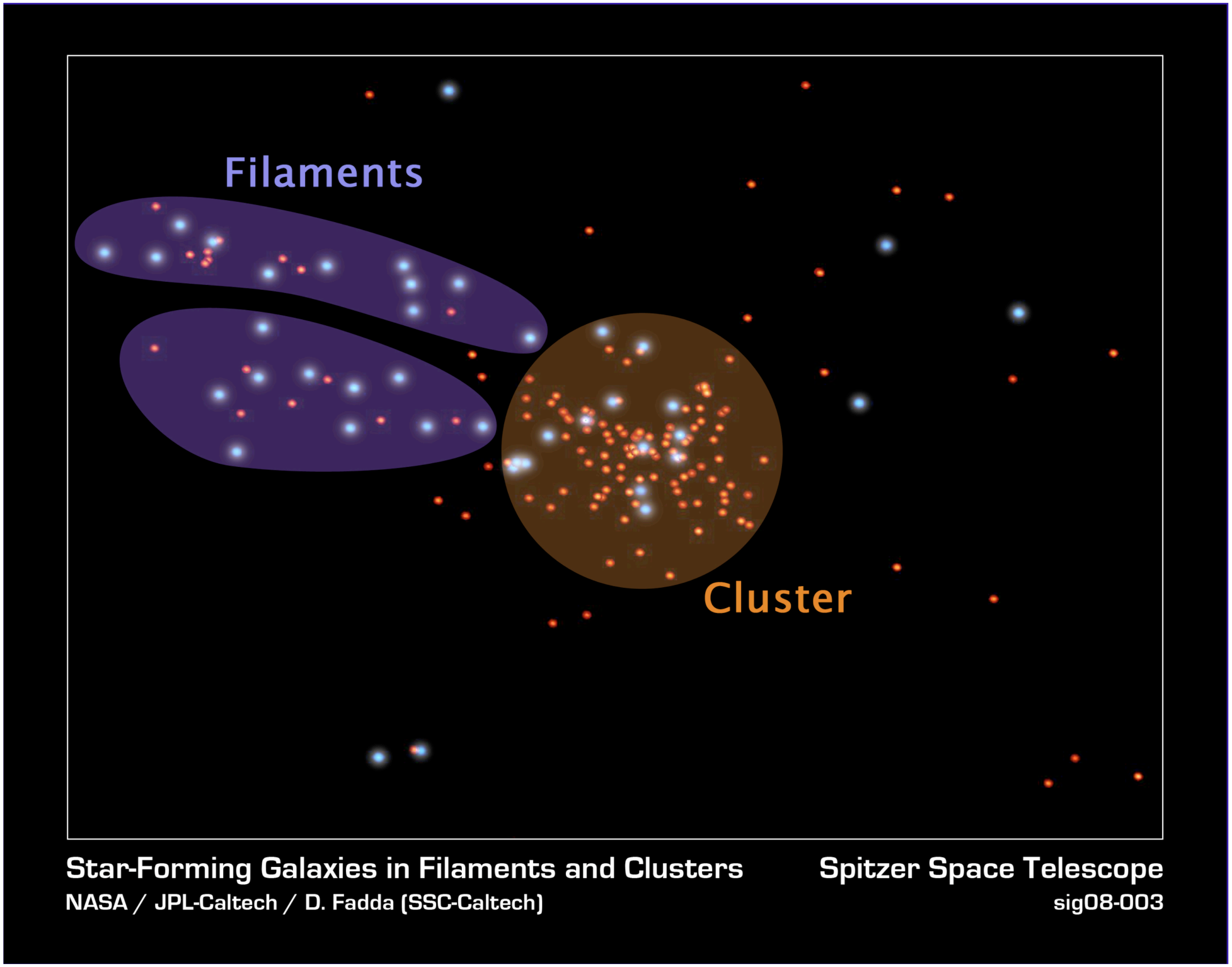
Evolution in the Moderate Redshift Cluster Abell 1763



- 2 galaxy filaments
- Southern directed to Abell 1770
- $\sigma N = -135 \pm 138$ km/s
- $\sigma S = 300 \pm 99$ km/s

L.O.V. Edwards
with
D. Fadda
F. Marleau
L. Storrie-Lombardi
A. Biviano
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G. Lima Neto

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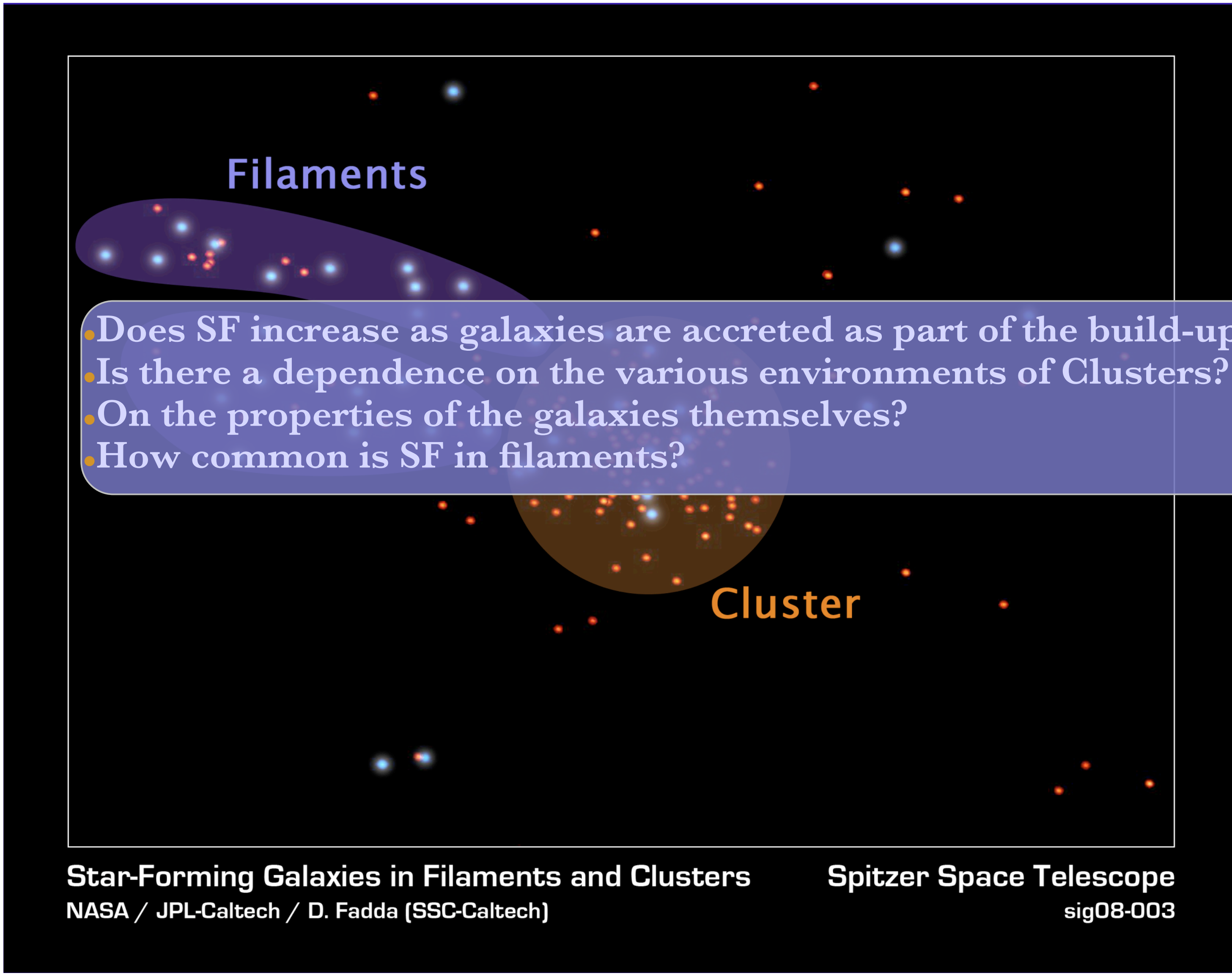

- Does SF increase as galaxies are accreted as part of the build-up of clusters?
- Is there a dependence on the various environments of Clusters?
- On the properties of the galaxies themselves?
- How common is SF in filaments?

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Galaxy Evolution as a function of Environment

- Perhaps highest density peaks formed first galaxies and SF finished first
- But there are so many plausible environmental effects
  - Ram-pressure (cold)
  - Strangulation (hot)
  - Harassment
  - Galaxy-galaxy interactions (or lack there of)

Galaxy Evolution as a function of Environment

- Cluster galaxies have less ongoing SF, less cold gas, and higher B/T than field galaxies.

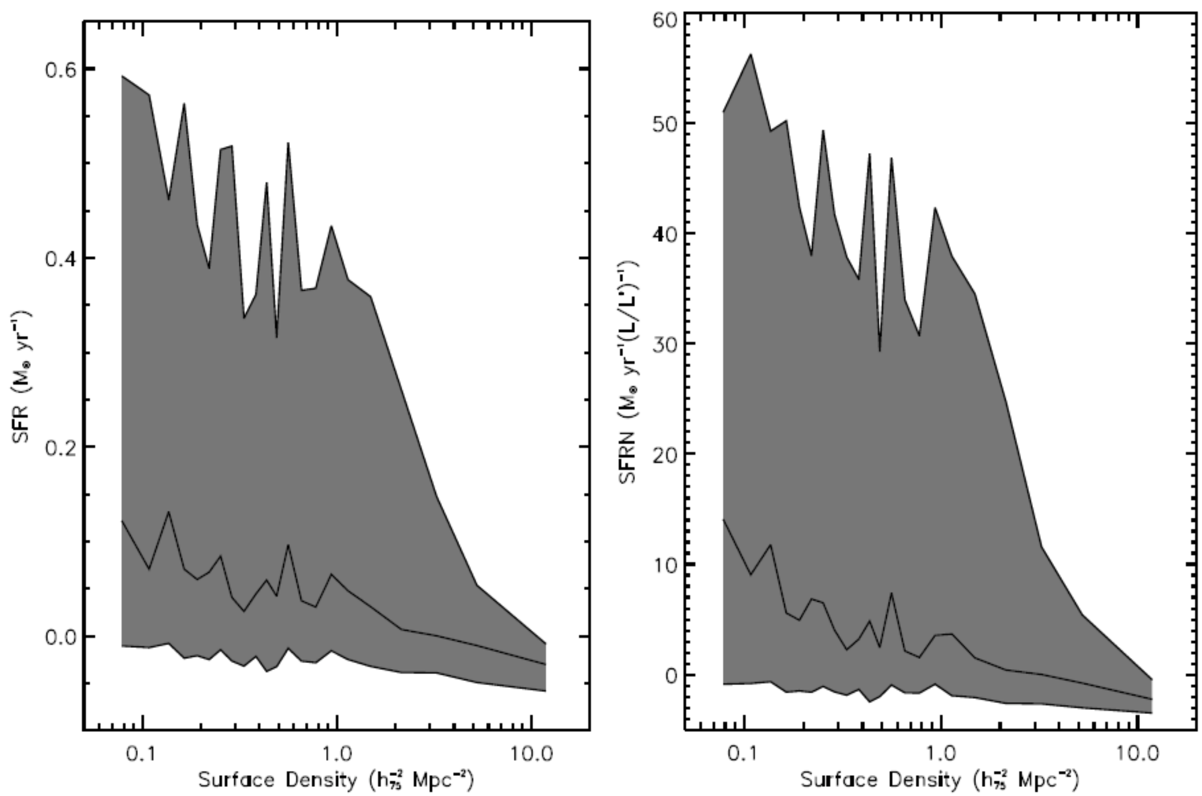


FIG. 4.— (Left) The shaded area represents the distribution of corrected SFR (Hopkins et al. 2001) as a function of the projected local surface density of galaxies. (Right) The shaded area represents the distribution of SFRN (the normalized SFR; see text) as a function of the projected local surface density of galaxies. In both plots, the top of the shaded area is the 75^{th} percentile, while the bottom is the 25^{th} percentile. The median is shown as a solid line. We have used all available galaxies in the SDSS EDR that satisfy our selection criteria. We have excluded galaxies near the edge of the survey and those which may have an AGN present based on the Kewley et al. (2001) prescription. Each bin contains 150 galaxies. These plots represents the density–SFR relation that is analogous to the density-morphology relation of Dressler (1980). We note here that the SFRs presented here are not corrected for the 3 arcsecond SDSS fiber aperture and are therefore, systematically lower, by a factor of ~ 5, compared to total SFRs derived from the radio or by integrating the light from the whole galaxy (see Hopkins et al., in prep)

