ISSN 0296-3140

Be STAR NEWSLETTER

NUMBER 27

March 1994

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Produced at the European Southern Observatory

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The Be Star Newsletter is open to all contributions concerning early-type stars. Please send manuscripts and all correspondence to the editor's address given on the front page.

Acknowledgements: The Be Star Newsletter is produced at and financially supported by the European Southern Observatory. We thank Pam Bristow and Erich Siml for their active help in administrative and technical matters.

EDITORIAL

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I am happy to send you Issue No. 27 of the *Be Star Newsletter*. The publication of this issue has been delayed because we were hit especially hard by the 6.8 magnitude earthquake that struck the northwestern San Fernando Valley at 4:31 a.m. on January 17. Our house, located essentially at the epicenter of the quake, sustained significant structural damage and we were forced to move out. I was working on the *Newsletter* on the evening before the quake and had organized the components in various folders. Well the earthquake not only scattered the master copy all over the floor, but the pages were buried under many fallen diskettes, books, furniture, and equipment. Although I was able to recover most of the material, the folder containing the contributions ended up being packed in a box with some manuals and other papers. Fortunately, I located this material, but if by chance I have not included a contribution that you have submitted, please send me another copy and I will be sure to place it in the next issue.

As you will see from Luis Balona's report in "Working Group Matters", unless there are overwhelming objections from the community and financial support materializes, the *Newsletter* will undergo a change this year. The current consensus of the scientific organizing committee (SOC) of the Working Group on Be Stars is that the paper format of the *Newsletter* should be replaced with an electronic version. The scope of the new WG and its newsletter will also be expanded to include a wider range of research topics concerning B stars. The committee argued convincingly that an electronic bulletin board will allow more rapid communication with the community and it will also solve our most pressing problem at the moment, the high cost of copying/mailing the *Newsletter*. So far, we have not been able to find an organization that is able and willing to pick up the expenses. The cost of copying and especially postage have risen sharply in recent years. The time involved in preparing the *Newsletter* has of course been entirely donated by the editors.

We will be able to mail at least one more paper version of the *Newsletter* from USC and would like to distribute it about 6 weeks before the IAU General Assembly in The Hague. In this issue we will include the ballot for the election of the new members of the Working Group. Therefore, please send contributions for Issue No 28 by:

May 15, 1994.

We request that lengthy contributions containing illustrations be submitted in a camera-ready format (see papers in the current issue for style). For short communications I especially recommend Electronic Mail (SPAN/DECnet - HYADES::PETERS) or telefax (telephone number: 213-740-6342). If possible, please send E-mail contributions as a Tex or LaTex file.

I wish you a very happy and productive 1994 and look forward to receiving contributions for Issue No. 28. Since 1987, financial support from the European Southern Observatory has made it possible for us to publish the *Newsletter*. On behalf of the Be Star community I would like to say "ESO, THANK YOU VERY MUCH"!

Gerrie Peters, Editor

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RECOMMENDATIONS OF THE WORKING GROUP COMMITTEE

During IAU Symposium 162 "Pulsation, Rotation and Mass Loss in Early-Type Stars" (Juan-les-Pins, 5-8 Oct 1993), a meeting of the full committee of the Working Group on Be Stars was held in which two very important recommendations were made. These recommendations are:

1. CHANGE OF NAME

The study of Be stars cannot proceed in isolation. One of the aims of the Symposium was to bring together researchers in many different fields (pulsation, rotation, stellar magnetism, stellar winds, etc.) in order that the exchange of ideas might further our understanding of Be stars. The committee feels that this exchange of ideas can be facilitated by expanding the scope of the working group itself. Hence it is proposed that the "Working Group on Be Stars" change its name to:

"Working Group on B stars".

The WG will not concern itself exclusively with Be stars, but with all aspects of B stars in general. Researchers in pulsating B-stars, stellar winds, etc. will be encouraged to make contributions which may or may not have direct relevance to Be stars.

