CO OBSERVATIONS IN THE SOUTHERN HEMISPHERE

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ABSTRACT

CO maps of areas around HII regions show many secondary hotspots. J=2-1 observations of 2 dark clouds are discussed.

INTRODUCTION

Few spectral line observations have been made at high frequencies at declinations less than -40°. This paper summarises CO observations with InSb systems, the only others being some by de Graauw (private communication) using a diode mixer.

THE OBSERVATIONS

The observations at 115 GHz were made with a system from Queen Mary College, London on the Anglo-Australian-Telescope and at 230 GHz with a system from the Max Planck Institut on the European Southern Observatory 3.6 m telescope; the beamwidths were 3.2 and 1.5 arcmin respectively, and the velocity resolutions were 2.6 km s^{-1} at 115 GHz and 1.0, 1.3 or 2.6 km s^{-1} at 230 GHz. The observing techniques are described in Gillespie et al. (1977 and 1979 respectively).

HII Regions

Spectra were taken of 41 southern Galactic radio sources; the spatial extent of the CO round the brightest of these was studied by scanning the source whilst switching the receiver between a line and a reference frequency. An area of about 1 deg^2 around each source was completely sampled, usually at several adjacent frequencies. In almost all the regions mapped there are bright CO peaks near the radio continuum peak, and also other CO hot-spots embedded in an extensive CO cloud; examples include RCW38, RCW122, and G316.8-0.1 which have simple radio continuum structures. Observations of the radio complex near RCW106 at

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115 GHz revealed a giant cloud approximately 100pc by 35pc (at 4.2kpc distance) which is larger than the Orion A complex (Kutner et al. 1977). There is a velocity gradient along it (V_{lsr}=-51 → -55 km s^{-1} North to South) and considerable structure within the cloud, there being four main maxima and an additional peak at the southern end which may be a second cloud with V_{lsr}=-49 km s^{-1}. The correlation of the peaks with the thermal radio sources of Goss and Shaver (1970) suggests a very large rotating cloud containing several well developed HII regions. An area of 1 deg.^{2} centred on the CO peak in Orion was observed at one frequency and shows considerable structure, particularly to the East.

Dark Clouds

The Coalsack is one of the most prominent features of the southern sky, and several (J=1-0) CO spectra were taken at positions in an H_2CO cloud (Brooks et al. 1976) which contains several dust globules. A (J=2-1) CO spectral line at the brightest J=1-0 position (No 4 in Huggins et al. 1977, T_A^*=7.9 K) has T_A^*=10 K and is not significantly resolved at a resolution of 1 km s^{-1}, so that a line width $\lesssim$ 0.5 km s^{-1} is implied. Allowing for resolution effects, the line intensity is consistent with the CO's being optically thick, confirming a mass of several solar masses for this cloud. The more northern dark cloud B68 was observed at 230 GHz; when the data are compared with the 115 GHz work of Martin and Barrett (1978), they imply that the CO is optically thick.

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