OMEGA
OSIRIS MAPPING OF EMISSION-LINE GALAXIES IN A901/902

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GOALS

Environmental dependence of **Star Formation** and **AGN** activity using the optical lines Hα and [N II].

GOALS

Environmental dependence of **Star Formation** and

AGN activity using the optical lines Hα and [N II].

What do Hα and [N II] tell us?

Star formation

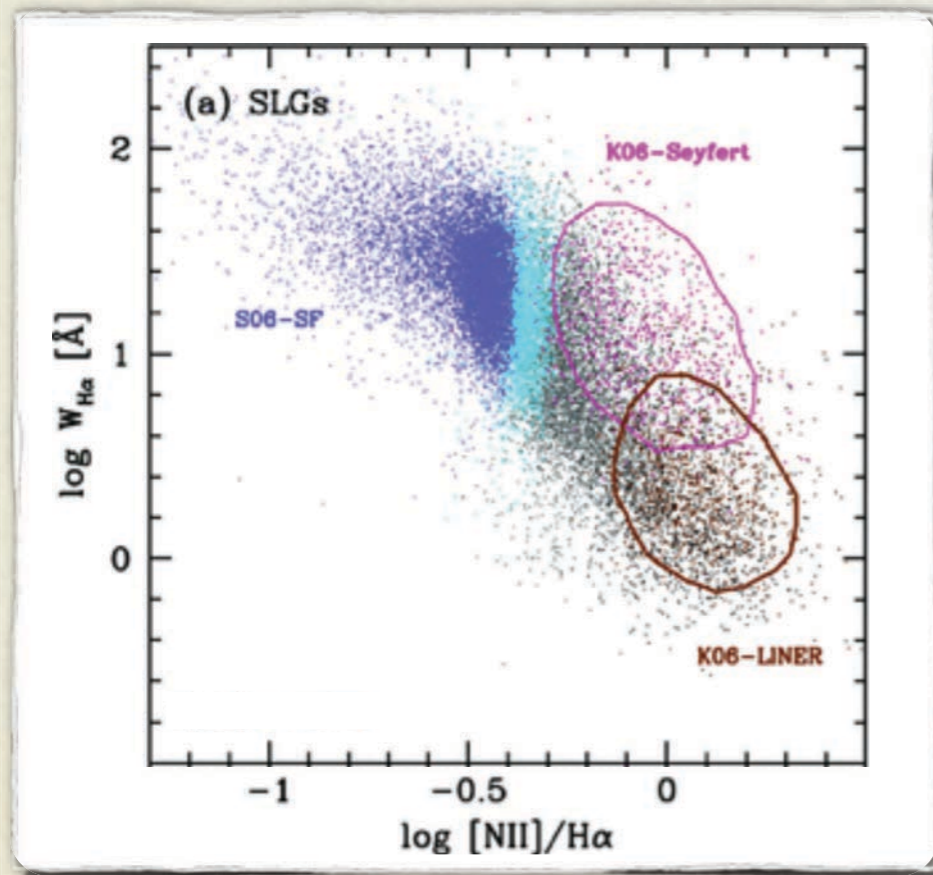Hα flux $\propto$ Star Formation Rate (Kennicutt 1998)

GOALS

Star formation
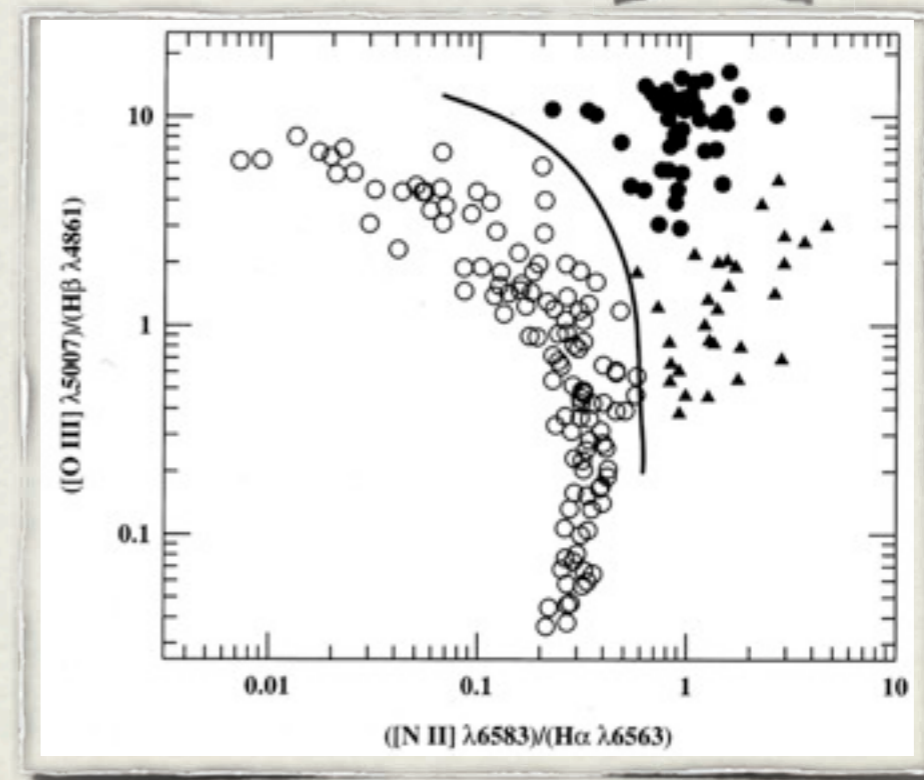 Hα flux ∝ Star Formation Rate (Kennicutt 1998)

AGN census WHAN

BPT

Cid-Fernandes et al. 2010

Baldwin, Philip & Terlevich 1981

GOALS

Star Formation

➡ SFRs down to 0.1 solar mass/yr.

➡ Role of obscured/unobscured SF (UV, IR).

➡ Concentration of the star-forming regions, resolution down to 3kpc in 1" seeing.

AGN activity

➡ Low-luminosity AGN with no X-Ray emission.

Tunable Filter Observations

...one of the several inventions of

Humanity named OSIRIS...

OSIRIS

...Egyptian god of afterlife, the underworld and the dead...

British Museum

OSIRIS

...also the name for (4+) astronomical instruments...

British Museum

➡Optical System for Imaging and low-Intermediate-Resolution Integrated Spectroscopy (**OSIRIS**) at the **GRANTECAN**

➡ OSIRIS is a near-infrared integral field spectrograph designed for the Keck Adaptive Optics System

➡ The Optical, Spectroscopic, and Infrared Remote Imaging System (**OSIRIS**) is the main imaging system of the **Rosetta mission**.

➡ The Ohio State InfraRed Imager/ Spectrometer (**OSIRIS**) is a multi-purpose infrared imager & spectrometer built by the Ohio State University for **SOAR**.

OMEGA

➡ 90 hours at GTC (10.4 m)   COMPLETED

➡ tunable filter mode.

➡ OSIRIS (Optical System for Imaging and low Resolution Integrated Spectroscopy).

➡ narrow band image
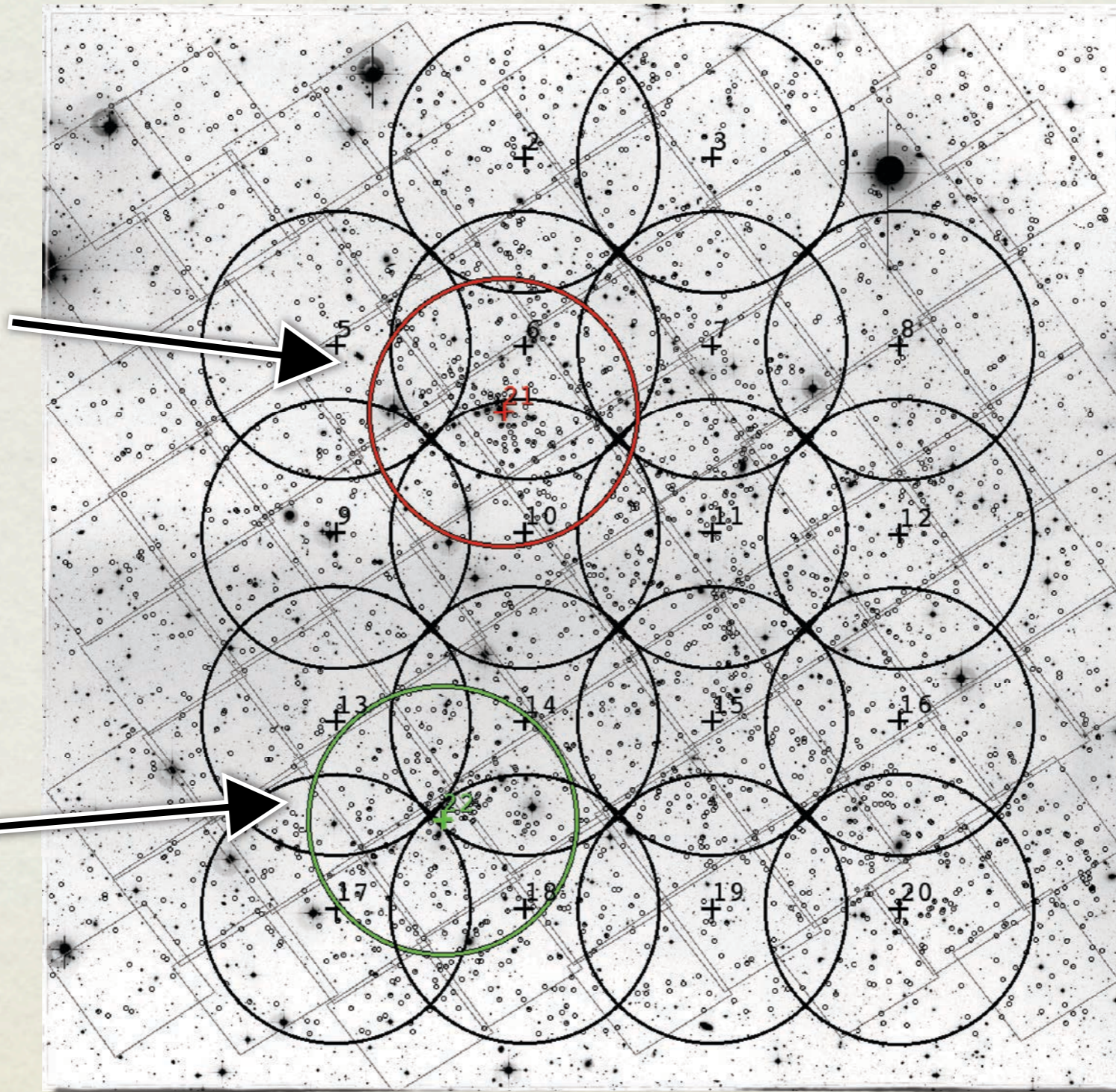
GTC in La Palma (Spain)
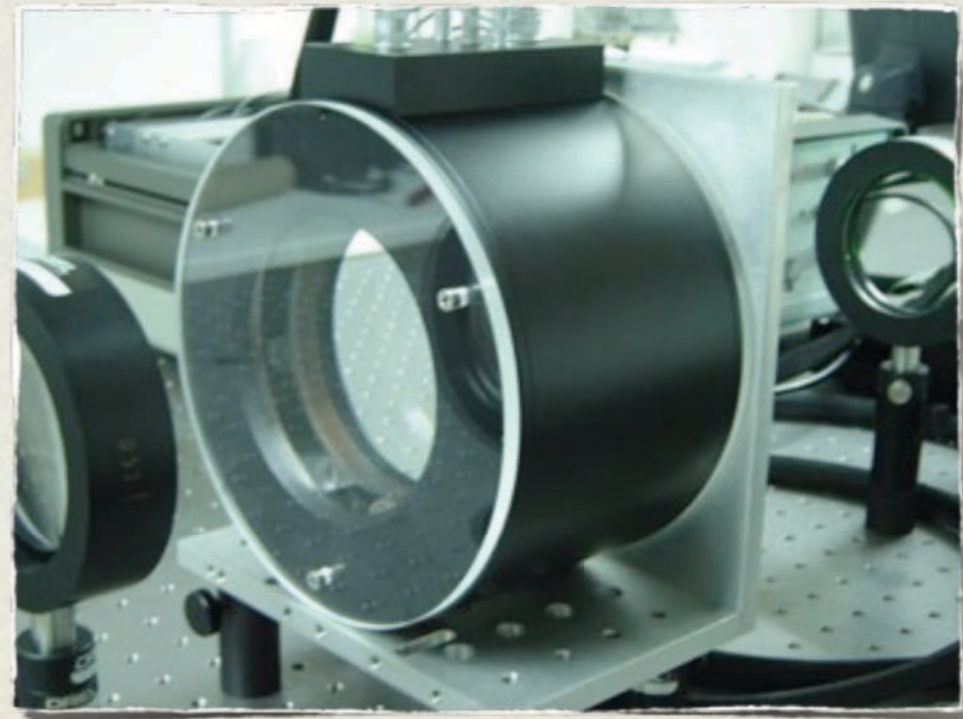
OSIRIS instrument

