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GEOS CIRCULAR ON RED VARIABLE STARS

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# V 2113 Oph , FOUR YEAR OF OBSERVATIONS : 1982-85

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***SUMMARY** : V 2113 Oph : FOUR YEARS OF OBSERVATIONS : 1982-1985*

*Discovered by O.J. EGGEN in 1973, the variations of star HD 156860 = V 2113 Oph have been confirmed photoelectrically at Jungfraujoch Observatory. Four years of visual observations give evidence of alternating intervals of stability and noticeable variations. The star could be an SRb-type variable.*

***RESUME** : V 2113 Oph : QUATRE ANNEES D'OBSERVATIONS 1982-1985*

*Les variations de l'étoile HD 156860 = V 2113 Oph, découvertes par O.J. EGGEN en 1973, ont été confirmées photoélectriquement à l'Observatoire du Jungfraujoch. Quatre années d'observations visuelles montrent des périodes de stabilité et des époques à variations sensibles. Il pourrait s'agir d'une étoile du type SRb.*

***RIASSUNTO** : V2113 Oph : QUATTRO ANNI DI OSSERVAZIONI (1982-1985)*

*La variabilità della stella HD 156860 = V 2113 Oph, scoperta da O.J. EGGEN nel 1973, è stata confermata fotoelettricamente all'Osservatorio dello Jungfraujoch. Quattro anni di osservazioni visuali mostrano sia periodi di stabilità che di vaziazione notevole : potrebbe quindi trattar si di una variabile tipo SRb.*

***RESUMEN** : V 2113 OPh : CUATRO ANOS DE OBSERVACIONES (1982-1985)*

*Las variaciones de la estrella HD 156860 = V 2113 Oph, descubiertas por O.J. EGGEN en 1973, han sido confirmadas fotoeléctricamente en el observatorio de Jungfraujoch. Cuatro anos de observaciones visuales muestran unos periodos de estabilidad y unas épocas con variaciones sensibles. Podria tratarse de una estrella del tipo SRb.*

## *INTRODUCTION*

*Regular monitoring of the eclipsing binary U Oph quickly allows observers to notice the variation of neighbouring star HD 156860 ( $\alpha$ = 17h 17m 15s, $\delta$ = +2° 11' 21"), already discovered by O.J. EGGEN (1).*

*The sky catalogue 2 000 gives the following data for the star :*

*V = 6, 8 B-V = + 1,6 Spectrum M4 III*

*Figure 1 shows the field of the star and the positions of stars F and K which were used as comparisons for the visual observations :*

| | | |
|---|---|---|
| *F = HD 156208* | *6,02* | *AO* |
| *K = HD 156458* | *6,70* | *FO* |

*Both these stars are hotter than the variable and the observations were made, as far as was possible, at constant air-mass. All the visual estimates were made with 50 mm binoculars, giving a power of 10 x, well adapted to the observation of the star.*

