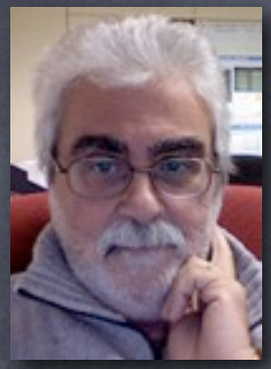
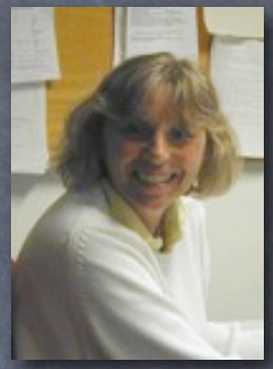
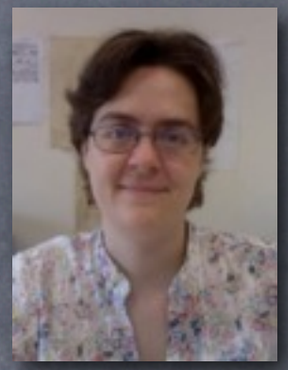
SPECTRAL LINES MEASUREMENTS IN CLUSTER GALAXIES: HINTS ON THE STAR FORMATION HISTORY

Jacopo Fritz
(Universiteit Gent)
&
the WINGS collaboration

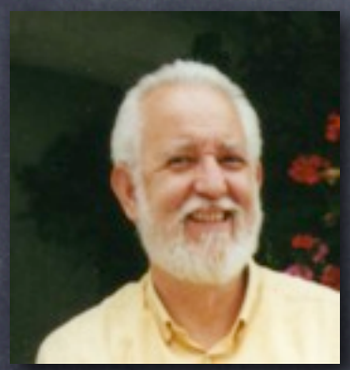
OVERVIEW

People & Institutes

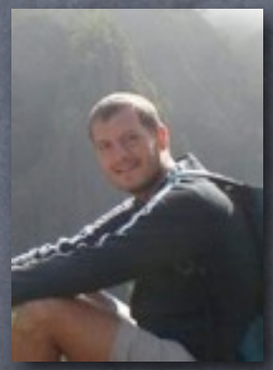


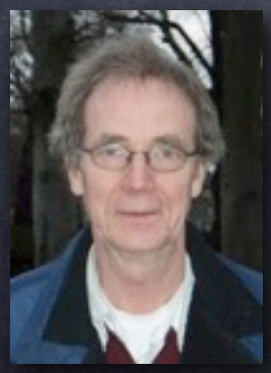



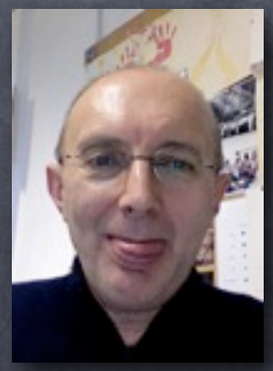
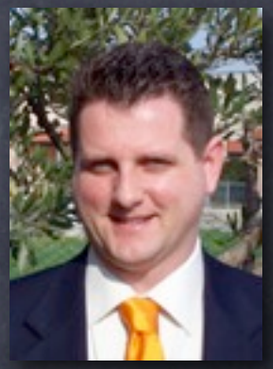
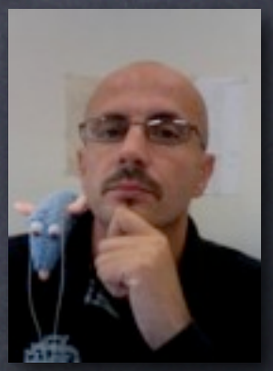

Core Team




(not so) young collaborators

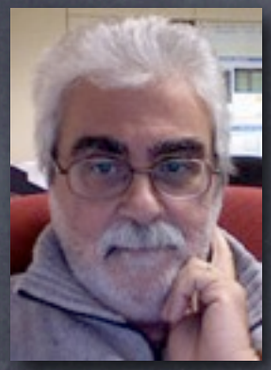


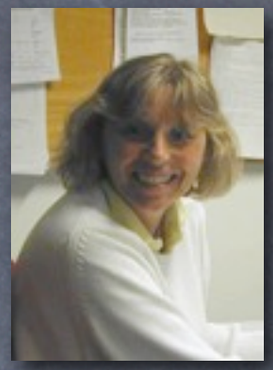


OVERVIEW

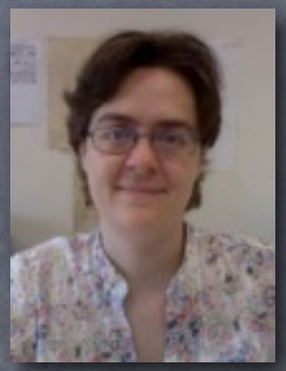
People & Institutes



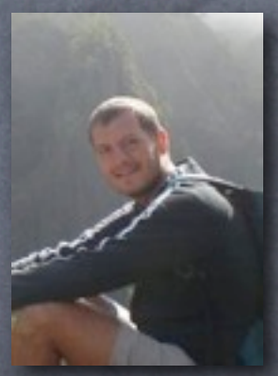


C.S.I.C. - Granada

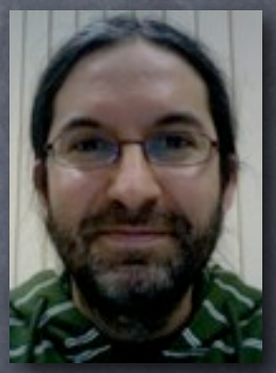
Spain

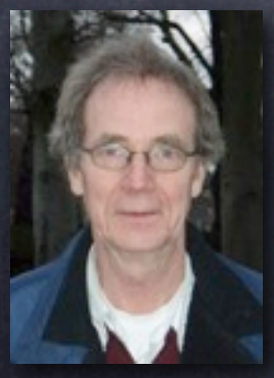


Core Team



(not so) young collaborators








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

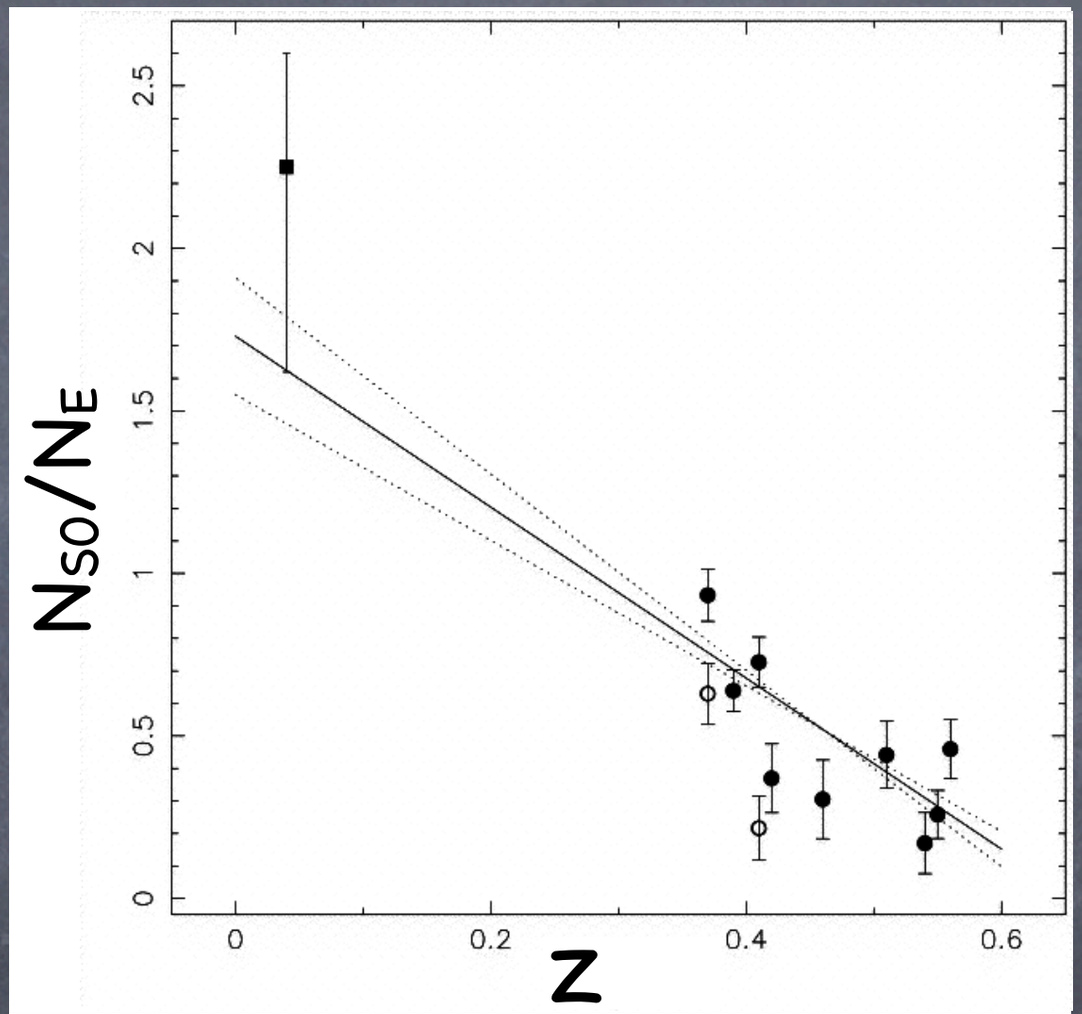
B+V
composite

34′

34′

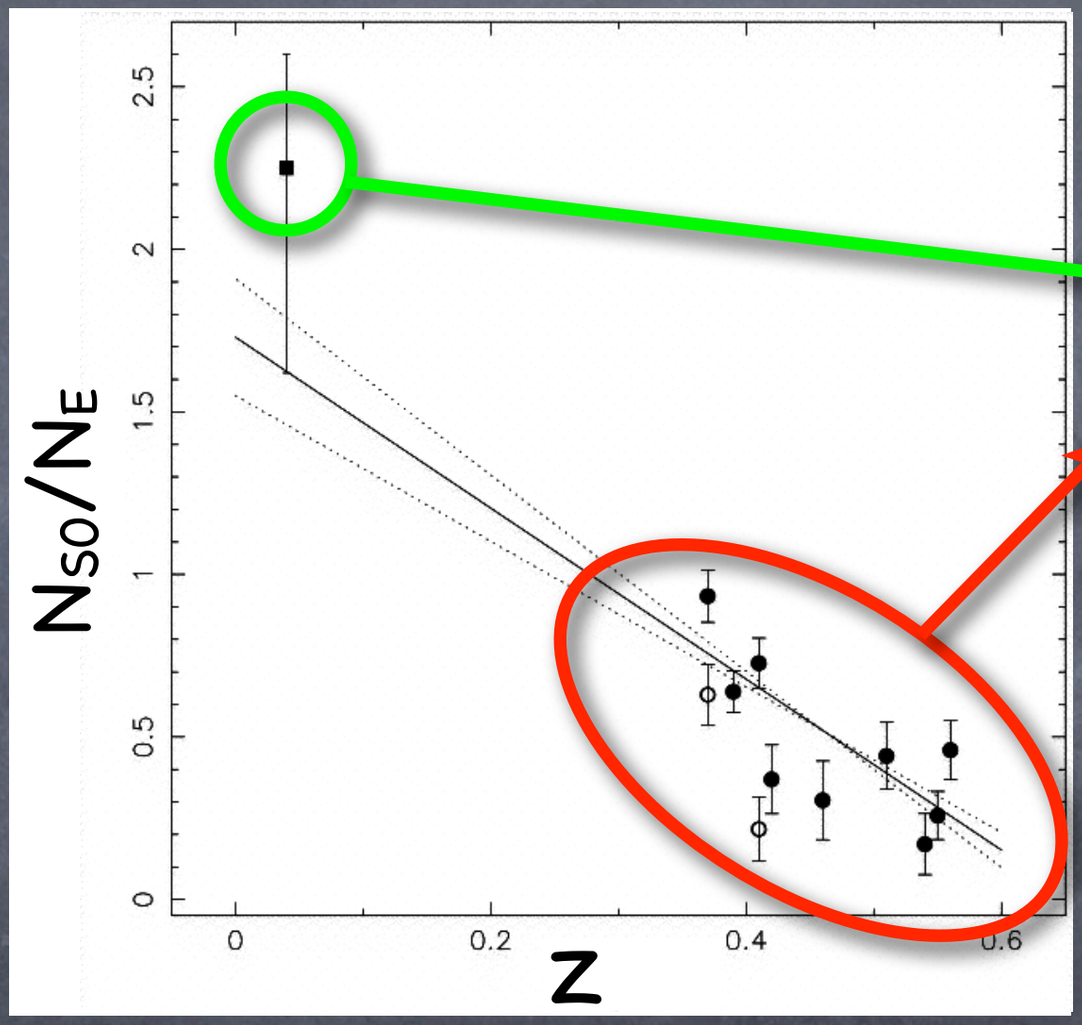
WHY WINGS?

- Optimal HST data @ z~0.5



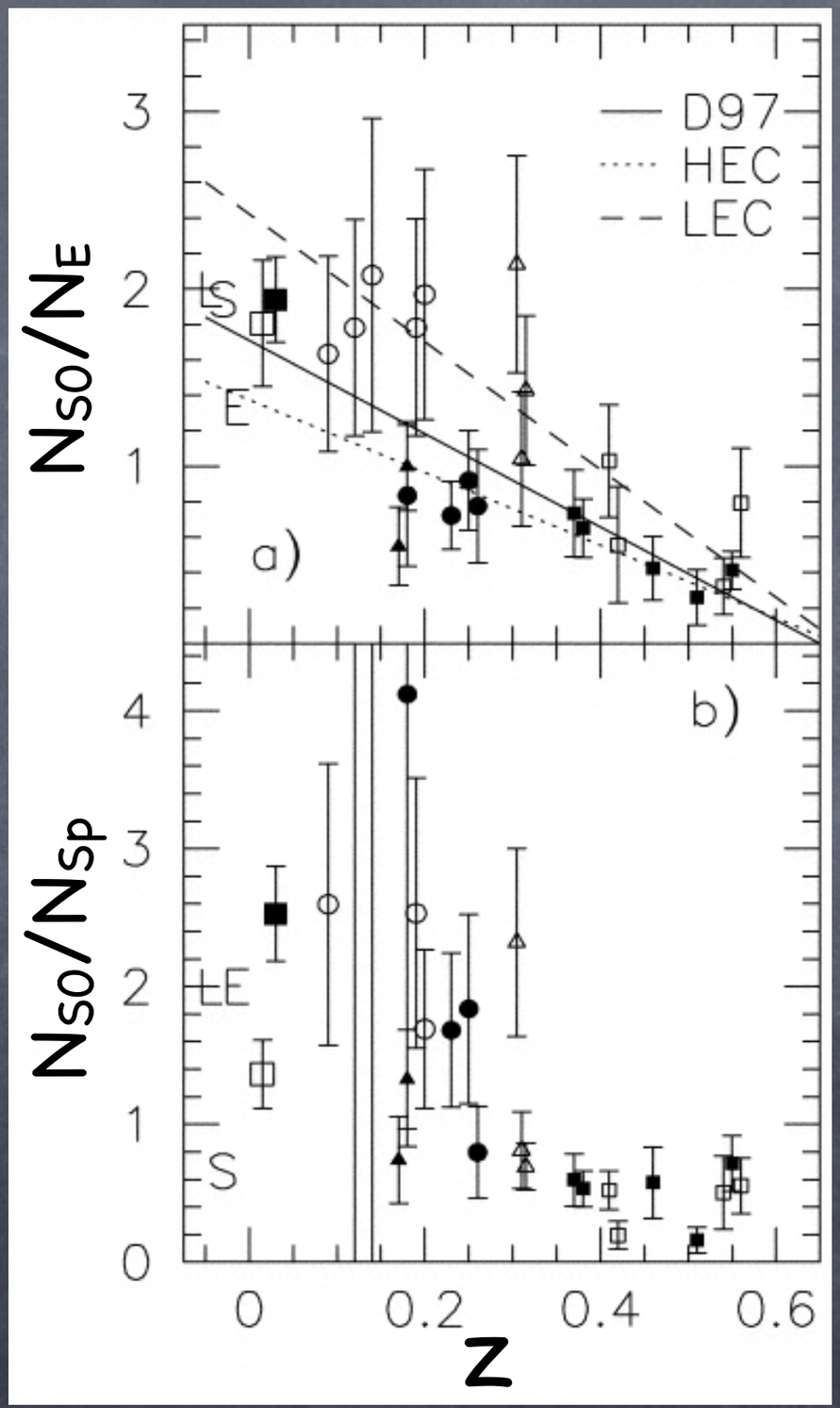
WHY WINGS?

