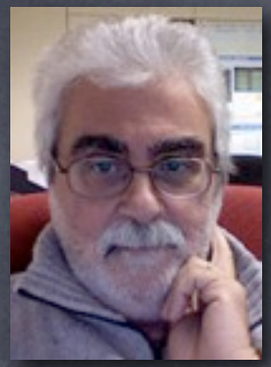
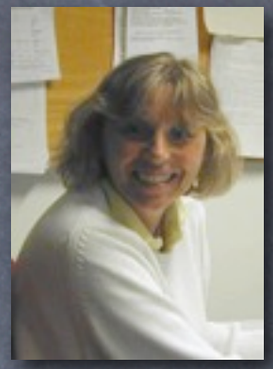
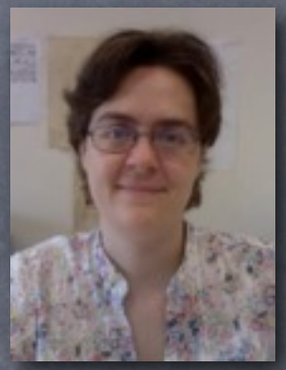
SPECTRAL LINES MEASUREMENTS IN CLUSTER GALAXIES: HINTS ON THE STAR FORMATION HISTORY

Jacopo Fritz
(Universiteit Gent)
&
the WINGS collaboration

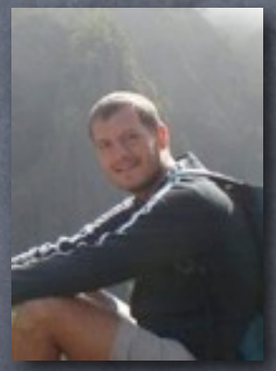
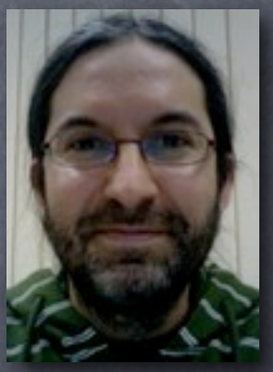
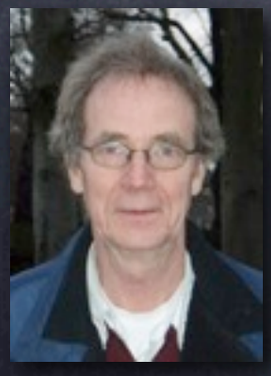
OVERVIEW

People & Institutes

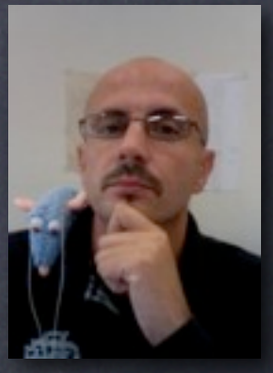






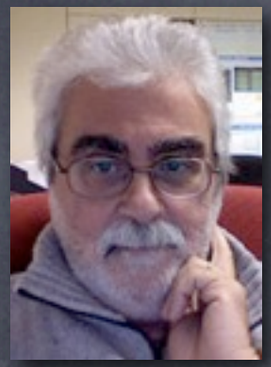



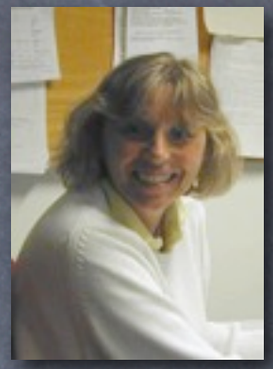
Core Team

(not so) young collaborators

OVERVIEW

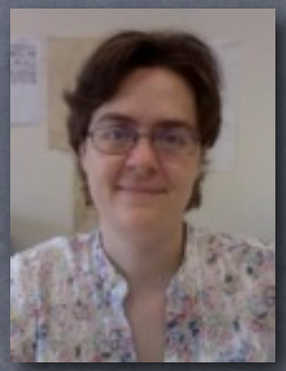
People & Institutes





C.S.I.C. - Granada

Spain



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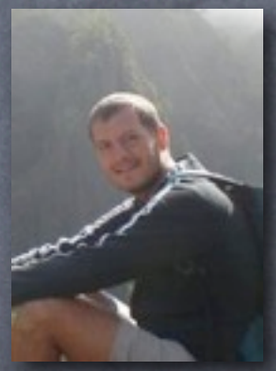

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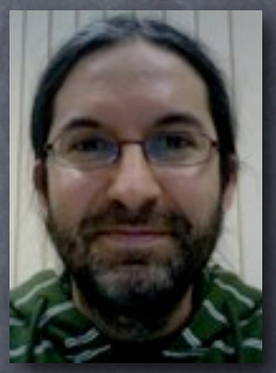
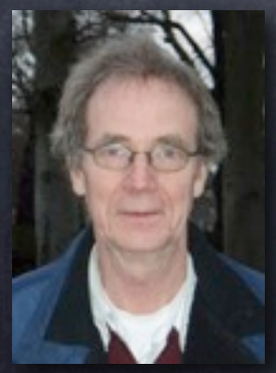







OVERVIEW

Wide-field Imaging of Nearby cluster-Galaxies Survey

- 77 X-ray selected clusters (BCS, Ebeling et al. 1996, 1998, 2000)
- complete in X-ray ($4x10^{43} < L_x < 10^{45}$)
- low redshift ($0.04 < z < 0.07$)

- Optical B & V band imaging
- Wide-Field Cameras @ INT & ESO2.2

OVERVIEW

Abell 2589

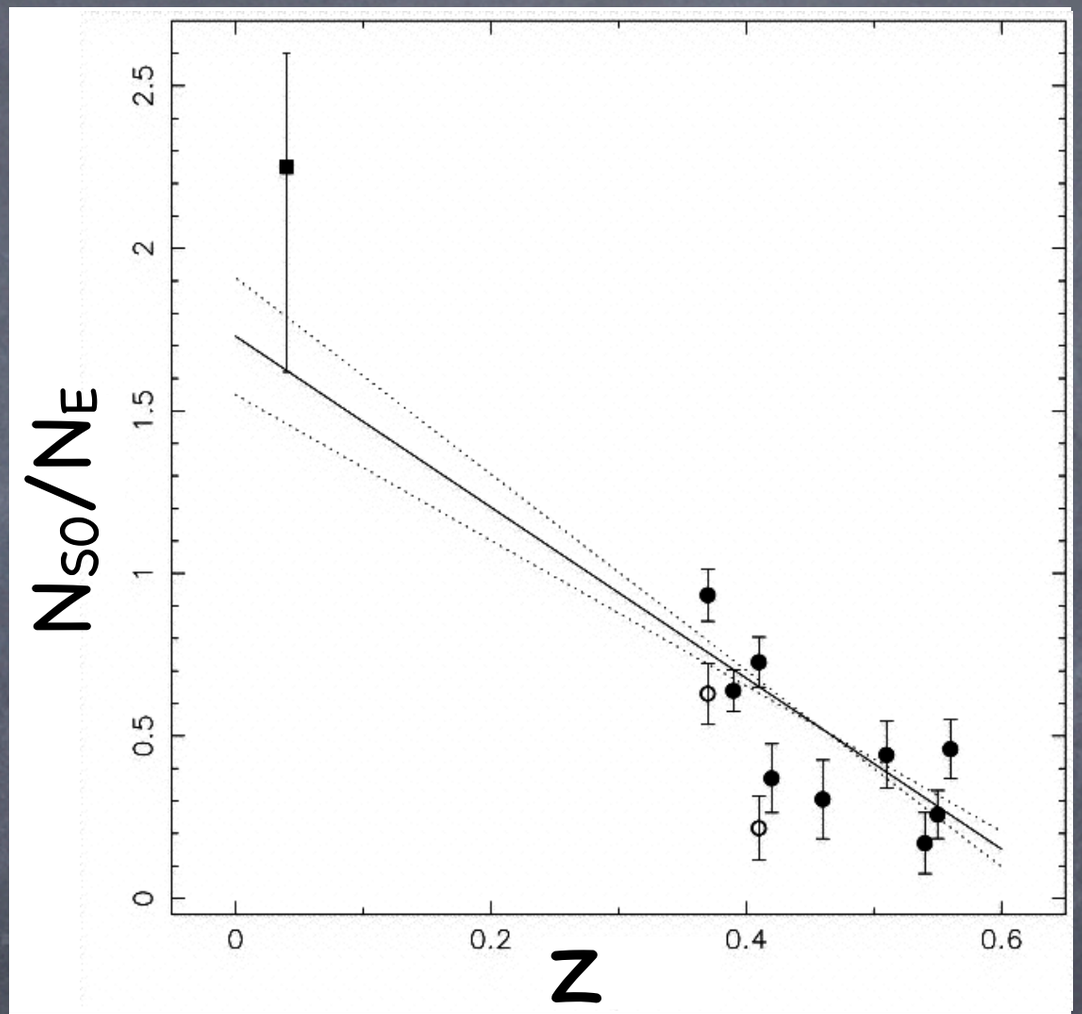
B+V composite

34′

34′

WHY WINGS?

- Optimal HST data @ z~0.5



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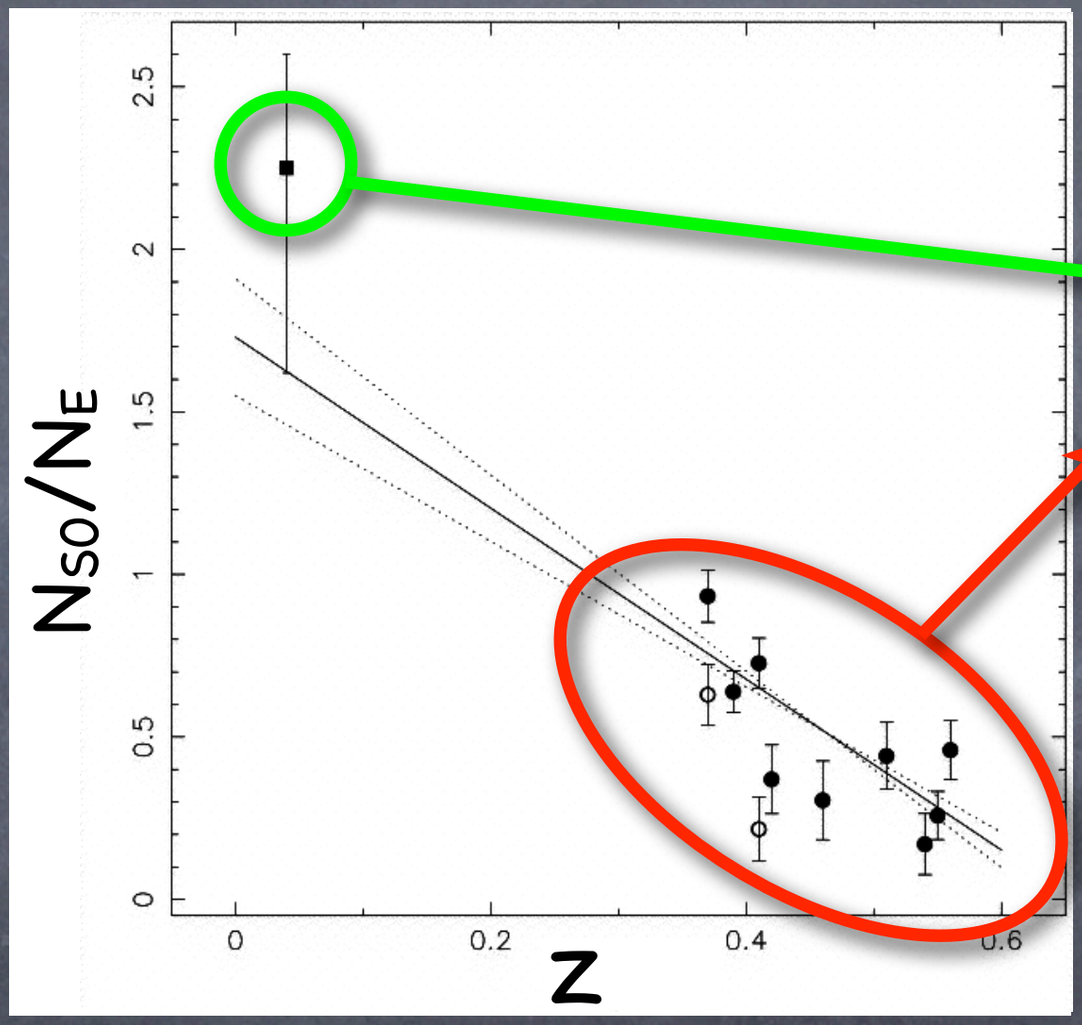

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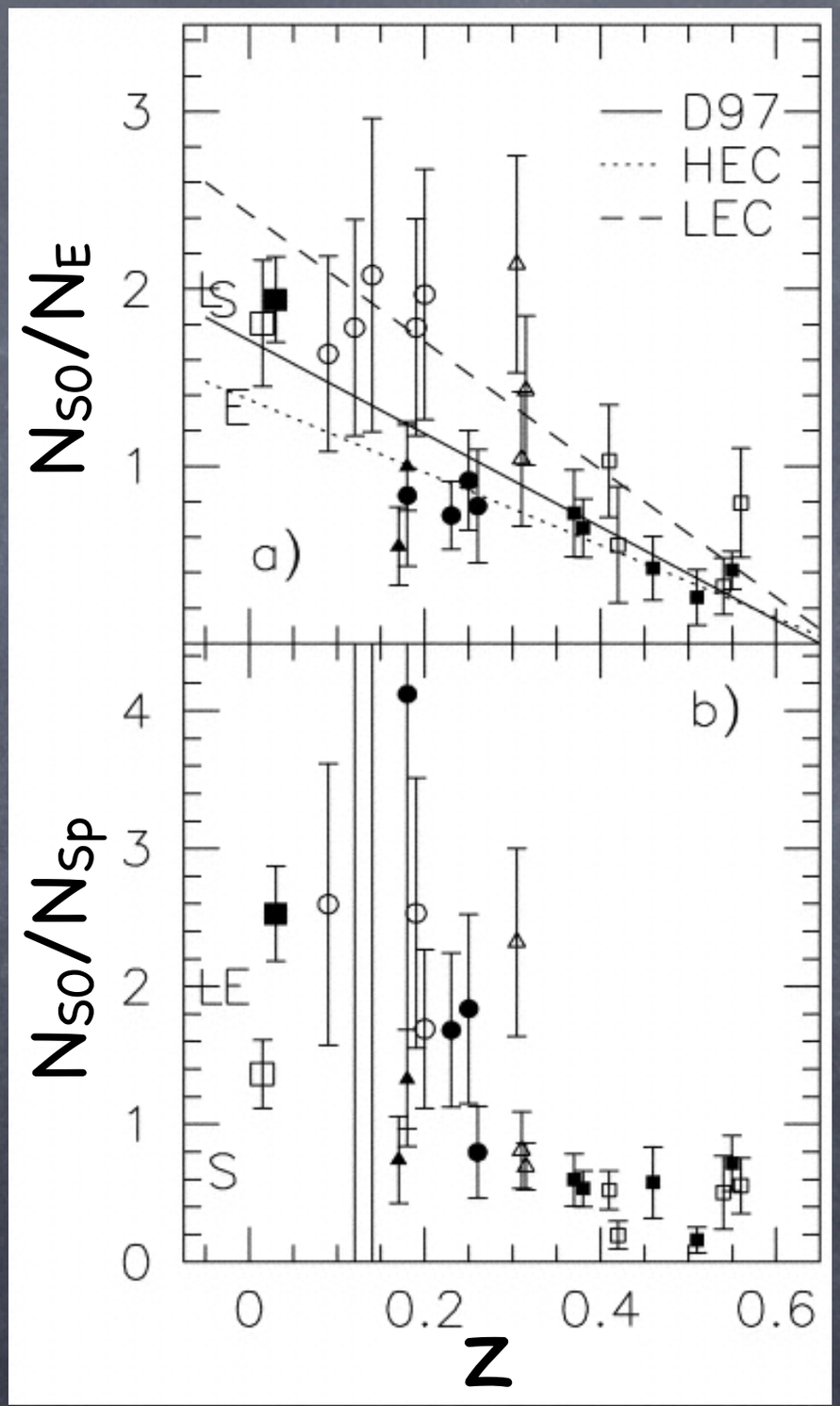
- Optimal HST data @ z~0.5
- Sparse data (Virgo, Coma), non-homogeneous @ z~0



