

THE SPIRAL ARMS OF M81

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ABSTRACT. An intensive study of M81 has shown a number of interesting features of the spiral-arm star formation process there.

The spiral galaxy M81 is a large ($\gtrsim 15'$ across) nearby (3.3 Mpc) two-armed spiral galaxy which is inclined by 59° to the plane of the sky, allowing both the accurate location of the spiral pattern and the determination of accurate velocities in the galactic plane.

The studies have all been done with M. Kaufman at Ohio State; the data include VLA $\lambda 6$ and $\lambda 20$ cm continuum maps, VLA H I 21 cm maps, H α maps, dust lane maps, Band I plates, and other data. These data have a typical angular resolution of $10''$, and several different collaborators are involved in the different studies.

The radio continuum data appear in Bash and Kaufman (1986); the H II regions are discussed in Kaufman, *et al.* (1987); the dust lanes in Kaufman, Elmegreen, and Bash (1989); and the spiral tracers are compared in Kaufman, *et al.* (1989).

We find that the H I extends to ~ 11 kpc whereas the young stars and the radio continuum fade beyond ~ 9 kpc. The H I, radio continuum, and young stars are not seen inside a circle of radius ~ 4 kpc except for very strong radio continuum from the nucleus. However, this inner region is full of old stars as seen on the I plate.

Along the spiral arms the H II region, young stars, ridge of old stars, the ridge of the non-thermal radio signal, the dust lanes, and the H I are all intermingled with no general tendency for one to lie "upstream" of the other, but all lie downstream of the observed position of the H I shock. The arms are 1–2 kpc wide. If the shock triggers star formation then the H II regions lie 5–50 million years downstream of it, assuming circular orbits.

References

- Bash, F.N. and Kaufman, M. (1986) 'The Global Spiral Structure of M 81: Radio Continuum Maps,' *Astrophys. J.*, **310**, 621–636.
- Kaufman, M., Bash, F.N., Kennicutt, R.C., Jr., and Hodge, P.W. (1987) 'Giant H II Regions in M81,' *Astrophys. J.*, **319**, 61–75.
- Kaufman, M., Elmegreen, D.M., and Bash, F.N. (1989) 'The Dust Lanes in M81: A Tracer of the Molecular Gas?' *Astrophys. J.*, **345**, 697–706.
- Kaufman, M., Bash, F.N., Hine, B., Rots, A.H., Elmegreen, D.M., and Hodge, P.W. (1989) 'A Comparison of Spiral Tracers in M81,' *Astrophys. J.*, **345**, 674–696.