

NEAR EARTH SPACE SPORADIC RADIO EMISSION
BUSTS OCCURRING DURING SUNRISE

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During the period of low solar activity sunrise effect of sporadic high frequency near earth space radio emission was experimentally discovered at middle latitudes. The possible mechanism of its origin is discussed.

Since September 1984 during the period of low solar activity the study of sporadic near earth space radio emission at middle latitudes [1] has been carried out at the experimental installation of Kharkov University [2]. The radio telescope with operating frequency of 38 MHz described in [2] was in addition provided with a mirror parabolic antenna having an effective area $\sim 16 \text{ m}^2$ radiation pattern width $\sim 12^\circ$ and receiving radio emission independently at the frequency of 325 MHz with East - West and North - South polarization; dual - channel radio frequency tract having the transmission band of $\sim 4 \text{ MHz}$ regulation sensitivity threshold being $2 \cdot 10^{-21} \text{ W/m}^2 \text{ Hz}$ for each channel. Tracing of signals was carried out with minimizing rate of 0.2 mm/s and integration time was not more than 1 s.

The analysis of experimental results proves that in

the vicinity of the moment of morning shadow - light boundary passage through the local meridium, series of radio high frequency emission burts arise diurnally at the frequency of 325 MHz (fig. 1).

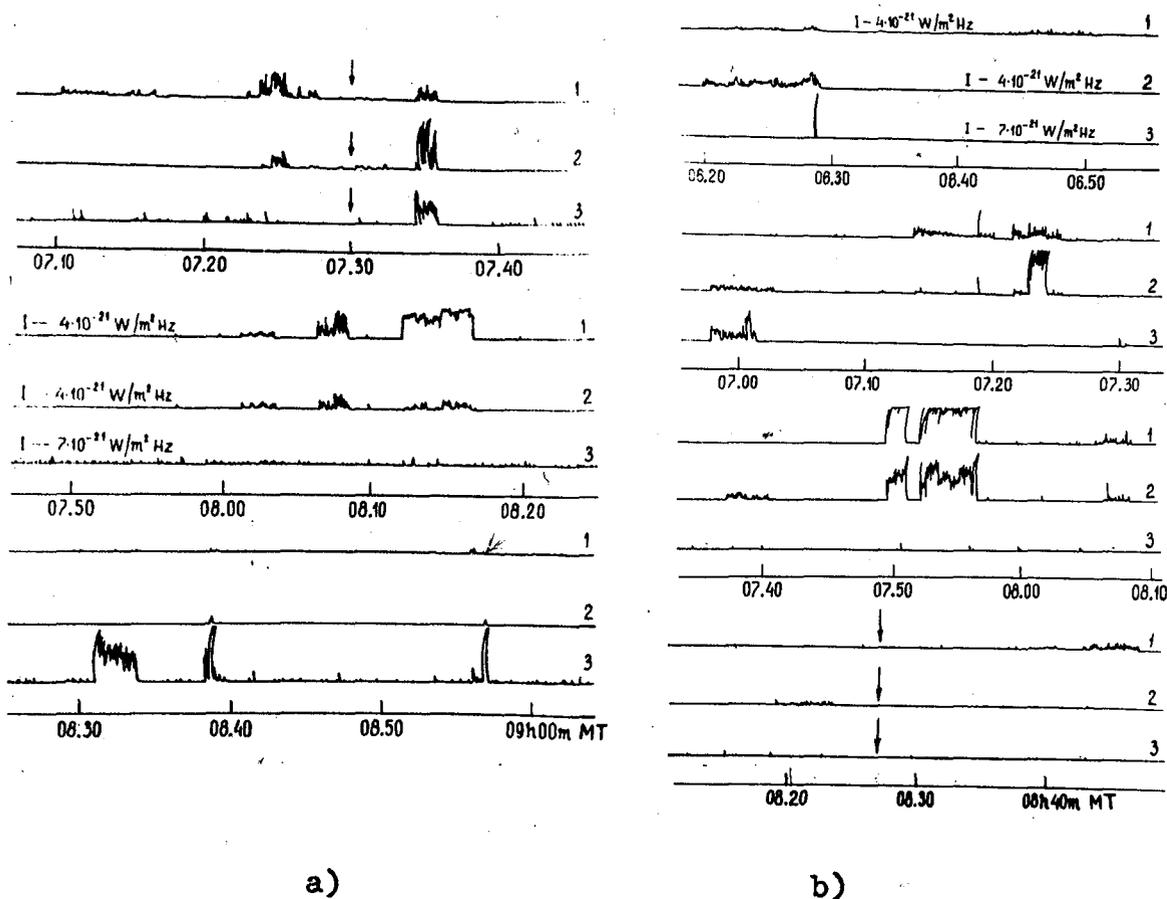


Fig. 1. Characteristic examples of high frequency radio emission bursts series emerging during sunrise. MT - Moscow Time. Arrows show the moment of sunrise at a definite place of observation. 1 - Operating frequency of 325 MHz, East - West polarization. 2 - Operating frequency of 325 MHz, North - South polarization. 3 - Operating frequency of 38 MHz, East - West polarization. a) Morning recording part September 28, 1984.

b) Morning recording part December 13, 1984.

