IV WORKSHOP DEL PROYECTO AYA2004-08260

ESTALLIDOS DE FORMACIÓN ESTELAR EN GALAXIAS

"UNA APROXIMACIÓN MULTIFRECUENCIA DE LA FORMACIÓN ESTELAR EN GALAXIAS".

"A MULTIWAVELENGTH APPROACH TO STAR FORMATION IN GALAXIES".

Tendrá lugar en Madrid los días 26 y 27 de enero del 2006 con el C.I.E.M.A.T. como anfitrión.

To be held in Madrid in January 26-27, 2006 hosted by the C.I.E.M.A.T.

Spectroscopy of the brightest knots of IIZw71

& Photometry

ESTALLIDOS IV

A multiwavelength approach to star formation in galaxies









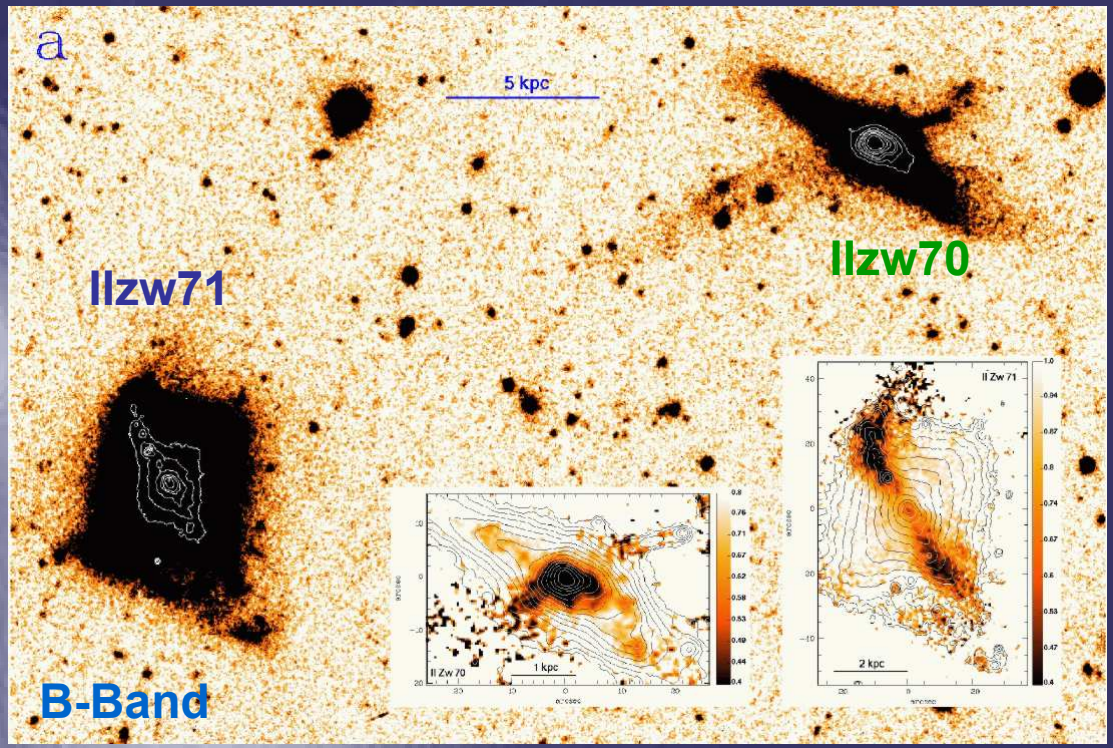


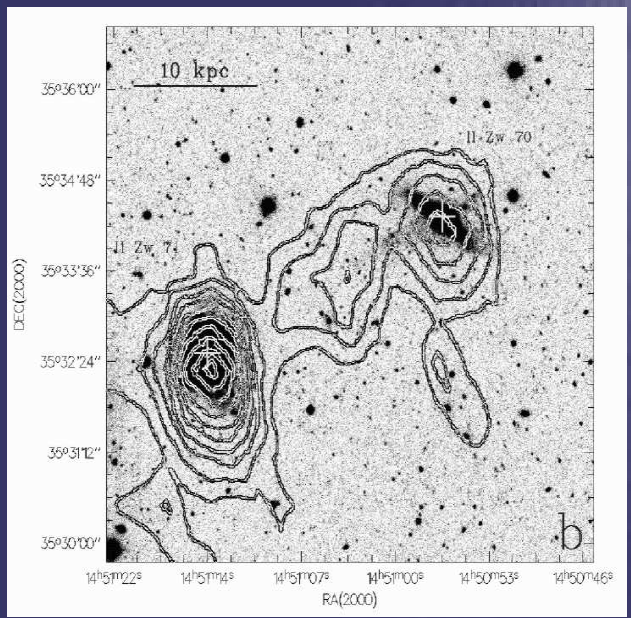
Webmaster → Enrique Pérez-Montero, Rubén García-Benito & Ángeles I. Díaz

魯文

Pair of BCD

Distance = 18.2 kpc



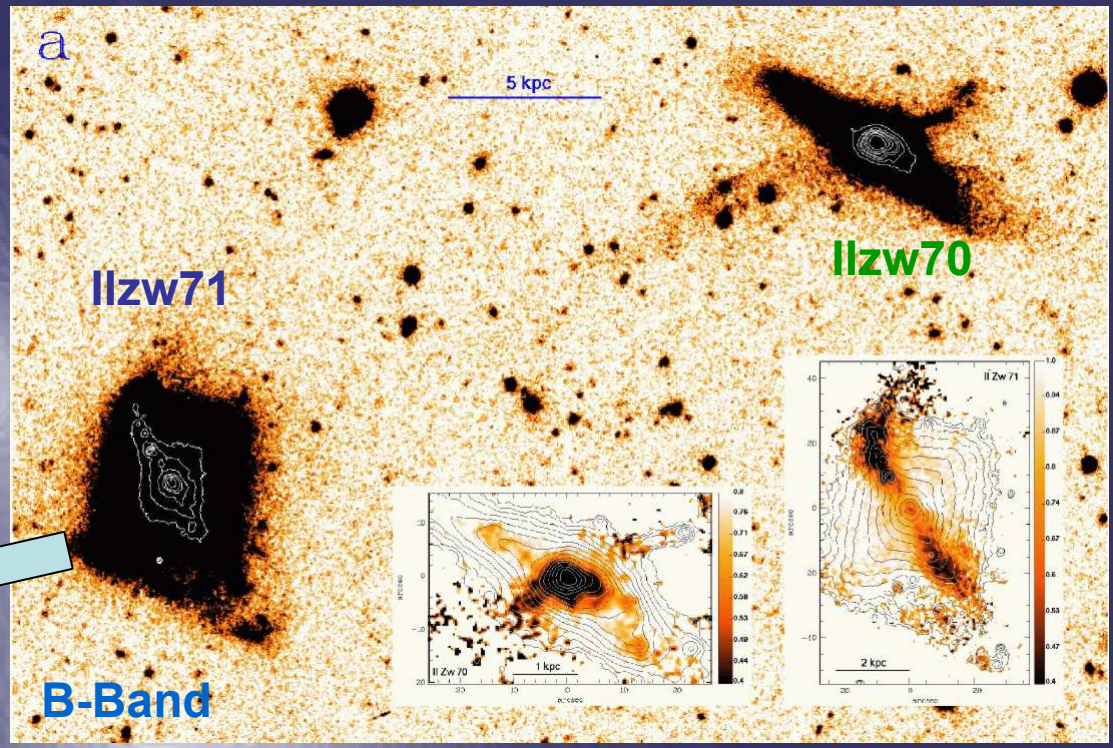


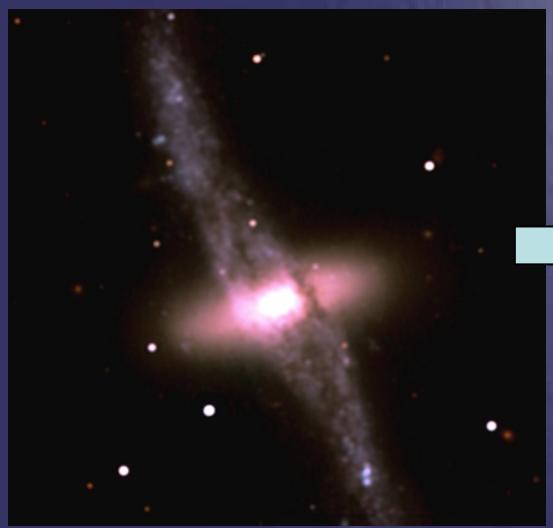
P. Papaderos, K.G. Noeske, L.M. Cairós, J.M. Vílchez, K.J. Fricke

HI map: massive HI streamer or gaseous bridge connecting the dwarf galaxies (Balkowsky et al. 1978)

A.L. COX et al. (2001), observe HI gas in regular Rotation about the minor axis of the polar ring in IIZw71 and none that shares the rotation of the S0 disk.

Polar Ring Galaxy

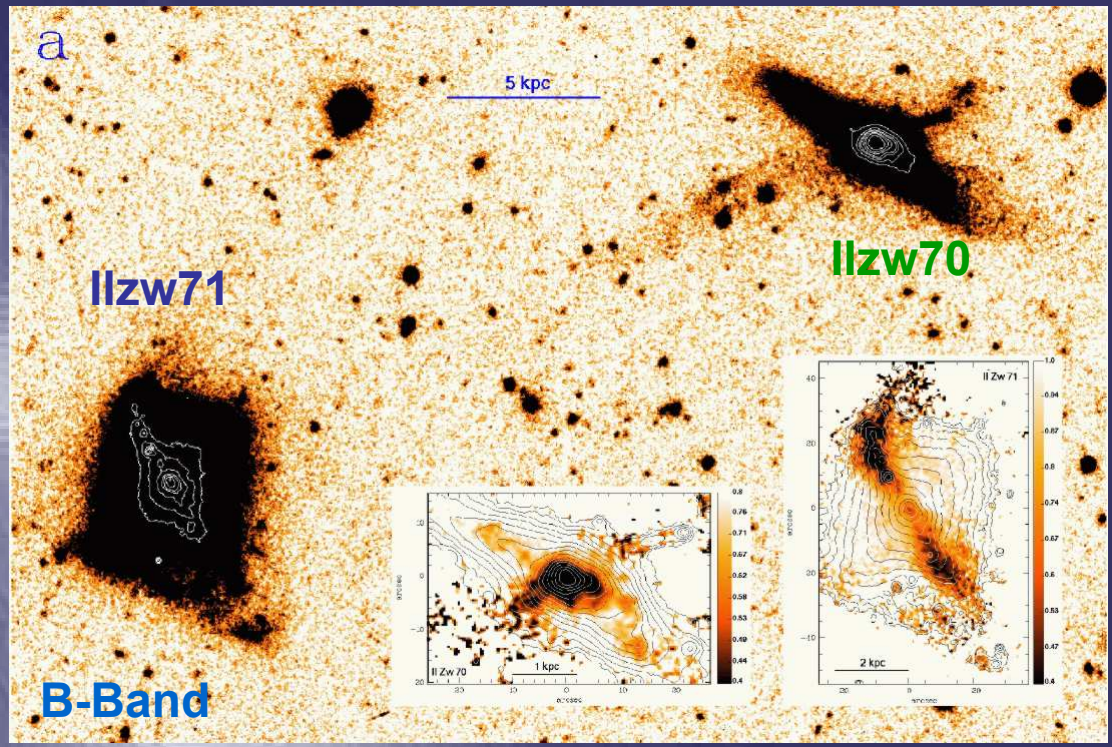




Polar ring galaxies are made-up of two distinct systems : the host galaxy and the polar ring. The host galaxy is a normal galaxy that gathers stars in a rotating disk. It is surrounded by a rotating ring, that contains stars and interstellar gas clouds. This ring is perpendicular to the plane of the host galaxy disk.