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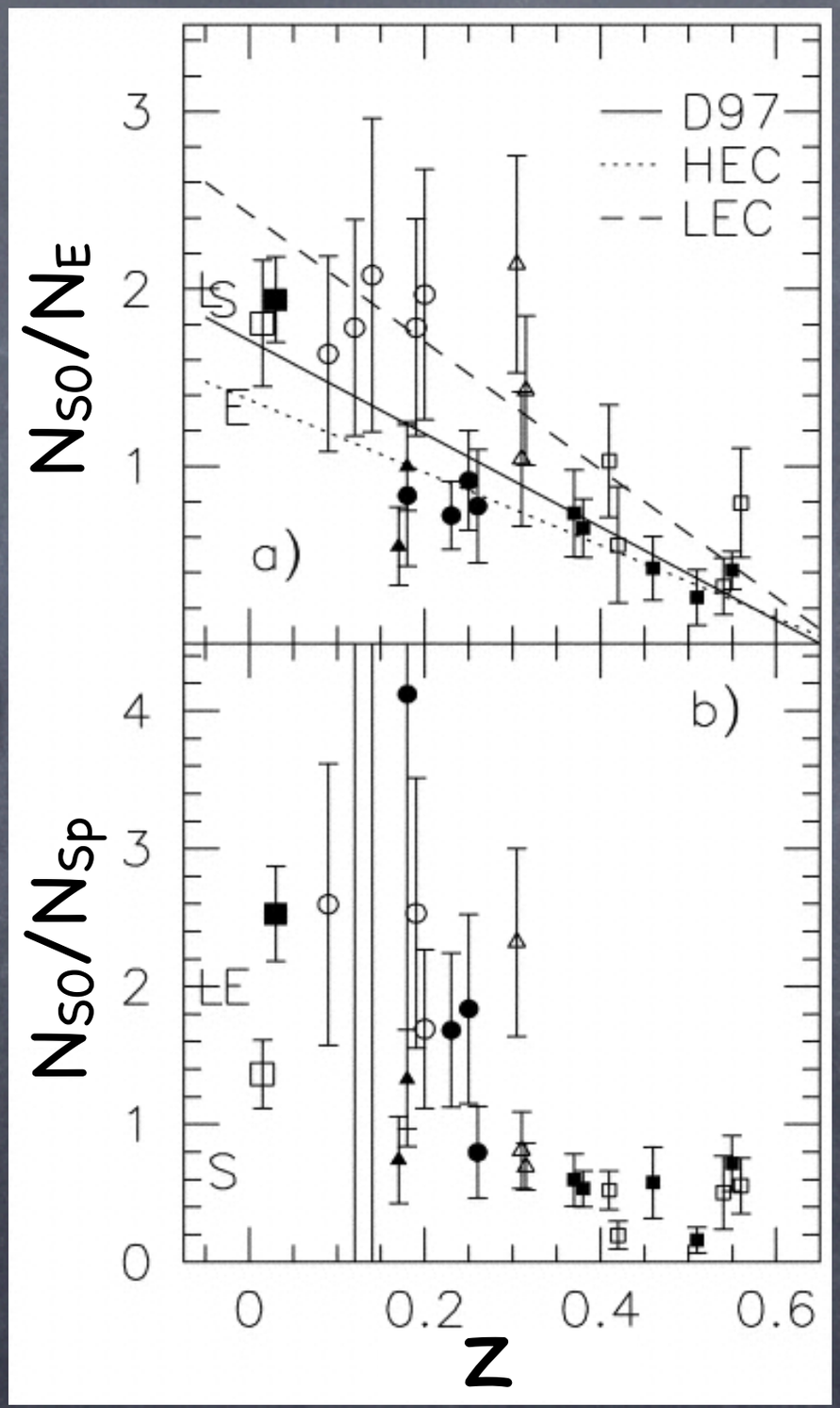
LACK OF A ZERO-POINT BENCHMARK !!



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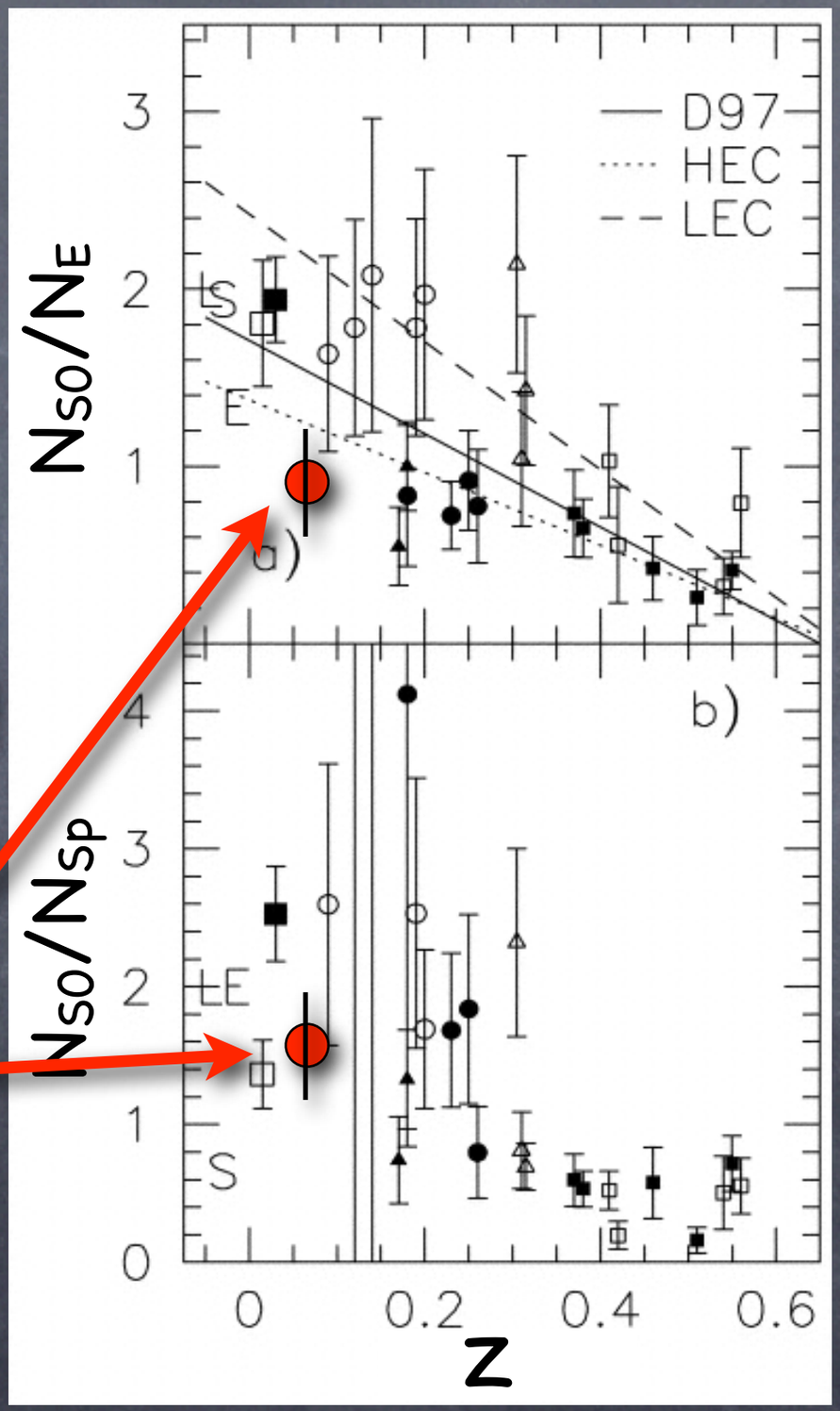


Poggianti et al. 2009

WINGS-SPE

CHARACTERISTICS

- Multi-fiber spectroscopy of 48/77 clusters (@ATT & WHT)
- About 6000 spectra (more than 3600 spectroscopically confirmed members)
- 100-300 spectra per field
- $V_{fiber}<21.5$ (~-15.5); $(B-V)_{5kpc}<1.4$
- 9-6 Å resolution
- spectral range: 3700÷8000 & 3800÷7000 Å

Cava et al. 2009

WINGS-SPE

GOALS

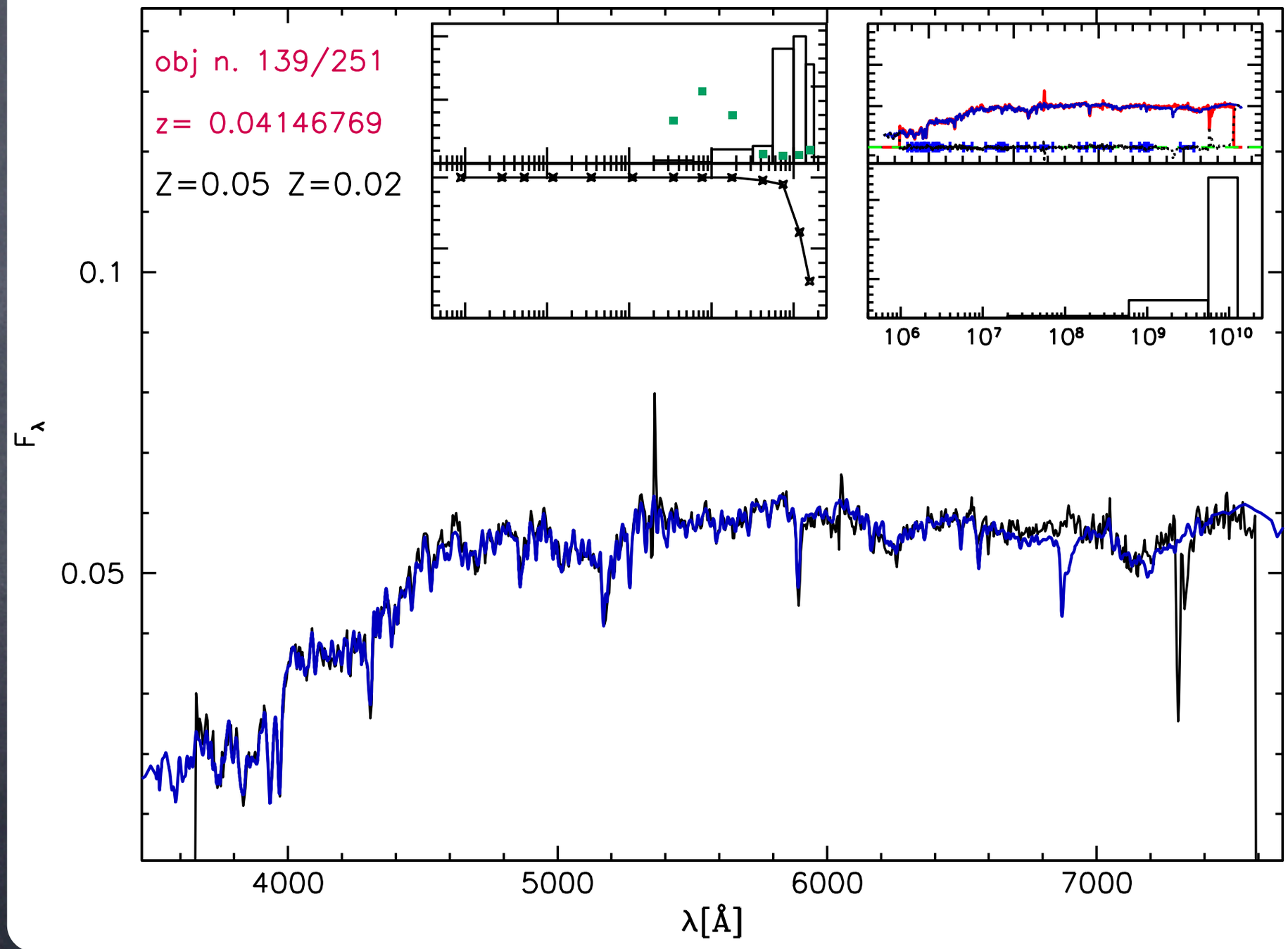
- Derive Redshifts & Proper Motions — Cava et al. 2009
- Derive Stellar Masses — Fritz et al. 2007, 2011
- Derive Star Formation Histories — Fritz et al., in prep.
- Measure Spectral Lines — Hansson et al., submitted
- Derive Ages and Metallicities from spectral indices — Ramella et al. 2007, Cava et al. in prep.
- Study Sub-Structures

WINGS-SPE

Early Results

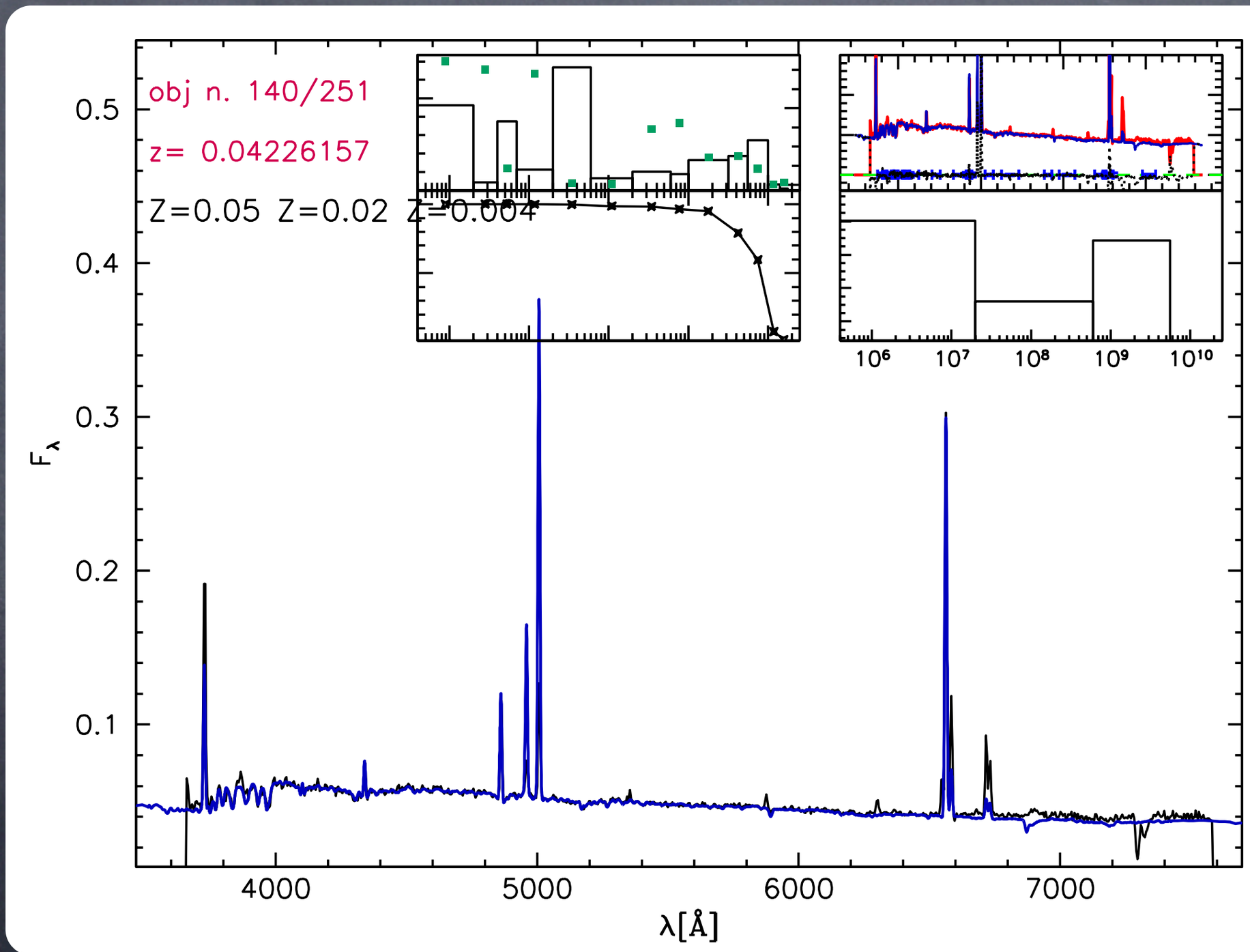
- 6137 redshifts
- Mean accuracy of ~45 km/s
- Velocity dispersions
- ~60% of galaxies classified as cluster members
- Number of known members triplicated

Stellar Mass & SFH



(Fritz et al. 2007, 2011)

Stellar Mass & SFH



(Fritz et al. 2007, 2011)

Equivalent Widths Measurements

- Which lines ?

