REPLY BY T. GOLD

I agree with Dr Simpson that the other possible modes of generation of these energetic particles must be investigated also. I consider the μ-meson decay idea to fall short by a substantial factor, but all injection mechanisms that draw on secondaries from cosmic rays will suffer from the difficulty that a high efficiency and very good storage would be required, because a flux of some hundreds of times the energy content of the cosmic ray flux has to be explained; in terms of particle number the enhancement is very great indeed, of order 10^7. For this reason I think the interpretation in terms of a general solar flux that gains access through suitable configurations of the field at present the most promising. This interpretation agrees with other considerations of the magnetic storm process, and it would allow one to identify an enhancement of this stored flux with the condition that gives rise to aurorae.

So far as the time constants of the decay of a distended magnetic field of the Earth are concerned there is no difficulty in accounting for the observed one of about one day, given by the rate at which the field strength recovers after a disturbance. The individual tongues that stretch in to allow the penetration of gas are of course of much shorter duration, as is shown by the auroral display.

4. THE INHOMOGENEITIES OF SOLAR CORPUSCULAR STREAMS

M. S. BOBROV

As a rule, a typical geomagnetic record obtained near the auroral zone during a magnetic storm shows some separate groups of peaks with intervals between them which are practically the records of an undisturbed field [1].

We consider this picture as observational evidence of the inhomogeneous structure of solar corpuscular streams in the vicinity of the Earth. From this point of view the magnetic storm is caused by a bombardment of the auroral zones and adjacent regions by clouds of solar plasma with some magnetic field frozen into it.

The approach of such a cloud to the point of observation causes a strong peak on the magnetogram.

This conception permitted us to estimate the following quantities:

(1) the number Z of the clouds per unit of time penetrating the ionosphere in the zenith of the point of observation;

(2) the size r of the clouds (by variation of the intensity and phase of disturbances with distance, see [2] and [3]);

(3) and (4) the volume density ρ_V of the clouds in the corpuscular stream and the mean distance R between the clouds.

For the moderate magnetic storm of 1953 November 11–21, with gradual commencement, we obtained the following: $Z \simeq 2 \cdot 10^{-4}$ sec^{-1}; $r \simeq 100$–300 km, $\rho_V \simeq 10^{-4}$; $R/r \simeq 40$.

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