Gomez et al. 2003 SDSS Local Galaxies

Galaxy Evolution as a function of Environment

- Cluster galaxies have less ongoing SF, less cold gas, and higher B/T than field galaxies.

- To understand the earlier stages, need to probe the outer cluster regions and infalling galaxies.

- Intermediate environments – Intense SB before quenching

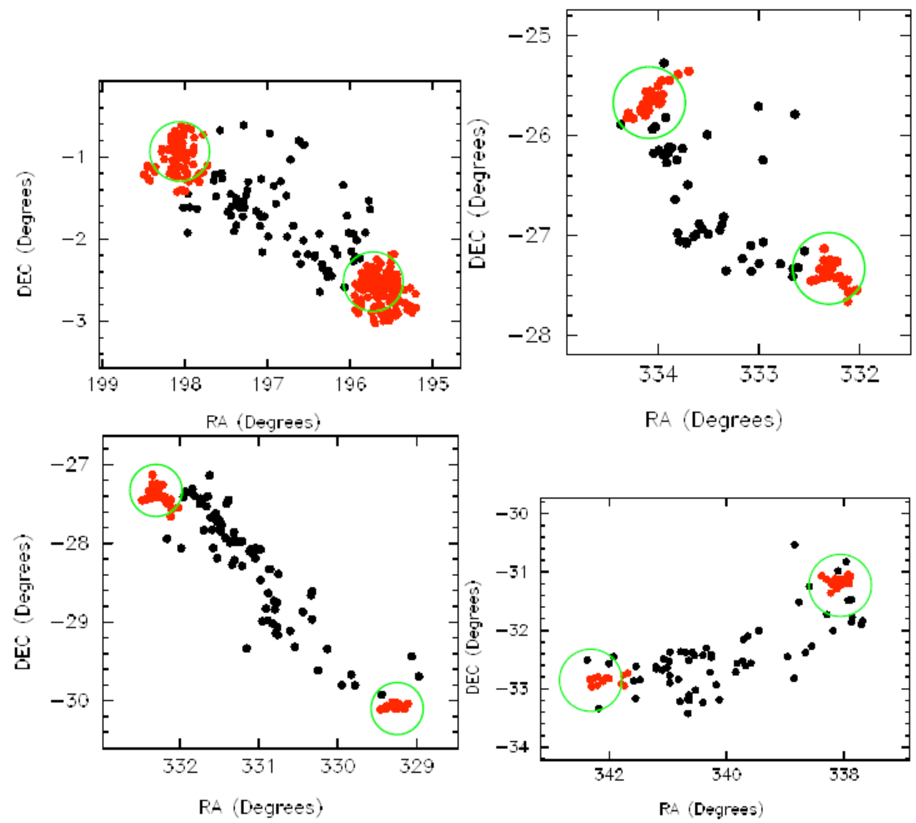


Figure 1. A few of the "clean filaments" used in this paper. The dots represent the galaxies from the 2dFGRS (with spectroscopic redshifts) included in these filaments joining the clusters (a) Abell 1692 and Abell 1663, (b) Abell 3837 and EDCC 0119, (c) Abell 2660 and APMCC 917, and (d) EDCC 365 and Abell S1155. Cluster members are shown in red, and the Abell radius (2.1 h_{70}^{-1} Mpc) is shown as a green circle.

Porter et al. 08

Activity in Filaments

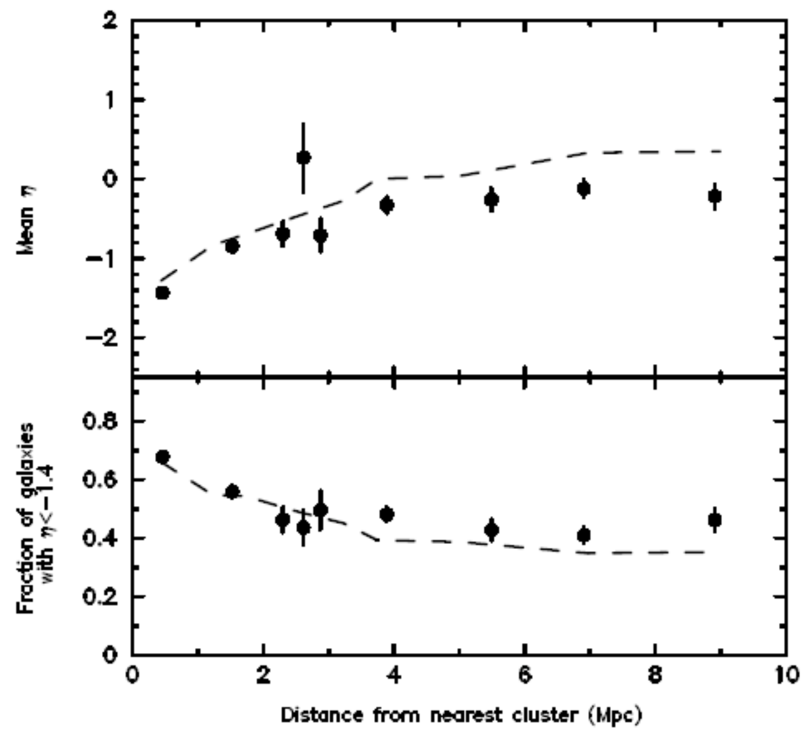
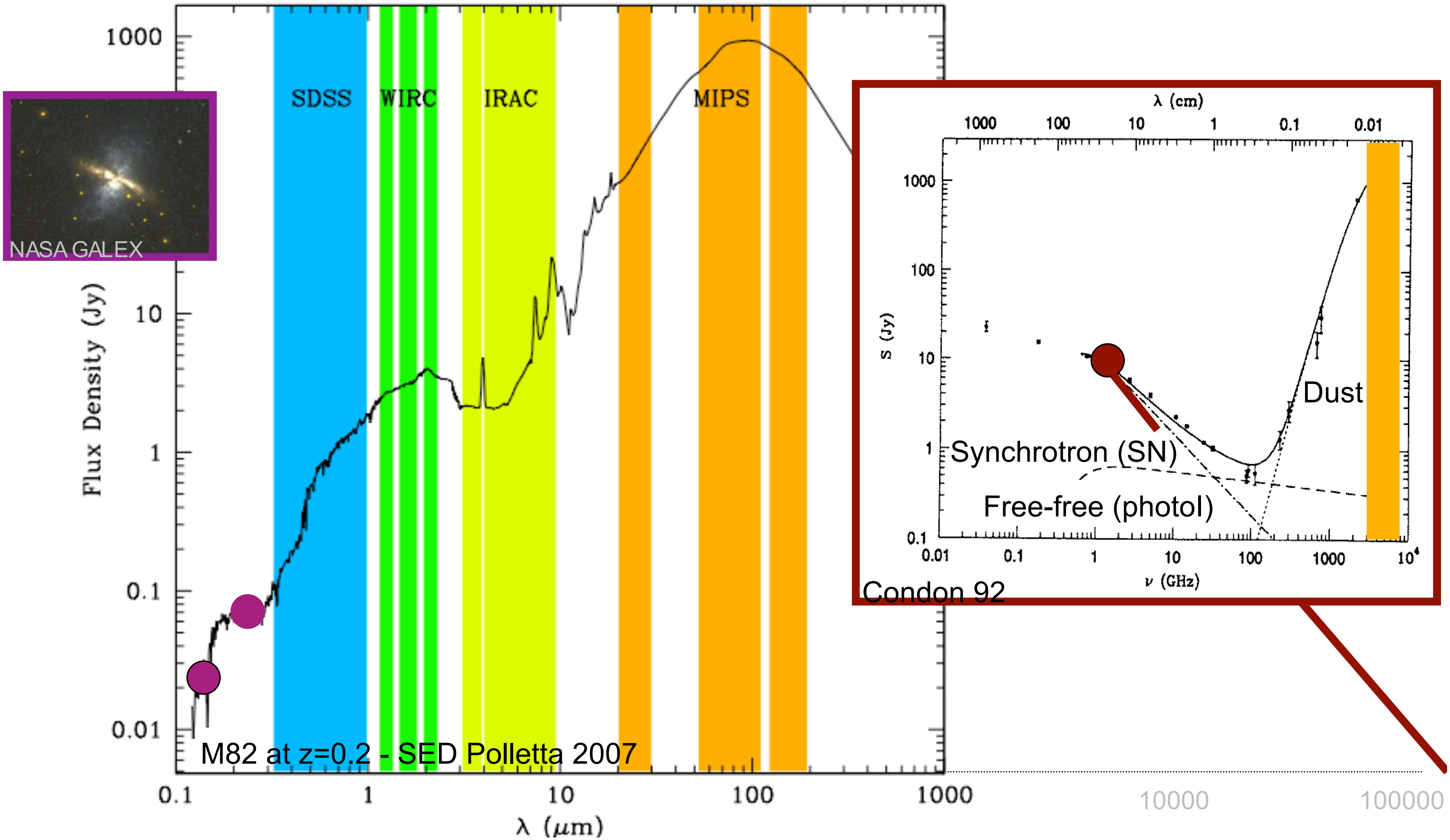


Figure 3. (a, Top) The mean value of η of galaxies belonging to the "clean" sample of 52 filaments, as a function of distance from the nearest cluster, is plotted here. The dashed line shows the mean η as function of distance from the nearest cluster (defined as a 2PIGG group with $\geqslant 30$ members) for *all* 2dFGRS galaxies. (b, Bottom) For the same galaxies as in the top panel the fraction of these galaxies with an $\eta < -1.4$ is shown as a function of distance from the nearest cluster. The dashed line showing the same fraction as a function of distance from the nearest 2PIGG group with $\geqslant 30$ members for the whole 2dFGRS.