Equivalent Widths Measurements

- Which lines ?

[OII]	3727	G-CO	4301
Hϑ	3798	Hγ	4341
Hη	3835	Hβ	4861
Hζ	3889	[OIII]	5007
CaK	3934	Mg	5177
CaH	3969	Na	5893
Hδ	4101	Hα	6563

Equivalent Widths Measurements

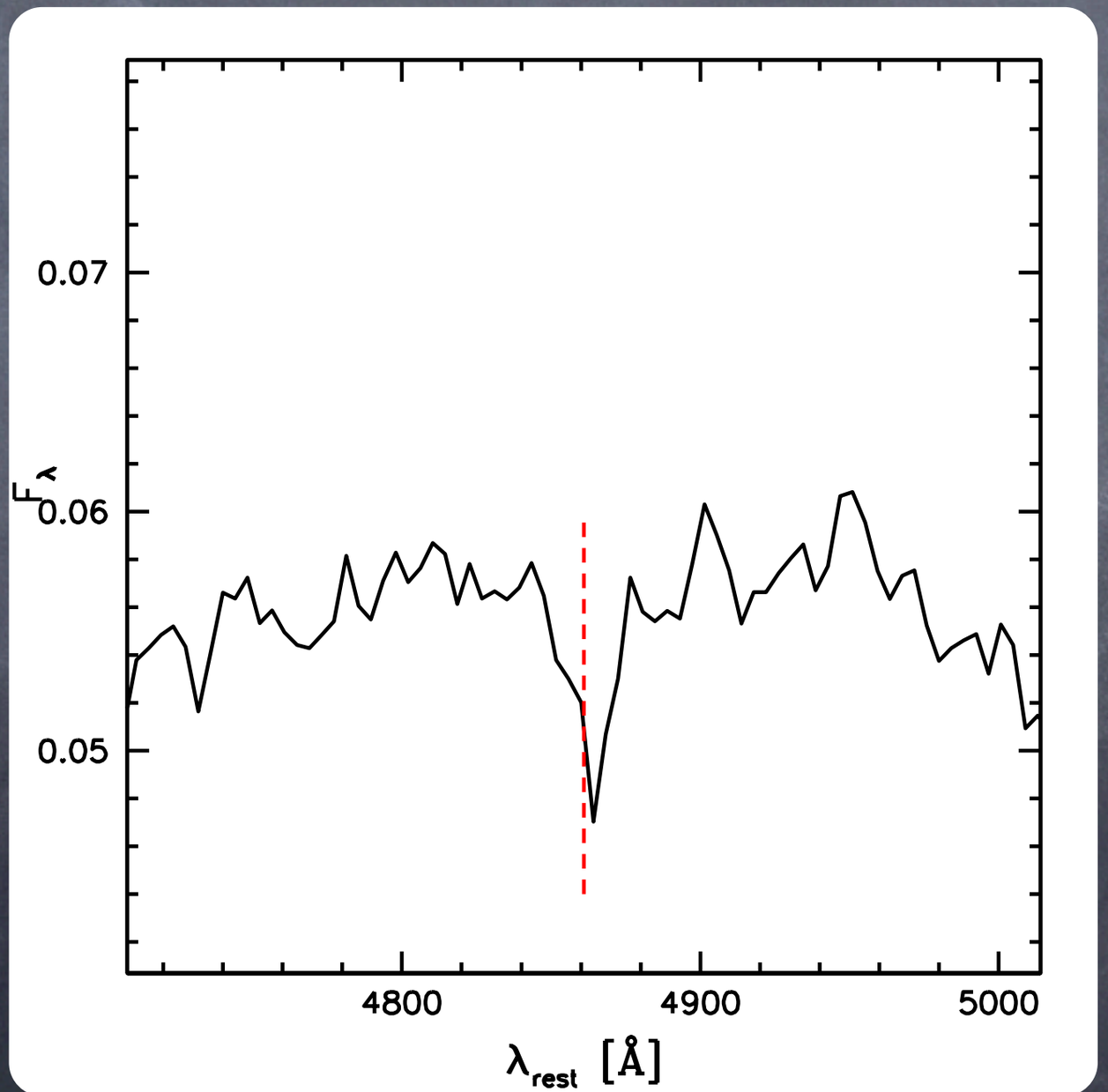
- What for?
  - SFR estimates
  - Extinction
  - SSP fitting
  - Stellar populations

Equivalent Widths Measurements

- How?

Equivalent Widths Measurements

- How?



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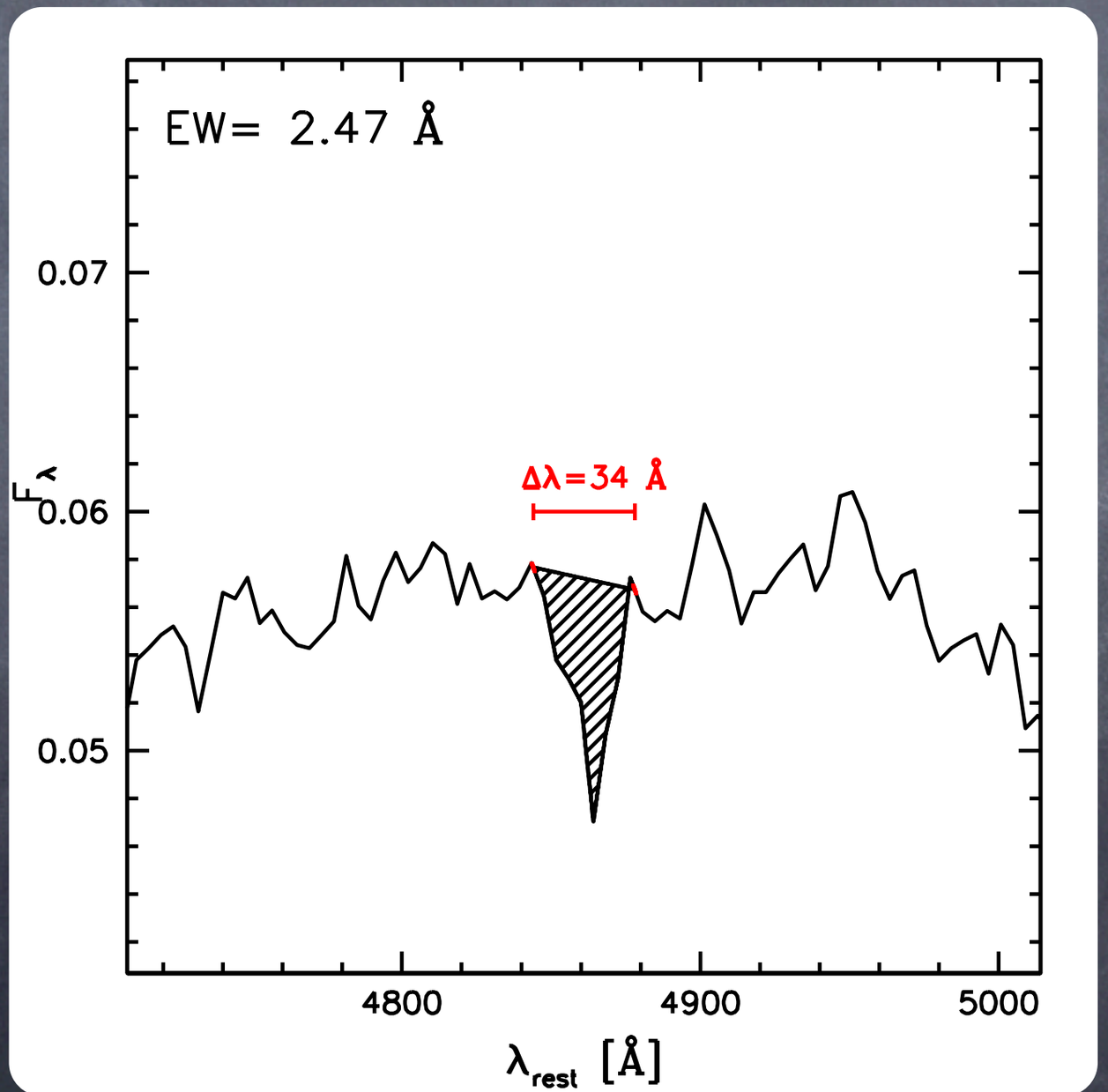

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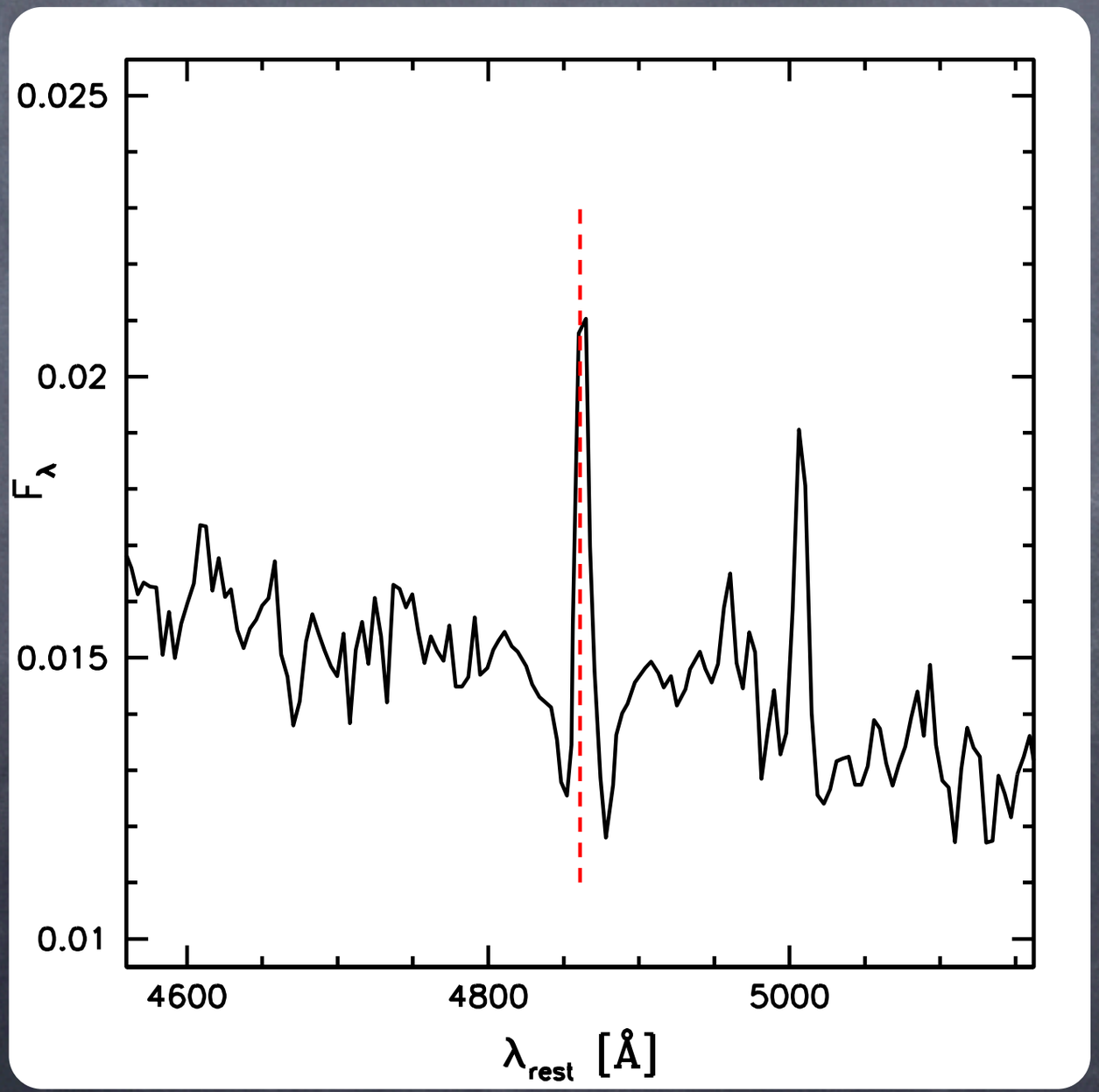