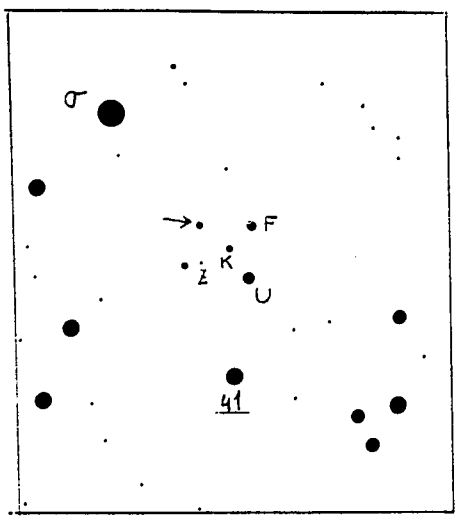


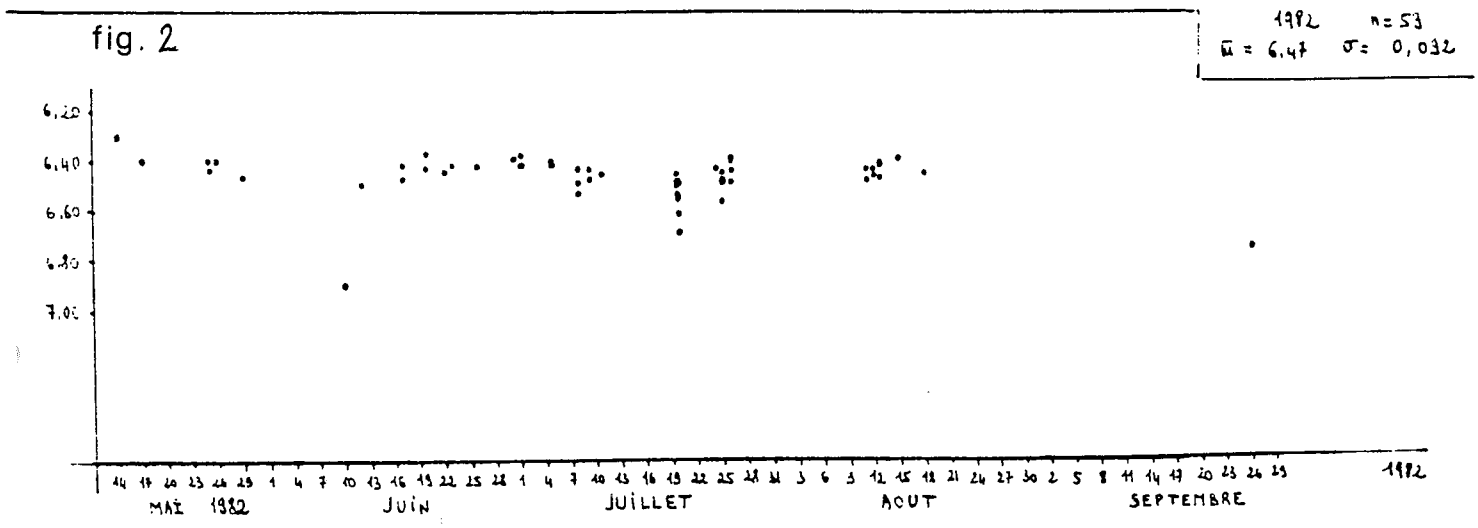

*Fig 1 : field of HD 156860*

*The variables U Oph and Z Oph are close by HD 156860*