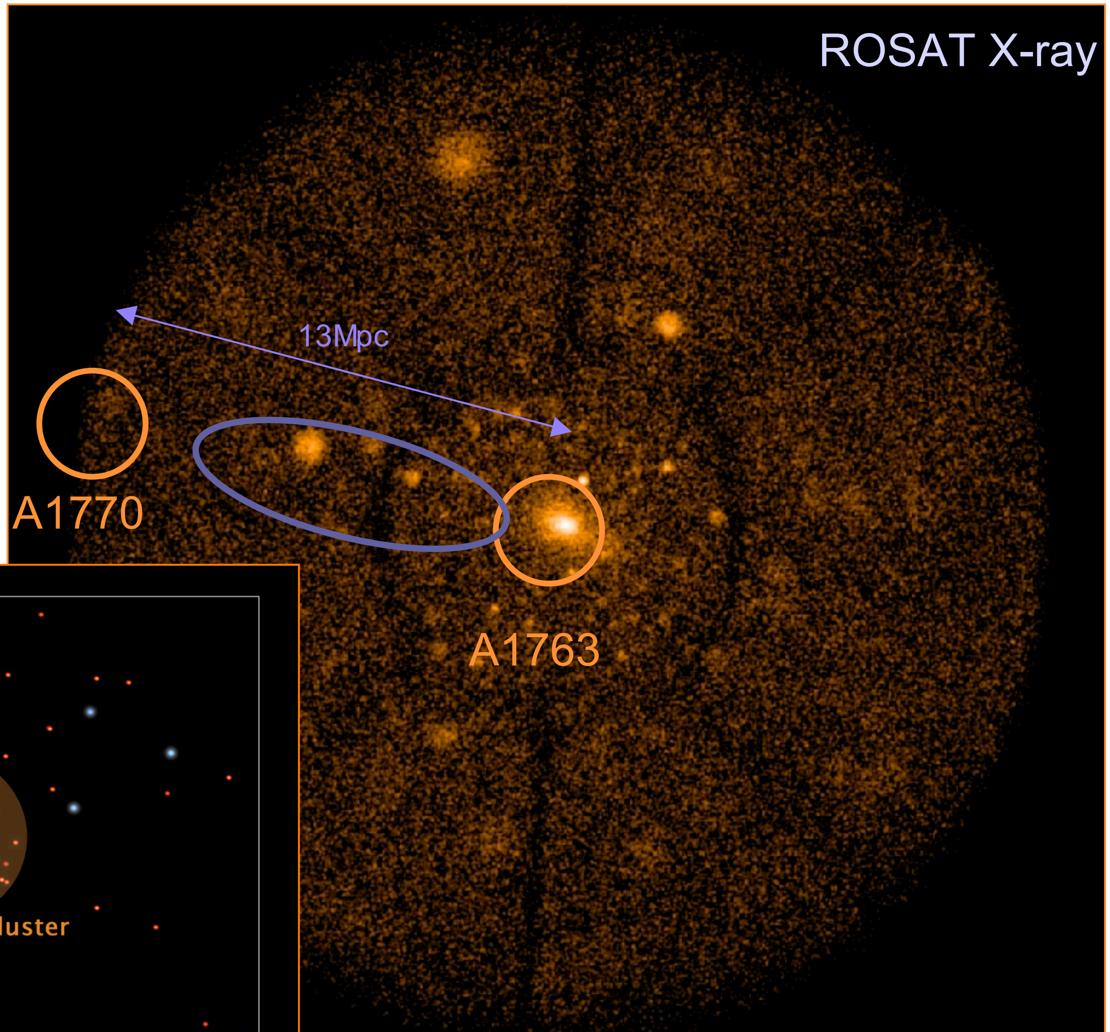
Porter et al. 08

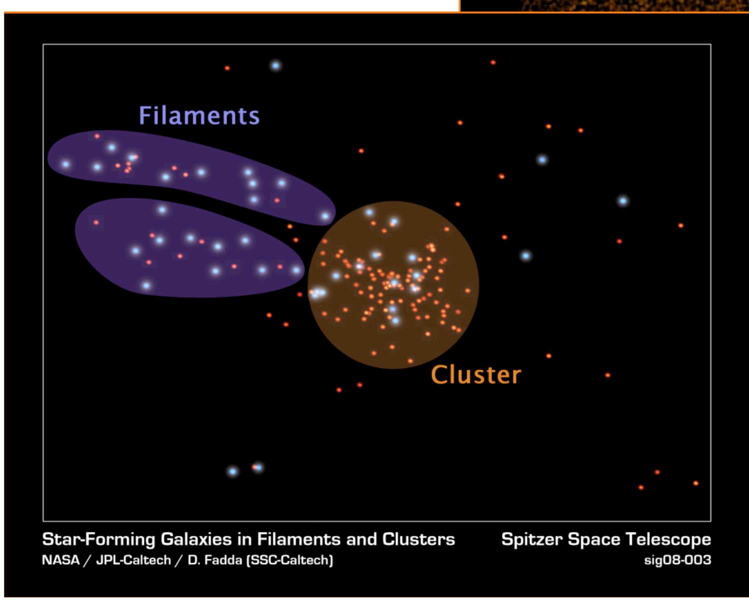
Multi-wavelength Observations

UV ext corr SF | colours+spec | masses | Hidden SF | total SF



The Abell 1763 - Abell 1770 Superstructure



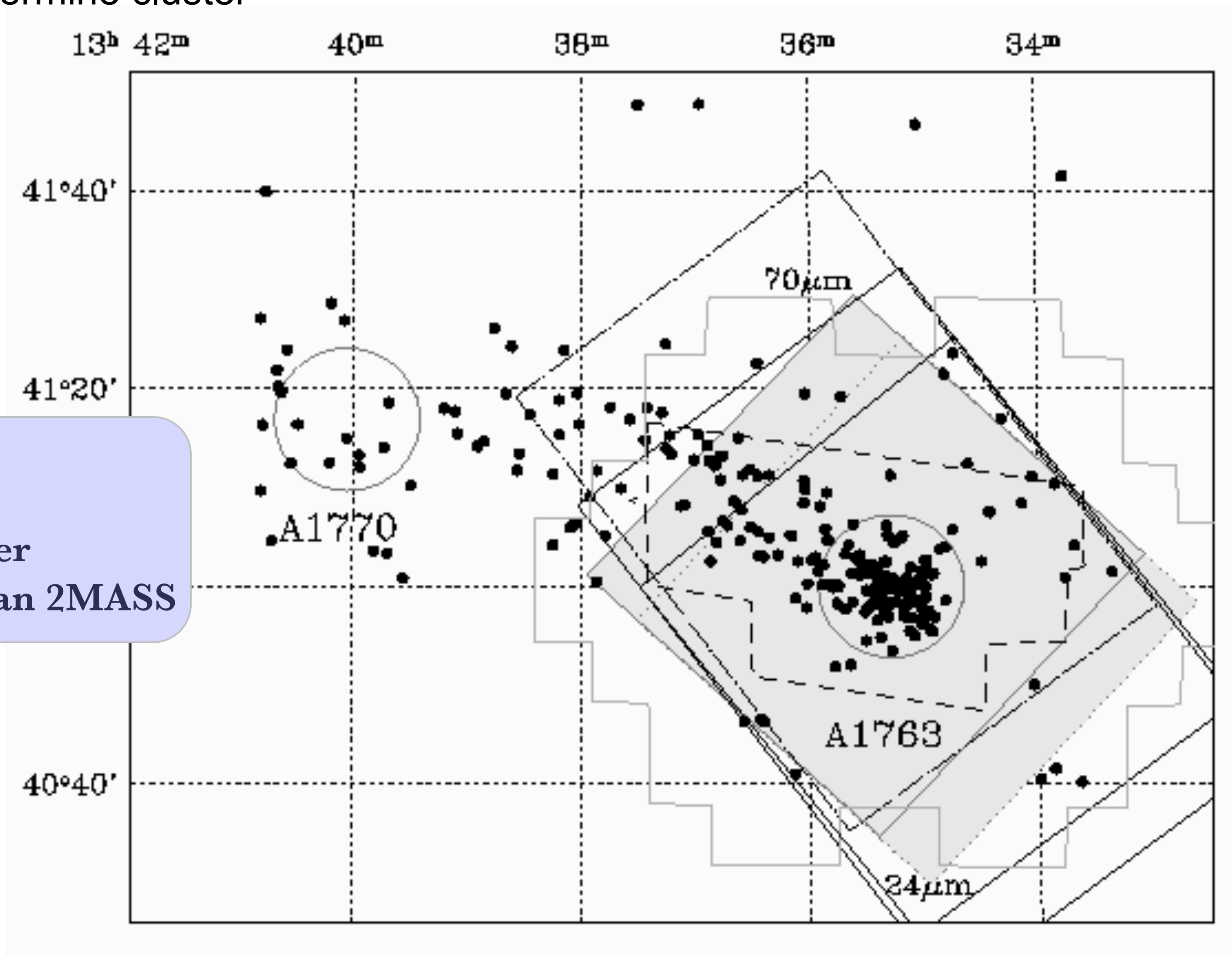


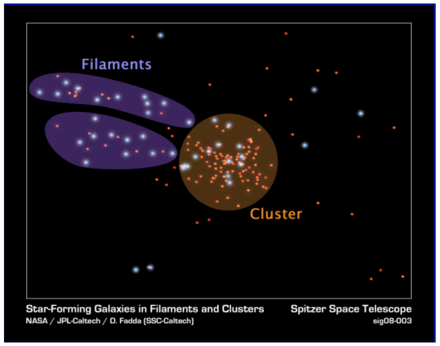
Optical and IR Data

We obtain spec_z's to determine cluster membership

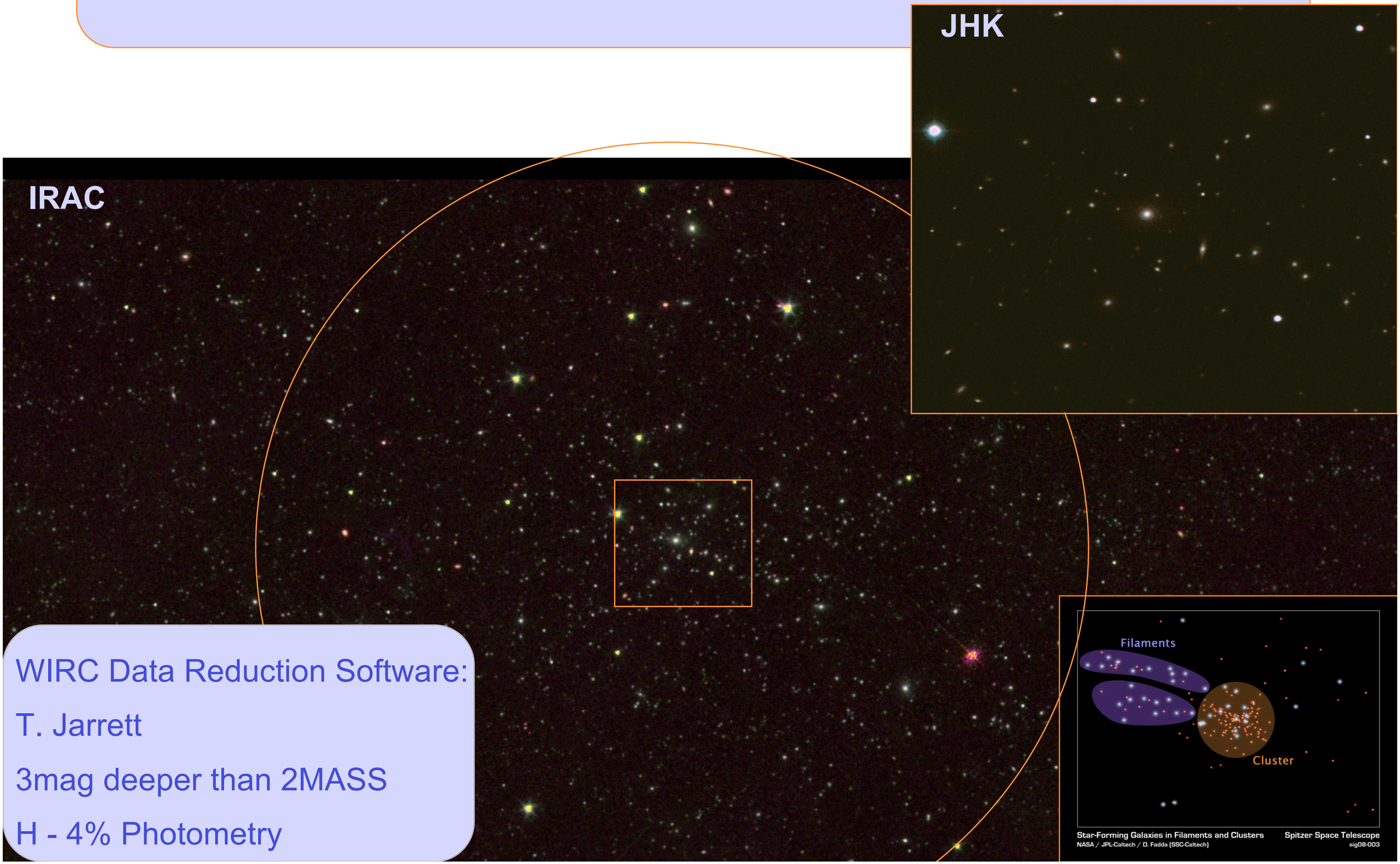
Survey	N_z Total	N_z Cluster	N_z Cluster & 24μm
WIYN	573	174	83
TNG	297	35	8
SDSS	139	104	16