2. ELECTRONIC NEWSLETTER

It is of great importance to have a medium of communication in which these ideas can be informally discussed, in which observers can be alerted to interesting stars and where references to relevant papers can be found. The *Be Newsletter* has served this purpose admirably for many years. For several reasons, however, it was felt that the continuation of the publication of the *Be Newsletter* in its current form is inappropriate. The advances in computer communication means that nearly everyone has the ability to send and receive text with a delay of no more than a few days. It seems logical that this be put to use by establishing an "electronic bulletin board" or some other means of distributing the *Newsletter* in electronic form. Another important reason for discontinuing paper copies of the *Newsletter* is the high cost of publishing and mailing. To copy and distribute two issues of the *Newsletter* each year costs about US$5000. Few institutes can afford this expenditure in the current economic climate.

Doug Gies (Atlanta) volunteered to investigate this aspect and to report on how the system will work. Provision needs to be made for the distribution of hard copies at regular intervals to those who still do not have access to world-wide electronic communication. This will also be handled by Doug. The transmission of figures electronically is a problem. It was recommended that Postscript files containing graphical information be appended to the end of each electronic contribution where necessary. Those who have access to Postscript facilities will then have no problem in printing the figures; those who cannot do this may request the author to telefax the figures if they are of particular interest.

Two more issues of the *Be Star Newsletter* will, we hope, be published before the General Assembly in August 1994. After that time it is expected that the electronic B-star newsletter will

be fully functional. A notice will be placed in the IAU Bulletin giving full details of how to use the the system.

It is important that your views on these two issues be made known. I would appreciate very much if you could send me your opinion by post or E-mail. If there is general approval of these recommendations, they will be implemented at the General Assembly. If there is widespread opposition, these recommendations will be reviewed. It must be stressed that funding for paper distribution of the *Newsletter* is a very serious problem. None of the institutes to whom WG committee members belonged were in a position to fund the *Newsletter*. Unless someone is willing to donate US$5000 a year, the distribution of paper copies will not be possible and the only alternative to an electronic newsletter is no *Newsletter* at all. With this in mind, we owe a very great debt of gratitude to Gerrie Peters as Editor and to Dietrich Baade as technical editor of the current *Newsletter*.

NOMINATIONS FOR THE WG COMMITTEE

The present committee of the WG on Be stars is composed of:

L.A. Balona (Chair), J. Dachs, M.A. Smith, J.R. Percy, G.J. Peters, D.R. Gies, P. Harmanec, and R. Waters.

The term of office of the committee members expires at the next IAU General Assembly when a new committee must be elected. Balona, Dachs, Percy and Peters have served two consecutive terms of office and according to informal rules should not be re-elected.

I would be very grateful for nominations for the new committee. Please send me by post or E-mail the names of eight people who you would like to see on the committee. A list of nominees will be published in the next issue of the *Newsletter* and you will be asked to cast your vote. Final vote counting and appointment to the new committee will be made at a business meeting during the next IAU General Assembly.

Luis Balona
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South Africa

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A PROPOSAL FOR AN ELECTRONIC Be STAR NEWSLETTER AND BULLETIN BOARD

I propose to establish an electronic bulletin board on a computer at Georgia State University (GSU) in Atlanta that would serve the Be community in the following ways:

1. Provide an electronic version of the *Be Star Newsletter*. Articles and contributions would continue to be sent to Gerrie Peters (and/or me) for publication in the *Be Star Newsletter*. The Newsletter would be distributed by e-mail 2 or 3 times a year; subscribers who prefer a paper copy would still be able to receive one (printed and mailed at GSU). I feel there is still a need for this means of communication which requires submission of contributions needing care in preparation and of wide interest to the community.

2. Establish a posting and reply electronic bulletin board. Users would log in remotely and be able to read, reply, or contribute interesting notes or inquiries. Some of these contributions might also be appropriate for subsequent publication in the *Newletter*.

3. Establish a fast method of sending announcements to the whole group of subscribers for important information. This would permit news of upcoming observing campaigns, for example, to be sent out to the entire community on a fast time scale. These messages would be screened and edited at GSU.

4. Establish a public archive for certain data sets. Some spectra or photometric data of widespread interest could be made available for for the whole community.

5. Set up an electronic conference procedure. It may be possible for users to set a pre-arranged time for multiple users to log in and type messages to the group as a whole in real time (for organizational meetings, for example).

Other functions are possible. I would welcome any comments from those in the Be star community.