## *RESULTS OF THE VISUAL ESTIMATES*

*Table 1 summarizes the observations of M. DUMONT which appear in figures 2 to 5.*

fig. 2



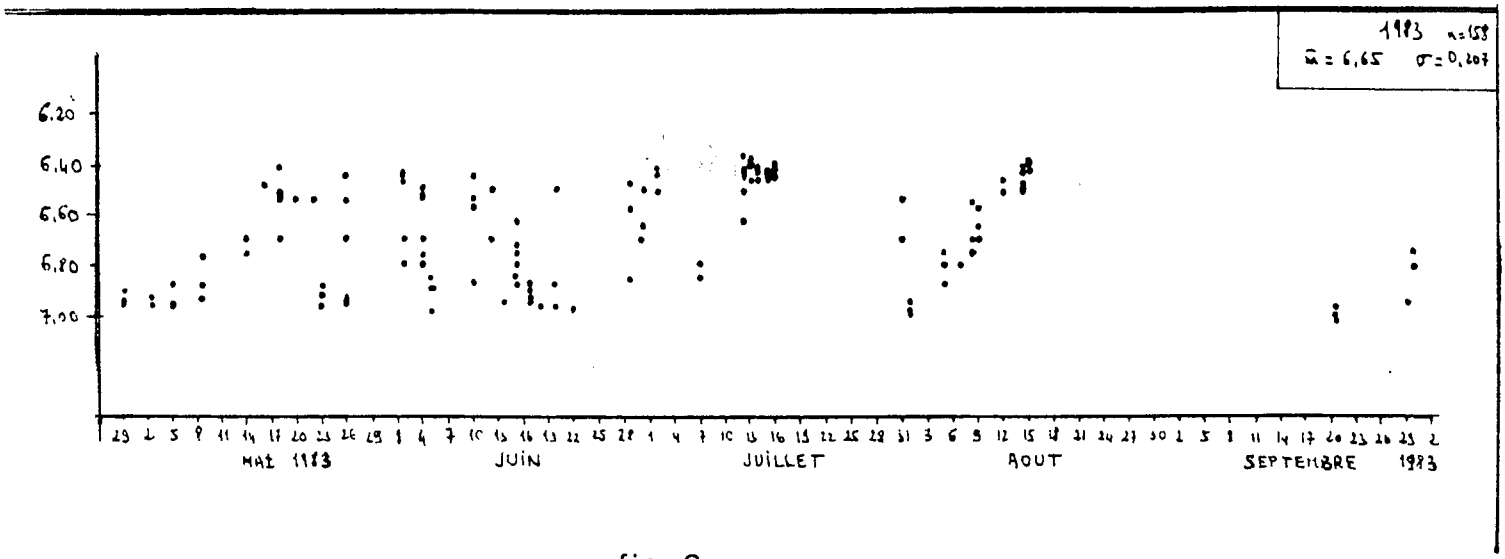
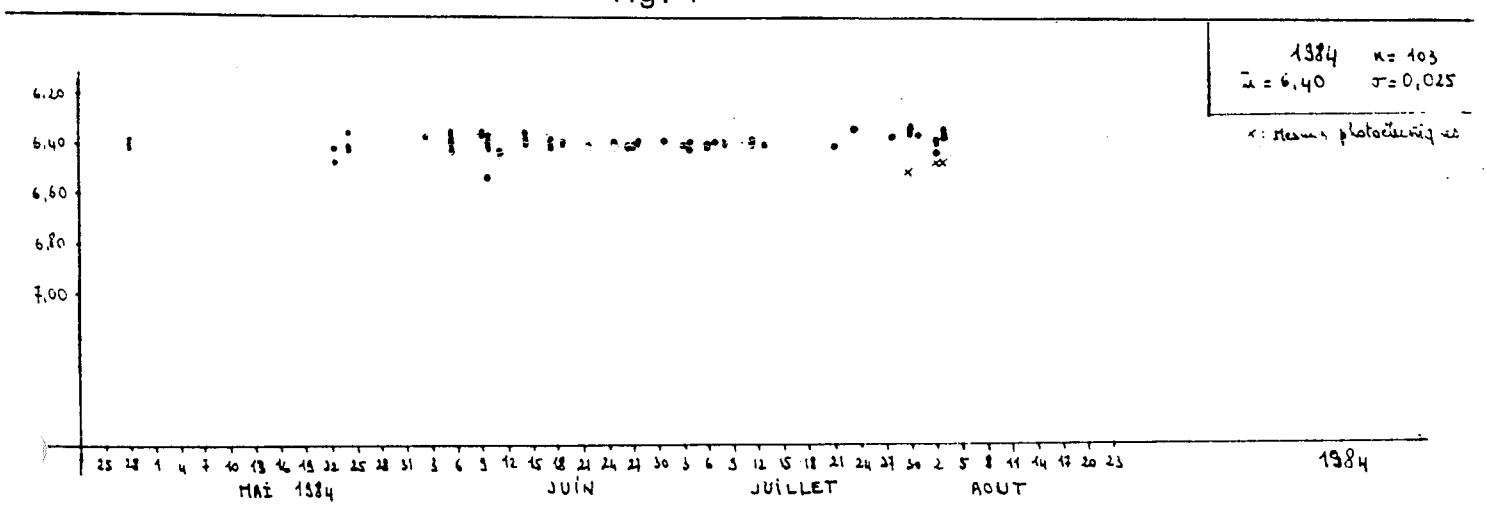



