Deep H α survey of the Milky Way.

III. The $l = 338^\circ$ area^{*}

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Abstract. — The Galactic plane has been observed between $l = 337^\circ$ and $l = 342^\circ$ in the frame of an H α Survey of the Southern Milky Way. This area is known to be rich in radio sources but poor in H α emission. The analysis of high resolution profiles of the H α emission observed in this direction nevertheless enabled to distinguish 6 different velocity components: 2 faint layers of diffuse ionized hydrogen at 0 and -12 km s^{-1} (V_{LSR}), 2 brighter layers at -28 and -39 km s^{-1} including individual HII regions, a faint patch at -50 km s^{-1} and two isolated bright HII regions at -61 km s^{-1} . Combining these H α observations with stellar and radio data we conclude about the most probable distances for the different components.

Key words: interstellar medium: HII regions — Galaxy: structure

1. Introduction

The study of the spiral structure of our Galaxy necessitates to clearly identify the large complexes gas-young stars as can be seen in other galaxies. Such complexes are most often made of a giant molecular cloud mixed with ionized gas and young stars or clusters. The detailed study of observational data for each of these components together with their relations is the only way to overcome the obstacle raised by the inaccuracy of individual distances deduced from spectrophotometry as well as kinematics. For instance, because of the uncertainties on their absolute magnitude, the error bar on the distance of OB stars is larger than 25%. The uncertainty on kinematical distances is due to peculiar motions of stars and gas, exhibiting deviations with respect to the circular rotation of the Galaxy.

The detailed study of velocities of the ionized gas at H α wavelength (diffuse emission as well as individual HII regions) enables to identify the associated radio sources through the similarity of radial velocities or to reveal expansion motions. The exciting stars of this ionized gas are the link between nebular radial velocities and stellar distances. In this context we make an H α survey of the

southern Milky Way with a 36 cm telescope in La Silla equipped with a scanning Fabry-Perot and a photon counting camera (Amram et al. 1991; le Coarer et al. 1992: Paper I).

The area of the galactic plane studied in this paper at H α wavelength is at galactic coordinates $l = 336^\circ$ to 343° , $b = -1^\circ$ to $+1^\circ$ ($\alpha = 16^{\text{h}}30^{\text{m}}$ to $16^{\text{h}}52^{\text{m}}$, $\delta = -48^\circ$ to -43°). The H α emission in this area is rather faint, lying between two large and bright HII regions: RCW 108 (covering about 3°) to the south and RCW 113 (covering about 5°) to the north. The only discrete HII regions catalogued in the studied area is the small group RCW 110-111 at coordinates $l = 341^\circ$, $b = -1^\circ$ (Marsalkova 1974).

Conversely at radiowavelengths this area appears quite complicated, rich in continuum sources and the velocities measured through recombination lines lead Caswell & Haynes (1987) to claim that “obviously there is considerable apparent superposition of features at quite different distances along the line of sight”. It is true that this area, together with the neighbouring area at $l = 332^\circ$, appeared to be a key-area when trying to distinguish the different spiral arms of the Galaxy (Georgelin & Georgelin 1976).

Since 1976 new radio observation of HII regions have been made at recombination lines, H₂CO (Caswell & Haynes 1987; Gardner & Whiteoak 1984) and OH (Turner 1979). Concerning the molecular clouds, Bronfman et al. (1989) have published a CO survey with an angular

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^{*}Based on observations collected at the European Southern Observatory

resolution 8'8" for this part of the galactic plane and some observations have been made in the direction of a few HII regions (see Table 2).

This set of recent radio data together with our new H α data enable to make a deeper study of this area. Our H α observations and results are presented in Sect. 2. The analysis of the radial velocities (H α and radio) is made in Sect. 3 whereas the stellar environment is discussed in Sect. 4. The discussion of the whole set of data, combining velocities and stellar data, is made in Sect. 5.

2. Observations and results

Our H α interferometric observations have been made at La Silla (Chile) in April 1991, March 1992, March 1993, April 1994, April and May 1995. The data cubes (x, y, λ) have been obtained with a spatial resolution $9'' \times 9''$ for 26 fields ($38' \times 38'$ each) extending over 6° along the Galactic equator. A complete description of our instrument, including data acquisition and reduction techniques, has been given in Amram et al. (1991) and le Coarer et al. (1992). The Fabry-Perot interferometer used for all our observations had an interference order 2604 (at H α wavelength) providing a spectral sampling of 5 km s^{-1} . The interference filter used is centered at $6562 \text{ \AA}$ with a FWHM $11 \text{ \AA}$.

The data reduction has been made following the procedure described in Georgelin et al. 1994 (Paper II). The nightsky lines are well fitted by the instrumental function; the brightest one (geocoronal H α) is lower than or equal to 0.5 event/px/h. The nebular lines are well fitted by gaussian profiles convolved with the instrumental function. A gaussian profile with a height of 1 event/px/h per channel and width $\Delta V = 25 \text{ km s}^{-1}$ roughly corresponds to a flux of 4 Rayleighs (Russeau et al. 1995).

Figure 1 shows 4 images of the mosaic of 26 fields observed at H α wavelength. Each image is made by adding 2 λ maps, thus covering a wavelength range of $0.2 \text{ \AA}$ (10 km s^{-1}). To show at best the different emission components we chose the images centered on the following values of radial velocity: $V_{\text{LSR}} = -13 \text{ km s}^{-1}$, -28 km s^{-1} , -37 km s^{-1} and -56 km s^{-1} . Apart from the brightest HII regions which can be seen on the 4 images one can see that many structures only show up at given velocities.

The main problem was to separate clearly the various components with faint intensity found in the complex H α line profile. Inside a given field we could distinguish most often 4 main components (leaving the geocoronal H α and OH nightsky lines apart) each corresponding to a different layer of ionized hydrogen. Generally the different components exhibit the same velocity all over the observed field, which enables to follow them rather easily despite their highly changing intensity.

2.1. Discrete HII regions

RCW 108

The very bright region seen in the field marking the south-west corner of the mosaic actually belongs to the HII region RCW 108. The brightest parts of this field have a velocity of -23 km s^{-1} while the filaments of the north-east part of the same field are found at -21 km s^{-1} .

RCW 113

In the north-east corner of the mosaic one can see the southern part of the large HII region RCW 113. The velocities measured there are more changing. In the northernmost field the main component is found at an average velocity of -22 km s^{-1} but some parts reach -30 km s^{-1} . Two other components are found in the same field, a uniform one at -12 km s^{-1} and another one at some places around -55 km s^{-1} . The southern neighbouring fields between $\delta = -43^\circ 30'$ and $\delta = -44^\circ$ display filaments with velocities increasing step by step up to -16 km s^{-1} . The emission between $\delta = -44^\circ$ and $\delta = -44^\circ 30'$ exhibits velocities ranging from -14 km s^{-1} to -10 km s^{-1} but it is hard to know if it still belongs to RCW 113 or is linked with the diffuse general emission at -12 km s^{-1} .

