THE MARSEILLE OBSERVATORY Hα SURVEY: COMPARISONS WITH CO, 6 CM AND IRAS DATA

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1. Introduction

The Marseille Observatory Hα survey supplies Hα velocities of the ionized hydrogen over large zones of the sky towards the galactic plane. This survey, led at the ESO La Silla, uses a 36 cm telescope equiped with a scanning Fabry-Perot interferometer and a photon counting camera (Le Coarer *et al.* 1992). About 250 fields ($39' \times 39'$) toward the galactic plane have already been covered (see Figure 1) with a spatial resolution of $9'' \times 9''$and a spectral resolution of $5\,\mathrm{km\,s^{-1}}$. This allows us to observe the discrete HII regions and the diffuse ionized gas widely distributed between them and to separate the distinct layers found along the line of sight. HII regions are often grouped on the molecular cloud surface, then CO, radio continuum and recombination lines surveys of the galactic plane are also essential to distinguish the HII region-molecular cloud complexes met on the line of sight, and in order to take dynamical effects into account, such as the champagne effect, for the kinematic distance determination. Indeed, the spiral structure pattern determination requires avoiding any artificial spread by clearly identifying the giant complexes composed of molecular clouds, HII regions, diffuse ionized hydrogen widely surrounding them, and exciting stars. On the other hand the ionized gas data (Hα and recombination lines) associated with IRAS data help us to study the nature of the young objects constituent of these complexes and to assess their detectability. We present two fields from the Hα survey and parallel large scale investigations.

B.J. McLean et al. (eds.), New Horizons from Multi-Wavelength Sky Surveys, 186–188.

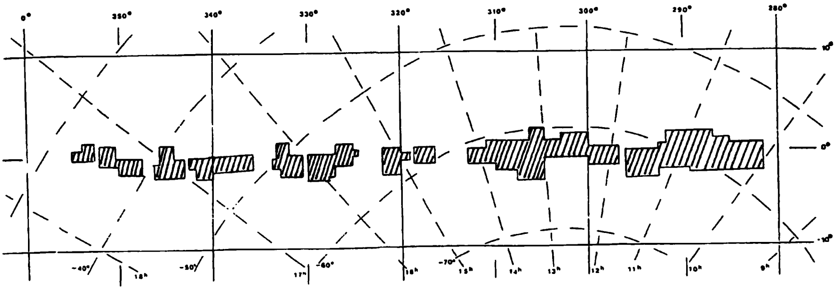

Figure 1. The coverage of the Hα sky survey between l=280° and 0°

2. The l=234°, b=0° Direction

The discrete HII regions met in this direction seem isolated, but the Hα data compared with CO and stellar ones, allow to identify two distinct HII regions-molecular complexes respectively at 2.1 kpc and 4.2 kpc. In S305 and S307, a "champagne" effect is observed (Russeil *et al.* 1995). If such an effect is neglected it will give an erroneous derived kinematic distance.

3. The l=298°, b=0° Direction

We enumerate the different kinematic components detected at the Hα wavelength along this line of sight.

- The first diffuse emission ($V_{lsr} \sim -3\,km\,s^{-1}$) can be associated with the interstellar medium linked to the Sco-Cen association which is situated at about 130 pc (Degeus *et al.* 1989).
- The second diffuse emission ($V_{lsr} \sim -25\,km\,s^{-1}$) at about 2.8 kpc accounts for the crossing of the near part of the Carina arm.
- The third diffuse emission ($V_{lsr} \sim -40\,km\,s^{-1}$) and the HII region RCW64 at about 5.4 kpc (Brand 1986) present a strong rotation curve departure.
- The far complex: 8 radio sources (Caswell & Haynes 1987) are detected in Hα ($V_{lsr} \sim +25\,km\,s^{-1}$). The 5 GHz radio continuum, IRAS and CO emission morphologies associated with kinematic distances allow to group the sources into one single complex at 10 kpc (located at the far part of the Carina arm). The IRAS and the 5 GHz radio continuum data suggest that the 3 radio sources without Hα counterpart can be explained by some absorbing cloud on the line of sight rather than by being burried inside the clouds.

4. Parallel Surveys

- The IRAS map investigation of the second field, has revealed 4 far-infrared extended sources without Hα nor radio counterpart: their nature remains ambiguous from color criteria only. In order to find potential common feature, we have itemized them through the fourth galactic quadrant: 177 sources have been selected. The study of the color ratios of these sources is in progress.
- A CO survey of the southern Milky Way has already been made with a 8.8′ resolution (Bronfman *et al.* 1989), very different from the 9″ resolution of the Hα survey. It allows to get only the large scale structure of molecular cloud. But, the hydrogen ionized by a newly formed star can exhibit a particular motion with respect to the molecular cloud within which was born. Then, to identify these particular regions we have begun a CO survey of the galactic plane, between l= 282° and l= 353°, with the SEST radiotelescope taking advantage of its 45″resolution to make a CO velocity probing of the Hα field for some particular areas and to measure the CO profile towards localized regions. About 130 regions has already been observed. At a first examination, certain highly emitting regions present no ^{13}CO counterpart and evident velocity departures.

5. Conclusion

The Hα survey of the Milky Way supplies optical observations of the galactic HII regions and allows to observe the large scale distribution of the ionized diffuse components. Comparing it with surveys at other wavelengths, we can identify and determine the distance of giant complexes and estimate the general absorption along the line of sight useful for the spiral structure study. This requires also the knowledge of the early type stars distribution. On the other hand, the use of multi-wavelength surveys would allow to identify the deeply embedded stars, to quantify the absorption, to derive the physical conditions of the HII regions, to establish the energy budget and eventually to clarify the nature of unclassified objects.

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https://doi.org/10.1017/S0074180900128554 Published online by Cambridge University Press