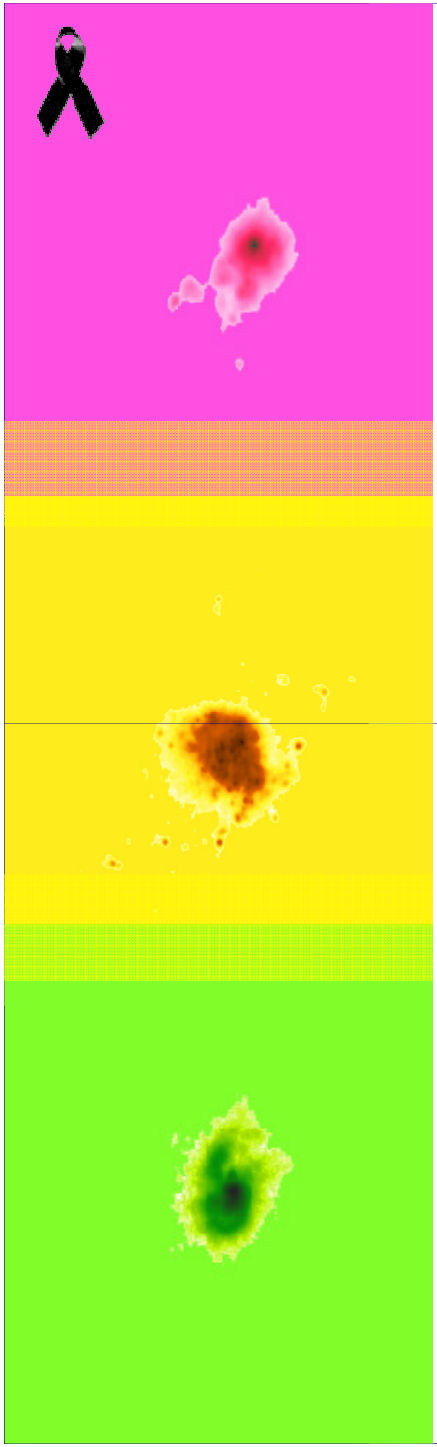


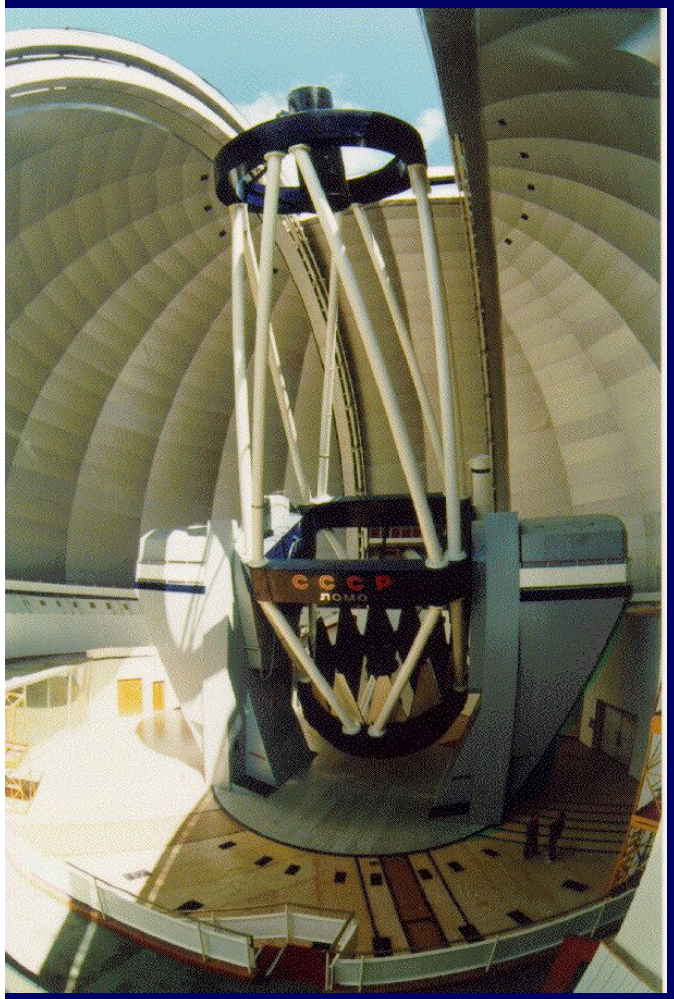
# 3D spectroscopy of BCDs:Inferring the Star Formation Activity


Ismael Martínez Delgado

In collaboration with: G. Tenorio-Tagle, C. Muñoz-Tuñón, A. Moiseev & L.M. Cairós

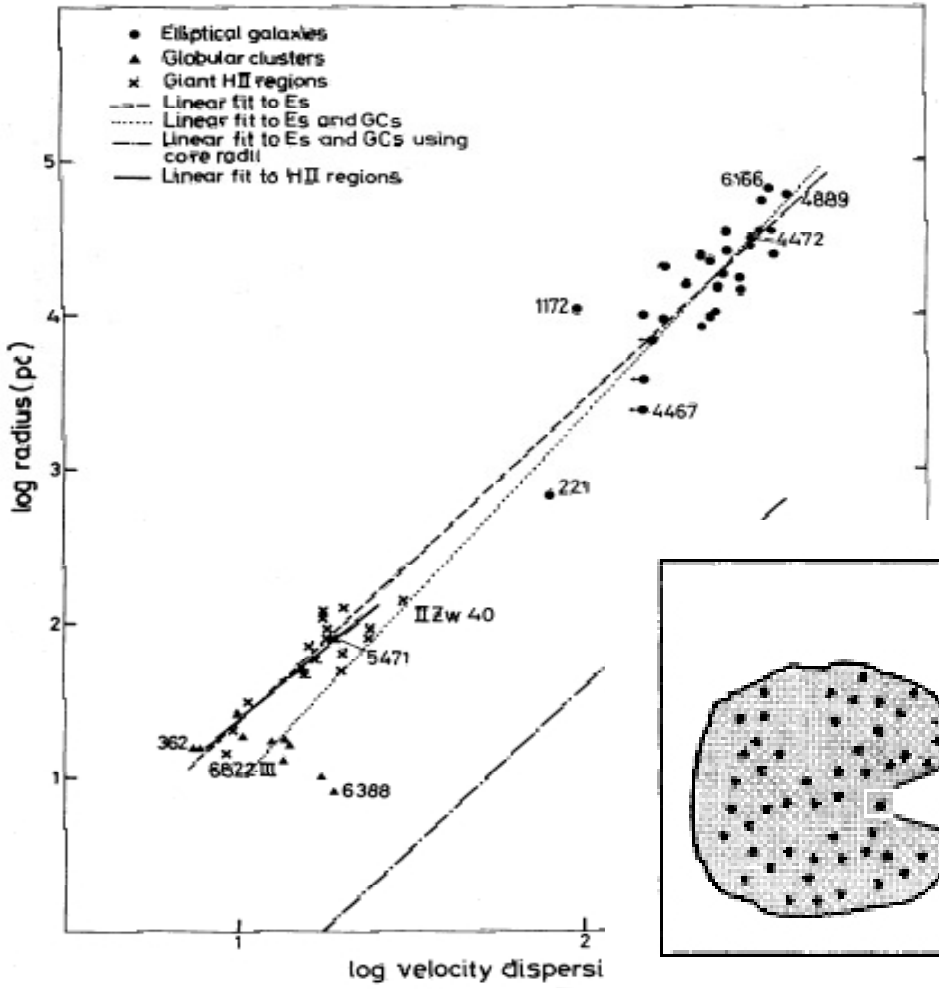
| Properties | | |
|---|---|---|
| Luminosity | $M_B > -18$ | |
| Compact Region | D ≤ 1 kpc | |
| Spectrum | RHII | |
| Gas Rich | $10^8 - 10^9$ $M_\odot$ | Thuan & Martin 1981 |
| Low Metallicity | $1/50 \leq Z/Z_\odot \leq 1/3$ | Kunth y Sargent 1986 |
| SFR | 0.1 – 10 $M_\odot$ año$^{-1}$ | Fanelli et al 1988 |
| IntermittentBurst | | Thuan et al. 1991 |
| Isolated | ~70% | Salzer 1989; Telles et al 1997 |

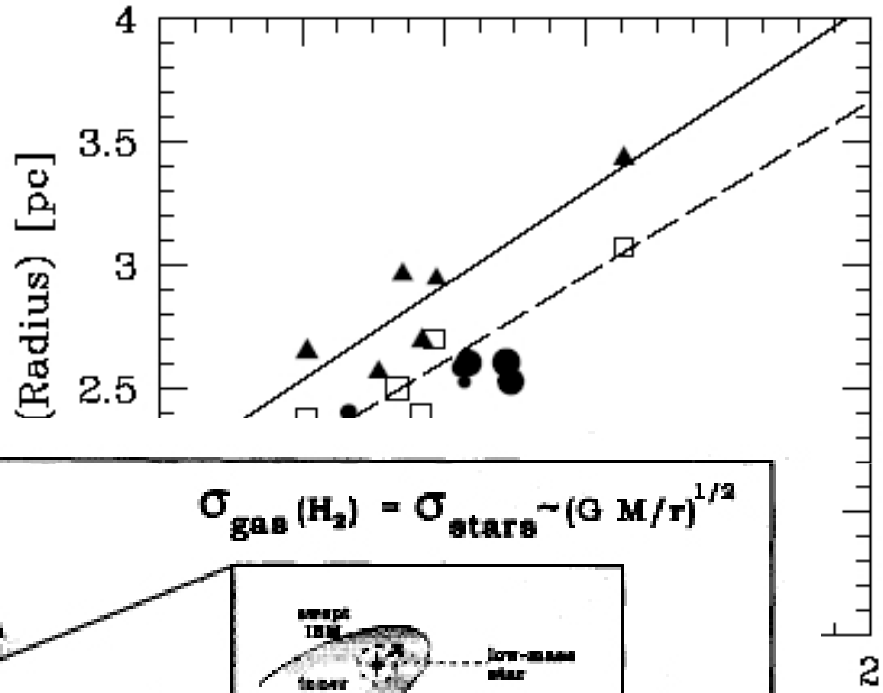
# Observations

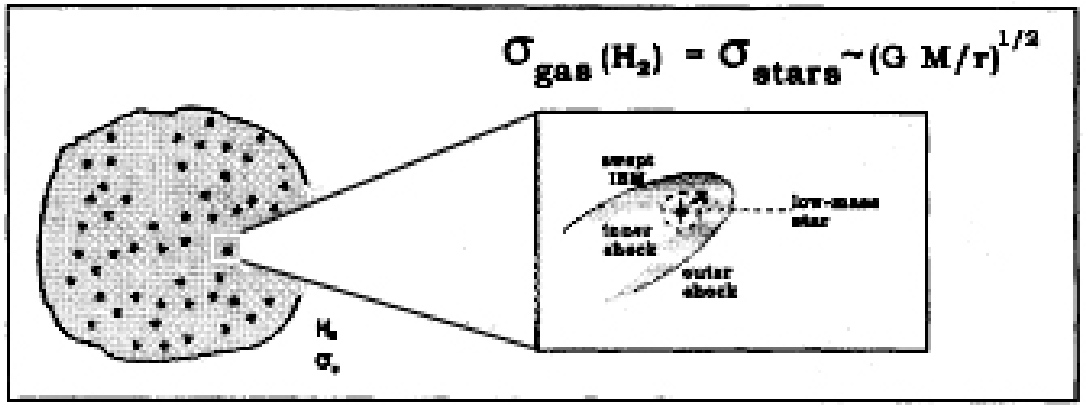



Special Astrophysical Observatory
Russian Academy of Sciences

| Big Telescope | Alta-azimuthal (BTA) |
|---|---|
| Diameter | 6m |
| Instrument | SCORPIO-IFP |
| Spatial Resolution | 0.7 " /pixel |
| Spectral Resolution | 0.7 Å |
| Spectral Range | 0.13 Å |
| Finnese | 17 |
| No. of spectral channel | 32-40 |
| Seeing | > 1.5 " |