RCW 110-111 (Gum 54)

This group is composed of several condensations bathing in an extended nebulosity at -29 km s^{-1} . Table 1 summarizes the velocities measured for the different condensations.

G 339.128 - 0.408

This HII region, roughly circular with a $6'$ diameter, has not been listed by Rodgers et al. (1960). It is well seen on our maps and corresponds to a radio continuum source exhibiting the same shape. Its average velocity is -38 km s^{-1} and its intensity reaches 18 evt./px/h.

G 338.742 + 0.641 and G 338.943 + 0.604

These radiosources are associated with an H α emission looking like a bright condensation with two wings. An enlargement of this region can be seen in Marcelin et al. (1995). Marston et al. (1994) already mention a faint nebular emission associated with WR 76 which is probably involved in the excitation process of this HII region. The H α velocity measured (-62 km s^{-1}) makes it the most distant H α region at these galactic longitudes.

G 340.240 + 0.482

This radiosource has been detected at H α wavelength in our survey. Like the previous ones it is quite bright and well seen in Fig. 1d.

G 341.050 - 0.100 and G 341.264 - 0.317

These radio continuum sources are detected at H α wavelength with the same velocity (-38 km s^{-1}) as measured through recombination lines. The H α emission at -38 km s^{-1} is detected all over the studied area but its intensity is higher around these sources (up to 1.5 evt./px/h) and shows up as a filament stretched along the Galactic plane in Fig. 1c ($\alpha = 16^{\text{h}}45^{\text{m}}$ to $16^{\text{h}}51^{\text{m}}$, $\delta = -44^\circ 50'$ to $-44^\circ 20'$).

Fig. 1. a to d) Mosaics of the different fields of the observed area showing the different components of the H α emission. The bandwidth of each mosaic is $0.2 \text{ \AA}$ (10 km s^{-1}) centered on the V_{LSR} velocities indicated. The intensity of the H α emission is coded following a scale of gray levels, with the clearest gray for intensity around 0.3 evt./pix/h and black for intensity above 5 evt./pix/h .

Fig. 1. b)

Fig. 1. c)

Fig. 1. d)

Table 1. Radial velocities of RCW 110-111 condensations

α	δ	dimension	gaussian height (evt./px/h)	V_{LSR} (km s $^{-1}$)	ΔV (km s $^{-1}$)
16 ^h 50 ^m 3	-45°04'	6'	22	-26	24
16 ^h 50 ^m 7	-45°09'	3'	40	-31	25
16 ^h 50 ^m 9	-45°09'	1'	29	-29	26
16 ^h 51 ^m 45	-45°2'5	1'	20	-30	28
16 ^h 51 ^m 5	-45°4'	1'	16	-32	25

2.2. Diffuse ionized hydrogen

As underlined above there are several faint diffuse emissions, with different velocities, seen as distinct components of the H α profile all over the studied area. The measured velocities appear to be grouped around a few average values, hereafter classified in decreasing order of velocity.

Emission around 0 km s $^{-1}$

A very faint component (0.1 to 0.4 evt./px/h) with V_{LSR} around 0 km s $^{-1}$ must be added almost everywhere to match the complex line profiles observed.

Emission around -12 km s $^{-1}$

This emission is very faint (≤ 0.6 evt./px/h) except in the northern part of the area where it reaches 9 evt./px/h and shows up as a cluster of elongated patches in Fig. 1a between $\delta = -44^\circ$ and $\delta = -44^\circ 30'$. This faint component is rather hard to distinguish from the neighbouring component (with slightly more negative velocity) but it seems to be detected all over the observed area.

Emission around -28 km s $^{-1}$

It is most often the brightest component, with an intensity ranging from 0.4 to 4 evt./px/h and a velocity range of -24 km s $^{-1}$ to -32 km s $^{-1}$. It is clearly seen in Fig. 1b, especially at negative galactic latitudes where it shows up as filaments between $\delta = -44^\circ 30'$ and $\delta = -47^\circ 0'$. RCW 110-111 belongs to this component.

Emission around -39 km s $^{-1}$

Slightly fainter than the previous one (its intensity ranges from 0.2 to 2 evt./px/h) it is detected everywhere. Its brightest parts show up as filaments in Fig. 1c although they are often difficult to distinguish from the filamentary structure of the component at -28 km s $^{-1}$ which remains visible on this map. Only a careful examination of the velocity profiles enables to detect unambiguously the component at -39 km s $^{-1}$. Several HII regions belong to this last component: 339.128 - 0.408, 341.050 - 0.100 and 341.264 - 0.317. A rather bright HII region with the same velocity can be seen to the south of RCW 110-111.

Emission around -50 km s $^{-1}$

Extended over about 1.5° (between $\alpha = 16^{\text{h}}40^{\text{m}}$ to $16^{\text{h}}50^{\text{m}}$ and $\delta = -44^\circ 0'$ to $\delta = -45^\circ 30'$) this emission is localized around the radiosource 340.047 - 0.253, exhibiting the same velocity, and reaches a maximum intensity of 1 evt./px/h.

3. Radial velocities of HII regions

In Table 2 we give the radial velocities of the HII regions found between $l = 336^\circ$ and $l = 342.4^\circ$. They have been grouped according to their velocity and morphology in order to identify the large complexes or regions physically separated. We also added the dark clouds for which a radial velocity is given in the literature.

- *Column 1*: Identification of the source.
- *Column 2*: Approximate dimensions of the source from optical (Rodgers et al. 1960) or radiocontinuum measures (Haynes et al. 1978).
- *Column 3*: H α velocity (V_{LSR} found from our Fabry-Perot measurements).
- *Column 4*: Velocities measured from radio recombination lines found in the literature.
- *Column 5*: CO velocities found in the literature.
- *Columns 6-8*: Velocities found in the literature from absorption lines at H $_2$ CO, OH and HI wavelengths.
- *Column 9*: Adopted distance. Those marked by an asterisk are stellar distances which are discussed in the following section. The other ones have been calculated from the average velocity of the complex using the Brand & Blitz (1993) Galactic rotation curve with $R_0 = 8.5$ kpc and $\theta_0 = 220$ km s $^{-1}$.
- *Column 10*: Associated stars.