IIZw71: Presence of several Hα very luminous knots distributed in a polar ring.

Analysis of these different bursts
of star formation and derive its properties



DATA

Single long-slit exposition of the main bursts of star formation in the direction of the ring of IIZw71

Available photometry in several bands

Single long-slit



ISIS + WHT during 1 night in July, 8th 2005.

- R600B grating - blue arm

-R300R grating

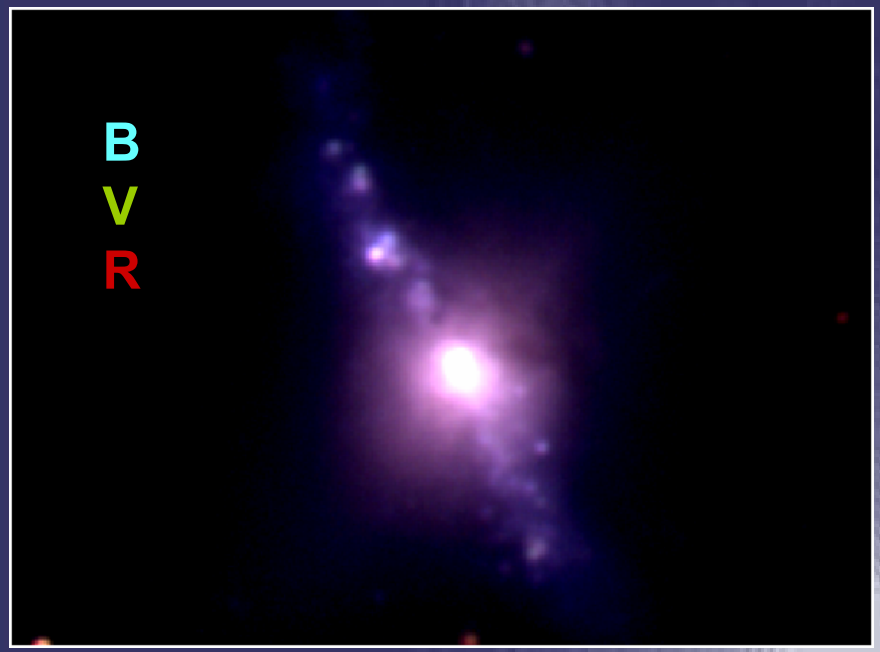
- Spectral coverage: 3500 Å to 1 micron

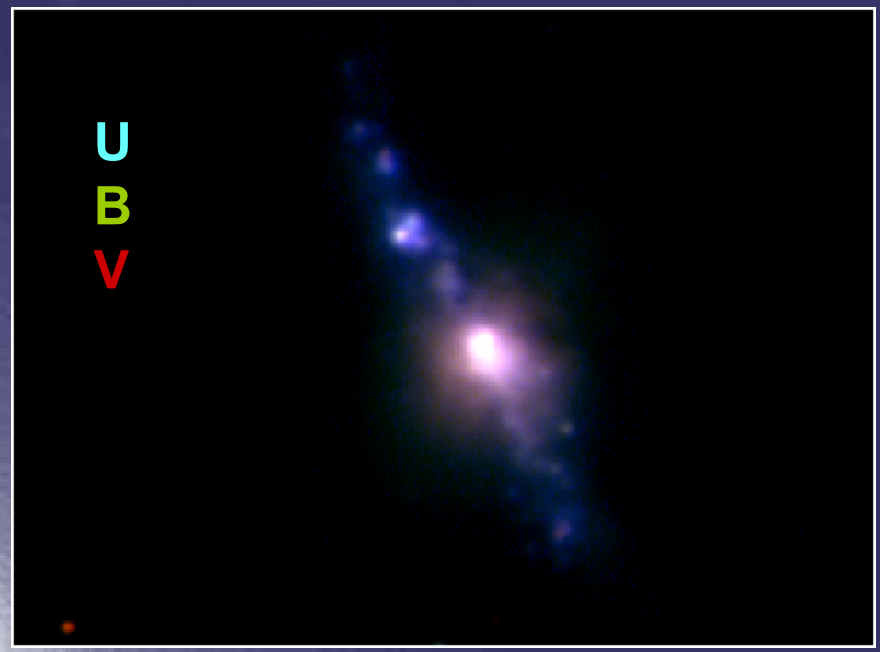
-Spectral resolution 0.45 Å / pixel 1 (arcsec width slit)

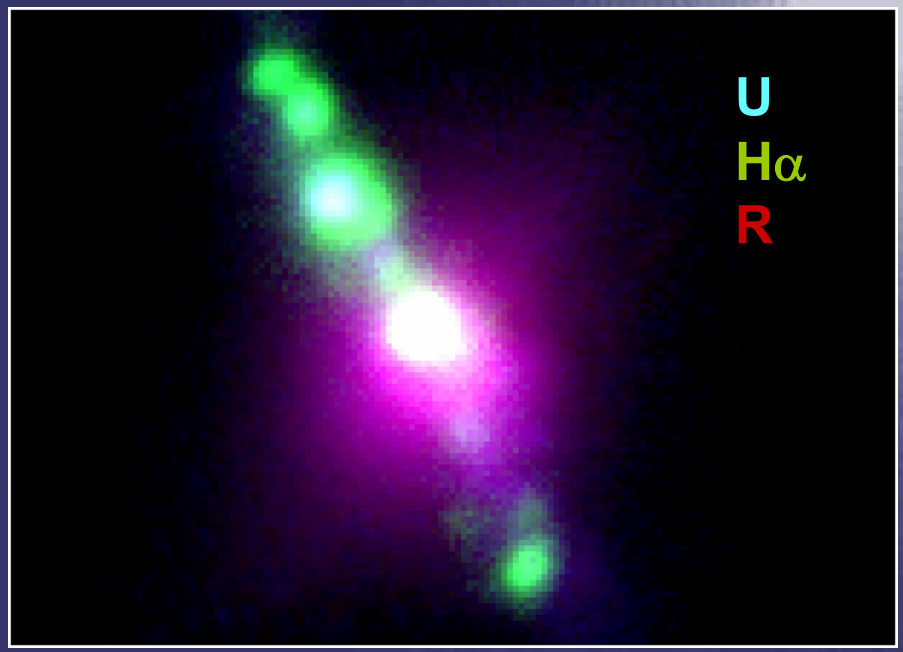
Available photometry in several bands

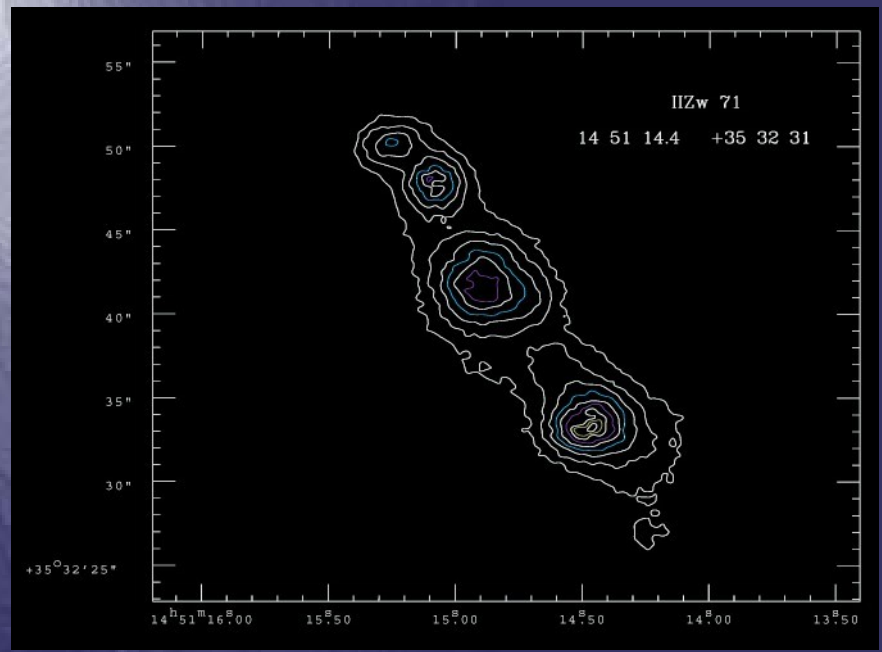
- UBVR images: **Luz Marina Cairós** (THANK YOU!)

- Hα image belongs to the Palomar Atlas of BCDs.