Total	988	294	93

- **IRAC Field 39' by 39'**
- **MIPS Field 40' by 55'**
- **SDSS+r' at 2mag deeper**
- **WIRC 3mag deeper than 2MASS**





JHK and IRAC Images



WIRC Data Reduction Software:

T. Jarrett

3mag deeper than 2MASS

H - 4% Photometry

MIPS24 Source Catalogs and SED Fitting

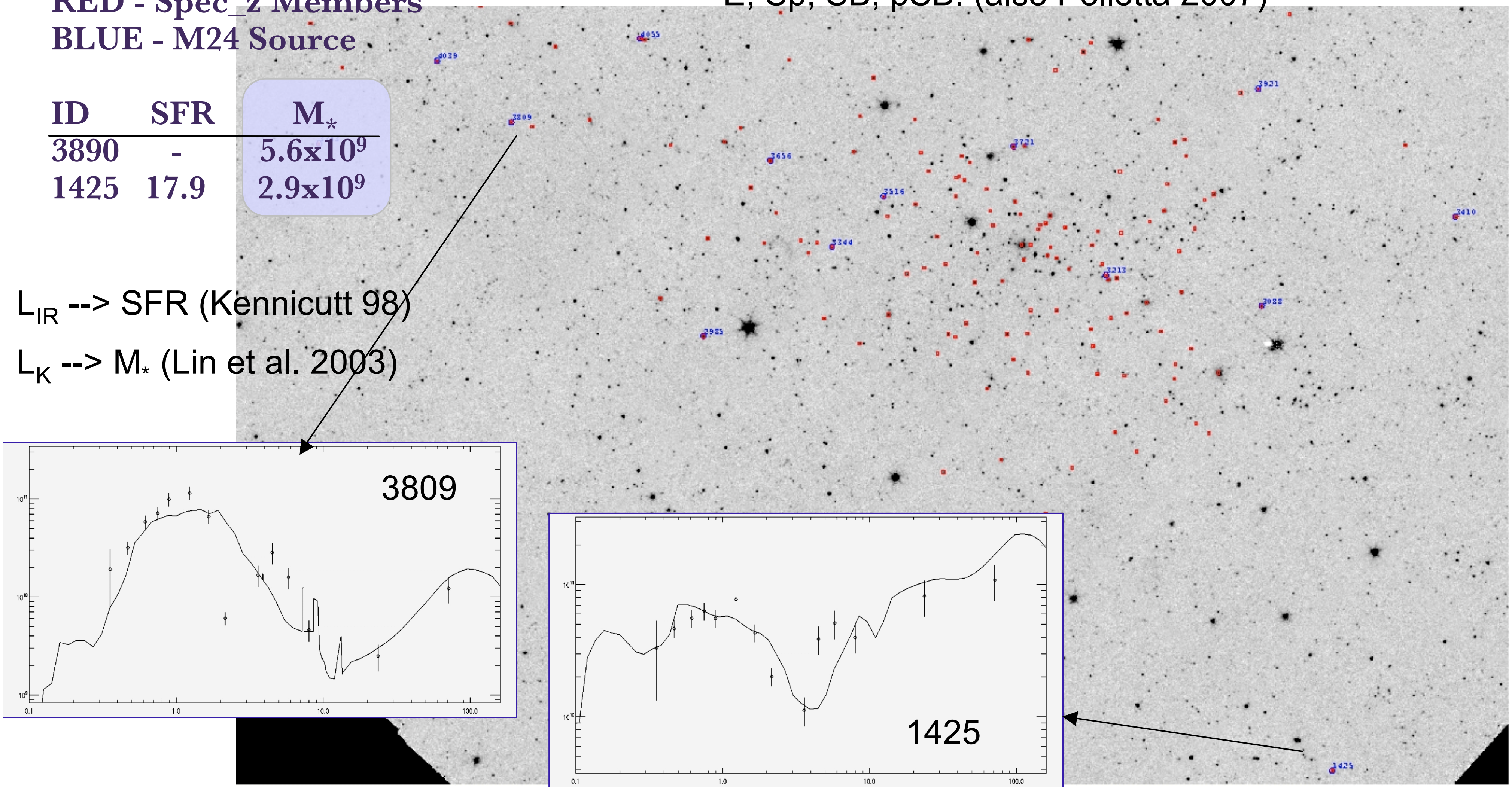
TEMPLATES: GRASIL (Silva et al. 1998)
E, Sp, SB, pSB. (also Polletta 2007)

RED - Spec_z Members
BLUE - M24 Source

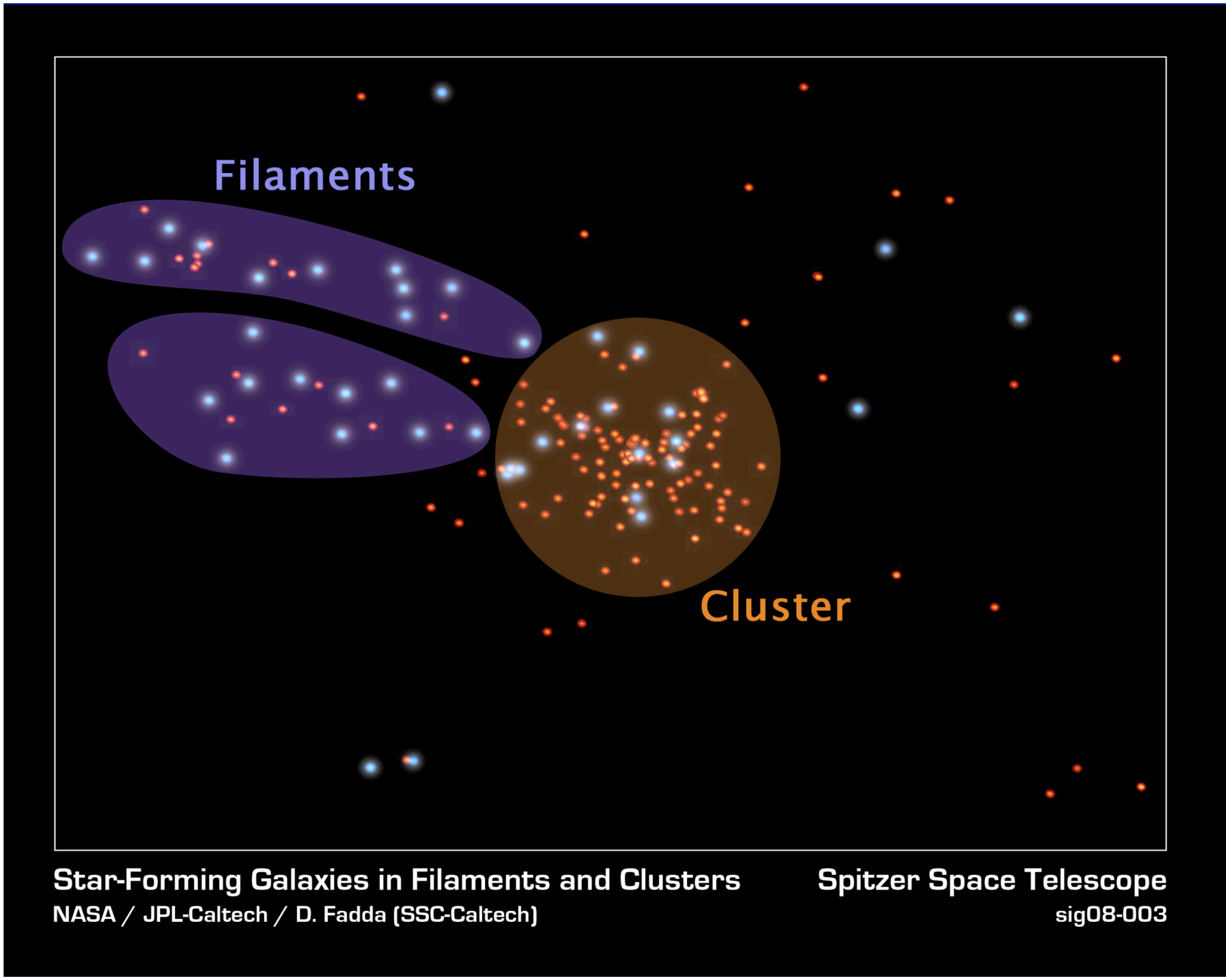
ID	SFR	M_*
3890	-	5.6×10^9
1425	17.9	2.9×10^9

