

I. PHYSICS

Astrophysics (Ionosphere)

SIGNAL STRENGTH FLUCTUATIONS IN TWO LINE-OF-SIGHT MICRO-WAVE LINKS DURING THE SOLAR ECLIPSE OF 16 FEBRUARY 1980

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DURING the total solar eclipse of February 16, 1980, two line-of-sight microwave links, with terminals in Calcutta, were in operation and the signal strength fluctuations were recorded. The first is the Dum-Dum-Andul link on 6.7 GHz, routinely operated by the Civil Aviation Department, and the second is the Calcutta-Amdanga segment of the P & T link (6.286 GHz) to Jorhat. A high impedance pen recorder (Rikadenki Kogyo Co.) was connected to the AGG loop of the receiver at the Calcutta end of each link and the signal strength fluctuations were recorded on strip chart. Although absolute values of the field strengths were not known, the fluctuations were measured in dB using previous calibrations.

Results describing the effect of solar eclipse on the signal strength in a microwave link are sparse in literature. Chimonas and Hines (1970) had predicted for the 1970 solar eclipse that gravity bow waves might be generated by the cooling action of the passage of moon's shadow, at supersonic speed, across the atmosphere. Ground level pressure measurements were made by Anderson *et al.* (1972) during the solar eclipse of March 7, 1970. Chimonas (1973) studied these pressure fluctuations and attempted to explain them in terms of surface gravity waves. The aim of our experiment has been to observe any fluctuations of signal strength if at all produced by the eclipse-induced surface gravity waves.

Keywords : Signal Strength; Line-of-Sight Microwave Links; Gravity Bow Waves; Surface Gravity Waves.

EXPERIMENT

System Location and Characteristics

The Calcutta-Amdanga link lies in an approximately north-south direction. Outside the city area, it crosses mostly cultivated fields and green lands whereas the Dum Dum-Andul link stretches approximately east-west and crosses the River Hooghly. The maximum obscuration of the solar disc over both links was about 95 per cent. Some characteristics of the links are summarized as follows :

TABLE I

Characteristics	Dum Dum-Andul link	Calcutta-Amdanga link
Path length	35.207km	30.912km
Operating frequency	6.7 GHz	6.2861 GHz
Transmitter power	1 watt	40 watt
Transmitting antenna	3m dish	3m dish
Receiving antenna	4m dish	3m dish
Antenna height	108ft (Dum Dum) 100ft (Andul)	295ft (Calcutta) 295ft (Amdanga)

RESULTS

The signal strength variations in the two links are shown in Figs. 1 and 2. The eclipse day record at Dum Dum is characterised by a prominent wavelike fluctuation (20 dB peak to trough) between 15hr and 18hr (approximately), not seen on the following day. The signal in the Calcutta-Amdanga link on the eclipse day was, however, more or less steady (within a few dB).

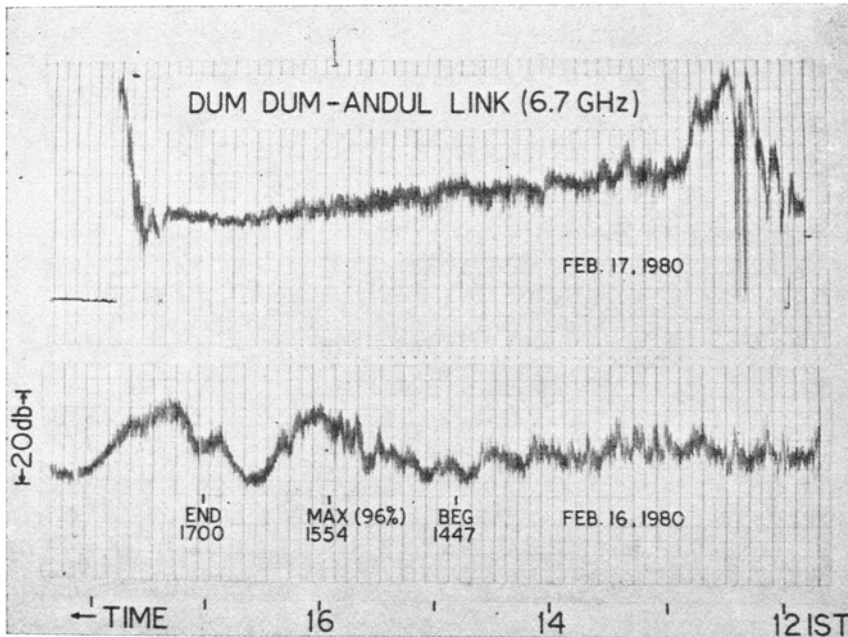


FIG. 1. Signal strength variation in the Dum Dum-Andul link in the afternoon of the eclipse day as well as of the following day.

Our preliminary analysis shows that the fluctuation in the Dum Dum-Andul link was probably an eclipse effect superposed on the usual afternoon pattern of the

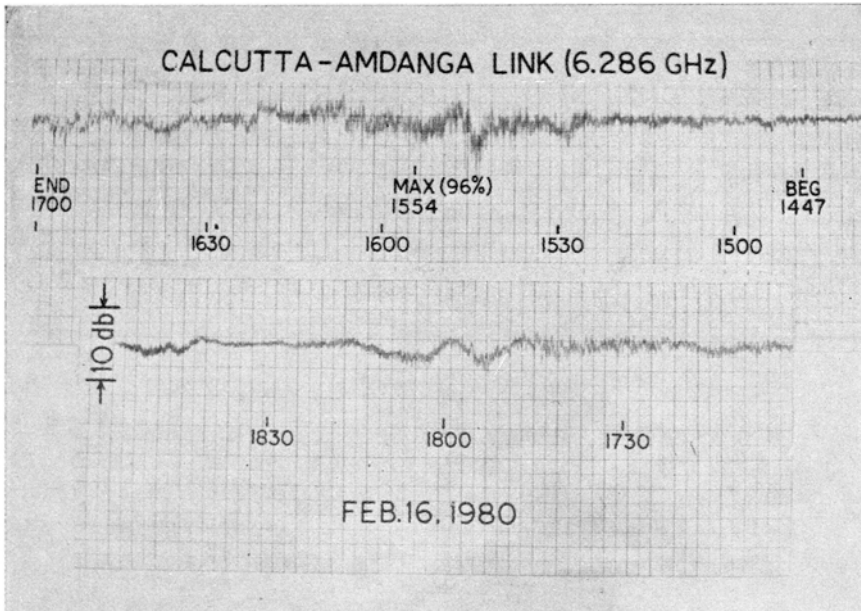


FIG. 2. Signal strength variation in the Calcutta-Amdanga link in the afternoon of the eclipse day. (Note the greater chart speed used as compared to that of Fig. 1).

signal variation. The presence of eclipse-induced surface gravity waves is not ruled out.

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