0.5 degrees

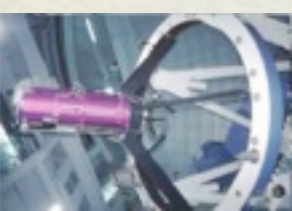0.5 degrees

z=0.165

COMBO-17 image

Tunable filter observations
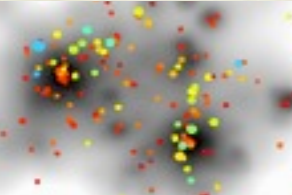
20 fields of D~8'

A901a

A902

STAGES: Space Telescope A901/2 Galaxy Evolution Survey (Gray et al. 2009)

|		
	Hubble Space Telescope	80-orbit mosaic morphologies, weak gravitational lensing
	COMBO-17 survey	17-band optical imaging: photo-zs, + SED fir 15000 objects
	Omega2000 @ Calar Alto	near-infrared extension (Y, J1, J2, H): M*, photo-zs
	2dF spectrograph	spectroscopy of ~300 cluster galaxies: dynamics, star-formation histories
	XMM-Newton	90 ks X-ray imaging/spectroscopy: ICM, AGN
	Spitzer	infrared imaging (8 and 24 μm): obscured star formation, AGN
	GALEX	NUV + FUV imaging: unobscured star formation
	GMRT	radio imaging (610 and 1400MHz) obscured SF, AGN
	simulations	N-body + hydro + semi-analytic models dark matter, gas, galaxies

Tunable filter
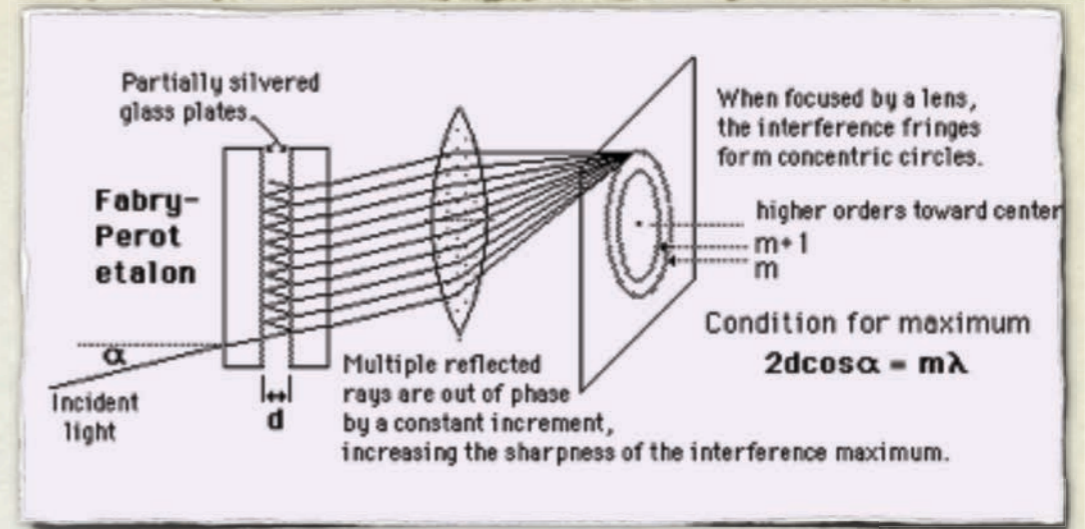
Wavelength dependence with distance to centre:

$$\lambda = \lambda_0 - 5.04 \times r \; (\text{arcmin})^2 \qquad (\lambda_0 \longrightarrow \text{central } \lambda)$$
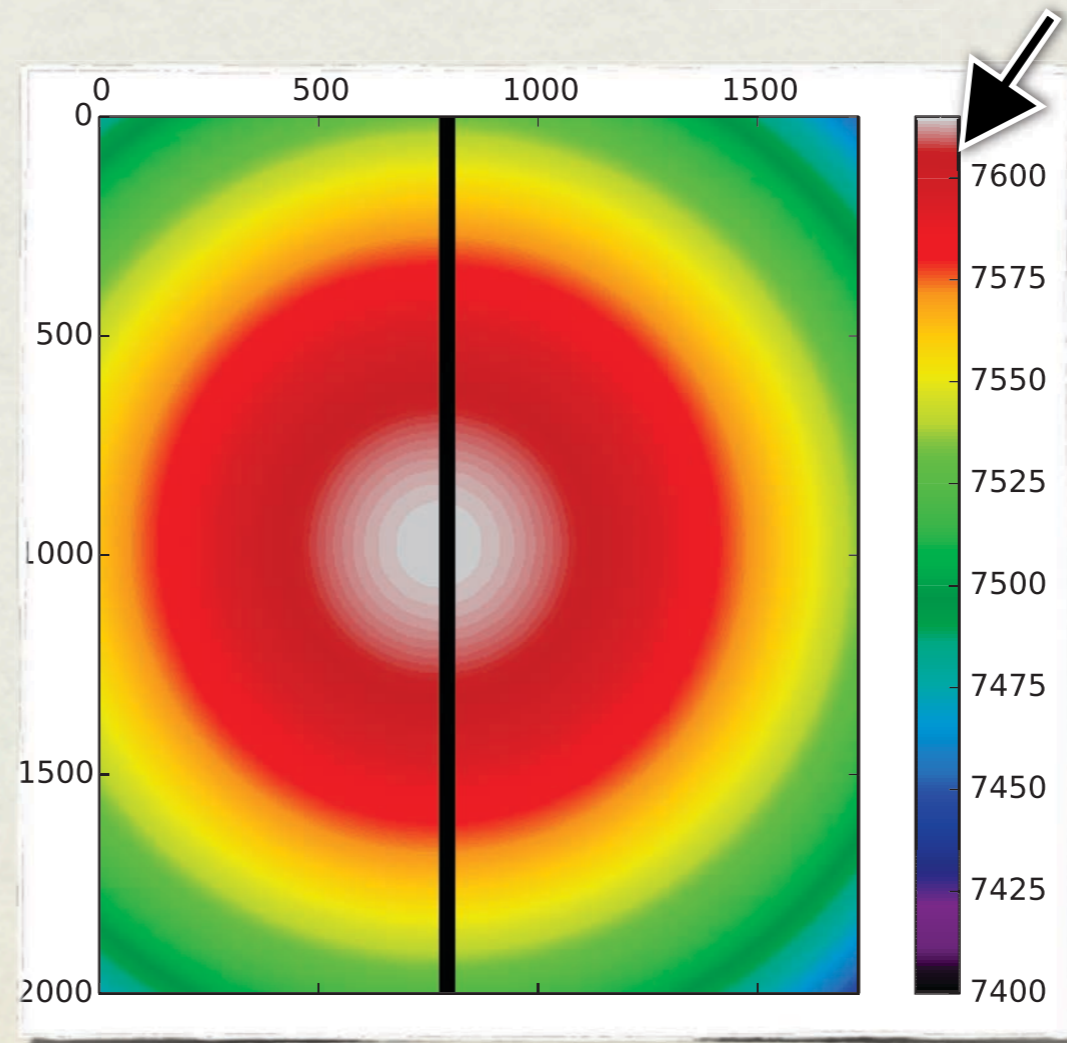
Tunable filter observations

➡ To optically deblend Ha and [N II]:

    ➡ Tunable filter FWHM bandwidth =14Å
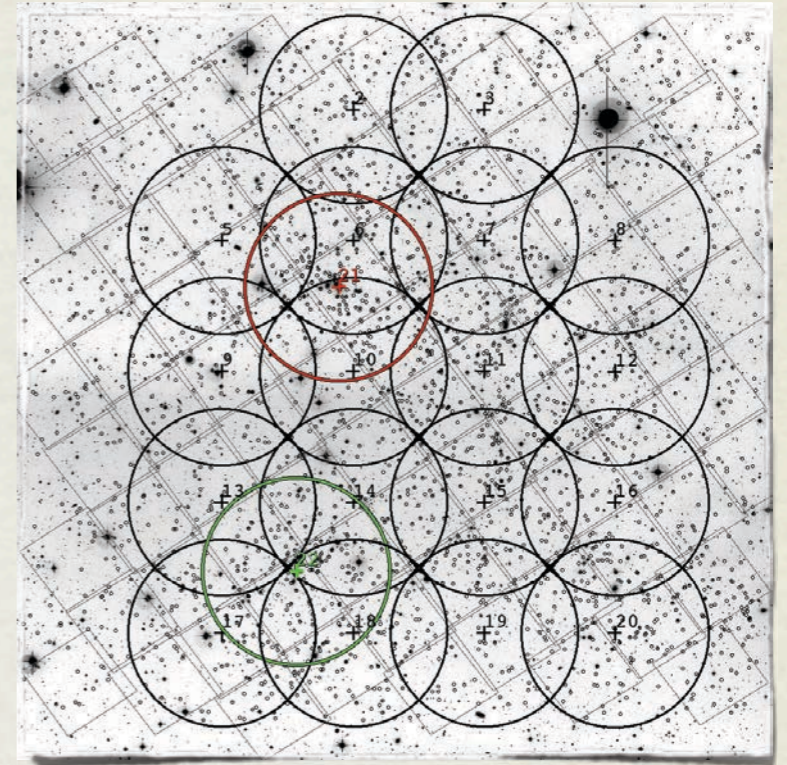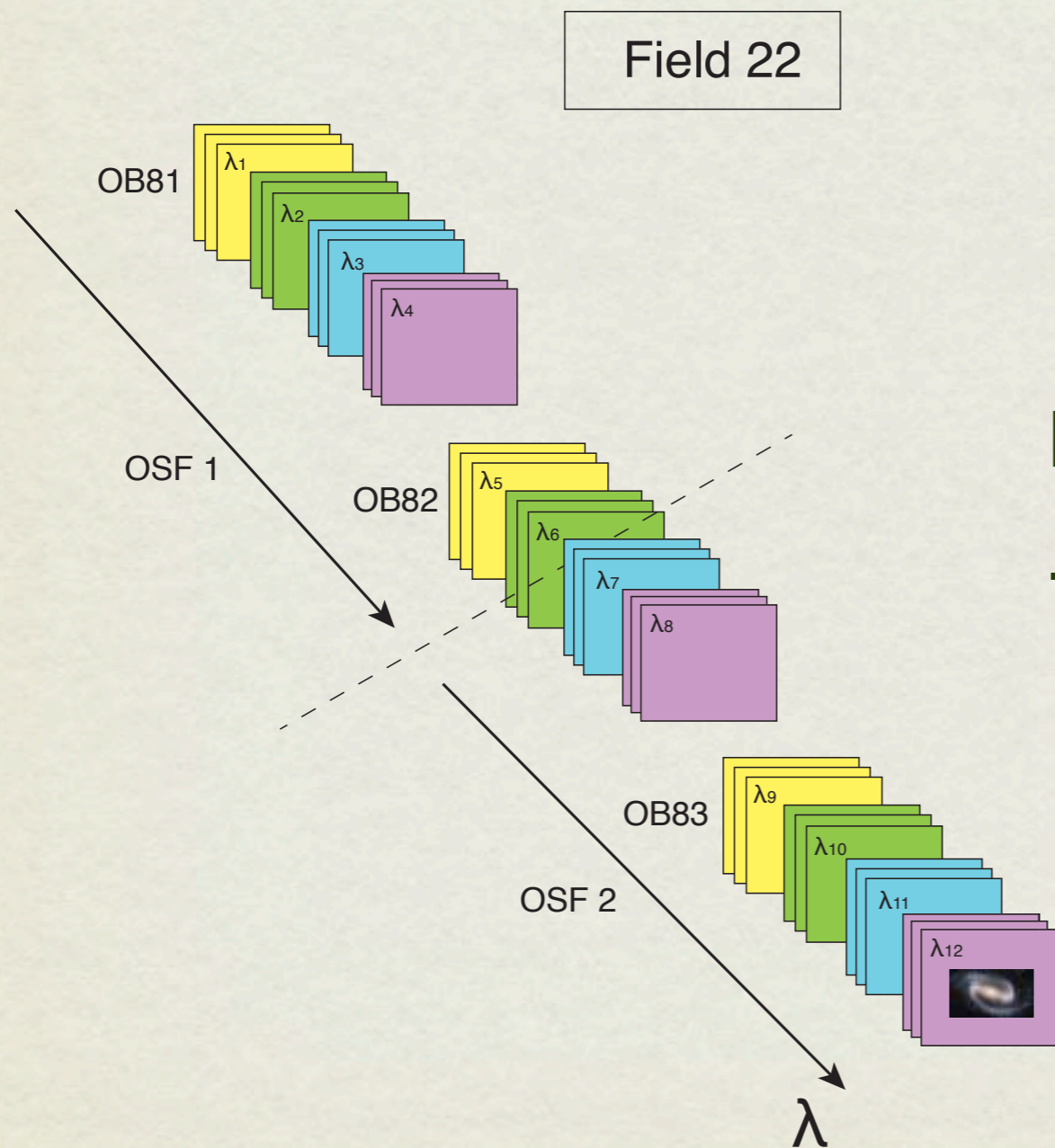
    ➡ Spacing between successive wavelengths = 7Å
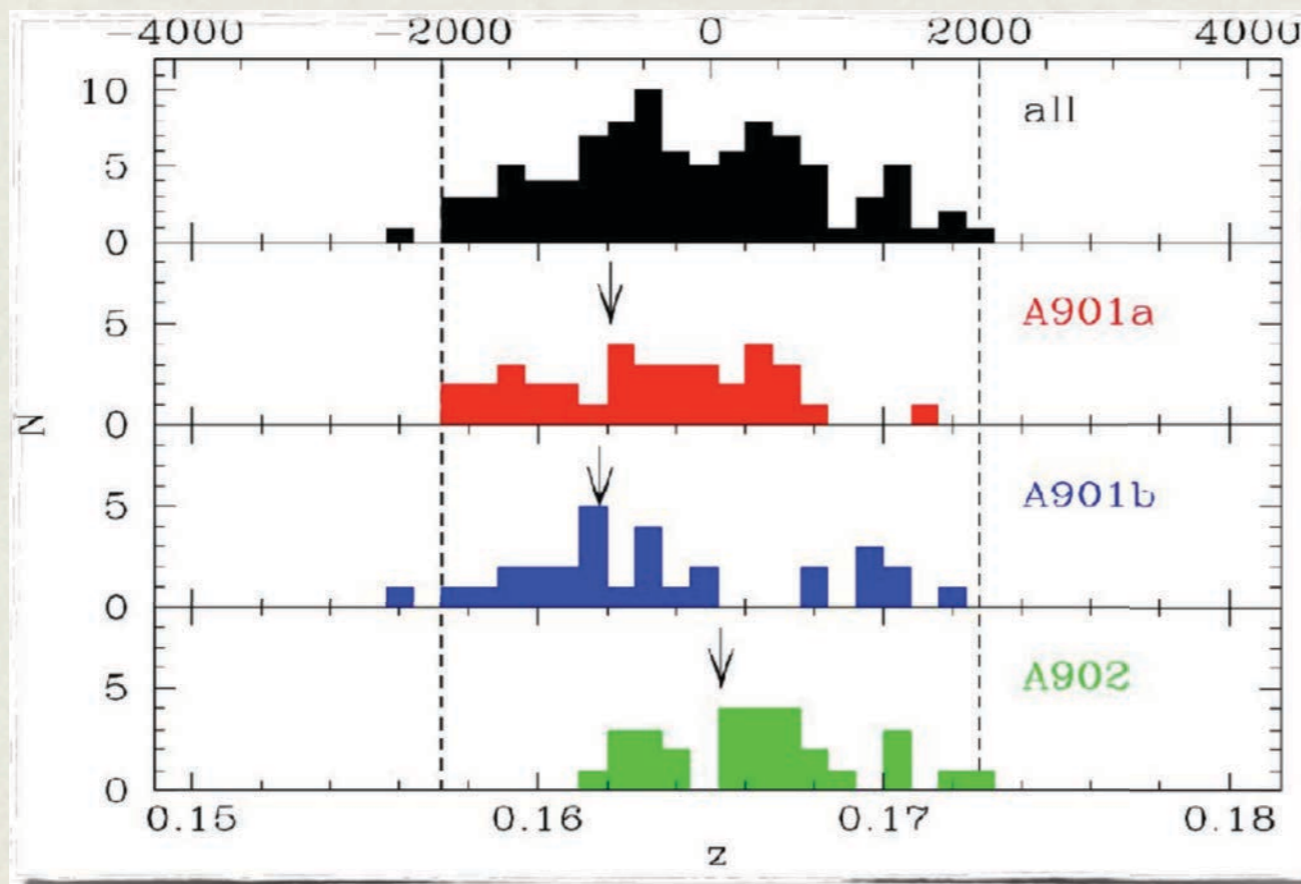
F2-20 (16 settings)