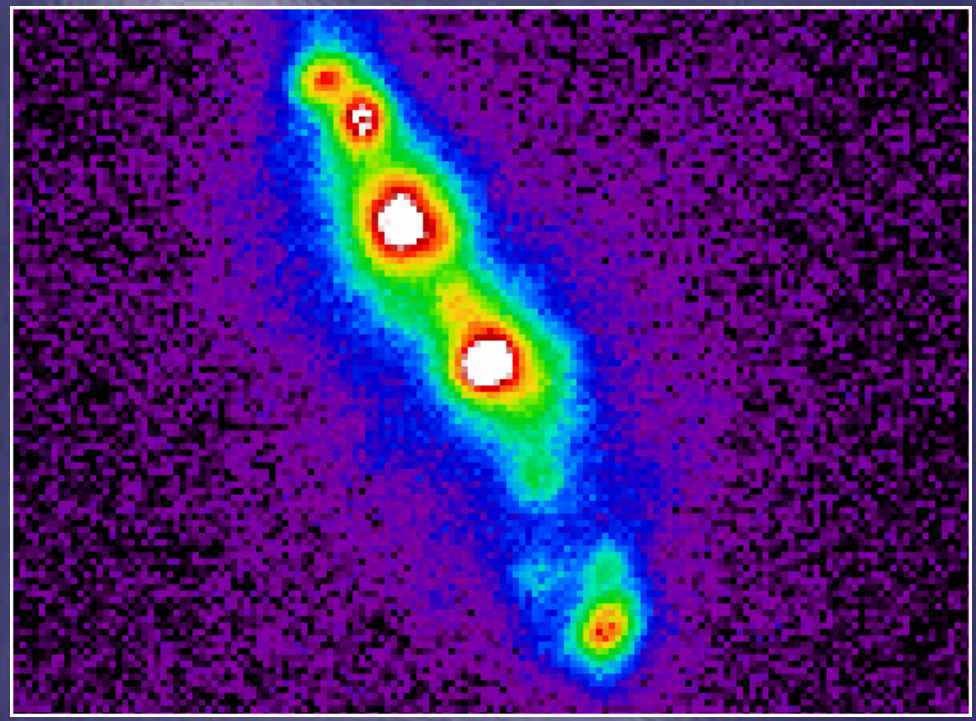

B
V
R


U
B
V


U
Hα
R

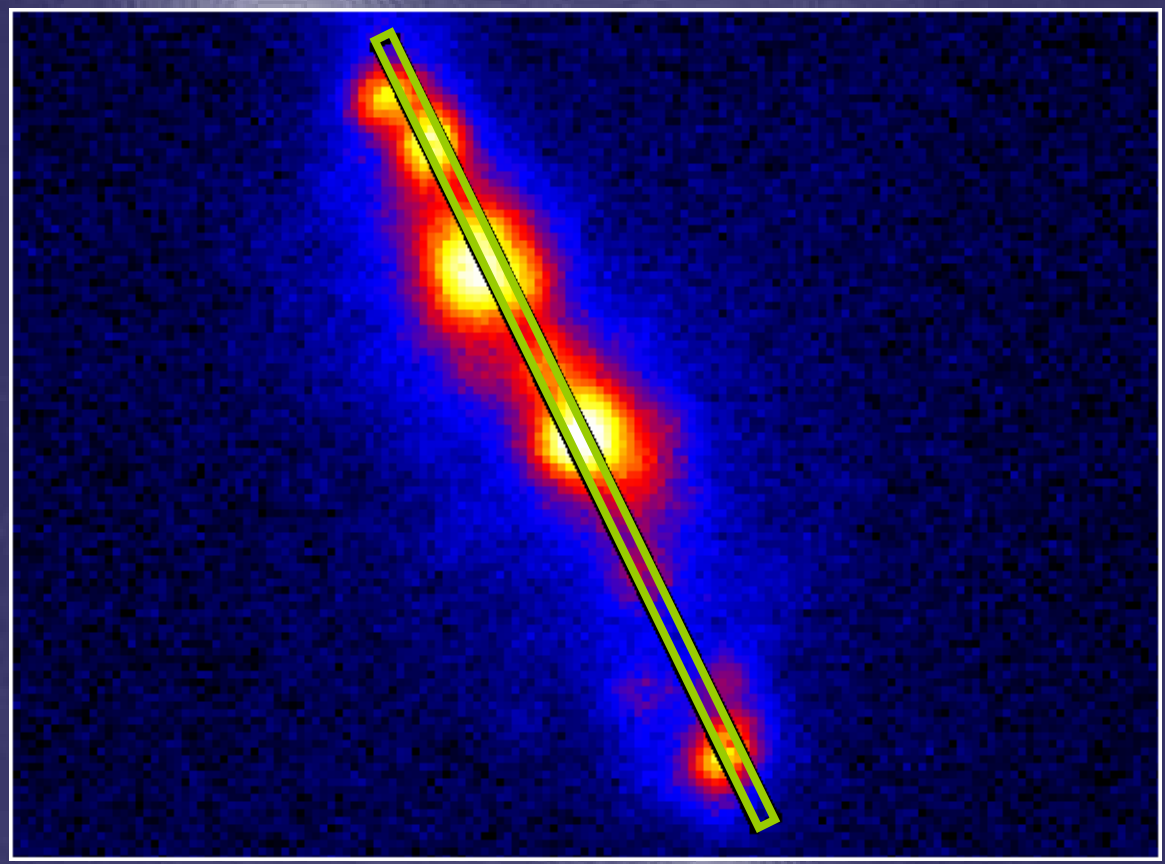

IIZw 71
14 51 14.4 +35 32 31
55"
50"
45"
40"
35"
30"
+35°32'25"
14h51m16s.00
15s.50
15s.00
14s.50
14s.00
13s.50

