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THE PROTON FLARE OF 9 JUNE 1968

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A small short-lived southern region on the sun produced severe and unexpected geophysical effects. The history of the region is detailed. The U-shaped spectral signature of the cm-dm burst gave warning of a possible PCA.

INTRODUCTION

Since proton flares occur infrequently, any proton event merits detailed analysis. Principal polar cap absorption (PCA) events are those exceeding 2.5 db at 30 MHz. The proton flare of 9 June 1968 is one of those, having produced the largest PCA and the largest magnetic disturbance since the event of 23 May 1967. The present event accounted for a 6 db riometer absorption (Masley 1968) and planetary magnetic indices Kp and Ap of 8 and 103 respectively (ESSA–ITSA Monthly Bulletins of Solar-Geophysical Data, 1968). Yet this event seemed little expected. Both the calcium plage (McMath No. 9429), and the associated spot group were born on the disk about 2 June. By 14 June the region had all but disappeared. Very few proton flares are associated with first rotation plages: a recent survey lists only 1 out of 40 events (USAF–SFC Report 4 WWM 105–1, *Forecasting Solar Activity and Geophysical Responses*, Colorado Springs, 1968). The spot group was small and had gamma-magnetic and D-Zurich classifications. The latter classification correlates only weakly with proton flares. Finally, the flare occurred in the southern hemisphere when activity was predominantly in the north. However, southern hemisphere proton flare activity may predominate during certain extended periods: In August 1968 sunspot activity in the south began to predominate (Smith 1968); the proton flares of October 1968 were also from the south. Prior to the event of 9 June no important PCA's were associated with southern regions during the present sunspot cycle. The present event may therefore have signalled the start of changing periodic solar magnetic patterns.

The optical capabilities of the Manila Observatory have been described earlier (Miller 1968). The radio patrol is maintained at discrete frequencies in the decimeter-centimeter wavelength region and is patterned after that of the Sagamore Hill Solar Radio Observatory. An essential objective of the program is to measure burst fluxes with a high degree of accuracy. Manila Observatory is one of the few solar observatories where both optical and radio measurements are made at the same site. Because the active region No. 9429 was so short lived and because almost complete optical and radio coverage is available through several related organizations, it is possible to study the evolution of this active region.

PRE-FLARE Hα PLAGE CONFIGURATION

In a study of 135 major flares Miller and Trinidad (1969) found a distinctive pre-flare Hα plage configuration. Before a major flare there was visible in some part of the active plage a bright roughly V-shaped configuration. This could also resemble a Y, or a gamma. The essential feature was a sharp, small angle between the two arms. It was found that the flare started at the apex or meeting point of the arms. When the V-configuration remained tight and sharp, more large flares could be expected; but when the V rounded into a U, the likelihood for a flare faded. On 9 June 1968, the Hα plage had this bright V-configuration before the proton flare and a rounded U after it. The next importance 1 flare took place four days later. The flare was observed visually but not photographically. Figure 1 shows the development of the configuration in the plage. The plage itself is much larger than the configuration but