- Optimal HST data @ z~0.5



WHY WINGS?

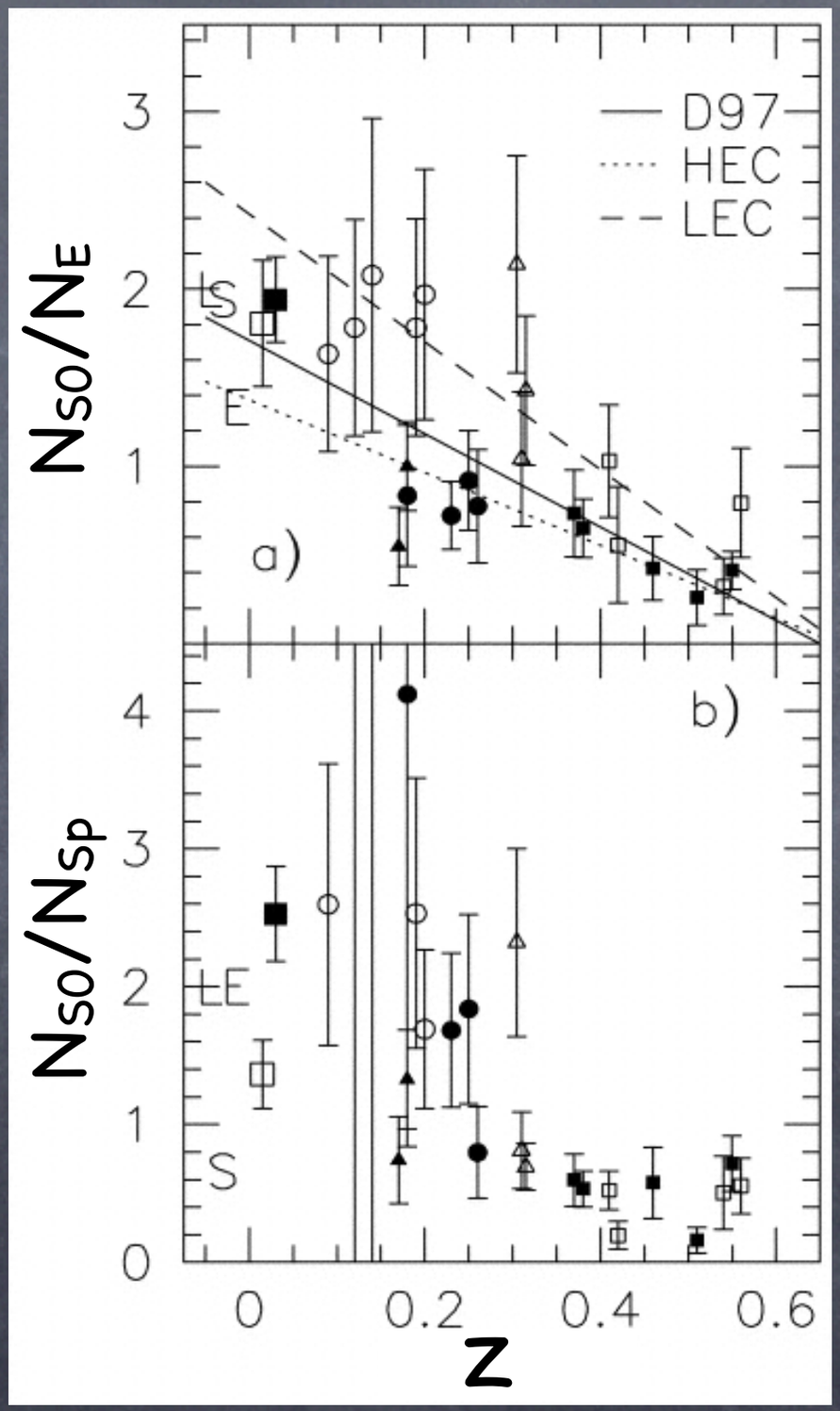
- Optimal HST data @ z~0.5
- Sparse data (Virgo, Coma), non-homogeneous @ z~0



WHY WINGS?

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

LACK OF A ZERO-POINT BENCHMARK !!

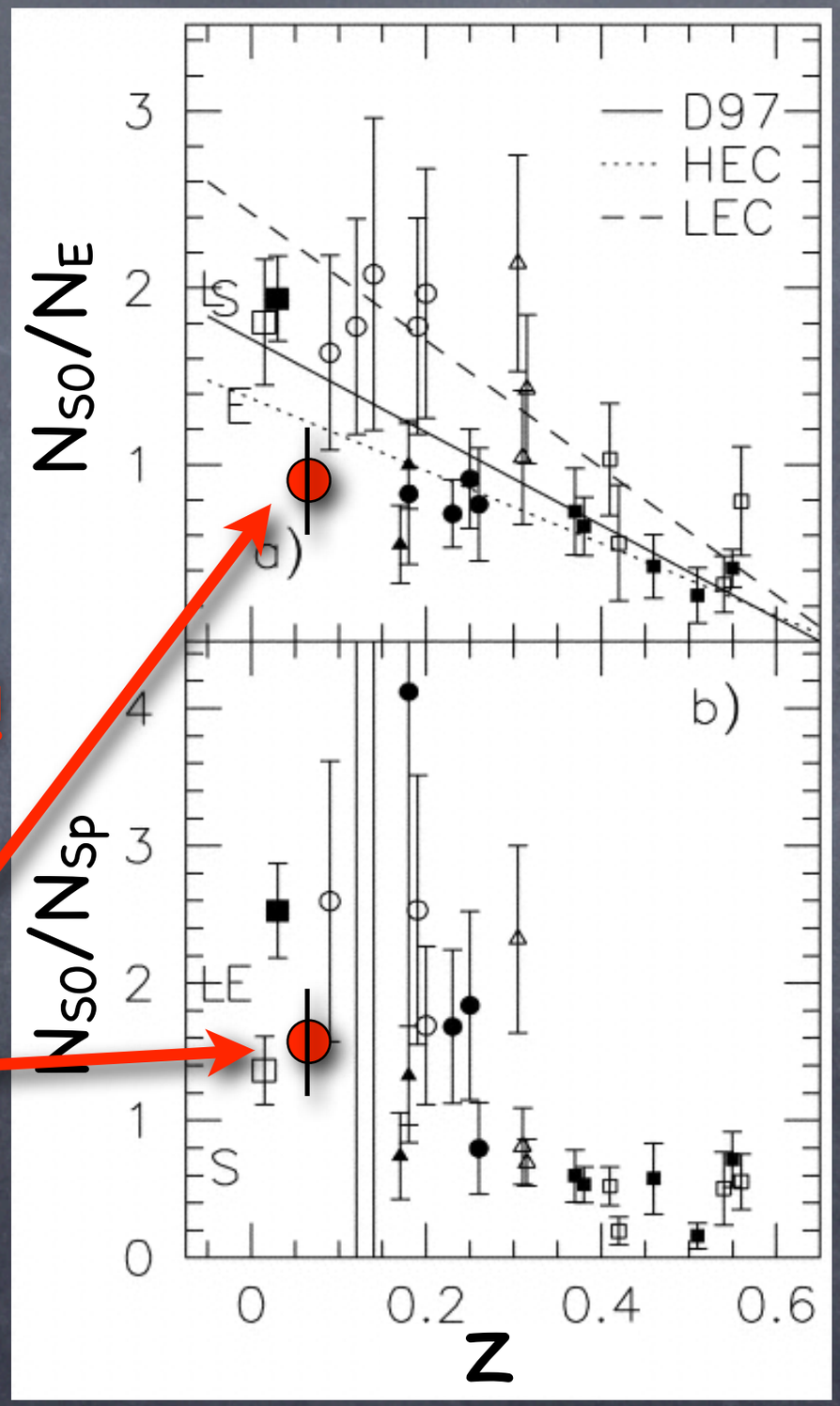


WHY WINGS?

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

LACK OF A ZERO-POINT BENCHMARK !!

WINGS



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

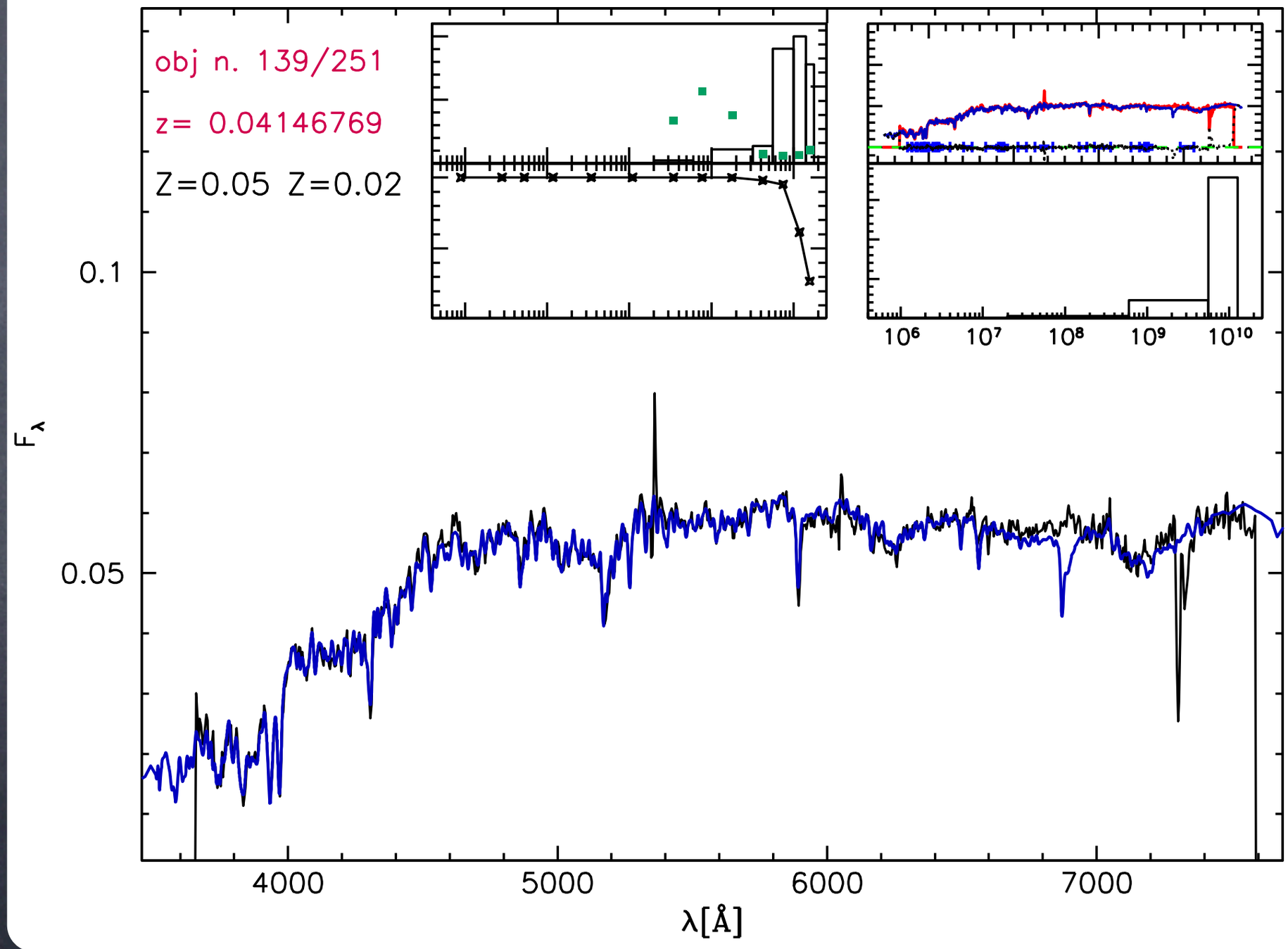
- Derive Redshifts & Proper Motions — Cava et al. 2009
- Derive Stellar Masses — Fritz et al. 2007, 2011
- Derive Star Formation Histories — Fritz et al., in prep.
- Measure Spectral Lines — Hansson et al., submitted
- Derive Ages and Metallicities from spectral indices — Ramella et al. 2007, Cava et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

