a latitude near 30° N., the value of $-dT/dt$ increasing by a factor of $1 \cdot 35 \pm 0 \cdot 02$. Also from Table 1 it appears that the orbits of the three satellites were very similar near the time of the change, and in particular that the perigee heights were almost identical.

When information was available only on *Sputnik* 2, it was not possible to say whether the abrupt change in slope was caused by a change in $S$ or in $\rho_p\sqrt{H}$. But now the same phenomenon has occurred with three satellites of widely differing mass, shape and size, and it is scarcely credible that all three should, when their perigee latitude was near 30° N., have altered their mode of rotation so as to change their effective cross-sectional area by the same factor. The more plausible explanation is that $\rho_p\sqrt{H}$ increases quite sharply when going south near latitude 30° N., and since $H$ would tend to increase if $\rho_p$ increased, it seems probable that the air density at a height of 120 nautical miles (220 km.) increases considerably somewhere between latitude 35° N. and 28° N.

If this conclusion is correct, a similar change in slope would be expected with the rocket of *Sputnik* 1 ($1957\alpha_1$). The information available to us on this satellite is not sufficiently accurate to provide a test. Any similar changes in the United States satellites 1958α, 1958β and 1958γ would not be so readily observable because the movement of perigee is much more rapid.

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## Observation of a Solar Flare at 4·3-mm. Wave-length

During a programme of solar observations at a wave-length of 4·3 mm., scans were made across the Sun on September 25, 26 and 27, 1957. The radio telescope used for these observations has a half-power beam-width of 6·7 minutes of arc. The antenna reflector is an aluminium paraboloid, 10 feet in diameter with a focal length of 35·8 inches. The receiver is mounted on the back of the antenna and is a Dicke-type radiometer consisting of a superheterodyne receiver preceded by a motor-driven attenuator wheel. This radio telescope has been described in a previous publication[1]. The observations were made by pointing the antenna ahead of the Sun and locking it in position. The radiometer output was then recorded continuously as the Earth's rotation carried the Sun's image through the antenna beam. The scans were made across a large plage region located in the eastern part of the solar disk. The scans for each of the three days are shown in Fig. 1. The observed enhanced radiation from the plage region is clearly evident on all three scans. The scan on September 26 was made at the time of the maximum of an importance 3 solar flare occurring in the plage region. The enhancement recorded on September 26 is about twice the enhancement for the two scans made on the day before and the day after the flare. This indicates that the enhanced radiation is from the flare.

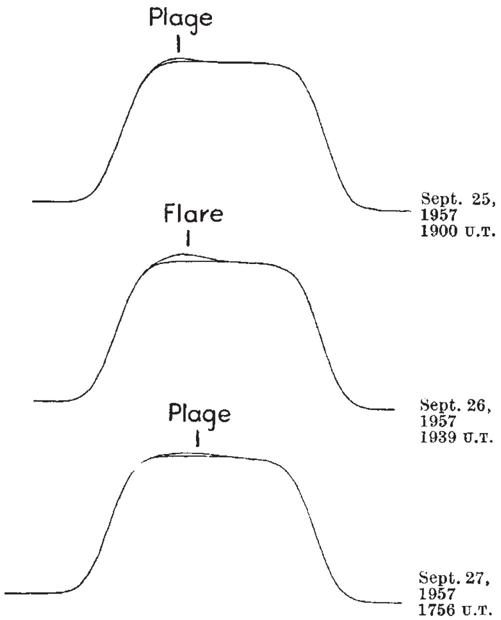


Fig. 1. 4·3-mm. solar scans across plage region and flare of importance 3. Upper curves, observed scans; lower, quiet sun scans for comparison

McCullough at the Naval Research Laboratory recorded the 9·4-cm. solar radiation on September 26, and Fig. 2 is his record of the burst observed coincident with the importance 3 flare. The increase in flux at 9·4 cm. was about 40 per cent at 1938. The observed increase at 4·3 mm. corresponds to a flux increase of 0·36 per cent with respect to the entire disk. Thus the per cent increase of flux at 4·3 mm. was about 1/100 of that at 9·4 cm.

The areas of the plage region before and after the flare and the area of the flare were determined from $H$-alpha photographs made with a flare patrol camera[2]. These areas were used to compute the average brightness of the plage and flare that would produce the observed enhanced radiation at 4·3-mm. wave-length. The average brightness temperature for the plage came out to be 8,100° K., which is to

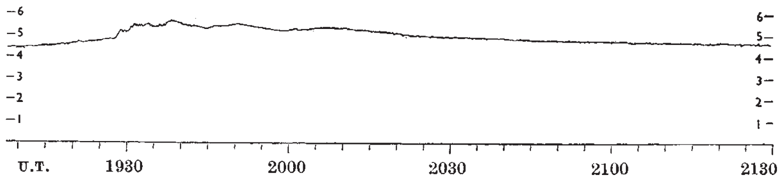


Fig. 2. Solar burst, $\lambda = 9 \cdot 4$ cm., Sept. 26, 1957. Horizontal axis represents sky-level

be compared with the 7,000° K. brightness temperature[1] of the quiet solar disk at 4·3 mm. The brightness temperature for the flare was 14,400° K. Neither the brightness temperature for the flare nor the plage is exceedingly high, and therefore it is fairly easy to explain the observed enhanced radiation as just thermal radiation from the flare area and from the plage area.

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[2] Edelson, S., Rep. NRL Progress, 12 (Jan. 1958).