F21 (14 settings)

F22 (12 settings)

Redshift distribution of the 300 brightest cluster galaxies within 1.2 Mpc diameter aperture (+/- 2000 km/s) from 2df data.
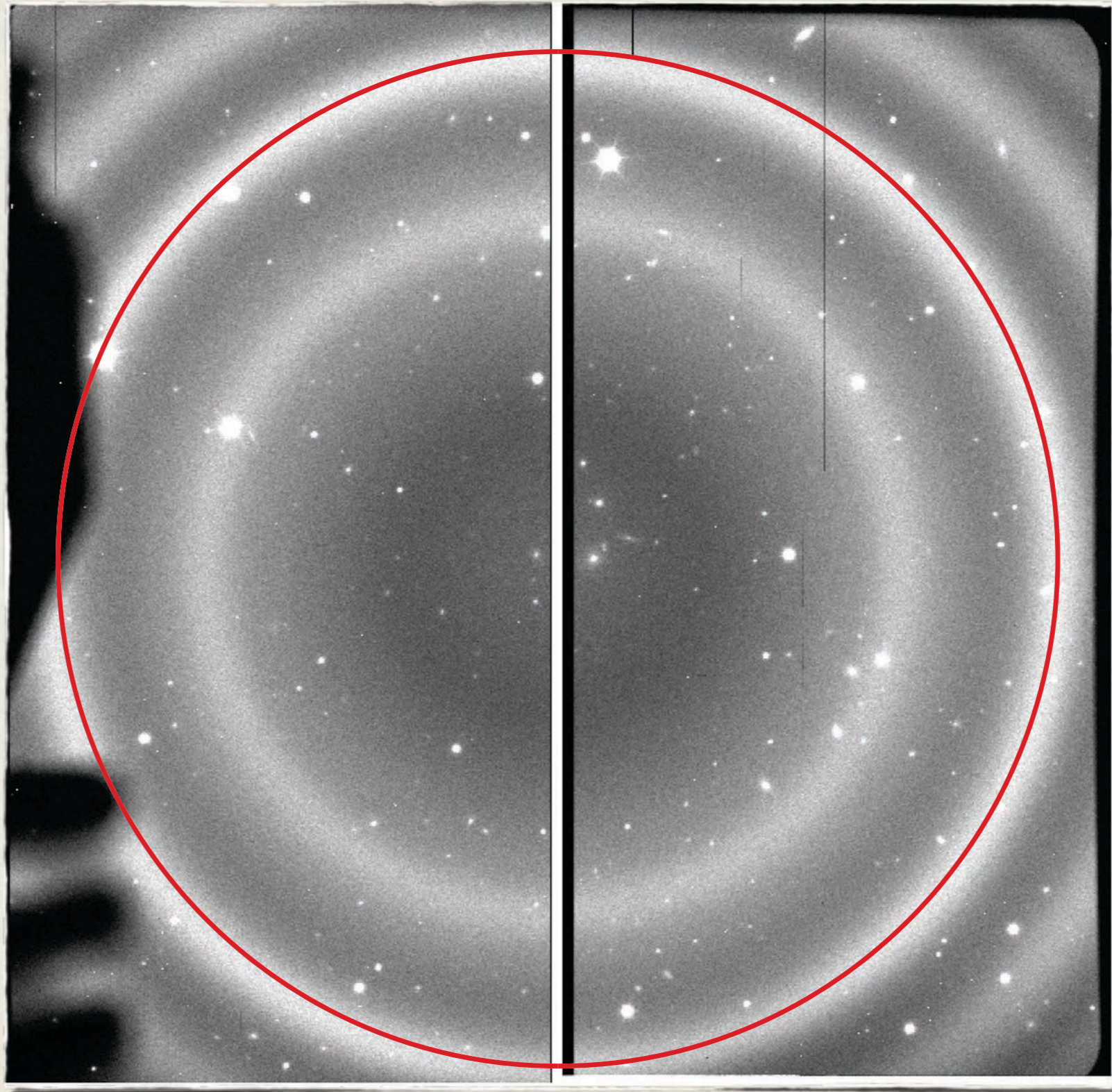
Tunable filter observations

Field 22

OB81

λ1
λ2
λ3
λ4

OSF 1

OB82

λ5
λ6
λ7
λ8

OB83

λ9
λ10
λ11
λ12

OSF 2

λ

Field 22:

- 3 OBs:
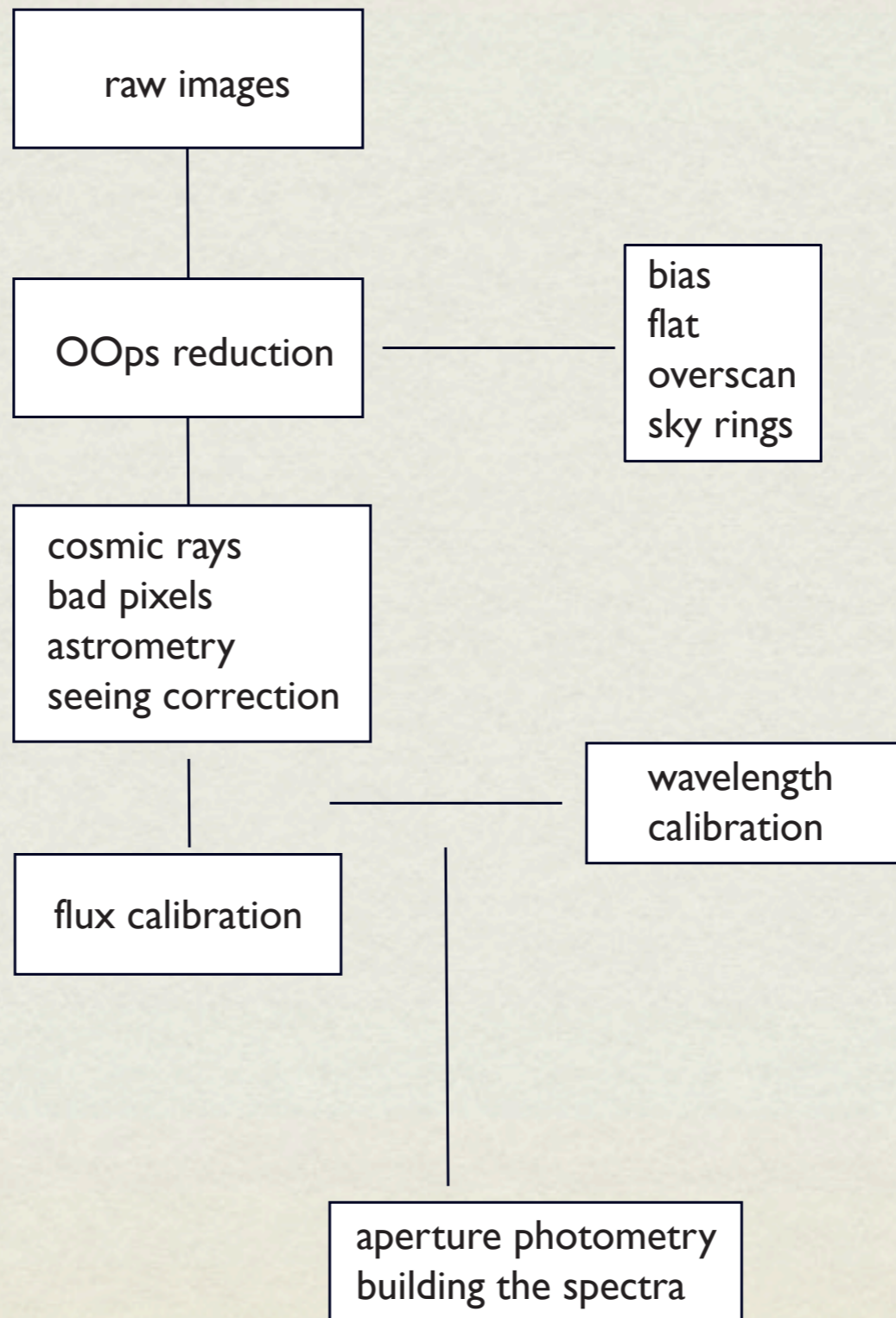 - 4 λ sets (spaced by 7Å):
    - 3 dithered images (200s)
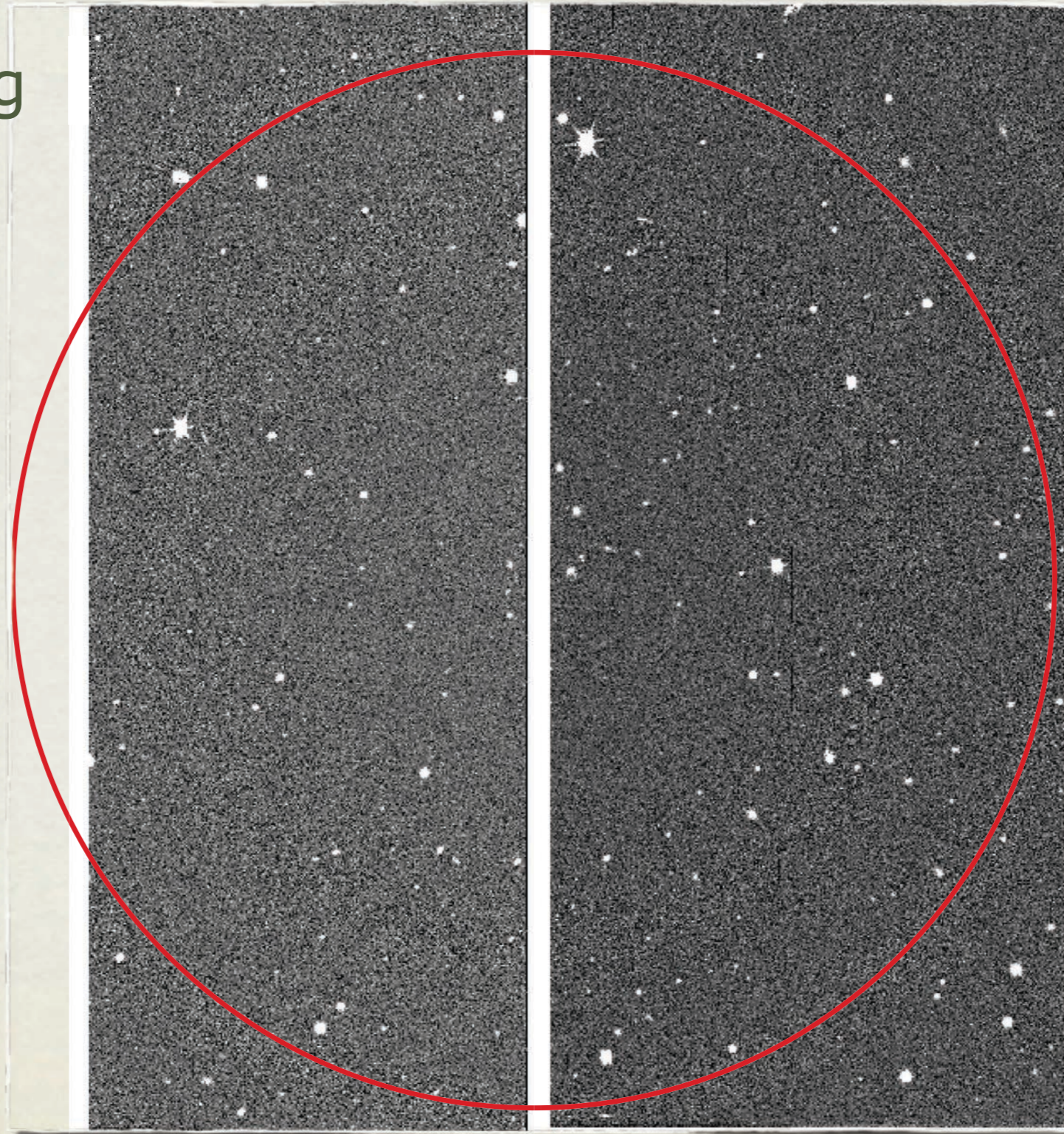
Total = 36 images