Systemic velocity of the RCW 108 complex

This complex is composed of objects of various types, making difficult to find its systemic velocity (the most representative of its rotation about the galactic center). RCW 108 is an HII region with extended H α emission displaying numerous sharp dust edges and filaments. It is probably excited by the two O type stars of the cluster NGC 6193 forming the core of the Ara OB1 association. An average H α velocity of -20 km s $^{-1}$ has been measured by Georgelin & Georgelin (1976) from Fabry-Perot observations (with a fixed spacing between the plates). The north-west part of this HII region has been considered by Bruhweiler et al. (1981) as being a nebula 2° in diameter bounded by a thin outer dust shell. In the center of this nebula lays the S-shaped nebula RCW 107 itself surrounded by a shell of sharp filaments covering about $20' \times 15'$. RCW 107, associated with the Of star HD 148937, is a bipolar nebula with a complex velocity

pattern which is studied in the frame of our H α survey (Rusell 1996). The H α velocities measured around RCW 107 are close to -21 km s^{-1} , with values at -18 km s^{-1} in a field to the southwest. These values are close to the velocity found for RCW 108, suggesting that the nebula pointed out by Bruhweiler et al. belongs to the nebular complex RCW 108, although it possesses its own exciting source (HD 148937). Moreover the distances obtained for the star HD 148937, and for the cluster NGC 6193, exciting RCW 108, are nearly the same.

The H166 α radio emission line has been detected with a velocity -20 km s^{-1} in the direction of NGC 6193 by Cersosimo (1982) using a half power beam width of $34'$. Contrary to the H109 α line, emitted by dense cores, the H166 α line originates in low density gas. Let us note that the H α emission (for which we also found a value of -20 km s^{-1}) is also related to the diffuse ionized gas at large scale.

RCW 108 exhibits a bright rim structure $15'$ west of the O stars of NGC 6193, marking the interface between the ionized gas and a dense dark cloud. This dark cloud contains the R association Ara R1 (Herbst 1974, 1975) together with a bright knot ($336.515 - 1.477$), $1'$ in diameter, observed in H 109 α by Wilson et al. (1970) and Caswell & Haynes (1987) at -25 km s^{-1} . One can see in Table 2 that the velocities measured in the direction of this compact radiosource are nearly the same from the CO emission line and H $_2$ CO and OH absorption lines. Infrared observations (Straw et al. 1987) reveal a recent star formation activity in this area. Although no CO mapping of NGC 6193 has been made at high resolution there are some evidences that CO molecular clouds with velocities above -25 km s^{-1} do exist. For instance Arnal et al. (1987) found -22 km s^{-1} and -19 km s^{-1} respectively $30'$ west and $40'$ south of NGC 6193. Philips et al. (1986) found a velocity -17 km s^{-1} for a compact CO ($j = 2-1$) cloud near the O stars of NGC 6193, probably being parental material.

Arnal et al. (1987) and Rizzo & Bajaja (1994) bring observational evidence for a large expanding HI structure. According to Rizzo & Bajaja the barycentric velocity of the HI shell is -16 km s^{-1} and its expansion velocity higher than 12 km s^{-1} . This shell could originate from the strong stellar winds of massive stars from NGC 6167, located at the center of the structure. The shell of sweptup material running into the molecular clouds would have triggered the formation of NGC 6193. Rizzo & Bajaja also claim that star formation is still going on in the dark cloud west of NGC 6193, in which direction velocities are different from that of the parental gas. Moreover Whiteoak & Gardner (1985) suggest from observations of interstellar NaI towards NGC 6193 stars that the turbulence seen optically has been caused by the interaction between two cloud groups moving towards each other.

As a consequence it seems that the velocity of the ionized gas is not well representative of the original velocity of the complex. The velocity of the HI shell studied by Rizzo & Bajaja (1994) and the similar velocity for the compressed CO cloud studied by Philips et al. (1986) are probably the most representative systemic velocity of the RCW 108 complex and we adopt -17 km s^{-1} .

337.949 – 0.476

The H α emission at -40 km s^{-1} is not reinforced at the very location of the radiosource but is found in several places all around. Furthermore there is no molecular line seen in absorption with more negative velocity and the galactic latitude is rather high. Therefore we conclude that this source is at the near distance.

338.398 + 0.164 and 338.450 + 0.061

Here again there is no H α concentration at the locations of the radiosources but all around, with velocities -28 km s^{-1} and -41 km s^{-1} . It is impossible to conclude whether they are the optical counterparts or not. The H α velocities give kinematical distances 2.2 kpc and 3.2 kpc respectively. We shall adopt the far distance for both radiosources since the OH absorption line exhibits more negative velocities than the H109 α line (let us note however that it is not the case for H $_2$ CO).

339.128 – 0.408

Clark et al. (1975) classified this source as a radio supernova remnant but Van den Bergh (1978) considered it as a low excitation planetary nebula. Its optical spectrum did not allow Murdin et al. (1979) to reveal its true nature. Shaver et al. (1980) detected H 109 α as well as H 137 β recombination lines, showing that it is a low excitation HII region.

We measure an H α velocity -38 km s^{-1} , not only for the brightest part of this HII region but also all around in the field where it appears as an extra component superimposed to the general diffuse emission at -28 km s^{-1} .

339.578 – 0.124

Comparing optical and radio emission measurements Haynes et al. (1979) place this object at the far distance because, comparing optical and radio emission measurements they find absorption $A_v > 4.6$ magnitudes. However, we detect H α emission with about the same velocity not only at the very location of this source but also everywhere in the field. Moreover, no absorption line with more negative radial velocity has been observed in this direction, so we adopt the near distance.

339.838 + 0.274

Two faint diffuse emissions are found all over the field, one at -12 km s^{-1} and the other one at -26 km s^{-1} . However, no peculiar concentration of H α emission is seen as it should be if it were at the near distance (1.8 kpc). No data from molecular lines in absorption being available we shall adopt the far distance.

4. Stellar environment

In order to link the radial velocities of the HII regions with stellar distances, independent from deviations from pure circular motions, we have looked for all stars with spectral type ranging from O to B3 in the studied area. We selected in the literature the stars for which data enabled to calculate the distance (spectrum, UBV photometry, $H\beta$ equivalent width, etc...). This work was facilitated by the use of the SIMBAD database of the Centre de Données Stellaires de Strasbourg where we could find a large part of our necessary information. The main references used for this work are (in chronological order): Feast et al. (1961), Whiteoak (1963), Crampton & Fisher (1974), Humphreys (1975), Garrison et al. (1977), Klare & Neckel (1977), Herbst & Havlen (1977), Dachs et al. (1982), Schild et al. (1983), Drilling (1991), Kaltcheva & Georgiev (1992).

