Subsequent to this test the soil was kept moist in a greenhouse for a period of 2 months, at which time it was reseeded. Eighty-four per cent of the quack grass seeds germinated, and the plants grew vigorously and showed no symptoms of injury, indicating that the carbamate had been inactivated, possibly through the action of soil microorganisms.

The present results from greenhouse experiments indicate that isopropyl-n-phenyl carbamate may be useful in reducing the population of some weedy grasses, such as quack grass, which infest certain crop areas.

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Geomagnetic Control of F_2 Layer Ionization

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In a recent communication to *Nature* (*2*) the author has given a brief account of the results of a study of the world distribution of F_2 layer ionization. Such a study has only become possible in recent years, when, to serve the operational requirements of the Allied Forces, many new ionospheric stations have been set up in different parts of the world. The chief results which have emerged from this study of F_2 layer morphology can best be illustrated by considering the local noon values of critical frequency at the equinoxes, when the earth is symmetrically illuminated by the sun with respect to the geographic equator. From these values it has been deduced that (a) for a constant longitude, the noon values of ionization at the same numerical latitude, north and south of the equator, are not necessarily equal, and (b) there is a variation of noon ionization with longitude along a line of constant latitude. It will thus be seen that, according to these results, it is not possible simply to relate noon equinox values of critical frequency for the F_2 layer to the sun's zenith distance, as is possible in the case of the E and F_1 layers. An additional controlling factor has therefore been sought.

In Fig. 1 is plotted the relation between equinox noon F_2 layer critical frequency and magnetic latitude, using all the data now available to the author for March 1944. It will be seen that the anomalies mentioned above, which appear when ionization density is related to geographic latitude, have now substantially disappeared.

One of the most remarkable features of Fig. 1 is the trough of low values of ionization density centered on the geomagnetic equator. A study of the detailed ionospheric information available from stations between $\pm 18°$ magnetic latitude shows that these low values are associated with a marked bifurcation of the F layer into its two components, F_1 and F_2. The phenomenon can thus be linked with others already identified previously in studies of the seasonal variation of F_2 layer noon ionization at Slough, England (lat. $51\frac{1}{2}°$N.). In measurements made at that station it has been found that there is a remarkable difference between summer and winter conditions. In winter the F layer appears fairly homogeneous and the ionization density is high, whereas in summer, under conditions of reduced solar zenith distance, there is marked bifurcation of the layer into its two components and the ionization of the upper component (F_2 layer) is much reduced. Under such conditions of bifurcation the F_2 layer exhibits entirely different physical characteristics. The electron production rate at the layer maximum is much reduced, as is also the electron recombination coefficient. Moreover, the variation of ionization is no longer substantially symmetrical about noon, there being often a minor minimum at mid-day, the major maximum of the day occurring in the evening.

It is therefore found that the equinox phenomena experienced at stations situated between magnetic latitude $\pm 18°$ are similar to those experienced at Slough in a northern summer, when the ionization in the F layer as a whole is distributed through a great range of vertical heights. On the other hand, the ionization maxima (Fig. 1), at $\pm 18°$ magnetic latitude, are

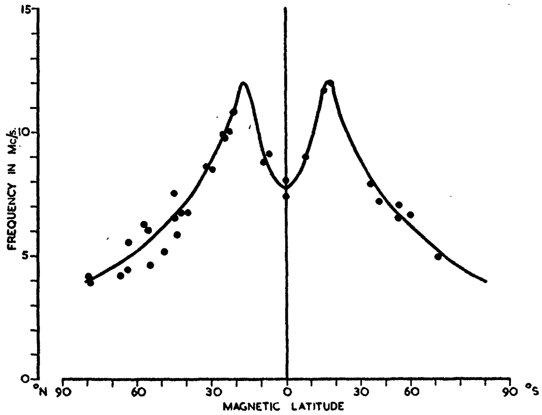

Fig. 1. Relation between equinox noon values of F_2 layer critical frequency and magnetic latitude.

associated with a relatively thin homogeneous F layer without marked bifurcation.

The long-term study of F_2 layer ionization has shown that, as in the case of the E and F_1 layers (*3*), there is marked variation of ionization in sympathy with the trend of the sunspot cycle. Such a correspondence is most strikingly exhibited if ionization density is compared with calcium flocculi figures (*1*). But, in addition, the author has found that the ratio $\frac{N_{max.}}{N_{min.}}$, where $N_{max.}$ and $N_{min.}$ refer to noon ionization densities at sunspot maximum and minimum, respectively, is not constant at any station for each month in the year. For example, this ratio is approximately 4 for the summer months (May, June, and July) at Slough and approximately 2 for the winter months (November, December, and January). Such a variation indicates that either the intensity of the ionizing radiation or the atmospheric medium which is ionized varies throughout the year. A study of similar phenomena at a number of stations in addition to Slough suggests that it is the seasonal variation of the atmospheric medium which is substantially responsible.

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