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THE STUDY OF OB STELLAR ASSOCIATIONS WITH THE GLAZAR

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ABSTRACT

The results of observations of a dozen OB stellar associations made with the ultraviolet space telescope Glazar is presented.

Key Words : OB stellar associations

I. THE GLAZAR SPACE TELESCOPE AND OBSERVATIONS

The *Glazar* space telescope (Tovmassian et al.1988) was functioning at the *Mir Space Station* from August 1987 to March 1989. It is a 40 cm Ritchey-Cretien wide field camera (1°.3, 40 mm at the focal plane) operating at 1640 Åwith a bandwidth of ~ 250 Å. The detector was a Multichannel Intensifier used with film sensitive to a visible light. The cassettes with exposed films have been brought to the Earth by the returning crews.

The star trackers of the telescope with pointing accuracy of about 3 arc were not used, and it was determined with that of the whole *Mir Space Station*, and was equal to about 40 ″. Due to this the sensitivity of the telescope was less. The limiting stellar magnitude decreased from 9^{m} to $\sim 11^{m}$.

Areas of a dozen OB stellar associations have been observed (Tovmassian et al. 1996 and references therein). An area of about 10-20 square degrees has been photographed in each direction by moving the axis of the telescope with steps of about 1°. Each 1°.3 field was photographed twice usually with 4 min and 8 min exposure time.

II. RESULTS AND DISCUSSION

At 1640 Åthe images of only OB and early A type stas were obtained on the *Glazar* photographs. The spectral types of about 15% of the observed stars were unknown. The stellar magnitudes of the observed stars at 1640 AA were measured with an accuracy of about $0.^{m}1$-$0.^{m}2$. Relatively bright stars observed earlier with the *TD-1* (Thompson et al. 1978) or *ANS* (Wesselius et al. 1982) served as standards.

The distribution of OB stars was studied with the help of a variable extinction diagram. Only stars with known spectral types were used. We determined by Johnson & Morgan's (1955) Q–method the so-called quasi–photometric spectral types, and accepted as a more reliable the one that was within one–two subtypes of the known ones. Accepting that $E(m_{1640} - V) = A_{1640} - A_V$, $A_V = 3.3E(B-V)$ and $A_{1640} = 7.69E(B-V)$ (Thompson et al. 1978) the variable extinction relation $(m - M)_{1640} = (m_o - M)_{1640} + A_{1640}$ transfers to $(m - M)_{1640} = (m_o - M)_{1640} + 1.75E(m_{1640} - V)$. Hence in the case of a normal absorption law the points representing stars of a certain physical group should be located on the variable extinction plot along a line with inclination equal to 1.75. The resulting expected spread of points around these lines should be about $\pm 0.^{m}5$.

The larger absorption of an emission of a star in UV in comparison with that of in the visible rays results in a larger gradients of distances, and hence in better distinguishing the existense of groupings of OB stars along the line of sight.

Observations with the *Glazar* reveiled more OB stellar associations in many of the observed directions than it was known before. A new, B type associations, that consist of stars of later than B2.5 spectral type have been discovered (Tovmassian 1991).

To avoid the existing confusion in naming of stellar associationsthis we suggested (Tovmassian et al. 1993) to name associations by the constellation and the distance expressed in kiloparsecs. The letters OB or B show the type of associaion.

III. DISUSSION

1. **OB stellar associations**. The results of observations of stellar associations are summarized in Table 1.

2. **The distribution of the absorbing matter**. The obtained data allowed also to study the distribution of the dust in the observed directions. It was found that the dust is mostly distributed within the volumes of stellar assoiations and that the space between associations is practically free of dust.

3. **Hot components of double**. Images of some late spectral type stars were obtained on the photographs. Their detection with the *Glazar* meen that they have hot companions, which are responsible for the observed far UV emission. The spectal types of hot components were estimated. For 16 stars it was found that the corresponding hot components are mostly white dwarfs or subdwarfs (Tovmassian et al. 1990, 1991).

Table 1. The list of detected stellar associations

Direction	Stellar association	Number of stars	D pc	Direction	Stellar association	Number of stars	D pc
Per OB 1	Per OB 0.5	3	460	Ori OB 1	Ori 1.2	5	125
	Per OB 0.8	5	850		Ori 0.3	24	270
	Per OB 1.5	11	1500		Ori 0.5	46	480
	Per OB 2.6	14	2600		Ori 0.7	17	730
Sco OB 1	Sco OB 0.25	5	250	Cas OB 1	Cas B 0.4	4	400
	Sco OB 1.7	15	1700	Cas OB 2	Cas B 0.4	4	370
Pup OB 1	Pup B 0.1	5	120	Car OB 1	Car B 0.6	13	560
	Pup B 0.4	14	370		Car OB 1.1	13	1100
	Pup B 0.7	8	700		Car OB 2.0	25	2000
	Pup B 1.2	5	1250		CarOB 3.0	21	3000
	Pup OB 2.4	10	2400		Car OB 4.0	6	4000
Pup OB 2	Pup OB 4.0	3	4000		Car OB 5.6	9	5600
Cyg OB 1	Cyg B 0.3	8	300	Vela OB 1	Vela B 0.5	36	460
	Cyg OB 0.7	11	660		Vela OB 1.1	7	1100
	Cyg OB 1.3	6	1300		Vela OB 1.7	9	1700
Mon OB 1	Mon B 0.6	6	650	Gem OB 1	Gem B 0.3	5	300
Mon OB 2	Mon OB 1.7	5	1700		GemOB 1.1	6	1070
Cru OB 1	Cru B 0.6	9	600	Aur OB 1	Aur B 0.6	3	600
	Cru B 0.9	6	850	Aur OB 2	Aur OB 1.1	11	1100
	Cru OB 1.2	13	1200		Aur OB 2.0	6	2000
	Cru OB 1.5	12	1500		Aur OB 3.0	3	3000
	Cru OB 2.6	14	2600				
	Cru OB 2.7	15	1500				
	Cru OB 4.0	13	4000				

4. **Circumstellar dust shells**. High value of $E(m_{1640}-V)$ extinctions of some relatively nearby stars in comparison with that of the remote ones located very close to the first ones on the sky allowed to suggest that their large extinctions could be caused by very small clouds or even circumstellar dust shells in which they are embedded. The consideration of the *IRAS* data at 12 μm, 25 μm and 60 μm confirmed that about 9 stars indeed have circumstellar dust shells (Tovmassian et al. 1996).

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