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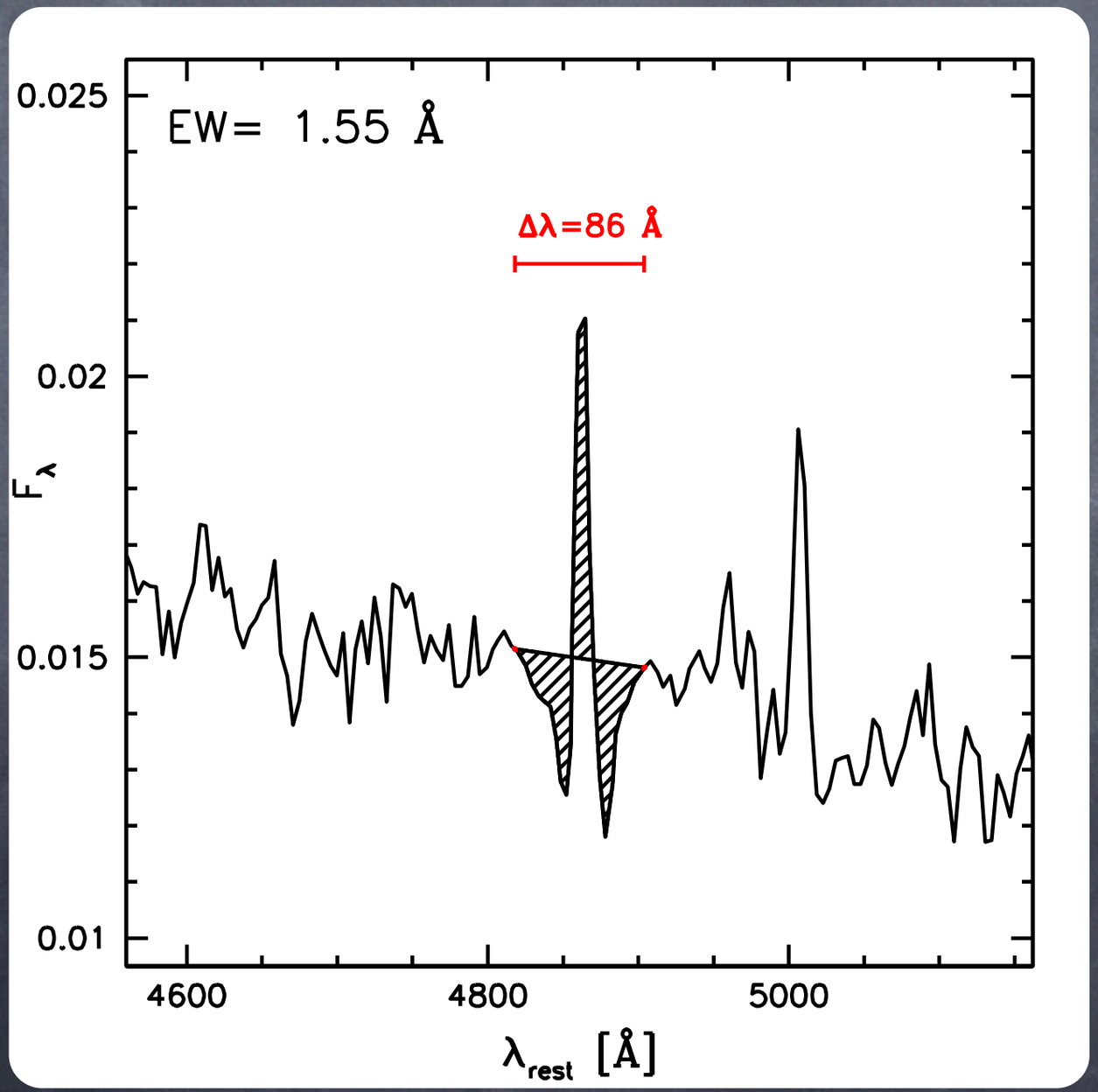

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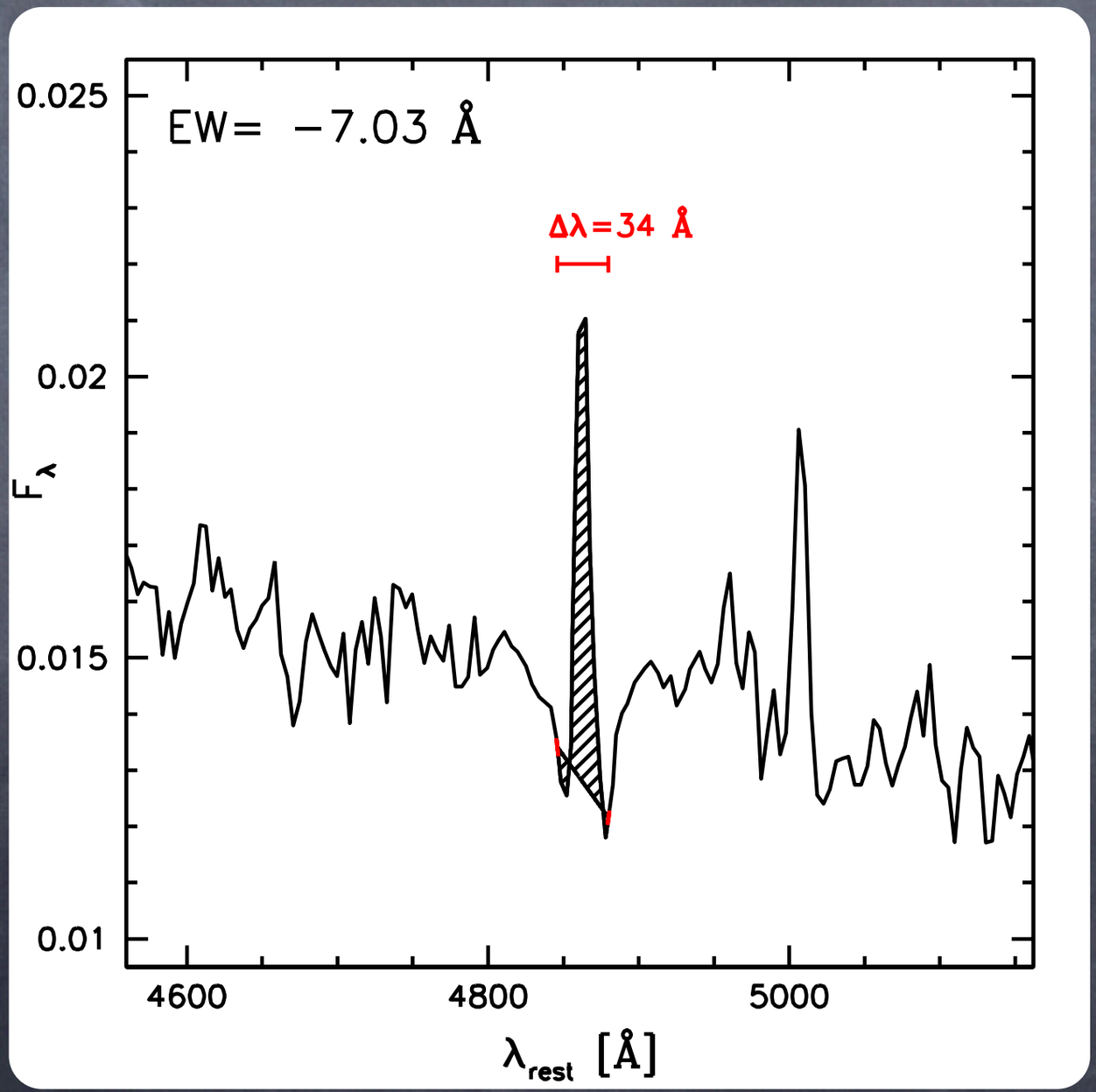
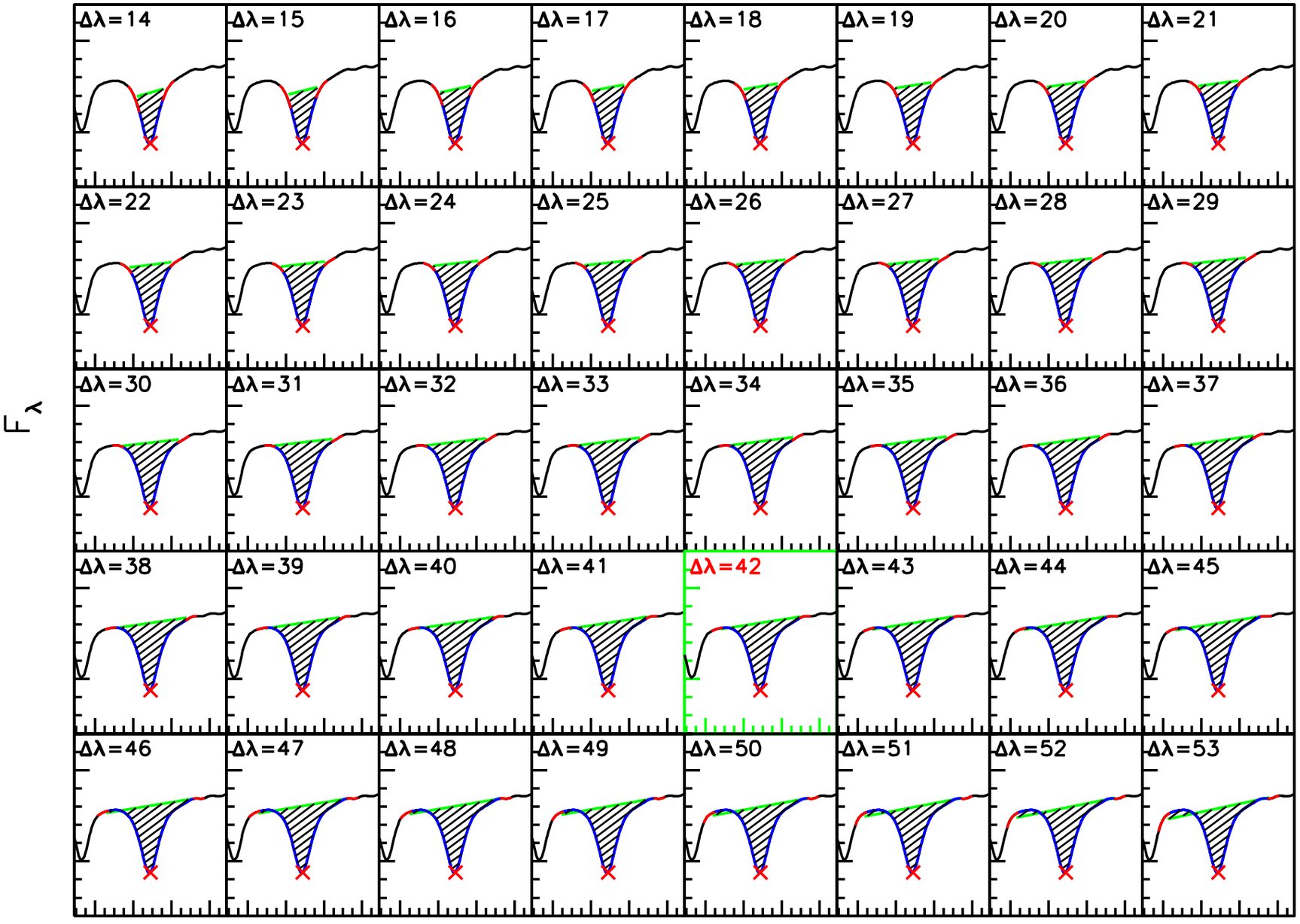


Getting to the optimal value



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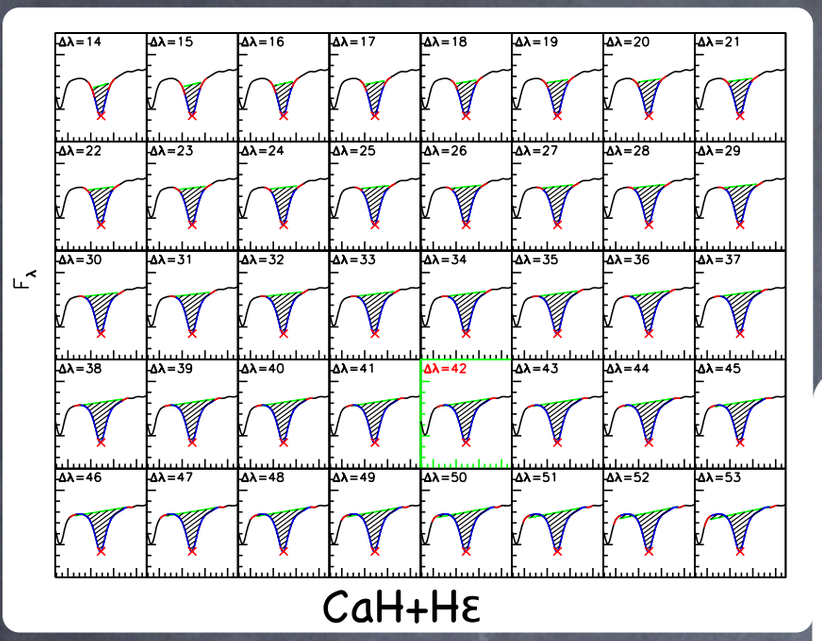