Hα image





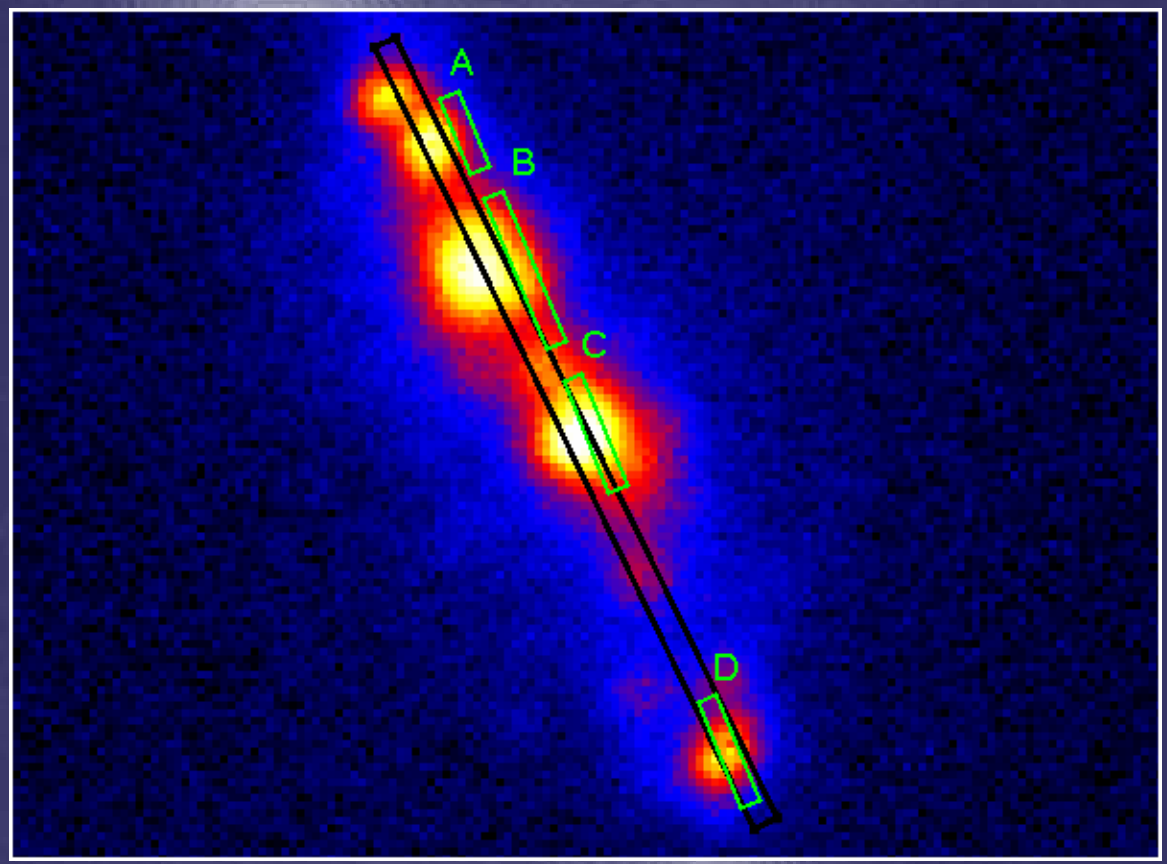


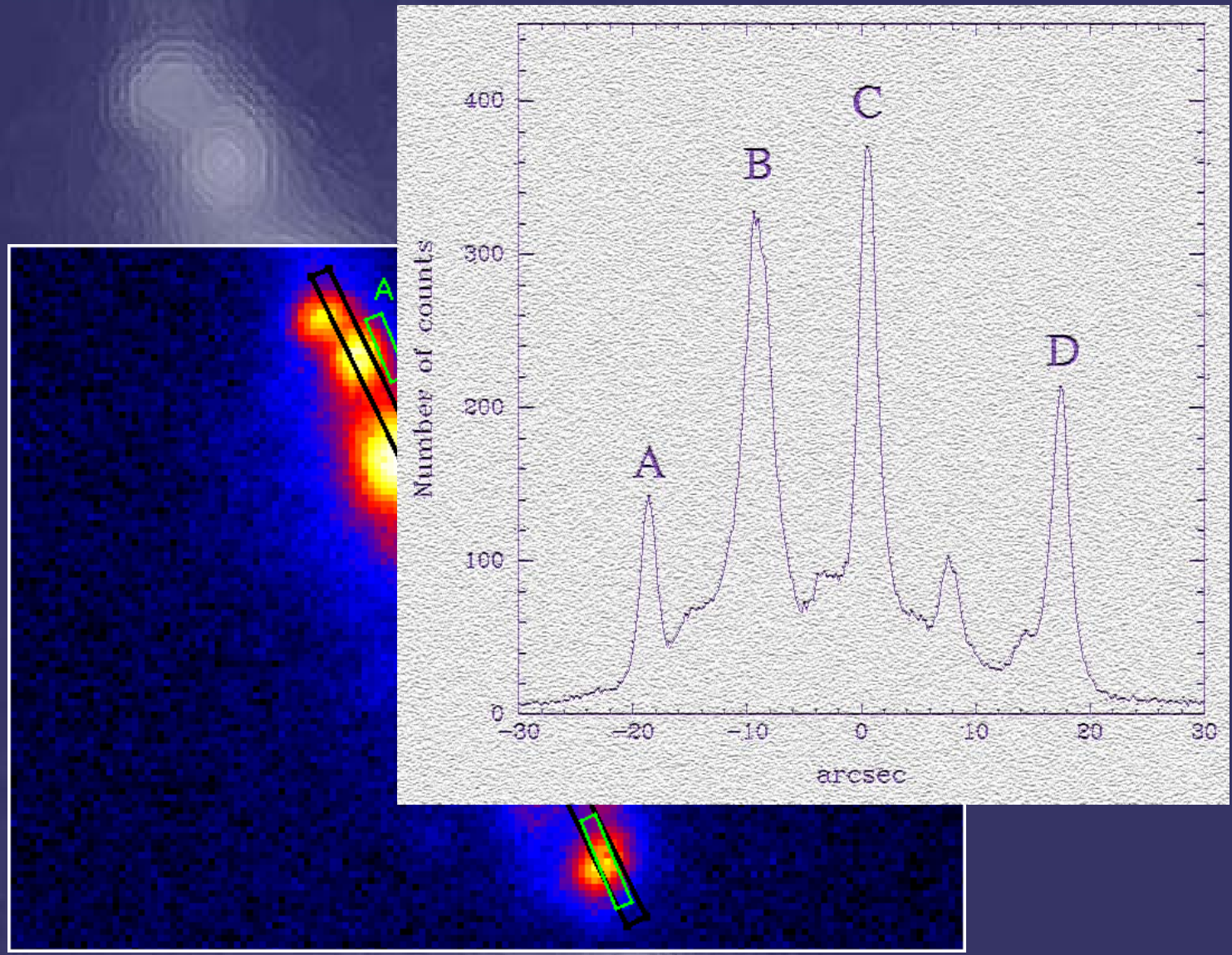




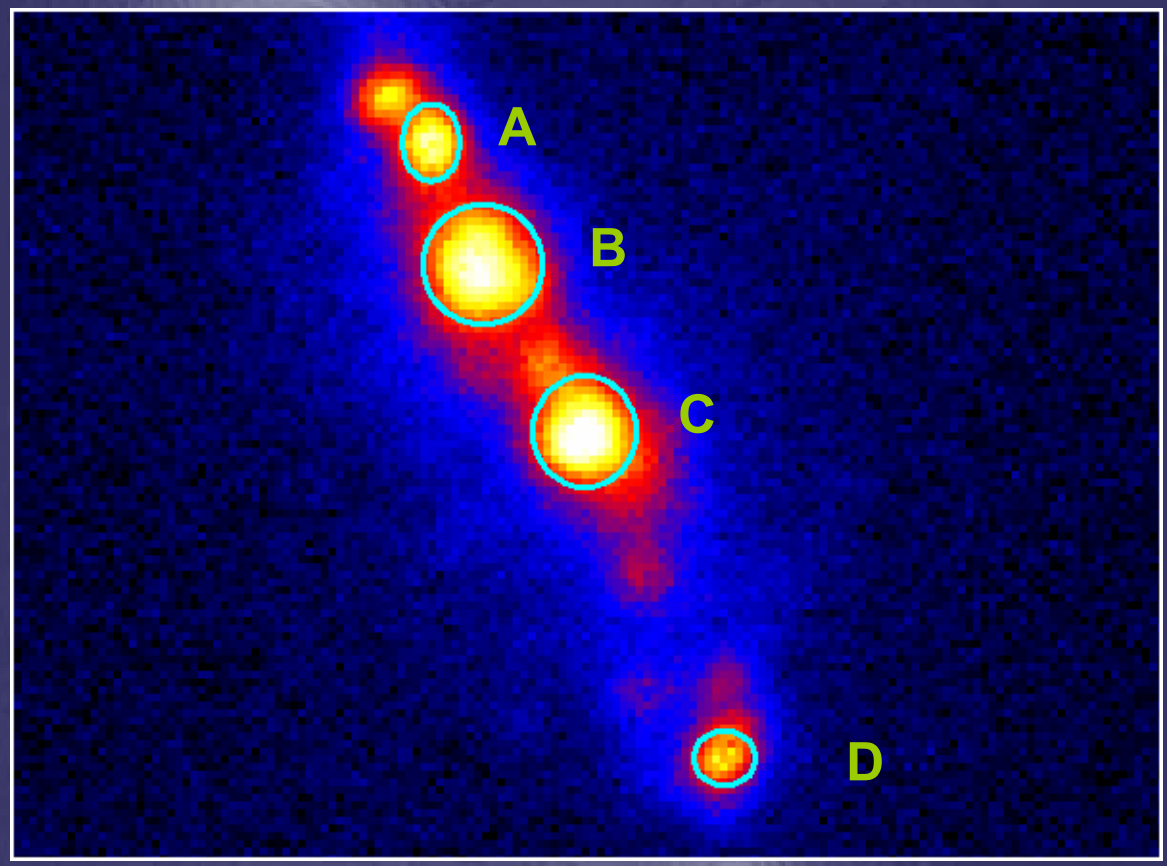
Flux Hα Spectroscopy ⟺ Hα Image






A
400
300
200
100
0
Number of counts
A
B
C
D
−30
−20
−10
0
10
20
30
arcsec

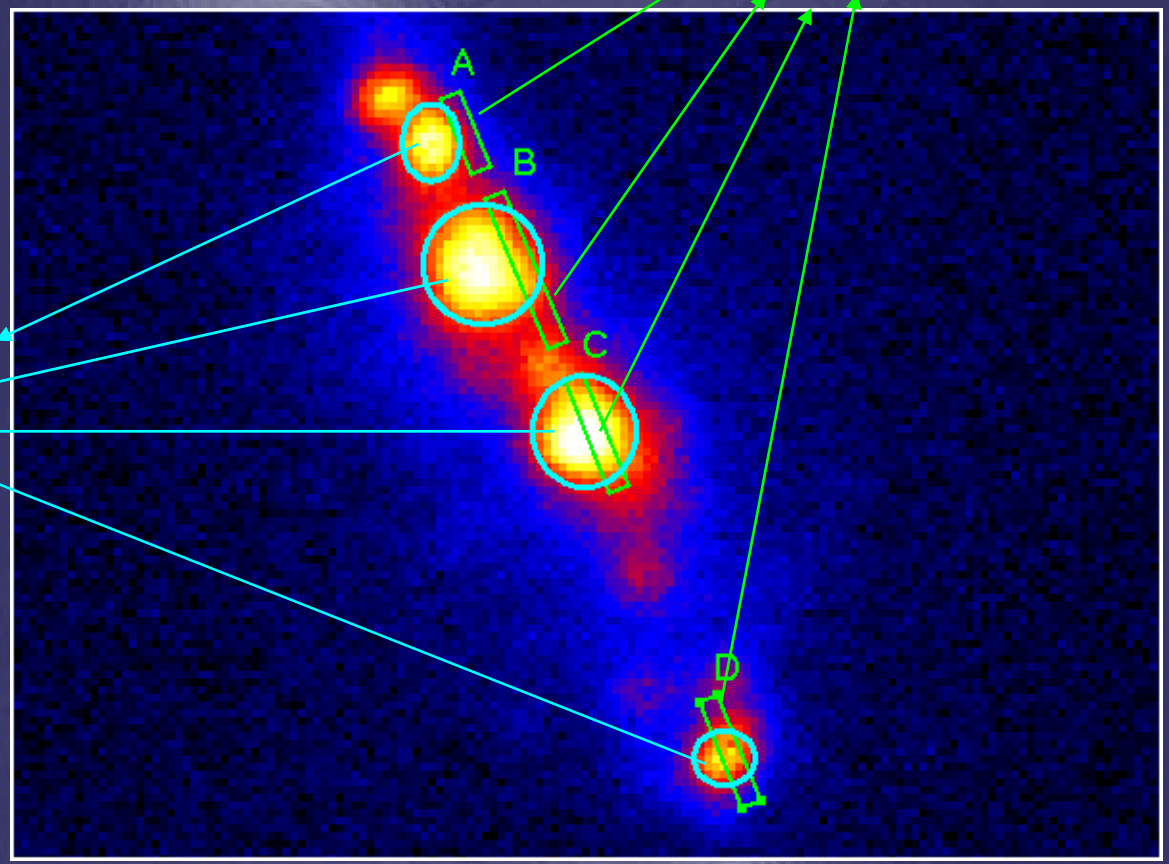
Measure UBVR photometry in REGIONS (Hα KNOTS)

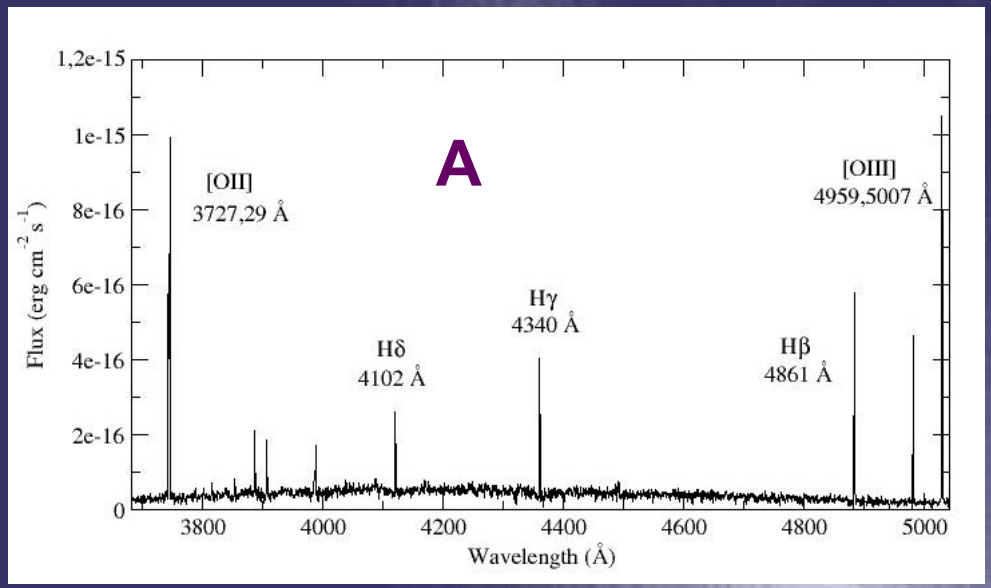


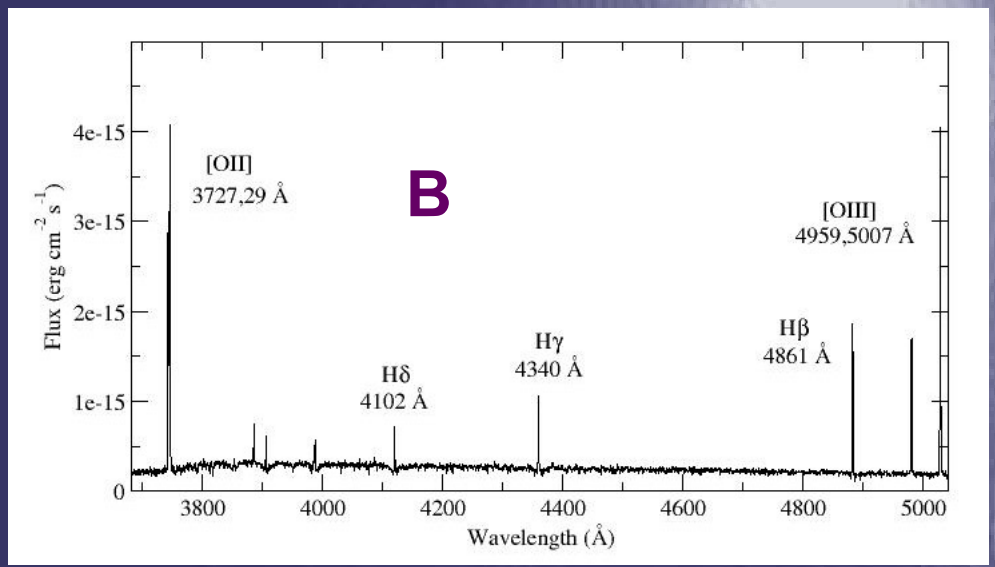
REGIONS defined over Hα image → Align Hα and UBVR images