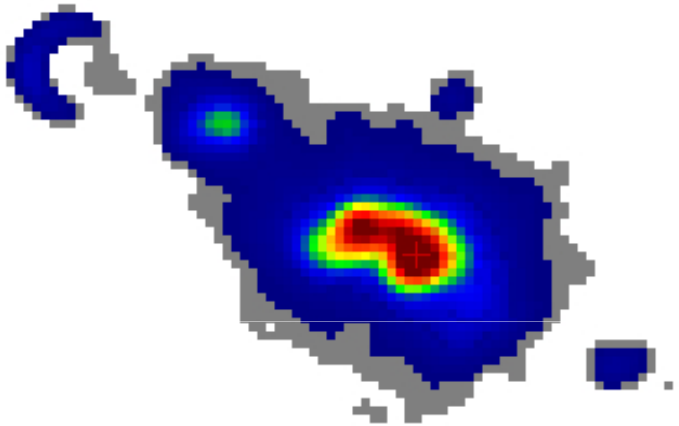



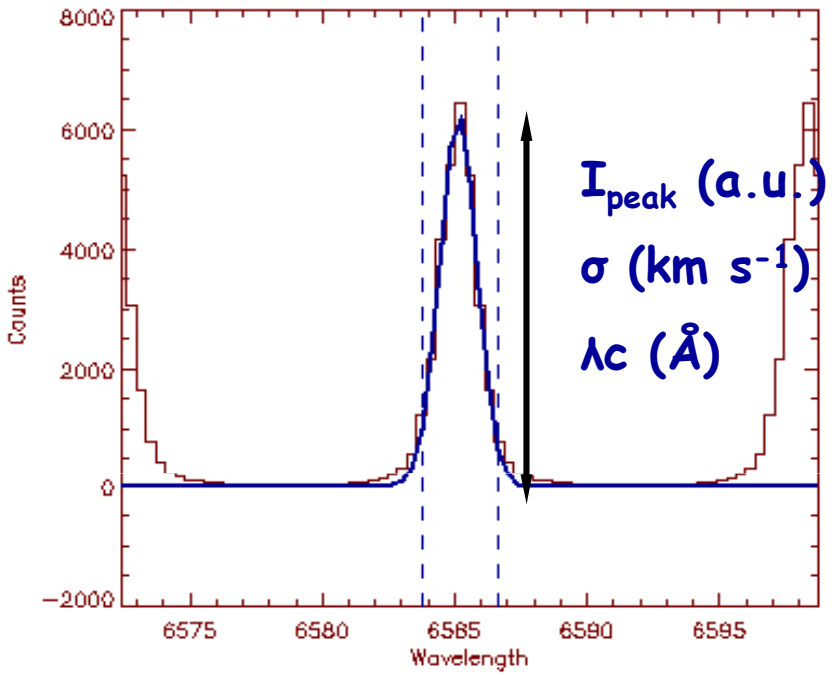

Roy et al. 1986

# Metodology

**Single gaussian fit profile to the emission lines.**



Mrk 600

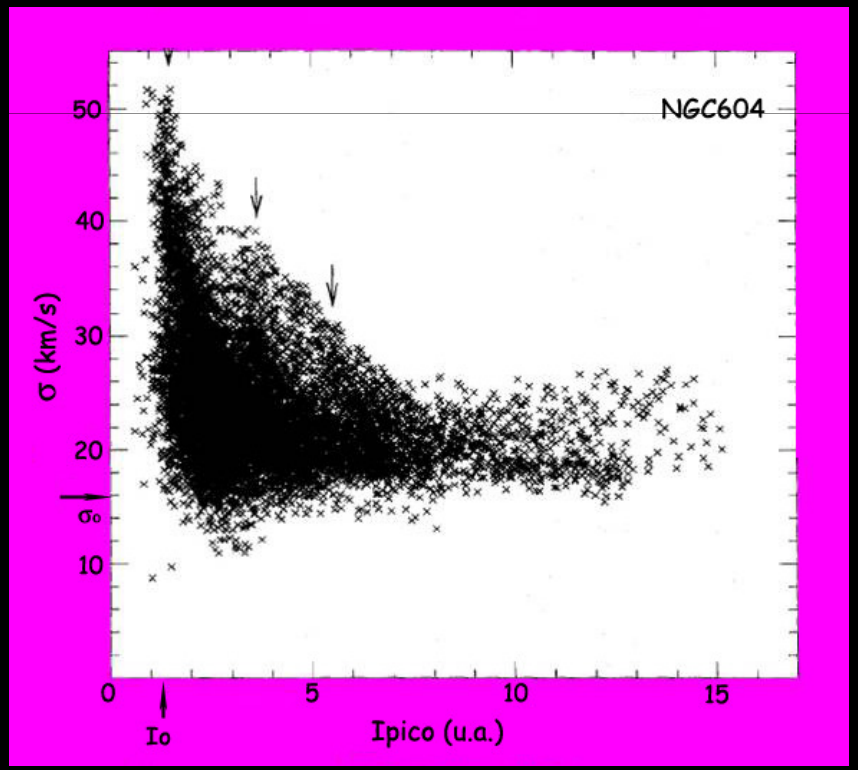



| Main Parameters |
|---|
| Intensity at the peak, $I_{peak}$ |
| Central Wavelength, λc |
| Velocity Dispersion, σ |

## Previous Work:

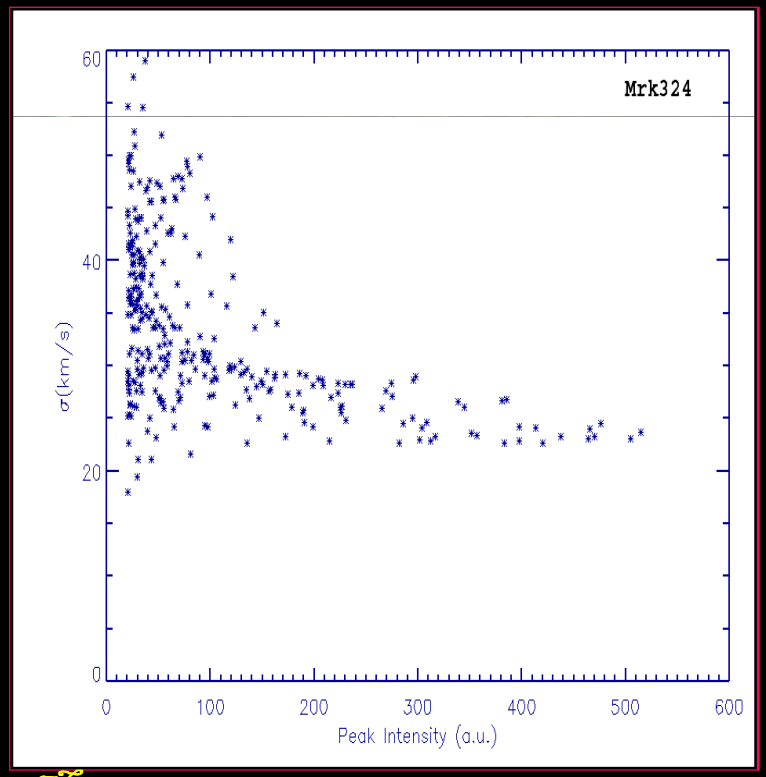
- Shells, Filements, Bubbles
- Nuclear regions