Table 3 gives:

- *Column 1*: Identification of the star (HD, CD or CPD identification, W for Whiteoak (1963), VBH for Van den Bergh & Herbst (1975) or HH for Herbst & Havlen (1977).
- *Column 2*: SLS number (Stephenson & Sanduleak 1971) when available.
- *Columns 3 and 4*: Coordinates (α , δ).
- *Column 5*: Spectral type.
- *Column 6*: V magnitude.
- *Column 7*: $B - V$ index.
- *Column 8*: $U - B$ index.
- *Column 9*: β index.
- *Column 10*: Absorption $A_v = 3.2 [(B - V) - (B - V)_0]$. The intrinsic colour index being taken from Schmidt Kaler (1983).
- *Column 11*: Distance in kpc. The calibration absolute magnitude - spectral type used to calculate the distance is that from Humphreys & Mac Elroy (1984). When no spectral type was available in the literature we deduced it from the UBV photometry assuming a luminosity class V.
- *Column 12*: Heliocentric velocity of NaI interstellar absorption lines observed in the spectrum of the star (mainly by Whiteoak & Gardner 1985). The underlined velocity is that of the main component.
- *Column 13*: Heliocentric velocity of CaII interstellar absorption line by Arnal et al. (1988).
- *Column 14*: Notes. Mention of spectroscopic binary type and cluster it seems to belong to or an HII region it seems to excite.

Although most of the stars of Table 3 are not exciting stars of discrete HII regions they enable to know distances of places where they are most numerous, thus revealing the distance of the nearest spiral arms.

The Wolf-Rayet star LSS 3693 is the exciting star of the HII region 338.943+0.604 we detected at H α wavelength. Van der Hucht et al. (1988) have calculated a

photometric distance of 6.33 kpc whereas Conti & Vacca (1990) indicate 9.6 kpc and Smith et al. (1990) 5.19 kpc from the same data (spectral type and photometry). The scattering of the results is mainly due to the differences in intrinsic colour index used by the different authors.

The data for stars of the cluster NGC 6200 mainly come from FitzGerald et al. (1977) who give a distance 2.4 kpc. However, the individual distances given for the outermost stars are clearly different from this value and they probably do not belong to this cluster.

Table 4 summarizes the main data and distances for the star clusters found in the observed area.

- *Column 1*: Name of the cluster.
- *Columns 2 and 3*: Coordinates 1950, α , and δ .
- *Columns 4 and 5*: Galactic coordinates, l and b .
- *Column 6*: Spectral type of the hottest star of the cluster.
- *Column 7*: Absorption $A_v = 3.2 E_{B-V}$.
- *Column 8*: Distance derived from photometric properties.
- *Column 9*: Reference.
- *Column 10*: Average heliocentric radial velocity of the cluster. Between parenthesis we give the number of stars used for this measure together with the quality (w increasing with the accuracy).
- *Column 11*: Reference for the radial velocity.
- *Column 12*: HII region excited by the cluster.

5. Discussion

The different layers of gas encountered along the line of sight in the direction of the observed area of the Milky Way, are discussed hereafter in order of increasing distance.

The two layers of faint diffuse H α emission, around 0 km s $^{-1}$ and -12 km s $^{-1}$, are detected all over the observed area but there is no discrete HII region (H α or radio) associated with them. However, there is neutral material with the same velocity in this direction such as the dark clouds listed in Table 2: DC 338.6 + 2.1 and DC 339.0 + 0.4, at $V_{LSR} \simeq -3$ km s $^{-1}$ or DC 337.8 - 1.6 and DC 338.3 - 2.0, at $V_{LSR} = -11$ km s $^{-1}$. These two velocity components are also found when measuring the position of absorption lines due to interstellar sodium in the spectra of stars. All the stars of Table 3 for which this measure was known exhibit an heliocentric velocity component between -4 km s $^{-1}$ and $+2$ km s $^{-1}$, giving an average $V_{LSR} = 4 \pm 1$ km s $^{-1}$ (Whiteoak & Gardner 1985). Most of these stars also exhibit the second component, with an heliocentric velocity ranging from -11 km s $^{-1}$ to -19 km s $^{-1}$ (average $V_{LSR} = -12$ km s $^{-1} \pm 2.5$ km s $^{-1}$).

At CO wavelength the latitude-velocity contour diagrams (Bronfman et al. 1989) at these galactic longitudes mainly show small clouds around -3 km s $^{-1}$ for l below 340° and clouds around 5 km s $^{-1}$ for l above 340° . These

Table 4. Open cluster distances

Cluster	α 1950 h m	δ ° ' "	l °	b °	Sp	A_v	d kpc	Ref	V_{hel} (km/s)	Ref	Associated HII region
NGC 6167	16 30.6	-49 30	335.32	-1.28	B	2.5 2.85	1.2 0.6 1.5	1 2 3			
NGC 6169	16 30.5	-43 57	333.38	+2.51	O no cluster		1.10 1.14	2 4	6($w=1$)	2	
NGC 6178	16 32.1	-45 32	338.40	+1.23	B5 B1	0.77 0.74	0.90 0.91	2 4	4.5(4 $\star$, $w=2$)	16	
NGC 6193	16 37.5	-48 40	336.70	+1.57	O7 O8 O O5	1.47 1.36 1.43 1.52	1.35 1.36 1.30 1.32 1.41	2 3 5 6 7	-24(5 $\star$, $w=0$) -34(19 $\star$) CaII - 17.5	16 17 17	RCW 108
NGC 6200	16 40.5	-47 23	338.00	-1.09	B0	2.02 1.95	2.26 2.4 1.8	2 8 9			
NGC 6204	16 42.8	-46 56	338.59	-1.08	OB B8 B0-1	1.50 1.21	0.89 0.81 1.32	2 4 5	-39($w=1$)	2	
Hogg 22	16 43.0	-47 01	338.55	-1.16	O9	2.11 2.04	2.8 2.78	2 4	-52(3 $\star$, $w=1$)	16	
Westerlund 1	16 43.2	-45 45	339.56	-0.39	OB	9.67	5.2	10			
NGC 6231	16 50.5	-41 43	343.47	+1.22	O8 B0 B0	1.47 1.26 1.41	1.85 1.77 2.0 1.62 1.6 2.0	2 5 11 12 13 14	-23($w=3$) -23(6 $\star$, $w=3$)	2 16	RCW 113
Lynga 14	16 51.6	45 14	340.88	-1.16	O9	4.74 4.59	2.25 2.34	2 15			RCW 110-111
NGC 6250	16 54.3	-45 52	340.79	-1.83	B8 B1	1.22 1.12	1.00 0.95	2 15			