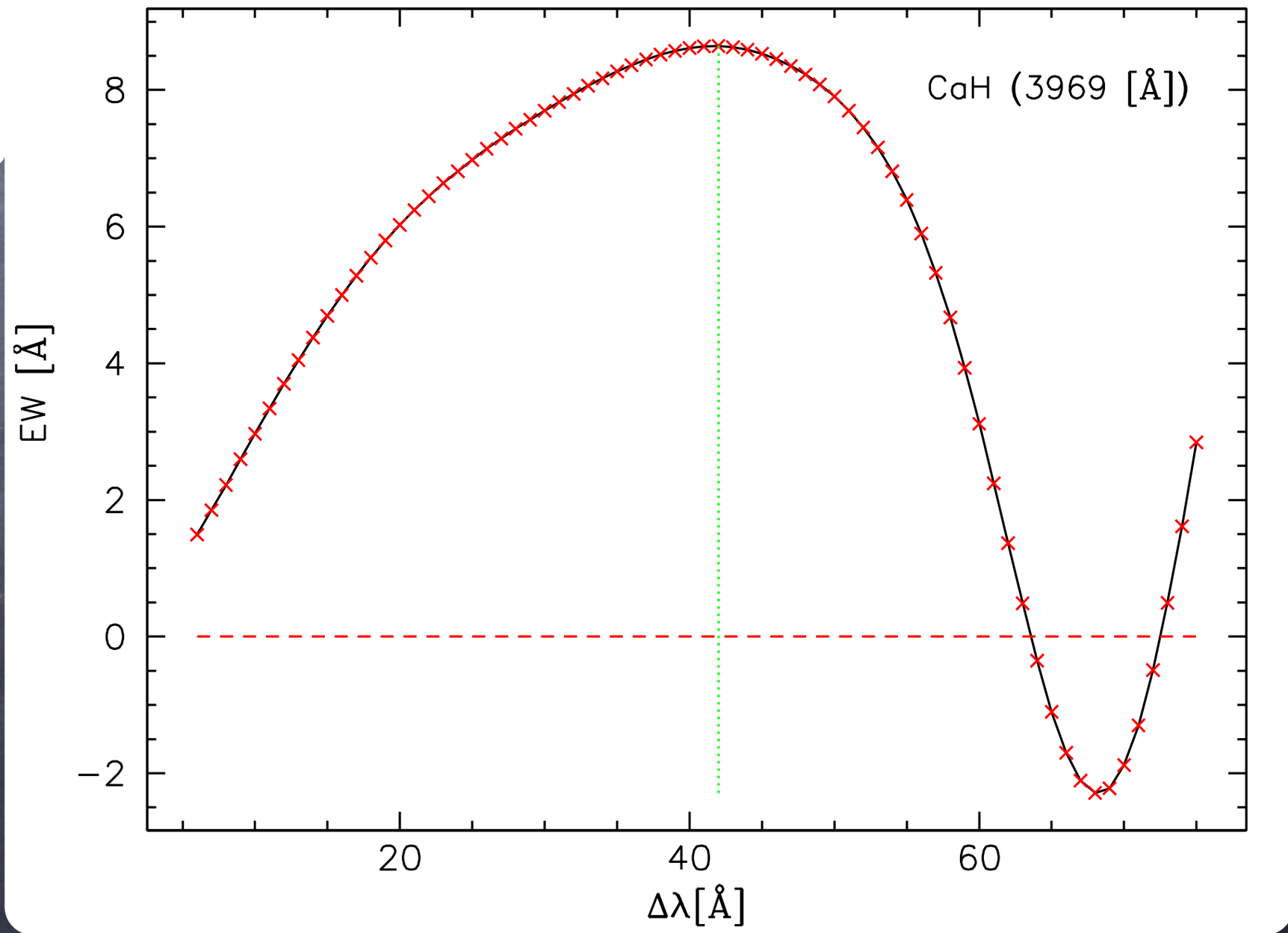

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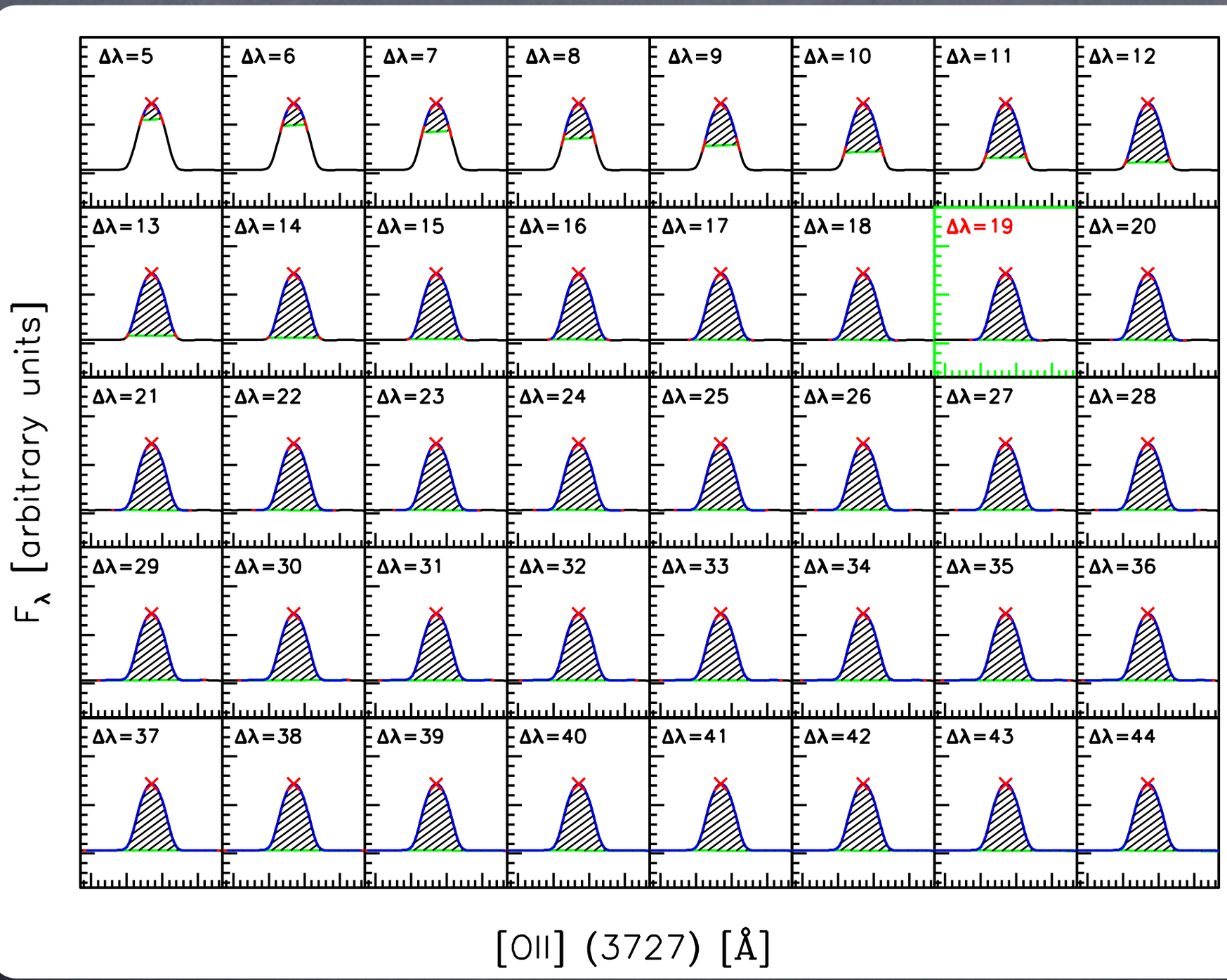

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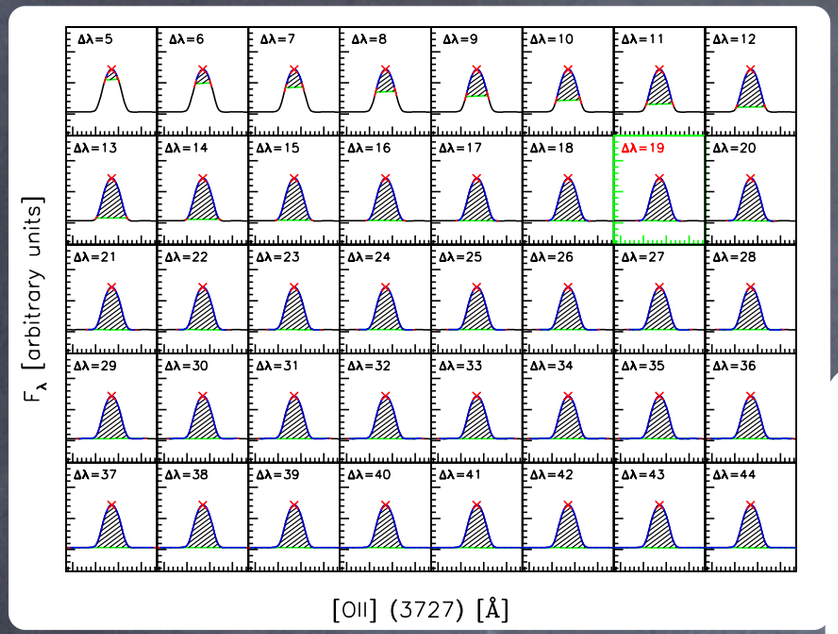

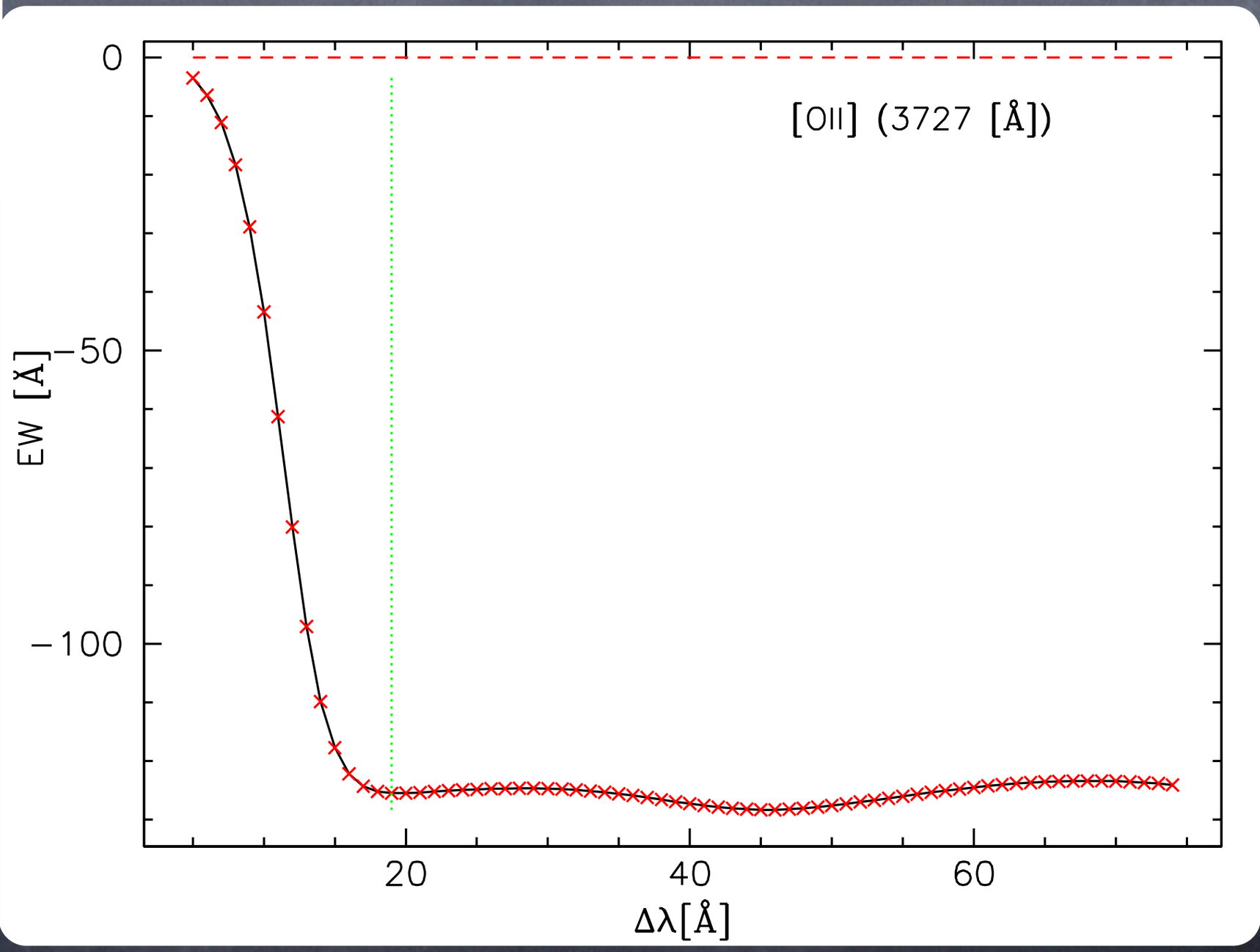

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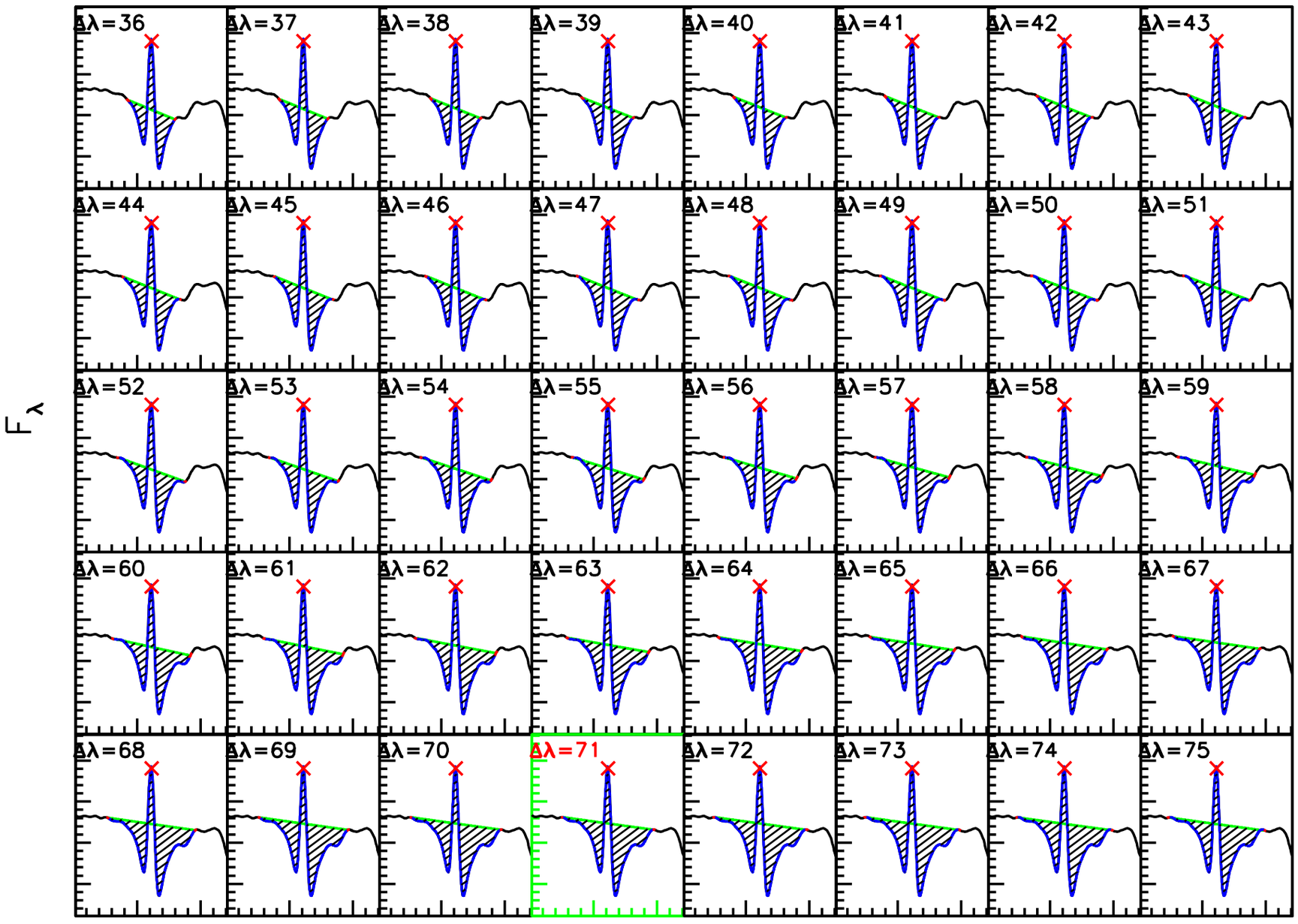

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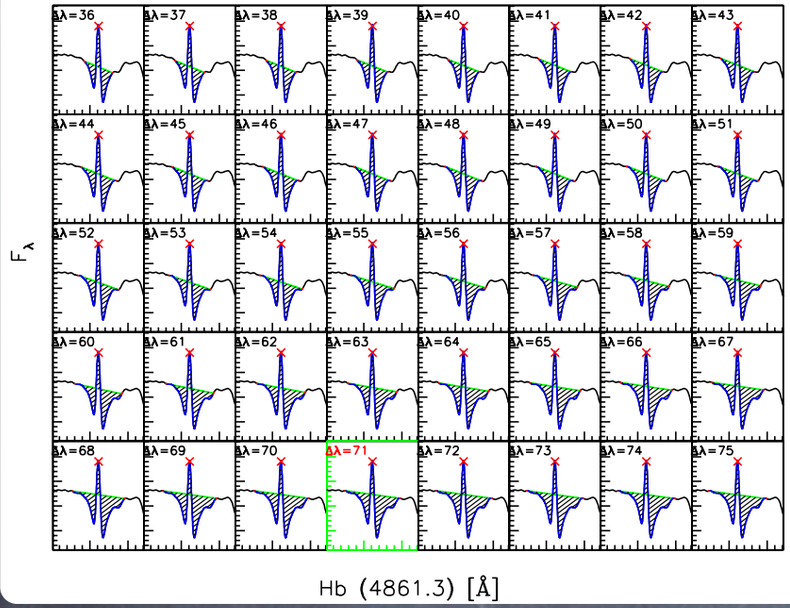