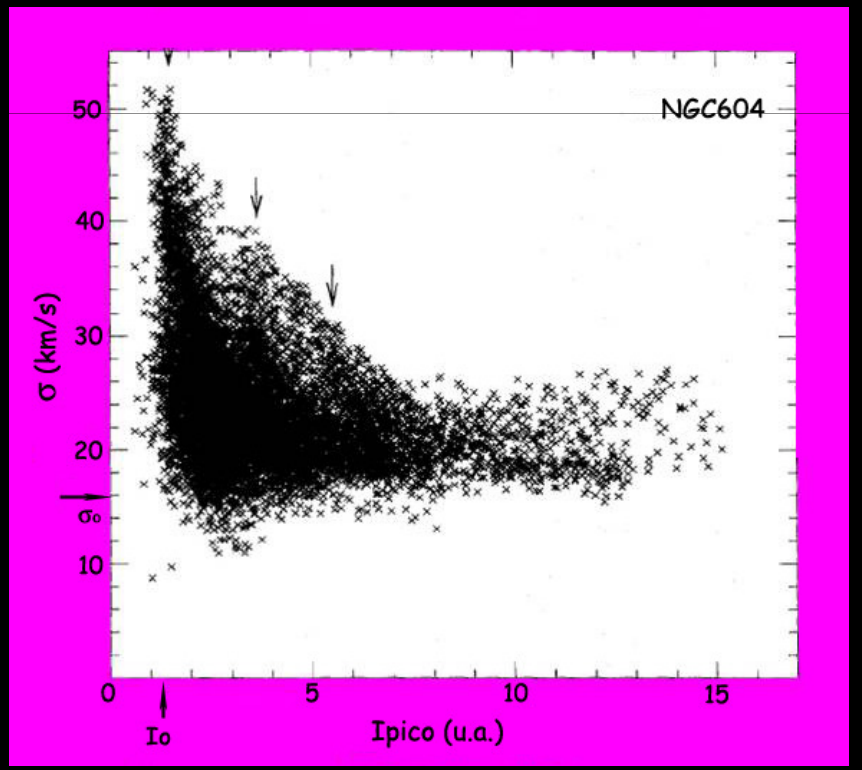


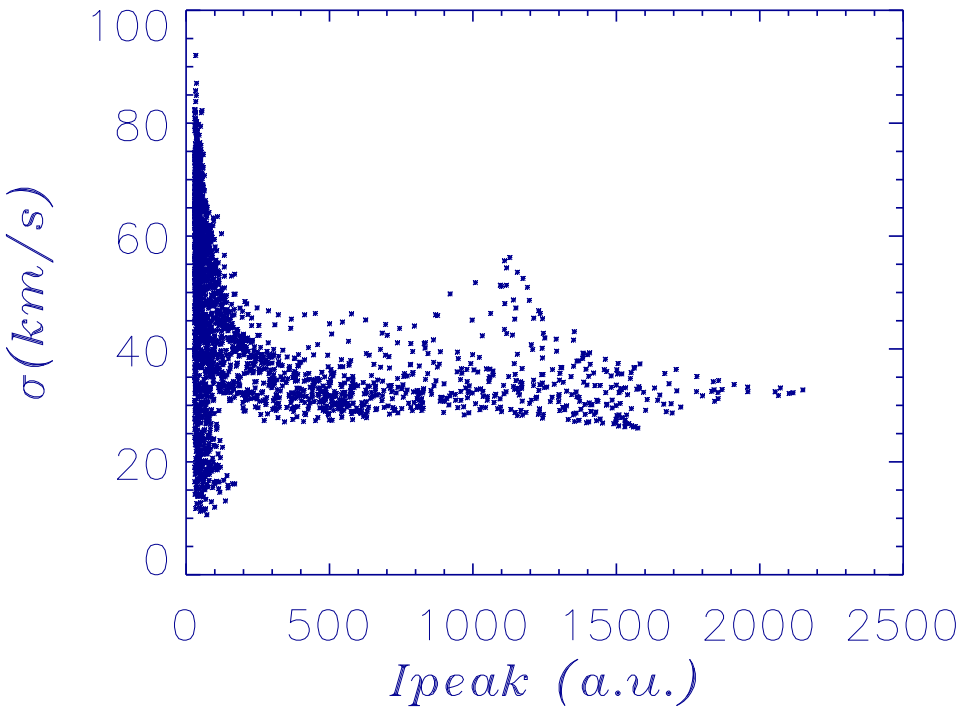



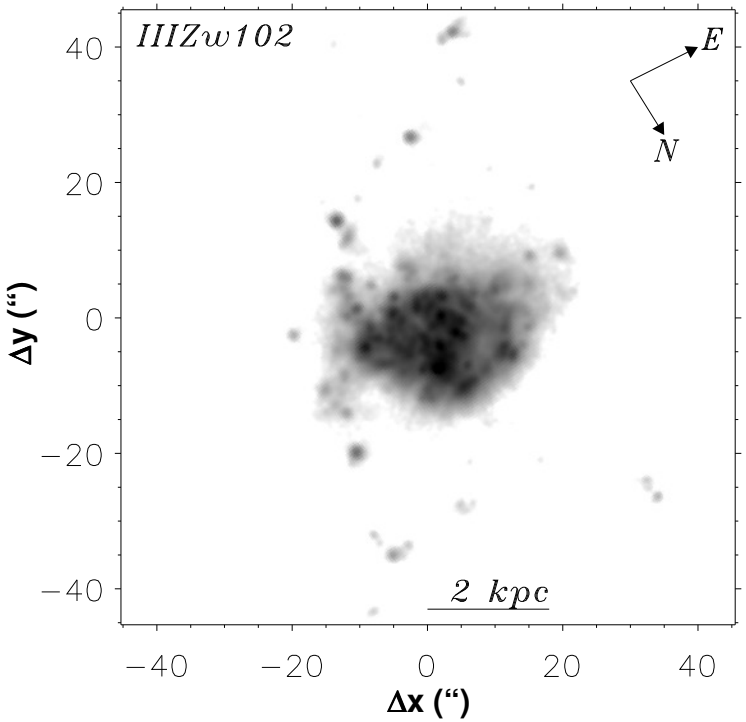
# The Sigma-Intensity-Lambda (SIL) diagrams:

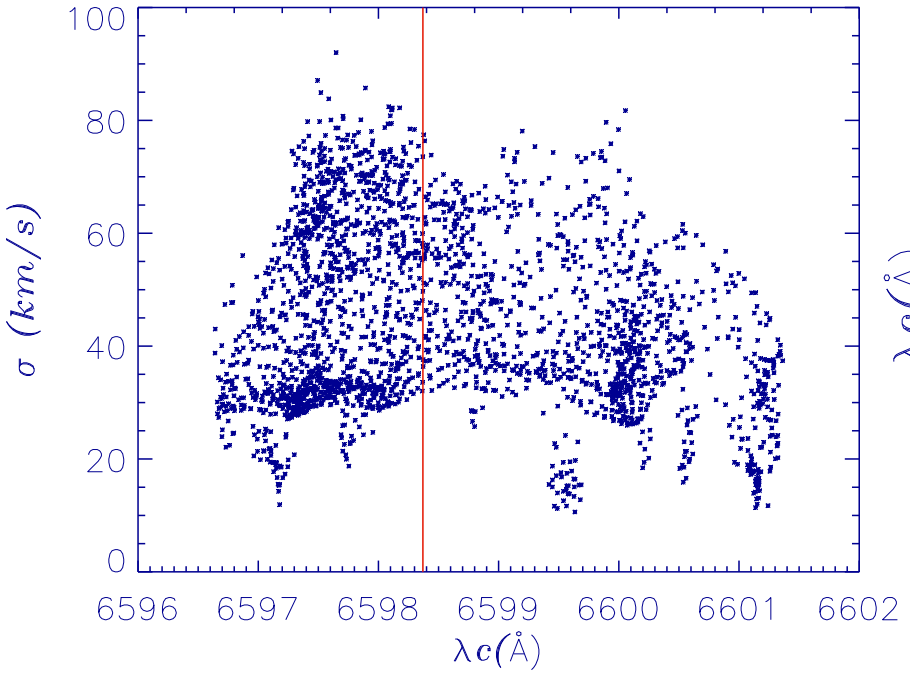
## I. Martínez-Delgado et al, AJ, June 2007

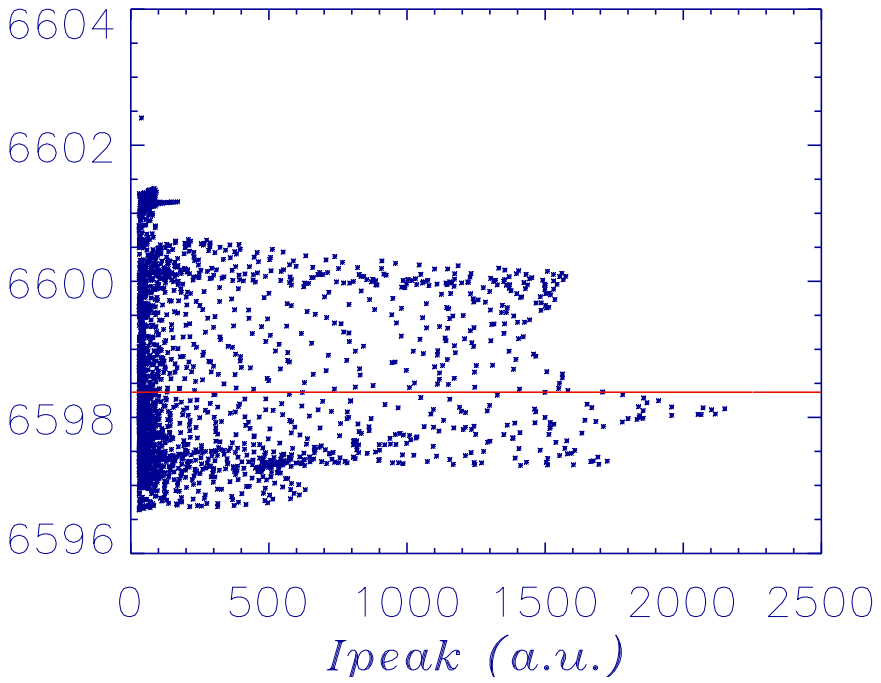


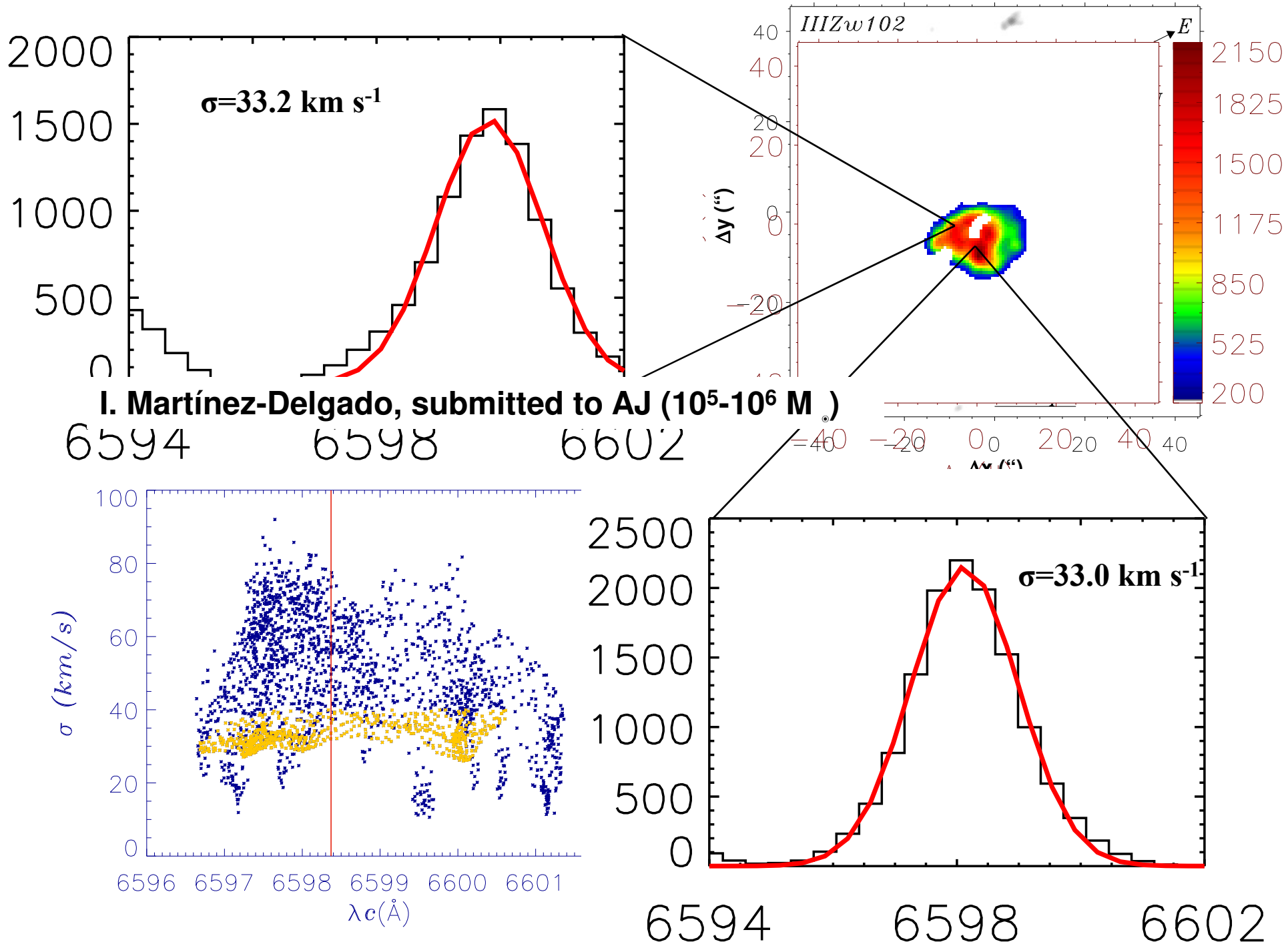




σ(km/s)
Ipeak (a.u.)