Douglas Gies (gies@chara.gsu.edu)

REQUEST FOR E-MAIL ADDRESSES

As there is some possibility that the next issue of the *Be Star Newsletter* may be the last paper edition, I would like to keep in touch with you via E-mail until the electronic version of the Newsletter becomes established. Please send me your E-Mail address (or FAX number) to:

lab@saao.ac.za

or FAX me at 2721-473639. I would also appreciate the E-Mail or FAX number of anyone who you know who does not receive the *Newsletter* but might be interested in the new "B Star Working Group".

Luis Balona

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To facilitate the establishment of an electronic *B Star Newsletter*, please also send your e-mail address to Doug Gies (address given above) and me at (DecNet/SPAN) PETERS::HYADES or (Internet) peters@hyades.dnet.nasa.gov. Thanks for your help.

Gerrie Peters, ed.

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DISAPPEARANCE OF Hα EMISSION IN OMICRON ANDROMEDAE

B. W. Bopp, J. Aufdenberg
Ritter Observatory, University of Toledo

The bright Be star *o* And (HR 8762) has been observed spectroscopically at Ritter Observatory since 1986. Echelle spectra (resolution 0.25 Å) of the Hα region with an intensified Reticon (1986-87) or with CCD's (1988-present) have been obtained about once per month during the observing season.

Our observations of *o* And during the interval September-December 1992 indicate that the emission components of Hα continued to decline in strength, and finally disappeared by the end of 1992. Figure 1 compares Hα profiles obtained in 1991 and late 1992. The obvious blue and red emission wings and the deep central absorption that are so prominent in 1991 have vanished by late 1992. A weak red emission wing can be seen on the November 30, 1992 scan, but there is no trace of emission by December 28.

The last major shell phase of *o* And was five years ago (Peters 1988), and it now appears that the star has entered a quiescent interval. Although there is apparently no periodicity to the recurrent shell episodes (Sareyan et al. 1992) strong shells do appear to recur every 5-9 years, so perhaps another spectroscopically interesting time is not far off.

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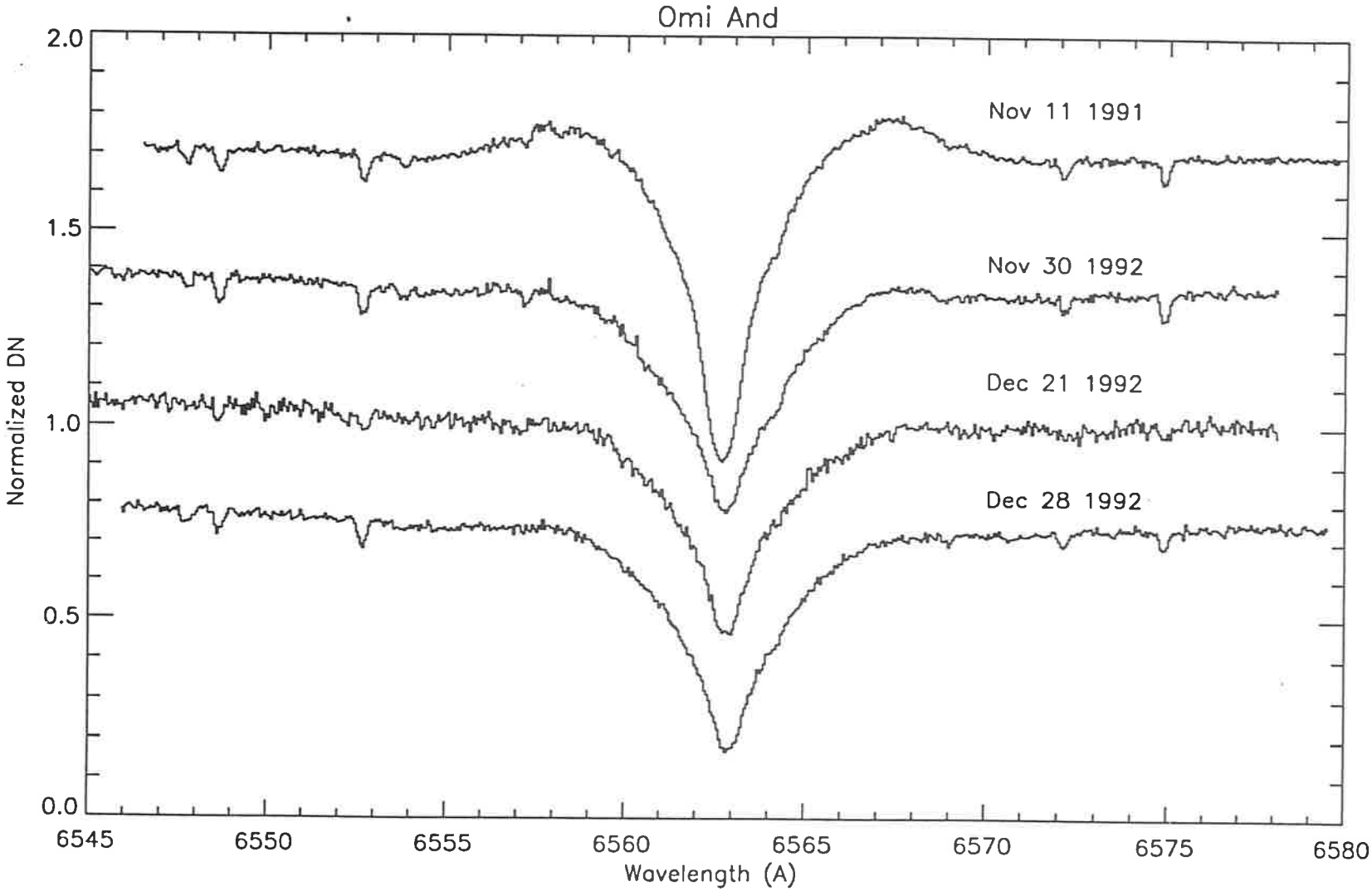
Omi And
Nov 11 1991
Nov 30 1992
Dec 21 1992
Dec 28 1992
Normalized DN
2.0
1.5
1.0
0.5
0.0
6545
6550
6555
6560
6565
6570
6575
6580
Wavelength (A)