References:

(1) Bruck & Smyth (1966), (2) Lynga (1987), (3) Rizzo & Bajaja (1994), (4) Moffat & Vogt (1973), (5) Becker & Fenkart (1971), (6) Herbst & Havlen (1977), (7) Vasquez & Feinstein (1992), (8) FitzGerald et al. (1977), (9) Fenkart & Binggeli (1979), (10) Westerlund (1987), (11) Garrison & Schild (1979), (12) Nicolet (1981), (13) Van Genderen et al. (1984), (14) Perry et al. (1991), (15) Moffat & Vogt (1975), (16) Hron (1987), (17) Arnal et al. (1988).

clouds are found within a large range of latitude suggesting that they are quite near. As for the -12 km s^{-1} component it is also found in CO at rather low latitudes ($b \sim -2^\circ$) with a large CO cloud at $V_{LSR} \sim -10 \text{ km s}^{-1}$ between $l = 337.5^\circ$ and $l = 341.75^\circ$.

The layer of interstellar matter with velocity close to 0 km s^{-1} is beyond any doubt related to the Sco - Cen association whose center is at 170 pc from the Sun (see Bochkarev 1987 for a review) but its precise location

with respect to the stars of the association is not clear (Crawford 1991). As for the layer of interstellar matter with velocity close to -12 km s^{-1} , giving a kinematical distance of 1.1 kpc, it is probably related to the nearest stars of Table 3, with mean distance $d = 1.1 \pm 0.15 \text{ kpc}$, and to the clusters NGC 6169, 6204 and 6250 ($d = 1.0 \pm 0.1 \text{ kpc}$).

Slightly further, at 1.4 kpc, one finds the Ara OB1-RCW 108 complex whose velocity has been discussed in Sect. 3. It is an important yardstick in the Sagittarius-Carina arm.

The Sco OB1-RCW 113 complex is brighter and larger than the previous one. The cluster NGC 6231 is the core of this complex and lays at the center of a large expanding bubble, RCW 113, on which is superimposed a huge HII region, IC 4628. Whether this HII region belongs to the complex or is seen in front of it is not clear. There are two main groups of velocities for its ionized hydrogen (Laval 1972) with -18 km s^{-1} to the north and -9 km s^{-1} to the south. The velocity of the CO cloud associated with IC 4628 has been estimated as -15 km s^{-1} from the velocity maps of Bronfman et al. (1989).

As for the bubble RCW 113, it is almost certainly related to NGC 6231 and at the same distance, 2 kpc (Perry et al. 1991), but its systemic velocity is not well known. Indeed we have seen in Sect. 2.1 that the outermost regions, south of RCW 113, have filamentary shapes and exhibit a gradient, from -22 km s^{-1} at $43^\circ 30'$ to -12 km s^{-1} at $-44^\circ 30'$. With such a velocity gradient an average velocity cannot be derived for RCW 113 since its exact limits are not known.

The layer of ionized hydrogen at -28 km s^{-1} (corresponding to a kinematical distance 2.4 kpc) is composed of well structured objects such as the HII region RCW 110-111, associated with stars (including the cluster Lynga 14) at an average distance 2.5 kpc, in good agreement with the kinematical distance. The clusters NGC 6200 ($d = 2.3 \text{ kpc}$) and Hogg 22 ($d = 2.8 \text{ kpc}$) are probably partaking of the excitation of this layer of gas. The presence of an important stellar group at about 2.5 kpc has been already found by FitzGerald (1987) in a 21° square field at $l = 335^\circ$, $b = 0^\circ$ and similarly by Kaltcheva & Georgiev (1992) and Rizzo & Bajaja (1994) in the Ara OB1 association.

The layer of ionized gas at -39 km s^{-1} (corresponding to a kinematical distance of 3.1 kpc) also exhibits local concentrations and HII regions (337.949–0.476, 338.921–0.089, 339.128–0.408, 341.050–0.100 and 341.264–0.317). The few stars in Table 3 which may belong to these regions give an average distance 3.0 kpc, in good agreement with the kinematical distance. Whiteoak & Gardner (1985) have detected a component of the interstellar NaI line at $V_{\text{hel}} = -37 \text{ km s}^{-1}$ (average value). 15 stars in Table 3 exhibit this component (with $V_{\text{hel}} < -35 \text{ km s}^{-1}$) and are found at an average distance $3.3 \pm 1.1 \text{ kpc}$. Averaging with the above stellar value we finally adopt 3.1 kpc for this layer of ionized gas.

Fig. 2. Histogram of the distribution of stars of Table 3 as a function of distance. The different components of ionized gas discussed in the text are plotted according to the suggested distance and referenced by their V_{LSR} velocity or name. The tick marks are thinner when the distance is more uncertain

A distant patch of ionized gas is detected, with $V_{\text{LSR}} = -50 \text{ km s}^{-1}$, in the direction of the HII regions 340.047–0.253 and 340.279–0.222. A large molecular cloud is found at the same location and same velocity on the CO maps by Bronfman et al. (1989). The corresponding kinematical distance is 3.8 kpc but no possible exciting star can be found there. However, Fig. 2 shows a histogram of the stars of Table 3 revealing that beyond 3.5 kpc there are two stellar groups at 4.4 kpc and 5.1 kpc. The ionized gas at -50 km s^{-1} could be associated with the first group at 4.4 kpc.

The outermost ionized gas encountered in the observed area is found at an average velocity -61 km s^{-1} , corresponding to a kinematical distance of 4.3 kpc. Several HII regions detected there with our H α Survey were only known as radiosources up to now (338.742+0.641, 338.943+0.604 and 340.240+0.482) as discussed in Sect. 2.1. The radiosource 342.085+0.423 with velocity -65 km s^{-1} could not be detected unambiguously since it is hidden behind RCW 113 which is quite bright at that place. A faint component at -55 km s^{-1} is seen in the H α profile there but it is not possible to know whether it is due to the region 342.085+0.423 itself or to an expansion motion of RCW 113. Anyway all 4 HII regions have similar latitude and velocity and, beyond any doubt, belong to the same spiral arm. The exciting star of 338.943+0.604 is known (see Sect. 4) but its distance is not accurately known, varying from 5.2 kpc up to 9.6 kpc depending on the authors. As underlined above there is a group of stars (Fig. 2) at about 5.1 kpc and the open cluster Westerlund 1 is at 5.2 kpc (see Table 4), suggesting that there is a spiral feature at about 5 kpc.

