UV Observations of Beta Cephei

D. FISCHEL and W. M. SPARKS (Greenbelt)

(Read by D. KLINGLESMITH)

I. Observations

Observations of β Cephei were taken by the OAO-II on April 5, 19, June 6—9, 11, 13, 15, 17—20 of 1971 totalling 64 scans from 1800—1200 Å. The C IV resonance line at 1548, 50 Å is very strong on April 5 but almost completely vanished on April 19.

The data cover 400 cycles of the 4^h34^m period. The bottom curve is the $\log_{10}$ of the counts (scaled by x64) recorded by OAO-II in the continuum at 1750 Å, plotted vs. phase in the 4^h34^m period. The upper curve is the $\log_{10}$ of counts at 1550 Å which is approximately the center of C IV. The lower points on this curve occur when the line is very strong and the upper points when the line is weak. The earliest data are represented by special symbols (Julian Day 47 is April 5, 61 is April 19 etc.). Looking at the X points which represent data taken on June 8 and 9 we see that the short period variation of the line is the same as the continuum.

The next slide shows the „equivalent width" in counts for the C IV line using data at 1540, 1550 and 1560 Å with the continuum being drawn between 1530 and 1570 Å. The variation at 1530 Å is identical to that of 1570 Å in the previous slide. The phase is over a period of 6 days. We estimate the uncertainty to be less than $\pm \frac{1}{4}$ day. The 4^h34^m pulsation has not been removed from the equivalent width because of the difficulty in determining the amplitude of the short period variation in the line from the data. There is *no* six day variation in the continuum.

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II. Interpretation

The C IV resonance doublet at 1550 Å is very luminosity sensitive (SPARKS & FISCHEL — NASA SP — 3066, Code-Utrecht meeting) whereas Si IV is not. We can only hypothesize three phenomena giving rise to such an effect; a beat period phenomenon, shock waves or tidal effects. If it is a beat phenomenon, the other pulsation would have a period of 4^h43^m and no such variation is known to have been observed for β Cephei. It is difficult to understand how a shock wave could affect only C IV and not have any thermal effects on the continuum or Si IV. The tidal effect is plausible. FITCH (1969 Ap. J. **158**, 269) presented evidence that β Cephei is a single line spectroscopic variable with a period of 10.893 days, and an eccentricity of about 0.5. The mass function and a sin i that he obtained are very low. The mean velocity due to the binary motion of about 3 km/sec makes the analysis very difficult. (The radial velocities range up to 46 km/sec.). A possible model is a 12 day orbital period with modest inclination and a nearly circular orbit. Such a model would show first one tidal bulge, then the other, with a period of 6 days. We do not propose this model as conclusive, but merely as the only way to make our data and analysis commensurate with that of FITCH.

I any event, future analyses of β Cephei will have to account for the periodic variation of the C IV resonance line.

Discussion to the paper of FISCHEL and SPARKS

HUTCHINGS: Is the C IV line the only one to show this behaviour?
KLINGLESMITH: Yes.
SAHADE: You have also there the variation in the forbidden He I line.
KLINGLESMITH: Which supports the idea of a density change rather than an abundance effect.

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