THE W 51 SOURCE COMPLEX

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ABSTRACT

Recent observational results for the giant H II complex W 51 are reviewed. The radio continuum emission is produced by two types of component: a diffuse, very extended ionized gas with low emission measure; and a number of compact sources with high emission measures and electron densities. The compact components are associated with near-infrared sources and with massive molecular clouds, the densities of which range from $n_{H_2} \sim 10^3$ cm$^{-3}$ to $10^5$ cm$^{-3}$. Some of the molecular clouds in the W51 complex may be part of a gas stream flowing along the Sagittarius spiral arm.
1. INTRODUCTION

The W51 complex consists of a number of discrete radio sources superimposed on an extended, low-brightness background. The region has been mapped with the 100-m telescope as part of the 5 GHz continuum survey of the galactic plane (Altenhoff et al. 1975). A preliminary version of the map is shown in Figure 1. At least nine discrete sources are resolved, in addition to a shell-like source which extends some 30' in galactic latitude. As the 5 GHz map shows, the radio emission can be divided roughly into 2 regions, conventionally labelled A and B. W51A consists of the strongest components, G49.5-0.4 and G49.4-0.3, plus two or three weaker sources and a somewhat extended, low-brightness background. The W51B sources include G49.2-0.4, G49.1-0.4 and G48-9-0.3, possibly some weaker components, and as with W51A, a low-level background. The shell-like source extends to meet and, probably, blend with the W51B sources.

The existence of such a large complex of radio emission is a consequence of the distribution of spiral arms in the Galaxy. At the longitude of W51 (l=49°) the line of sight intersects the Sagittarius arm tangentially (Kerr and Westerhout 1965). It is perhaps not always appreciated that this intersection is not simply a grazing of the line of sight across the outermost edge of the arm. Burton and Shane (1970) have shown that the arm is inclined away from the circle of constant galactic radius, and curves out toward the Sun. As a result, we see the arm nearly in cross section, with a total path length through the arm of at least 5 kpc at l = 49°. Since H II regions are generally good tracers of spiral arms, it is not surprising that we find a large concentration of thermal sources at this longitude. It is important, then, to bear in mind the possible projection effects which may be present toward W51.

II. RADIO CONTINUUM AND INFRARED OBSERVATIONS

A) Large-scale Structure

The W51 complex has been mapped over a frequency range from 53 MHz to