WINGS-SPE

Early Results

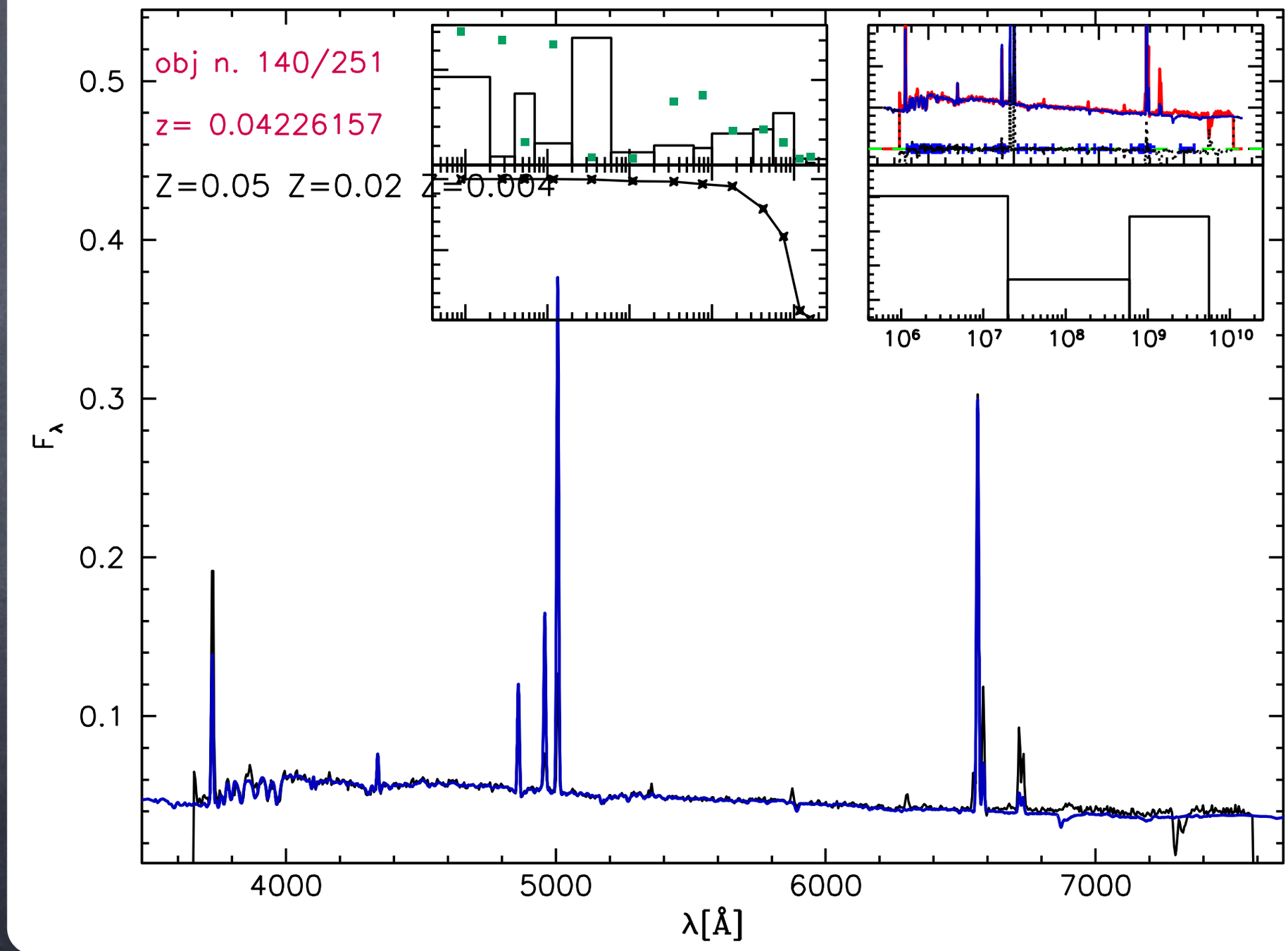
- 6137 redshifts
- Mean accuracy of ~45 km/s
- Velocity dispersions
- ~60% of galaxies classified as cluster members
- Number of known members triplicated

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

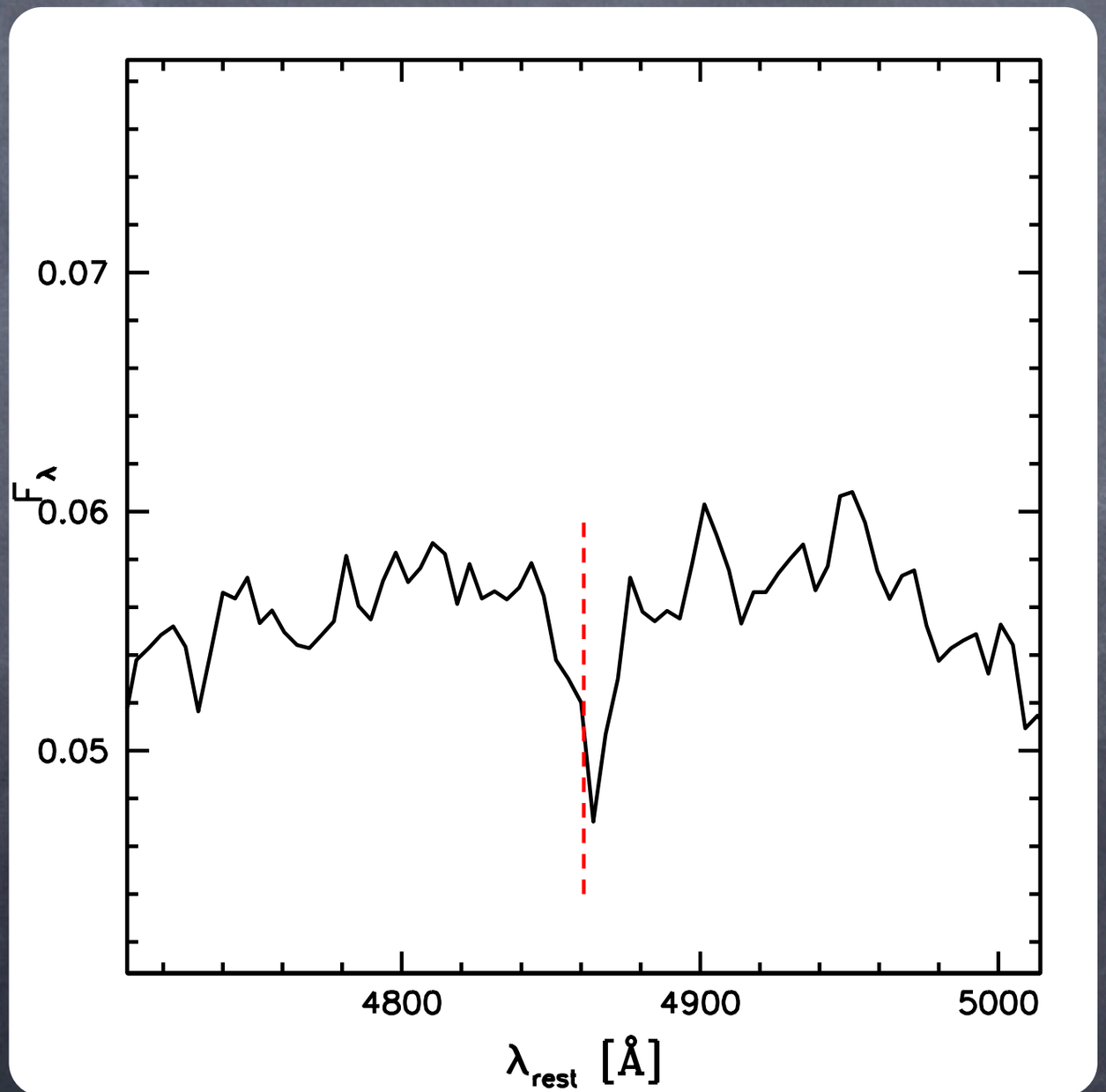
- What for?
  - SFR estimates
  - Extinction
  - SSP fitting
  - Stellar populations

Equivalent Widths Measurements

- How?

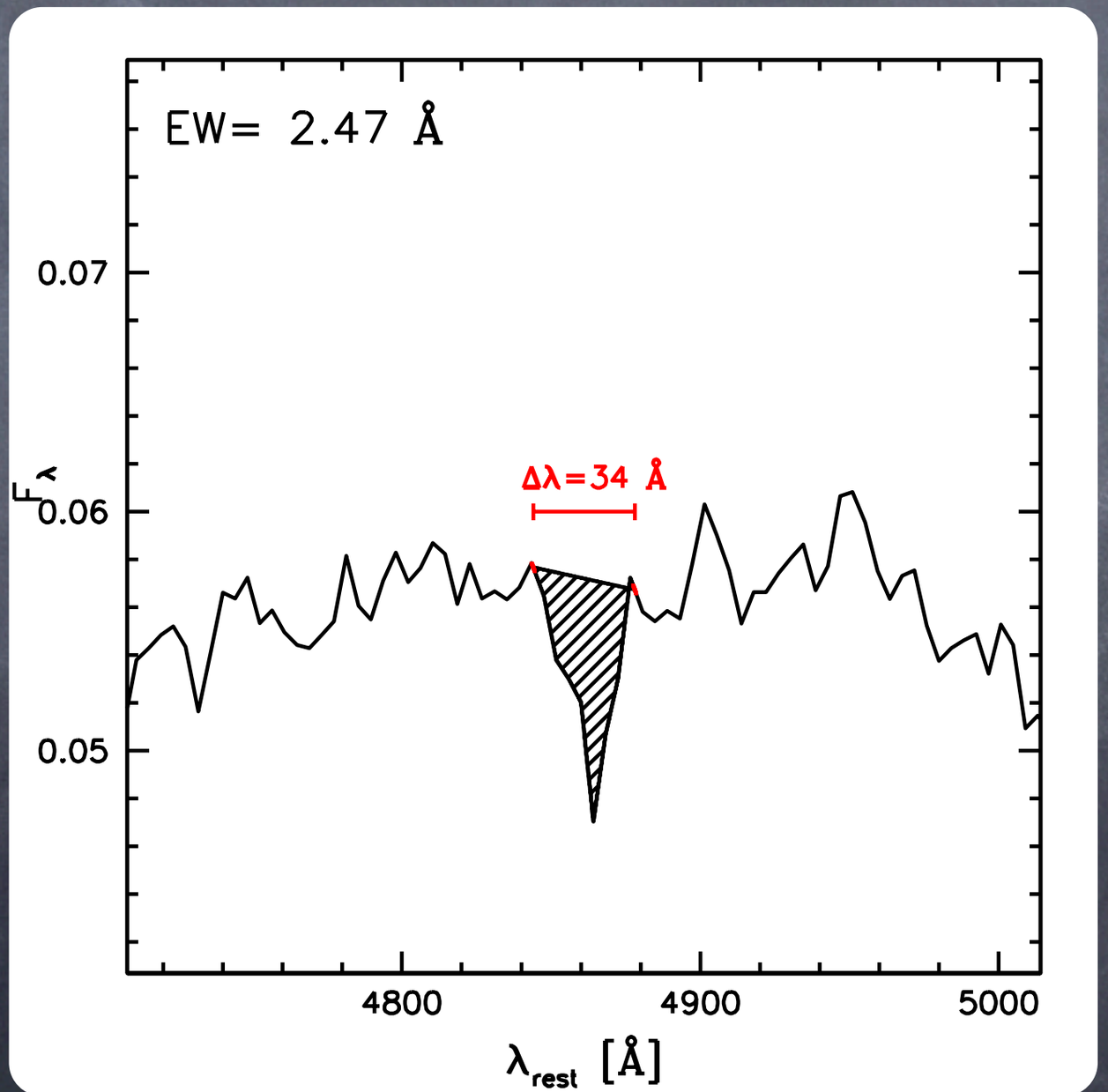
Equivalent Widths Measurements

- How?



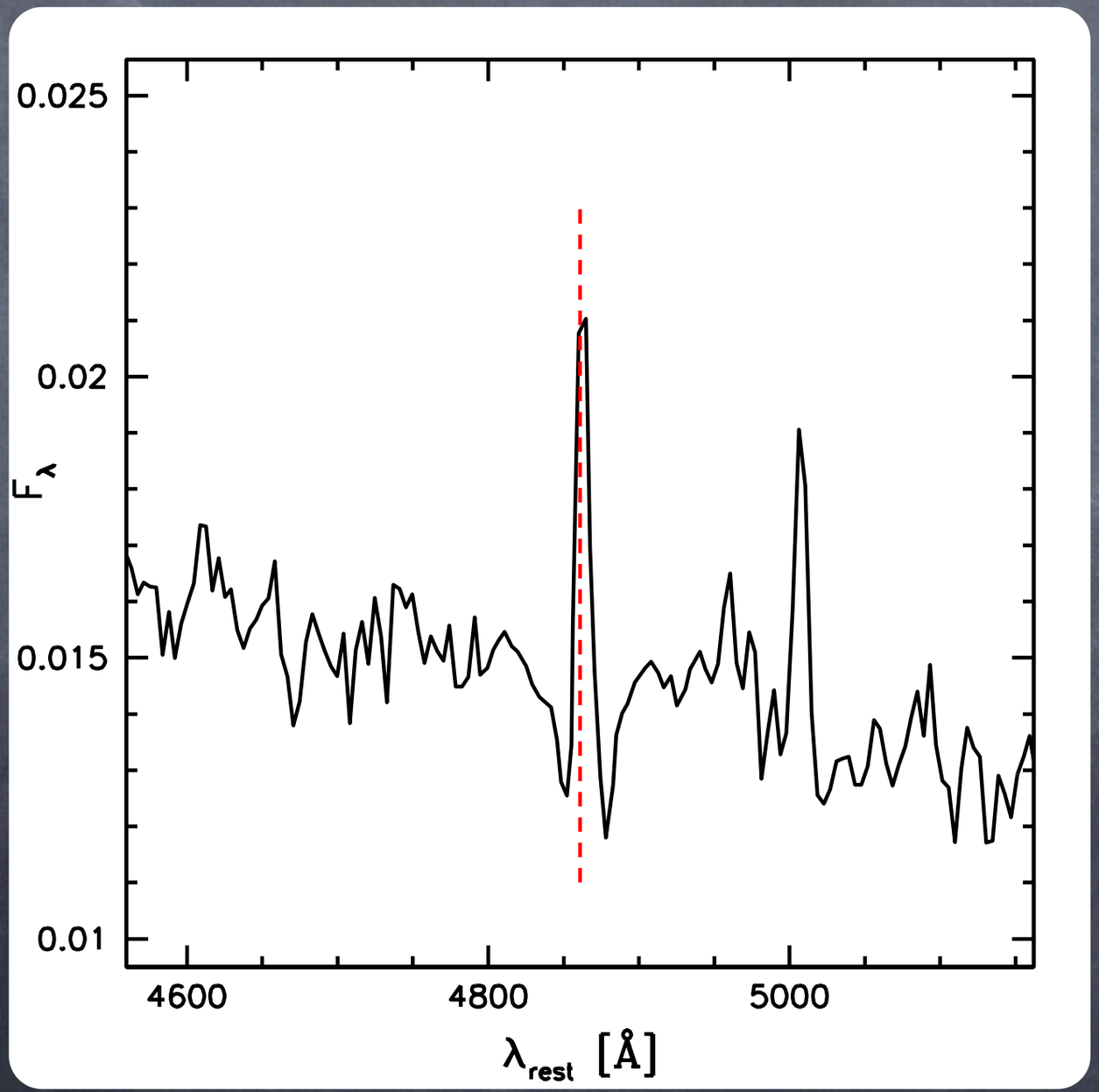
Equivalent Widths Measurements

- How?