Figure 1

The Nature of the Gas Envelope around the Be star X-ray Source A0538-66

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Bhabha Road, Bombay-400005, India

The X-ray source A0538-66 (White and Carpenter,1978) is in the Large Magellanic Cloud and was identified with a 15th mag. B2IVe star (Johnston et al.,1979,1980). Recurrent x-ray flares were observed by Skinner et al. (1980) using the HEAO-1 satellite. The flares occured with a periodicity of 16.6 days. The x-ray emission also showed a pulsation period of 0.069 s (Skinner et al., 1982), indicating the presence of a neutron star. The 16.6 day period was identified as the binary period of the neutron star orbiting around the Be star. Optical observations were made by Charles et al.(1983), and they suggest an eccentricity of about 0.7 for the binary orbit.

The x-ray flares were explained by Apparao(1985) using a model in which the neutron star revolves around the Be star in an eccentric inclined orbit. The gas envelope around the Be star was assumed to be in the form of a ring in the equatorial plane of the Be star. It was found that a uniform gas density in the ring does not reproduce the flare profiles. To explain the profiles, a dense central region with the density decreasing on either side of this central region of the ring and also falling exponentially in a direction perpendicular to the ring, was needed. The maximum of the x-ray flare occurs near the periastron of the neutron star orbit. The model assumes that the ring move outward as is indicated by the P-Cygni profiles observed by Charles et al.(1983). A parameter in the x-ray flare profile fitting is the distance of the densest part of the ring from the center of the Be star.

Six x-ray flares were observed by Skinner et al.(1980) during June and December 1977. There were five occasions,

when an x-ray flare was expected on the basis of the 16.6 day period, no x-ray flux was observed. These occasions were interspersed between the flare times. Using the model described above , we have determined the gas density in the dense central part of the ring each time the neutron str arrives at the periastron. This density as a function of the flare number is plotted in the figure. Upper limits are shown when a flare was not observed as expected on the basis of the binary period. The line through the points is arbitrarily drawn.It must be cautioned that the figure is not a snap-shot of the ring structure, as the points belong to different times.

The figure indicates that the density at the periastron of the neutron star orbit varied and generally decreased with time, at times decreasing beyond detectability. A possible interpretation is a multiple ring emission by the Be star with gaps in between, reminiscent of Saturn's rings. It seems as if the Be star is emitting gas in puffs.It will be interesting to see if the phenomenon repeats in A0538-66.

The neutron stars in binary orbits aound Be stars act as probes of the gas environment around the Be star; a study of the x-ray wmissionfrom these objects offers clues to the nature of the gas envelopes of Be stars.

