EFFECT OF SOLAR ECLIPSE OF 20TH JUNE 1955 ON LONG DISTANCE SHORTWAVE TRANSMISSIONS

STUDY of the Ionosphere during a solar eclipse is an important means of ascertaining the source of ionising radiation on the solar disc. With a view to study the effects of the solar eclipse of 20th June 1955 on the Ionosphere, field strengths of C.W. transmissions from Radio Ceylon (distance 1,300 Km.) on 9·52 Mc/sec. were recorded at Waltair (Lat. 17° 41′) during the eclipse day and a few days before and after the eclipse using Hallicrafters type SX-42 receiver with a D.C. amplifier and a pen-recording equipment.

The eclipse was total at Colombo. The first hop reflection point falls at about Madras where the beginning of the eclipse is reported to be at 0711 hr. (I.S.T.). The maximum phase of 86% was reached at 0816 hr. and the end was at 0930 hr. Records were taken in the morning hours between 0700 to 1000 hr. and also during night time with the same setting of the gain controls so as to get the reference signal strength when it is at its maximum. The average of signal strength received on days other than the eclipse day are plotted against time and is shown in Fig. 1. The night value of signal strength is also shown as a reference level. The values of the signal strength obtained on the day of eclipse are plotted on the same graph.

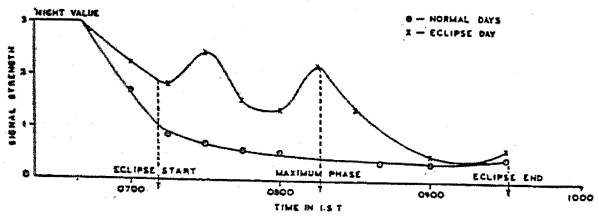

FIG. 1

It can be easily seen from the graphs that the signal strength on the eclipse day is about 30% higher than the normal value even at 0700 hr. when the optical eclipse has not started. It appears from this record that the effect on the absorbing layer is felt even before the optical eclipse started probably because of the eclipsing effect on the Corona which sets in earlier.

A peculiar feature observed in this record is the strong dip of signal strength at about 0800 hr. A strong maximum in the signal strength is noticed at 0816 hr. which is the time of maximum phase of the eclipse. The signal strength at this time is about 4·5 times the value that is usually observed in the normal days at that time. The intensity is about 72% of the night value. A rapid fall of the intensity reaching almost the normal value at about 0900 hr. was observed although the ending of the eclipse is at 0930 hr.

Many of the previous investigators[1,2] observed a definite decrease of ionisation densities of both E and F_1 layers during the solar eclipse. Using highly oblique incidence C.W. transmissions during solar eclipse some of the previous investigators observed a rise of signal strength[3] and some others[2] observed a fall of the same. This controversy indicates that the non-deviative D-region absorption has only a little role in causing the above changes of signal strengths.

The fall of signal strength during morning hours in the normal days is due to the growth of E layer ionisation which tends to obscure the F_1, F_2 reflections as judged from the critical frequency data for this month. But during the eclipse period due to the fall of E layer ionisation F_1 and F_2 reflections will be predominant along with the single hop E reflection and this causes considerable rise in the signal strength. Part of this rise in signal strength might have also been contributed by decrease in D-region absorption. The dip of the signal strength at about 0800 hr. is very probably due to the passage of a sporadic E cloud across the propagation path as in the summer month of June the frequency of occurrence of E_s with $f_o E_s$ between 3 Mc/sec. and 5 Mc/sec. is as high as 25 days in a month at this time as reported from Ahmedabad Ionosphere station.

Another interesting feature of this record soon after the commencement of the eclipse is the setting in of a quick and most uniform periodic pattern all of a sudden. This sudden change occurred 7 minutes after the start of the eclipse at the first hop reflection point and continued upto 0900 hr. This quick periodic fading during the eclipse is most probably due to the rapid rise in the level of F_1 layer with respect to E causing a continuous change of path difference between single hop E and F reflections. Full details of this investigation will be published elsewhere.

Ionospheric Labs., M. S. V. GOPALRAO.
Physics Dept., B. RAMACHANDRA RAO.
Andhra University, Waltair,
October 20, 1955.

1. Kirby, S. S., Berkner, L. V. and Grilliland, T. R., *Bur. Stds. Jour. Res.*, 1933, **11**, 829.
2. Gejer, S. and Akerlind, P., *Terr. Mag. and Atmos. Elect.*, 1947, **52**, 479.
3. Rastogi, M. Sheriff, *J. Sci. Industr. Res.* (India), 1955, **14A**, 159.