RevMexAA (Serie de Conferencias), **20**, 240–240 (2004)

A COMPREHENSIVE Hα NOVA SURVEY OF M81

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A spatially complete Hα survey of M81 for novae was conducted continuously over a 5 month interval using the Calypso Telescope at Kitt Peak, AZ. A raw nova rate for M81 gives 23 yr^{-1} which is a lower limit. Monte Carlo simulations using nova light curves and survey frame limits yield a nova rate of 33^{+13}_{-8} yr^{-1}. Using this value and the K-band photometry for M81 from the 2MASS Large Galaxy Atlas of Jarret et al. (2003) gives a luminosity specific nova rate of $\rho_k = 3.96^{+1.8}_{-1.1}$ yr$^{-1}[10^{10} L_{\odot,K}]^{-1}$. The spatial distribution of the novae follows the bulge light much better than the disk or total light according to KS tests of their radial distribution. The asymmetric nova distribution across the major axis line of M81 implies a bulge-to-disk nova ratio of > 9 and supports the idea that novae originate primarily in older stellar populations.

The high nova rate we find for M81 implies that nova rates for other galaxies derived from surveys with incomplete spatial coverage and widely spaced epochs may be underestimates. Given the spatial distribution of novae in M81, most of the incompleteness arises in the central regions of the galaxies surveyed.

The asymmetry of the nova distribution apparent in Figure 1 (see Hatano et al., 1997) and the radial distributions shown in Figure 2 imply the predominance of bulge novae in M81. This adds weight to the idea that novae are associated with older stellar populations and calls for comprehensive surveys, like this one, of other galaxies to further test this idea. If verified, it would imply that novae don't appear in young stellar populations and would greatly constrain theories of nova formation and evolution.

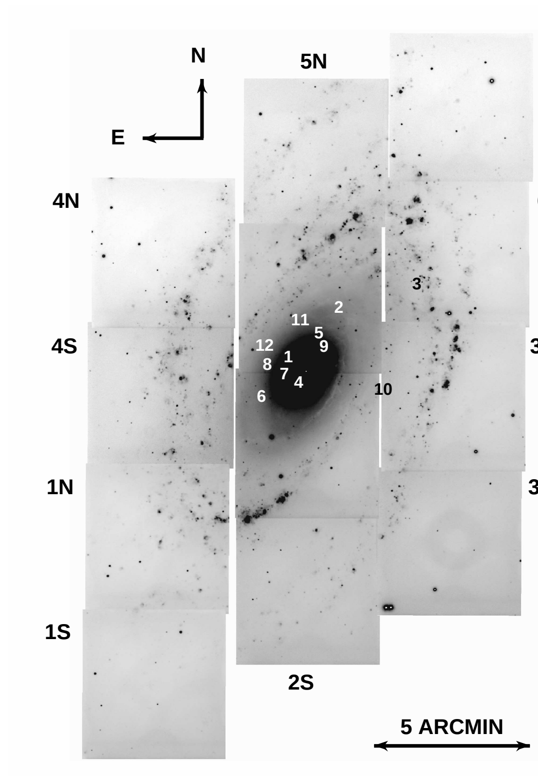

Fig. 1. Spatial distribution of novae in M81

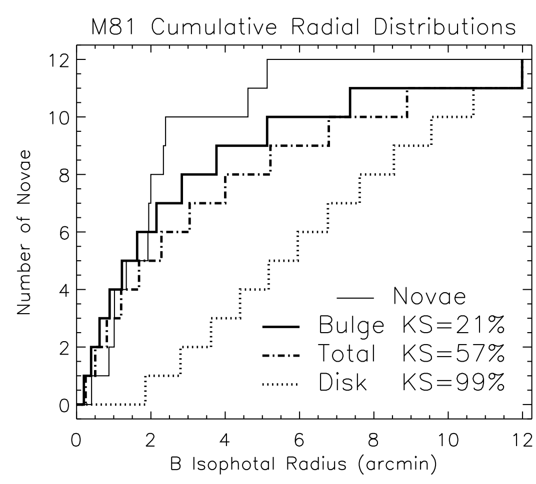

Fig. 2. Nova radial distribution and the bulge/disk decomposition of Simien & de Vaucouleurs (1986)

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