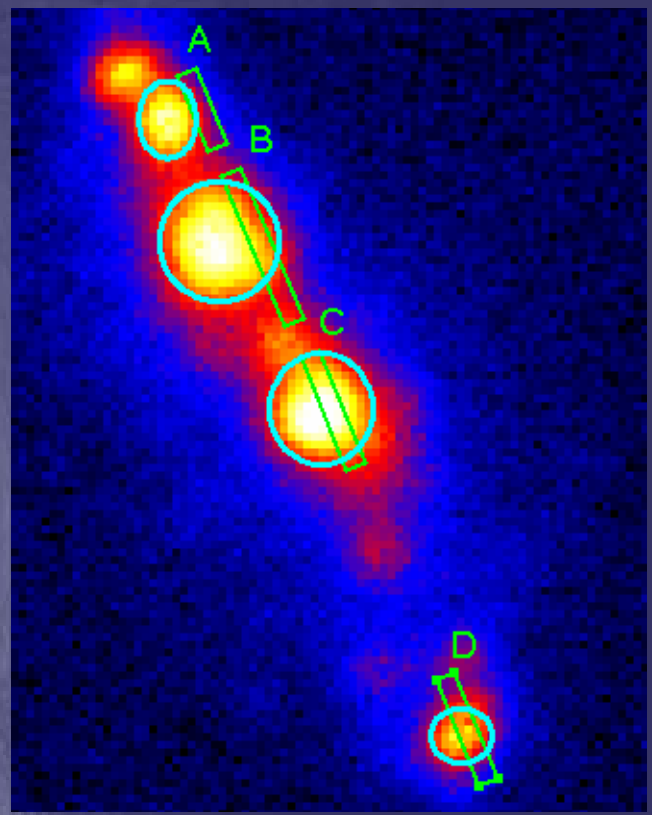
Spectroscopy
vs
Slit photometry

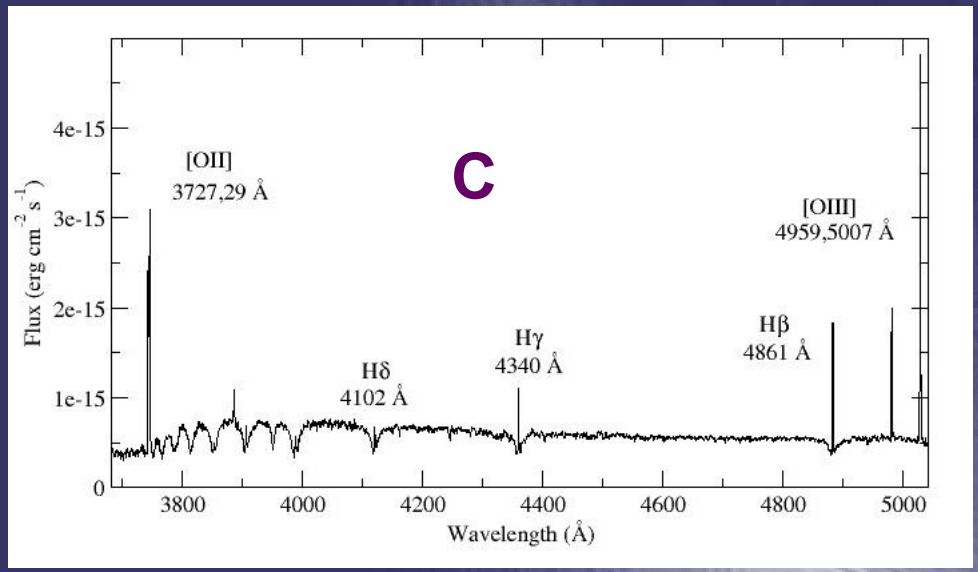
REGIONS
photometry

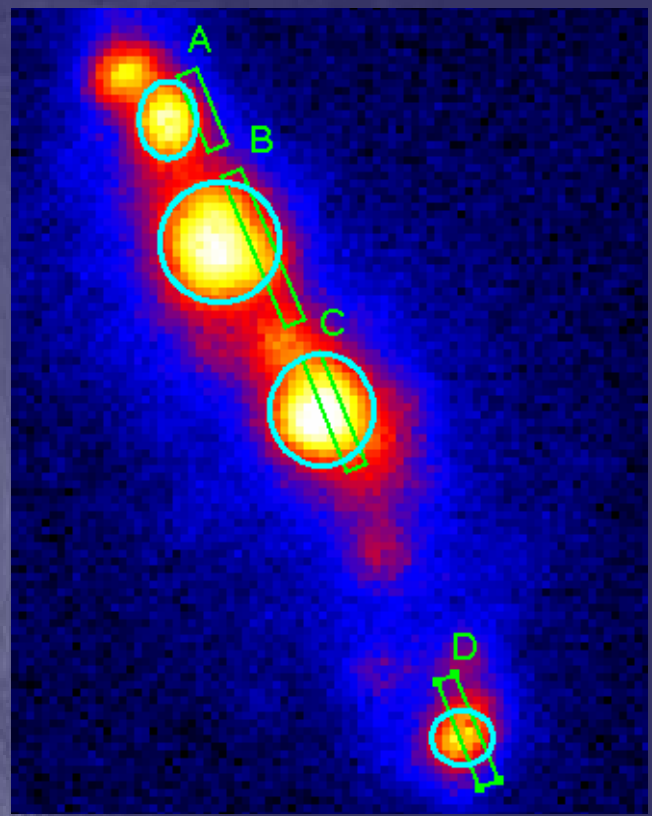


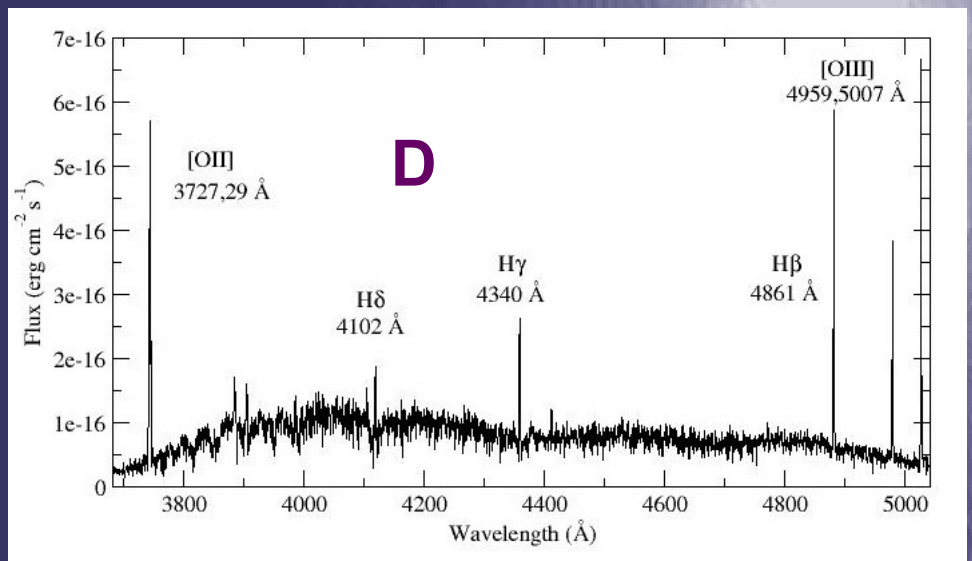

A
[OII]
3727,29 Å
Hδ
4102 Å
Hγ
4340 Å
Hβ
4861 Å
[OIII]
4959,5007 Å
Flux (erg cm^{-2} s^{-1})
Wavelength (Å)
1,2e-15
1e-15
8e-16
6e-16
4e-16
2e-16
0
3800
4000
4200
4400
4600
4800
5000

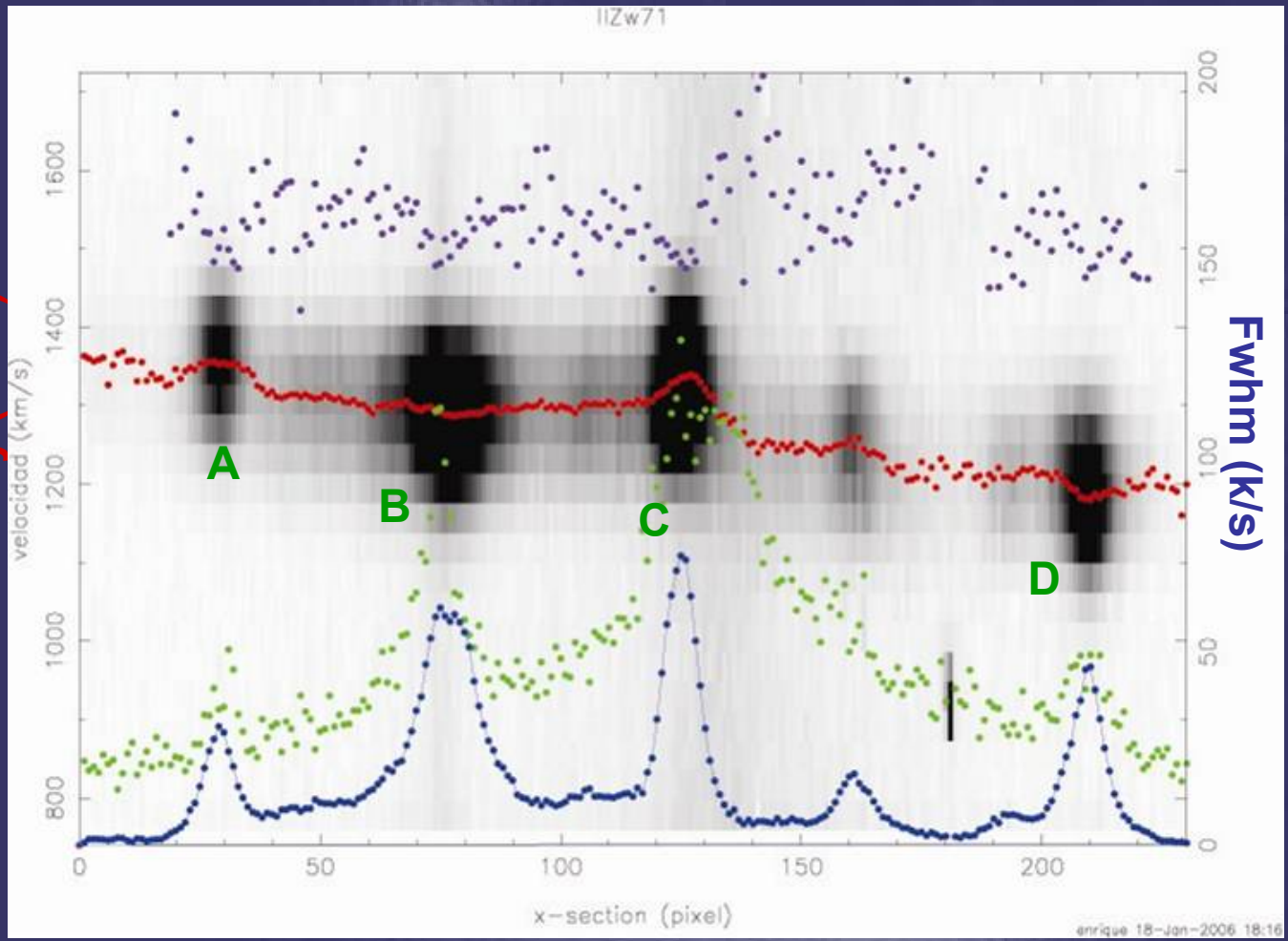

B
[OII]
3727,29 Å
Hδ
4102 Å
Hγ
4340 Å
Hβ
4861 Å
[OIII]
4959,5007 Å
Flux (erg cm^{-2} s^{-1})
Wavelength (Å)
4e-15
3e-15
2e-15
1e-15
0
3800
4000
4200
4400
4600
4800
5000


A
B
C
D


C
[OII]
3727,29 Å
Hδ
4102 Å
Hγ
4340 Å
Hβ
4861 Å
[OIII]
4959,5007 Å
Flux (erg cm^{-2} s^{-1})
Wavelength (Å)
0
1e-15
2e-15
3e-15
4e-15
3800
4000
4200
4400
4600
4800
5000


A
B
C
D


D
[OII]
3727,29 Å
Hδ
4102 Å
Hγ
4340 Å
Hβ
4861 Å
[OIII]
4959,5007 Å
Flux (erg cm^{-2} s^{-1})
Wavelength (Å)
0
1e-16
2e-16
3e-16
4e-16
5e-16
6e-16
7e-16
3800
4000
4200
4400
4600
4800
5000