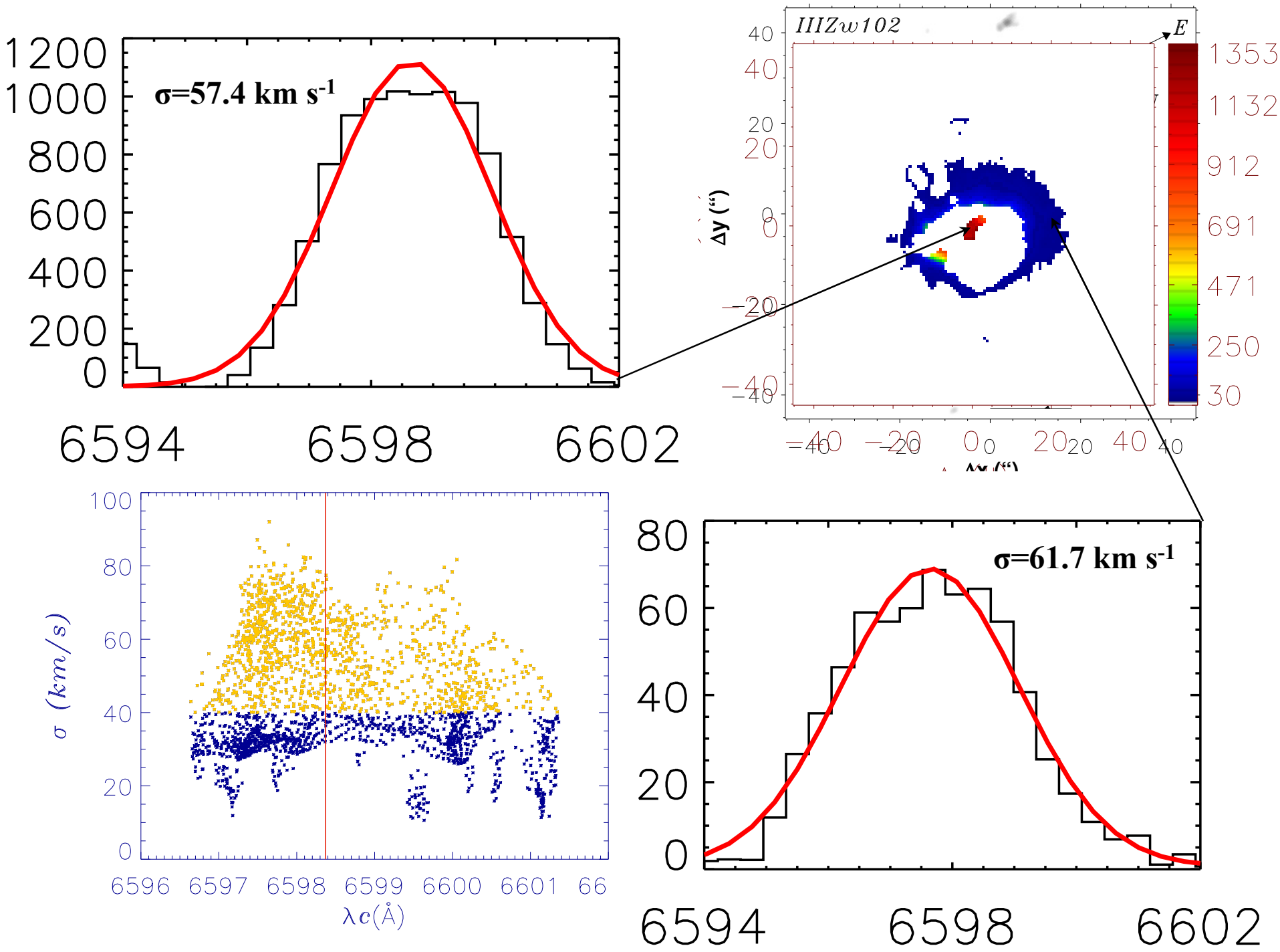

IIIZw102
E
N
2 kpc
Δy (“)
Δx (“)

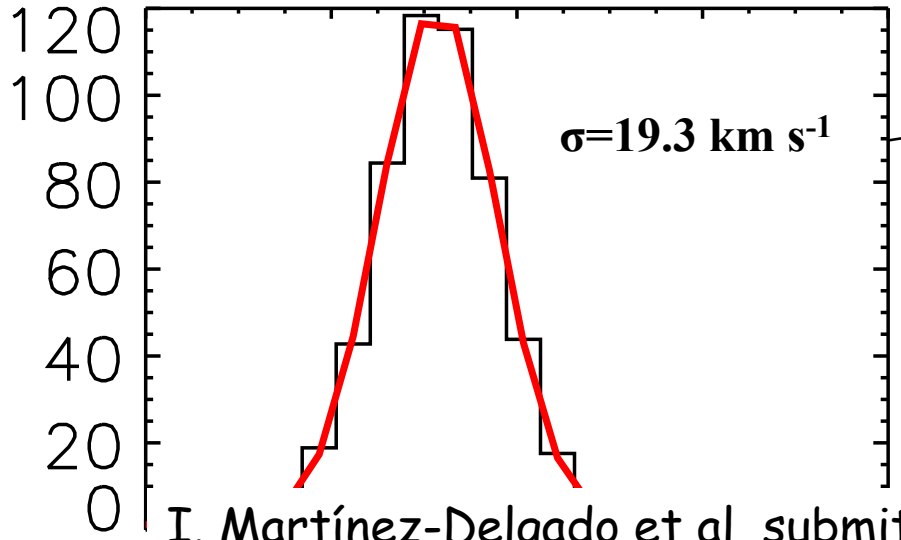

σ (km/s)
λc(Å)

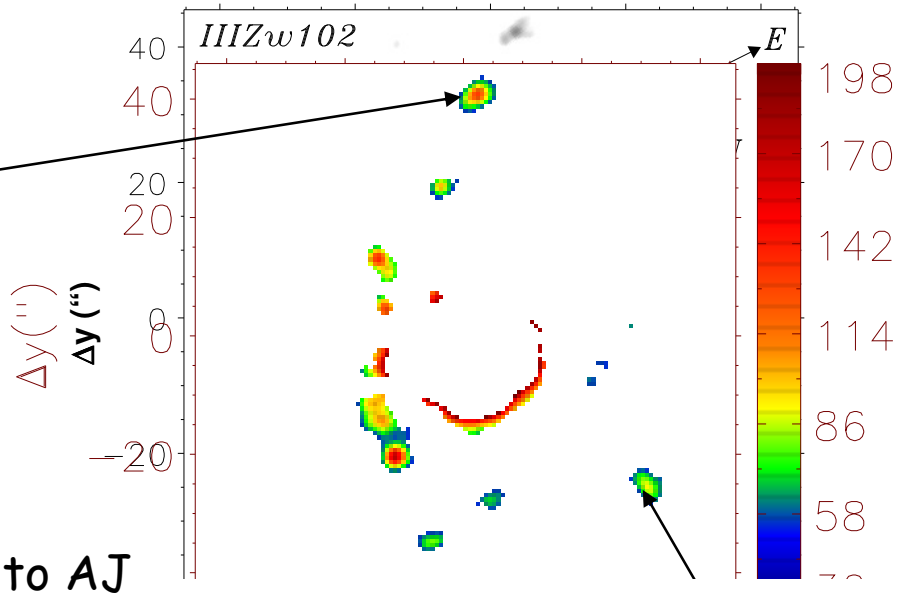

λc(Å)
Ipeak (a.u.)