Tunable filter observations

Data Reduction

OOPS (Osiris

Offline Pipeline
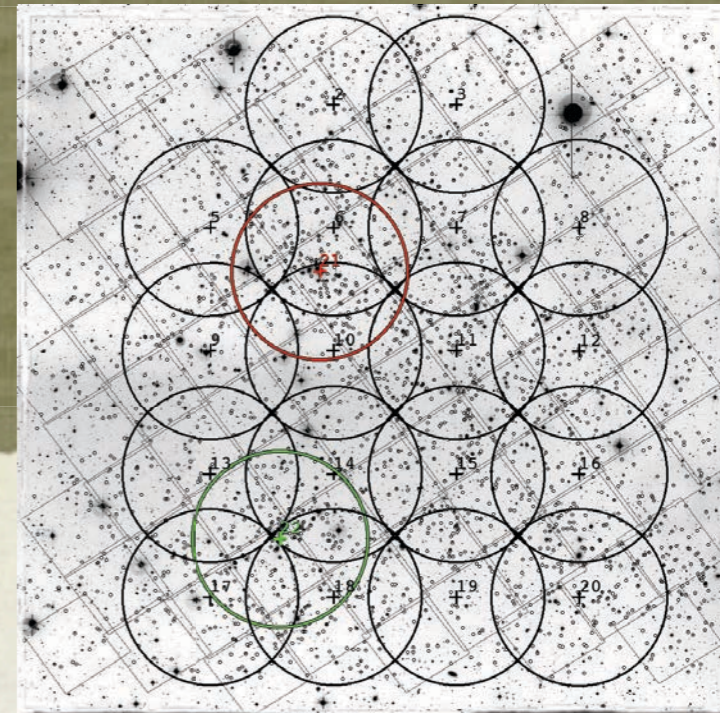
Software,

A. Ederoclite)

raw images

OOps reduction — bias / flat / overscan / sky rings

cosmic rays / bad pixels / astrometry / seeing correction

wavelength calibration

flux calibration

aperture photometry / building the spectra
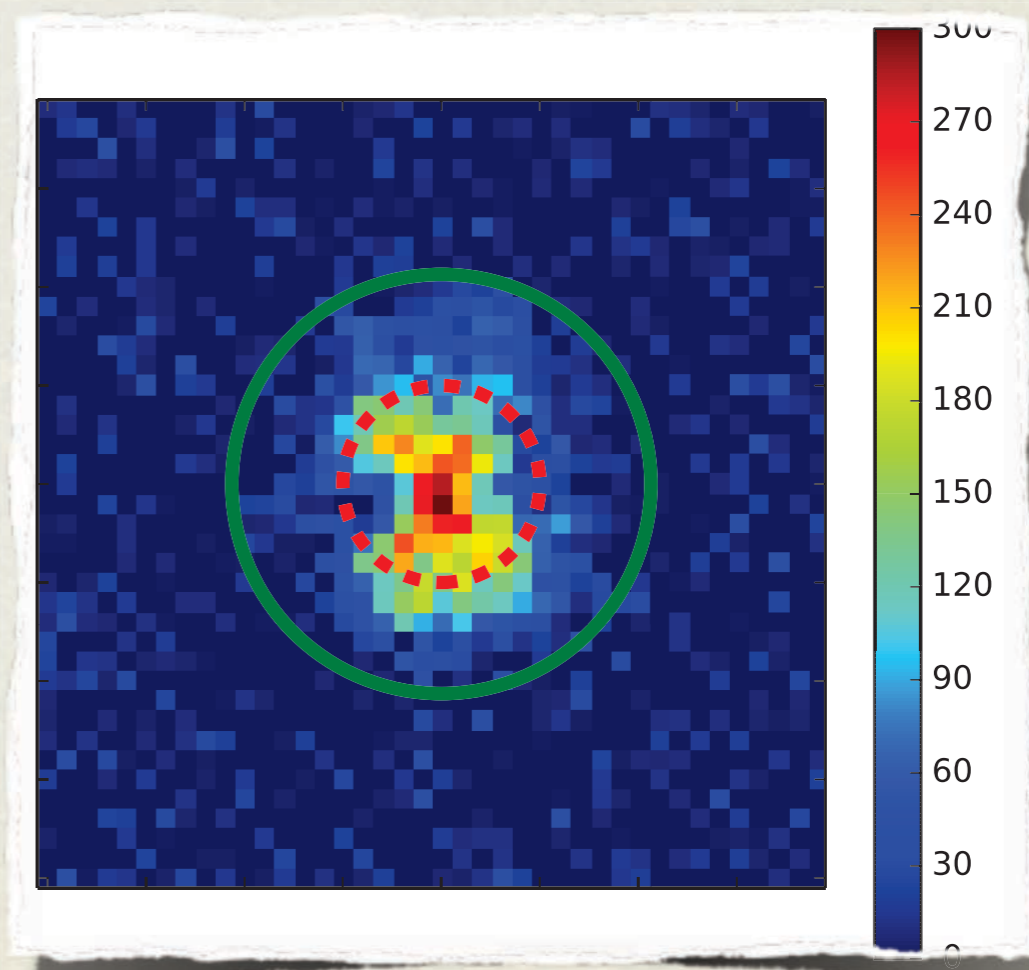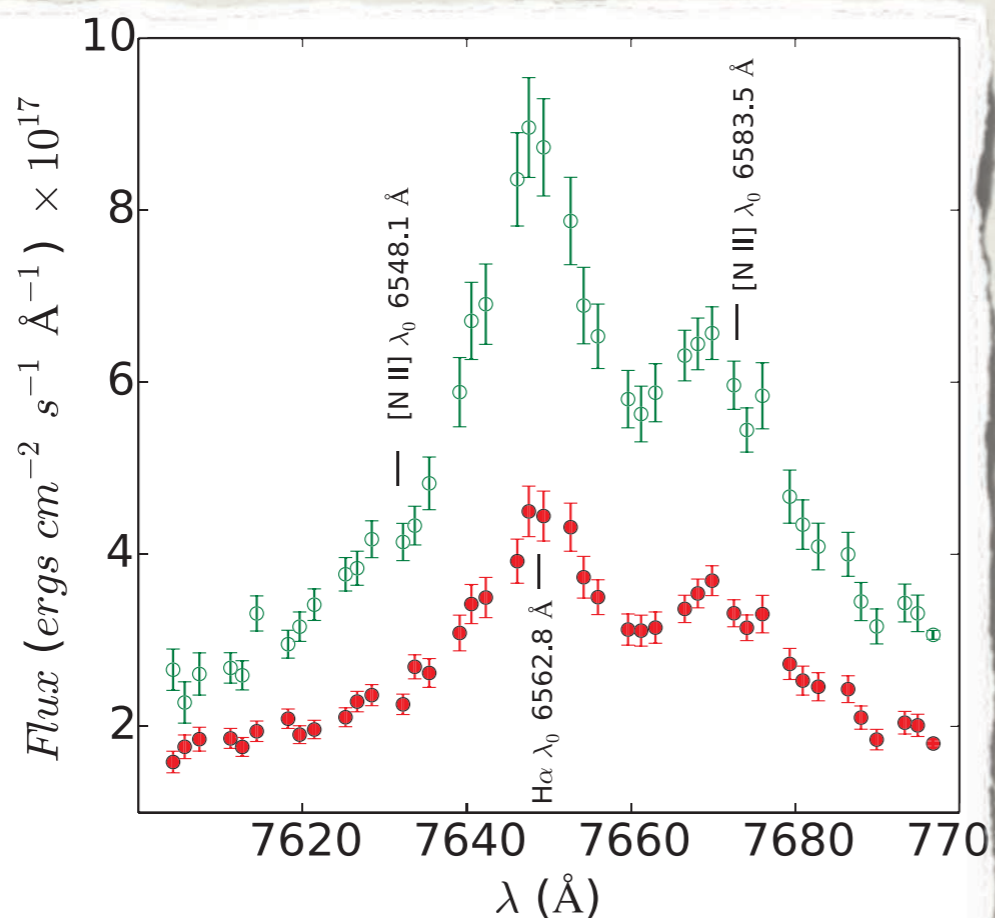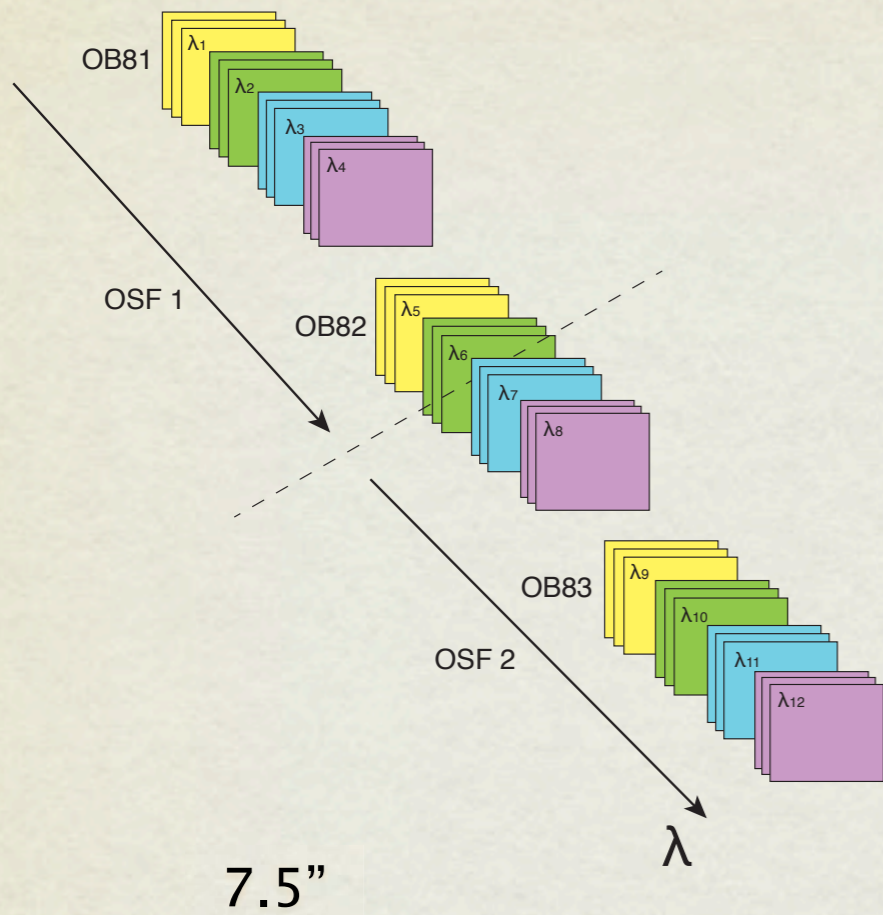
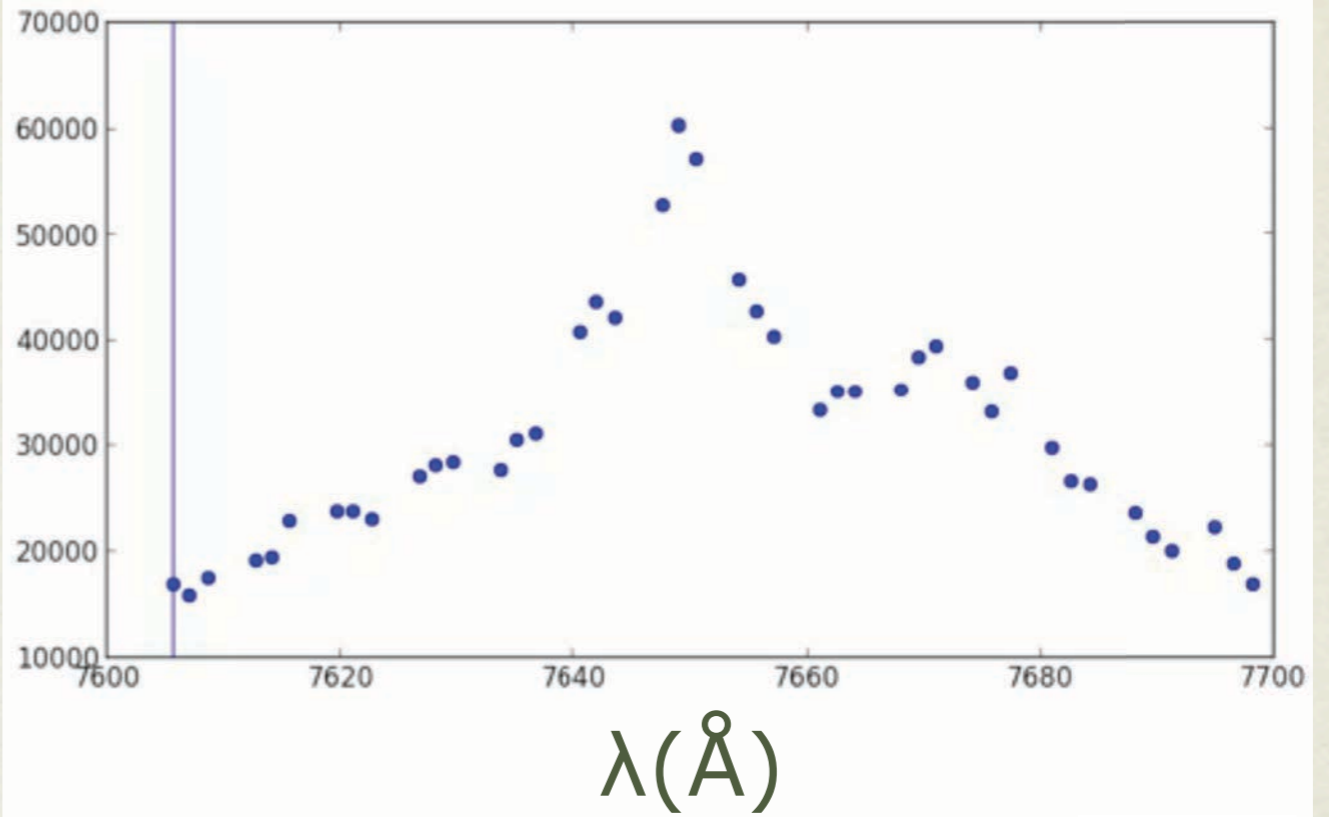# Data Reduction