Red : velocity

Blue: Hα intensity

Green: Continuum flux

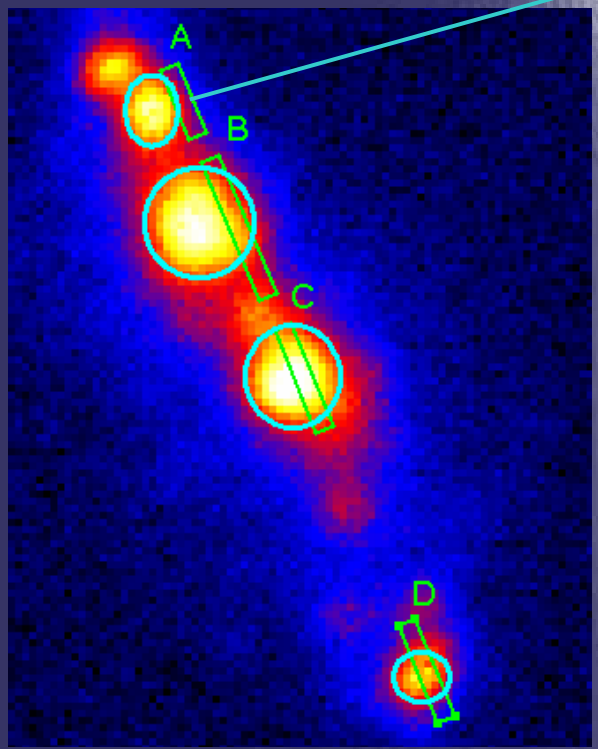
Violet: Hα fwhm

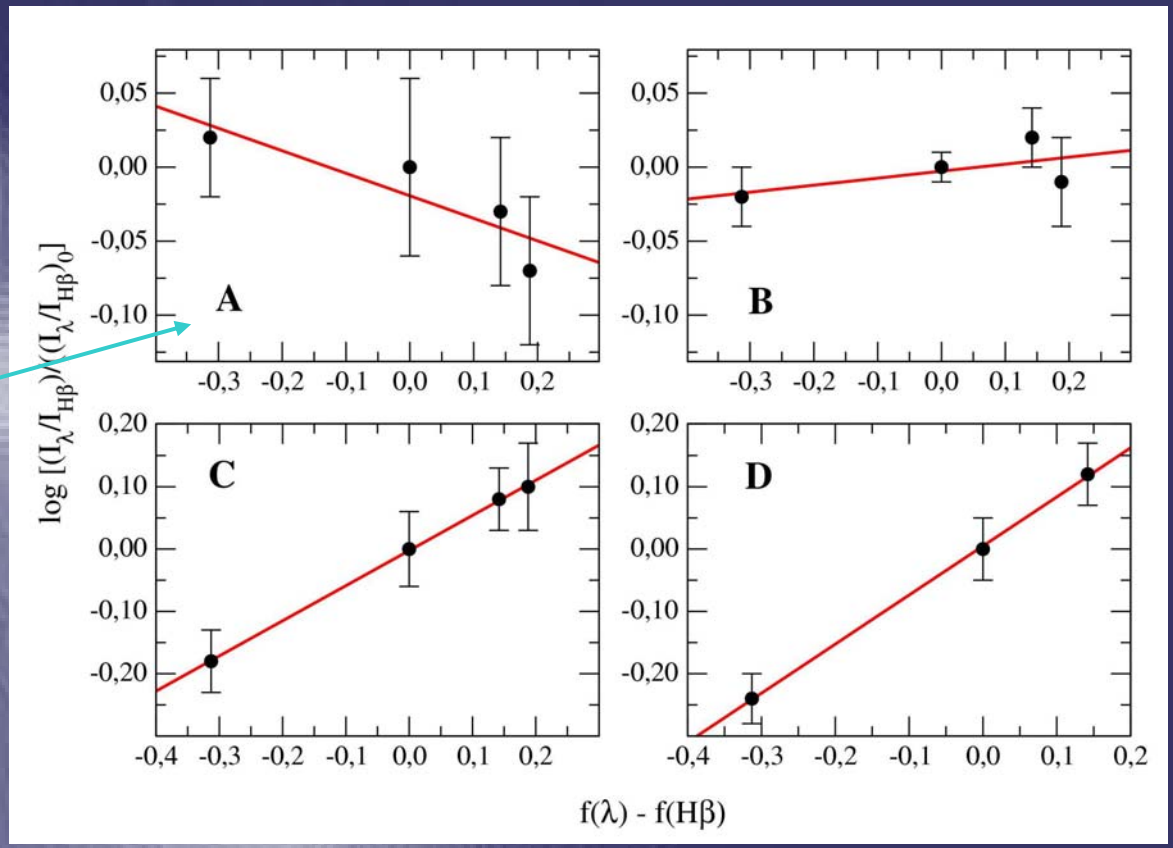
Enrique Pérez Jiménez



Kinematical study

c(Hβ) Reddening





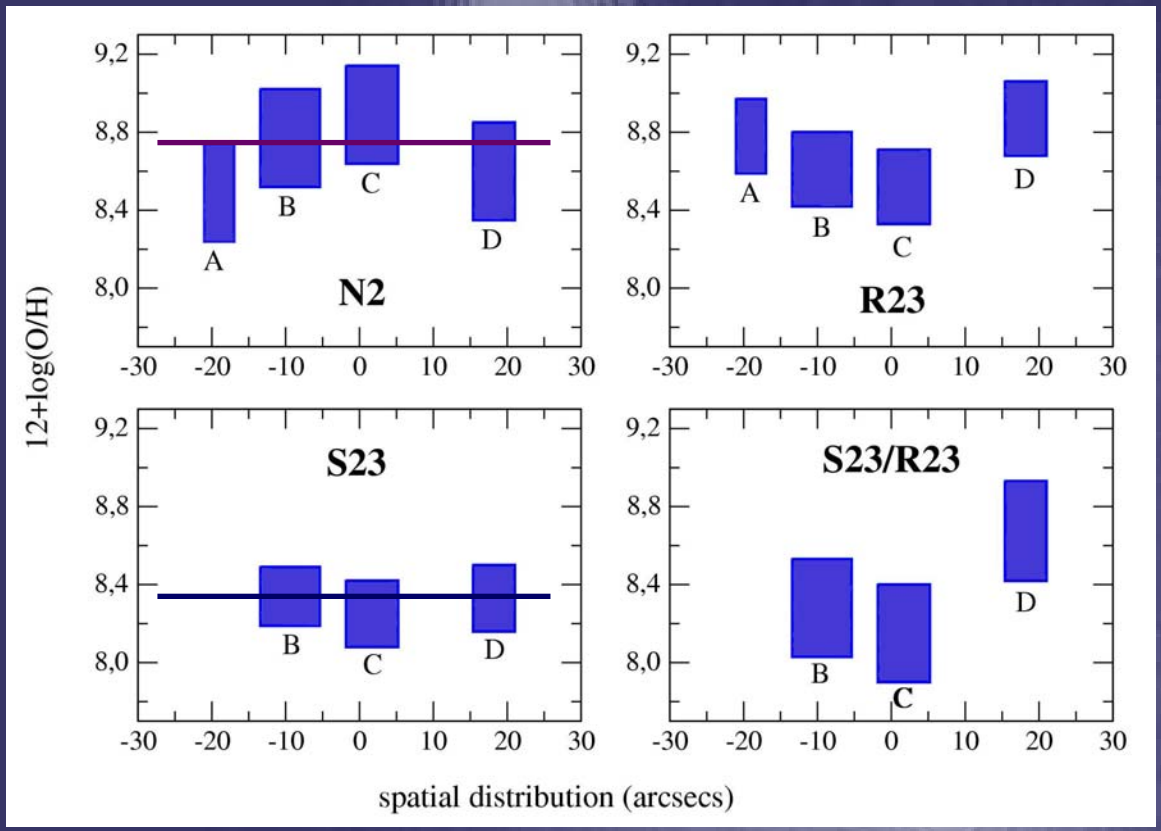
-Quotients of the detected Balmer lines (Hα, Hβ, Hγ and Hδ) and Hβ in relation to the theoretical expected values and the extinction curve.

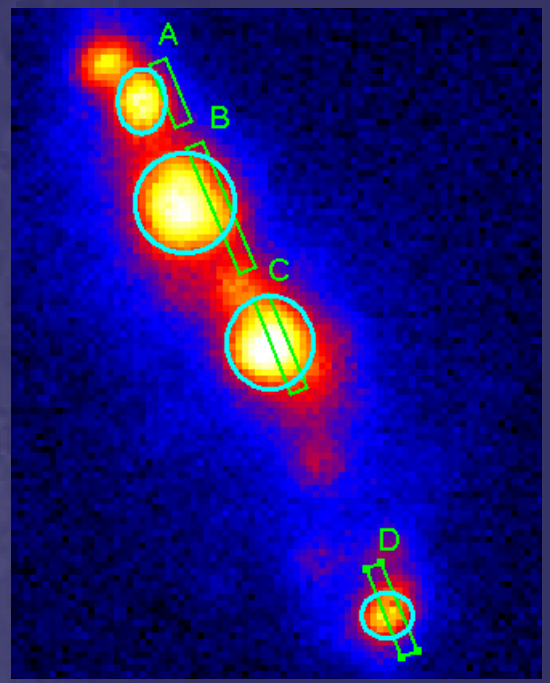
-Slope → estimator constant of reddening

-Galactic extinction is negligible

-Only knots well covered by the slit lead to values of C(Hβ) clearly larger than 0.