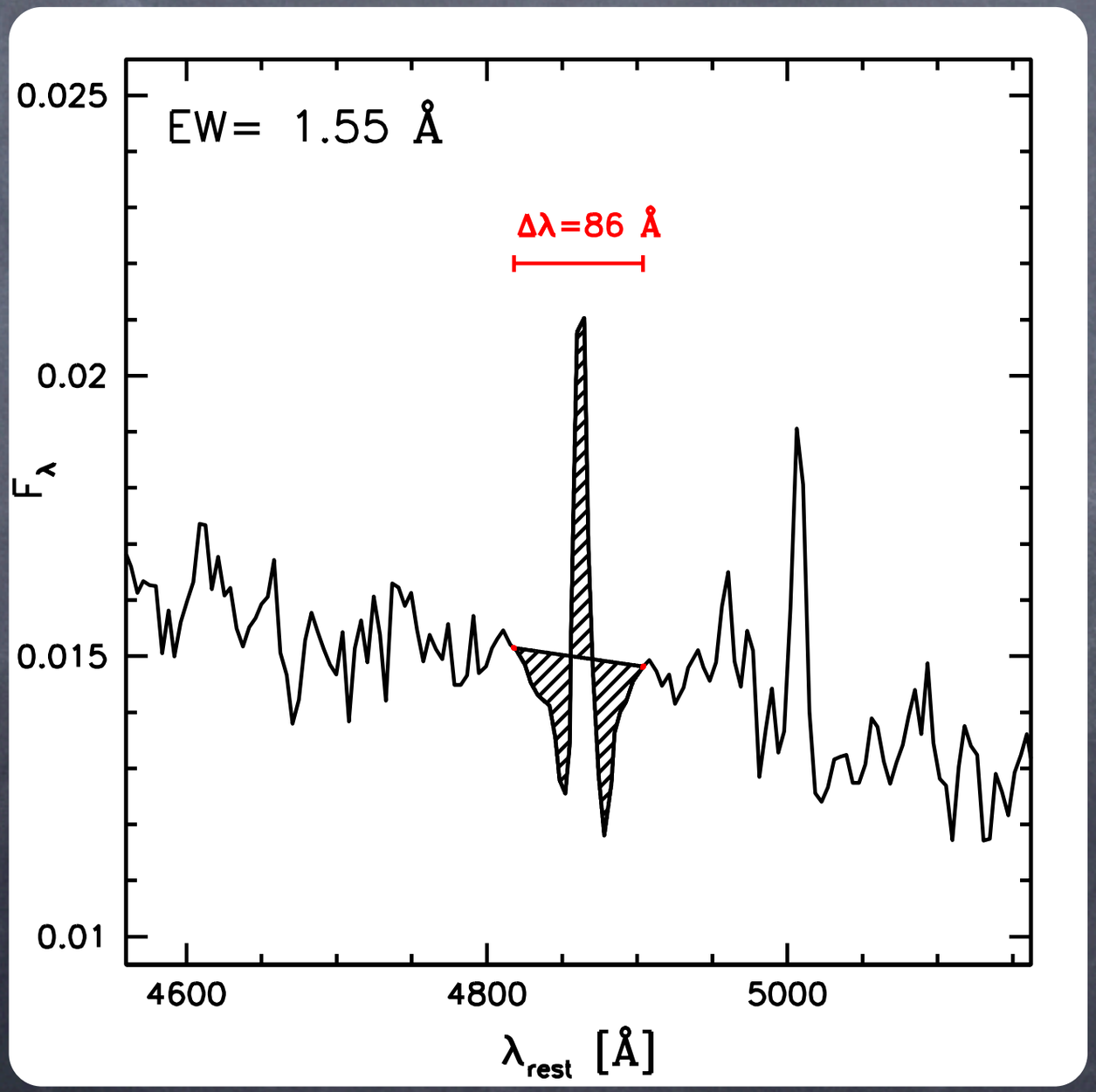
Equivalent Widths Measurements

- How?



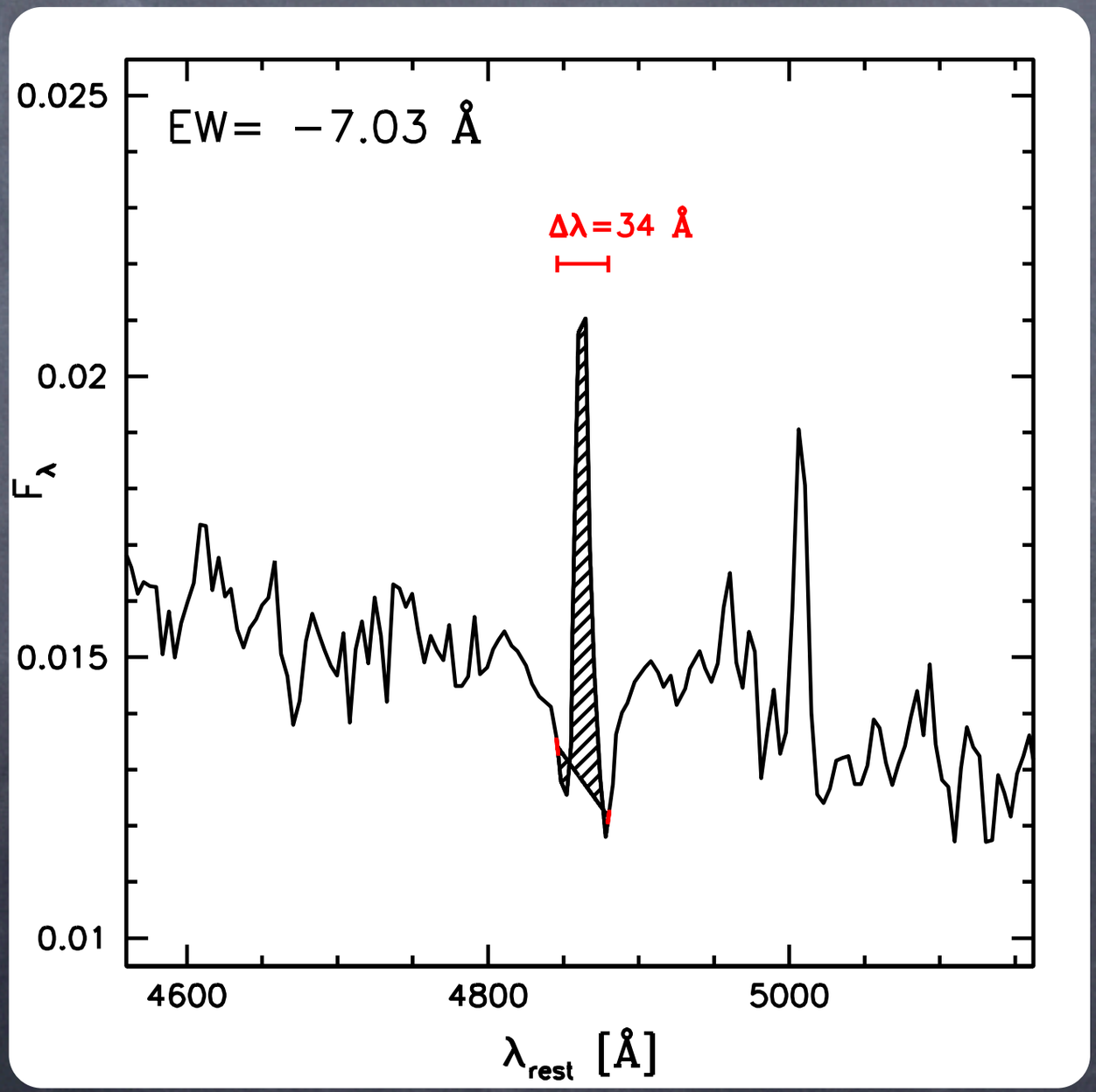
Equivalent Widths Measurements

- How?

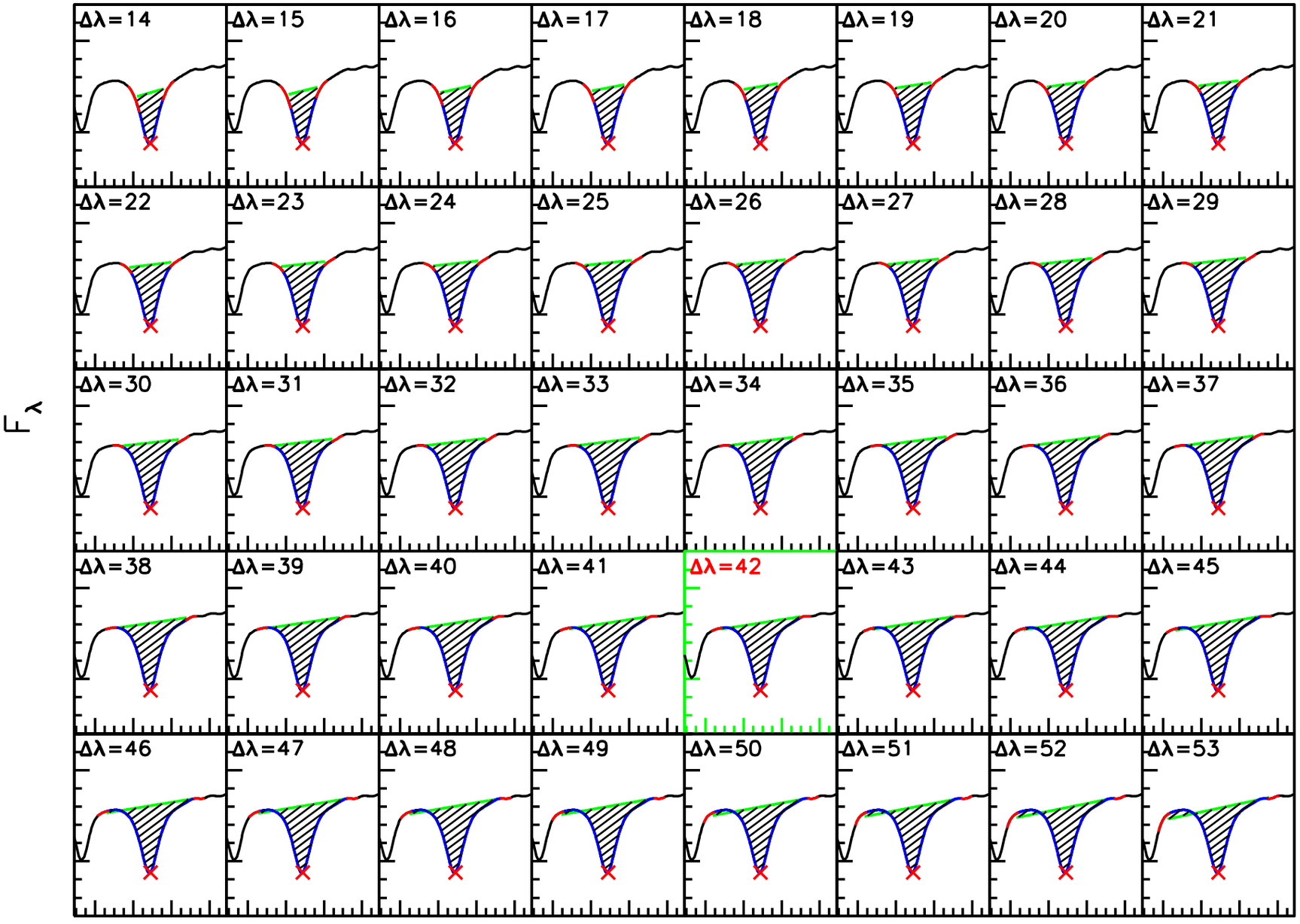


Equivalent Widths Measurements

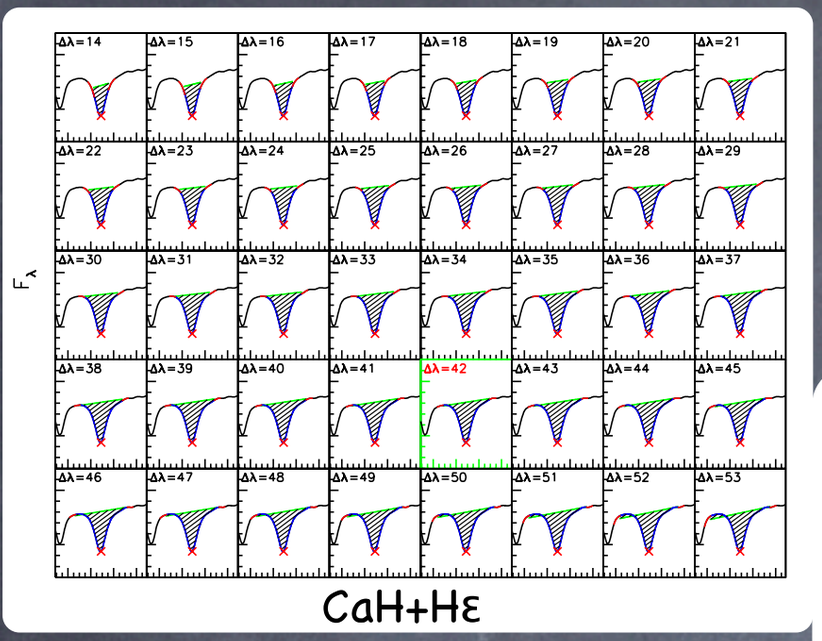
- How?