L_{IR} --> SFR (Kennicutt 98)

L_K --> M_* (Lin et al. 2003)



Results: Star Forming Galaxies Preferentially Inhabit the Filaments



Fraction of SB galaxies:

filaments: 0.6±0.1
central r_{500}: 0.3±0.1
outer-filaments: 0.2±0.1

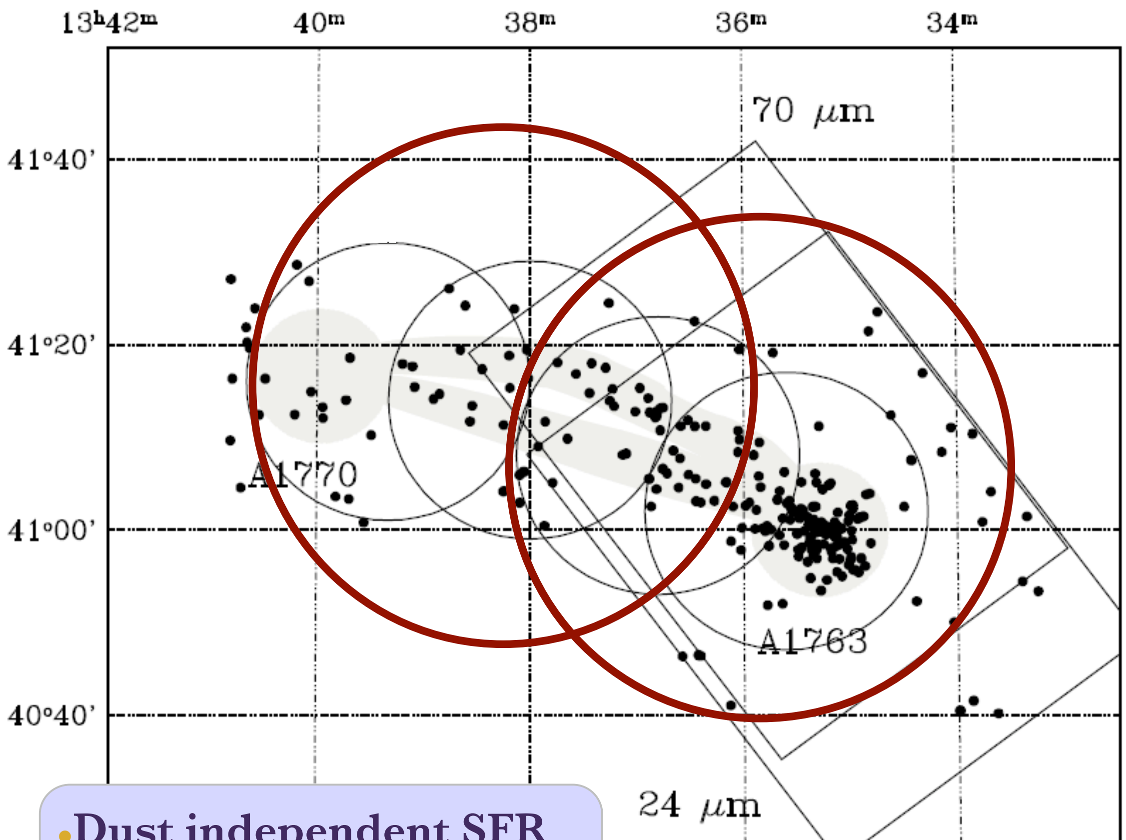
$f_{sb} = \tau \times SFR / M_*$

= 0.26± 0.02 (filaments)

= 0.14± 0.02 (cluster)

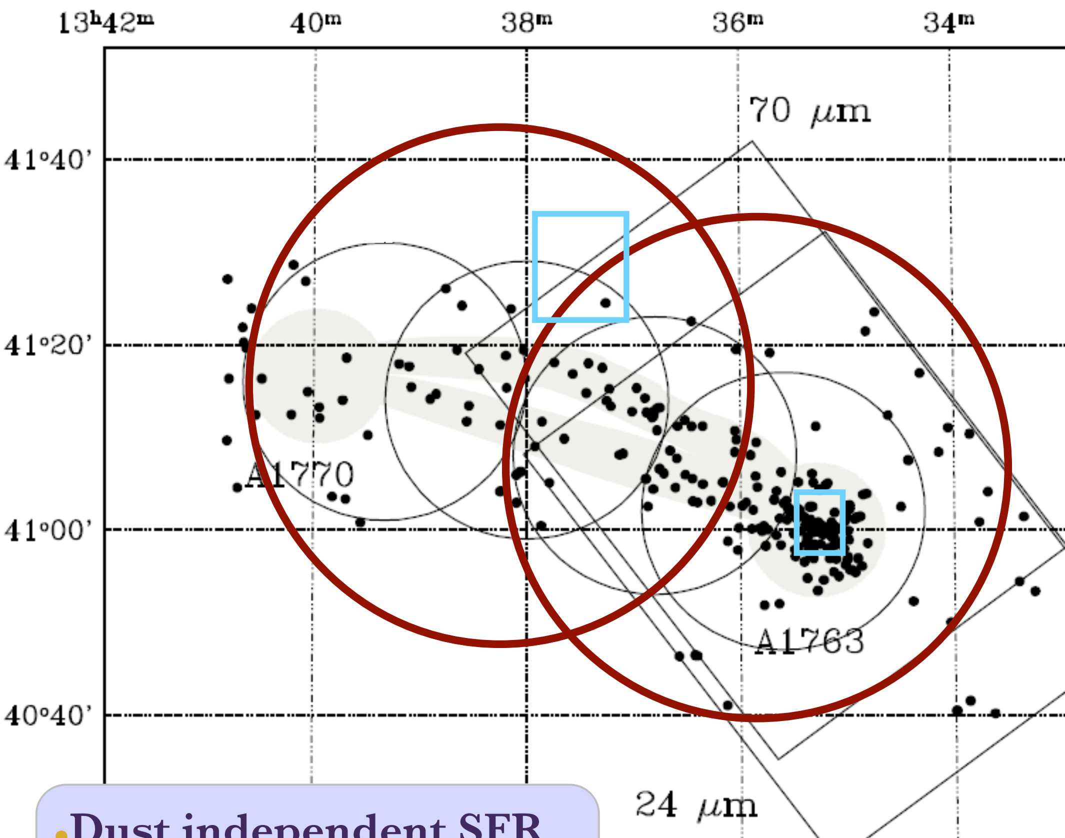
= 0.17± 0.02(outer-fil)