Metallicity

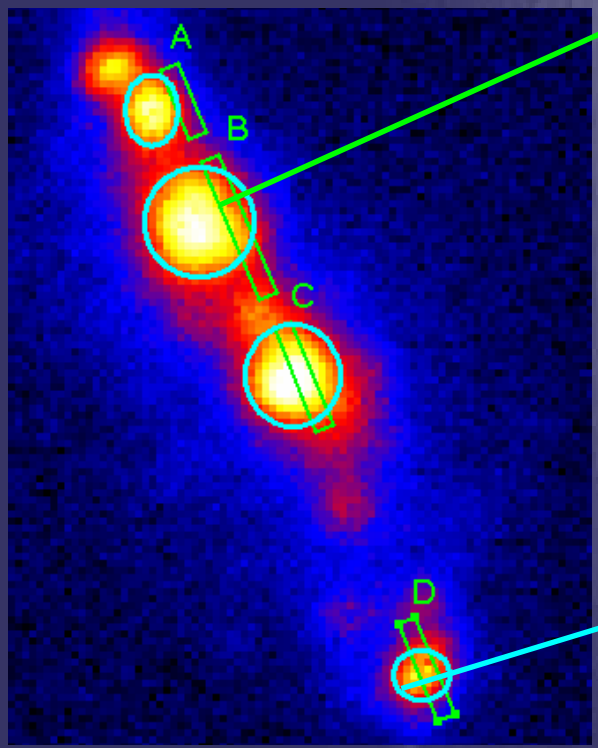


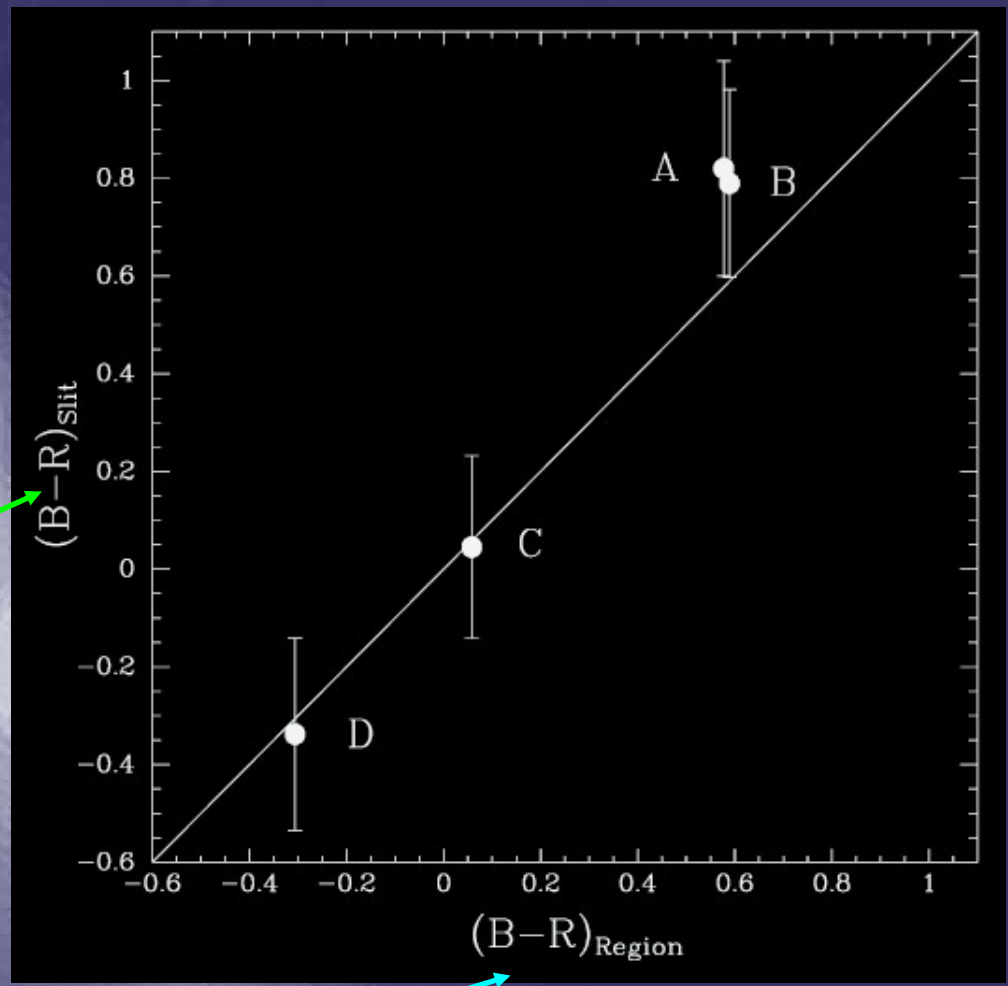


-Cannot measure auroral lines (electron temperatures)
-Use strong emission lines to derive the metallicity by means of empirical calibrators.
-N2 ([NII] 6584 Å), almost reddening unaffected → shows gradient of metallicity from A to C → due to different coverages of the regions in the slit.
-For R23 ([OII] and [OIII] lines) trend is opposite to that obtained from N2.
-[SIII] lines (not possible in A → OH sky lines problems), S23 parameter shows values of the metallicity according with the values found in BCDs → not large variations between each knot.

PHOTOMETRY

Slit vs Region





Third Workshop of the Coordinated Project
"Estallidos de Formación Estelar en Galaxias (AYA2001-3939)"

focused on

"Star Formation and Structures in Galaxies"

To be held in Tenerife on December 2 - 3, 2004
hosted by the Instituto de Astrofísica de Canarias

FIRST DAY - December 2th, 2004

WELCOME

9:00-10:00. Invited review: *"Structures in galaxies and star formation"*, Jan Palous

10:00-10:30. Revision of the PROGRAMA: *Structure parameters in galaxies. Our galaxy and nearby ones.* Mercedes Prieto & Emilio Alfaro.
10:30-11:00. *Measurements of pattern speeds in barred galaxies,* Alfonso Aguerri et al.

11:00-11:30. Coffee break

11:30-12:00. *2D fits, a better tool for analyzing BCDs*, Ricardo Amorín et al.
12:00-12:30. *Star formation in galaxies from the GALEx point of view*. Jorge Iglesias Páramo et al.
12:30-12:45.*The fractal dimension of projected clouds*, Néstor Sánchez

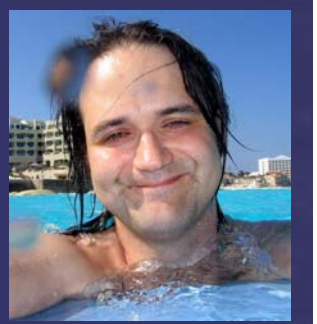
13:00-15:00. Lunch break

15:00-15:30. *Charactering the stellar populations of spiral galaxies*, Mercedes Mollá et al.
15:30-16:00. Estallidos / ELMER, M. García Vargas
16:00-16:30. *XMM-Newton Obsevation of NGC 1808*. Elena Jiménez et al.

16:30-17:00. Coffee break

17:00-17:30. *CHORIZOS: Fitting parametric models to multi-color photometry*, Jesús Maíz Apellániz
17:30-18:00. *Star cluster outflows and their X-ray emission*, Sergey Silich
18:00-18:30. *Spatial distribution of Lyman alpha emission*. Miguel Mas-Hesse et al.
18:30-19:00. Estallidos / EAST, L. M. Cairós

Jesús Maíz



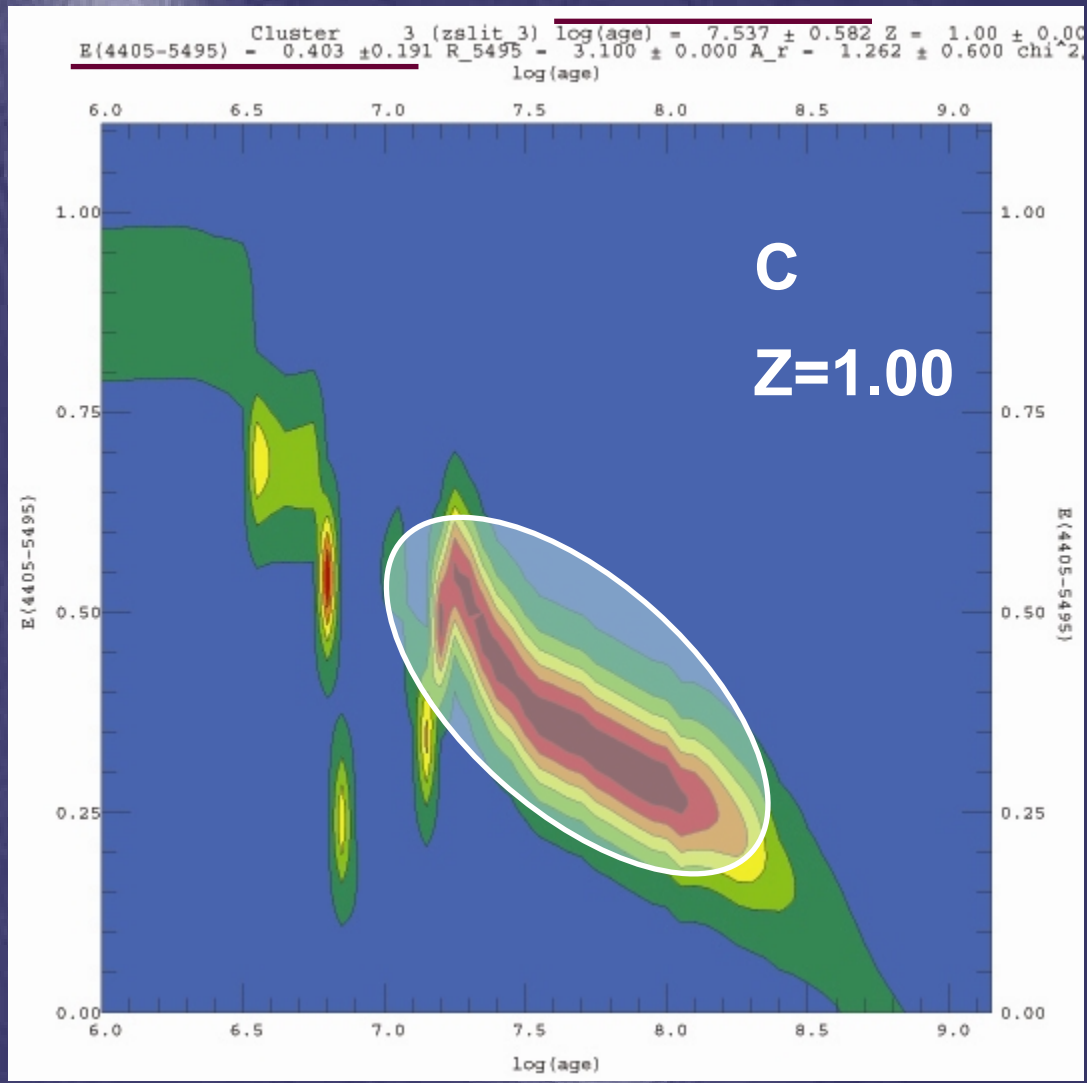
CHORIZOS

UBVR Photometry

Starburst 99

E(B-V)