As can be seen on Table 2 several HII regions known as radiosources have not been detected at H α wavelength. All of them are quite far away, near the tangent point

(regions with velocities around -100 km s^{-1}) or at the far distance according to H $_2$ CO, OH or HI velocities, which is quite coherent with the lack of H α detection. According to their clustering and velocities these distant HII regions may be grouped in three bundles at 8, 12 and 15 kpc.

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Table 2. Radial velocities of HII region complexes

Object	dim. '	H α km/s	H 109 α km/s	CO km/s	V_{LSR} H ₂ CO km/s	OH km/s	HI km/s	Adopt. dist. kpc	Assoc. stars
336.375-0.131	5		-88 (1)		-119,-39 (1)	-37 (4)		★ 1.4	
336.404-0.234	5		-68.5 (2)		-39 (3)				
336.489-0.154	7		-93 (1)		-88,(-39) (3)	-38 (4)			
RCW 107	8x4		-93.1 (2)						
			-84 (1)		-90 (1)				
			-88.6 (2)		-89 (3)				HD 148937
336.456+0.038	10		-63 (1)		-129,(-96), (-72),-38 (3)			11.3	
RCW 108	210	-20	-20 (5)					★ 1.4	NGC 6193
336.514-1.477	x210 1		-25 (1)	-25.5 (6)	-22 (3)	-24 (4)	-26,(-9.0) (7)		
CO16 ^h 38 ^m -48°42'	7x5		-24.9 (2)	-26.5 (8)					
DC 336.4-1.4	15x10			-17.5 (9)	-23.0 (12)				
336.732+0.072	7		-78, -112 (1)		-119,-73, -34 (1)	-76,-50,-38 -20,-4 (4)		10.9	
336.840+0.047	9		-78.9 (2)	-117,-74, -35 (8)	-122,-114, -76,-37 (3)				
336.9-01	6		-79 (1)		-119,-75, -38 (3)				
337.147-0.181	5		-73.1 (2)	-73.5 (6)	-119,-87,-74, -39,-21 (3)	-76,-38, -21 (4)	-73,(-117, -98,-37, -20) (7)		
			-73 (1)	-115,-86,-74, -54,-37(10)	-66,-38 (3)	-118,-75, -38,-20 (5)			
337.3-0.1	4		-72.7 (2)	-115,-71, -54,-37 (8)		-119,-75, -68,-39 (5)			
			-53.5 (2)						
337.548-0.304	3		-101 (1)		-62,-35 (1)			5.9-9.8	
337.665-0.048	10		-55 (2)	-46 (10)	-94,-47 (3)	-46,-38 (5)		11.9	
337.8-0.1	4		-52 (11)	-54 (15)	-90,-50, -37 (3)	-38 (4)	-122,(-52, -38,-20)(7)		
338.014-0.121	11		-54 (1)		-88,49 (1)	-89,-42 (4)			
338.087+0.007	8		-52.5 (2)	-117,-94, -51 (8)	-89,-50 (3)	-89,-41 (5)			
338.131-0.173	9		-47 (1)		-88,-69,-52, -40 (3)				
			-41.7 (2)		-89,-43 (3)				
337.949-0.476	1.3	(-40)	-53 (1)	-42.1 (8)	-37 (3)	-36 (4)	-50 (7)	3.1	
			-40 (1)			-35,-24 (5)			
			-40.4 (2)						
DC 337.8-1.6	6x4				-10.7 (12)			1.0	
DC 338.3-2.0	24x14				-10.6 (12)				
338.398+0.164	4x8		-29 (1)	-110,-59, -34 (8)	-35 (1)	-117,97,-79, -33,-3 (5)		13.0	
338.450+0.061	5x9		-37 (1)	-116,-99,-78, -42,-29 (8)	-36 (3)	-77,-34 (4)	(-127,-115, -58,-33, 0) (13)		
			-36.9 (2)		-29 (3)	-75,-36,-28 (5)			
338.407-0.238	1		2 (1)		-36 (3)	-35 (4)		15.8	
			-4.3 (2)			-36 (5)			
338.742+0.641	5	-61	-62 (1)						
338.943+0.604	3.5	-62	-63 (1)	-61 (15)	-63 (3)	-63 (4)	-62,(-37, -20,2) (7)	★(5.2) or 4.3	WR76
339.286+0.163		(-60)	-63.0 (2)		-69,-29 (1)	-62 (5)			
			-71 (1)						
DC 338.6+2.1	12x8			-3.8 (14)	-3.3 (12)			0.3	
DC 339.0+0.4	45x5				-2.4 (12)				
338.921.-0.089	1.8	-41	-40 (1)		-45 (3)	-46,-37 (5)		3.1	
			-40 (2)						
339.128 - 0.408	7	-38	-37 (1)					★ 2.7?	SLS3723, 3746?
339.089-0.216	4.2		-120 (1)	-120 (15)				6.7-9.2	
339.578-0.124	4.2	-29	-30 (1)		-33 (1)			2.6	
DC 339.5-0.8	15x5				-23.3 (12)				

Table 2. continued

Object	dim. '	H α km/s	H 109 α km/s	CO km/s	V _{LSR} H ₂ CO km/s	OH km/s	HI km/s	Adopt. dist. kpc	Assoc. stars
339.838+0.274	3.1		-19 (1)					14.1	
339.955-0.566	3.5		-89 (1)		-93,-20 (1)			5.5 or 10.5	
340.047-0.253	8x3	-50	-52 (1)	-50 (15)	-53,-35 (3)			3.8	
340.279-0.222	2	-50	-43 (1) -43.3 (2)		-52,-47, -35(3)	(-93),-40 (4) 46,-35 (5)			
340.240+0.482	10x6	-60	-62 (1)					4.4	
DC 340.5+0.5	7x2				5.0 (12)				
340.777-1.008	5.3		-25 (1)	-31,-16 (8)	-28 (3)	-28,-16 (5)	-28,(-13) (7)	★ 2.5	SLS3799,
= RCW 110-111		-29		-28 (15)		-28 (4)		2.6	3825, Ly14
341.050-0.100	12	-38	-38 (1)		-42 (1)			★(3.4)?	HD151791?
341.264-0.317	9x6	-38	-38 (1)		-44 (1)			3.2	
341.963+0.205	5		-8 (1)	-8 (15)	-80,-40, -20,-8 (1)			15.3	
342.085+0.423	1		-65 (1)					4.7	
342.300+0.314	11		-122 (1)					6.7-9.5	
342.382-0.044	5.6		-13 (1)		-20,-74 (1)			14.8	

References:

(1) Caswell & Haynes (1987), (2) Wilson et al. (1970), (3) Whiteoak & Gardner (1974) and Gardner & Whiteoak (1984), (4) Caswell & Robinson (1974), (5) Turner (1979), (6) Gillespie et al. (1977), (7) Caswell et al. (1975), (8) Whiteoak et al. (1982), (9) Phillips et al. (1986), (10) White & Phillips (1982), (11) Dickel & Milne (1972), (12) Goss et al. (1980), (13) Goss et al. (1972), (14) Alvarez et al. (1986), (15) Estimated from Bronfman et al. (1989).

