

Newkirk

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HIGH ALTITUDE OBSERVATORY
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Solar Research Memorandum No. 90

Subject: Distribution of Flares of Different Importance Over the Solar Disk *

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The Working Group of Flare Classification (I.A.U. Commission 11) has recommended that the corrected area of flares be used as a primary basis for classification by importance. Of all observatories participating in the flare patrol and reporting to the I.A.U. Quarterly Bulletin some also use the $H\alpha$ line width or intensity in estimating the importance. Because of the immense complexity of the flare phenomenon this leads to difficulties in making a recommended estimation of the flare importance and discrepancies between importances designed by different observatories are likely to result.

Since so much statistical work on solar activity, etc., is based on flare data from the Quarterly Bulletin, I have thought it worth while to consider some aspects of the flare data given in the Quarterly Bulletin. The period studied is 1951-1955.

The flares were divided in central (C) and non-central (NC) flares according to whether their longitude (l) is numerically less than 30° or not.

Table 1 gives the number and percentage of central flares in each of the importance classes 1, 2 and 3, and Table 2 shows the total number of importance 1 flares studied and the percentage of central flares per year, to illustrate the scatter.

Table 1

Importance	1	2	3
Number of C flares	331	61	10
Per cent of C flares	38	58	63

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Table 2

Year	1951	1952	1953	1954	1955	Total
Total number of importance 1 flares	372	136	76	16	246	846
Per cent C flares	41	34	43	68	36	38

From these tables it becomes apparent that for the period considered the ratio of central to non-central flares increases with increasing importance of the flare. This can hardly be a real effect and is probably due to a tendency of underestimating the importance of limb flares (for instance, by not employing the area correction factor properly).

If we for comparison consider the work by J.W. Warwick (1) on flares observed at Sacramento Peak, we see that Warwick found a distribution curve of corrected area which showed that the ratio of central to non-central flares decreases markedly with increasing flare area. It should be noticed that it is not surprising that this result for the Sacramento Peak flares does not affect our results significantly even though the periods in question partly overlap, since the percentage of Sacramento Peak flares in the Quarterly Bulletin is rather small.

The tendency of underestimating the importance of limb flares might have some bearing on a result concerning the ionospheric influence of flares, reported by Dodson, Hedeman and McMath (2). In their study Dodson et al. found that for flares of comparative importance (especially in importance class 1) the ionospheric disturbances tend to be greater for flares near the solar limb. This seems to me to be physically difficult to interpret. Even though one might call on some flare model where the ionizing radiation (Lyman α or X-rays) is generated higher up in the solar atmosphere than the H α radiation, which would partly remove the physical difficulties, the observations are easier explained in terms of the above-mentioned underestimation of limb flares.

References

- (1) J.W. Warwick: Ap. J. 121, 376, 1955.
- (2) H.W. Dodson, E.R. Hedeman and R. McMath: Ap. J., Supl. Ser. 20, 1956.

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