After OOPSing

BUILDING THE SPECTRA

Aperture photometry

➡️ R_{cen} (matching the seeing)

➡️ R_{ToT}

OB81

λ₁
λ₂
λ₃
λ₄

OSF 1

OB82

λ₅
λ₆
λ₇
λ₈

OB83

λ₉
λ₁₀
λ₁₁
λ₁₂

OSF 2

λ

7.5"

HST postage stamp

E

N

aperture radius=1.25"

21Kpc–>30pix=7.5"

Flux (counts)

λ(Å)
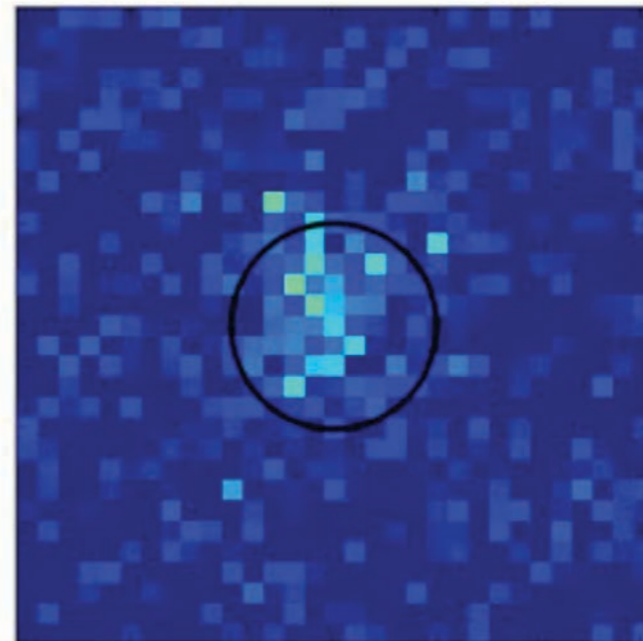
Spectral modelling
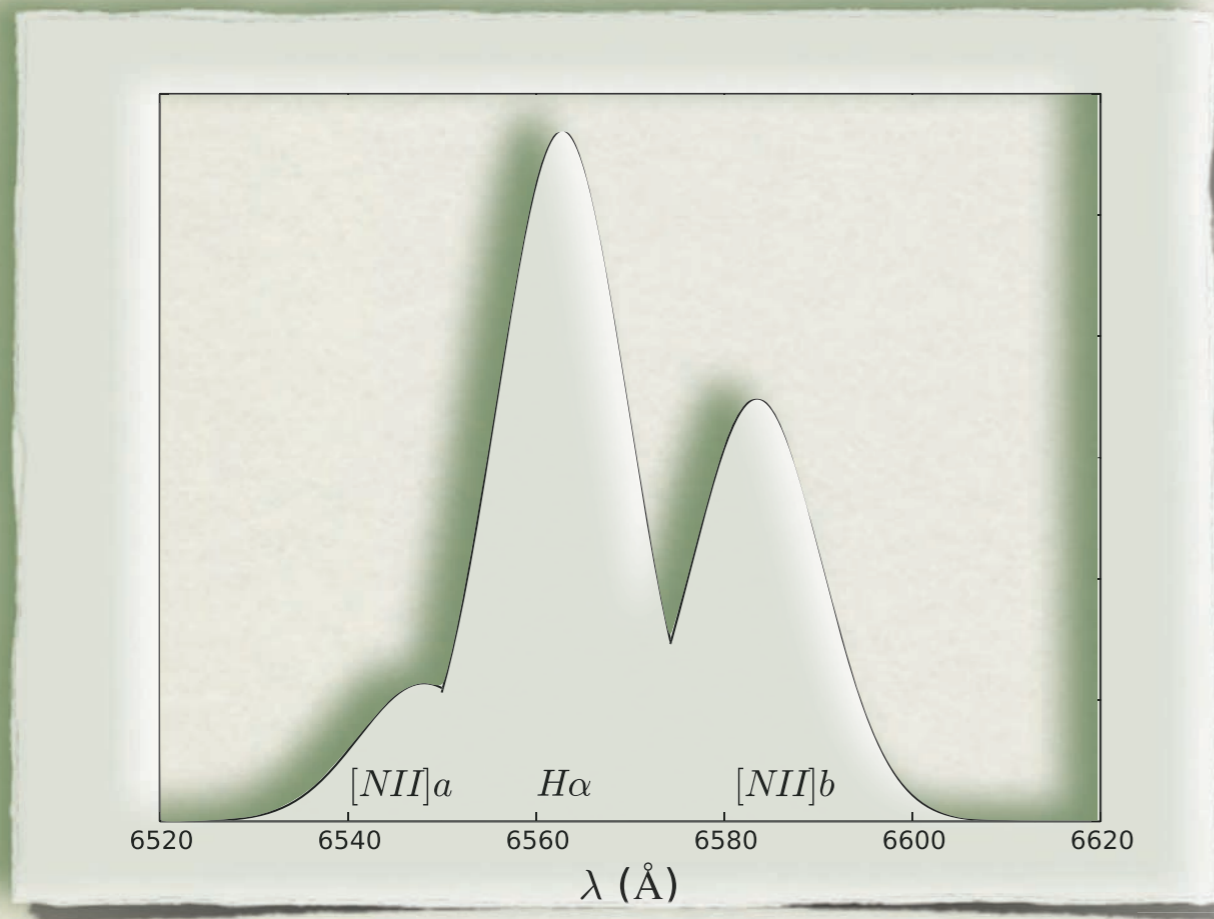
Spectral modelling
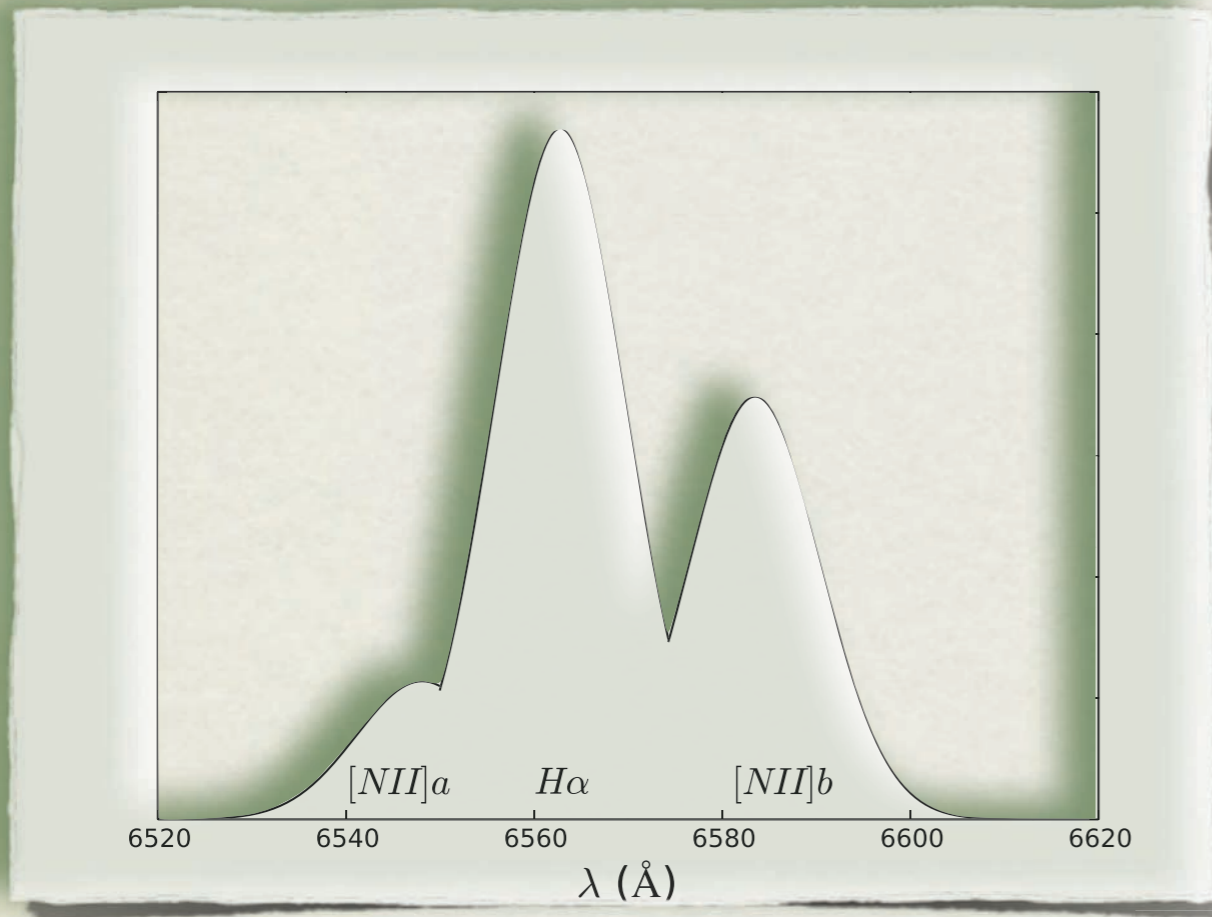
Hα   [N II]
Bruno   Ana

Bruno Rodríguez del Pino

➡ Hα

➡ Great PhD student, on the job market!

