THE STATISTICAL ANALYSIS OF THE OPTICAL AND INFRARED LUMINOSITIES OF YOUNG STARS

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ABSTRACT. The infrared IRAS data for supposed sources of optical outflows and young stars in Taurus-Auriga complex are studied. It is shown that there exists a group of stars with extremely low optical and infrared luminosities. It's suggested, that they are the stars with anisotropic sourface activity.

1. INTRODUCTION

The study of non-stable phenomena, connected with young stellar objects, always attracted attention of astronomers. This interest was further increased after discovery of high-velocity outflows from these objects [1]. Herbig-Haro-objects, collimated jets, cometary nebulae and molecular flows, all of which being the consequences of anisotropic outflows from young stars are good indicators of violent non-stable processes in star formation regions.

During the investigation of optical collimated outflows our attention was attracted by sources with very low optical luminosity ($L<0.001L_{\odot}$)[1-3]. It was usually suggested, that extremely low luminocity of these objects is due to the fact that outflow is perpendicular to the line of sight and radiation of the source is absorbed in the plane of circumstellar disk. The model with thick dust disk is universally adopted now. According to this, such objects must have comparatively strong emission in far infrared.

In this paper a new approach to the problem of anisotropic outflows from young stars based on the analysis of the their optical and IRAS luminosities is used.

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2. RESULTS

In this study optical and IRAS data for 23 suggested excitation sources of HH objects from Cohen and Schwartz list [4] and 33 T Tau stars from Taurus-Auriga complex were included.

Factor analysis of luminosities in different spectral regions confirmed, that continuous emission of young stars can be interpreted as a sum of photospheric and envelope ($T \sim 50K$) emissions.

IRAS colours for anisotropic outflow sources and for T Tau stars show the marked differences between them. This is in good agreement with the data of other authors [5] and can be conditioned by different evolutionary stages of these objects.

From the analysis of IRAS luminosities was found that objects with low optical luminosities have also rather low luminosities in far infrared region.

On Fig.1 for the sources of optical outflows the IRAS - luminosities and shortwave ($\lambda < 7\mu$) luminosities diagram is presented. A group of low luminosity sources, which

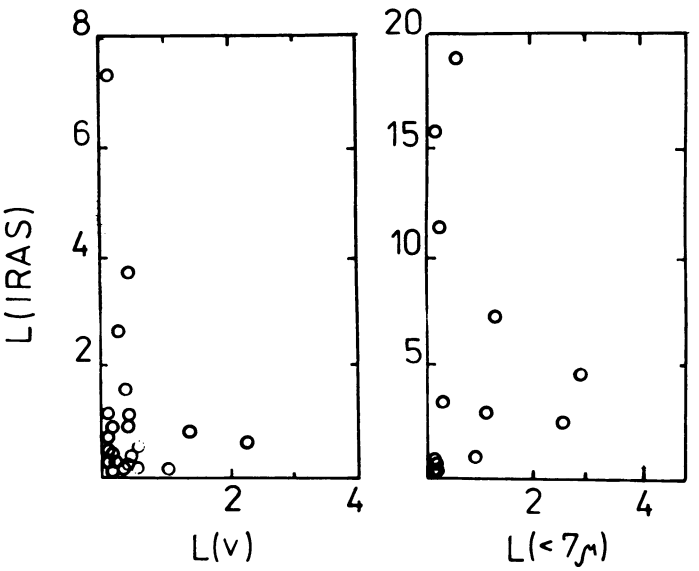

Figure 1. The sources of optical outflows (left), T Tau stars (right).

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stands out from general tendency of increase of far infrared emission as shortwave emission decreases, can be easily distinguished. On Fig.1 the dependence of L(IRAS) from L(V) for T Tau stars is presented. The same picture can by seen here, but in this case the group of faint stars isn't separated so clearly, and there are some intermediate luminosity stars.

3. CONCLUSION

Thus a conclusion can be made that there exist a group of objects with extremely low shortwave luminosities, which cannot be explained by the presence of thick dust disks around stars. One can think that these stars are deeply embedded in dark cloud, but this assumption cannot be true for the sources of jets because jets have very low surface brightness and can't be seen through the cloud. May be the lack of so sharply detached group for the T Tau stars can be due to their different immersion in clouds.

It is worth to note that whole detached group on Fig.1 consists from sources, immediately connected with optical jets (HH30, DG Tau, FS TauB, Th28). And these outflows are rather strong: for example, HH30 outflow stretches on great distance (0.1pc)[6], and the Th28 outflow velocity exceeds 300km/s [7].

The existence of such a group of objects, at our opinion, is an evidence in favour of the idea that collimated outflows are not the consequence of outer anisotropy, connected with the presence of dust disks, but are the consequence of anisotropic activity of stars itself on early evolutionary stages.

REFERENCES

1. Mundt,R., Brugel,E.W., and Buhrke,T.(1987) 'Jets from young stars', Astrophys.J., 319, 275-303
2. Movsessian,T.A., Magakyan,T.Yu.(1989) 'CoKu Tau/1 - a new object with optical bipolar flow',Astrofizika, in press
3. Magakyan,T.Yu., Movsessian,T.A., Afanass'ev,V.L. and Burenkov, A.N. (1989) 'The spectral investigation of collimated flows in HL/XZ Tau region', Sov.Astr.Lett., Vol.15, 124-130
4. Cohen,M. and Schwartz,R.D.(1987) 'IRAS observations of the exciting stars of Herbig-Haro objects', Astrophys.J., 316,311-322
5. Berrilli,F., Ceccarelli,C., Liseau,R., Saraceno,P. and Spinoglio,L.(1989) 'The evolutionary status of young stellar mass loss driving sources as derived from IRAS

https://doi.org/10.1017/S007418090018787X Published online by Cambridge University Press

observations',Mon.Not.R.Astr.Soc., 237, 1-15
6. Mundt,R.(1987) 'Flows and jets from young stars', Mitt.Astron.Ges., 70, 100-115
7. Krautter,J.(1986) 'Th28: a new bipolar Herbig-aro jet', Astron.Astrophys., 161, 195-200

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