I. Martínez-Delgado, submitted to AJ ($10^5$-$10^6$ $M_\odot$)


σ=57.4 km s-1
IIIZw102
E
Δy (")
σ (km/s)
λc(Å)
σ=61.7 km s-1

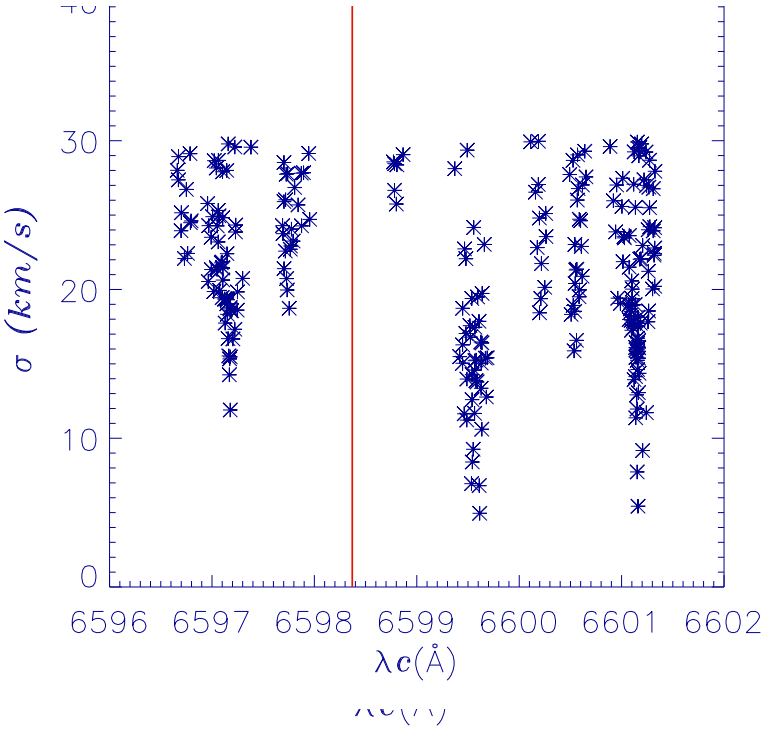


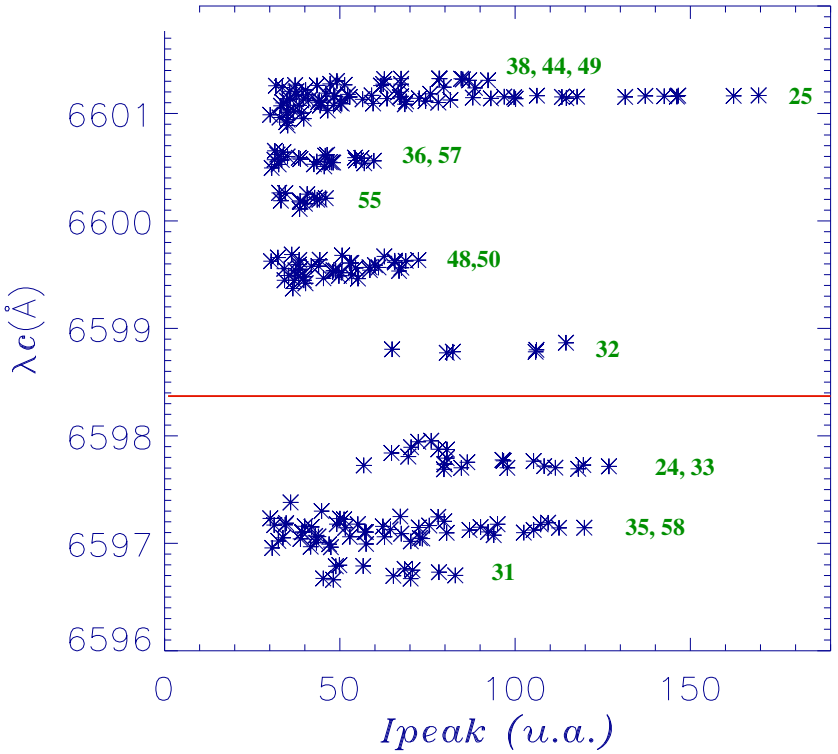




I. Martínez-Delgado et al, submitted to AJ

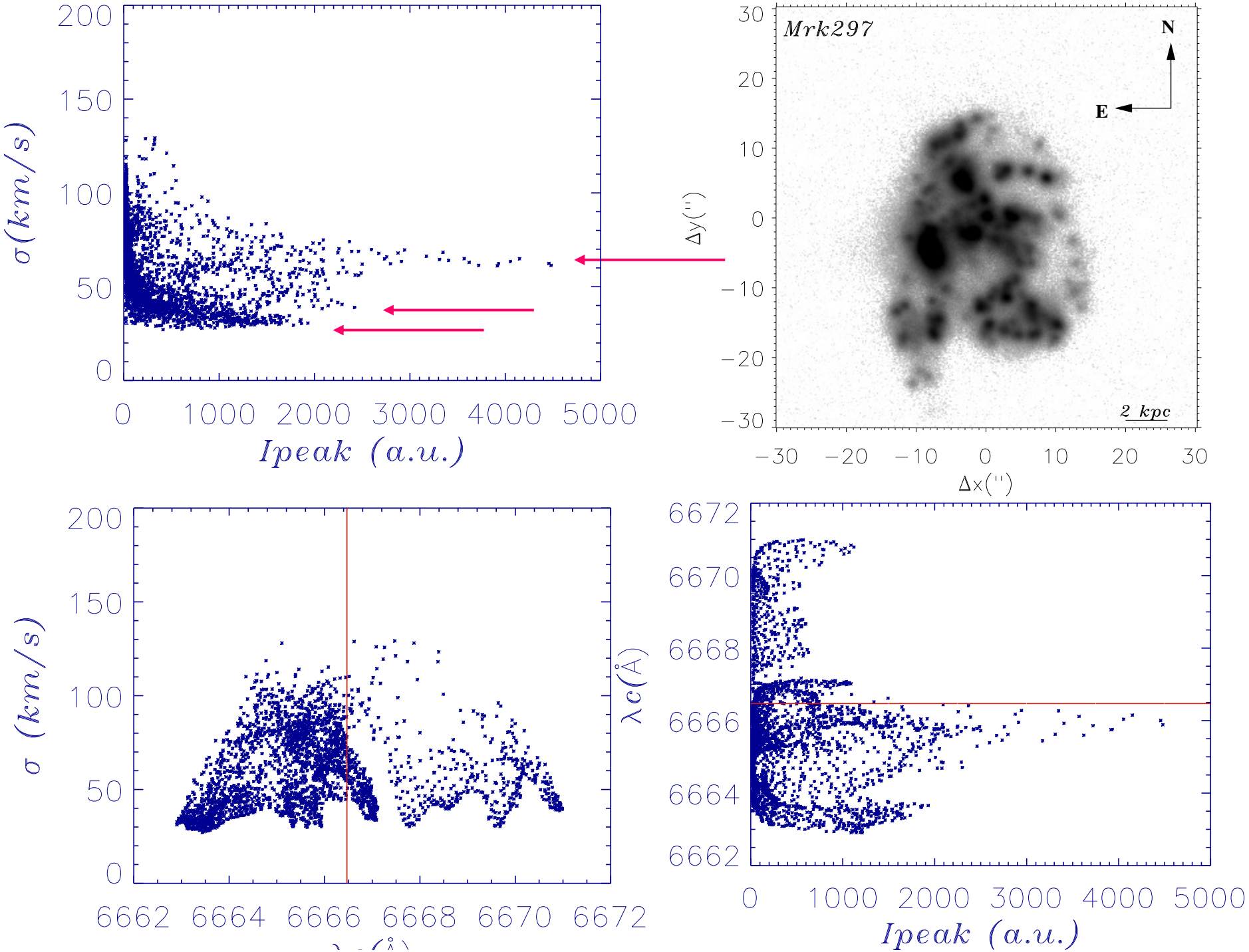
(~$10^4$ $M_\odot$ )

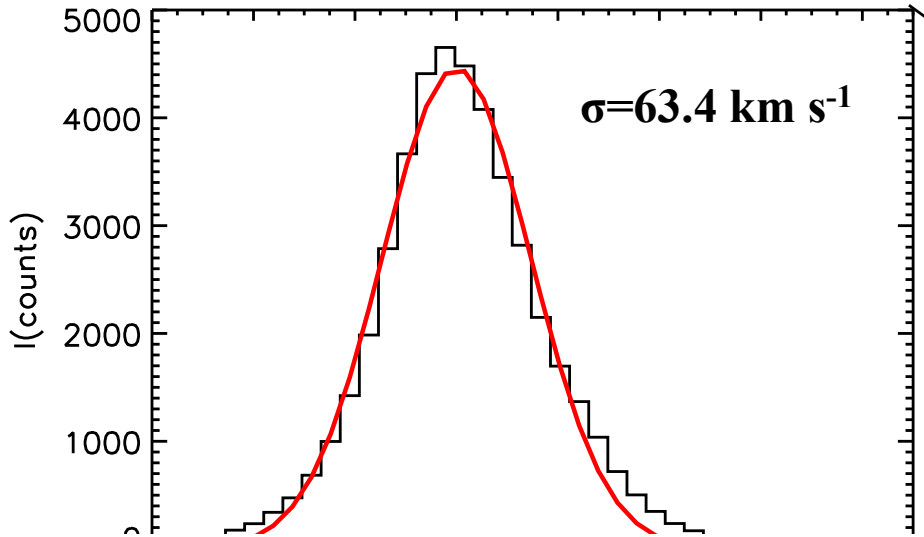
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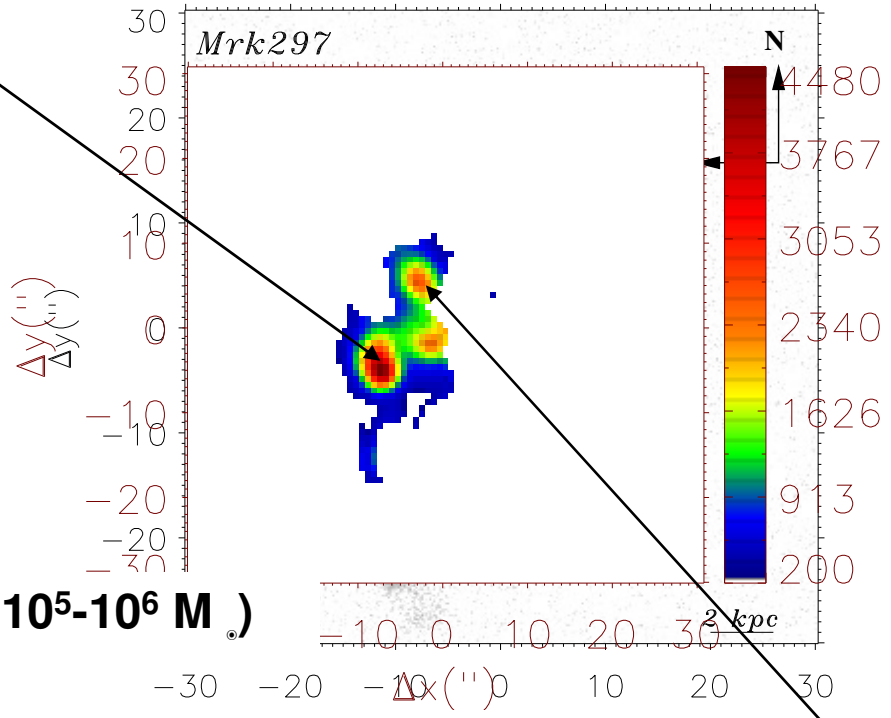


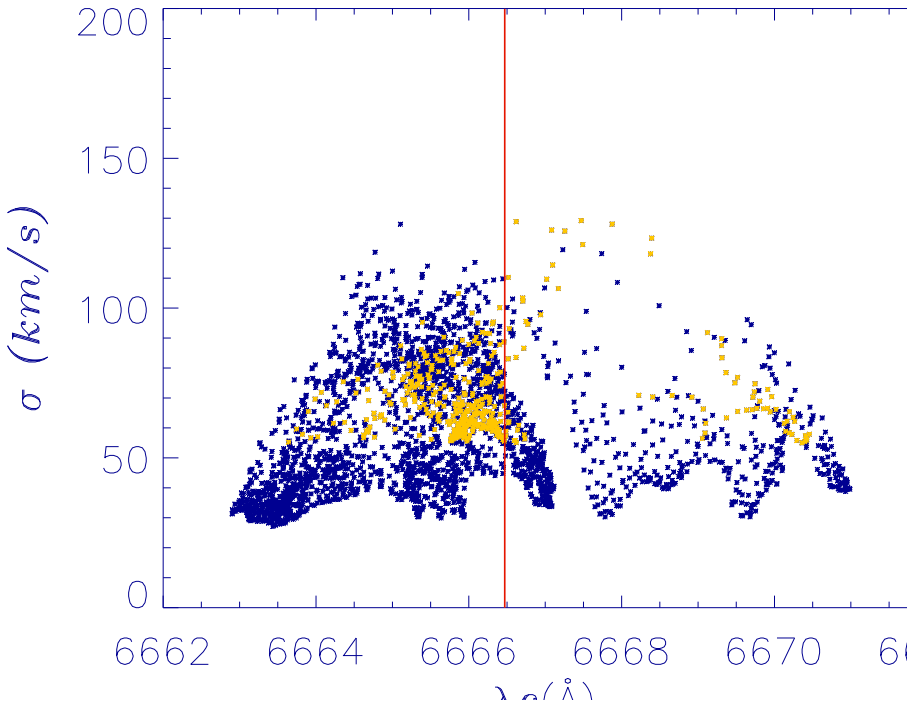

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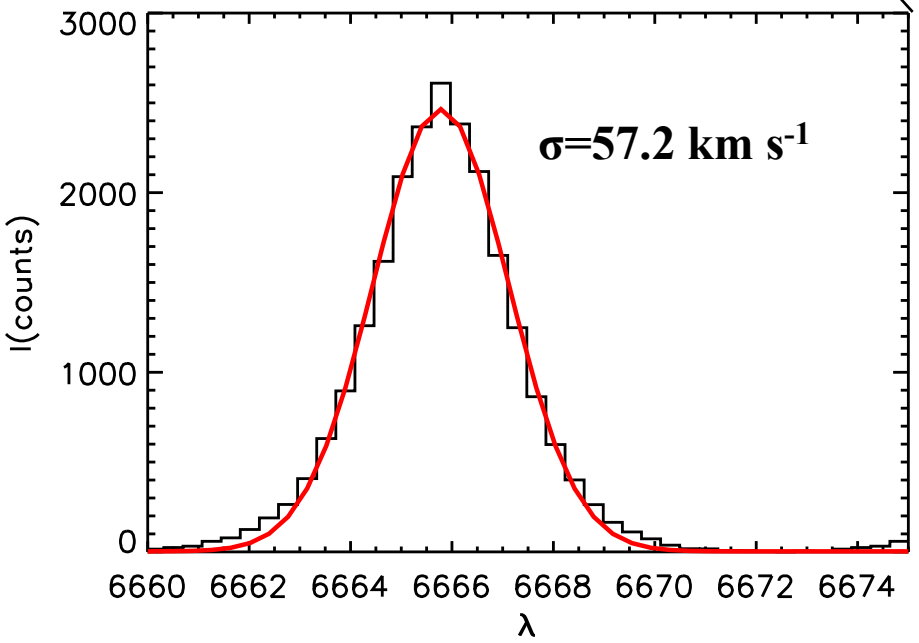

σ(km/s)
Ipeak (a.u.)
Mrk297
N
E
2 kpc
Δy('')
Δx('')
σ (km/s)
λc(Å)
Ipeak (a.u.)

