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News

Meteors go pop in the night

Recordings of sounds from shooting stars defy explanation.

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Scientists camping out in the Mongolian snow at minus 30 °C have made the first recordings of an elusive sound: the crackle and pop of a meteor shower¹ (#B1). Their observations defy all current explanations of what happens when debris burns up on entry to the Earth's atmosphere.

"Basically, we are back to the drawing-board," says expedition member Dejan Vinkovic of the University of Kentucky.

Some meteor booms are simply acoustic waves like those from supersonic aircraft. But for centuries there have been rumours of more baffling 'electroponic' noises occurring at the same time as meteors become visible.

Because light travels much faster than sound, there should be a delay between the appearance of a meteor and its sound - just as thunder generally comes seconds after a lightning flash. In fact, meteors burn up so high in the atmosphere that this time delay ought to be a few minutes.

Yet many observers report hearing pops, buzzes and whistles while sighting a meteor for the first time. The Italian Geminiano Montanari was the first to note this discrepancy in 1676. Reviewing such reports in 1714, the astronomer Edmond Halley concluded that they were merely figments of the imagination. Until now, many other scientists thought so too.

Fireball survey

Vinkovic was not so sure. He has collected about 700 accounts of meteor noise, and is pursuing dozens of recent claims. The phenomenon was particularly well documented during the spectacular Leonid shower of 1833, when people described sounds resembling "the noise of a child's popgun". Similar reports accompanied two more recent Leonid storms.

In 2000, Vinkovic and others established the Global Electroponic Fireball Survey, to collate such reports worldwide.

Next Vinkovic and researchers from the Croatian Physical Society, in a project led by Slaven Garaj of the Ecole Polytechnique Federale de Lausanne in Switzerland, journeyed to a "remote desert-like plain" 20 kilometres from Ulaanbaatar in Mongolia to observe the 1998 Leonid shower. As this area is virtually free from background noise and radio interference, the researchers measured audio and low radio-frequency signals that the meteors triggered.



Croatian Physical Society researchers set up their instruments in Ulaanbaatar

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On the radio

Why radio signals? Because one of the leading candidate theories is that electrically charged particles streaming behind meteors interact with the Earth's magnetic field and produce radio waves, which cause the electrophonic noises. These radio waves are broadcast to an observer at the speed of light. They could be converted to sound by exciting vibrations in objects at ground level.

“People describe meteors as sounding like a child's popgun”

Very-long-frequency(VLF) radio signals have occasionally been detected alongside meteors. The Croatian team recorded two electrophonic pops but no simultaneous VLF signals.

If radio waves do create the pops (as the team still believes), these waves must be of lower frequency than anticipated. No explanation so far proposed explains the measurements made in the Mongolian plains.

References

1. Zgrablic, G. et al. Instrumental recording of electrophonic sounds from Leonid fireballs. *Journal of Geophysical Research* (**in press**), (2002).