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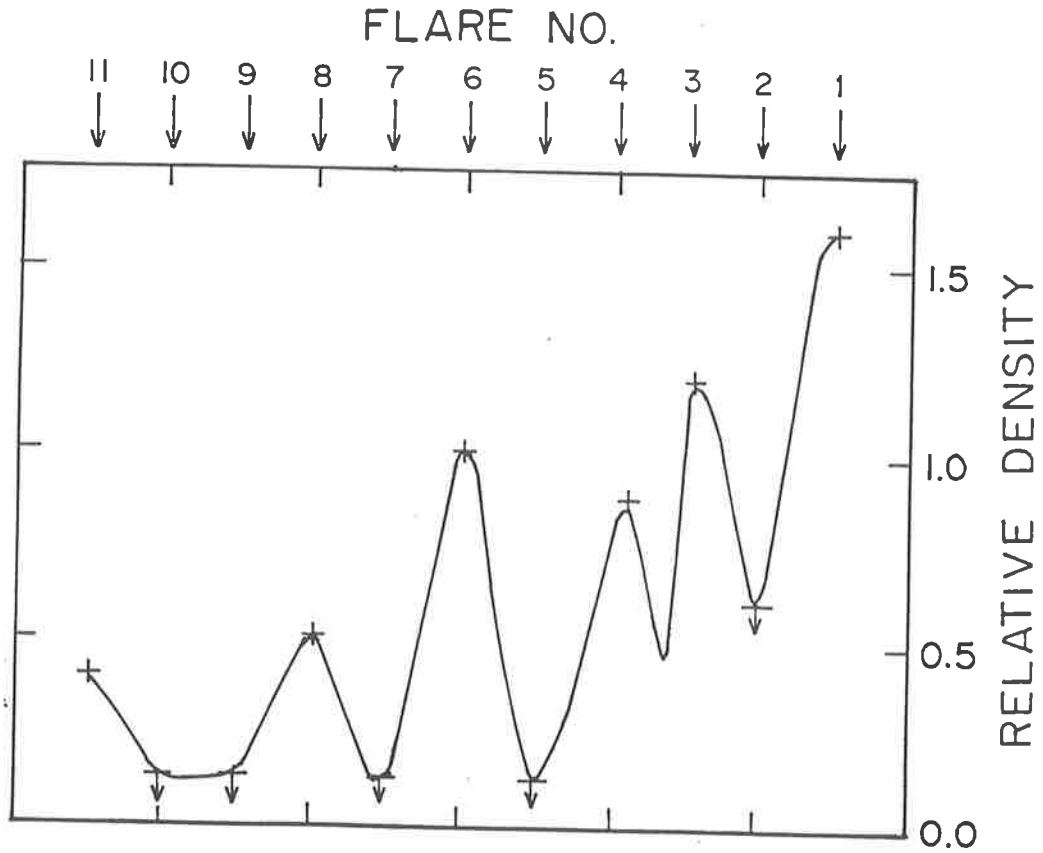
FLARE NO.
11
10
9
8
7
6
5
4
3
2
1
1.5
1.0
0.5
0.0
RELATIVE DENSITY

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Hα OBSERVATIONS AT KITT PEAK NATIONAL OBSERVATORY

This report continues a series of updates on the variations in Hα and He I 6678 in selected Be stars of current interest to the community. Observations were made with the Coude Feed Telescope at KPNO from 1993 September 8 - 14 with the T2KB CCD detector (2048 pixels), grating A, and camera 5. The resolution for a line width of 2 pixels is 0.32 Å, and the S/N for the observations range from 100 - 400 averaged over twenty pixels. The observations described below will be compared with those reported in previous issues of the *Be Star Newsletter (BSN)*. As in previous reports, the V/R that is quoted is I_V/I_R (not the historical $(I_V - I_{cont})/(I_R - I_{cont})$).

γ Cas - The general appearance of the Hα emission feature was similar to that reported in *BSN* 25, however the emission is now skewed to the violet with a weak redshifted core. The peak intensity was 5.2±0.1 I_{cont}. Double peaked emission (~1.05 I_{cont}, which shows an overall slight violet shift) was seen in He I 6678.

ψ Per - Strong double-peaked Hα emission (5.0 I_{cont}) was present. There was no emission in He I 6678.

