CO IN THE LARGE MAGELLANIC CLOUD

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In our galaxy molecular clouds account for about half the total interstellar gas and are probably the sites of all star formation. The high gas content and widespread star formation in the Large Magellanic Cloud would therefore suggest a high molecular content. Very little however is actually known about molecules in the LMC. The most extensive previous survey (see Israel in this volume) found CO in half of the 22 points observed but covered less than 10^{-4} of the LMC area.

When the Columbia Southern Millimeter-Wave Telescope began operation in January 1983, we therefore immediately started a fully sampled survey of 2.6 mm CO emission from the LMC. The telescope, a close copy of the Columbia telescope in New York, is a 1.2 meter Cassegrain with a very accurate surface capable of working well into the sub-millimeter. It has a liquid nitrogen cooled receiver with a single sideband noise temperature of 385 K and a 256 channel filter bank spectrometer with a resolution of 500 kHz (1.3 km sec^{-1} at 2.6 mm). The beam of the telescope, 8' or 120 pc at the LMC, is large enough to make a complete LMC map practical -- the survey will require several thousand hours -- but is still able to distinguish objects about the size of galactic giant molecular clouds.

The final survey will cover virtually the entire LMC (at least 6° x 6°) with points spaced every beamwidth and each point observed for about 30 minutes to obtain a noise of 0.07 K RMS per channel. Although the survey is now only about 30% complete (Figure 1), it already shows that molecules are more abundant than in other megallanic irregulars (Elmegreen et al. 1980) and can be detected in many regions of star formation. In particular, there is a ridge of emission starting south of 30 Doradus at N159 and extending over one kiloparsec further south. Assuming the standard galactic H_2 mass to CO luminosity relation (Lebrun et al. 1983) applies in the LMC, this ridge contains a molecular mass of 4×10^6 $M_\odot$, about the same as a galactic giant molecular cloud but spread over a much larger area. The HI mass in the same region is 50×10^6 $M_\odot$. This ratio seems to be typical of the LMC, with calculated column densities for H_2 generally about 5 to 10 times lower than for HI.

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It is possible, however, that the galactic mass-to-luminosity does not apply because of the low metalicity, and hence CO abundance, in the LMC.

REFERENCES

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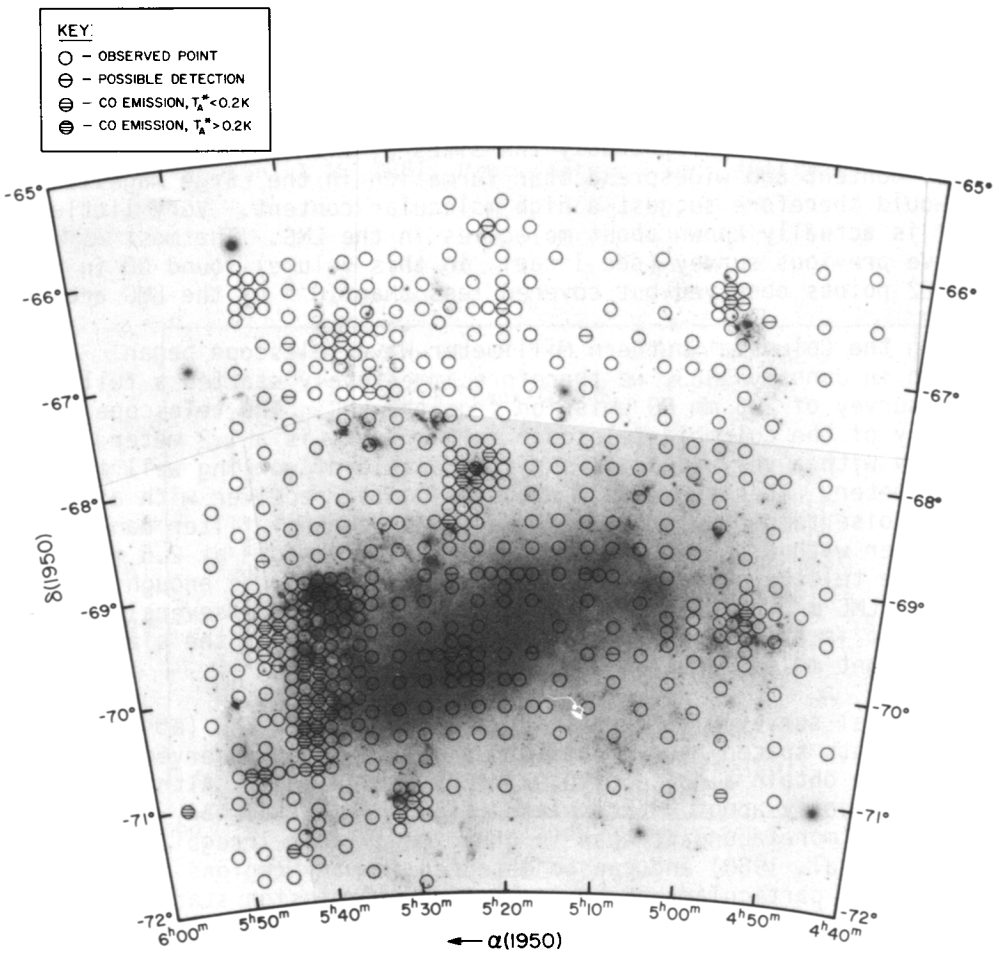

Figure 1. LMC CO observations superimposed on the ESO/SRC Atlas IIIaJ plate.

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