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RECENT MASS LOSS EPISODE OF THE Be STAR o And

Variability in the spectra of Be stars on time scales ranging from days to decades is well known in the astronomical community (Doazan 1982, and references therein). o And (1 And, HR 8762, HD 217675-6, BD + 41°4664) is one such interesting object which is having a long history of spectrum variations. It has changed from a normal B-type star to a shell star and back again a number of times and also shows more rapid variations. Analyzing all observations available in the literature on this star, Harmanec(1984) finds evidence for the short - term variations reported by many observers being truly periodic with period $1^d.571$. Also the shell spectrum phases of this star repeat after integer multiples of 3100 d. This short term activity of presumably photospheric origin and the long - term variability of the envelope is clearly visible in this star. Baade (1981) has suggested that this star is a nonradial pulsator. Recent observations suggest that perturbations in the nonradial pulsation spectrum may be involved in the episodic mass loss from early-type stars (Smith and Ebbets,1981; Vogt and Penrod, 1983; Baade and Ferlet, 1984; Smith and Penrod. 1984).

In order to find a correlation between photospheric pulsations and mass loss, we started narrow band Hα photometric observations of o And during September 1985. The observations were made using an Hα filter of bandpass 5 Å , centered at 6563 Å with an automated photon-counting system in the cassegrain focus of the 102 cm telescope at Vainu Bappu Observatory. Photon counting interval was 1 sec. o And was observed on 5 nights in September 1985. Along with o And, different standard stars and sky background were also scanned to find out the steadiness of the sky. Except the night of 13 Sep. 1985, in all other nights there were no drastic change in Hα flux. The results of 13 Sep. night are shown in Figure 1. From Figure 1 it is clear that average Hα flux level (Hα flux continuum level) slowly increased during the development of mass loss episode and during this episode Hα flux strength

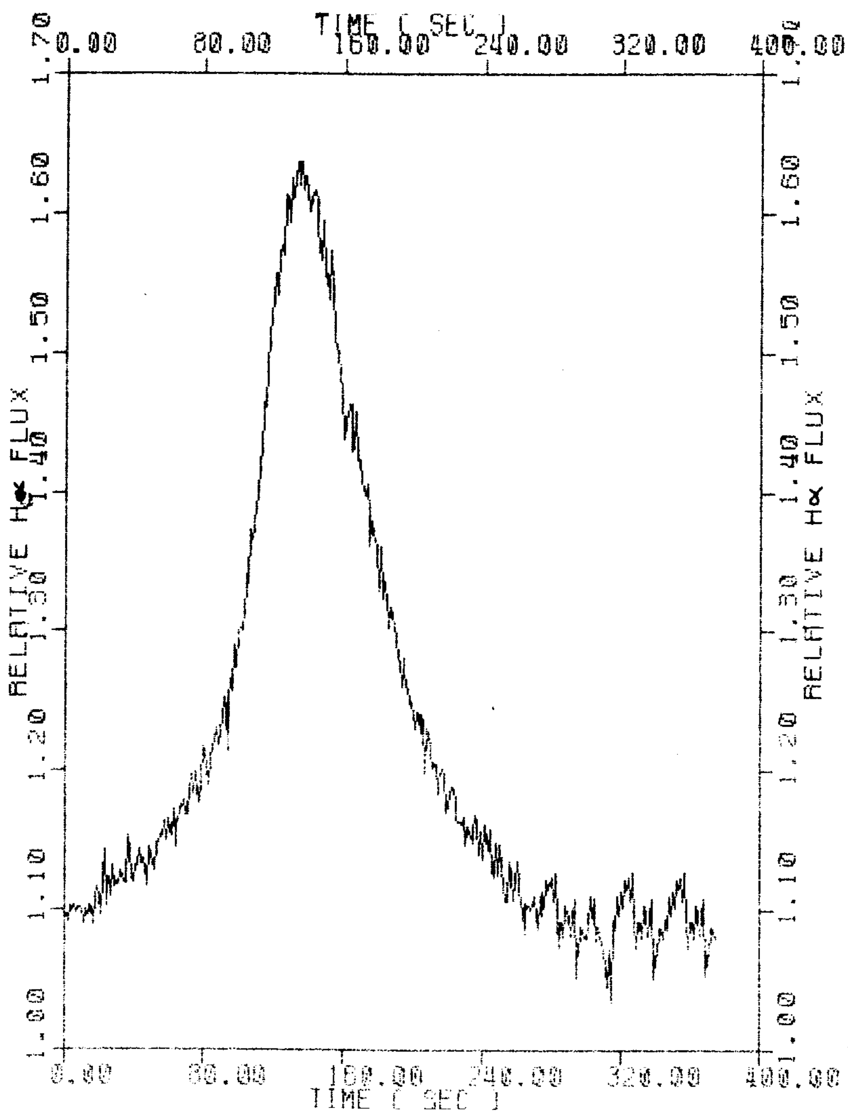

Fig. 1. Hα flux variations in o And during mass loss episode on the night of 13.7326 September 1985 (JD= 2446322.2344). Relative Hα flux in the sense ratio of Hα counts during the episode and that two hours before the episode. Two hours before the episode Hα average count over 5 Å band pass was 17500 which we have defined as Hα continuum (relative Hα flux = 1).

enhanced by a factor of 1.64 over a duration of 300 sec. Afterwards this flux decreased slowly and came back to the normal level.
There are two explanations for mass loss mechanisms of Be stars. According to Hayes and Guinan (1984), mass loss is due to some type of marginal stellar instability (Rayleigh type rotational instability) arising from the star's angular momentum gradient and it can be inferred from rapid increase of continuum polarization accompanying the strengthening of Hα flux.

Other explanation is that if the resonance occurs between different l-modes (one unstable mode already pulsating with large amplitude and another mode which produces large surface amplitudes) when some overall equipartition of energy between different modes is achieved, the result is likely to be a rapid damping of the pulsation energy by shock waves in the stellar envelopes and these shock waves drive the episodic mass loss (Vogt and Penrod, 1983 and references therein). Smith and Ebbets (1981) proposed that the simultaneous excitation of many modes can also produce surface shock waves through heating effects. Propagation of shock waves through the stellar envelope will temporarily increase the local temperature of the medium and as a result the average Hα flux (we have described as Hα continuum level) will increase which is clearly visible in Fig. 1. Also the ejected mass (due to the episode) driven by shock waves will temporarily increase the optical depth of the envelope and Hα strength will enhance (Fig. 1.). From the present observation it is seen that the onset of this episode in o And was accompanied by rapid variability in Hα flux on a time scale as short as 5 minutes. This short duration variability was indicative of the presence of a high-order nonradial mode. To find the positive correlation between photospheric pulsations and mass loss for Be stars, it is very urgent to have different types of observations on Hα. With present observations it may be remarked that nonradial pulsations were prominent in o And during the development of this mass loss episode.

From the enhancement of Hα strength one can measure about volume emission ($V N_{ion} N_e$), envelope mass and the energy required to lift the material from the photosphere into the envelope. Detailed results will be published elsewhere.

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