➡ Spectral modelling part of this work
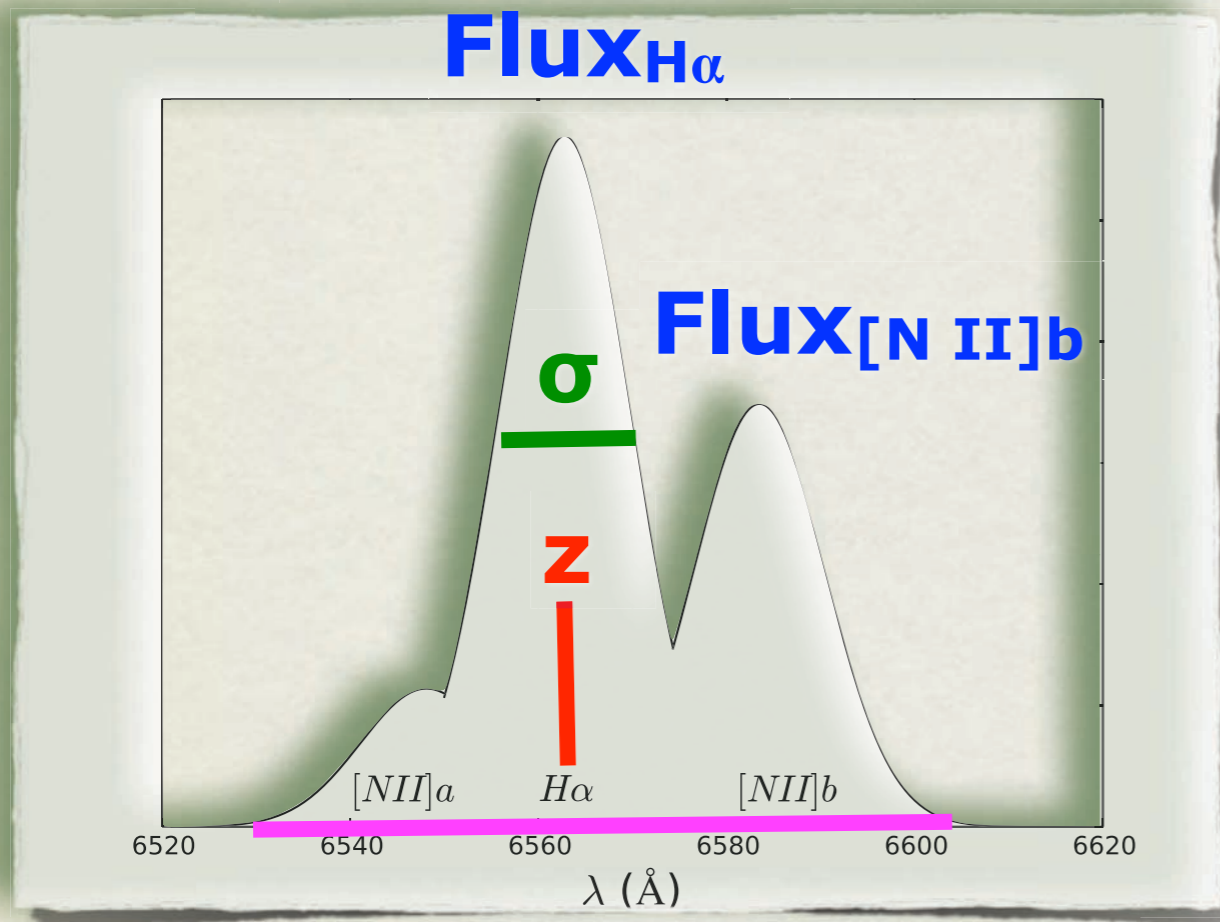
MCMC

Hα [N II]
Bruno   Ana

Spectral modelling

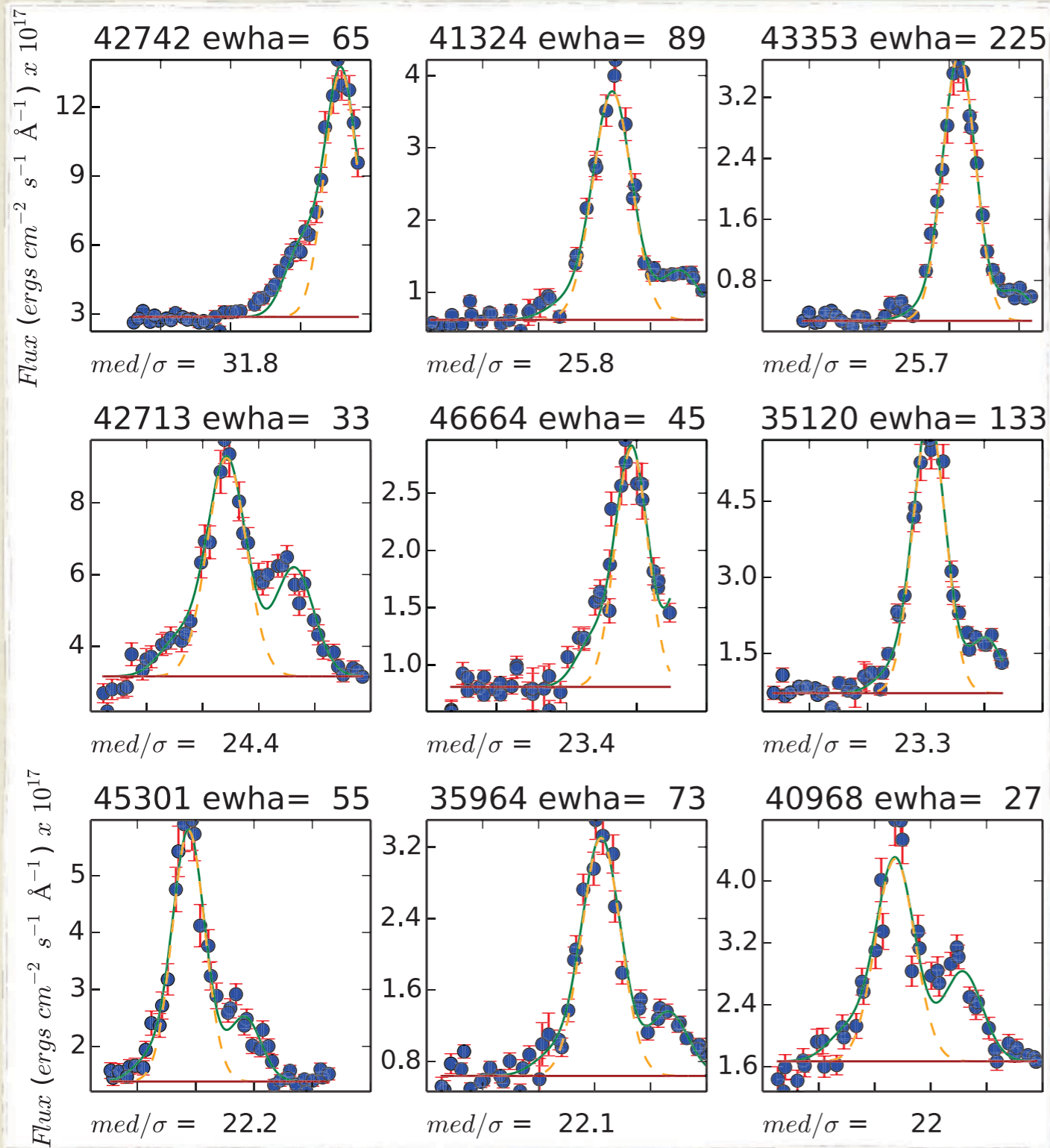Model of **3 Gaussians** + **continuum** (total of 6 parameters):

$\Rightarrow$ Flux$_{[N\ II]b}$ = 3.06× Flux$_{[N\ II]a}$

Parameter space is explored using Markov Chain Monte Carlo (MCMC) techniques.
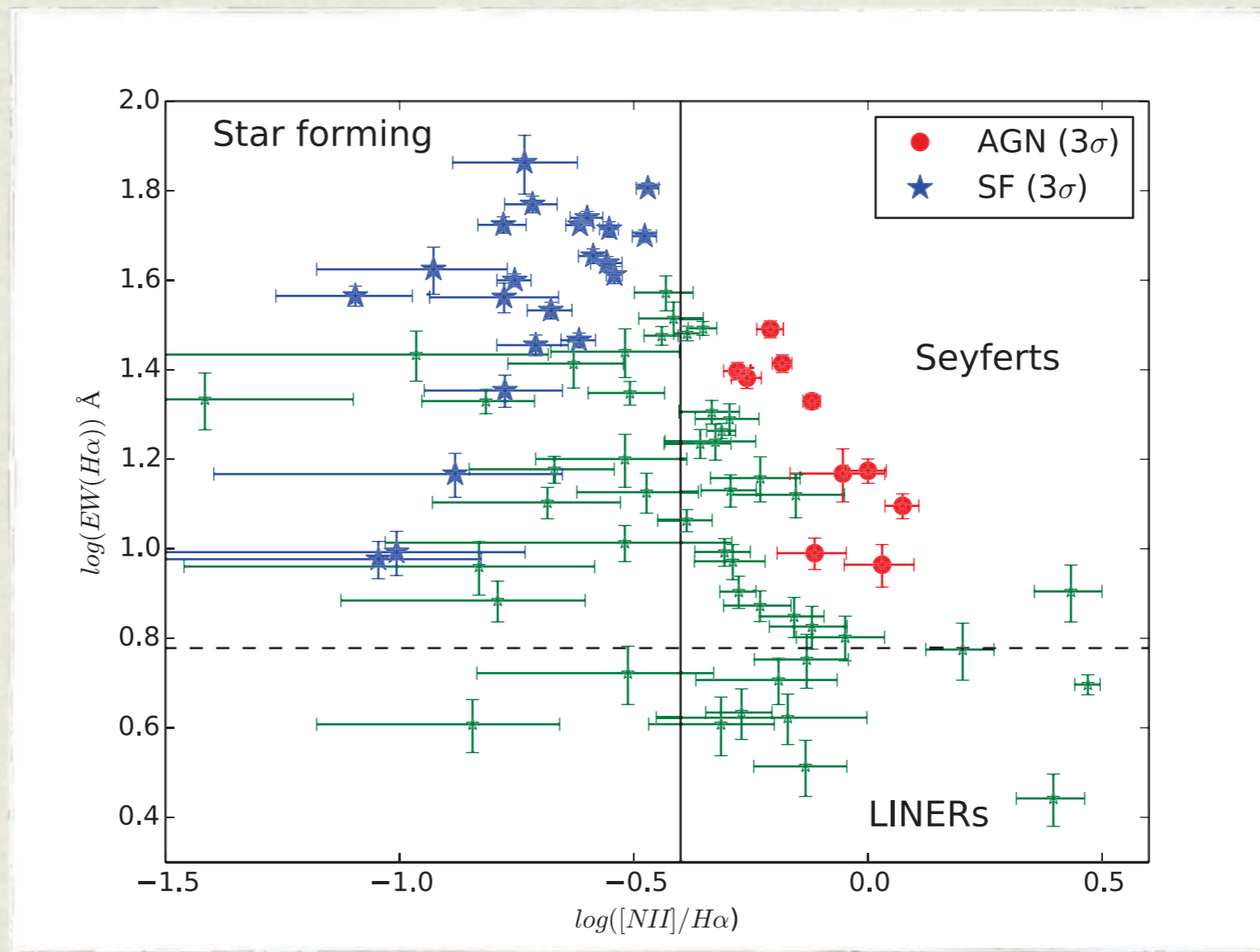
Results!