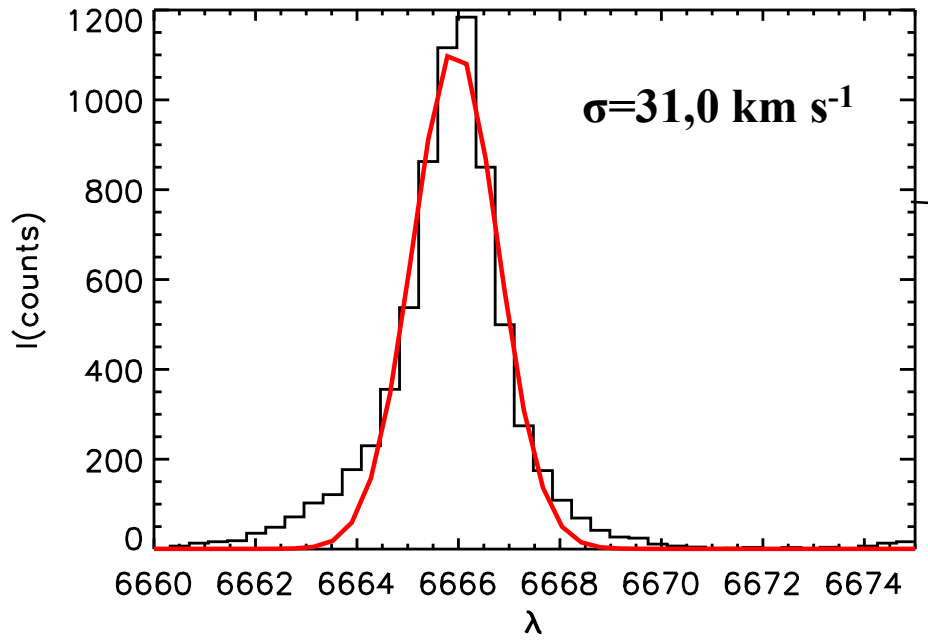


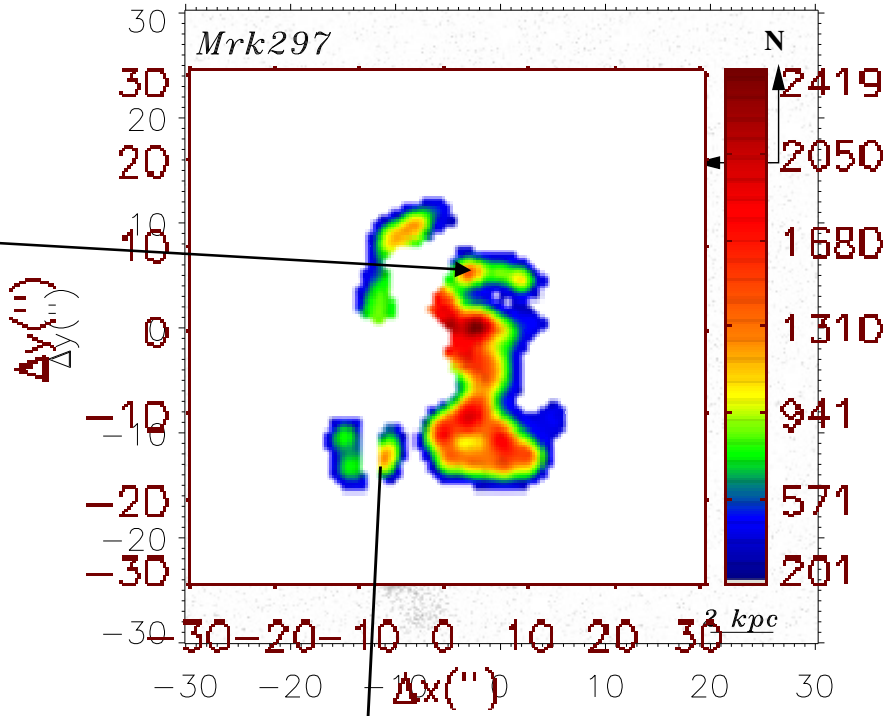



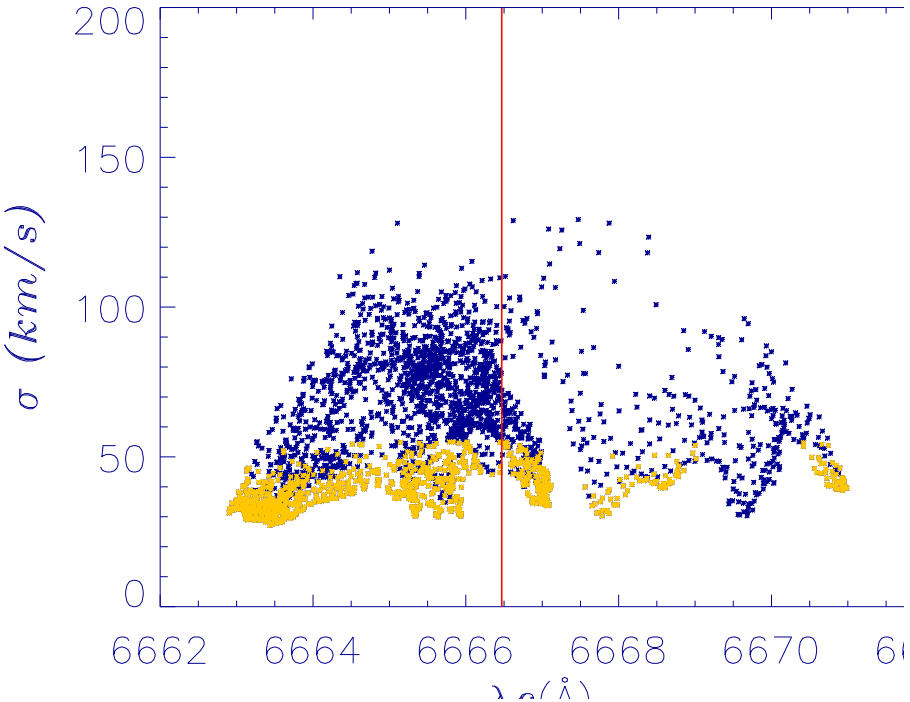

**I. Martínez-Delgado, submitted to AJ ($10^5$-$10^6$ $M_\odot$)**

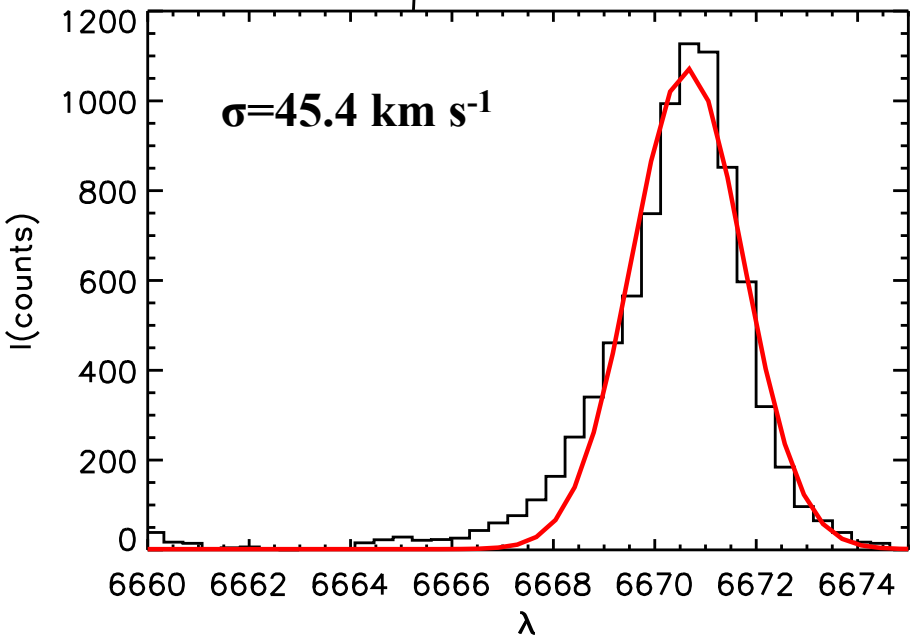


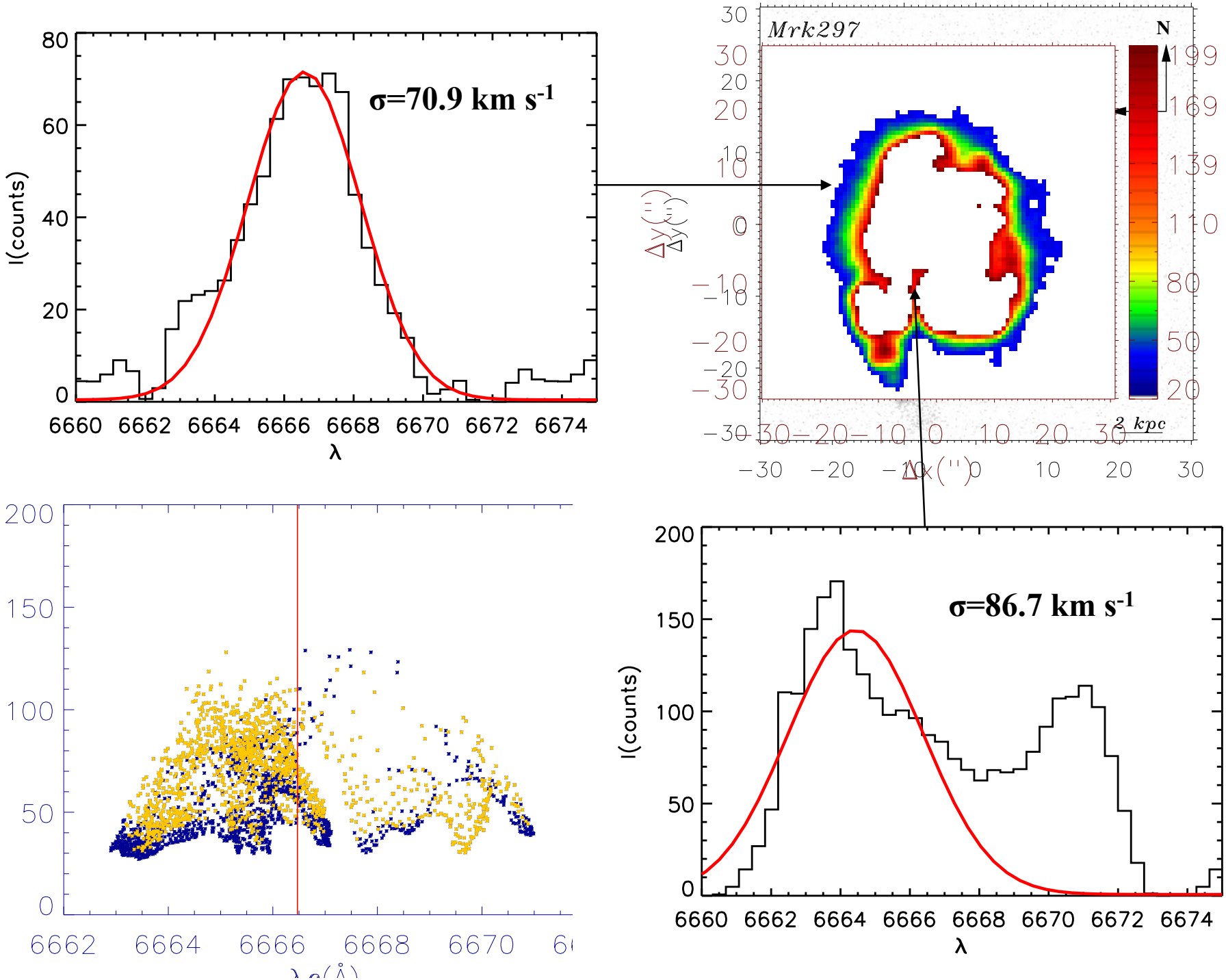



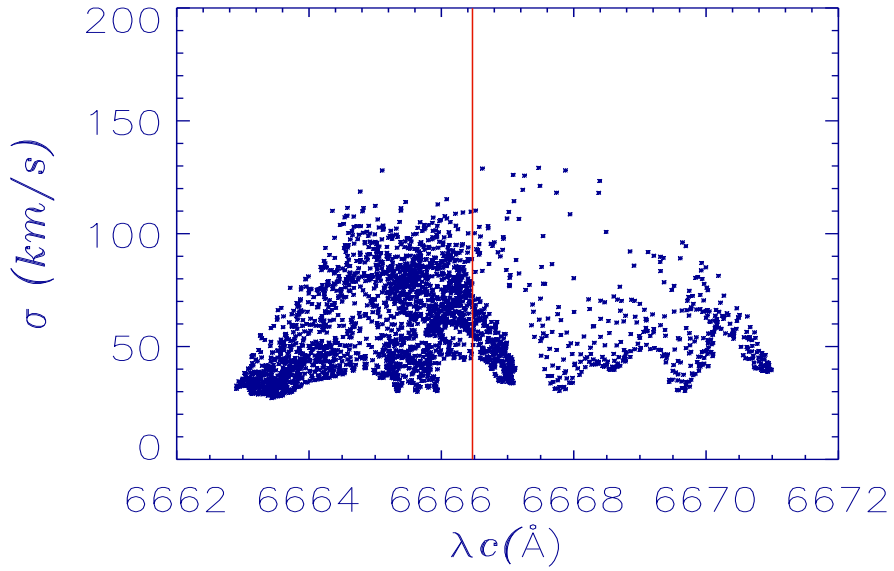

σ=31,0 km s-1
I(counts)
λ

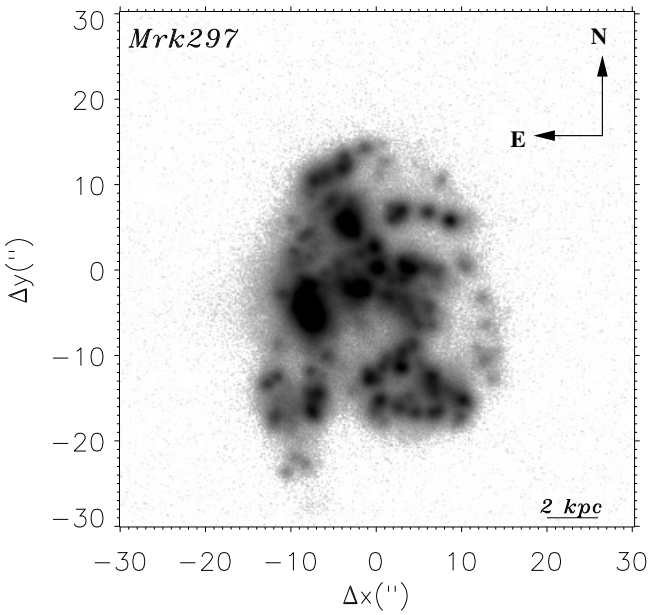

Mrk297
N
2419
2050
1680
1310
941
571
201
2 kpc
Δy(")
Δx(")

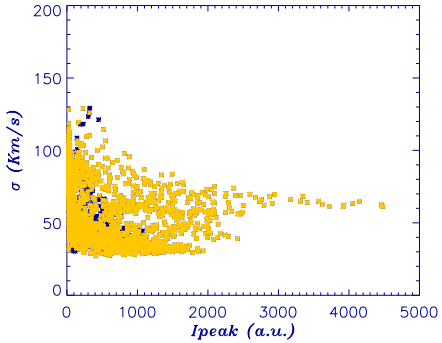

σ (km/s)
λ (Å)

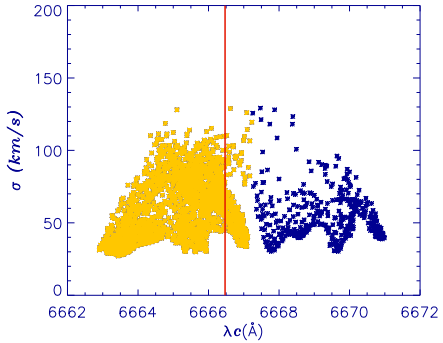

σ=45.4 km s-1
I(counts)
