# SUBFUORS IN ORION ASSOCIATION

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ABSTRACT. Results of spectral and photometric observations of Sugano star = V1143 Ori in brightness minimum and near it are given. Emission lines of HI, CaII, FeI, TiI, TiII and TiO absorption bands are detected. The appearing envelope is observed also in minimum. A brightness increase of Shanalstar VIII8 Ori is observed. In its spectrum lines of HI, CaII, FeI, FeII are found, testifying to formation of an envelope.

During the last ten years data on T Tau type stars which have fuor-like outburst-subfuors were obtained. Two such stars were found in Orion association. These are V1118 Ori [1] and V 1143 Ori [2,3]. In recent years, in Byurakan observatory observations of these stars have been made.

## 1. OBSERVATIONS

Observational material were obtained by the SAO 6m telescope, 2.6m Cassegrain and 40" Schmidt system telescopes of Byurakan observatory. Observations by 6m telescope were made with scanner with dispersion D=1.8 A/canal, resolution is $\simeq$ 4 A. Observations by 2.6m telescope were made on UAGS spectrograph with inverse dispersion of 101 A/mm, resolution is $\simeq$ 4 A.

## 2. V1118 ORI

The first outburst of this star was observed in 1982 [1]. We have no information about the rise time. Star was in maximum for four months,the decrease lasted about a year [4]. We have no data about the existence of any spectral observation. The next brightness increase was observed by us in December 1988 [5]. The star spectrum during second outburst on 11.1.89 observed by 6m telescope, is given on Figure 1. Spectrum is moderate intensity with emission lines



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of HI, CaII, FeI, FeII. Presence of P Cyg type profiles in Balmer series high members are suspected.

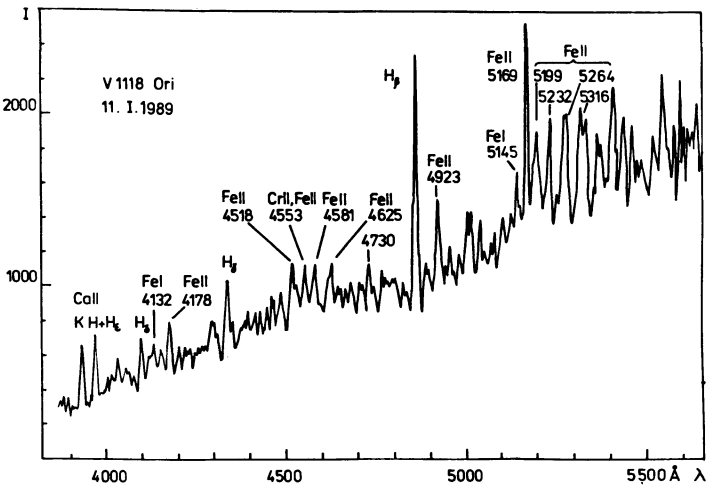


Figure 1. The spectrum of V1118 Ori on 11.1.89.

## 3. V1143 ORI

The first outburst occured at the end of 1982. Sugano's observations made it possible to define the rise time, which lasted about three months. For more than four months the star was in the maximum with brightness variation about $0^m.5$. Duration of the flare was about 18 months [4,6]. The next outburst occured in 1984 [6] and 1986 [7]. One more brightening perhaps was observed in 1988. According to Natsvlishvili, on April 7 1988, the magnitude of the star reached $m_{pg}$=15.5 [8].At the same time, by the observations in Crimea observatory on April 13 and 14, the star had $m_{pg}$=17.3–17.4 [9]. In December 1988 the star was near minimum with $m_{pg}$=17.6, and in october 1989 $m_{pg}\sim$15.5.

Spectral observations of V1143 Ori, carried out in February 1983 during the first outburst, exhibit strong emission line spectrum with the lines of HI, CaII, FeI, FeII, TiII, CrII [10,11]. The spectral type on the decrease stage was about K7–M0 [12]. The spectrograms during the second outburst on decrease stage in 1987–1989 are dominated by emission lines of HI, CaII, FeI, FeII, TiII and by strong absorbtion bands of TiO. Spectral type changed from K7–M0 to M2. The variation of hidrogen lines was observed. Thus, spectral features, both in the beginning of the outburst and

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after, show that this is a T Tau type star with weak emission in minima.

According to Herbig [10], the spectrum of V1143 Ori near the maximal brightness was similar to subfuors DR Tau and VY Tau. In addition this star shows fast flare with $\Delta m=0.6$. So the stage of subfuors must take place in some T Tau stars with weak emission, which shows flare activity also.

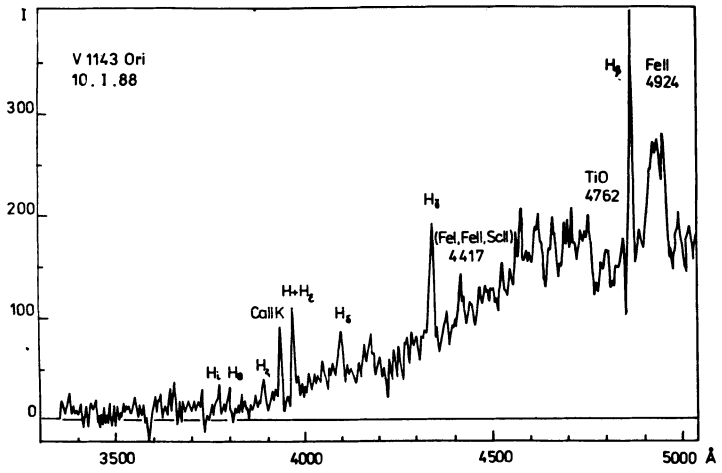


Figure 2. The spectrum of V1143 Ori on 10.01.1988.

## 4.CONCLUSION

The photometric data of V1143 Oriand V1118 Ori during the outburst show ultraviolet excess which reduce with the decrease of flare [4]. Spectra of these stars during the outburst and after it are similar to T Tau stars with moderate intensity. The solution of the problem, why some T Tau stars become fuors, while the others under the same conditions become only subfuors (perhaps not realised fuors), will help us to understand one of the evolution stage of T Tau stars.

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**APPENZELLER: On which wavelength range of the spectrum was the K7 classification of V1143 based? (I am asking this question since in T Tau spectra the spectral types are known to depend on the wavelength. Blue classification spectra usually result in earlier types than red spectrograms.)**

**PARSAMIAN: Classification was made by TiO absorption bands in the long wavelength part of the spectrum.**

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