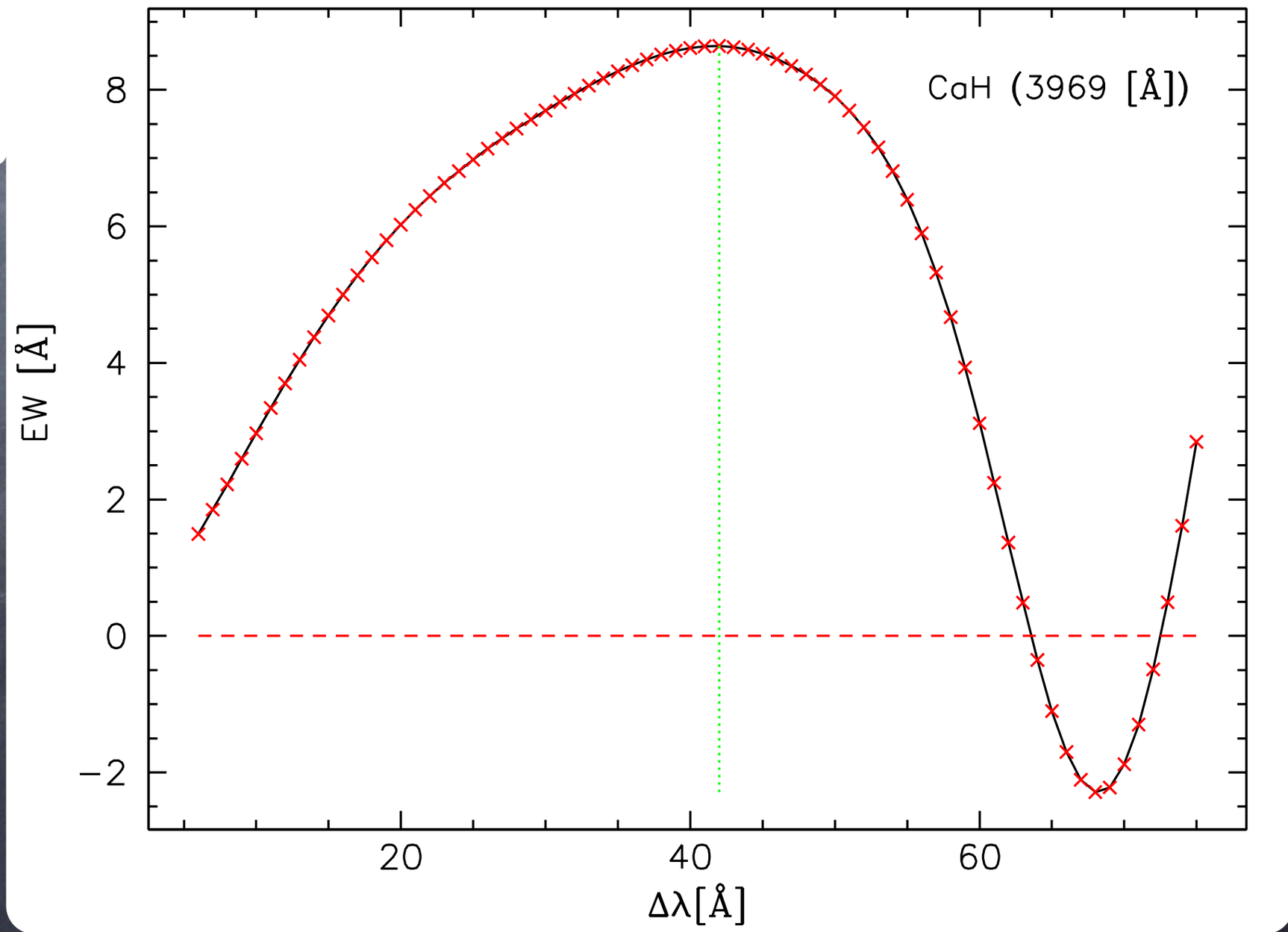


Getting to the optimal value

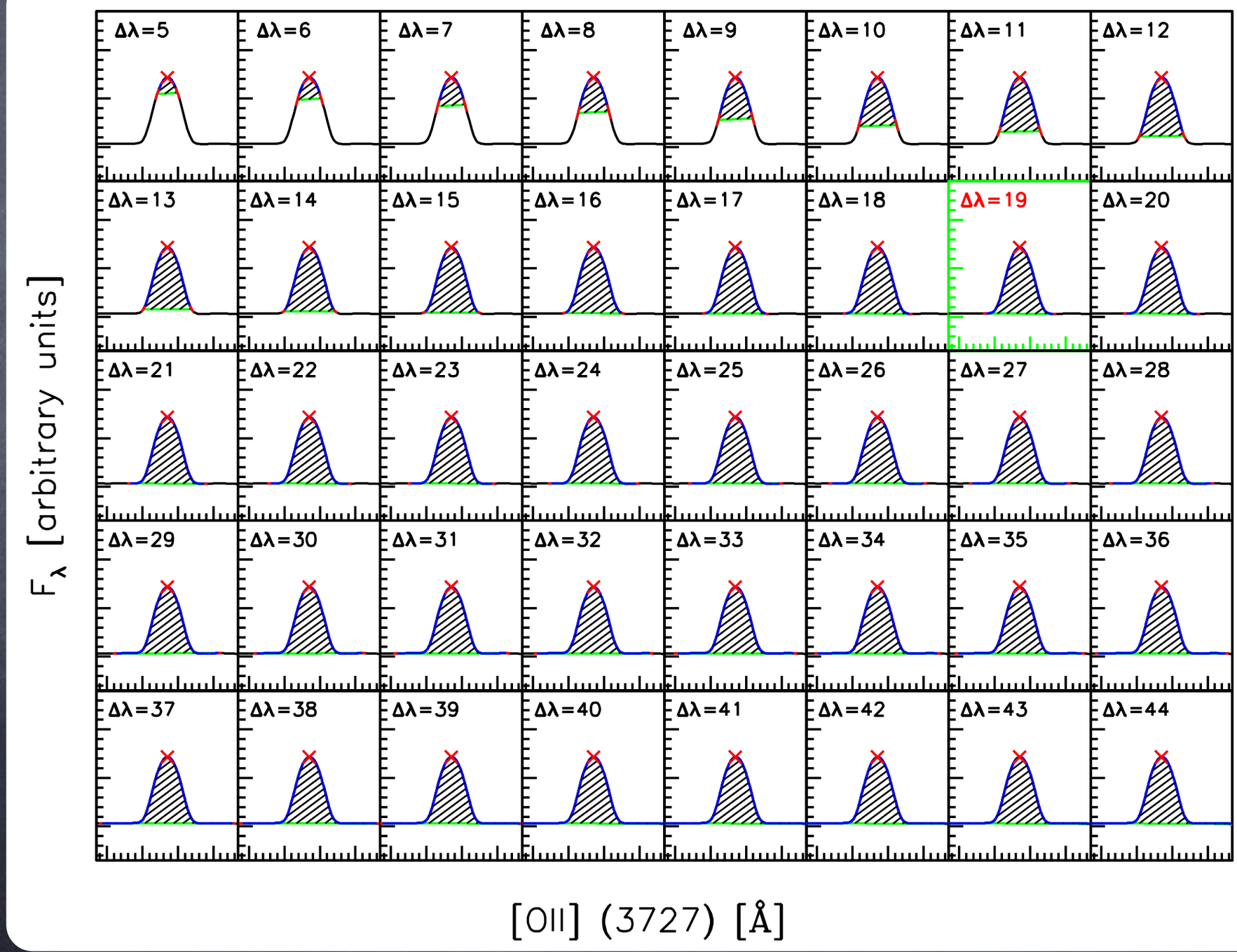


Getting to the optimal value

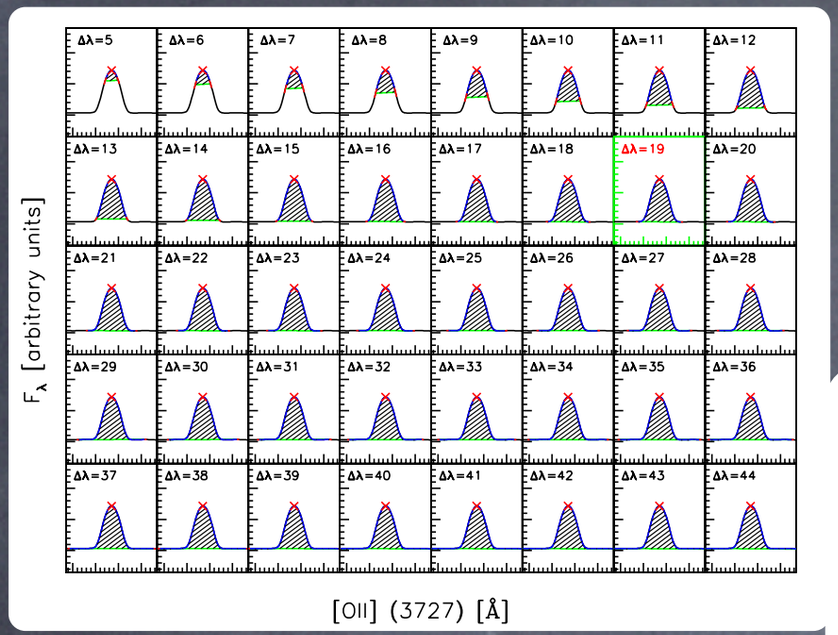


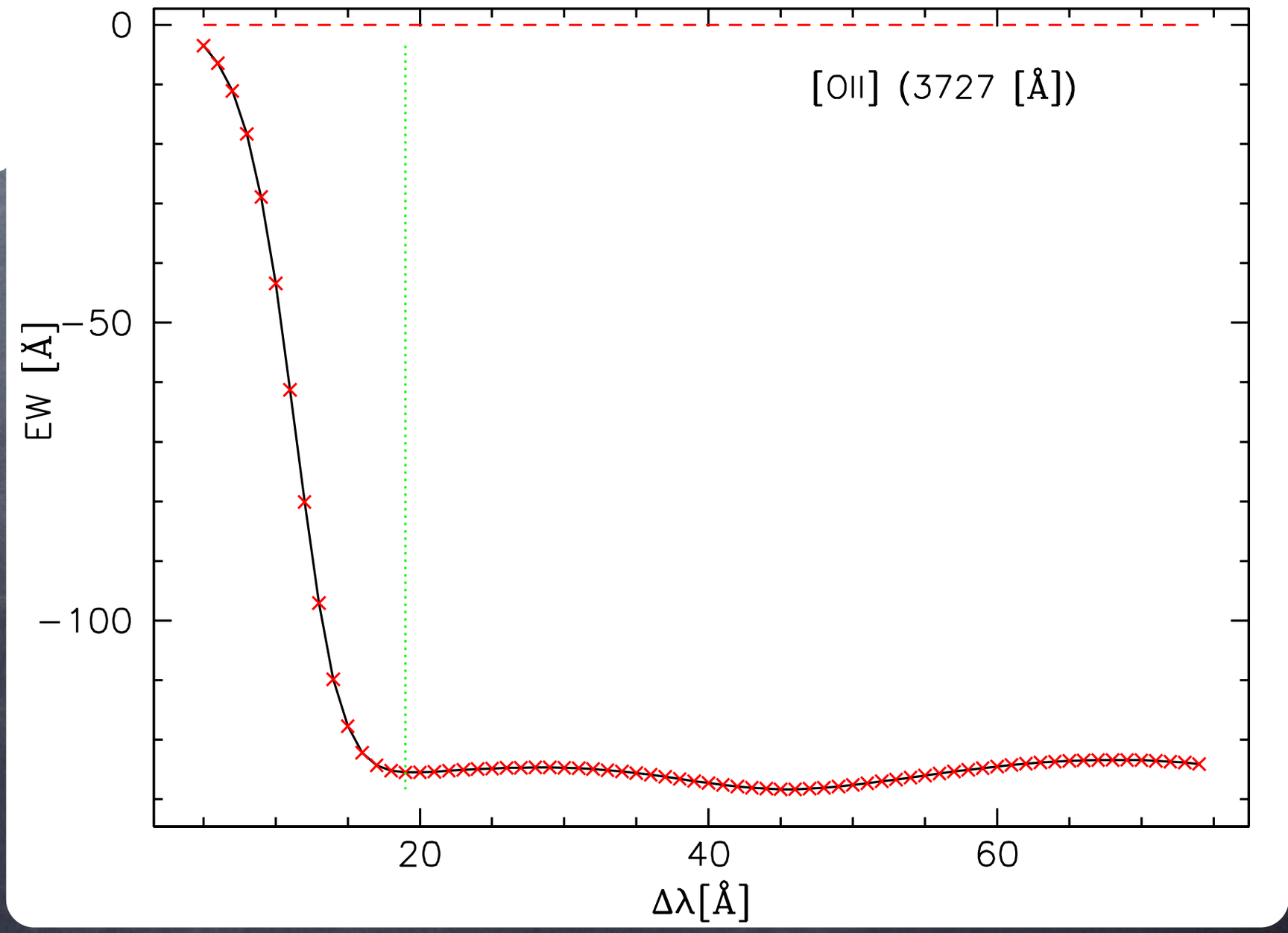


Getting to the optimal value

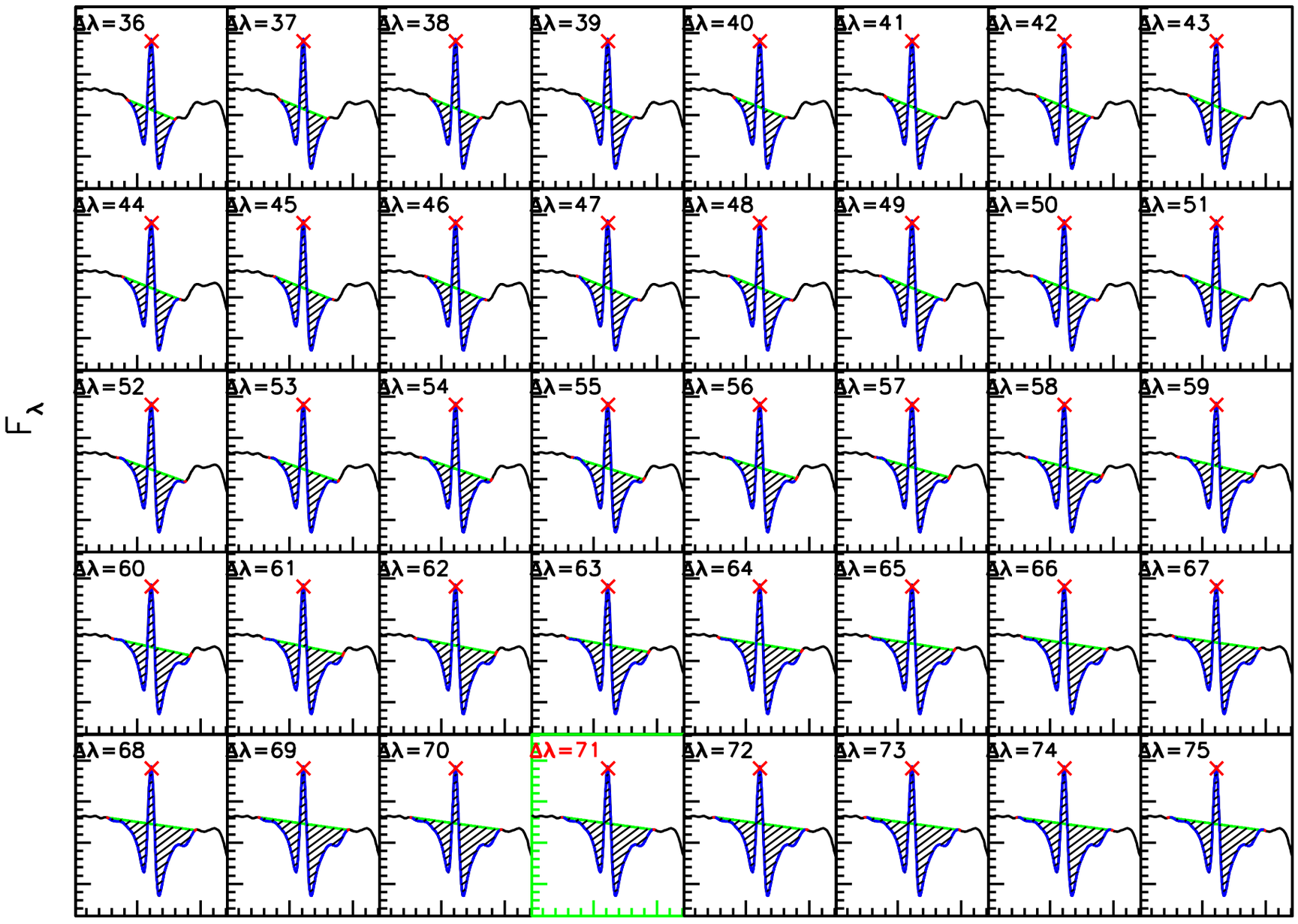


Getting to the optimal value