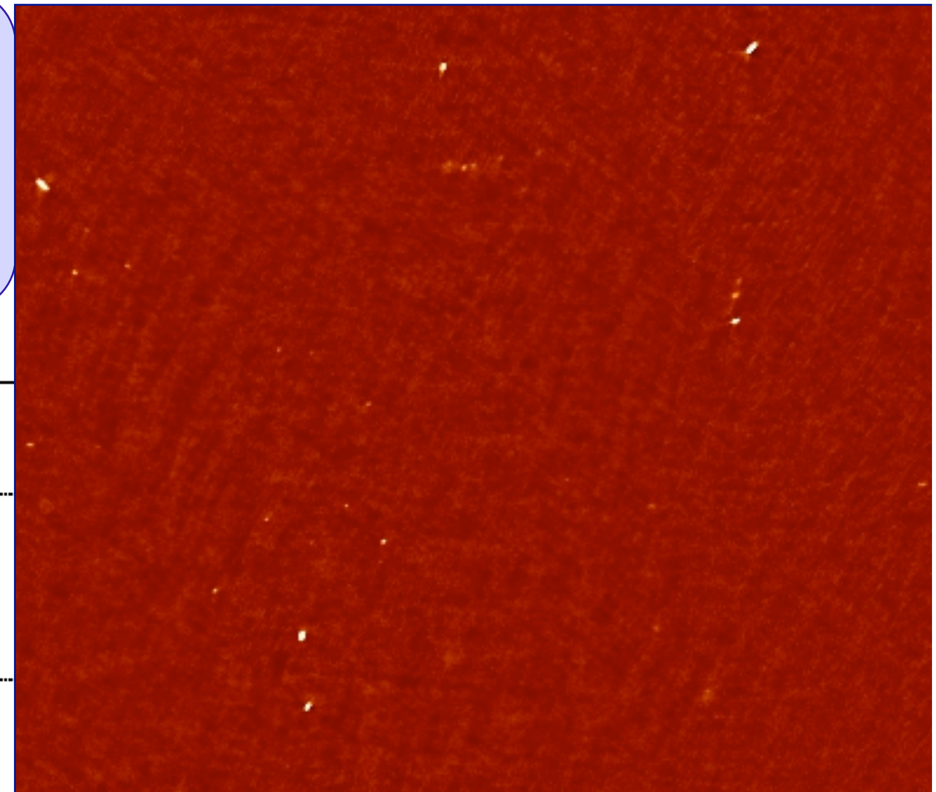
Radio Data

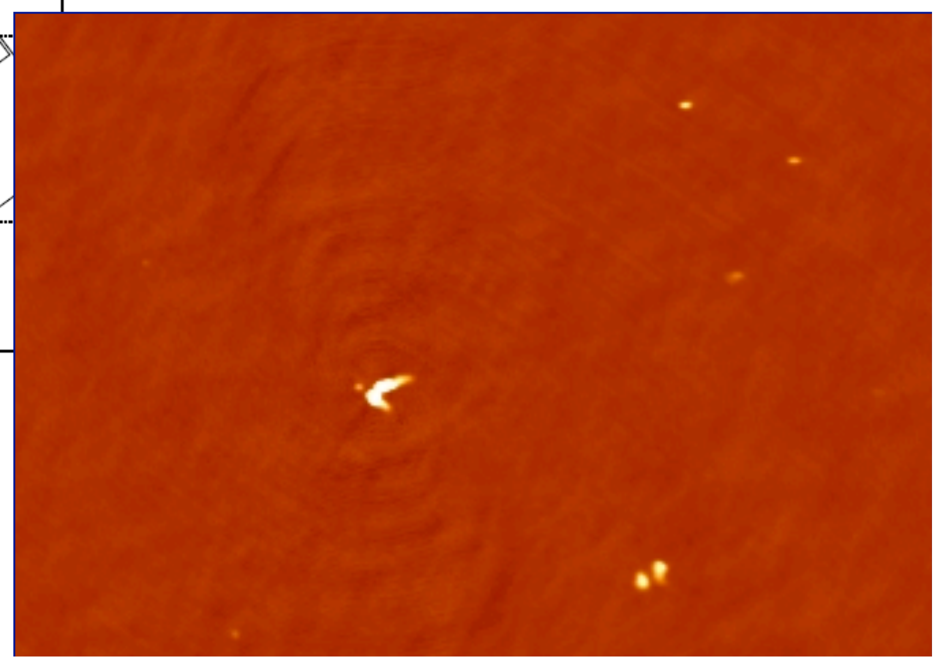


- Dust independent SFR
- FIR-Radio Correlation
  - AGN/SF

Radio Data







- Dust independent SFR
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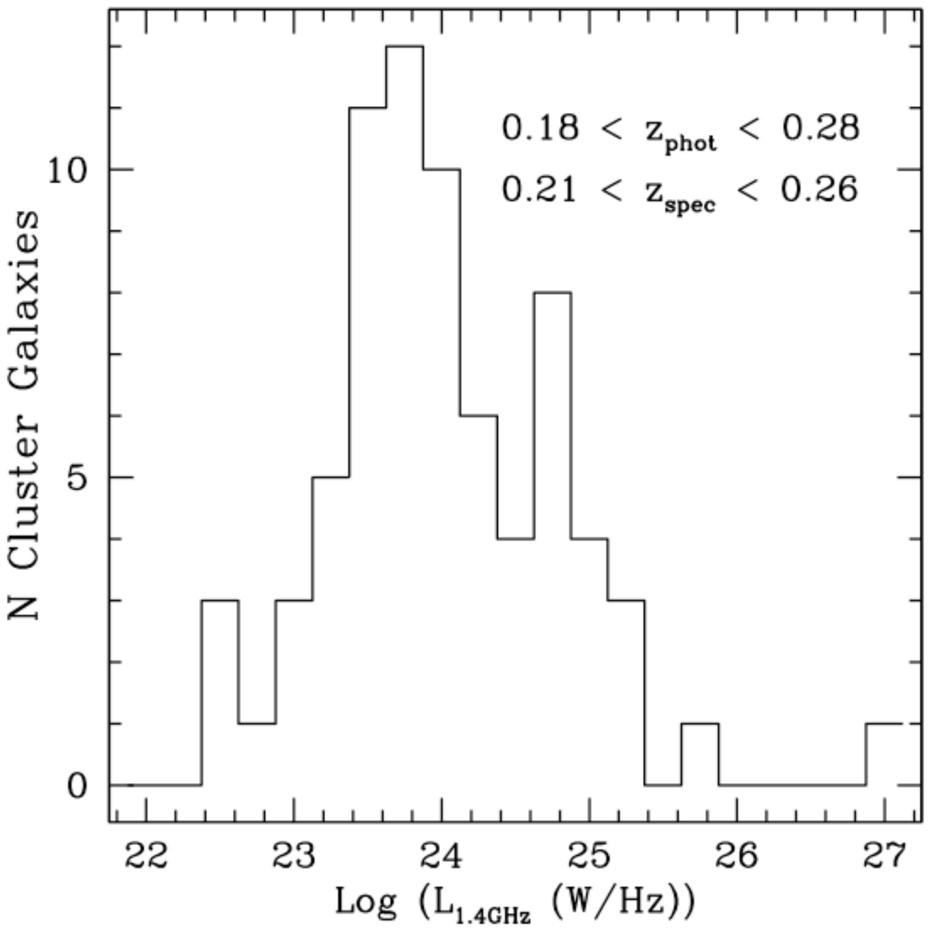
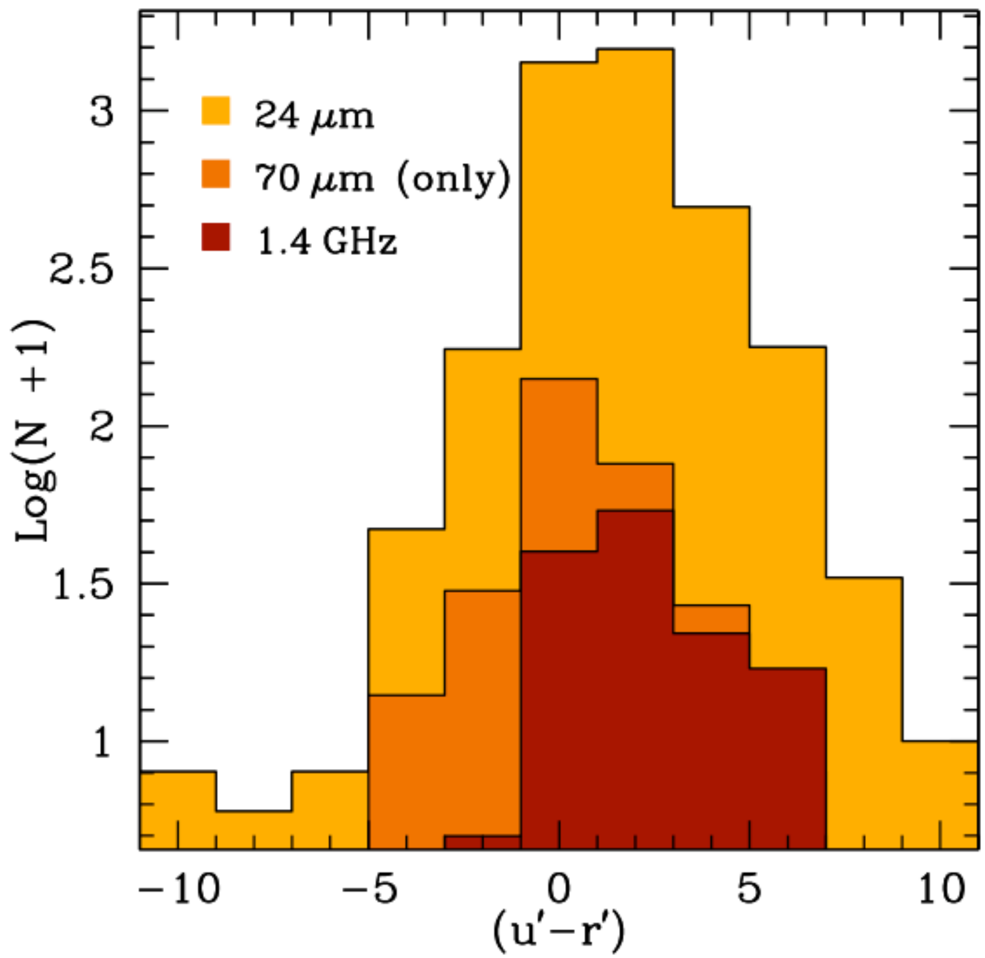
  - AGN/SF

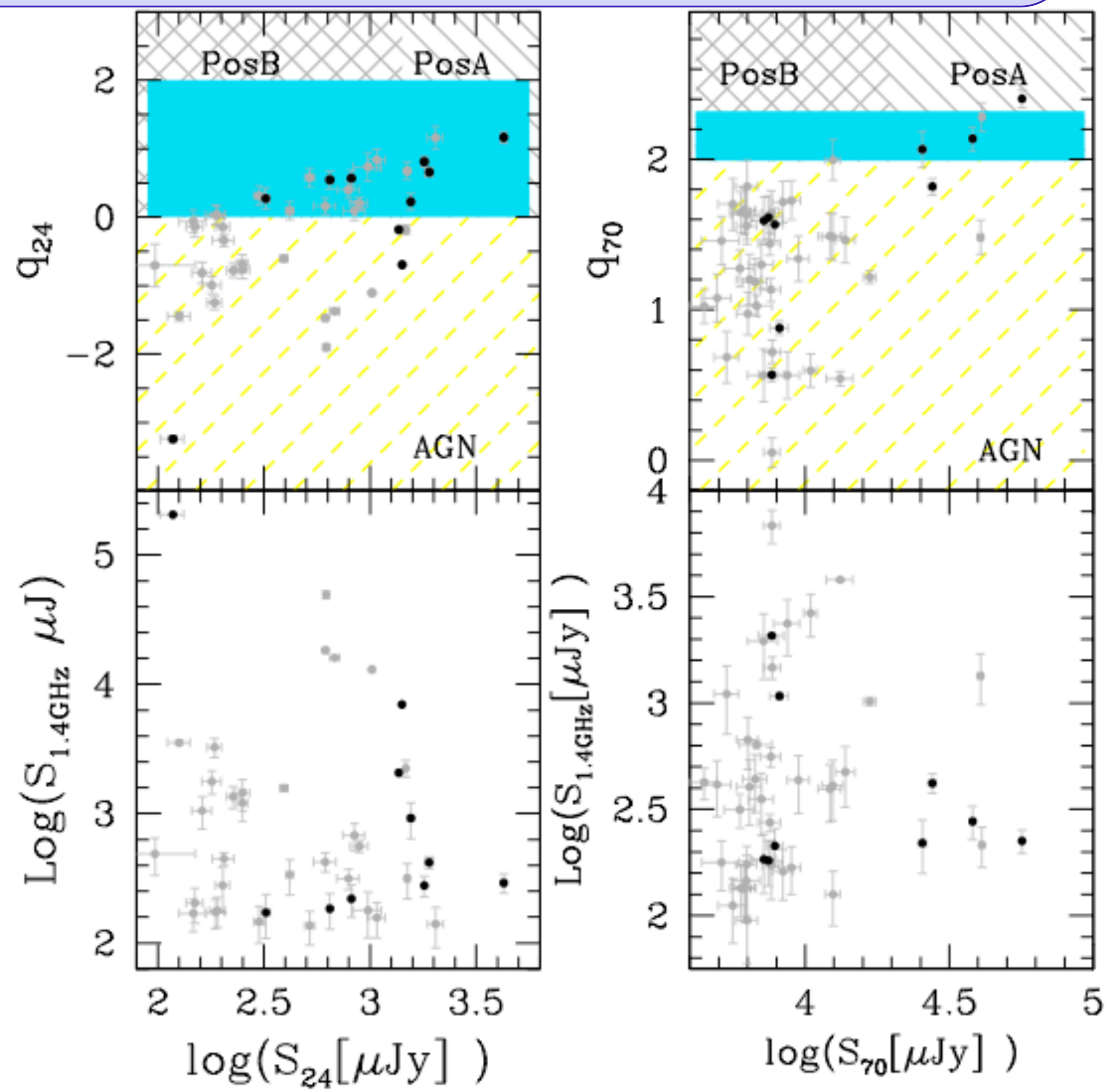
Radio Source Population





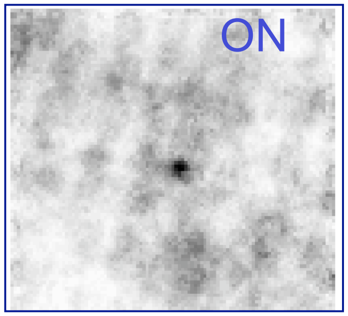
FIR-Radio Correlation

- Use FIR-Radio Correlation of Appleton et al. 2004
- Two pointings have different depths
- MIPS is the deepest
- When S_{24} < 0.4mJy only pick up AGN



