COLLOQUIUM ON SOLAR-TERRESTRIAL RELATIONS

At this colloquium speakers were invited to give special consideration to insight resulting from the International Geophysical Year. Contributions are only briefly reported since it may be expected that fuller reports will appear elsewhere.

M. Waldmeier, A direct observation of a solar stream.

The motion of an ascending prominence, observed on 1961 March 18, and reaching a height of 733 000 km has been analysed by measuring trajectory and velocity. The trajectory was very similar to the shape of a coronal streamer observed during the total eclipse of the Sun on 1961 February 15, at the same latitude. The velocity was increasing outwards but the acceleration was decreasing; it seemed that the velocity would approach about 500 km/s. During the ascent the equation of continuity (r^2vp = constant) was fulfilled. From the observations it was concluded that the prominence was taken away from the Sun by the 'solar wind'. Hence the long rays of the corona represent a stationary streaming, and the velocity of the stream can be deduced from prominences floating in it.

V. A. C. Ferraro, The possible emission of electric current-bearing streams from the Sun.

Bennett and Hulbert have pointed out that during the passage of a corpuscular ionized stream emitted from the Sun through the interplanetary gas, the stream electrons tend to be slowed down more rapidly than the stream ions by collisions with the interplanetary particles. This means that an electric current develops in the stream which Bennett and Hulbert thought might be large enough to constrict the stream into a jet. However, Bennett and Hulbert neglected the effect of self induction which tends to limit the current considerably. When this is taken into account it is found that the current in the stream cannot much exceed about a thousand amperes—a value far too low to be of geomagnetic interest.

D. K. Bailey, A survey of polar cap absorption events in the period 1952 through 1960.

A complete catalogue was submitted of the 46 polar cap absorption events detected in this period together with details of possibly related preceding solar flares and short-wave fade outs.

E. R. Mustel, Preliminary comparison of geomagnetic disturbances with events on the Sun during the IGY period.

The relation between geomagnetic disturbances and the central disk passage of plages was demonstrated graphically. Various maxima and minima in the superposed epoch graph were explained to result from the auto-correlation of plages at set longitude differences.

J. W. Chamberlain, Theory of auroral bombardment.

A mechanism is proposed for ejection into the atmosphere of geomagnetically trapped protons and electrons. An irregularity in longitude distribution is assumed and the tendency for positive and negative particles to drift in opposite directions will lead to momentary electrostatic fields. Some of the particles drifting into this potential will spiral out the ends of the flux tube into the atmosphere. Density fluctuations in the auroral plasma can maintain their identity and cause the auroral ray structure. Various other consequences of the theory are examined. It is proposed that an $\mathbf{E} \times \mathbf{B}$ drift accounts for the statistical preference for auroral patterns to move towards the sunlit hemisphere and for the departures of auroral forms from alignment along circles of geomagnetic latitude. Other morphological features are explained.

Constance S. Warwick, Phenomena of solar proton events.

Systematic analysis of data on solar flares and bursts shows that polar cap absorption is most closely associated with solar events observed at long wave-lengths. Delay time of PCA tends to be longer near maximum solar activity and is related much more strongly to phase of the solar cycle than to flare position or to magnitude of the flare-burst event. Properties of solar particles of higher energy (causing an increase of cosmic ray monitors at ground level) and of low energy (causing geomagnetic disturbance) show that the probability that an interplanetary magnetic field will stop, delay, or deflect solar particles increases as the individual particle energy increases and is greatest near maximum phase of the solar cycle. Observed energy spectra show that relativistic solar particles will act as single particles in interplanetary fields, while particles causing geomagnetic disturbances, and, in general, those causing PCA will act co-operatively. Characteristics of propagation of solar particles can be explained by a model in which a weak ($< 10^{-6}$ gauss) uniform field, which may be identified with the galactic arm field approximately normal to the ecliptic plane, is compressed by outward moving solar plasma clouds into concentrations of 10^{-5} to 10^{-4} gauss.

Helen Dodson-Prince, Characteristics of flares associated with polar cap absorption.

A careful study of those flares most probably associated with polar cap absorption has shown that many of the flares show no great intensity or any other severe abnormality. The most characteristic property of these flares is that they cover the umbrae of sunspots.

A. D. Fokker and *H. P. Th. van Lohvizen*, The correlation between impulsive micro-wave flares and geomagnetic crochets.

Observations of micro-wave solar radio outbursts and geomagnetic crochets have been obtained by the Ionosphere and Radio Astronomy Section of the Netherlands PTT. It has been found that strong micro-wave outbursts of the impulsive type are often associated with crochets. If the bursts' peak intensity (in 10^{-22} W m^{-2} (c/s)$^{-1}$) be denoted P and its impulsiveness (= peak intensity/rise time) be I, then:

(*a*) of the SID-associated micro-wave bursts with $\log P < 1{\cdot}7$ and $\log I < 1{\cdot}5$ only 3·6% are associated with crochets;

(*b*) of micro-wave bursts with $\log P > 2{\cdot}3$ and $\log I > 2{\cdot}1$ as much as 55% are crochet-associated.

Geomagnetic effects and corresponding micro-wave bursts start practically simultaneously, and durations are usually the same. Both impulsive micro-wave flares and crochet flares tend to recur within one and the same active centre.

D. H. Menzel, The role of magnetic fields in solar prominences.

H. Friedman, Solar x-rays and the E-region. *G. Righini*, Publication of plages from Arcetri.

G. Piccardi, Chemical tests and solar activity. (This paper showed recent trends.)

P. Bernard, A new solar weather relation.

The speaker discussed certain specific cases when the evenness of the Earth's rotation appears to have been influenced by, or associated with, flares and micro-seisms.

G. E. Moreton, Optical detection of 1000 km/s disturbances.

Small movements and changes of filaments and other features have revealed very rapid and widespread disturbances emerging from a flare.