28 Tau - Strong, double-peaked Hα emission was seen (V < R; V = 5.0 I_{cont}, while R = 6.0I_{cont}). At best He I 6678 displayed marginal absorption.

48 Per - Strong, featureless, Hα emission with a peak intensity of 6.0 I_{cont} was observed. He I 6678 appeared to be purely photospheric.

λ Eri - No Hα emission was present in September 1993. Profile variability and structure indicative of on- going NRP and transient activity were seen in He I 6678 but no emission was present.

ζ Tau - Hα emission with V/R ~ 0.58 (R = 3.80 I_{cont}) was present. Conspicuous violet-shifted (-90 km s^{-1}) cores were seen in Hα and He I 6678. There was no emission in He I 6678.

66 Oph - The Hα emission in this star has definitely declined since its record value of 10.0 I_{cont} observed in March-April of 1990 (*BSN* 22). In September 1993 its intensity was 5.0±0.1 I_{cont}. Only subtle structure is now present. The feature displays a quasi-"winebottle"-type profile with the shoulder on the red side of the feature more prominent. Weak emission (~1.02 I_{cont}) is visible on the red side of the He I 6678 profile (opposite that reported in *BSN* 25).

28 Cyg - Double-peaked Hα emission (V = R) with a peak intensity of 2.6 I_{cont} was present. He I 6678 appeared to be purely photospheric with weak structure indicative of NRP.

59 Cyg - The peak intensity of the Hα emission is still 1.8 I_{cont}, but in September 1993 V > R (V/R ~1.13). Sharp, violet emission with a peak intensity of ~1.05 was present in He I 6678 (there was no emission on the red side of the line).

υ Cyg - The Hα emission feature showed a peak intensity of 6.0 I_{cont}. There was a very weak central reversal. He I 6678 appeared to be purely photospheric except for marginal double emission on its extreme wings.

ϵ Cap - Weak, double Hα emission was present with V/R $\simeq$1.02. The peak intensity was about 1.07 I_{cont}. A deep core was present in Hα (r_{ν}=0.33). The He I 6678 line displayed its usual "narrow" appearance with a core intensity of 0.82 I_{cont}.

π Aqr - The Hα emission in this star appears to have declined in recent years (cf. *BSN* 22,25). The profile remains similar with V/R $\sim$ 0.95. Prominent double emission ($\sim$1.04 I_{cont}) is observed in He I 6678.

Gerrie Peters

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Myron Smith reports on 1994 February 2 that "λ Eri has gone into emission again". Observations were made by S. Stefl (Ondřejov) a few days earlier. Weak V/R emission was observed in both Hα and He I 6678. An *IUE* image taken by G. Peters on 1994 January 21 revealed that the C IV wind absorption had increased by 0.4 Å in equivalent width over its quiescent value of 2.2 Å observed in 1993 December. Virtually all of the increase in EW was due to the appearance of a DAC of $\sim$ 0.3Å at a velocity of -950 km s $^{-1}$. This feature was not observed in 1993 November or December. Such behavior is consistent with that which we have previously observed in this star.

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PREPRINTS RECEIVED

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Observations of Coherent Large Amplitude Variations of the 900 to 1100 Å Flux from α Eridani with the Galileo EUV Channel and Voyager UVS

HOLBERG J.B.[1] - SANDEL B.[1] - DRAKE V.[1] - PETERS G.J.[2]; 1. Lunar and Planetary Laboratory - West, Gould-Simpson Building, University of Arizona, Tucson, AZ 85721, USA; 2. Space Sciences Center, University of Southern California, University Park, Los Angeles, CA 90089-3141, USA.

Submitted to: *Astrophysical Journal*
Preprints: J. Holberg at first address.

Abstract: Between 10 Dec. and 14 Dec. 1992, the bright Be star α Eri was observed with the University of Colorado EUV Channel instrument on the *Galileo* spacecraft at wavelengths between 900 to 1280 Å. During this same period α Eri was also observed for an 8-hour period with the *Voyager* Ultraviolet Spectrometer (UVS) at wavelengths between 900 to 1700 Å. The *Galileo* observations revealed α Eri to exhibit a sinusoidal light curve with a period of 1.28±0.02 days and a peak-to-peak amplitude of 30%. The briefer *Voyager* observations confirm these variations. The flux variations are accompanied by changes in the UV energy distribution of α Eri. We compare these recent α Eri data with *Voyager 1* and *2* observations obtained a decade earlier and with the optical observations (Balona *et al.* 1987).

