Proc. Indian natn. Sci. Acad., **47**, A, No. 1, 1981, pp. 77–79.

I. PHYSICS

Astrophysics (Ionosphere)

RADIO WAVE PROPAGATION DURING THE TOTAL SOLAR ECLIPSE OF 16 FEBRUARY 1980

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(*Received 13 October 1980*)

DURING the total solar eclipse of February 16, 1980, various scientific observations were made by group of investigators of the Centre of Advanced Study in Radio Physics and Electronics, University of Calcutta. The observations were mainly aimed at exploring the changes of ionization of the earth's upper atmosphere, which is known to support ionospheric propagation of radio signals to long distances while at the same time causing perturbation of transionospheric radio signals for satellite telemetry.

Keywords : Radio Wave Propagation; Ionization; Transionospheric Radio Signals; Satellite Telemetry; Magnetospheric Radio Noise.

EXPERIMENT

Description

Observational programmes were made from Puri, Varanasi, Calcutta and Berhampore. Medium wave radio broadcast signals from Calcutta A (657 KHz) and Chittagong (870 KHz) in Bangladesh were recorded from Puri, while a short wave broadcast from Radio Ceylon (11.8 MHz) was recorded from Varanasi. From Calcutta, the radio signals recorded include a short wave standard time broadcast on 10 MHz from the National Physical Laboratory, New Delhi, a radio navigational signal in the long wave band on 280 KHz from Jessore in Bangladesh and several medium wave stations. Also, VLF radio noise of atmospheric origin and magnetospheric noise in the HF band on 29 MHz were recorded in Calcutta from Berhampore, two long wave radio navigational signals from Calcutta on 332 KHz and another from Jessore in Bangladesh on 280 KHz were recorded at the Physics Department, K. N. College.

RESULTS

The results obtained from a preliminary analysis of the data indicate that (1) the radio wave propagation in the short wave, medium wave and long wave bands improved considerably during the eclipse even at locations for which the path mid-point is outside the path of totality of the eclipse, indicating that D-region and E-

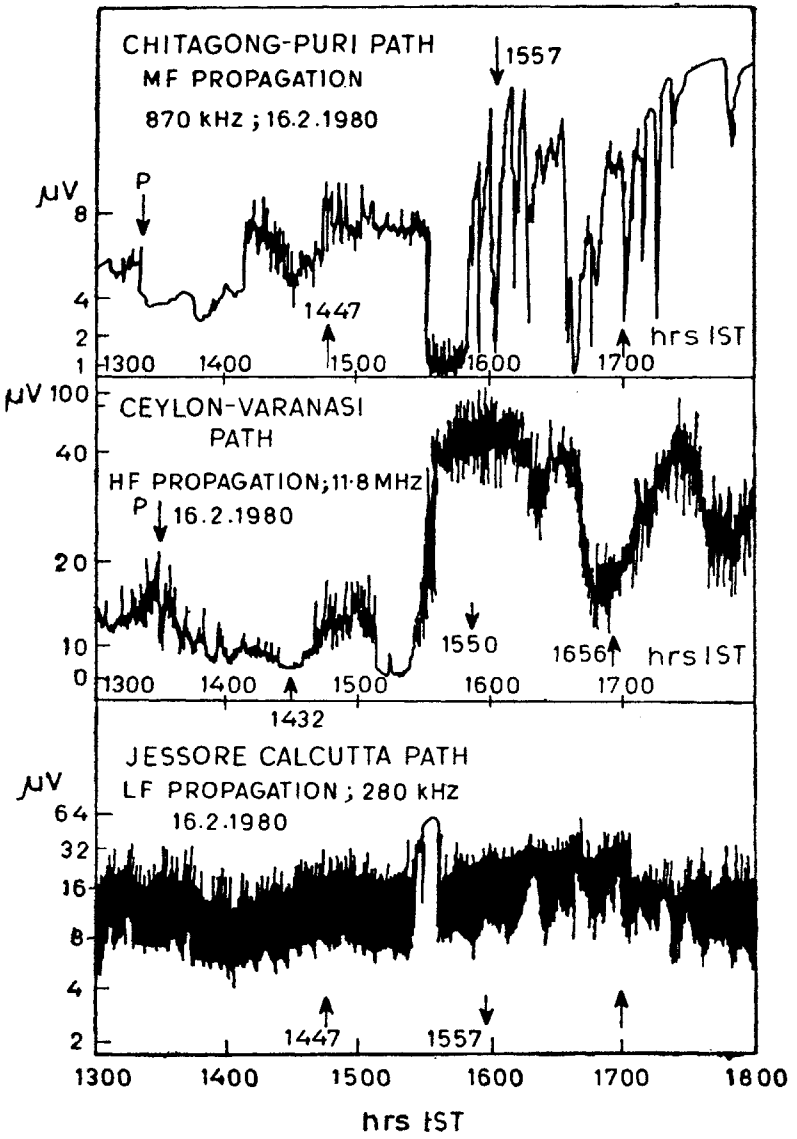

FIG. 1. A few typical records of signal strength variations in the MF, HF and LF bands during the total eclipse of February 16, 1980. The ordinate shows the receiver inputs; the arrow marks indicate the times of start, peak phase and end of the eclipse at the path mid-points; the arrow marked *P* shows the time of start of a precursor in the MF and HF bands associated with the incidence of reflected ionising radiations from the moon's surface. The sharp rectangular dips in these records prior to the peak phase occuring after the start of the eclipse while the sharp peak in the LF record at such times are indications of gravity wave perturbations.

region absorptions are reduced at such times, the effects being most pronounced in the short wave band with path midpoint near totality; (2) the F-region of the ionosphere is little affected; (3) there is some evidence of gravity wave perturbations in the lower ionosphere at a height of about 80–85km; (4) the atmospheric radio noise in the VLF band increased only slightly during the eclipse, while there is a marked increase of magnetospheric radio noise appearing as sweepers. Besides these, there are indications of absorption events in the short and medium wave bands occurring earlier to the eclipse start presumably due to extra-ionising radiations reflected from the surface of the approaching moon. Any similar effect occurring after the end of eclipse was unobservable due to the sunset.

Location

(1) Puri, 19° 50′N; 85° 50′E; (2) Varanasi, 25° 6′N; 82° 42′E; (3) Calcutta, 22° 34′N; 88° 24′E; (4) Berhampore, 24° 3′N, 88° 2′E; (5) Chitagong, 22° 27′N; 91° 48′E; (6) Jessore, 23° 10′N; 89° 10′E; (7) New Delhi, 28° 35′N; 77° 13′E; (8) Ceylon, 6° 52′N; 79° 50′E.

Participants/Cooperating Group

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