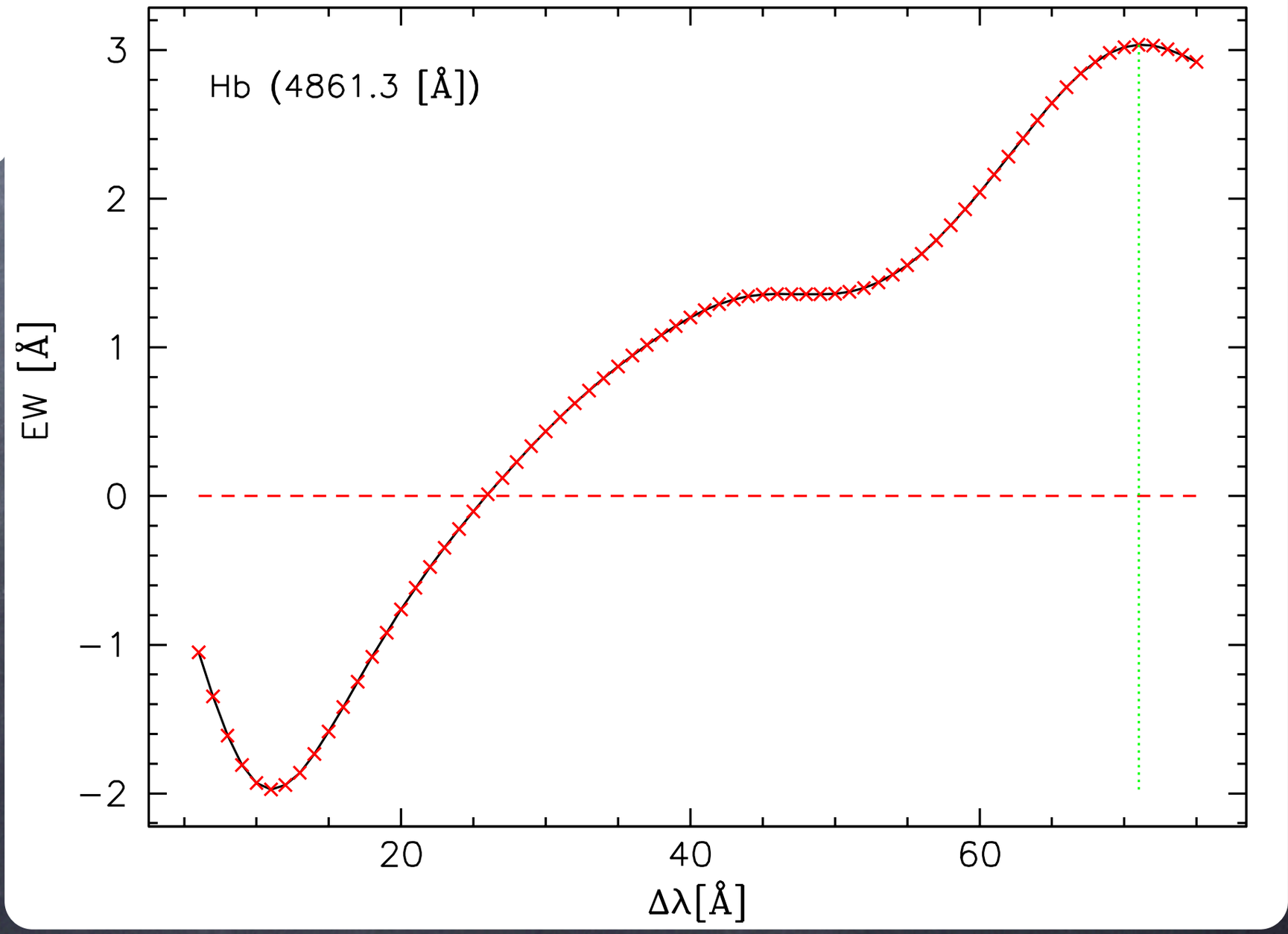

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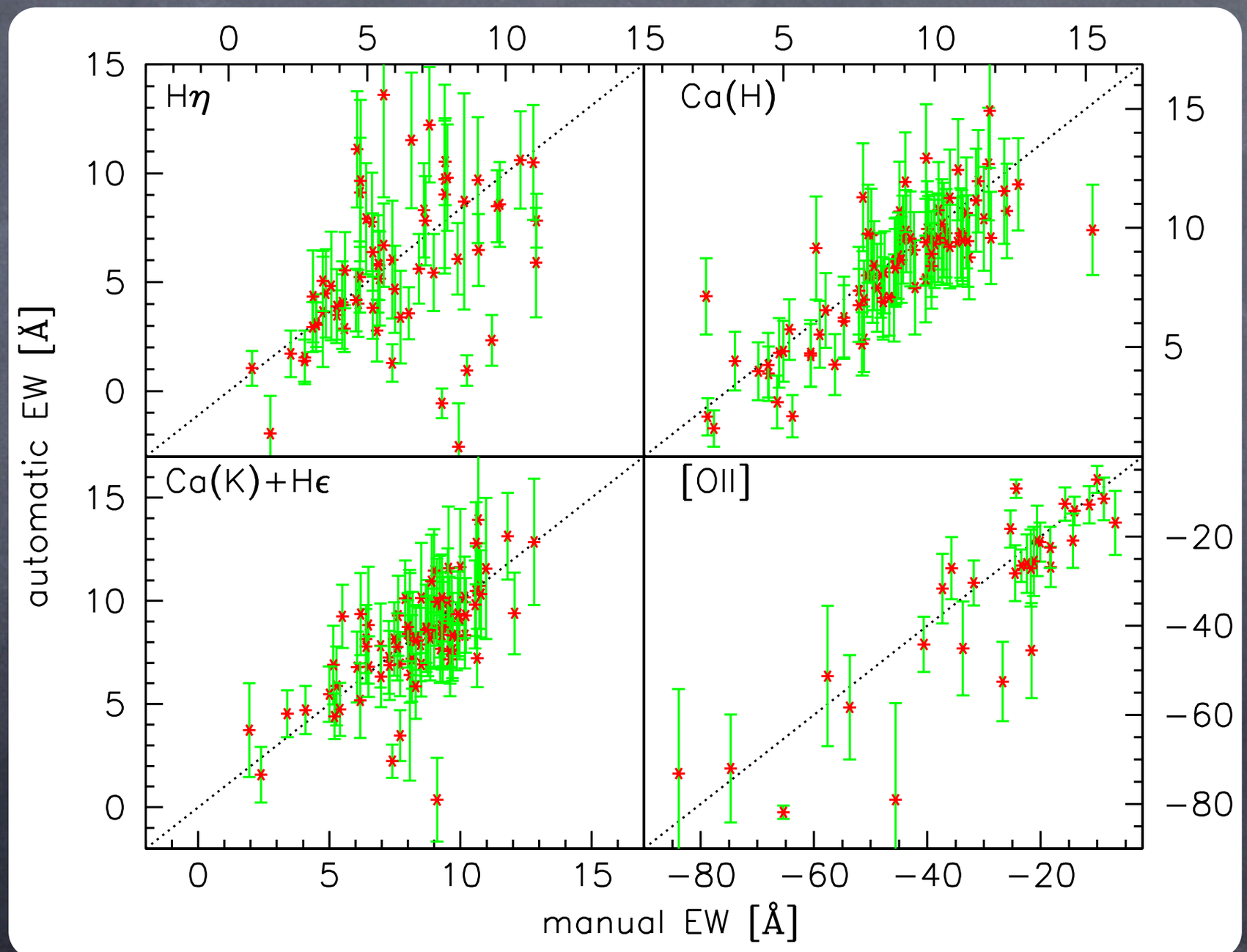


Spectral Classes

(Couch & Sharples, 1987; Dressler et al., 1999)

- e(b) $[\mathrm{O\,II}] \leq -40 \ \& \ \mathrm{H}\delta < 4$
- e(c) $-40 < [\mathrm{O\,II}] < 0 \ \& \ \mathrm{H}\delta < 4$
- e(a) $[\mathrm{O\,II}] < 0 \ \& \ \mathrm{H}\delta \geq 4$
- a+k $[\mathrm{O\,II}] = 0 \ \& \ \mathrm{H}\delta \geq 8$
- k+a $[\mathrm{O\,II}] = 0 \ \& \ 3 \leq \mathrm{H}\delta < 8$
- k $[\mathrm{O\,II}] = 0 \ \& \ 3 \leq \mathrm{H}\delta < 8$

Spectral Classes

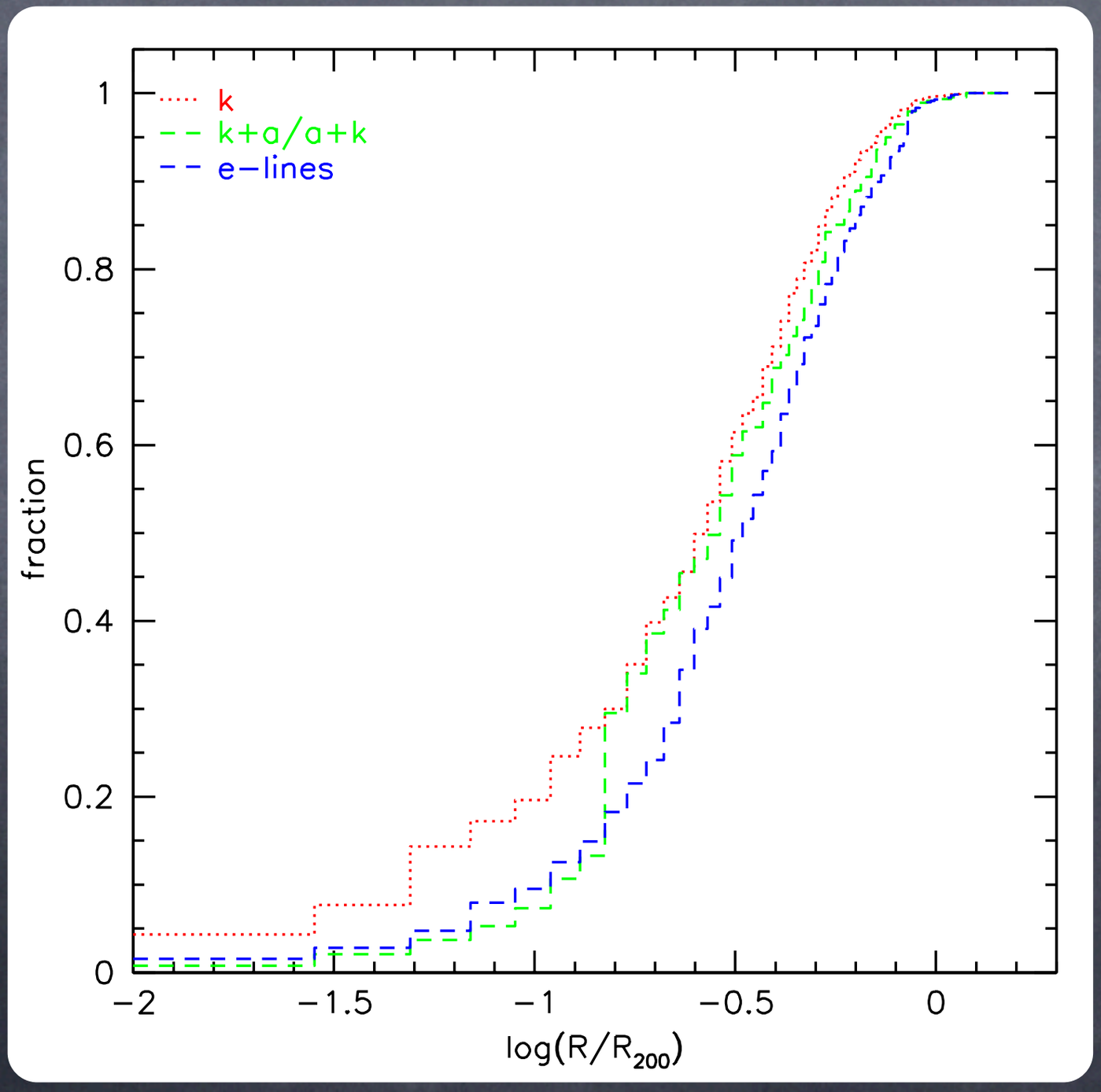
(Couch & Sharples, 1987; Dressler et al., 1999)

Star-Formation Burst	e(b)	$[\mathrm{O\,II}] \leq -40 \ \& \ \mathrm{H}\delta < 4$
Constant Star-Formation	e(c)	$-40 < [\mathrm{O\,II}] < 0 \ \& \ \mathrm{H}\delta < 4$
Emission-Lines+ A-type stars	e(a)	$[\mathrm{O\,II}] < 0 \ \& \ \mathrm{H}\delta \geq 4$
A-type stars+ K-type stars	a+k	$[\mathrm{O\,II}] = 0 \ \& \ \mathrm{H}\delta \geq 8$
K-type stars+ A-type stars	k+a	$[\mathrm{O\,II}] = 0 \ \& \ 3 \leq \mathrm{H}\delta < 8$
Old stars (K-type)	k	$[\mathrm{O\,II}] = 0 \ \& \ 3 \leq \mathrm{H}\delta < 8$

The Galaxy Population in Local Clusters

- 40% are "passive" galaxies (k-type)
- 28% are e(c)
- 8% & 3% of e(a) and e(b)
- 10% are post-starburst (a+k & k+a)
- 10% un-classifiable