λ

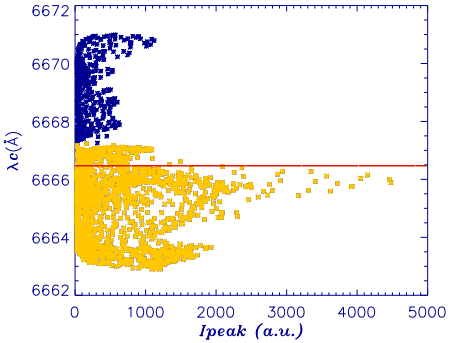

σ=70.9 km s-1
I(counts)
λ
Mrk297
N
2 kpc
Δx('')
Δy('')
σ=86.7 km s-1
I(counts)
λ
σ (km/s)

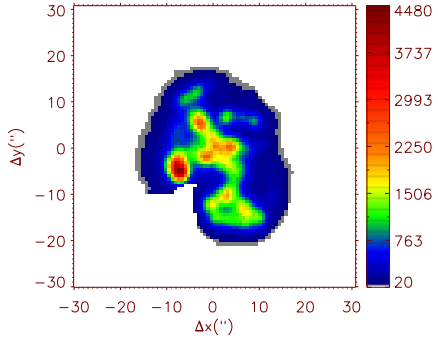

σ (km/s)
λc(Å)

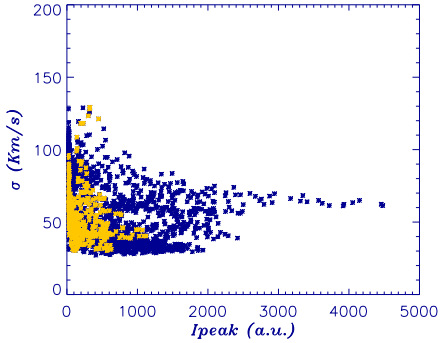

Mrk297
N
E
2 kpc
Δy('')
Δx('')

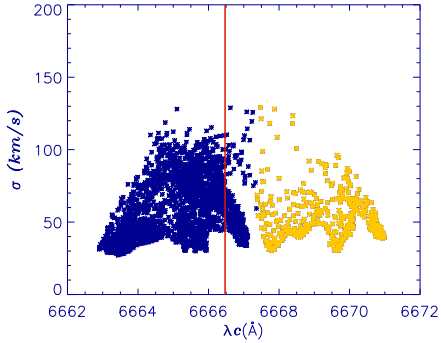

σ (km/s)
Ipeak (a.u.)

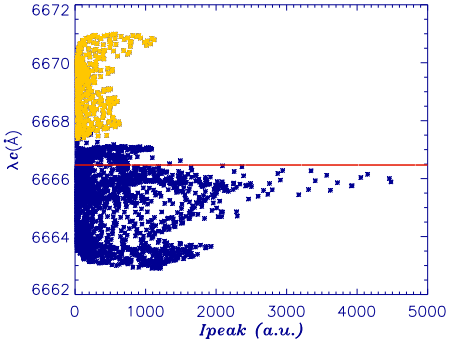

σ (km/s)
λc(Å)

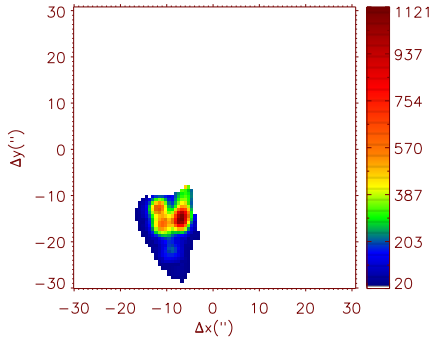

λc(Å)
Ipeak (a.u.)


Δy('')
Δx('')


σ (km/s)
Ipeak (a.u.)


σ (km/s)
λc(Å)

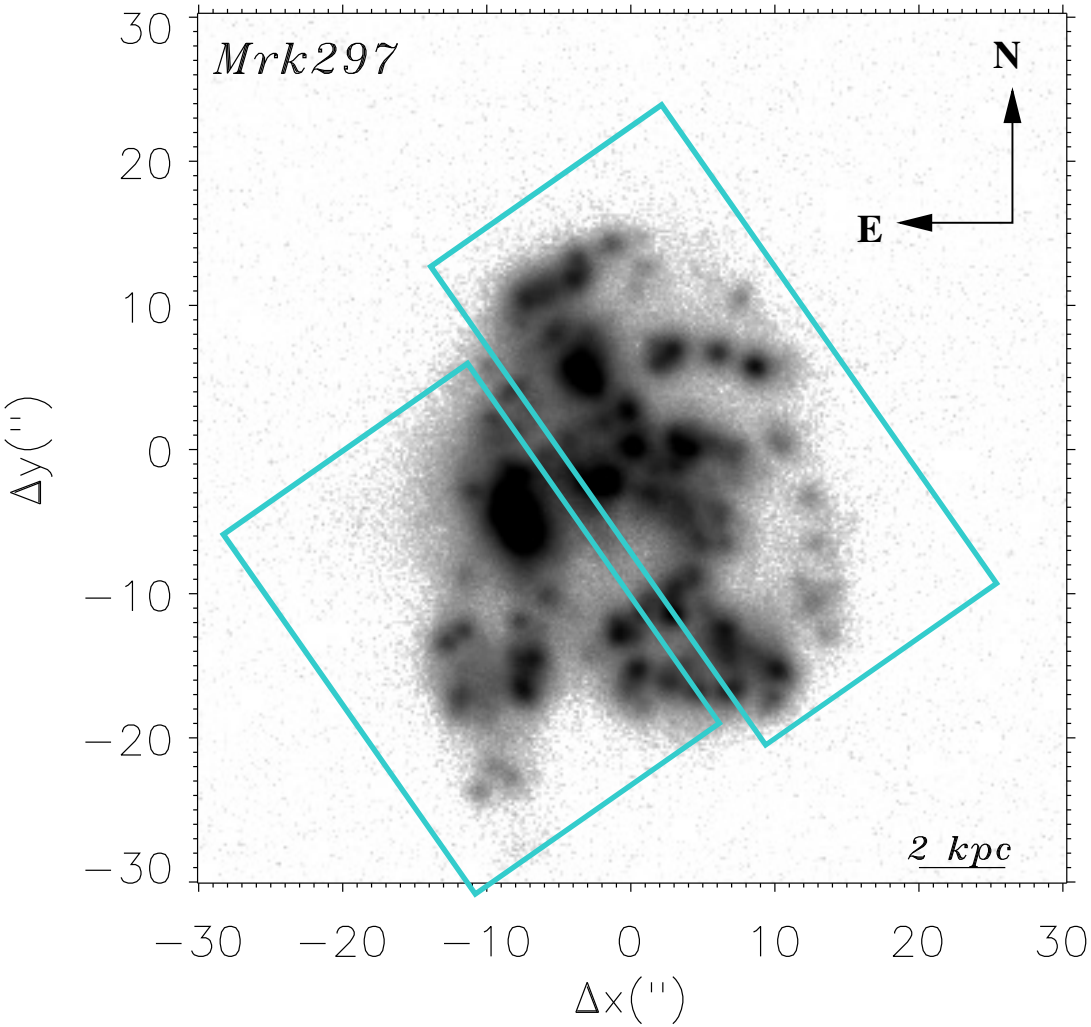

λc(Å)
Ipeak (a.u.)


