

ELECTROPHONIC SOUNDS FROM THE REENTRY OF THE MOLNIYA 1-67 SATELLITE OVER AUSTRALIA: CONFIRMATION OF THE ELECTROMAGNETIC LINK. A. Verveer¹, P. A. Bland² and A. W. R. Bevan³, ¹Perth Observatory, Walnut Road, Bickley 6076 Western Australia, ²Department of Mineralogy, Natural History Museum, Cromwell Road, London SW7 5BD, UK, ³Department of Earth and Planetary Sciences, Western Australian Museum, Francis Street, Perth, 6000, Western Australia.

Introduction: Anomalous ‘hissing’ or ‘fizzing’ sounds accompanying the passage of large fireballs have been well documented. Called electrophonic sounds, they are apparently transmitted at the speed of light. Several explanations for their origin have been proposed [1,2], notably that they are generated by transduction of radio transmissions in the ELF/VLF range (generated in the plasma trails of large fireballs) into an acoustic form [2]. Here we present measurements of the electromagnetic radiation produced by the Molniya fireball, recorded during technology evaluation for the Nullarbor Camera Network.

Background: On the 27th of January at 14:50 UT the Russian communications satellite, Molniya 1-67 entered the atmosphere above Western Australia. The re-entry was observed from south of Perth to Wyndham in the north of the State. A large orange fireball crossed the coast of southern Australia and was seen travelling in a north-westerly direction. Electrophonic sounds were reported by an observer in Wyndham. From the orbital elements of the satellite, we have reconstructed the trajectory through the atmosphere.

Results: At 14:50:28.6 for 52.9 seconds a 1Hz Geospace HS-10-1 Geophone situated in Perth recorded a burst of noise. At the same station in Perth, the N-S detector in a seismometer also recorded the event, but the E-W detector recorded nothing. The seismometer and the Geophone use different amplifiers and filters. The time of visual observations of the Molniya fireball coincided with the seismometer reading suggesting that the events were associated. Geophysical stations elsewhere in Western Australia did not record the event, but these seismometers were shielded from magnetic effects.

The local seismometers use magnets and feedback coils to dampen the pendulums. The Geophone uses a large magnet, coil and spring. The N-S seismometer is orientated roughly along the re-entry path while the E-W seismometer is perpendicular to the path. The N-S seismometer recorded an event while the E-W seismometer did not, indicating that the disturbance must have been magnetic.

Magnetic readings were checked from four other stations in Australia (Learmonth, Townsville, Canberra, and Hobart). All showed a distinct magnetic pulse at the time of satellite entry. The total field strength variation was approximately 40 nT. The Learmonth station is west of the re-entry path and exhibited a lowering of the magnetic Y component. The

two stations east and north of Learmonth showed an increase in the Y component of the magnetic field.

The HAARP facilities induction magnetometer also showed some activity from 0 Hz to 3 Hz. The principal activity was in the 1 Hz and lower bands.

Conclusions: From these observations we suggest that the passage of the fireball had a marked effect on the Earth’s magnetic field. As an observer reported an electrophonic sound near the end path of the satellite, we suggest that these sounds are electromagnetic in origin, associated with the ELF band (prominent frequencies are 0.68 Hz, 0.72 Hz, 5.4 Hz, 6.1 Hz, 9.3 Hz). Although these values are significantly lower than the 1–10 kHz suggested by Keay [1,2], no instrumentation was available to detect electromagnetic radiation above 10 Hz. Finally, it is noteworthy that these frequencies are in a range that may effect the human brain directly. Direct stimulation of the human temporal or limbic cortices by applied electromagnetic patterns may require energy levels which are similar to those detected [3].

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