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Age-dating a Starburst: Gemini/CIRPASS Observations of the Core of M83

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1. Introduction

The circumnuclear starburst in NGC 5236 (M 83) has been studied photometrically by Harris et al. (2001) using *HST*/WFPC2 images in the broad-band near-UV and optical, as well as narrow-band Hα and Hβ to derive colors and line equivalent widths for 45 clusters. Despite the excellent spatial resolution of these observations, optical photometric analyses such as this suffer from: (i) patchy (and not easily quantifiable) dust extinction; (ii) the fact that the reddening vector parallels the evolutionary tracks in a two-color diagram; and (iii) selection effects, which tend to exclude the very youngest ($t < 5$ Myr) clusters which have strong emission lines, but only a weak stellar continuum. Additionally, it is not possible to distinguish an instantaneous burst of star formation from a constant star formation rate, on the basis of broad-band colors alone.

To help overcome these drawbacks, we have used the Cambridge Infra-Red Panoramic Survey Spectrograph (CIRPASS; Parry et al. 2000) in Integral Field Unit (IFU) mode on the 8.1 m Gemini South Telescope to map the equivalent widths of the Paβ line and the CO(6,3) band across much of the circumnuclear star-forming region in M83. As demonstrated by Ryder, Knapen, & Takamiya (2001) for M100, the combination of two such diagnostics constrains not just the age, but also the burst duration, for *any* cluster within the IFU field of view, allowing us to compile an unbiased account of the recent star formation history.

2. Results

While a quantitative analysis is still in progress, we can already see evidence for a much more complex star formation history than that found by Harris et

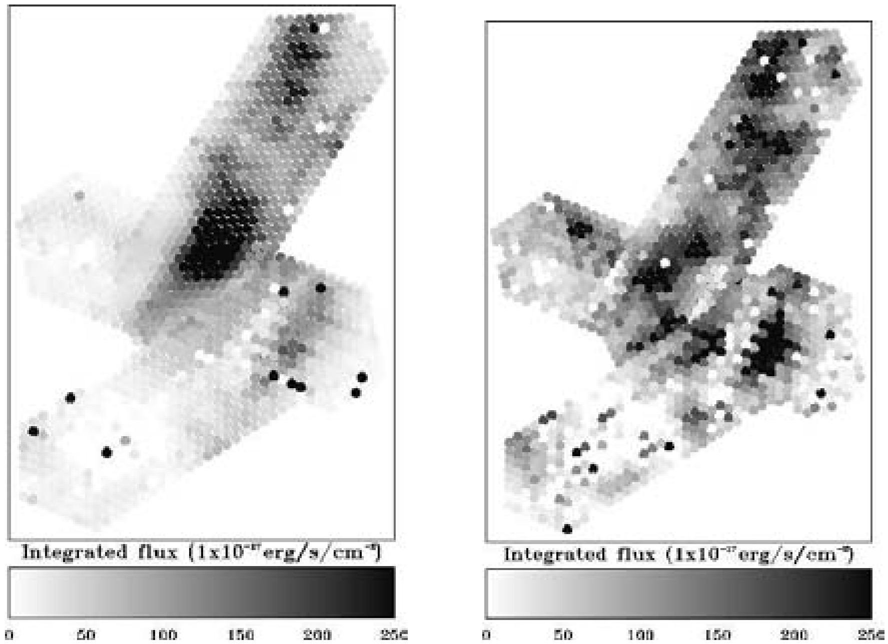

Figure 1. Integrated flux in the Paβ line (*left*), and in the [Fe II] 1.644 μm line (*right*) from a mosaic of 3 IFU pointings. Each IFU pixel is $0\farcs36$ across, with north at the top, and east to the left. The nucleus of M83 lies near the eastern end of the central IFU position.

al. (2001), or by Thatte, Tecza, & Genzel (2000) from a single long-slit near-IR spectrum. There is extensive diffuse Paβ emission due west of the nucleus, but only a weak stellar continuum (and thus weak CO absorption), indicative of a very recent burst. Figure 1 compares the distribution of Paβ emission with the [Fe II] 1.644 μm emission (which falls within our H-band spectral coverage), which is thought to trace shocks due to supernovae within the past 10^4 years (Alonso-Herrero et al. 2003). The [Fe II] is both clumpier and slightly more extended than Paβ, suggestive of star formation propagating outwards into regions of previously undisturbed gas.

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References

Alonso-Herrero, A., Rieke, G. H., Rieke, M. J., et al. 2003, AJ, 125, 1210
Harris, J., Calzetti, D., Gallagher, J. S., et al. 2001, AJ, 122, 3046
Parry, I. R.; Mackay, C. D.; Johnson, R. A., et al. 2000, SPIE, 4008, 1193
Ryder, S. D., Knapen, J. H., & Takamiya, M. 2001, MNRAS, 323, 663
Thatte, N., Tecza, M., & Genzel, R. 2000, A&A, 364, L47