

SPATIALLY RESOLVED KINEMATICS OF THE CENTRAL REGIONS OF M83:
HIDDEN MASS SIGNATURES AND THE ROLE OF SUPERNOVAE

J. PIQUERAS LÓPEZ¹, R. DAVIES², L. COLINA¹, AND G. ORBAN DE XIVRY²
¹ Centro de Astrobiología, INTA-CSIC, Spain; piqueraslj@cab.inta-csic.es
² Max-Planck-Institut für extraterrestrische Physik, Postfach 1312, 85741 Garching, Germany
 Received 2012 February 15; accepted 2012 April 9; published 2012 May 24

Central region of M83のVLT/SINFONI観測

- 235x140pc
 - 4pointings
 - 0.2”(4pc) resolution
 - 1hr integration
- Various lines
 - BrG => ionized gas
 - H2 1-0(S1)@2.122um => warm mol. gas
 - [FeII]@1.644um
 - CO absorption @ 2.293/2.323um => stellar kinematics

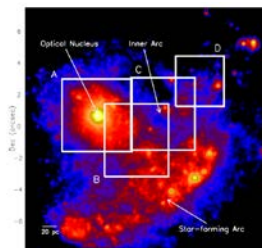


Figure 3. Central region of M83: A07/NICMOS F222M image with the fields covered by the four SINFONI pointings superimposed. The location of the

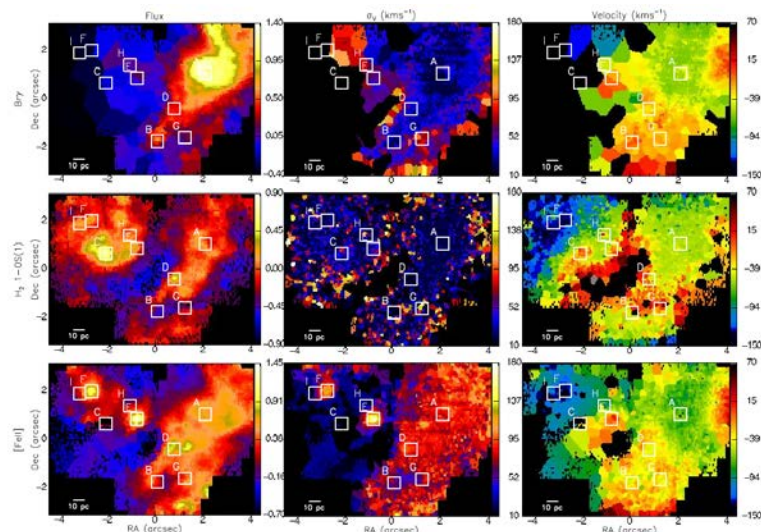


Figure 4. Flux and kinematics maps of the main emission lines. From top to bottom, the Br γ , H $_2$ 1-0(S1), and [Fe II] maps, and from left to right, flux, velocity

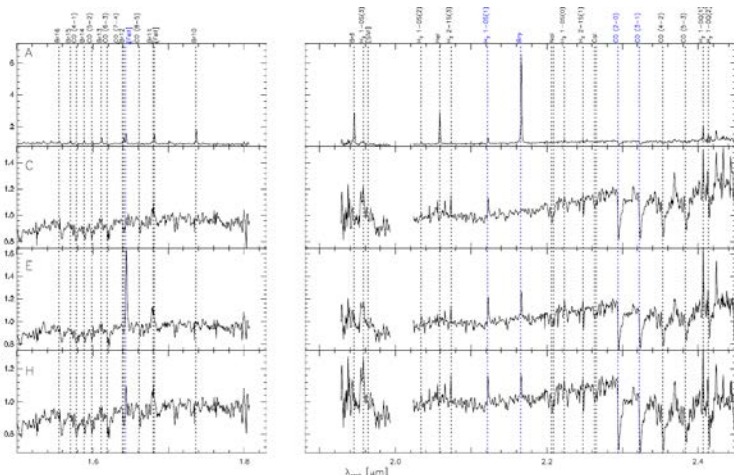


Figure 3. Normalized H+K spectra of the apertures A, C, E, and H (see Figure 4 for reference). Aperture A is located at the maximum of the Br γ emission, aperture

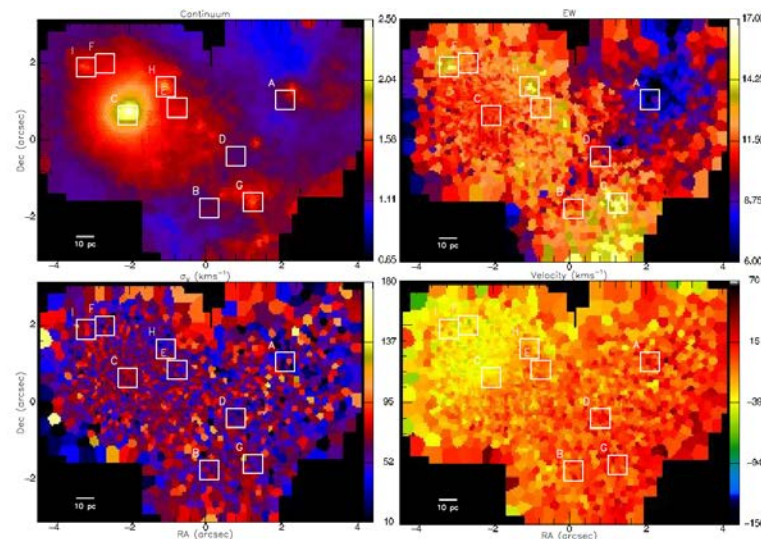


Figure 5. Maps of the stellar continuum flux (top left), equivalent width (top right), velocity dispersion (bottom left), and velocity field (bottom right) for the nuclear