...F21 and F22, 2/20...

Detections

142 objects with Hα detection

79 objects with Hα + NII

AGN *vs*. SF census

Chies-Santos+14 to be submitted

79 objects: { 23 Star-forming

10 AGN

Spatial Distribution
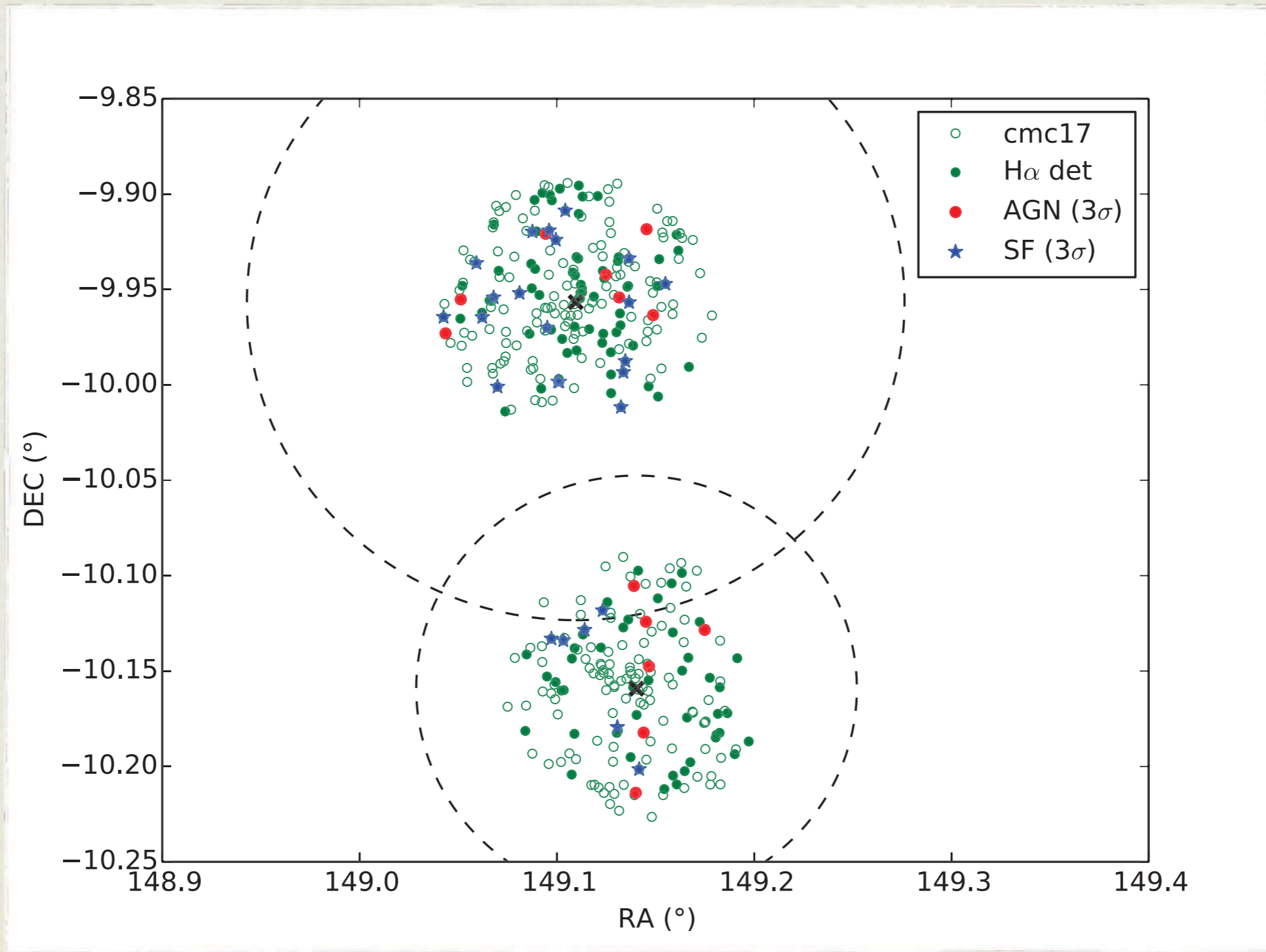
Chies-Santos+14 to be submitted

Morphology
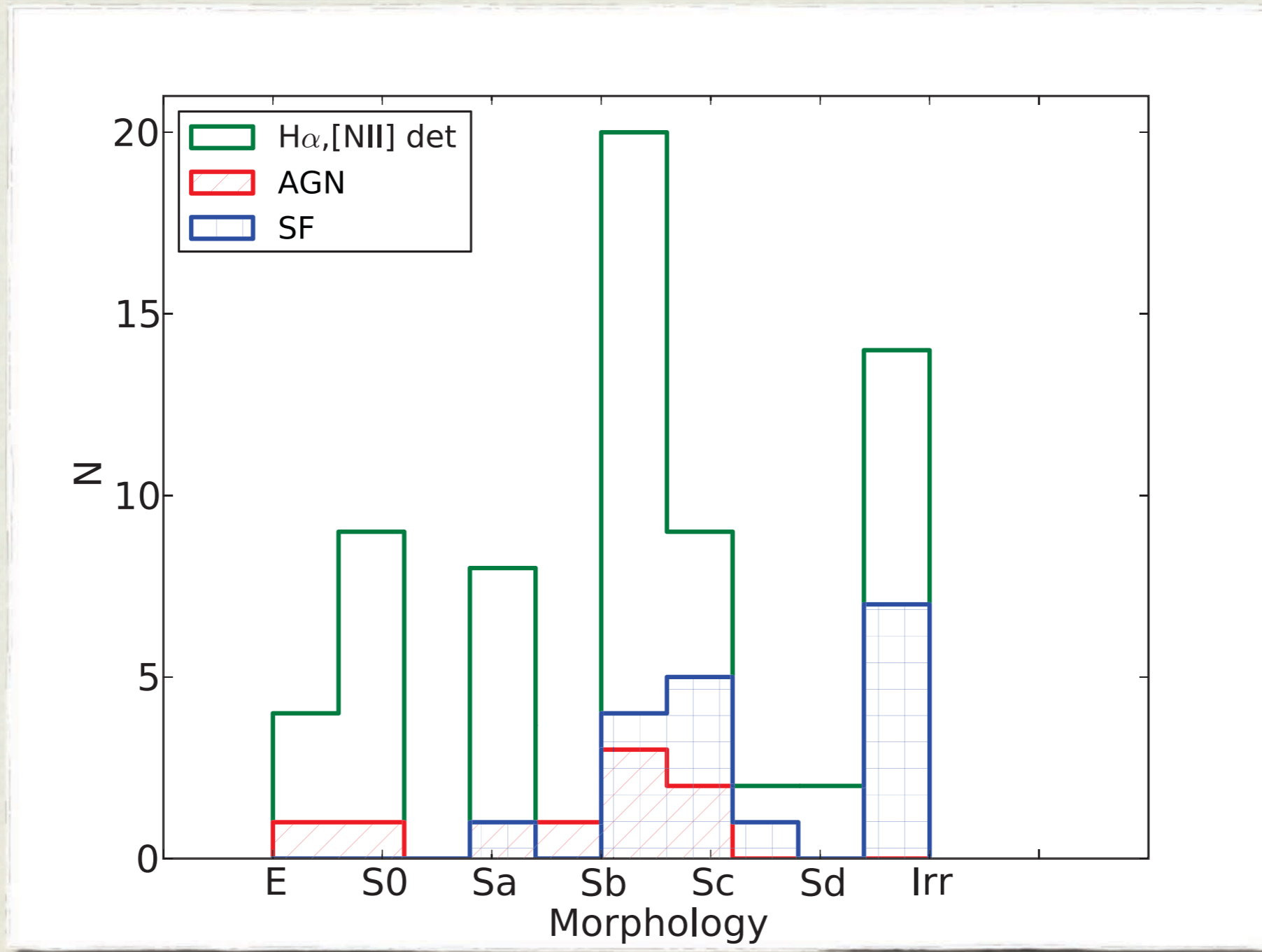
Mass and m$_R$
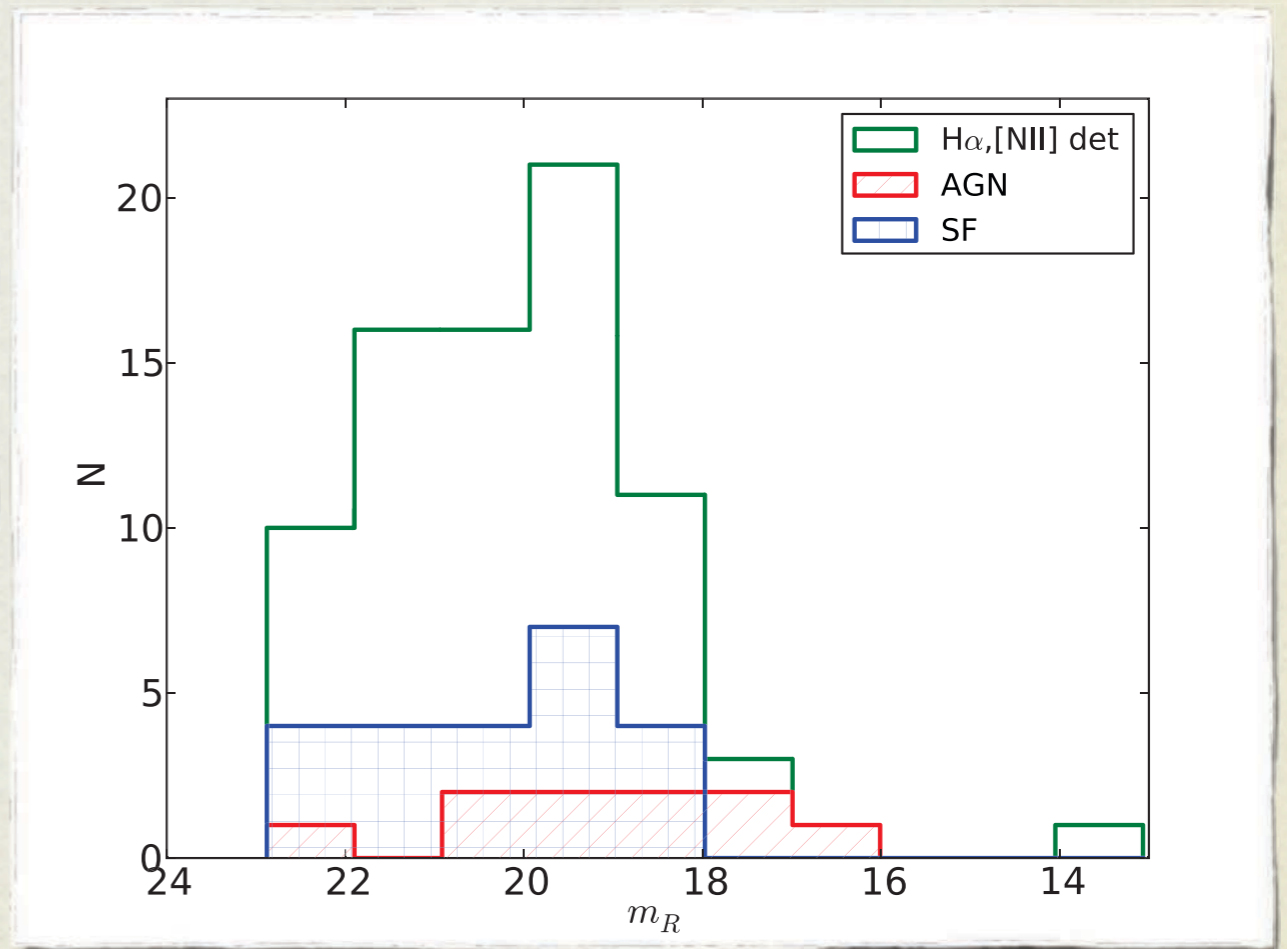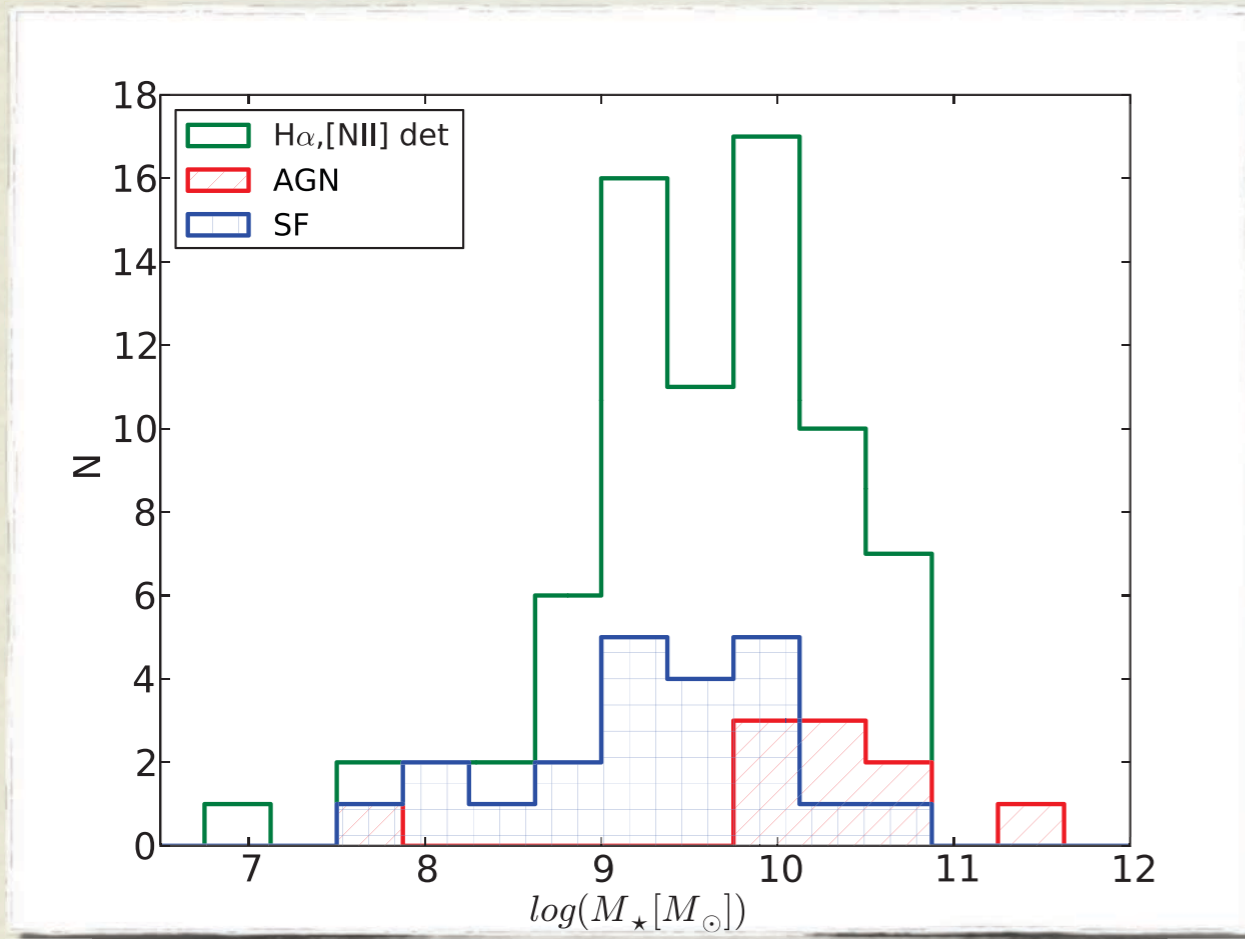
Suppression of SF!

