Fig. 2. The time separation ΔT between magnetic impulses during the International Geophysical Year

particularly strong during the International Geophysical Year, and the mean period was $2\frac{1}{2}$ days (Fig. 2). The data were insufficient to investigate periods of less than one day.

A separate investigation³ was made of the time separation, Δt , between the occurrence of solar flares and magnetic SSC impulses during the International Geophysical Year. All flares listed, from 1- to 3+, were given equal weight in the analysis. Intervals of up to 14 days were tabulated to the nearest $\frac{1}{4}$ day, from SSC to flare ($-\Delta t$), as well as from flare to SSC ($+\Delta t$). The $N(+\Delta t)$ curves show a $1\frac{1}{2}$ -day periodicity which is not present in $N(-\Delta t)$, and which could conceivably arise from the transit time of a disturbance from Sun to Earth. Removal of the $1\frac{1}{2}$ -day component leaves a 3-day periodicity in $N(+\Delta t)$ of about the same amplitude as a $2\frac{1}{2}$ -day periodicity in $N(-\Delta t)$. It could not be determined from this analysis whether the above difference between $2\frac{1}{2}$ and 3 days is significant. A one-day periodicity in the International Geophysical Year flare listings⁴ made it impossible to decide whether the $N(\Delta t)$ contain a non-spurious one-day component.

The above periodicities in the time separation between geophysical disturbance data may be significant in the interpretation of statistical examination of upper atmospheric disturbances. It was previously suggested¹ that the 1-4-day periodicities in a_p were consistent with repeated Sun-Earth transits of a hydromagnetic wave. Although this is still a possibility, it now seems probable that the observed periodicities are more directly related to the timing of solar disturbance events. The solar flare to SSC time analysis indicates that such solar disturbance events may occur within $\frac{1}{4}$ day of flare times, and this investigation is continuing.

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Possible Solar Flare Effects in the F Region of the Ionosphere

I HAVE read with interest the recent communication by Knecht and Davies on this subject¹ which reports a series of large solar flares accompanied by marked effects in the F region of the ionosphere. A particular feature is that the ionospheric effects and the flares are simultaneous only at isolated locations.

In this connexion, I should like to direct attention to a communication by Martyn, Munro, Higgs and Williams². In that communication a correlation appeared to be established perhaps even more clearly than in the communication by Knecht and Davies. I write, however, not to claim priority of discovery but to report subsequent developments which considerably modified the conclusions in that communication. Continuation of that work brought to light two very significant new facts. It was found that the ionospheric disturbances occurred much more frequently than solar flares, and, even more important, that they almost always appeared at Canberra and Sydney with an appreciable time difference. They were, in fact, travelling disturbances. It becomes obvious, therefore, that there is a high probability, at any single point, of a disturbance occurring close to the time of a flare and an even higher one of a coincidence somewhere.

When the War began in 1939, much research work, including the above, ceased. Moreover, publication of scientific results was also largely inhibited until after the War, and ionospheric literature and history tend to start from that epoch, after a gap of some seven years.

These results, therefore, though reported locally to the Radio Research Board, were never published. When ionospheric work was resumed at this Laboratory in 1947 attention soon became directed to ionospheric travelling disturbances³, and it was realized they were the same phenomena observed earlier.

The characteristics of such disturbances have now been very fully investigated here⁴, and their manifestations are becoming more familiar in a variety of ionospheric investigations throughout the world, particularly as a result of work done during the International Geophysical Year. Their effects on ionosonde records are similar to those shown in Fig. 1 of Knecht and Davies's communication and they can also cause changes in frequency of the signals received by an ionospheric path as in their Fig. 2.

It would seem that since the ionospheric effects of a solar flare are due to ultra-violet radiation they should all be observed simultaneously over the sunlit surface of the Earth.

I would urge the authors, in their further work, to give very careful consideration to these aspects. For a correlation to have scientific value it must be significant both statistically and physically.

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