COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1312

Konkoly Observatory
Budapest
1977 July 28

EVIDENCE OF MASS EJECTION FROM β PERSEI (ALGOL)

Observational evidence of mass ejection has been detected in the ultraviolet spectrum of β Per obtained from the Balloon-borne Ultraviolet Stellar Spectrometer (BUSS). The observations were obtained at JD 2442330.674 in the 24 Å spectral range centered at 2800 Å, which includes the Mg II resonance doublet at 2795.523 and 2802.698 Å and their respective subordinate lines at 2797.989 and 2790.768 Å. The spectrometer entrance slit had a width corresponding to 1/4 Å. The wavelength scale was determined to an accuracy of 1/4 Å.

The resonance lines are narrow and deep and the subordinate lines are markedly pronounced. Both features are analogous to those seen in shell stars. The deep subordinate lines are also characteristic of high luminosity objects (class I or II) in late B spectral types.

To be noted are the shortward-shifting (by 3/4 Å) of the entire set of Mg II lines, as also seen in the shell star ζ Tau (Morgan, Kondo and Modisette, Ap.J., 1977 September 1). The orbital phase of β Per at the time of observation was 0.314; as K_1 = km s^{-1}, the orbital velocity of the primary at that time (-17.6 km s^{-1}) cannot account for the shifting of the Mg II lines. One possible explanation is that all Mg II lines originate from an optically thick expanding shell. (The "photospheric" Mg II lines are theoretically thought to originate in the outermost layers.) The outflowing matter might have been undergoing an acceleration in the fashion of solar wind. If so, the observed expansion velocity of the shell, which is about 80 km s^{-1}, does not preclude the possibility that the mass was being lost from the binary system.

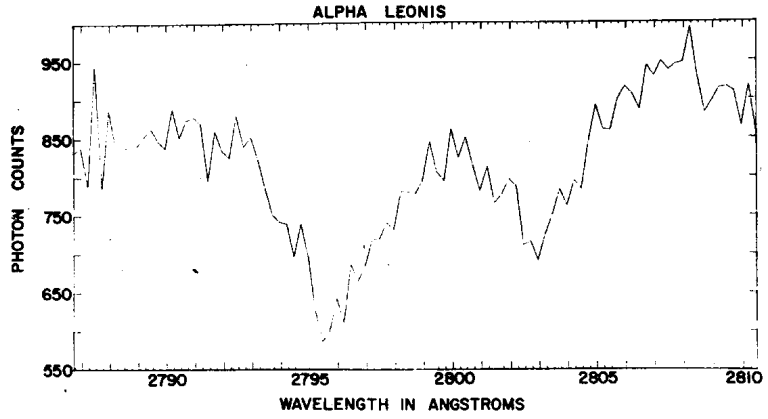
The Copernicus observations of the Mg II lines, obtained by

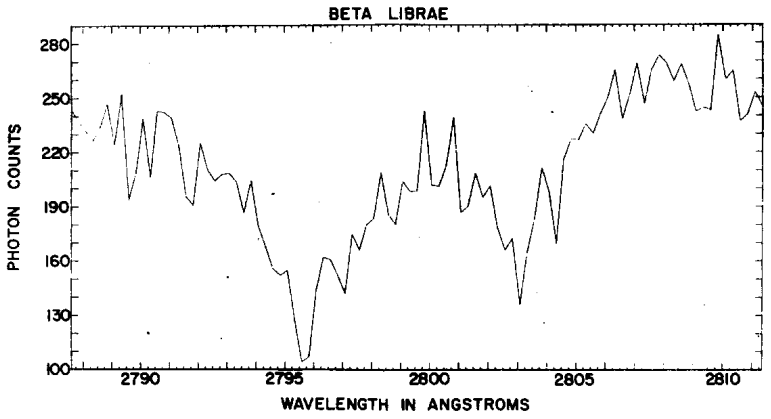
Chen and Wood (1976, MNRAS,176, 5P) in January 1974 at phases between 0.845 and 0.093, did not show any measurable shifting of these lines beyond what can be accounted for as the radial velocity of the primary. A tentative explanation of the apparent difference is that the 1974 October 10 BUSS observations were obtained when a significant amount of mass was flowing out of the primary. Had appropriate observations been made at about the same time, Algol might have appeared as an active radio source and a weak X-ray source. Algol has been identified as an incipient radio source by Hjellming, Wade and Webster (1972, Nature Phys.Sci.,238, 52) and as an occasional weak X-ray source by Schnopper et al. (1976, Ap.J. 210, L75). Alternatively, it is possible that a steady-state, non-uniform flow produces different Doppler-shifts at different phases.

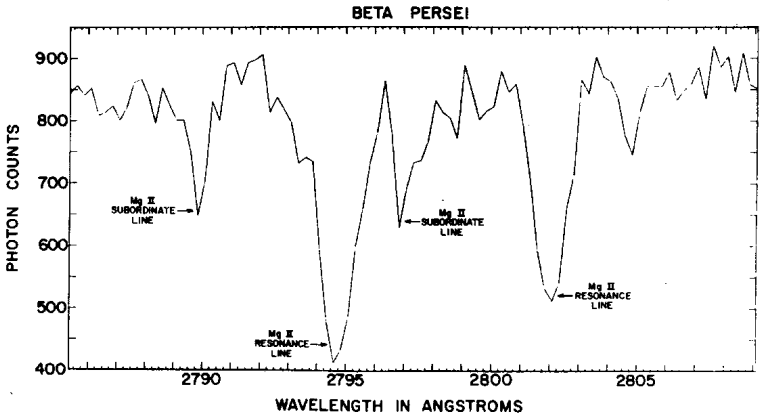
The BUSS spectrum of β Per (B8 V + K IV) is shown together with those of two comparison stars β Lib (B8 V) and α Leo (B7 V). Background has been subtracted in these plots. The spectral classification for β Per is by Hill et al. (1971, Ap.J., 168, 443).

YOJI KONDO
SC23
Johnson Space Center
Houston, TX 77058, U.S.A.

J.L. MODISETTE
T.H. MORGAN
Houston Baptist University
Houston, TX 77036, U.S.A.


ALPHA LEONIS
PHOTON COUNTS
950
850
750
650
550
2790
2795
2800
2805
2810
WAVELENGTH IN ANGSTROMS


BETA LIBRAE
PHOTON COUNTS
280
250
220
190
160
130
100
2790
2795
2800
2805
2810
WAVELENGTH IN ANGSTROMS


BETA PERSEI
PHOTON COUNTS
900
800
700
600
500
400
Mg II SUBORDINATE LINE
Mg II RESONANCE LINE
Mg II SUBORDINATE LINE
Mg II RESONANCE LINE
2790
2795
2800
2805
WAVELENGTH IN ANGSTROMS