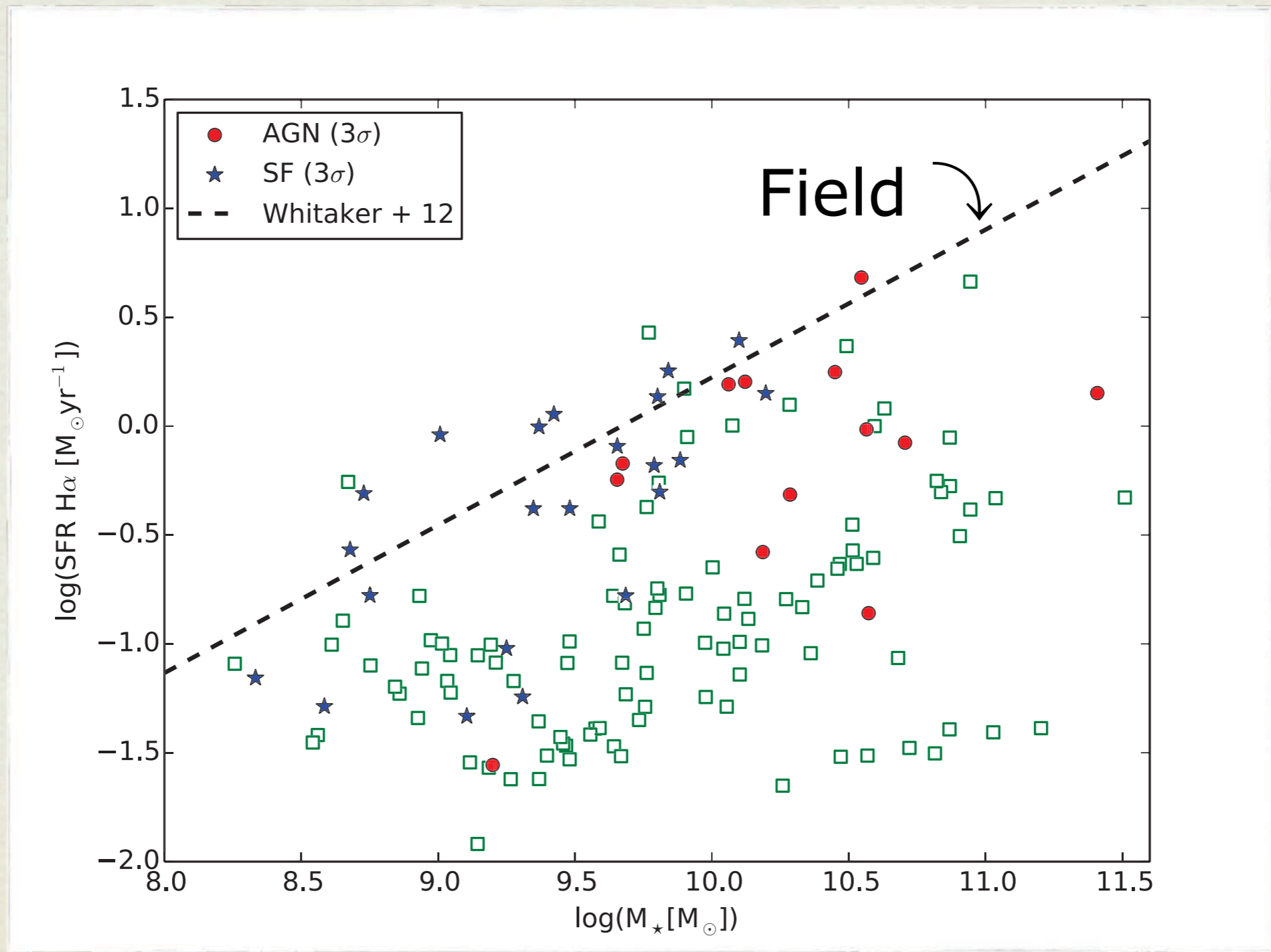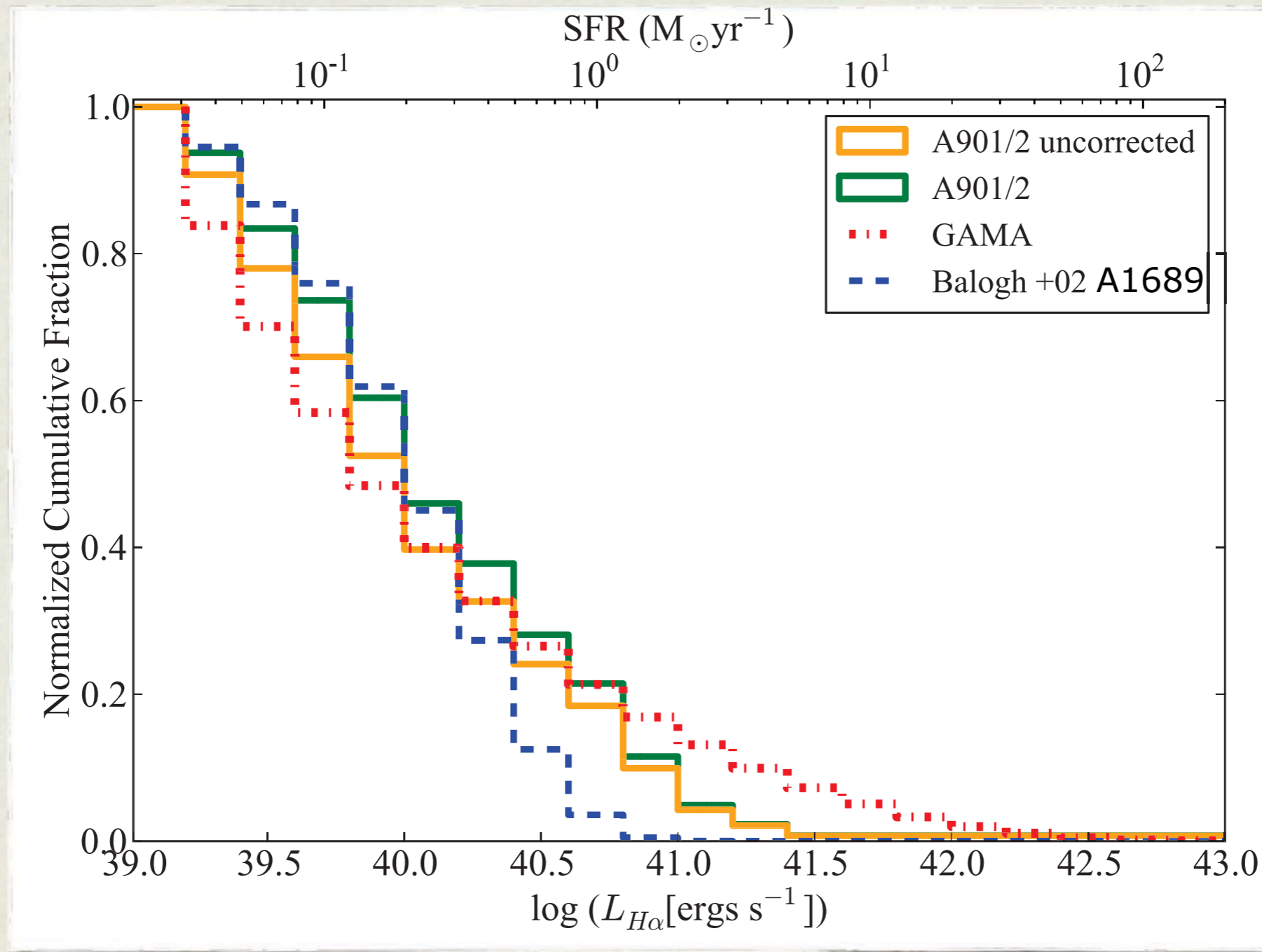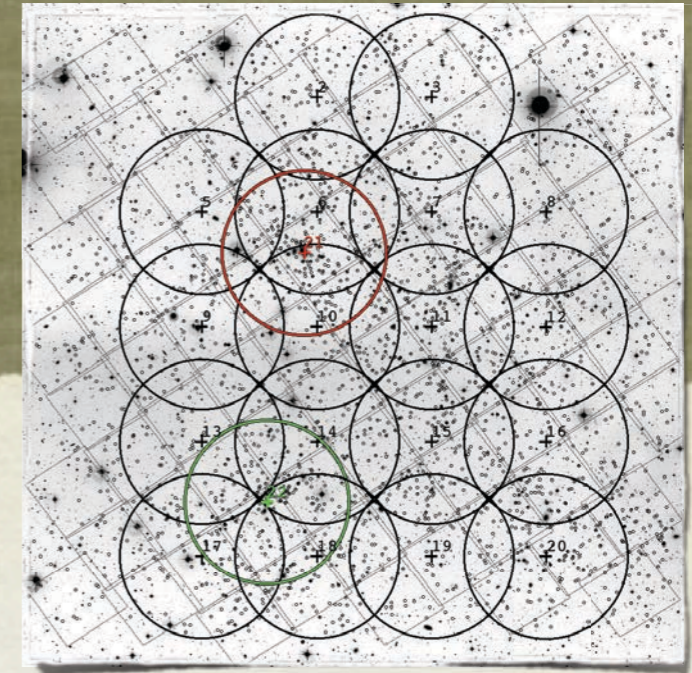SFR vs. Stellar Mass: Chies-Santos+14 to be submitted

Hα Luminosity Function

Chies-Santos+14 to be submitted

GAMA Hα Luminosity Function (Gunawardhana et al. 2013)

THE END THANK YOU

➡ Analysis of 2 out of 20 Fields

➡ Full **AGN census** and **integrated Star Formation** properties **20 Fields**

➡ **Size of SF regions** from Hα maps and its dependence with **environment**.

work in progress

STAY TUNED FOR Chies-Santos+14

Rodriguez del Pino, Chies-Santos et. al. +14