RevMexAA (Serie de Conferencias), **33**, 164–164 (2008)

THE ISM AROUND SOUTHERN O-TYPE STARS

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The structure and kinematics of the interstellar medium (ISM) are strongly modified by the action of stellar winds from massive stars which create interstellar bubbles. These structures can be detected as slowly expanding neutral shells in the HI line emission distribution around O and WR stars (e.g. Cappa & Benaglia 1998; Cappa 2006).

Based on HI 21cm line observations obtained with the radiotelescope of the IAR, and data at other frequencies, we analyzed the ISM in the environs of the galactic O-type stars HD 171589, HD 38666 and HD 124979. They are located at relatively high galactic latitudes ($b > 3°$), favouring the formation of large cavities and shells because of the low ambient densities. This analysis allowed us to disclose HI interstellar bubbles probably related to the stars.

The stellar parameters are summarized in Table 1. The estimated physical parameters (systemic velocity V_{sys}; expansion velocity V_{exp}; kinetic energy E_k; dynamical age t_d) of the probable HI interstellar bubbles associated with the stars, are also listed in Table 1.

The HI emission distribution around HD 171589 reveals two cavities surrounded by a thick neutral shell, with the star projected onto one of them. The supernova remnants G17.4-2.3 and G17.8-2.6 (Green 2001) are projected near the second cavity. The SHASSA-H survey shows the presence of faint optical emission projected onto the O star HI cavity.

The runaway star HD 38666 is an O-type star with weak winds (Martins et al. 2005). The HI emission distribution shows a hole and a shell, elongated in the direction of the proper motion of the star. Neither HII regions nor supernova remnants were detected in the region.

The runaway star HD 124979 is located close to one of the higher density borders of an HI cavity. The cavity and the almost complete shell are elongated in the direction of the fast motion of the star. None HII regions or supernova remnants seems to be linked to the structure.

TABLE 1

STELLAR AND HI BUBBLE PARAMETERS

Stellar parameters			
	HD171589	HD38666	HD124979
$(l, b)(°)$	18.65,-3.09	237.29,-27.10	316.40,+9.08
Sp. Type	O7 II (f)	O9.5 V	O8 II ((f))
d_*(kpc)	1.15-1.5-3.0	0.531	4.1
$\dot{M}$ ($M_\odot$ yr^{-1})	1.3[b]	0.005[a]	1.0[b]
V_w (km s^{-1})	2935[c]	2000[d]	2775[c]
L_w(10^{36} erg s^{-1})	3.5	0.007	2.5
Physical parameters of the HI structures			
V_{sys} (km s^{-1})	+36	+8	−41
V_{exp} (km s^{-1})	10	6	14.5
d_k(kpc)	3.2±0.4	1.0±0.5	3.0±0.5
Adopted d (kpc)	3.2	0.5	3.0
Radius (°-pc)	1.5-85	2.8-26	1.6-82
Swept-up mass ($M_\odot$)	5300±1300	170	2000±670
E_k (10^{48} erg)	7.2	0.05	12
t_d (10^6 yr)	4.7	2.4	3.1

[a]Chlebowski & Garmany (1991). [b]From Lamers & Leitherer (1993) using stellar parameters from Martins et al. (2005). [c]Prinja et al. (1990). [d]Leitherer (1988).

In all three cases, the kinematical distances (d_k) of the HI bubbles agree with the stellar distances (d_*), reinforcing the hypothesis of the association of the HI structures with the stars. The IRAS emission at 100 μm reveals the presence of interstellar dust counterparts of the HI shells and/or voids.

The new HI bubbles have dimensions in the range 50 and 170 pc, and expansion velocities lower than 15 km s^{-1}. The estimated mechanical energies released by these O-type stars into their local ISM is enough to create the observed interstellar bubbles.

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