The most probable duration of bursts is in the interval of $0.5 + 4$ m. The bursts growth and fall times are usually less than 5 s. Morning radio bursts tend to arise quasiperiodically. The quasiperiod of each bursts series is equal to $5 + 20$ m with mean value for full observation time being ~ 10 m. The character of sporadic radio emission polarization does not often remain unchanged even within a single series of bursts. Fine structure of bursts is irregular in most details has a period of $\sim 0.01 + 0.02$ s with characteristic time of irregular modulation $\sim 0.15 + 0.5$ s. The radio emission bursts coinciding in time at the frequency of 38 and 325 MHz appeared to have similar minimal scale of fine structure details but they do not coincide in all the details of modulation.

Average diurnal course of sporadic radio emission bursts density (a number of bursts per an hour) at a frequency of 325 MHz during the autumnal equinox (1) and the winter solstice (2) is shown in fig. 2, where the sunrise and sunset are considered to take place at 6 and 18 o'clock of local time independently on the season respectively. The presence of strongly pronounced bursts density maximum during sunrise and its seasonal shift are worth emphasizing.

The observed morning effect is suggested to be connected with an excitation of internal gravity waves (IGW) by the solar terminator [3] moving in neutral atmosphere. Oscillations of IGW in neutral atmosphere draw in the ionospheric plasma and initiate its primary density disturbances. At some phase of primary disturbance in magnetized ionospheric plasma in-

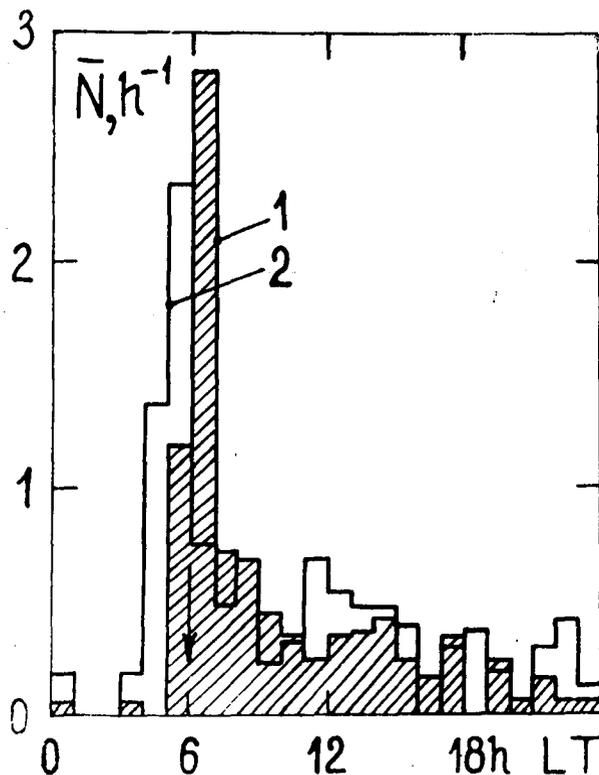


Fig. 2. Average diurnal run of near earth space sporadic radio emission reduced to equinox; \bar{N} is a number of radio bursts per hour; the arrow shows the moment of sunrise; operating frequency is 325 MHz; LT is a local time. 1) September, October 1984; mean with respect to 25 days period of observations. 2) December 1984, January 1985; mean with respect to 20 days of observations.

stabilities begin to swing quickly [4], for instance, gradient - cyclotron ion instabilities reach saturation and in this state remain unchanged during the time corresponding to the sporadic radio emission burst duration. The instability can generate radio emission either of braking or dipole natu-