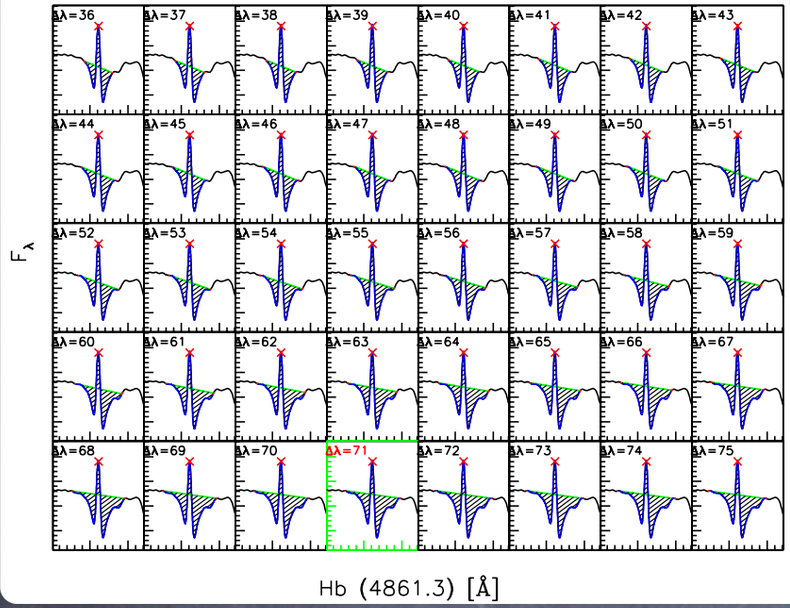


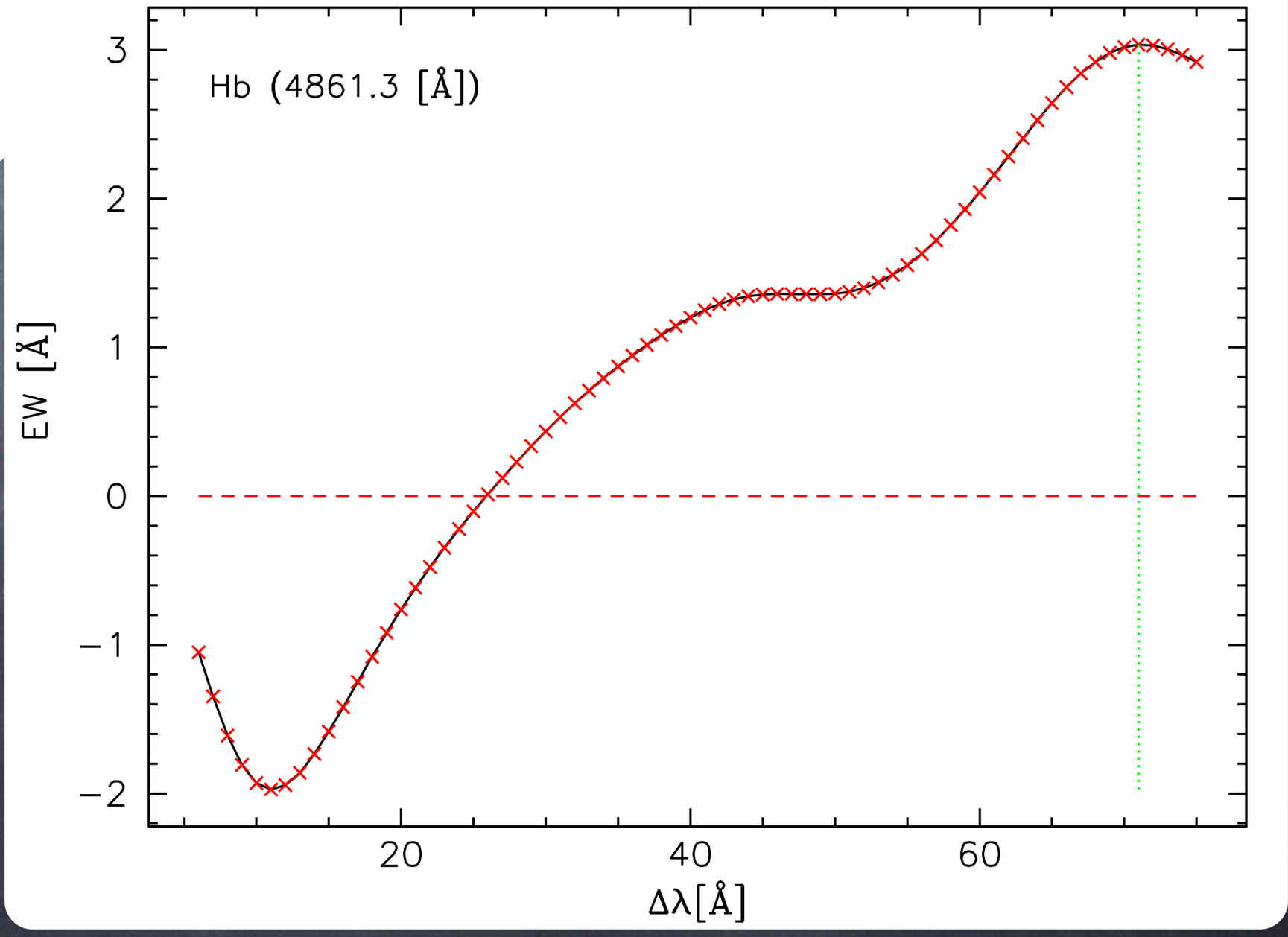


Getting to the optimal value

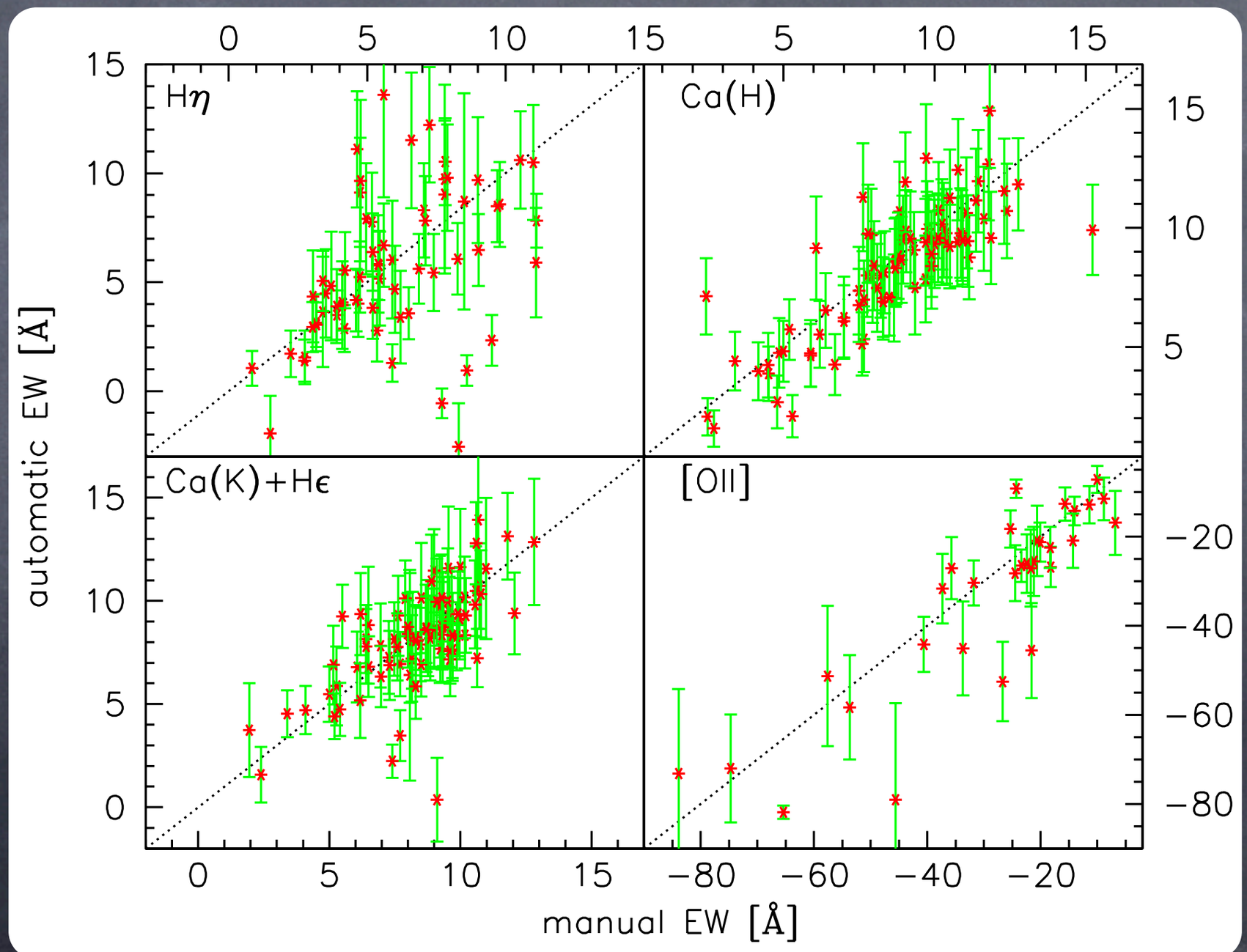


Getting to the optimal value





Getting to the optimal value



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

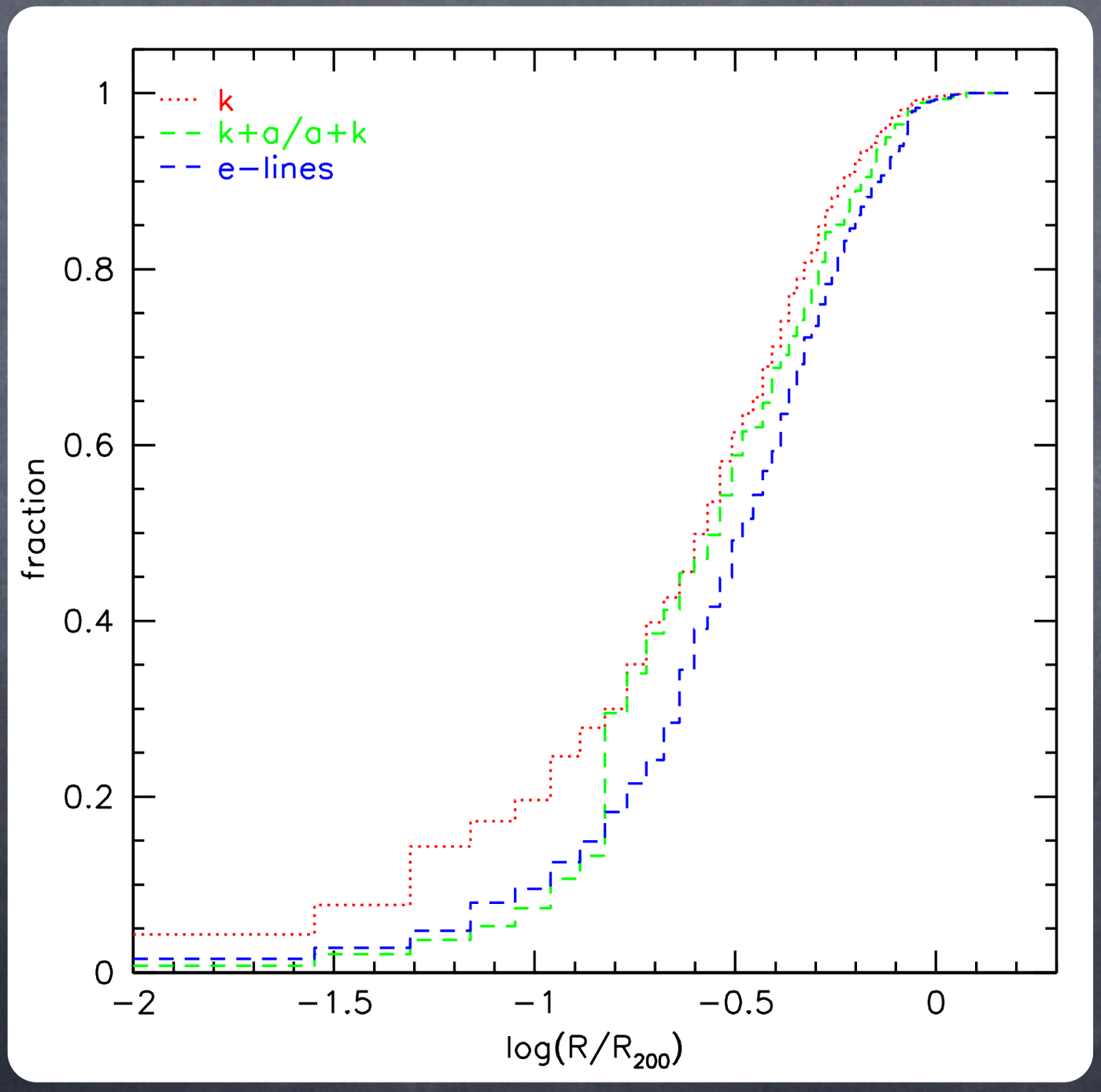
(Couch & Sharples, 1987; Dressler et al., 1999)

