STAR FORMATION IN THE SOUTHERN SPIRAL ARM OF M31

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Conspicuous dust lanes define the spiral arm in the south of M31. The integrated H I line emission map shows several large cloudlike structures with sizes ranging from hundreds to thousands of parsecs, forming a spiral arm along the dust lanes (Figure 1). To investigate how such super clouds correlate with star formation phenomena, we present in Figure 2 a compilation of published data on: CO emission, dark clouds, H II regions, OB associations, and thermal infrared radiation from IRAS. The CO emission distribution is similar to that of H I and also forms large cloudlike structures. The large CO clouds P, Q, and R, which are located in the high density H I areas, have bright H II region complexes of several hundred parsecs at their outer edges. Further out large OB associations are found. In contrast, cloud B, which shows weaker CO emission, has a large and diffuse H II region which may be relatively old. This giant H II

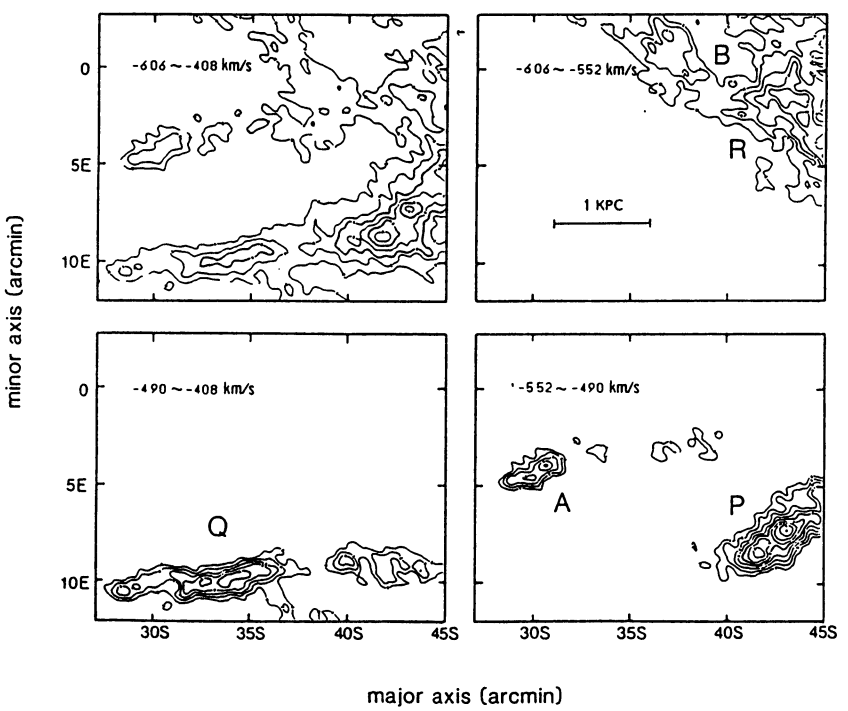

Fig. 1. The contour map of integrated H I emission in each velocity range at the southern part of M31 (Brinks and Shane 1984). The spatial resolution is 24" × 36" (80 pc × 120 pc).

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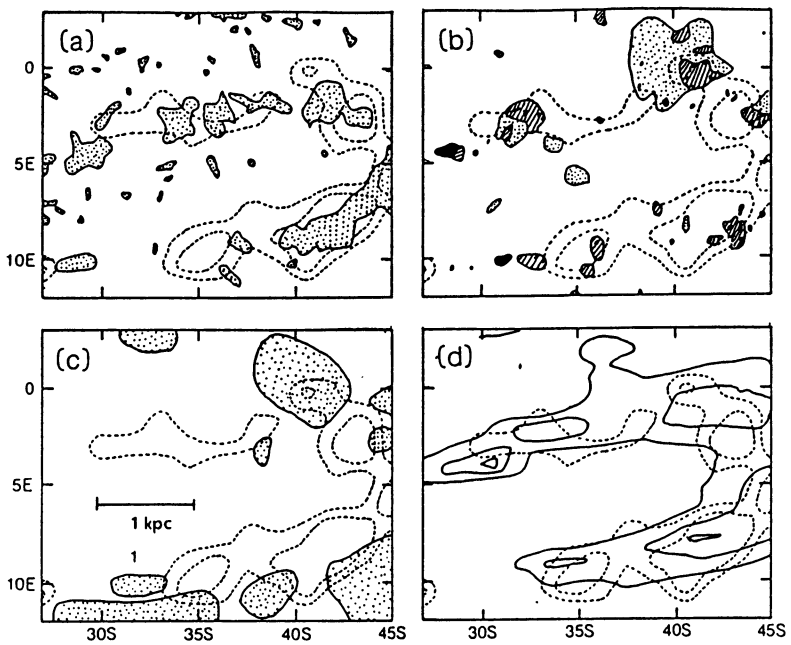

Fig. 2. Compilation of published data in the southern part of M31: (a) dark clouds (Hodge 1981), (b) H II regions(Pellet *et al.* 1978), (c) OB associations (van den Bergh 1964), (d) thermal emission at 25 μm from IRAS (Habing *et al.* 1984). All data are shown on the integrated CO emission contour of Stark (1985).

region is located in a large hole of H I and dark clouds (Brinks 1981). The IRAS maps show strong correlated thermal emission from the dust lanes. The luminosity from the star formation activity heats the dust in the molecular clouds. The local peaks at A, P, and Q in the 25 μm band, extending 200-300 pc, have revealed the existence of massive young stars embedded in the clouds.

The systematic displacement of the emission regions of H I, H II, CO, and 25 μm parallel to the spiral arm suggests the interchange of matter and a short time scale of star formation history in the super clouds. Our CO observations with a resolution of 47 pc, made with the Nobeyama 45-m telescope, resolved CO clouds in the super H I clouds (Ichikawa *et al.* 1985, Nakano *et al.* 1986). The CO cloud complex observed at P was found to extend over 1 kpc along the super H I cloud (Figure 3). The width is, however, less than 500 pc, much narrower than that of 1-2 kpc of the H I cloud.

These data indicate that the super cloud is a coherent star forming region in the disk of M31. In P, Q, and R, the star formation may have been recently ignited. On the other hand, the neutral gas at B has almost been exhausted, and A may be in the middle stage of its star formation activity.

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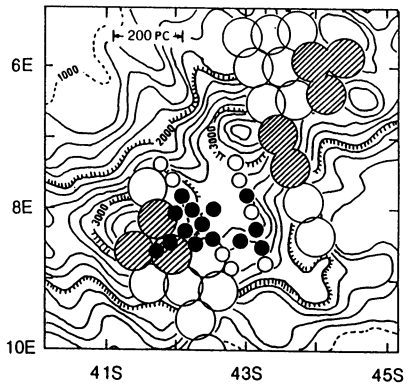

Fig. 3. CO observations in the super H I clouds P. The size of the circles shows the beam size. The large and small circles correspond to observations of Boulanger *et al.* (1984) with 100 pc resolution and of Ichikawa *et al.* (1985) and Nakano *et al.* (1986) with 47 pc resolution. Hatched and filled circles represent the regions where CO emission was detected.

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STAR FORMATION IN THE SPIRAL GALAXY M33

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The spiral galaxy M33 has been observed at several frequencies from the ultraviolet to the radio regions. The observations at 2030 A have been presented by Milliard (1984); the radio data obtained with the WSRT

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