Table 3. Stellar distances

Star	SLS	α h m s	δ 1950 ° ' "	Sp	V	$B - V$	$U - B$	β	A_v	d (kpc)	V_{hel} NaI	V_{hel} CaII	N
148260	3621	16 25 13	-44 55 26	B1Ib	7.93	0.41	-0.50	2.580	2.02	2.2			
148259		16 25 15	-44 42 10	B2III	7.42	0.13	-0.57	2.621	1.15	1.0			
328209	3624	16 25 45	-44 21 41	O9.5Ia	9.77	0.80	-0.20	2.550	3.17	5.0			
148379	3625	16 26 04	-46 08 03	B1.5Iap	5.34	0.57	-0.42	2.522	2.54	1.1	- 35,-22, -8,-1,+6		
148538		16 27 07	-44 42 30	B2V	9.29	0.36	-0.40	2.653	1.91	0.9			
148567	3632	16 27 24	-46 22 19	B1IIIne	7.76	0.37	-0.54	2.514	2.02	1.0			
148610		16 27 47	-49 1 22	B3III	8.22	-0.02	-0.59	2.693	0.58	1.3			
148937	3646	16 30 10	-48 0 25	O6If	6.72	0.34	-0.66	2.555	2.08	1.7	- 22,-11, +1; -14		1
148989	3650	16 30 22	-48 46 37	B0.7Ia	8.81	0.60	-0.40	2.548	2.65	4.3	- 38,-18, +1		
149038	3654	16 30 31	-43 56 29	O9.7Iab	4.95	0.03	-0.85	2.553	0.88	1.3	-5	+4	2
149019	3651	16 30 36	-49 39 58	A0Ia	7.42	0.88	0.15	2.545	2.75	2.2	(- 38),-18, +1		
-44°10965		16 31 35	-44 16 41	B0.5IV	9.64	0.39	-0.50	2.608	2.13	2.4			
149257	3668	16 32 08	-45 31 09	B2Vp	8.47	-0.02	-0.78	2.621	0.70	1.1			3
149277		16 32 11	-45 34 37	B2IVn	8.38	0.03	-0.65	2.641	0.86	1.2			3
149426	3675	16 33 15	-48 33 49	B0.5Ib	9.51	0.61	-0.38	2.566	2.74	4.1	(52),-38, -29,-14, +1	- 15.0	
149452	3679	16 33 30	-47 01 47	O8.5III	9.05	0.59	0.43	2.585	2.88	1.9	- 18, 0		
149610		16 34 28	-48 07 13	B2/3Vne	9.05	0.03	-0.58		0.78	1.1			
328507	3686	16 34 39	-44 48 34		10.22	0.37	-0.46		2.01	(1.9)			
VBH72b		16 35.0	-48 47	B2V	10.79	0.41	-0.43		2.08	1.7		-20	4
328530	3688	16 35 01	-45 30 09		10.99	0.42	-0.44		2.19	(2.5)			
					10.64	0.54	-0.61		2.84	(4.4)			
VBH72c		16 35.4	-48 50	BIVp	11.50	0.66	-0.29		2.94	2.2			4
149834		16 35.9	-48 45		9.17	0.21	-0.57		1.49	(1.2)		-13	5
VBH72a		16 36.3	-48 42	B3V	11.02	0.38	-0.30		1.86	1.4			4
WR76	3693	16 36 27	-45 35 20	WC9	[15.46]	[1.12]			(5.5)	(5.2)			6
									(6.7)	(9.6)			
	3694	16 36 48	-48 27 25		10.34	0.30	-0.53		1.80	(2.2)		-15	7
150041	3695	16 36 59	-48 39 36	B0III	7.06	0.08	-0.83	2.581	1.18	1.5	-14,+2	-14	7
W44		16 37.0	-48 43		10.71	0.18	-0.50		1.3	(1.9)		-18	7,8
-47°10939	3696	16 37 06	-47 38 45	B1II	11.15	0.68	-0.41		3.01	4.5	(- 43),-19, +1		
-47°10941	3698	16 37 12	-47 39 48	B0IV	9.98	0.58	-0.46		2.84	2.2	(- 47),-22, +2		
HH 291					10.86	0.27	-0.43		1.58	(1.8)		-13	7
150135	3700	16 37 35	-48 40 04	O6.5V(f)	6.89	0.17	-0.80	2.591	1.57	1.2	(-35),- 23, -12,0	-15	7,5
150136	3701	16 37 35	-48 40 03	O5III(f)	5.51	0.19	-0.78	2.568	1.60	(1.0)	(-35),- 24, -14,0	-13	7,9
W53		16 37.6	-48 39		9.55	0.20	-0.65		1.53	(2.1)		-34	7
	3702	16 37 37	-48 39 18	B0IV	8.40	0.15	-0.68		1.44	2.0			7
150155		16 37 40	-46 45 42	B2-3II	9.41	0.23			1.76	(2.8)			
W54		16 37 41	-48 39 30	B0V	8.45	0.16	-0.70		1.47	1.4	-34,-24, -13,+1	-18	7,8
328686	3705	16 37 47	-46 49 1	B3Vnn	10.46	0.44	-0.33		2.05	1.0			
-48°11076		16 37 48	-48 28 13	B1IV	10.10	0.39	-0.50		2.08	2.3		-6	
	3704	16 37 50	-48 40 36		10.45	0.28	-0.33		1.63	(1.2)		-24	7,8
-48°11078		16 37.8	-48 38	B2V	10.04	0.26	-0.56		1.68	1.5		-23	7,9
-48°11080		16 37 51	-48 41 28		10.32	0.26	-0.47		1.58	(1.8)		-10	7
-48°11082		16 38 01	-48 41 55		10.38	0.25	-0.54		1.61	(2.1)		-13	7
150197	3707	16 38 1	-47 27 27	O9III	9.51	0.40	-0.57	2.584	2.27	3.1	- 40,-27, -16,+1		
W65		16 38.1	-48 39		10.38	0.38	-0.36		1.95	(1.5)		-24	7
W66		16 38.2	-48 36		10.05	0.31	-0.38		1.69	(1.2)		-20	7,8
W67		16 38.3	-48 37		10.59	0.41	-0.37		2.08	(1.6)		-23	7
150288	3710	16 38 35	-46 55 14	B2IV:nep	8.69	0.14	-0.62	2.525	1.22	1.3			
	3711	16 38 51	-44 3 10	O9.5Ia	10.27	0.63	-0.38		2.82	8.1			
	3713	16 39 29	-47 24 59	B2V	10.64	0.32	-0.59		1.79	1.9			10
150422	3714	16 39 28	-46 24 46	B1.5Vne	8.97	0.24	-0.62	2.408	1.57	1.1			