fig. 3

fig. 4



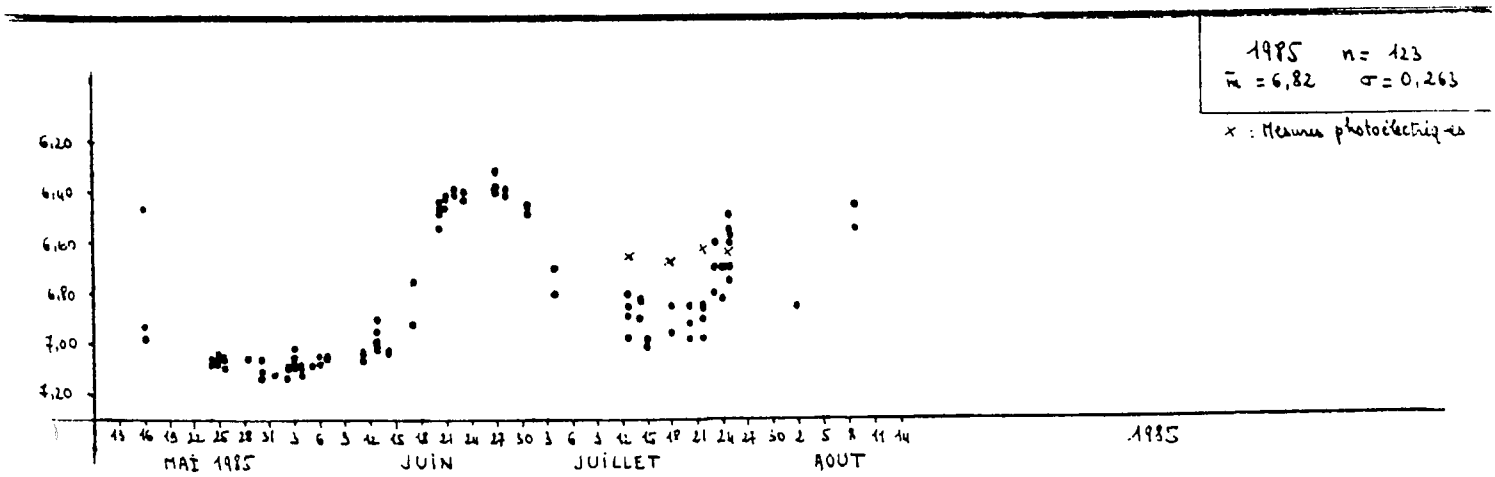




fig. 5

| Year | Number of estimates | averaged magnitude | Standard deviation | Figure | Conclusion |
|---|---|---|---|---|---|
| 1982 | 59 | 6,47 | 0,092 | 2 | Constancy |
| 1983 | 158 | 6,65 | 0,207 | 3 | Unconclusive |
| 1984 | 103 | 6,40 | 0,025 | 4 | Constancy |
| 1985 | 123 | 6,82 | | 5 | Regular variations |

TABLE 1

The standard deviation was calculated assuming that the star was constant throughout the observing season. In 1985, however, the hypothesis is not likely. Also, the strong dispersion of the observations of 1983 is not clearly explained. The star could well have shown rapid and irregular variations but the fact that the observations may have lacked accuracy and thus scattered cannot be ruled out.

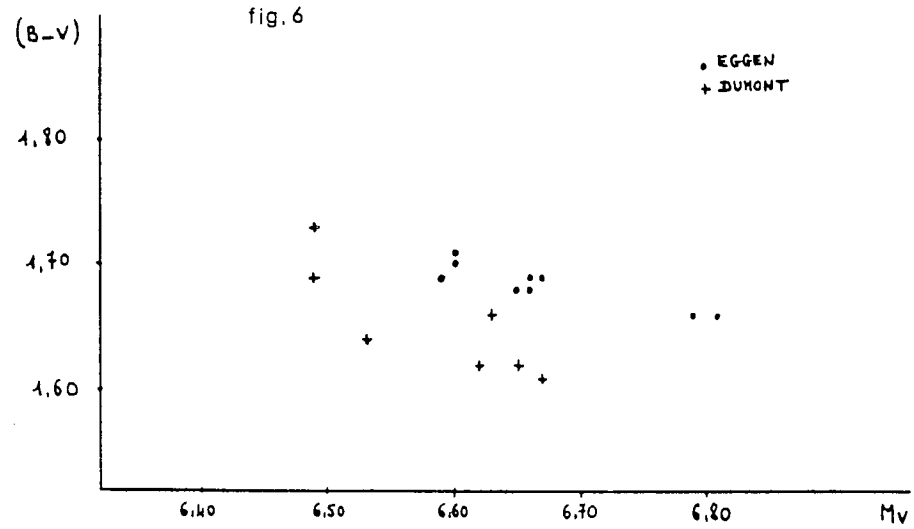
An examination of the four light curves reveal an amplitude of the order of 0,7 magnitude. This alternation of constancy (1982, 1984) and relatively rapid variations (1985 and perhaps 1983) suggest that the star could be an SRb-type variable, a hypothesis which would agree with the spectral type M4 III (3).

## PHOTOELECTRIC MEASURES

Seven photoelectric measures were made in 1984 and 1985. They were made in the three colours U, B and V of the Geneva photometric system. These measures are listed in Table 2

| Dates | UT | Mv | (B-V)G | (U-B)G | (B-V) |
|---|---|---|---|---|---|
| 1984 July 29 | 22 h 03 | 6,53 | 1,11 | 2,95 | 1,64 |
| 1984 August 02 | 0 h 07 | 6,49 | 1,21 | 3,01 | 1,73 |
| 1984 August 02 | 22h 31 | 6,49 | 1,17 | 2,99 | 1,69 |
| 1985 July 12 | 22 h 20 | 6,65 | 1,08 | 2,99 | 1,62 |
| 1985 July 17 | 22 h 08 | 6,67 | 1,07 | 2,99 | 1,61 |
| 1985 July 21 | 22 h 10 | 6,62 | 1,08 | 3,01 | 1,62 |
| 1985 July 24 | 21 h 53 | 6,63 | 1,13 | 2,98 | 1,66 |

TABLE 2




*The star was unmistakably brighter in 1984 than in 1985. The (B-V) index was calculated from (B-V)G (4). This seems to reveal a certain trend : the (B-V) index seems to be higher when the star is brighter. Eggen's measures also show the same character (1). These measures and ours are plotted in figure 6 which gives the variation of (B-V) against* $M_V$.

## *CONCLUSIONS*

*More visual observations would be necessary to confirm the SRb type and the variation of (B-V) with Mv. This mode of variation suggests that the star is at maximum brightness when its diameter is maximum and that this diameter varies in a ratio sufficiently large (at least 1,4) to compensate for the slight drop in temperature.*

*Michel DUMONT*

## *REFERENCES*

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