LETTERS TO THE EDITOR

ASTROPHYSICS

4430 Å Absorption in Magellanic Cloud Stars

THE unidentified interstellar absorption band at 4430 Å is well known in reddened early-type stars in the Galaxy. Indications of its presence have been found on microphotometer tracings of Radcliffe spectra of stars belonging to the Magellanic Clouds, including the most heavily reddened known members of the Large and Small Cloud. A sample tracing appears in Fig. 1. The bands are, as usual, so wide and shallow that no precise measure of wave-length is possible, but from the 11 best tracings a mean central wave-length of 4425 ± 10 Å, relative to the stellar absorption lines, is found. The 4 deepest bands have central depths ranging from 6 to 10 per cent.

Fig. 1. Tracing of spectrum of Small Magellanic Cloud star HD 4976

Duke¹ records central depths of up to 20 per cent for galactic stars of low latitude, but the values fall off rapidly with increasing galactic latitude and beyond $b = 32^\circ$ no depth greater than 4.6 per cent is found. The observed depths in the Cloud stars at $b = 33^\circ$ (Large Cloud) and 45° (Small Cloud) make it extremely unlikely that the absorption occurs in the galactic foreground rather than within the Magellanic Clouds. The two members with strong absorption in the Large Cloud are in areas of nebulosity which are certainly associated with the Cloud and not with the Galaxy.

The only previous indication of 4430 Å absorption in the Magellanic Clouds (or in any external Galaxy) has been found by Walker², who used interference filter methods, but the results were inconclusive.

The observation of 4430 Å absorption in stars belonging to the Small Cloud is of special interest as the absorption band is an indicator of interstellar dust. It has been believed by many writers (for example, Burbidge³) that the Small Cloud is essentially free of dust, and some evolutionary theories have been built on this hypothesis. The observation of the 4430 Å band, together with Wesselink's⁴ nebular counts and photoelectric colours combined with spectra, provides evidence that the dust content of the Small Cloud is not necessarily abnormal.

More detailed results of the measures of these stars and others in the Magellanic Clouds will be published elsewhere in due course.

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¹ Duke, D., *Astrophys. J.*, **113**, 100 (1951).

² Walker, G. A. H., *Mon. Not. Roy. Astro. Soc.*, **125**, 141 (1963).

³ Burbidge, G. R., *Die Entstehung von Sternen*, 87 (1960).

⁴ Wesselink, A. J., *Mon. Not. Roy. Astro. Soc.*, **122**, 503 (1961).

RADIOPHYSICS

Regularities in the Occurrence of Solar Flares

STRIKING regularities in the occurrence of intense solar flares have been identified, and an investigation of these regularities is beginning to provide new information about solar disturbance events.

On the basis of earlier work¹⁻³ the work recorded here began with the assumption that regular variations, with periodicities of the order of several days, occur on the Sun. The physical nature of these variations is unknown, but it was assumed that one manifestation of their existence is the occurrence of discrete solar disturbances. The general concept was that the probability of occurrence of an event, such as an intense flare, is determined by the phase of the assumed solar periodic variations.

In this analysis the solar data were restricted to the starting times of flares listed by at least one observatory as of importance ≥ 2 . All flares were included, regardless of their location on the solar disk. Six data samples totaling some 24 months were selected from the period 1949-62. The flare lists are obviously an incomplete record of solar flare activity. In addition to gaps in the world-wide flare patrol, half the total activity occurs on the far side of the Sun. Nevertheless, it was found that the data could frequently be sorted into two distinctive types of time series, referred to here as series A and B. The A series are quasi-periodic; that is, they are characterized by time intervals that are approximately constant, or that have a constant common factor. The A series may occur alone, or in association with B series. The time intervals of a B series are not constant, but tend to increase regularly in consecutive integral multiples of the first interval of the series. The occurrence of the A series is not inconsistent with the initial assumptions, but the occurrence of the

Table 1. TYPE B TIME SERIES (1949-62)*

Time origin	Initial interval (days)	Total No. of terms	Missing terms
1949			
Jan. (15-28)	0.27	10	3
Feb. 10-14	1.32	7	1
April (23-61)	1.45	5	1
April 24-44	1.45	5	0
May 26-28	3.12	6	0
July 29-59	0.68	5	0
1951			
May 17-75	0.33	6	0
1956			
Feb. 20-81	0.75	7	0
Feb. 23-46	3.05	6	0
April 6-25	2.21	7	0
1958			
June 23-29	2.82	6	0
1960			
Mar. 29-28	0.36	6	0
Sept. 21-56	3.36	7	0
1962			
Mar. 17-81	4.62	5	0

* This is a partial list only, obtained from six data samples. When the first term of a series is missing, the computed time origin is shown in parenthesis.