

RADIOPHYSICS

An Ion Gyrofrequency Phenomenon observed in Satellites

Barrington and Belrose¹, Gurnett and O'Brien² and Brice *et al.*³ have reported that very-low-frequency emissions at frequencies of a few kc/s may be observed in satellites immediately following an atmospheric which has propagated upwards to the satellite. Brice and Smith⁴ suggested that these triggered emissions were related to the lower hybrid resonance for propagation transverse to the Earth's magnetic field.

A related phenomenon has now been observed in the *Alouette I* and *Injun III* very-low-frequency data, examples being given in Figs. 1 and 2 respectively. These noises were first detected, aurally, by one of us (J. K.) on recordings of *Alouette I* made at Stanford. It was realized that the noises were genuine (and not interference from other equipment in the satellite) when similar noises were found at Stanford from tapes of very-low-frequency recordings of the *Injun III* satellite which were on loan from the State University of Iowa.

These noises are observed only after the reception of an atmospheric and are at frequencies much less than 1 kc/s. They show initially a rapid rise in frequency, following which the frequency is very nearly constant. This maximum frequency is 520 c/s in Fig. 1 and 400 c/s in Fig. 2. The satellites were at heights of about 1,000 km (for *Alouette I*) and 1,800 km (for *Injun III*) when the noises of Figs. 1 and 2 respectively were recorded.

It is suggested that these noises may be related to an ion gyrofrequency resonance, since the maximum frequency is approximately the gyrofrequency for protons in the plasma surrounding the satellite.

While the relationship of these noises to the preceding atmospherics suggests a 'triggering' process, it appears possible that the noises are simply dispersed forms of the original atmospheric impulse (with the dispersion arising from propagation from the ground to the satellite).

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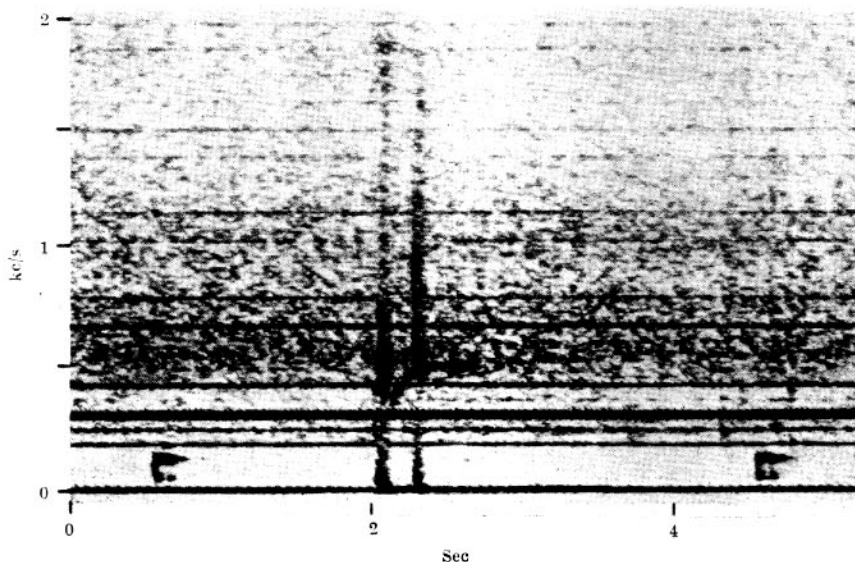


Fig. 1. Discrete noises which appear to be triggered by atmospherics at frequencies below 1 kc/s, recorded by *Alouette I* (March 18, 1963; 0807:05 U.T.)

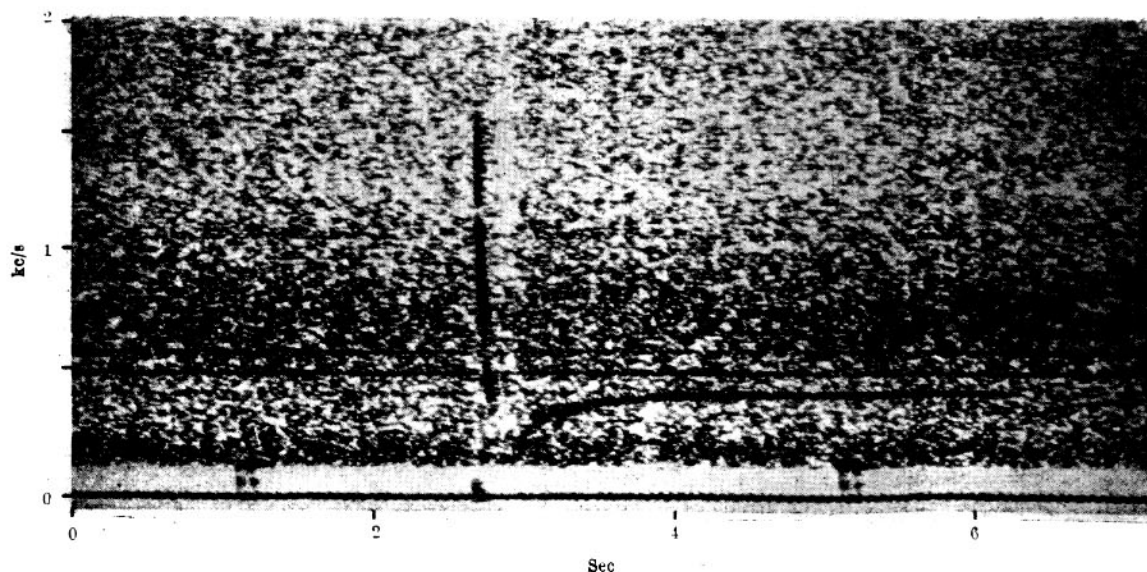


Fig. 2. A strong quasi-constant frequency discrete noise below 1 kc/s recorded by *Injun III* (February 17, 1963; 1231:12 U.T.)

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¹ Barrington, R. E., and Belrose, J. S., Paper presented at Spring URSI Meeting, April 29–May 2, 1963, Washington, D.C. (1963).

² Gurnett, D. A., and O'Brien, B. J., "High-Latitude Geophysical Studies with Satellite Injun 3. 5. Very-Low-Frequency Electromagnetic Radiation," *J. Geophys. Res.*, **69** (1) 65 (1964).

³ Brice, N. M., Smith, R. L., Belrose, J. S., and Barrington, R. E., *Nature*, **203**, 926 (1964).

⁴ Brice, N. M., and Smith, R. L., *Nature*, **203**, 926 (1964).