Constraints on the AGN Fraction

Faint $q_{24} \sim 0.84$
Members Only
$q_{24} \sim 1.26$



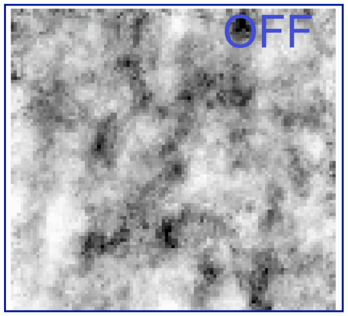
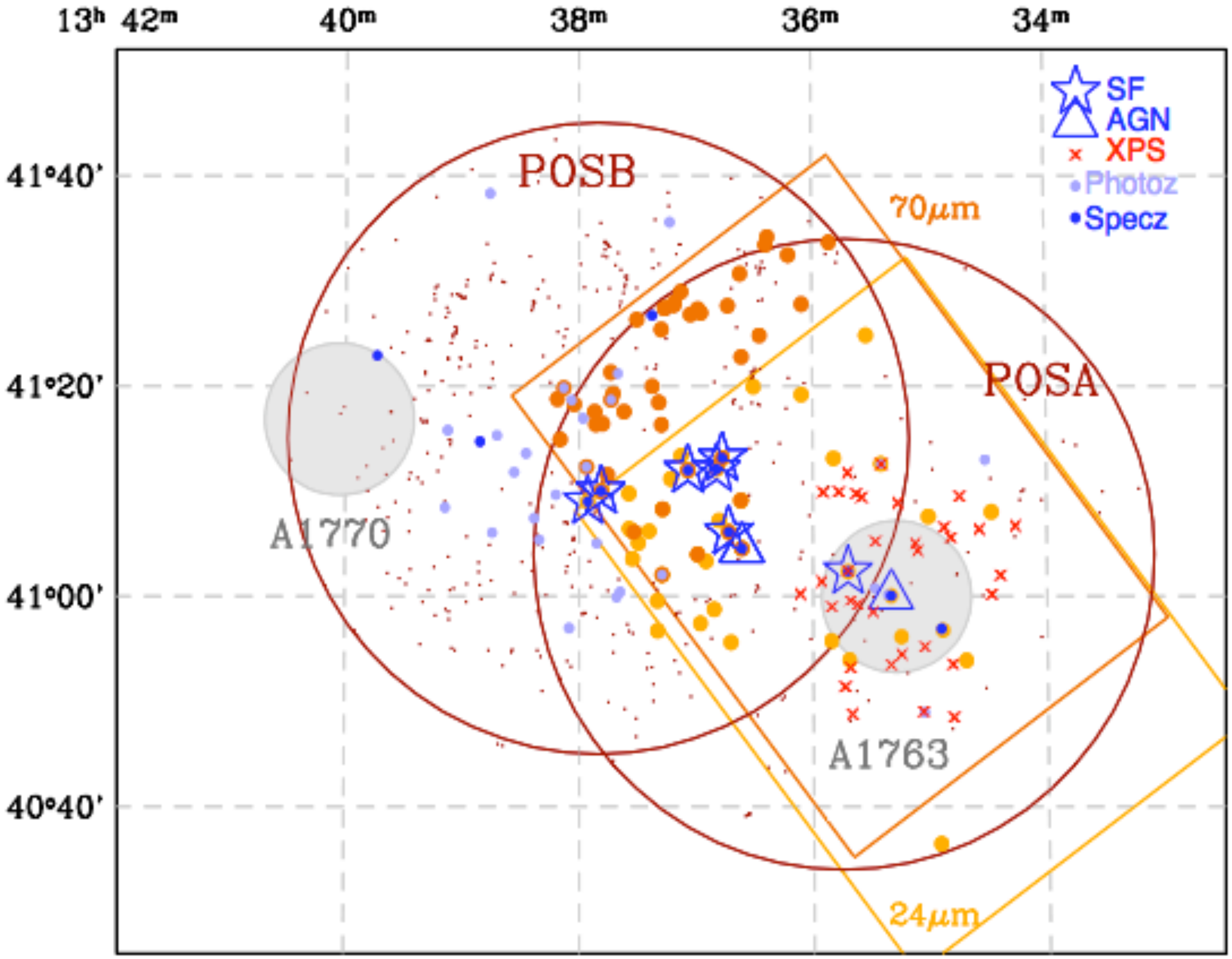


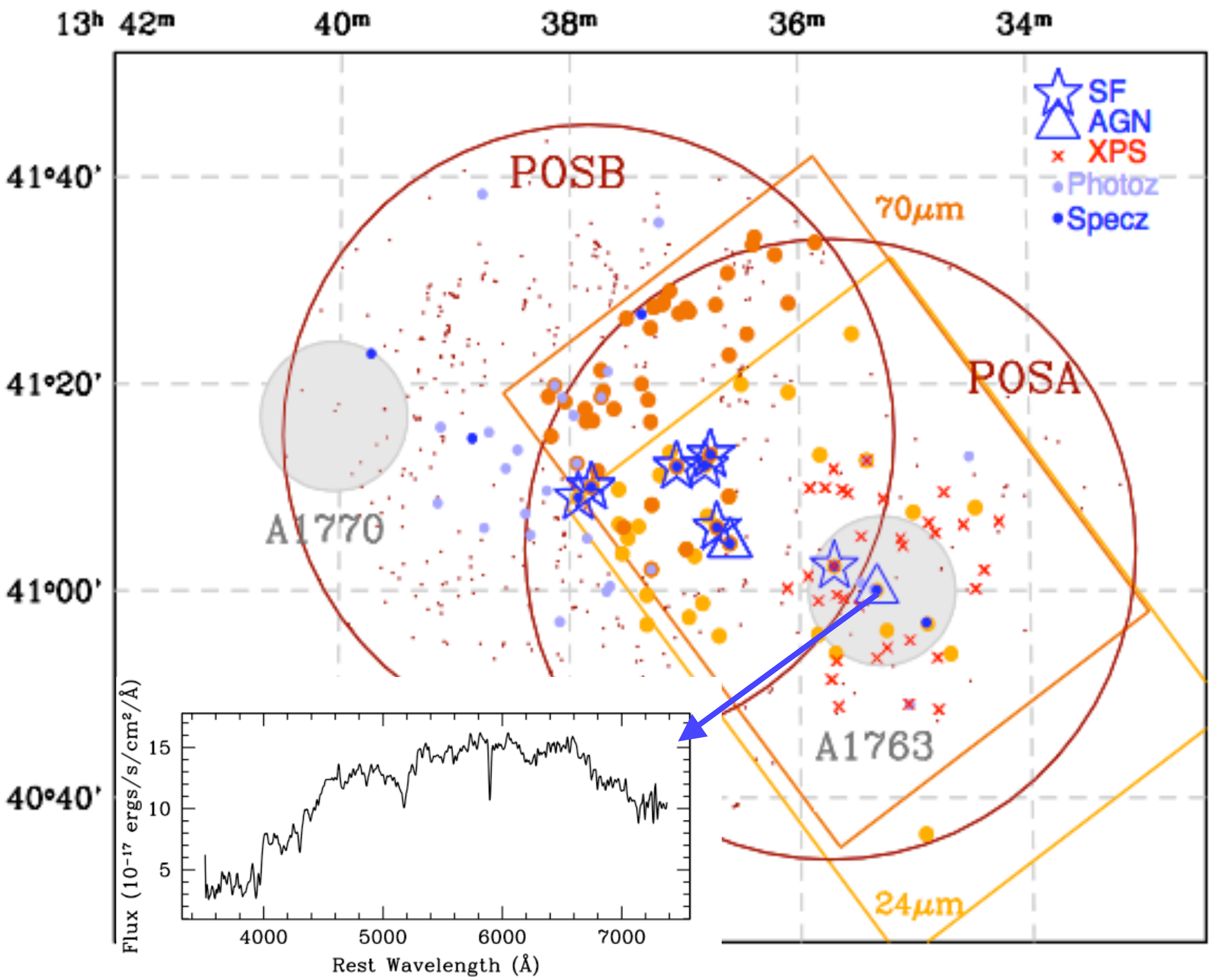
TABLE 4
NUMBER OF ACTIVE GALAXIES

	Filament	Area($10^{6\prime\prime 2}$)	density (10^{-6})/$^{\prime\prime 2}$)	Outside	Area($10^{6\prime\prime 2}$)	Density ($^{-6}$)/$^{\prime\prime 2}$)
Radio	230	4.723	49.7	361	7.058	51.1
Radio+ z_{ph}	25	4.723	5.29	12	7.058	1.7
Radio+ z_{sp}	12	4.723	2.54	1	7.058*	0.14
Radio+ MIPS	33	2.610	12.6	44	3.388	12.98
Radio+ MIPS+ z_{sp}	9	2.610	3.44	0	3.388*	0
Radio+ MIPS SF	18	2.610	6.89	4	3.388	1.03
Radio+ MSF+ z_{sp}	7	2.610	2.68	0	3.388*	0
Radio+ MIPSAGN	22	2.610	8.42	37	3.388	10.92
Radio+ MAGN+ z_{sp}	3(2)	2.610	0.77	0	3.388*	0

Type of Activity in Filament



Type of Activity in Filament



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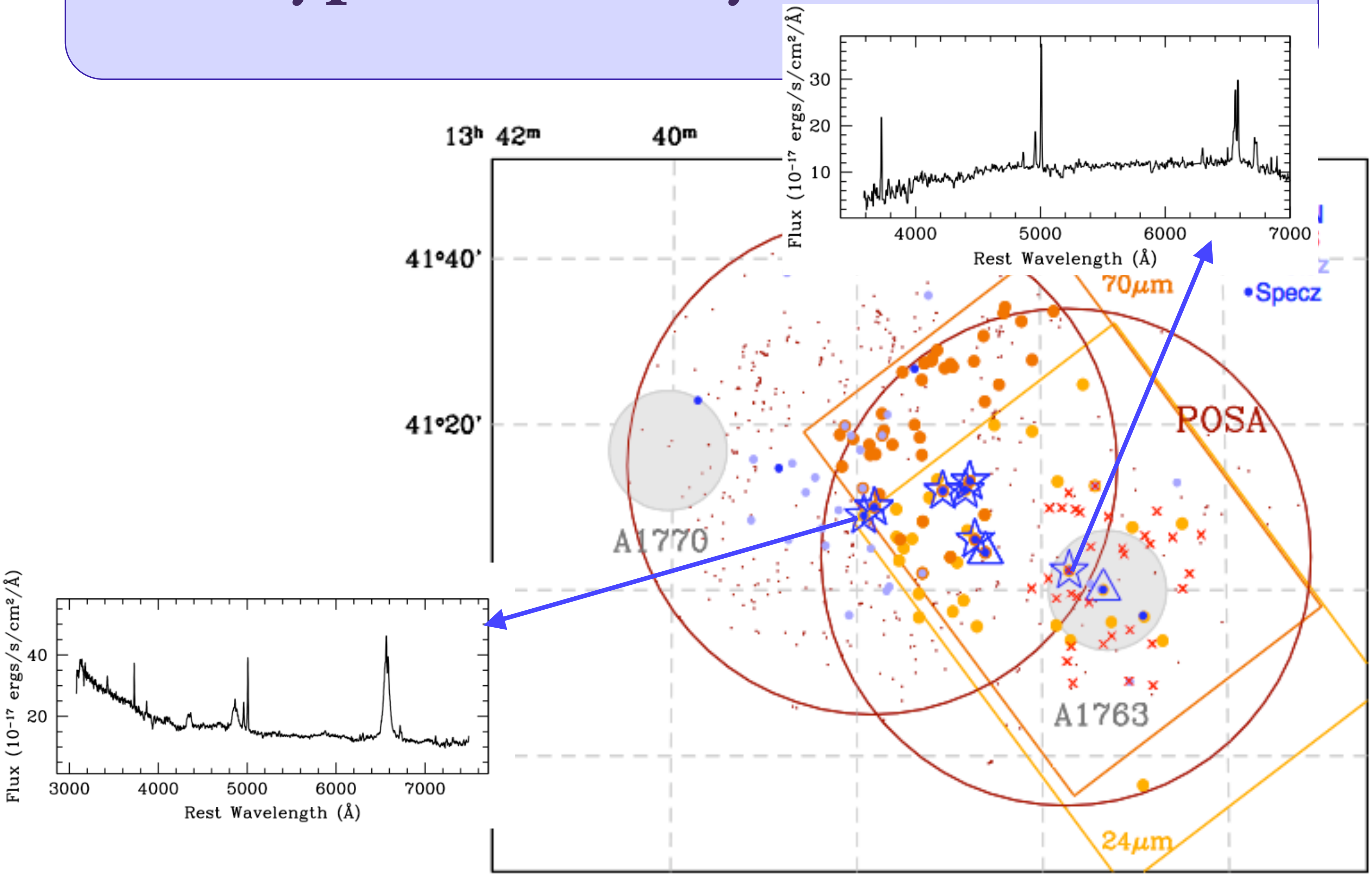