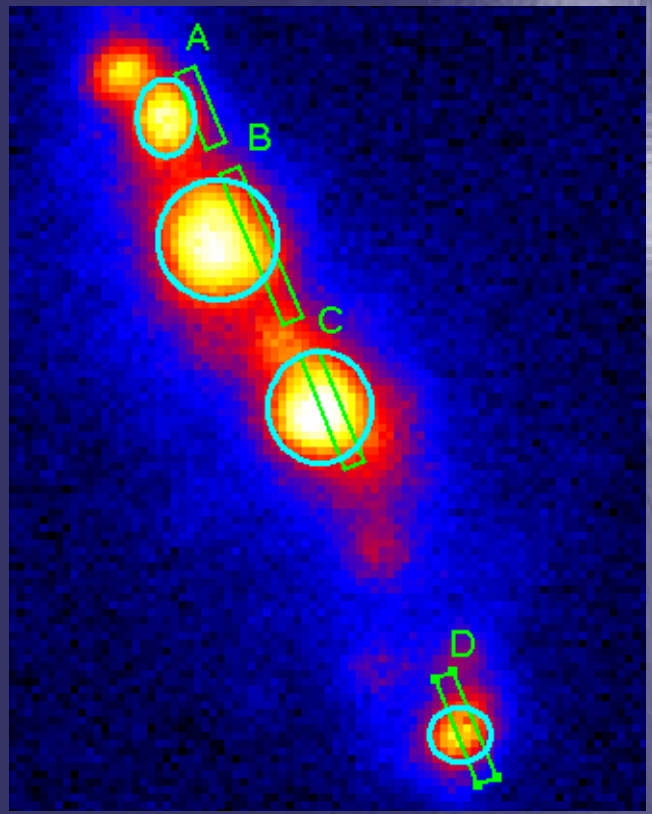
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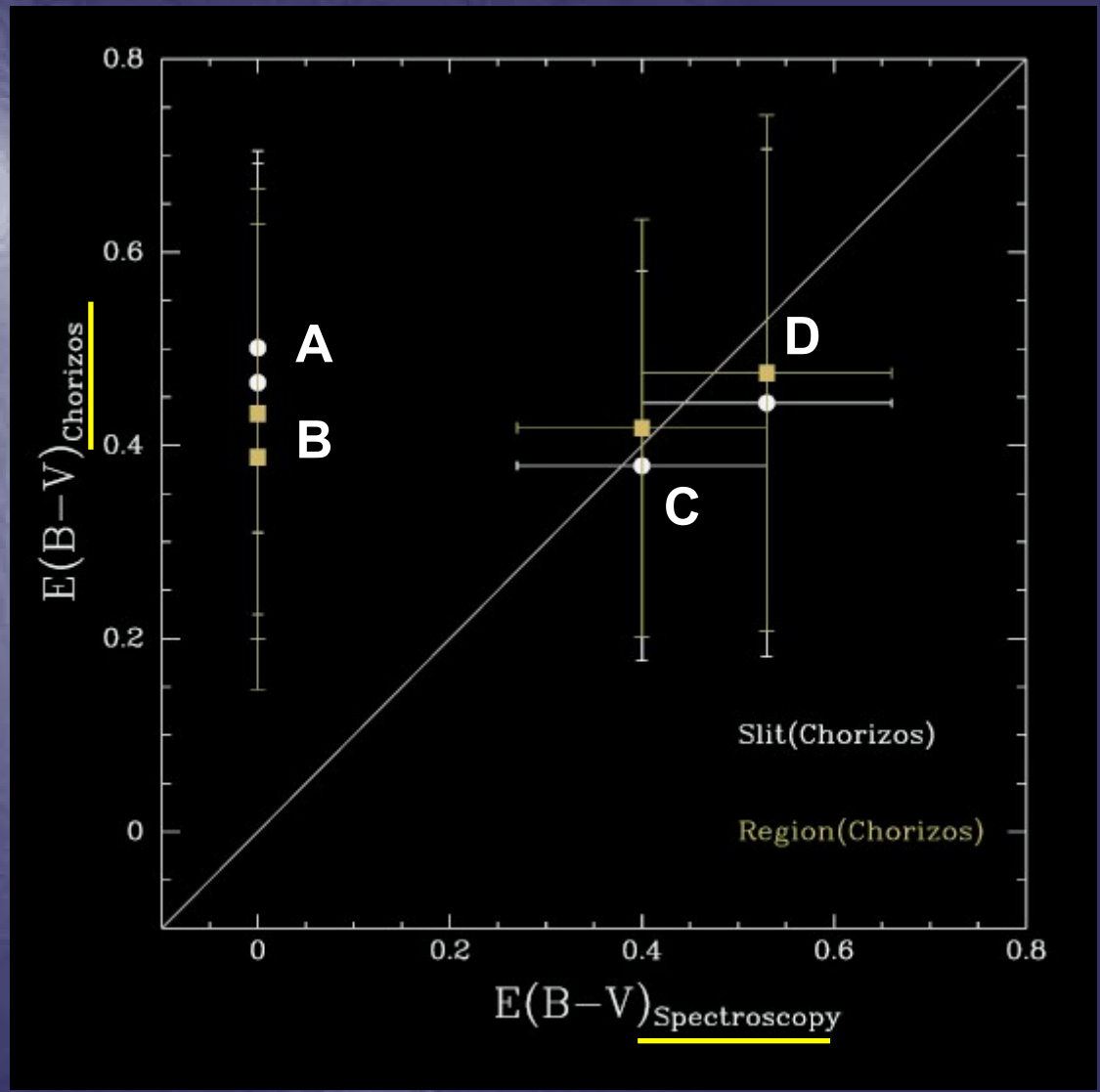


Log(AGE)

CHORIZOS vs SPECTROSCOPY

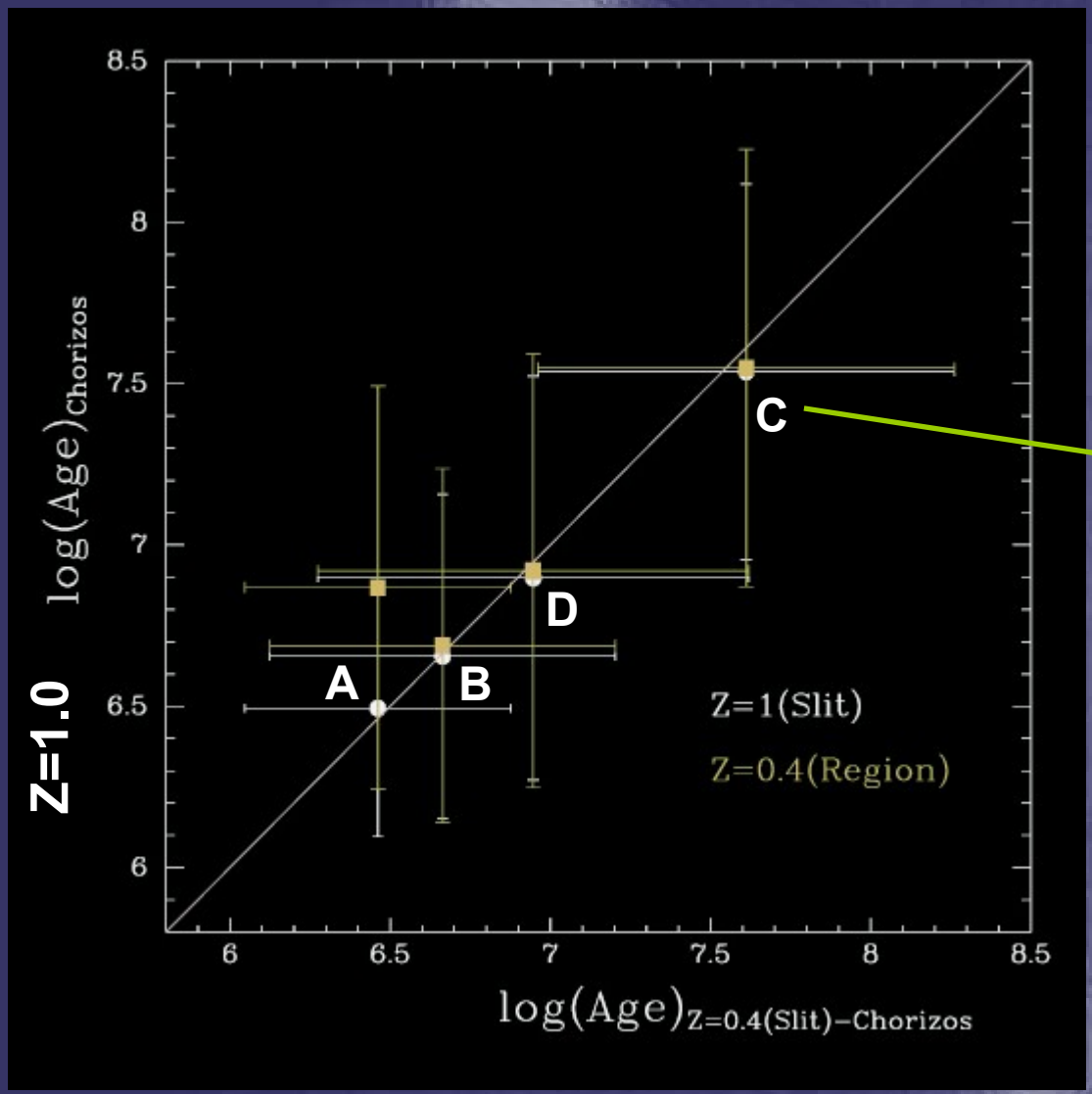
Color excess





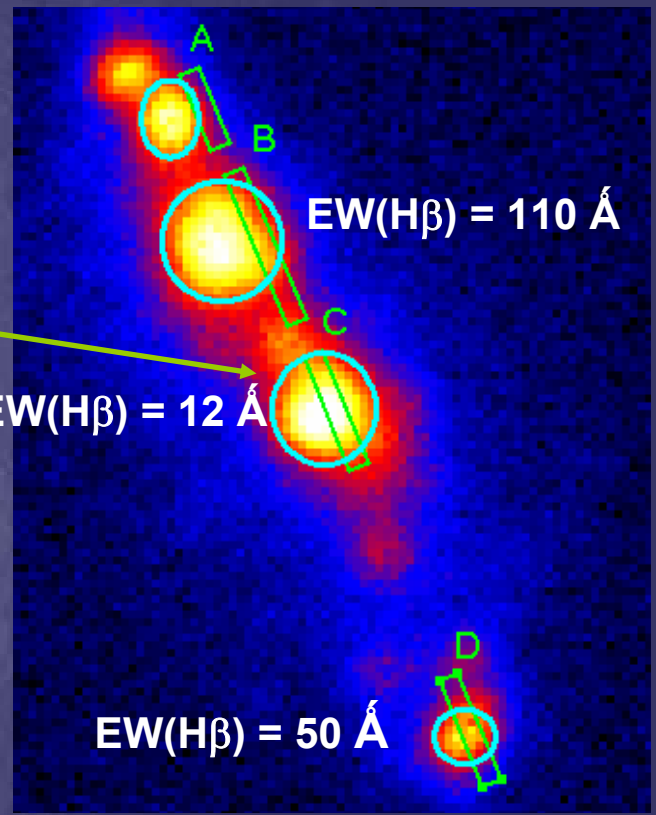
Slit → worse χ^2 fit

A G E


8.5
8
7.5
7
6.5
6
log(Age)Chorizos
6
6.5
7
7.5
8
8.5
log(Age)Z=0.4(Slit)–Chorizos
A
B
C
D
Z=1(Slit)
Z=0.4(Region)

Z=1.0

Z=0.4


A
B
C
D
EW(Hβ) = 110 Å
EW(Hβ) = 12 Å
EW(Hβ) = 50 Å

CONCLUSIONS

Long slit spectroscopy (upto 1 micron) → diagnostics of the ionised gas in Giant Extragalactic HII regions.

Incorrect coverage of the knots in the selected apertures can lead to underestimate the reddening and the metallicity.

Objects with complex spatial distribution → Spectroscopy with spatial resolution (i.e. **3D spectroscopy**): Colaboration with **Carolina Kehrig** (PMAS, INTEGRAL)



Colaboration with **Luz Marina Cairós & col.** → Study of IIzw71 & IIzw70

Young+old stars, gas, dust → hard to characterize star populations.

Importance of multiwavelength study:

-Spectra + Photometry

-Stellar populations, SFH, mechanims trigger star formation in galaxies.

-Study of gas parameters, properties of young stars in each knot.

Spectroscopy of the brightest knots of IIZw71



Enrique Pérez-Montero,
Rubén García-Benito
& Ángeles I. Díaz