Δy('')
Δx('')

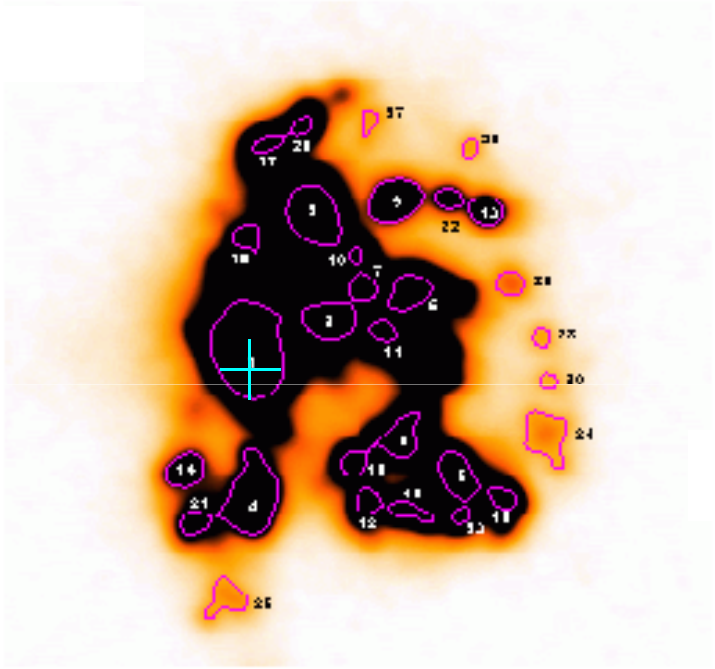
# Galaxy - Galaxy Collision

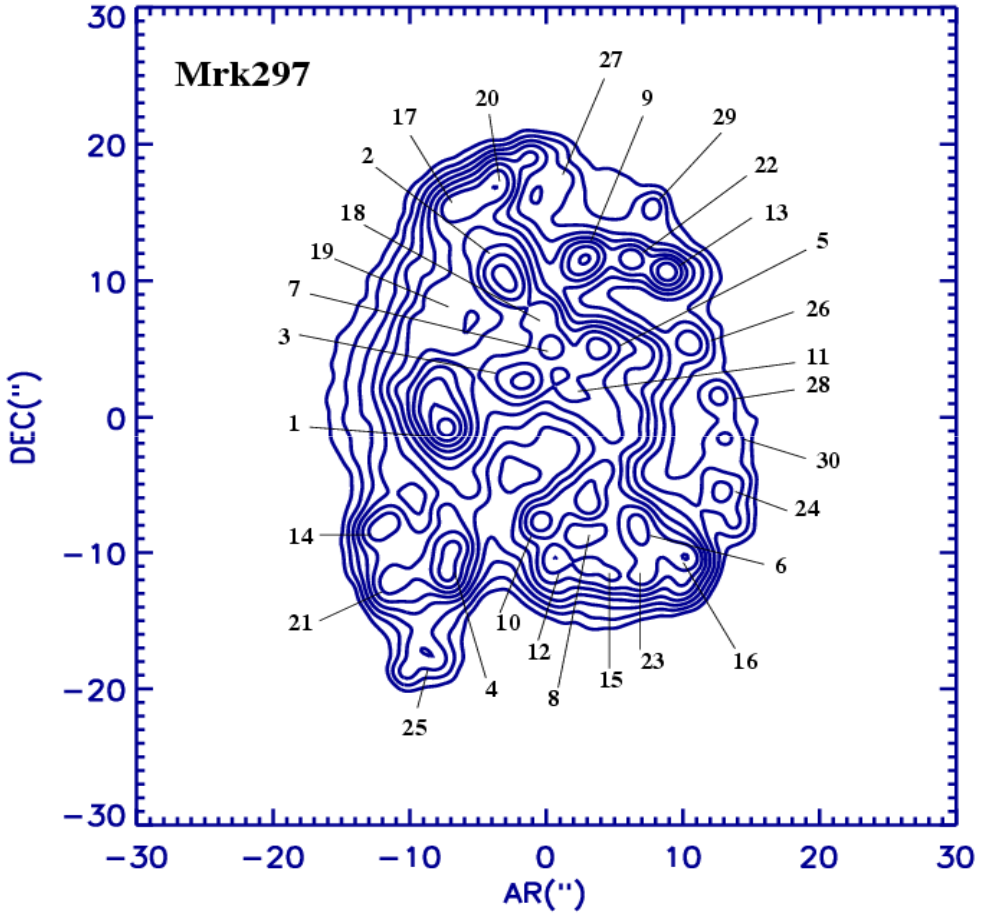
- **Alloin & Duflot (1979)** is a *colliding system* between two disk galaxies, one in the NW and the other in the SE

- **Taniguchi et al (1991)** A co-planar radial penetration collision between two disk galaxies



# Estudio de los brotes de FE





# Mrk 297 – Ages and Masses Catalogue

| ID | AE(Å) | Edad(Maños) | $M(10^6 M_\odot)$ | $U-B$ | Edad(Maños) | $M(10^6 M_\odot)$ |
|---|---|---|---|---|---|---|
| 1 | 240.42 | 5.3 | 19 | -0.74 | 5.1 | 24 |
| 2 | 296.97 | 5.1 | 4.9 | -0.59 | 5.5 | 9.4 |
| 3 | 75.09 | 6.6 | 11 | -0.44 | 6.1 | 10 |
| 4 | 88.68 | 6.4 | 6.4 | -0.61 | 5.4 | 4.3 |
| 5 | 200.33 | 5.6 | 2.5 | -0.71 | 5.1 | 2.8 |
| 6 | 191.55 | 5.7 | 2.1 | -0.79 | 5.0 | 1.9 |
| 7 | 188.77 | 5.7 | 2.0 | -0.59 | 5.5 | 2.6 |
| 8 | 190.99 | 5.7 | 2.0 | -0.68 | 5.1 | 2.1 |
| 9 | 249.39 | 5.3 | 1.2 | -0.74 | 5.1 | 1.8 |
| 10 | 202.79 | 5.6 | 0.9 | -0.65 | 5.3 | 1.1 |
| 11 | 65.84 | 6.8 | 1.9 | -0.52 | 5.9 | 1.3 |
| 12 | 201.26 | 5.6 | 0.7 | -0.71 | 5.1 | 0.77 |
| 13 | 365.74 | 5.0 | 0.4 | -0.81 | 5.0 | 0.64 |
| 14 | 113.29 | 6.2 | 1.1 | -0.61 | 5.4 | 0.85 |
| 15 | 215.89 | 5.5 | 0.6 | -0.81 | 5.0 | 0.61 |
| 16 | 305.98 | 5.1 | 0.4 | -0.87 | 4.7 | 0.40 |
| 17 | 197.00 | 5.6 | 0.5 | -0.72 | 5.1 | 0.60 |
| 18 | 189.74 | 5.7 | 0.5 | -0.56 | 5.7 | 0.75 |
| 19 | 108.87 | 6.2 | 0.8 | -0.62 | 5.4 | 0.63 |
| 20 | 248.63 | 5.3 | 0.4 | -0.77 | 5.0 | 0.44 |
| 21 | 100.04 | 6.3 | 0.7 | -0.70 | 5.1 | 0.45 |
| 22 | 269.60 | 5.2 | 0.3 | -0.73 | 5.1 | 0.37 |
| 23 | 177.60 | 5.7 | 0.4 | -0.83 | 4.9 | 0.32 |
| 24 | 95.08 | 6.4 | 0.6 | -0.63 | 5.4 | 0.39 |
| 25 | 60.62 | 6.9 | 0.5 | -0.58 | 5.6 | 0.27 |
| 26 | 105.17 | 6.2 | 0.3 | -0.66 | 5.2 | 0.16 |
| 27 | 152.55 | 5.9 | 0.08 | -0.62 | 5.4 | 0.08 |
| 28 | 87.27 | 6.4 | 0.04 | -0.49 | 6.0 | 0.04 |
| 29 | 225.18 | 5.5 | 0.02 | -0.73 | 5.1 | 0.02 |
| 30 | 71.57 | 6.7 | 0.03 | -0.58 | 5.6 | 0.02 |

# Summary and conclusions

## THE SIL DIAGRAMS

- The **σ vs $I_{peak}$ is an excellent diagram to separate the main broadening mechanism affecting the emission lines that lead to shells, loops by the violent action of the massive stars**.

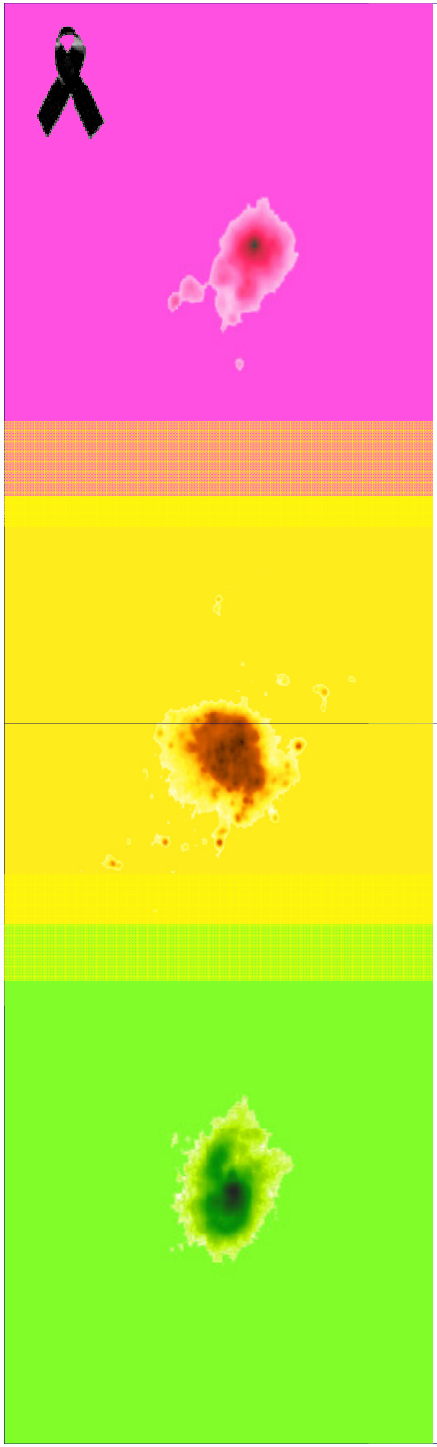
- **The σ horizontal band, for the case of multiple massive nuclear burst of SF, has been shown to split in different bands in the λc vs $I_{peak}$.**

- **The σ vs λc diagram picks up the small burst of stellar formation by tracing their lower intensity and slower expansion of their immediate surroundings**.

- **In the case of III Zw 102 the stalactites correspond to the outer ionized regions and their spred in σ is the result of their expansion in a lower density medium. .**

- **In the case of Mrk 297 the displacement among the emission lines between two areas of the galaxy are consistent with previous works for a collition event.**

- **On the whole, the SIL diagrams, provide the posibility of inferring the SF activity in distant galaxies even if these are not spacially resolved by means of 3D spectroscopy.**



# 3D spectroscopy of BCDs:Inferring the Star Formation Activity


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