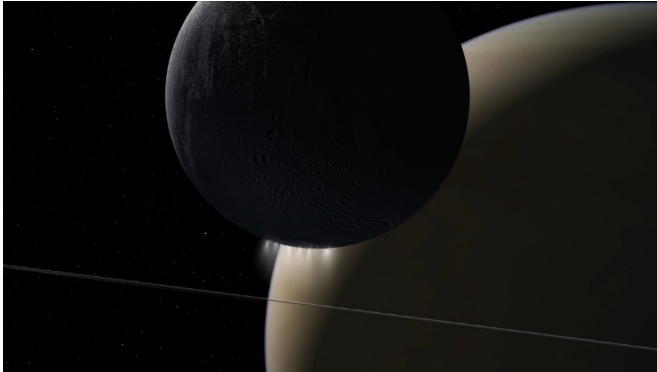


Sound of electromagnetic energy moving between Saturn, Enceladus

10 July 2018



NASA's Cassini spacecraft's Grand Finale orbits found a powerful interaction of plasma waves moving from Saturn to its rings and its moon Enceladus. Credit: NASA/JPL-Caltech

New research from NASA's Cassini spacecraft's up-close Grand Finale orbits shows a surprisingly powerful and dynamic interaction of plasma waves moving from Saturn to its rings and its moon Enceladus. The observations show for the first time that the waves travel on magnetic field lines connecting Saturn directly to Enceladus. The field lines are like an electrical circuit between the two bodies, with energy flowing back and forth.

Researchers converted the recording of plasma waves into a "whooshing" audio file that we can hear—in the same way a radio translates electromagnetic waves into music. In other words, Cassini detected [electromagnetic waves](#) in the audio frequency range—and on the ground, we can amplify and play those signals through a speaker. The recording time was compressed from 16 minutes to 28.5 seconds.

Much like air or water, plasma (the fourth state of matter) generates waves to carry energy. The Radio Plasma Wave Science (RPWS) instrument on board NASA's Cassini spacecraft recorded

intense plasma waves during one of its closest encounters to Saturn.

"Enceladus is this little generator going around Saturn, and we know it is a continuous source of energy," said Ali Sulaiman, planetary scientist at the University of Iowa, Iowa City, and a member of the RPWS team. "Now we find that Saturn responds by launching signals in the form of [plasma waves](#), through the circuit of [magnetic field lines](#) connecting it to Enceladus hundreds of thousands of miles away."

Sulaiman is lead author of a pair of papers describing the findings, published recently in *Geophysical Research Letters*.

The interaction of Saturn and Enceladus is different from the relationship of Earth and its Moon. Enceladus is immersed in Saturn's magnetic field and is geologically active, emitting plumes of water vapor that become ionized and fill the environment around Saturn. Our own Moon does not interact in the same way with Earth. Similar interactions take place between Saturn and its rings, as they are also very dynamic.

The recording was captured Sept. 2, 2017, two weeks before Cassini was deliberately plunged into the atmosphere of Saturn. The recording was converted by the RPWS team at the University of Iowa, led by physicist and RPWS Principal Investigator Bill Kurth.

More information: A. H. Sulaiman et al. Enceladus auroral hiss emissions during Cassini's Grand Finale, *Geophysical Research Letters* (2018). [DOI: 10.1029/2018GL078130](https://doi.org/10.1029/2018GL078130)

A. H. Sulaiman et al. Auroral hiss emissions during Cassini's Grand Finale: Diverse electrodynamic interactions between Saturn and its rings, *Geophysical Research Letters* (2018). [DOI: 10.1029/2018GL077875](https://doi.org/10.1029/2018GL077875)

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