分布

- BrG : inner SF arc
- H2 : inner arc + optical nucleus, 速度場はBrGと同じ
- Stellar continuum : ガスとは全く異なった速度場

H2輝線比

- Non-thermal processからの寄与がかなりある
- Inner arc : ほぼモデルで合うが、 $v=2$ のレベルが少しoverpopulated => thermal + recent SN?
- Optical nucleus : $J_u=5$ のレベル(S(3))のoverpopulationが非常に大きい => fluorescent excitation?

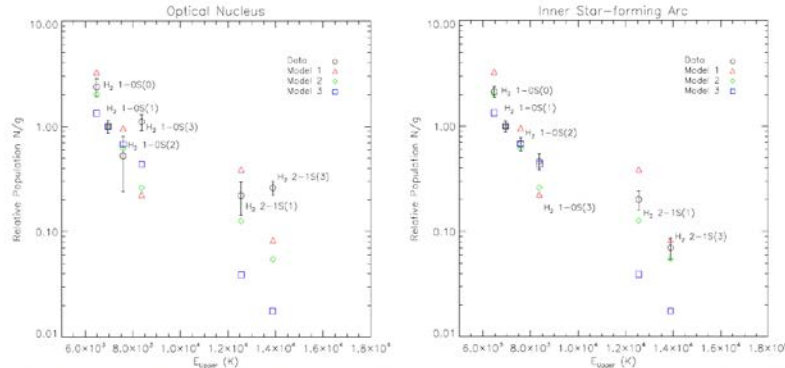


Figure 8. H₂ excitation diagrams relative to 1-0S(1) for the optical nucleus (left panel) and the inner star-forming arc (right panel). The lines from which the population

Table 3
Integrated Fluxes of the H₂ Lines for the Optical Nucleus and the Inner arc

Line	λ (μm)	Flux ($10^{-15} \text{ erg s}^{-1} \text{ cm}^{-2}$)	
		Optical Nucleus	Inner Arc
1-0S(3)	1.958	4.24 ± 0.73	1.19 ± 0.20
1-0S(2)	2.034	0.50 ± 0.27	0.43 ± 0.06
2-1S(3)	2.073	1.30 ± 0.19	0.23 ± 0.05
1-0S(1)	2.122	1.85 ± 0.26	1.24 ± 0.15
1-0S(0)	2.223	0.73 ± 0.14	0.44 ± 0.05
2-1S(1)	2.248	0.55 ± 0.19	0.34 ± 0.07

Model 1 & 2 : $n_H=1e3-4$, UV fluorescence

Model 3 : thermalized $T=2000\text{K}$

SNの形跡

- BrG ring
- [FeII] arc : SNR shock?
- [FeII] ピーク : high dispersion

Optical nucleus

- $M_{\text{dyn}} \sim 1e7 M_{\text{sun}}$
- $L_K = 6e5 L_{\text{sun}} \Rightarrow M/L_K$ から出した年齢は $\sim 100\text{Myr}$
- CO吸収線から出した年齢と一致

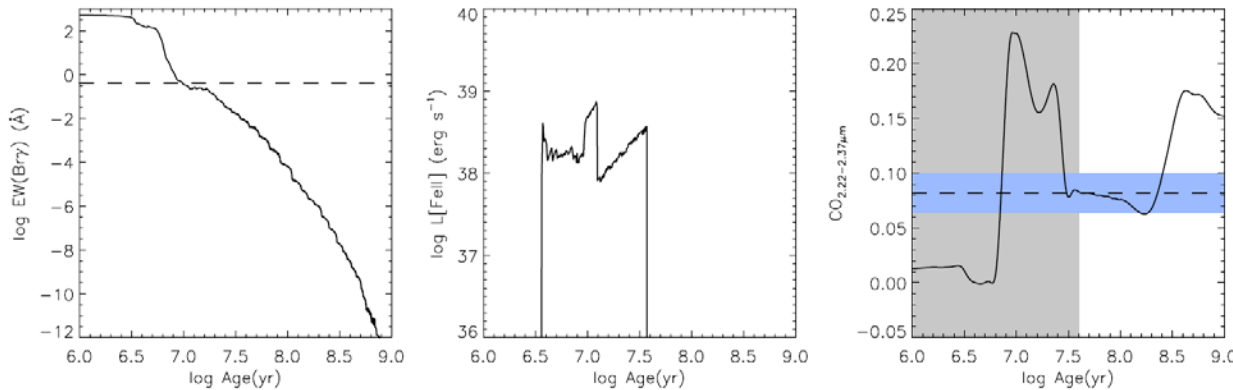


Figure 10. Evolution of the Br γ equivalent width (left) and [Fe II] flux (center) from SB99 models, and CO_{2,22-2.37 μm} index (right) from M05 models. The dotted