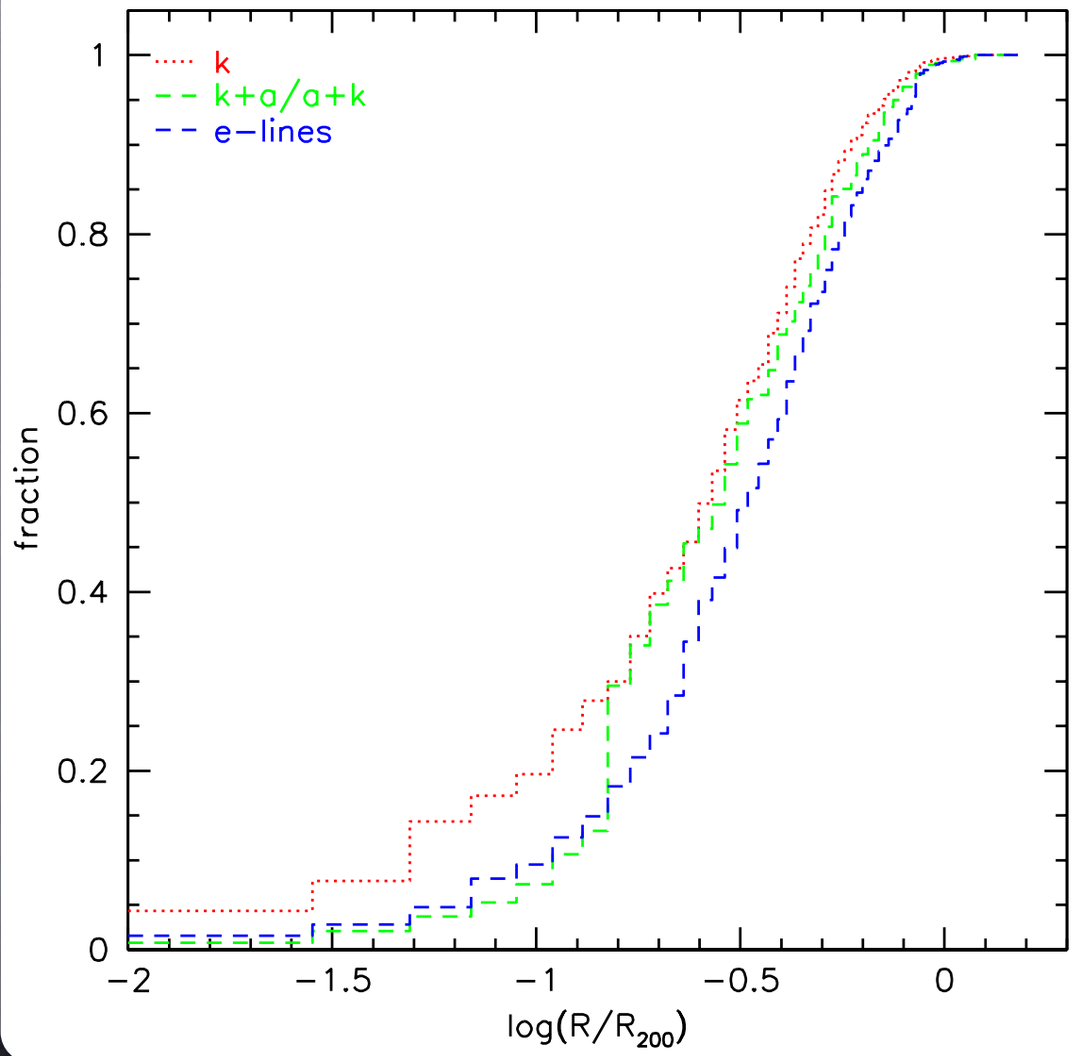
The Galaxy Population in Local Clusters



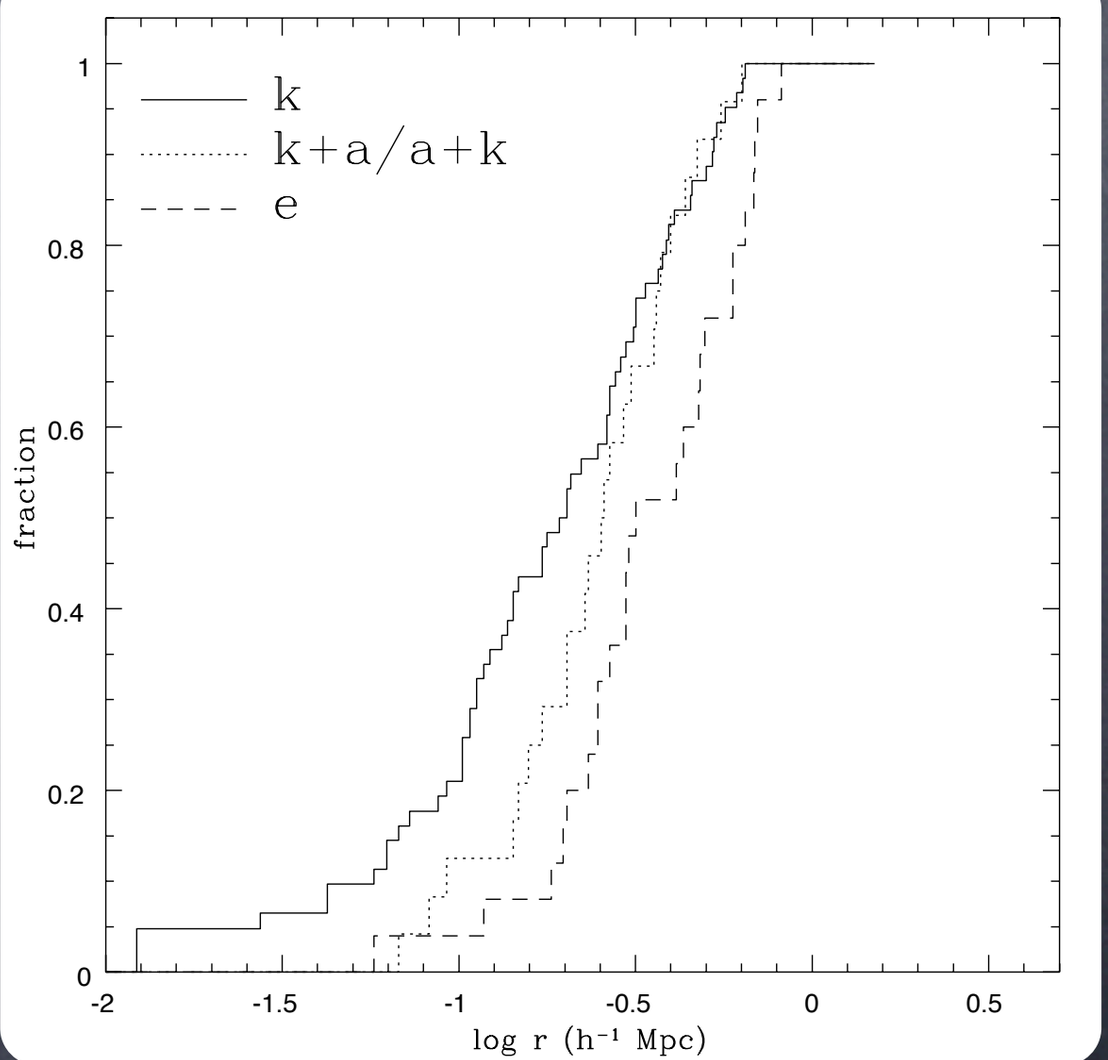
Average radial distribution of spectral types

The Galaxy Population in Local Clusters

WINGS



MORPHS (Dressler et al. 1999)



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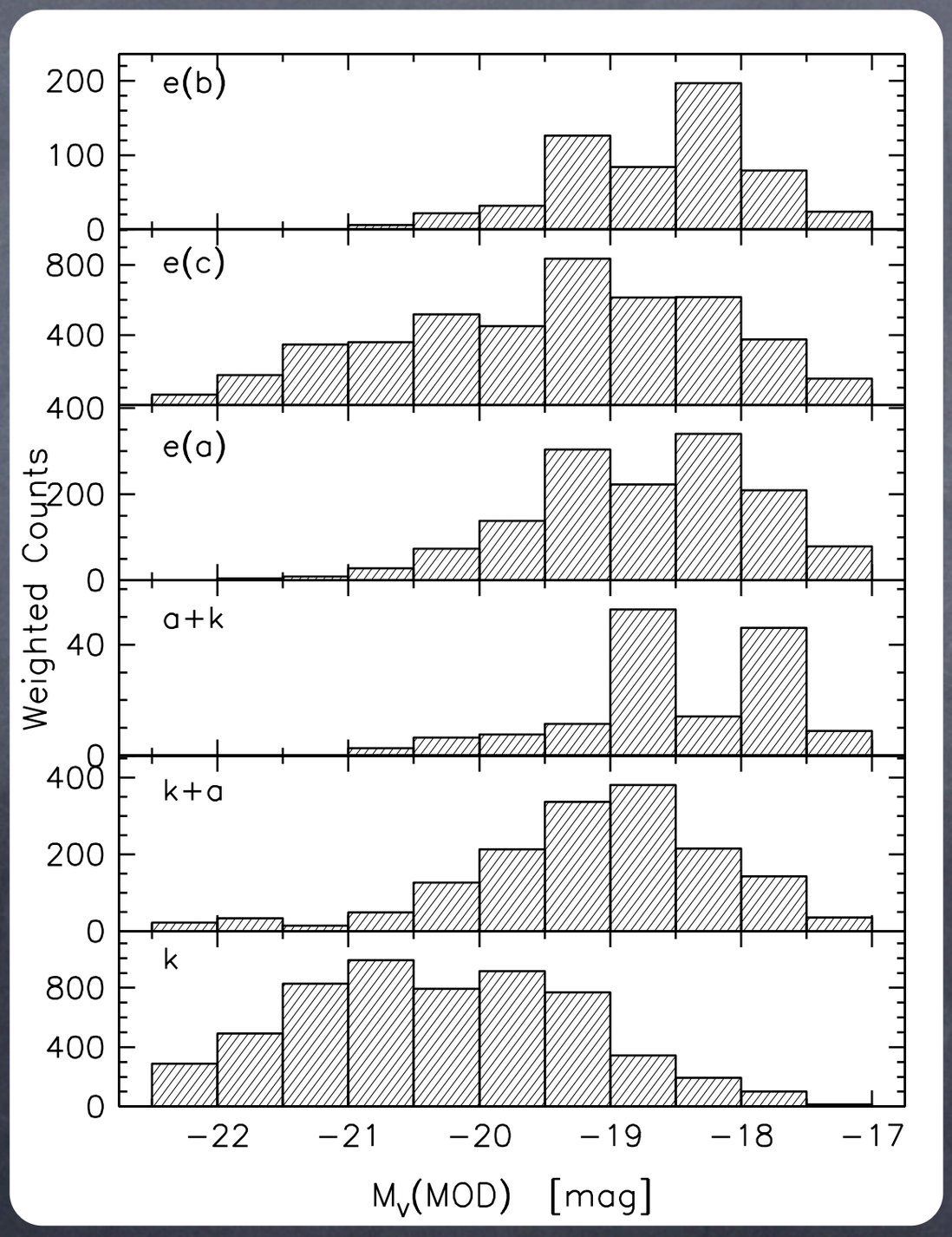

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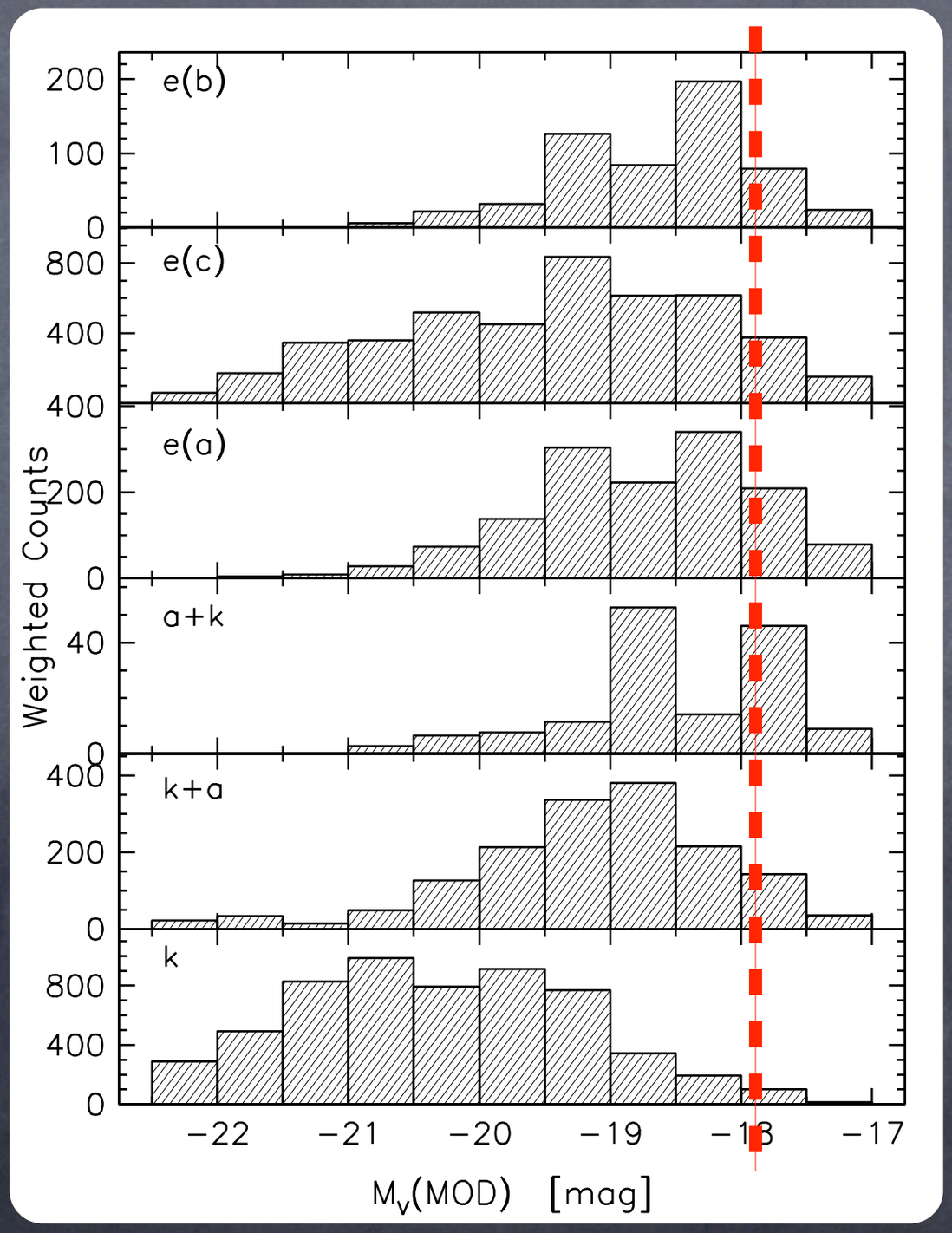

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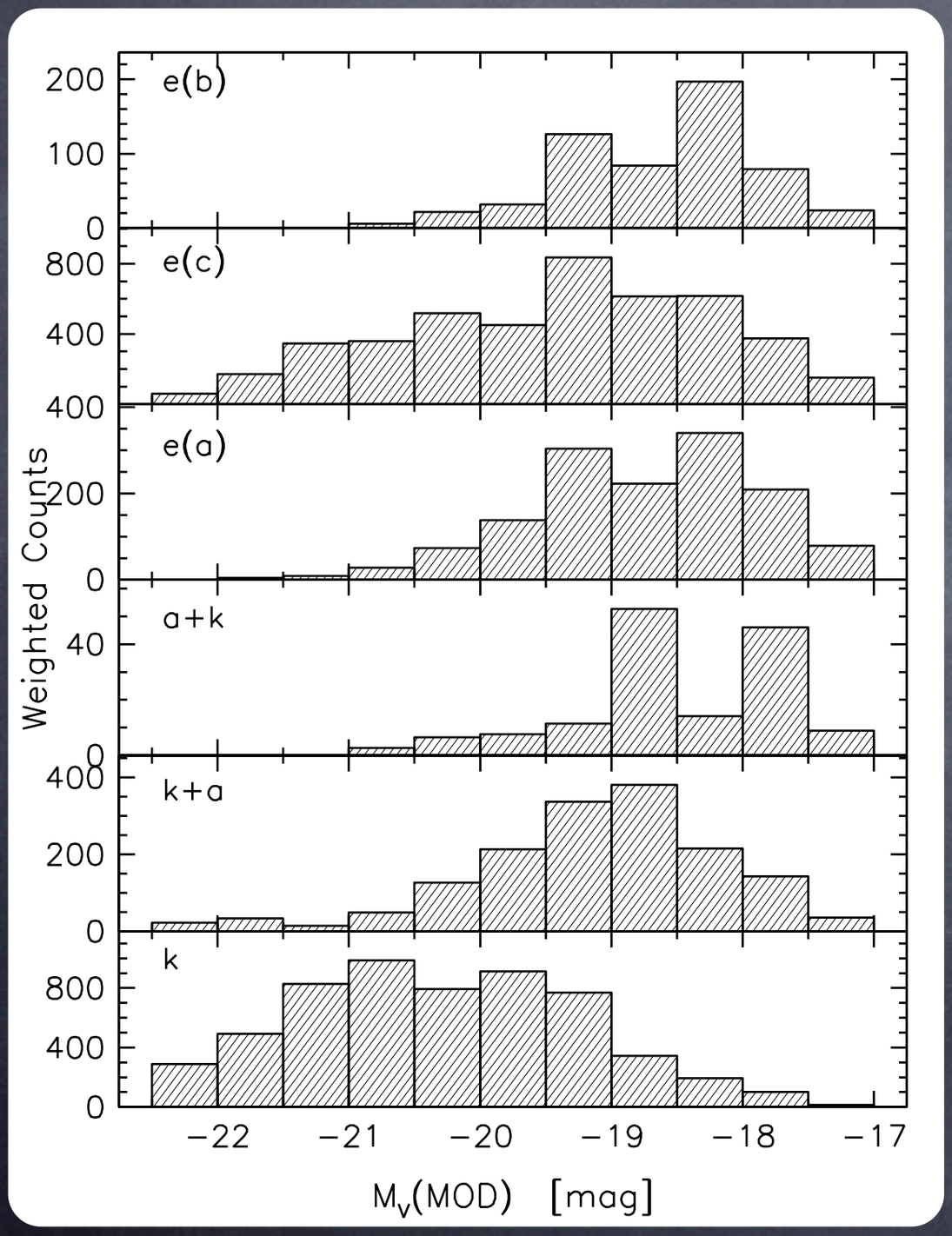