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

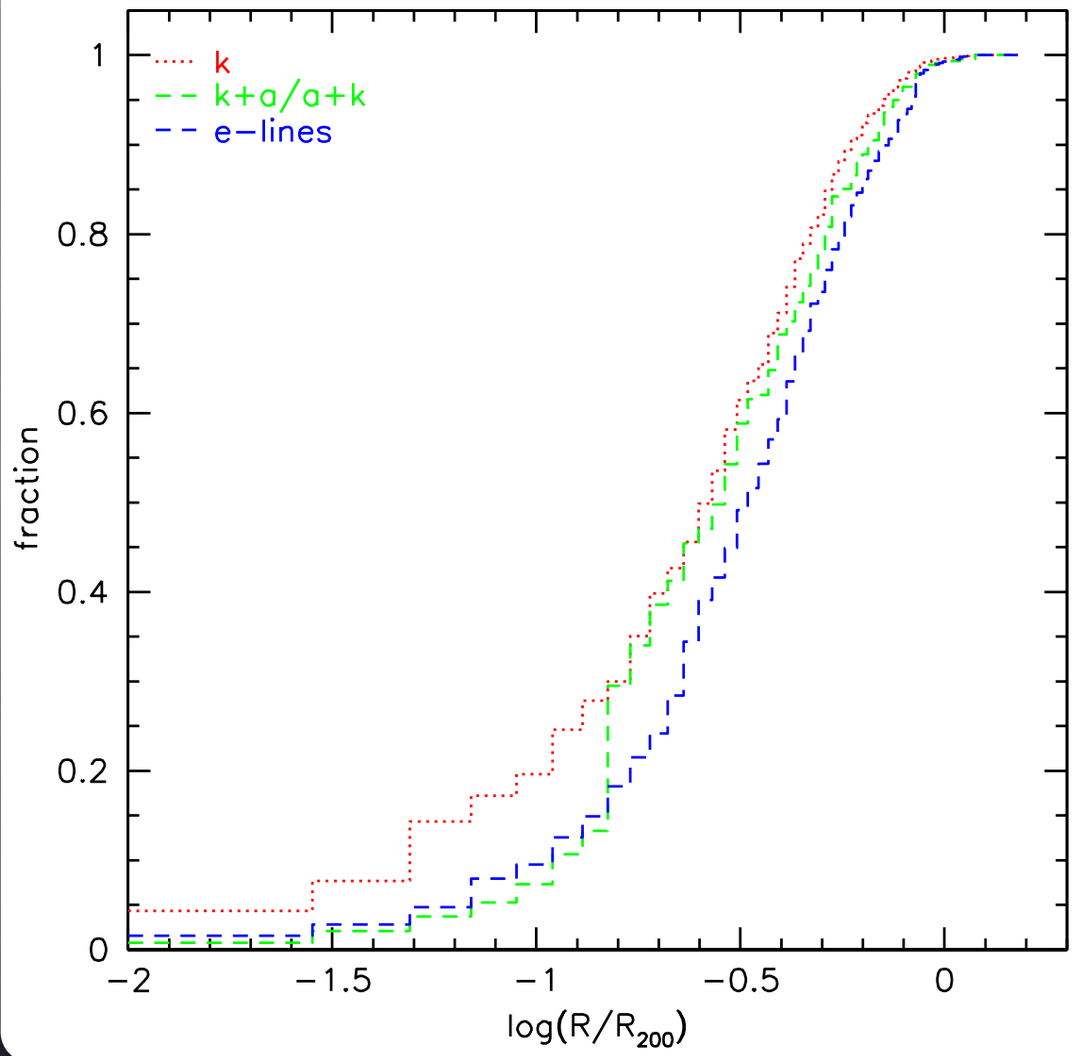
The Galaxy Population in Local Clusters



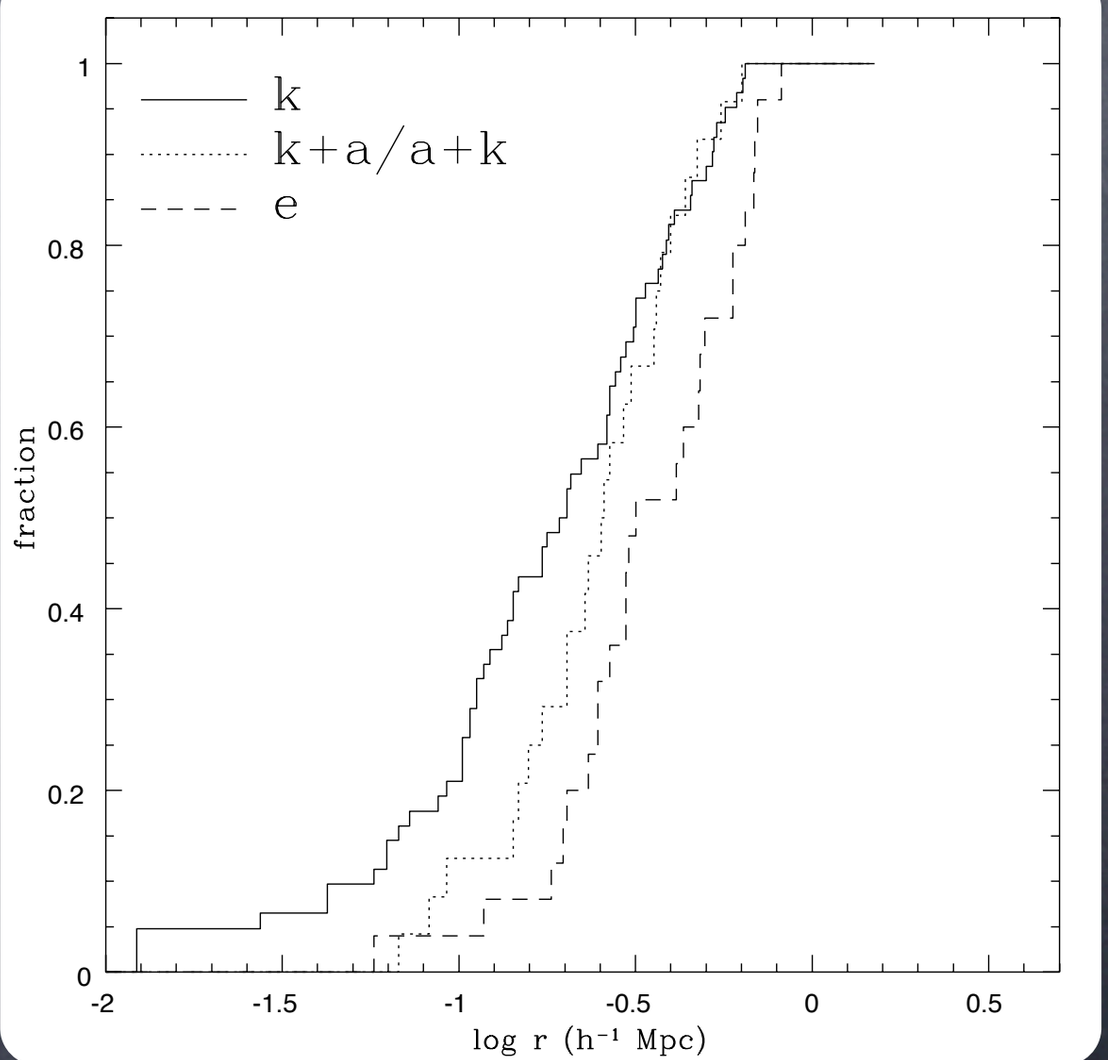
Average radial distribution of spectral types

The Galaxy Population in Local Clusters

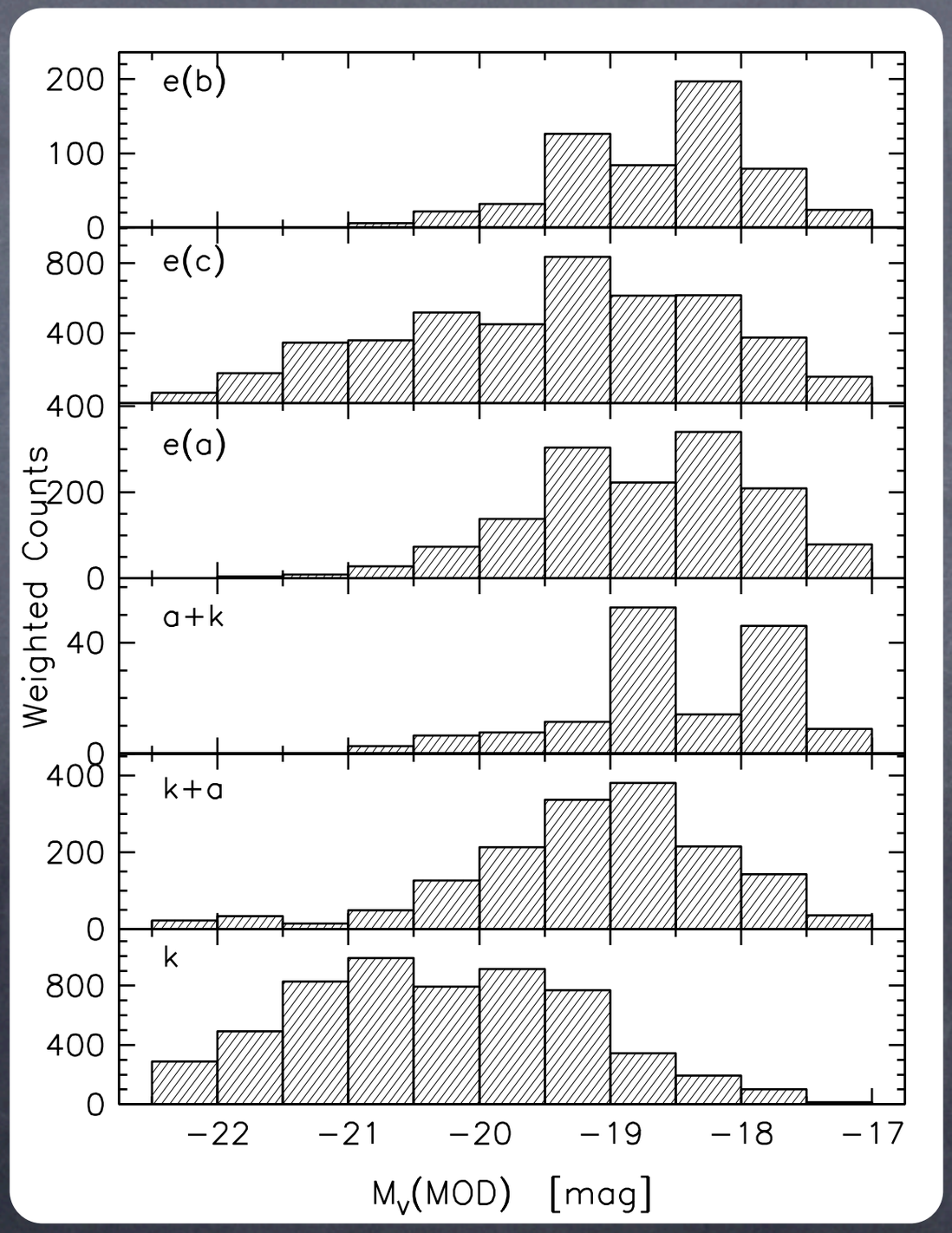
WINGS



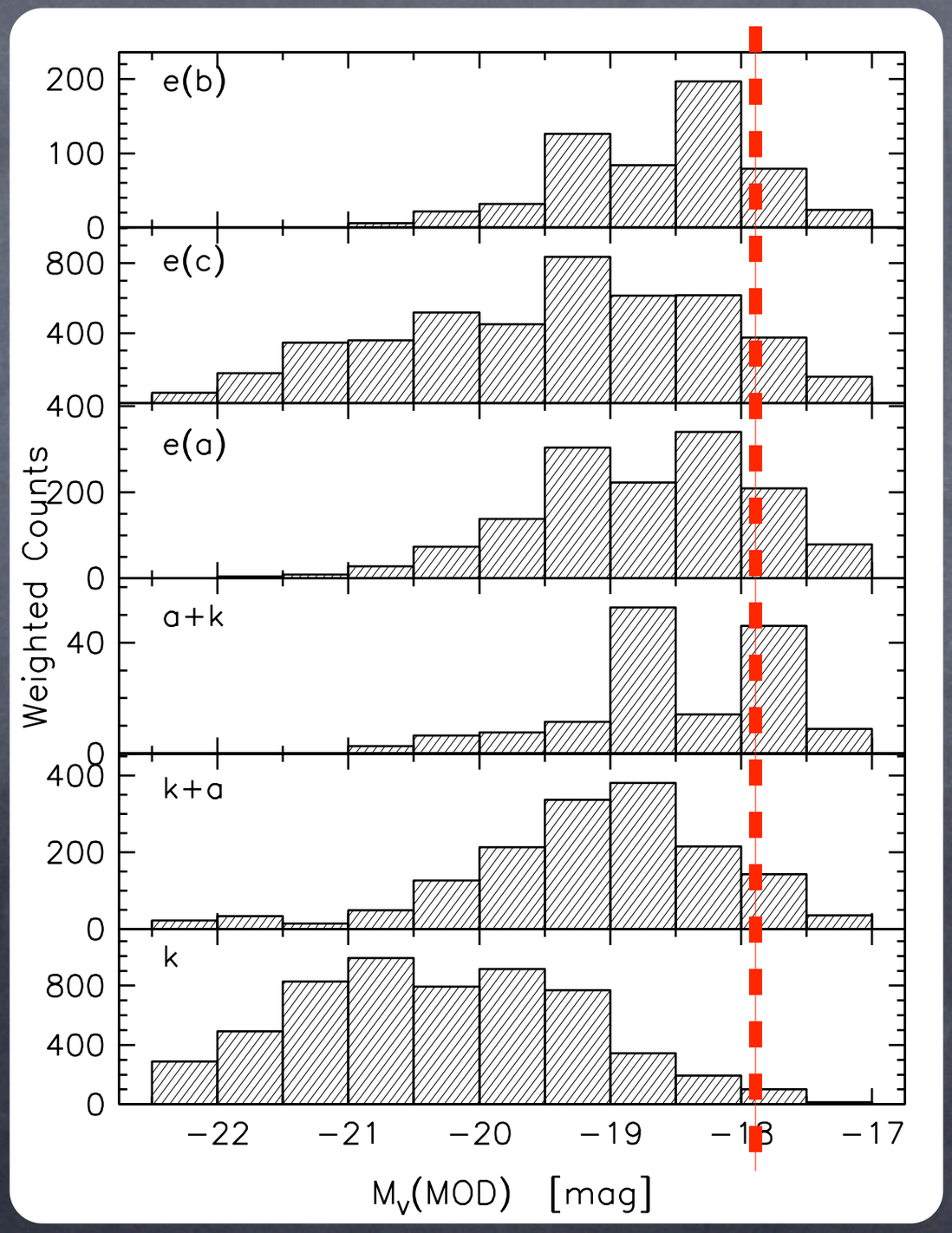
MORPHS (Dressler et al. 1999)