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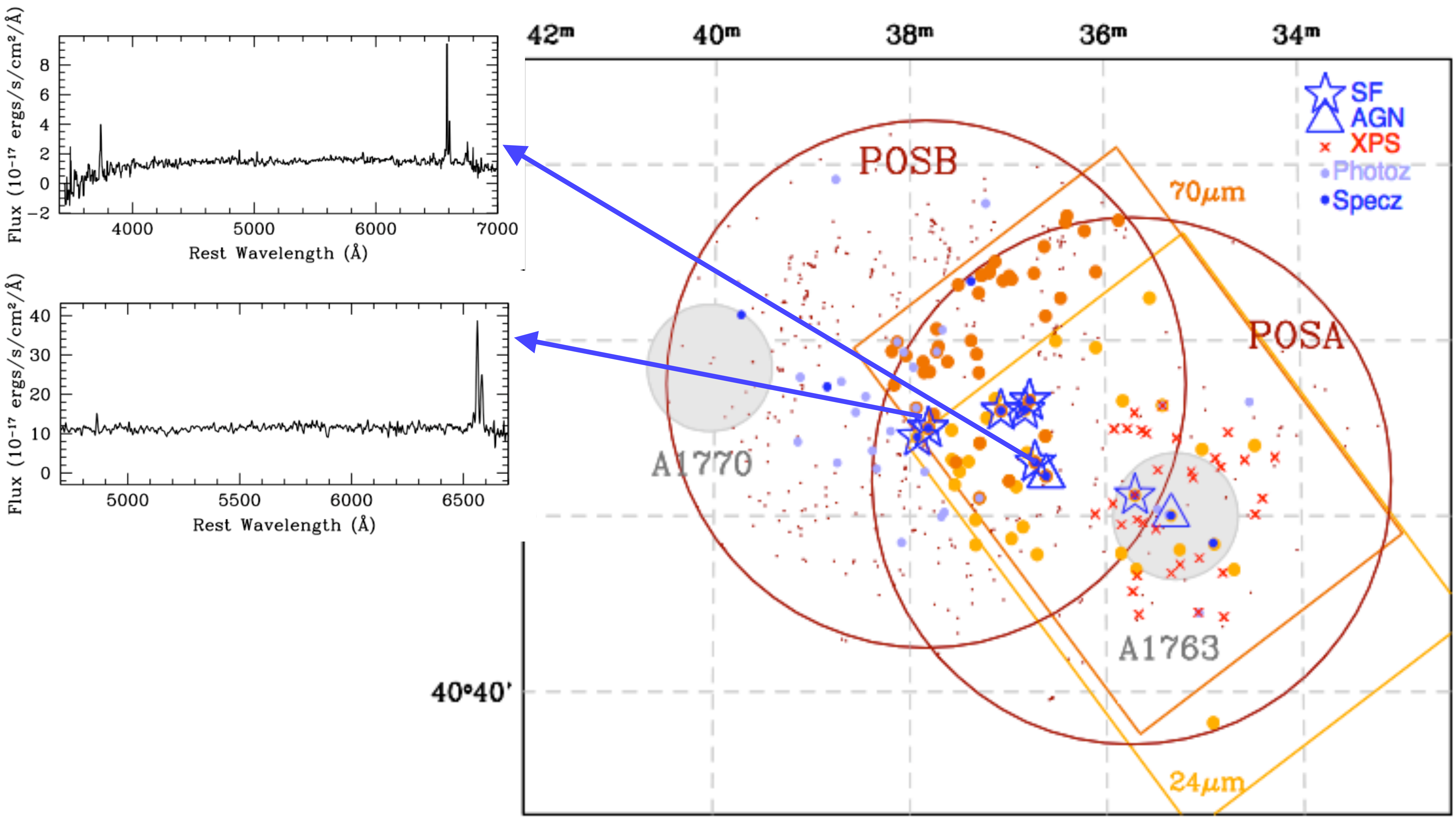
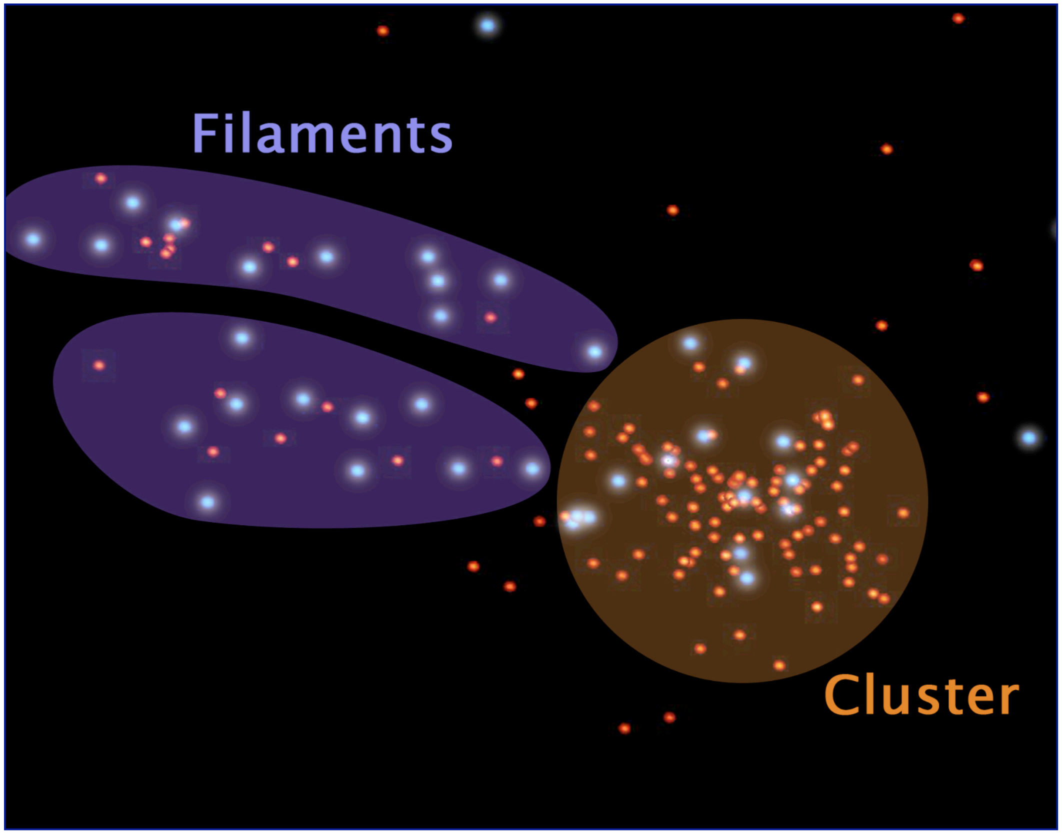
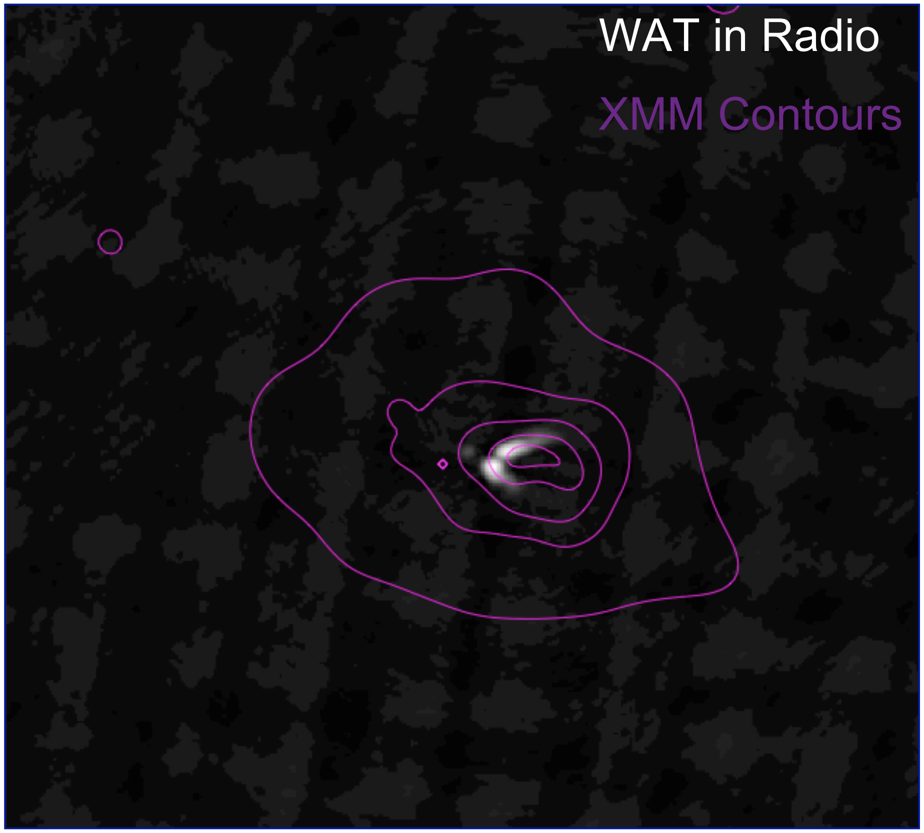


cD-Cluster Interaction





Near and Moderate z Clusters Observations

- Can we find an evolutionary picture?
- Will filaments become important?
- Compare to cosmological simulations
- Follow up and morphological studies

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The Diverse Nature of Optical Emission Lines in Brightest Cluster Galaxies: IFU Observations of the Central Kiloparsecs

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Shameless Plug:
MNRAS, 396 ,1953
http://arxiv.org/abs/0904.2208