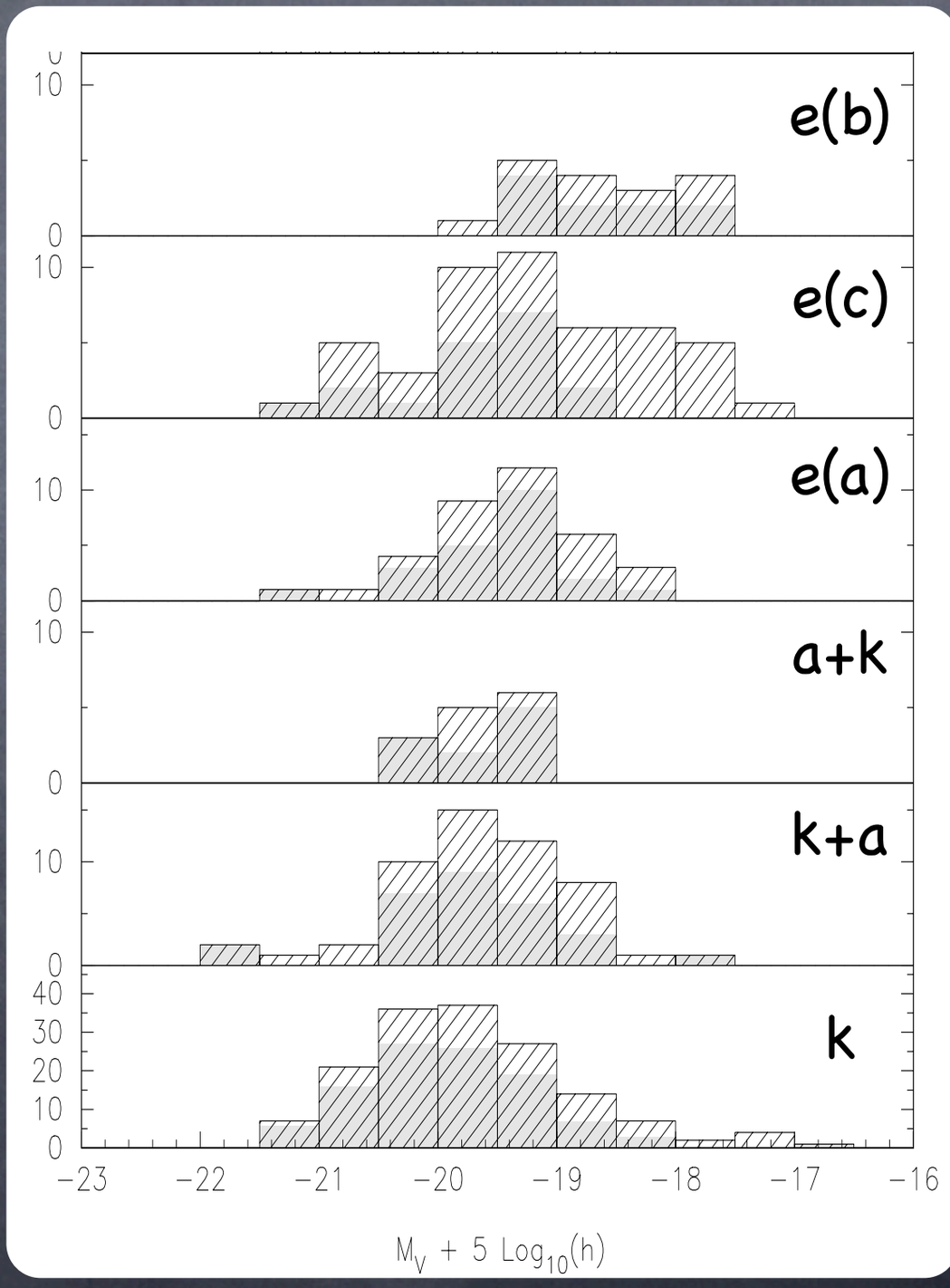

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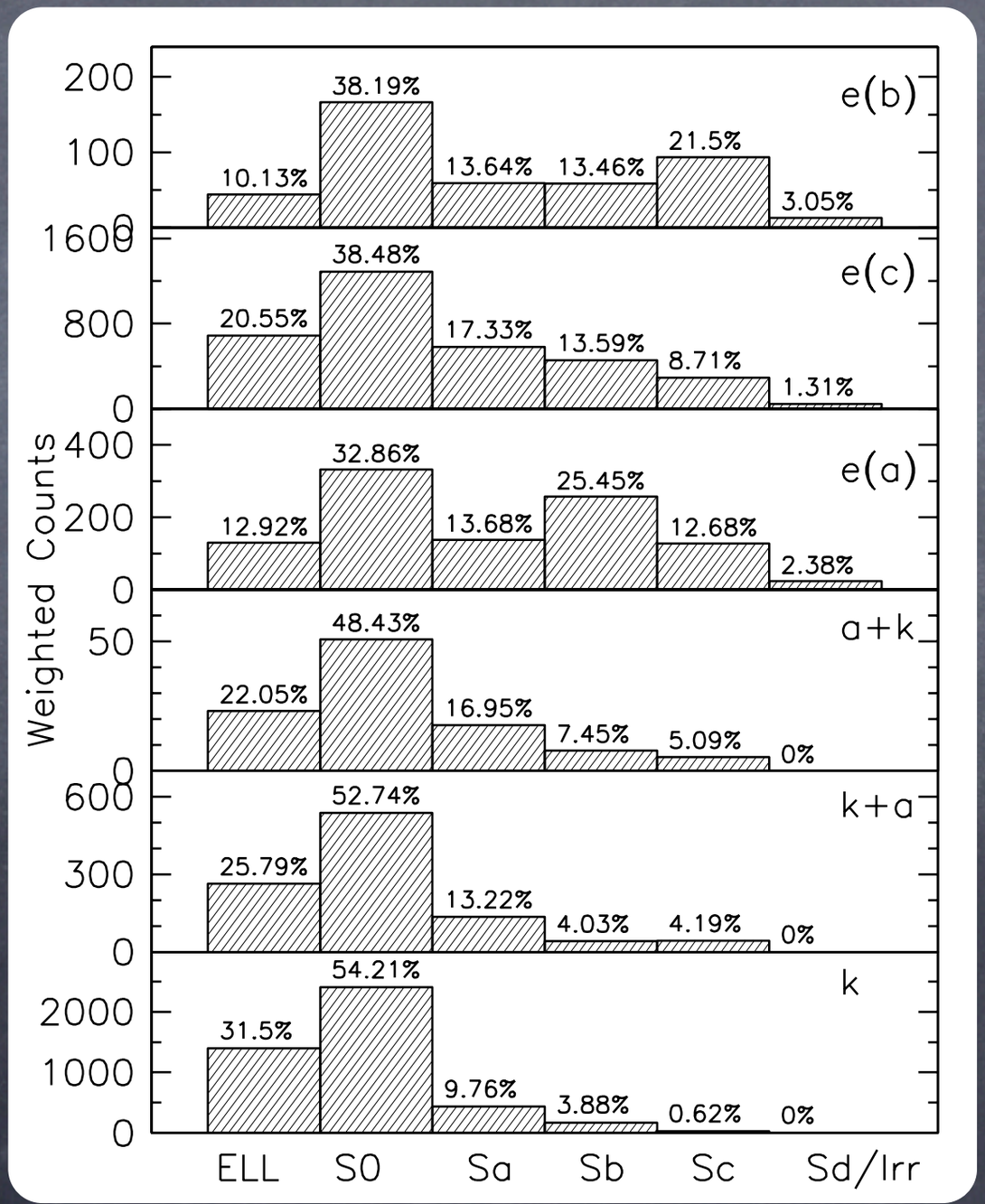

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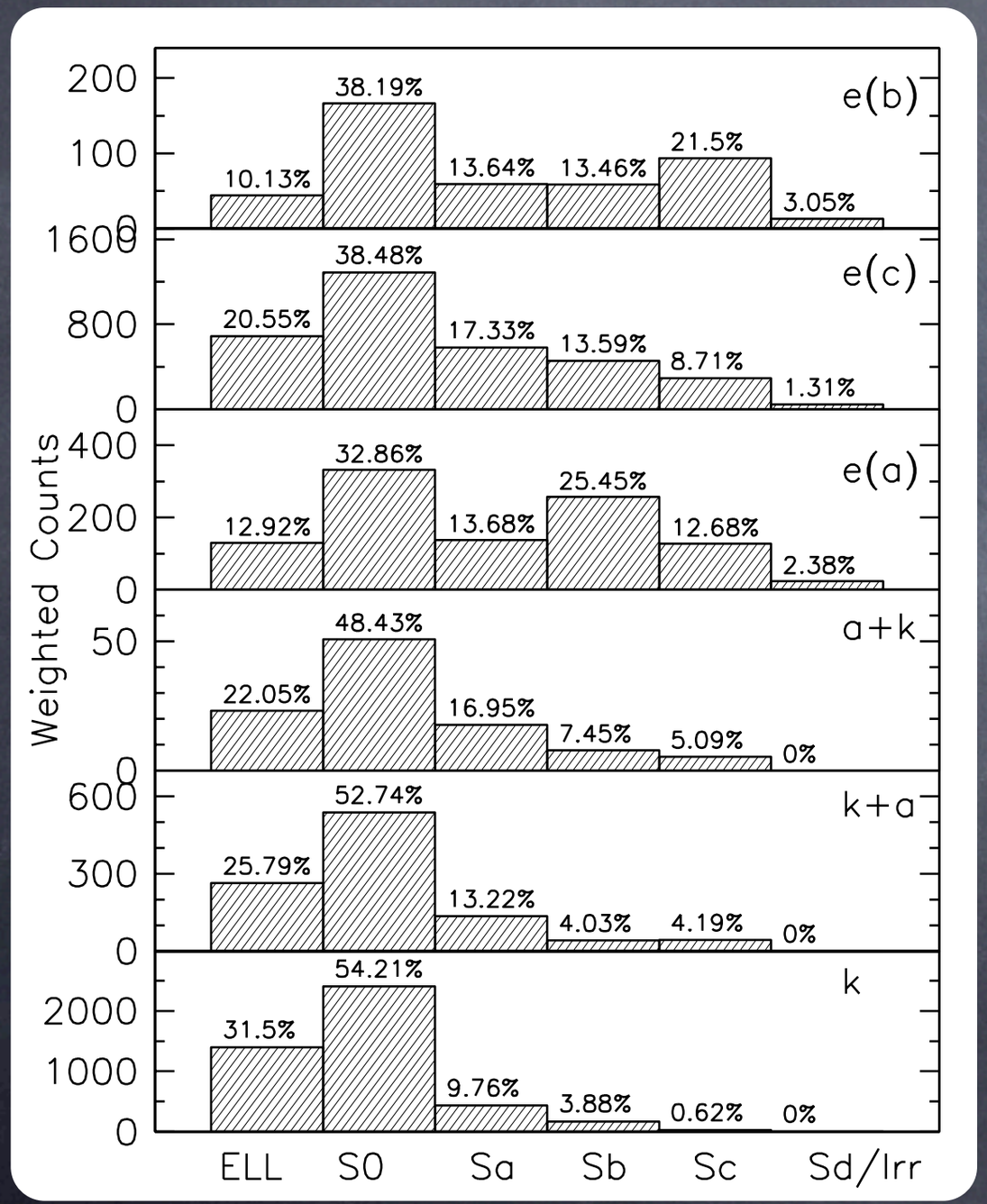

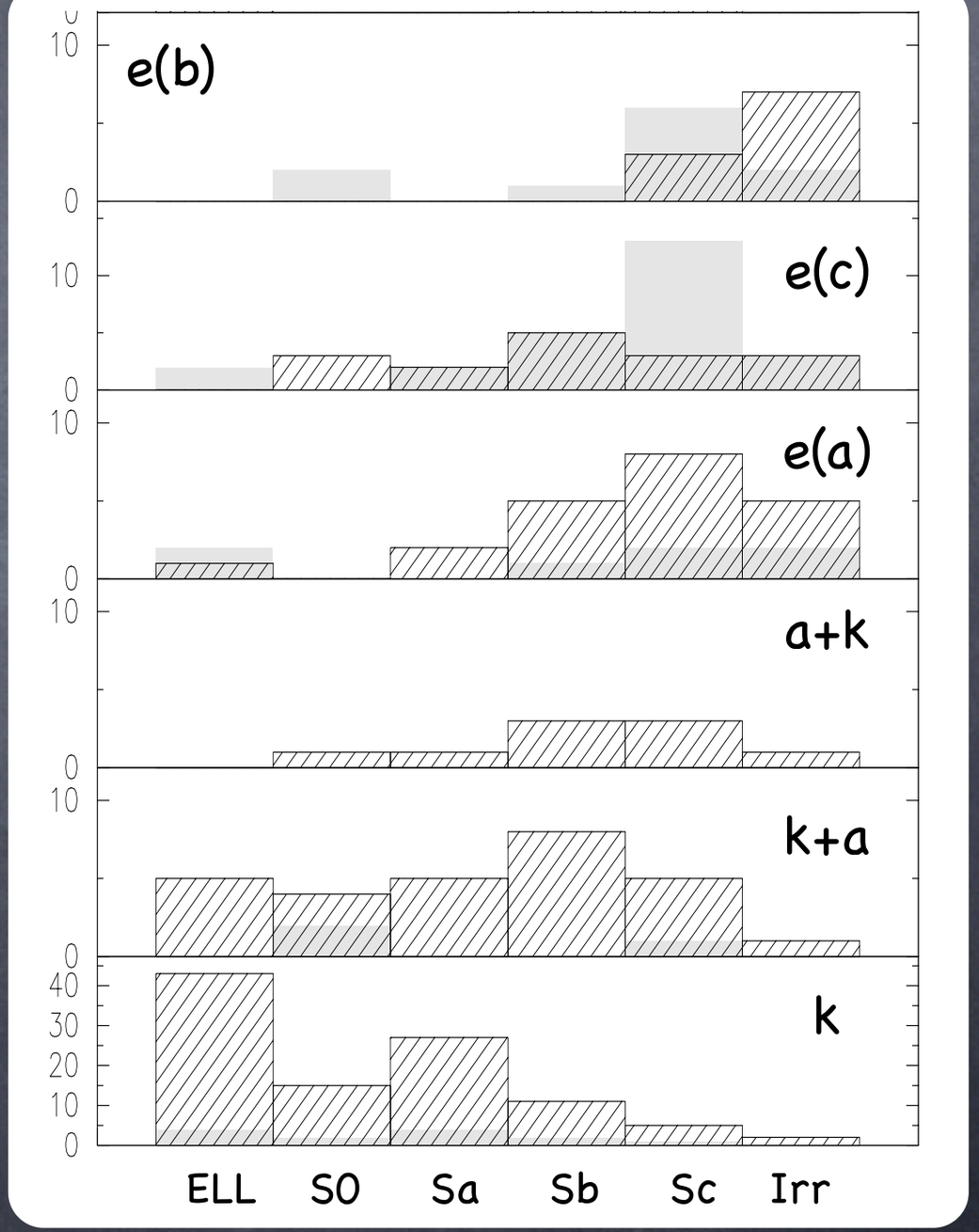

HVALA!

For further information and
to use WINGS data & results
visit:

http://web.oapd.inaf.it/wings/index.html