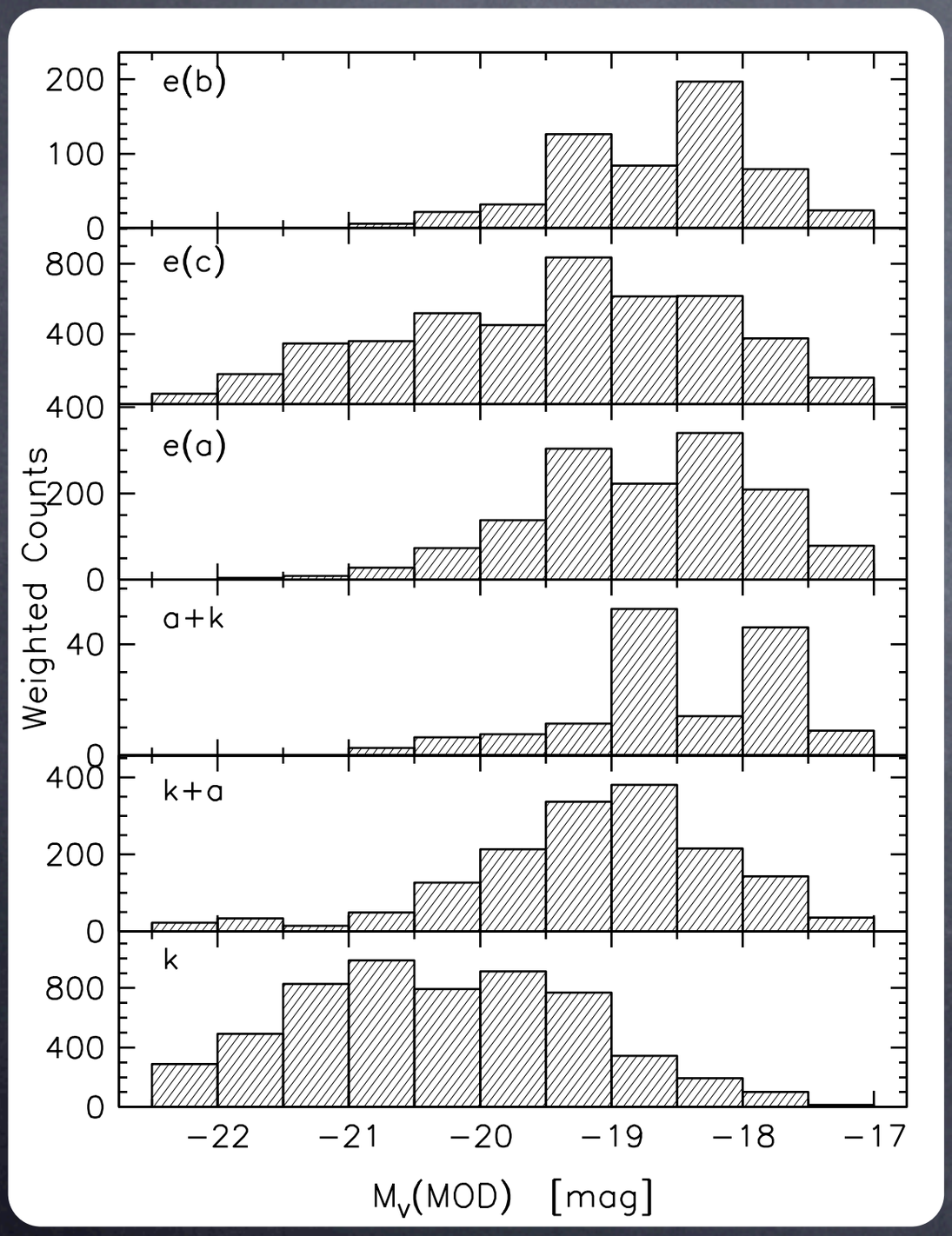
The Galaxy Population in Local Clusters

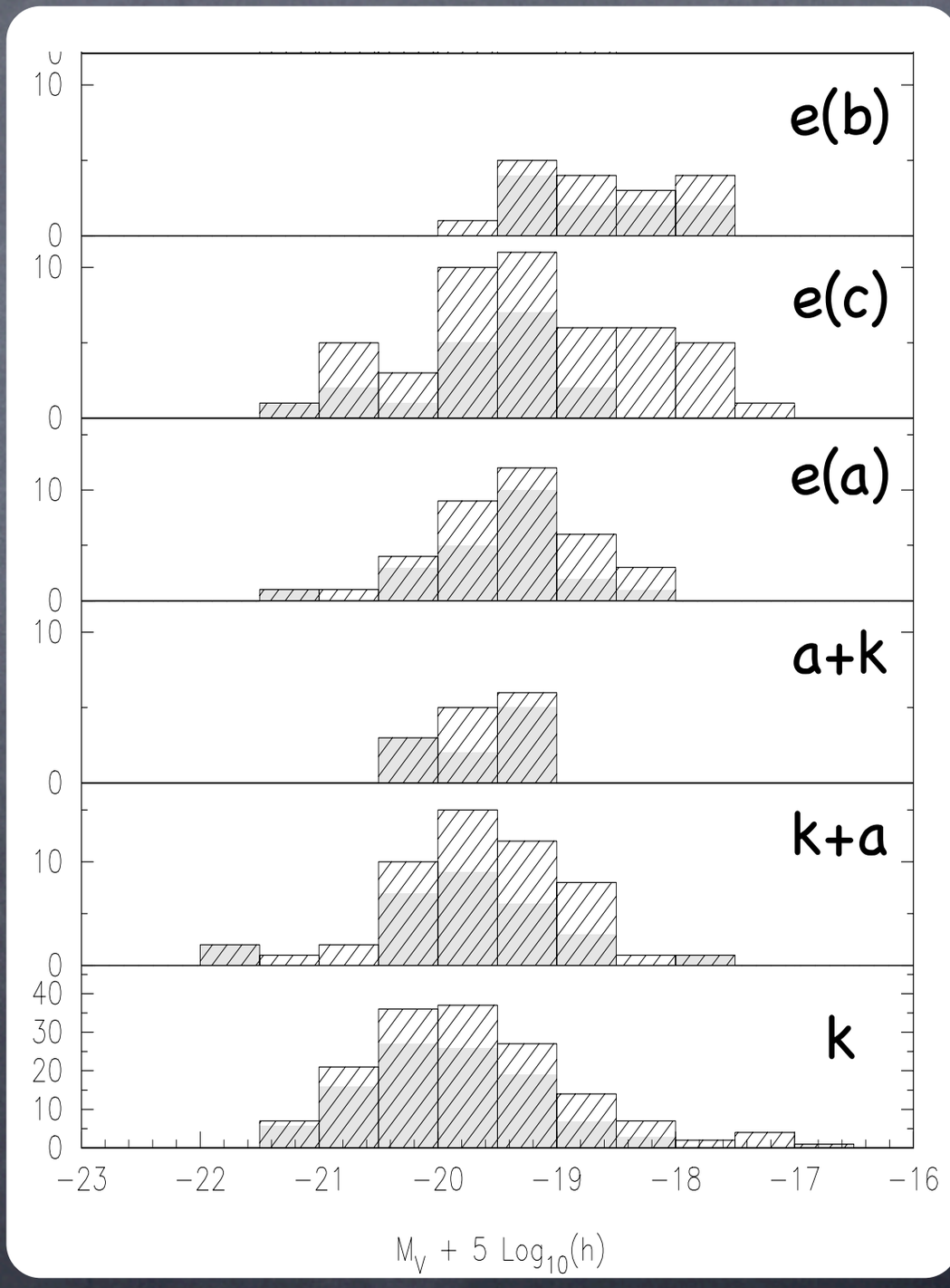


The Galaxy Population in Local Clusters

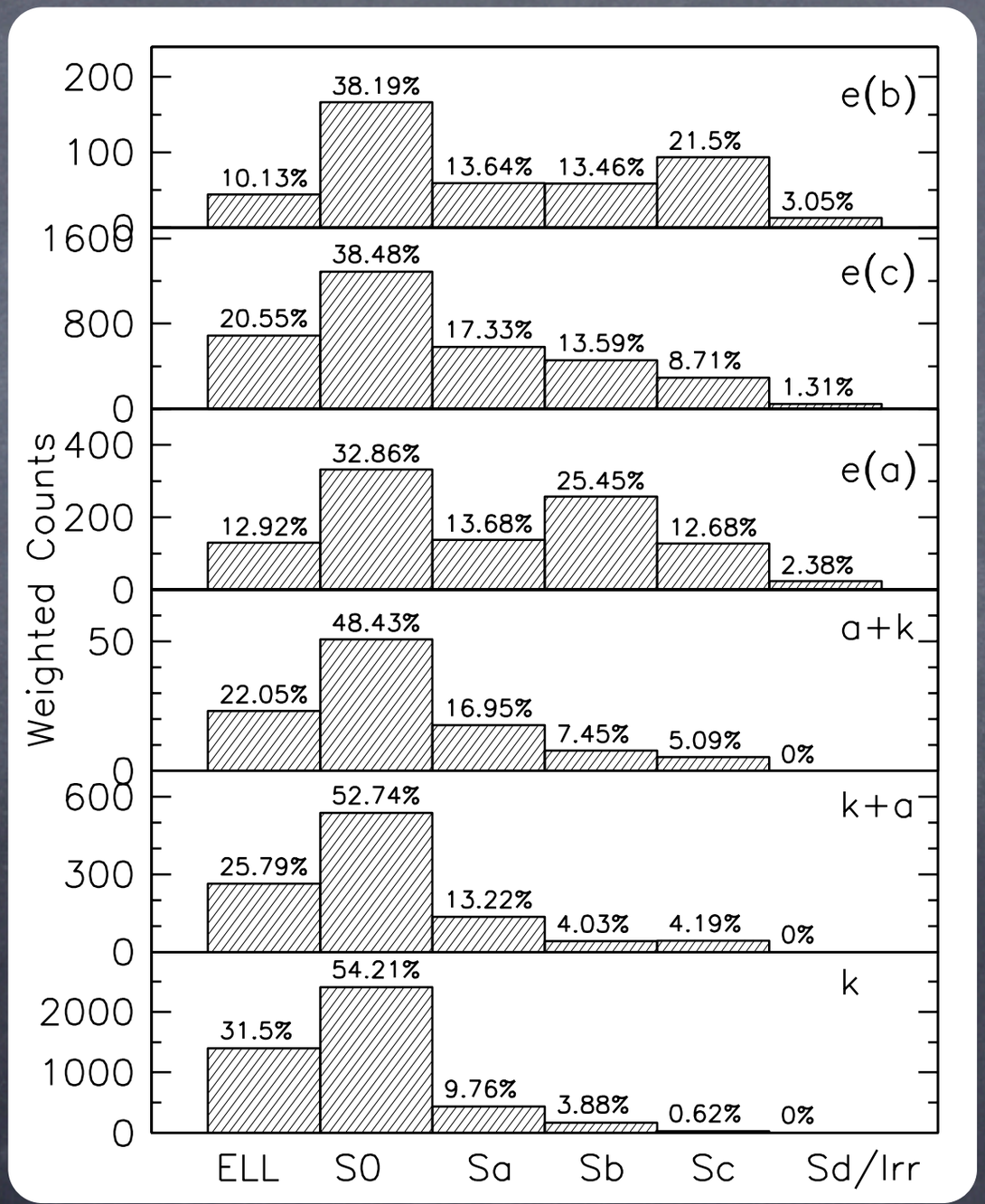


The Galaxy Population in Local Clusters

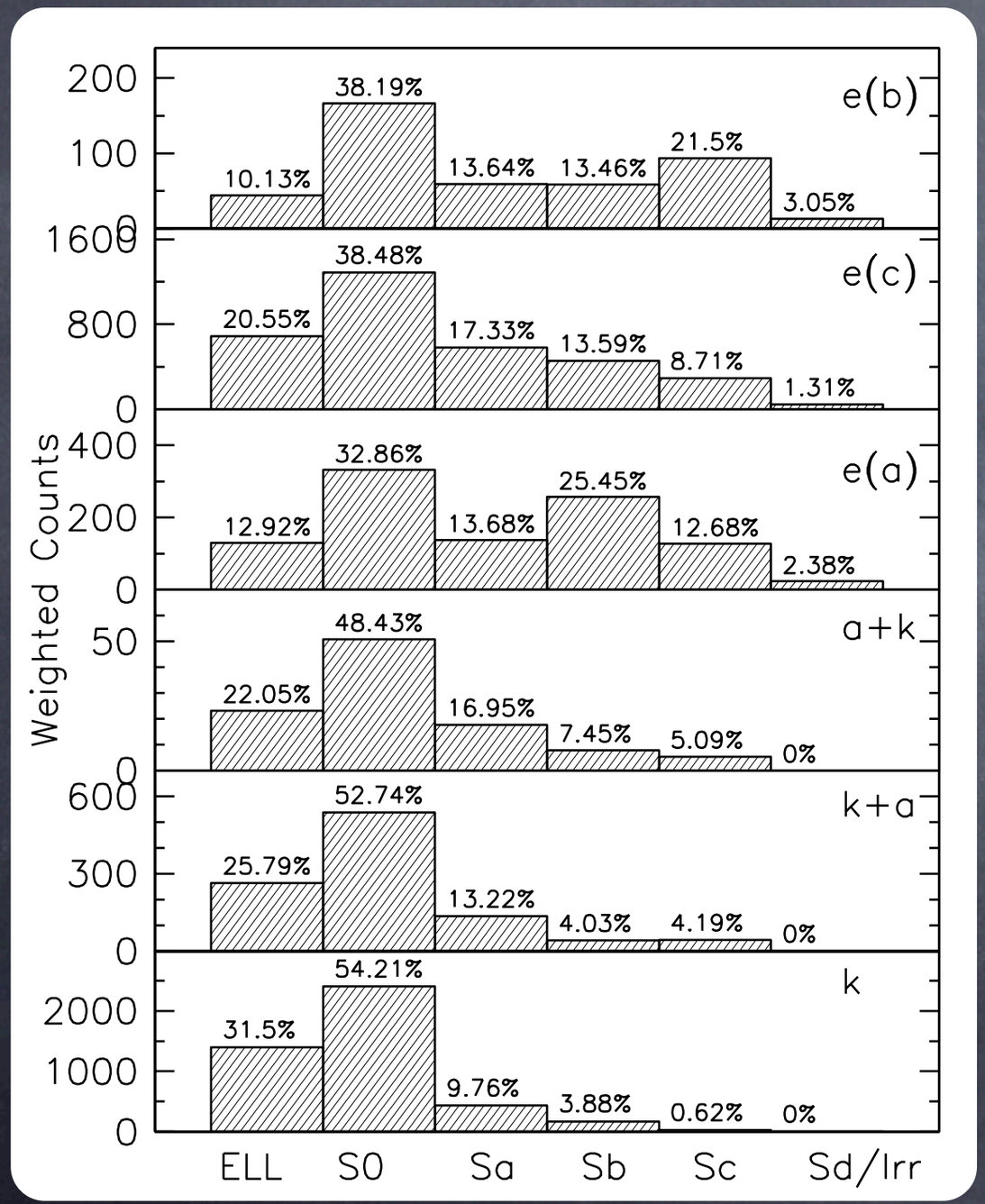


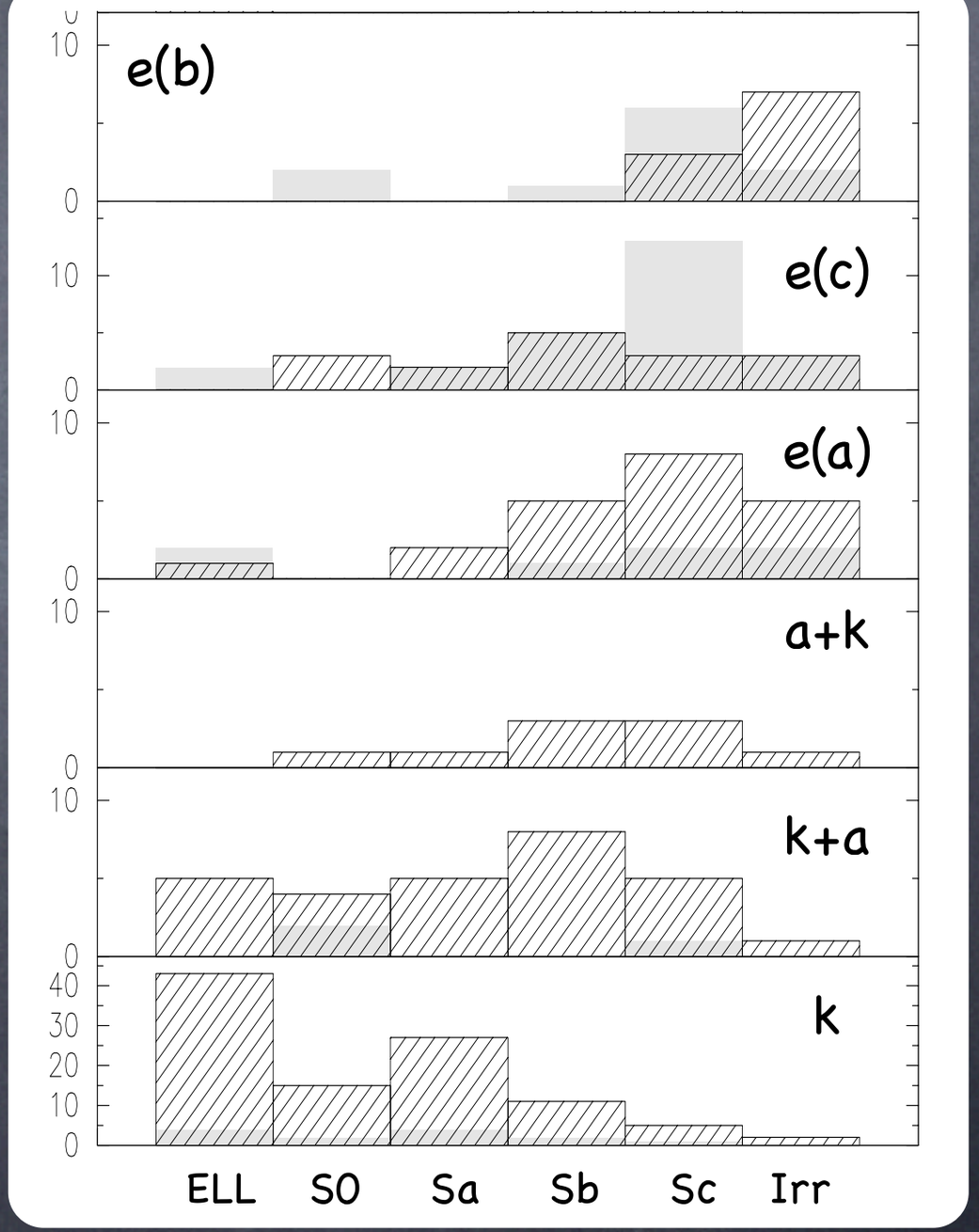


The Galaxy Population in Local Clusters



The Galaxy Population in Local Clusters





HVALA!

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

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