THE CORONAL DISTURBANCE OF 12 AUGUST 1972

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Abstract (*Solar Phys.*). The association of flare sprays, distortions of the overlying coronal structures and moving type IV radio bursts is a reasonable one and is well accepted despite the paucity of observational evidence. On 12 August 1972 there occurred a flare spray observed optically by both flare patrol (National Oceanographic and Atmospheric Administration) and coronagraph (High Altitude Observatory) instruments. A subsequent moving type IV radio burst was recorded on two swept frequency interferometers (Universities of Colorado and Maryland). In addition distinct changes in the *K*-coronal brightness at 1.6 $R_\odot$ were measured (High Altitude Observatory *K* coronameter). These observations combine to form one of the most complete sequences of measurements yet recorded covering the range from the chromosphere to about 6 $R_\odot$. The separate measurements are discussed and we show that they can be combined to form a relatively simple physical picture of the whole event.

Material ejected from a prominence behind the limb was observed in Hα out to a radius of 2 $R_\odot$. During the event the ambient coronal magnetic field above the flare at heights of 1.2–1.6 $R_\odot$ moved sideways, carrying with it the coronal plasma, as evidenced by changes seen in the *K*-coronal structure. The disturbance caused by the ejection moved out through the opening carrying with it material from the low corona. Subsequently (within 24 h) material left higher regions in the corona, diminishing the electron density enhancement over the region at heights of 1.2 and 1.6 $R_\odot$. The passage of the material created a shock wave which moved out through the corona ahead of the material which created it. Synchrotron radiation within the shock resulted in a type IV radio burst.

DISCUSSION

Wild: Was there an associated type II burst?

Riddle: No; the type IV started at 70 MHz and drifted to 30 MHz. I believe the source was behind the limb by about 15°.

Pneuman: I want to comment on the *K*-coronameter isophotes. Before the disturbance, they were roughly gaussian in shape, and square afterwards. This implies that matter was pushed to the sides of the condensations by some action moving through the middle.

Riddle: I agree, I should have made that clearer.

Gotwols: Please clarify whether the radio burst actually began at 2100 UT, or is that merely the time when it drifted into the passband of the swept frequency interferometer?

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Riddle: The Boulder spectrograph covers up to 80 MHz whereas the burst was observed to start up at 70 MHz so the true starting of the radio event was ~2100 UT.

McLean: Why do you say that the type IV source is a shock rather than something pushed ahead of the visible matter?

Riddle: That is certainly possible, however the large height difference between the 'piston' and the radio source suggests a shock with a large standoff distance.

Sturrock: Studies of the bow shock near the Earth's magnetosphere indicate that the standoff distance is typically 0.4 times the radius of curvature of the obstacle. Does this fit your data?

Riddle: I think these theories apply for higher Mach number (4–5) than that of interest here, which is closer to 2–3. Also, I don't know how we'd find the appropriate piston radius.

Dryer: The theory for an accelerating piston certainly needs improvement. A rule of thumb is to add 10% to the distance the piston has moved to find the stand-off distance.

Riddle: We need more data to clear up the question.