Table 3. continued

Star	SLS	α 1950 h m s	δ 1950 ° ' "	Sp	V	$B - V$	$U - B$	β	A_v	d (kpc)	V_{hel} NaI	V_{hel} CaII	N
150423		16 39 29	-48 10 54	B2III	9.26	0.19	-0.56		1.38	2.1			
150533	3716	16 40 05	-45 22 13	O9Ib	9.47	0.64	-0.46	2.553	2.94	3.7	-34,-18, -4		
328867	3718a	16 40 10	-47 25 03	BIV	9.69	0.31	-0.64		1.82	1.6	-29,-18, -1		10
	3717	16 40 12	-47 33 54	B0.5III	10.26	0.36	-0.55		2.05	4.4			10
	3719a	16 40 26	-47 22 35	B0III	9.20	0.32	-0.63		1.95	2.8			10
	3719b			B1IV	10.64	0.47	-0.36		2.34	2.6			10
	3719c			B2IV	10.19	0.32	-0.48		1.79	2.0			10
328862	3721	16 40 27	-47 13 28	B0.5III	10.13	0.28	-0.50		1.79	4.7			10
150574	3723	16 40 28	-46 02 55	O9III np	8.47	0.24	-0.72	2.587	1.75	2.4	-36,-21, -6,+ (14)		11
	3722	16 40 30	-47 19 8	B0V	9.22	0.32	-0.57		1.98	1.6			10
-47°11009		16 40 48	-47 35 52	O5	10.94	0.49	-0.54		2.62	5.5			
150627		16 40 52	-47 22 54	B0IV	9.17	0.36	-0.58	2.599	2.08	2.1	-50,-30, -17,-1		
	3727	16 40 52	-45 10 14		10.98	0.50	-0.20		2.27	(1.2)			
	3728	16 41 04	-47 17 45	B1IV	11.06	0.51	-0.31		2.46	3.0			10
-44°11088	3730	16 41 10	-44 19 31	B0.5Ia ⁺	10.39	1.43	+0.34		5.41	(5.0)			
328870	3729	16 41 16	-47 26 29	B0IV:	10.65	0.34	-0.57		2.05	4.2			10
	3732	16 41 33	-47 17 24	B0.5II	10.82	0.39	-0.50		2.10	5.8			10
-47°11027	3735	16 42 03	-47 50 29	B0.5IaII	9.80	0.62	-0.30		2.66	5.3	-40,-26 -16,-1		
		16 42 31	-46 55 46		10.91	0.36	-0.52		2.03	(3.1)			
-46°11009		16 42 51	-46 59 29	O9.5III	8.50	0.44	-0.55	2.565	2.37	2.1	-36,-18, 0		12
W108		16 42 53	-47 00 43	B0.5III	10.27	0.31	-0.59		1.89	4.7	-37,-18, +1		
-46°11017	3740	16 42 54	-46 59 47	B0III	9.20	0.40	-0.58	2.578	2.21	2.5			12
150958	3741	16 42 57	-47 00 02	O6.5If	7.30	0.35	-0.64	2.510	2.11	2.7	-33,-16, 0		12
151018	3746	16 43 17	-45 47 55	O9.5Iab	8.72	0.62	-0.41	2.556	2.81	3.0	(-65),-28, -17,-1		11
-46°8220		16 42.9	-47 00	B0III	10.24	0.35	-0.58		2.04	4.4			12
328857	3747	16 43 22	-47 13 53	B0.5I	9.95	0.54	-0.40		2.39	6.5			
329033	3755	16 44 18	-47 07 53	B1III	10.03	0.48	-0.35		2.37	2.5			
151213	3759	16 44 36	-47 11 35	B0.5Ib	7.65	0.29	-0.62	2.583	1.70	2.2	-19,-2		
151300	3760	16 45 09	-47 04 49	O5.5III(f)	9.29	0.46	-0.53	2.578	2.50	3.2	-19,+2	-7	
151536		16 46 25	-45 09 03	B2II	9.26	0.32			1.76	2.9			
329027	3769	16 46 44	-47 04 13	O9.5I	9.86	0.82	-0.23		3.46	3.8	-38,-19, 0		
329038		16 46 53	-47 33 29	B2IV	10.01	0.55	-0.33		2.53	1.3			
151791		16 47 59	-44 24 33	B2/3IbII	9.33	0.37			1.79	(3.4)			13
151835	3782	16 48 25	-48 06 31	B1Ia	8.66	0.75	-0.23		3.01	3.4			
	3792	16 49 32	-44 35 22		11.33	0.61	-0.27		2.78	(2.2)			
152077	3793	16 49 39	-43 40 02	B1II	9.16	0.27	-0.55	2.610	1.70	2.4			
152078		16 49 45	-45 22 43	B3III	8.16	0.03	-0.40	2.693	0.74	0.9			
-45°11029	3795	16 49 48	-45 19 27	B1e	11.26	1.05	-0.12		4.19	(4.0)			
Hen3-1271		16 49 53	-44 35		11.33	0.60	-0.27		2.74	(2.3)			
-45°11034	3799	16 50 13	-45 13 26	O8III:n	11.06	0.89	-0.24		3.84	3.0			14
152162		16 50 14	-45 56 01	B2III	8.59	0.18			1.34	1.7			
-45°11051	3815	16 51 04	-45 10 34	O8.5	10.96	0.95	0.11		4.03	(2.0)			15
326440	3823	16 51 22	-43 51 35	B0.5III	10.27	0.70	-0.23	2.631	3.14	2.7			
152386	3825	16 51 29	-44 54 28	O5Ia ⁺ fep	8.13	0.51	-0.49	2.478	2.69	2.8			14
152477		16 52 09	-48 04 07	B1Ib	9.03	0.66	-0.27	2.608	2.76	2.6			

Notes

(1) RCW 107, (2) NGC 6169, (3) NGC 6178, (4) Ara R1, (5) SB2 ?, (6) 338.9 + 0.6 see text, (7) NGC 6193, (8) SB1, (9) SB2, (10) NGC 6200, (11) 339.128 - 0.408 ?, (12) Hogg 22, (13) 341.050 - 0.100 ?, (14) RCW 110-111, (15) Lynga 14