

# Observations of the 22 September 2020 Earth-Grazing Fireball

*Wednesday, 21 June 2023 14:25 (15 minutes)*

Meteoroids larger than about 10 cm in diameter produce shockwaves upon entering dense regions of the Earth's atmosphere, where the local Knudsen number corresponds to the continuum flow regime. Shockwaves generated by the hypersonic flight and fragmentation of meteoroids decay to low frequency sound (infrasound). Given desirable propagation conditions and sensor availability, meteoroid generated infrasound can be detected by microbarometers at large distances. As such, meteoroids serve as a natural laboratory for high altitude sources of infrasound and provide valuable ground truth information that otherwise would not be available. Earth grazers are a rare class of meteoroids; these objects enter at a very shallow angle and traverse the upper regions of the atmosphere, producing a luminous path spanning as much as several hundreds of kilometers. Unless they completely ablate or slow down to fall down to Earth, Earth grazers exit back into space at a slower velocity and an altered orbit. While direct observations of Earth grazers are extremely uncommon, detection of infrasound generated by such objects is even more scarce. We report infrasound detection and analysis of a rare horizon-to-horizon Earth grazer event that occurred over northern Europe on 22 September 2020. SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

## Promotional text

This work investigates infrasound detections of a long lasting fireball, a natural and non-traditional source of infrasound at altitude, with the aim to advance monitoring goals for event identification and characterization.

## E-mail

esilbe@sandia.gov

## Oral preference format

pre-recorded video

**Primary author:** SILBER, Elizabeth (Sandia National Laboratories (SNL))

**Co-authors:** Mr BOWMAN, Daniel (Sandia National Laboratories (SNL)); Mr RONAC GIANNONE, Miro (Sandia National Laboratories (SNL)); Ms ALBERT, Sarah (Sandia National Laboratories (SNL))

**Presenter:** SILBER, Elizabeth (Sandia National Laboratories (SNL))

**Session Classification:** O1.4 Multidisciplinary Studies of the Earth's Subsystems

**Track Classification:** Theme 1. The Earth as a Complex System: T1.4 Multi-Discipline Studies of the Earth's Subsystems