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Correlated Long-Term Light, Colour and Spectral Variations of the Be Star κ Dra

JUZA K.[1] - HARMANEC P.[1] - BOŽIĆ H.[2] - PAVLOVSKI K.[2] - ŽIŽŇOVSKÝ J.[3] - TARASOV A.E.[4] - HORN J.[1] - KOUBSKÝ[1]
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To be Published in: *Astronomy and Astrophysics*
Preprints: P. Harmanec at first address.

Abstract: Intensity of the Balmer emission lines of κ Dra, documented by spectral records from the past 100 years, was found to vary with a period of 8406 d ($23^{y}.01$). Optical brightness and continuum polarimetry seem to vary with the same period. Polarimetric changes are in phase with the emission strength. The brightness of the object attains maximum during the rise of emission. Then it declines to a local minimum which coincides with the maximum strength of the Balmer emission. Possible qualitative interpretation of these facts is briefly outlined.

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Dynamic Processes in Be Star Atmospheres II. He I 2P-nD Line Formation in λ Eridani (Outburst)

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To be Published in: *Astrophysical Journal* Preprints: M. A. Smith at first address.

Abstract: The He I λ6678 line of early Be stars generally shows violet (V), red (R) emission whenever Hα emission is present, but its use as a diagnostic has been handicapped by a poor understanding of the processes that drive it into emission. In an attempt to address this problem we obtained three series of echelle spectra of the first two members of the singlet and triplet 2P-nD series of λ Eri (B2e) during 1992 November 3-5 at Kitt Peak. During these observations λ6678 showed substantial emission variability in both the wings and central profile, providing an opportunity to compare its behavior with that of the λ4922, λ5876, and λ4471 lines. We found that the responses of the lines were different in several respects. Whereas the emissions in the V wings of all four lines scales together, the R wing of the λ4922 line invariably responded with increased absorption whenever the R wing of λ6678 line showed increased emission. These same trends occurred within the central photospheric profiles. The R-wing behavior shows that much, but not all, of the emission in λ6678 is caused by matter projected against the stellar disk. The excitation temperatures of the neighboring 2^1P transitions, λ6678 and λ4922, must be greater than/less than the photospheric continuum temperature, respectively.

We have investigated departures from LTE for the He I spectrum in a variety of *ad hoc*, perturbed model atmospheres. We have found only one way to cause the source function in λ6678 to increase so strongly, namely by increasing the atmospheric temperature of the line formation region to 30,000-40,000 K. When the kinetic temperature is this hot the resonance λ584 transition becomes transparent, causing the 2^1P level to become underpopulated relative to other levels. Stimulated emission amplifies this condition, driving λ6678 selectively into emission. This effect was discovered by Auer and Mihalas for O3-O4 atmosphere models, but it has not been applied to active B stars.

Our models suggest that λ6678 emission in Be stars can be used as a sensitive monitor of localized hot spots on these stars' surfaces. In particular they show that λ6678 emission originated in a plasma having a high (photosphere-like) density. Combining this finding with our observation that foreground material exhibits a predominant *red*shift implies a physical mechanism that incorporates both heating and violent downward motions penetrating well into the photosphere. The energies involved in heating the active portions of the atmosphere are too high to be produced by gravitational infall. This leaves magnetically-induced flares among the few known processes on the surfaces of stars capable of sustaining this energy level.

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Abbreviations used for the Publications

AA	Astronomy and Astrophysics
AASS	Astronomy and Astrophysics Supplement Series
AAS	Acta Astronomica Sinica
AAPS	Acta Astrophysica Sinica
AJ	Astronomical Journal
APJ	Astrophysical Journal
APJS	Astrophysical Journal Supplement
ASS	Astrophysics and Space Science
BAAS	Bulletin of the American Astronomical Society
BAC	Bulletin of the Astronomical Institutes of Czechoslovakia
IAUC	IAU Circular
IBVS	Information Bulletin on Variable Stars
MNRAS	Monthly Notices of the Royal Astronomical Society
PASJ	Publications of the Astronomical Society of Japan
PASP	Publications of the Astronomical Society of the Pacific
PBAO	Publications of the Beijing Astronomical Observatory
RMAA	Revista Mexicana de Astronomia y Astrofisica