

## CASSINI-HUYGENS

## Enceladus and its plume

Enceladus is Saturn's most geologically active moon, spouting a plume of gas and grains discovered by Cassini. The low gravity of this tiny moon (just 500 km across) allows the material to escape into orbit around Saturn, where it forms the so-called E ring, discovered by astronomers just a half-century ago. The plume is fed by jets that escape from fractures in Enceladus's surface in and around the south pole, and the underlying source is thought to be an interior ocean of liquid water whose presence was also detected by the Cassini spacecraft. The plume is hard to see except when sunlight is shining through it and scattered by the grains, and therefore when the surface of Enceladus itself is not illuminated by the Sun. This unusual image, then, is not a composite of two images — it is a single image in which the surface of Enceladus is lit by reflected light from Saturn (Saturn-shine), while the plume (and its source jets close to the surface) are illuminated by the scattered light of the Sun, which is roughly in the direction of the camera (but out of the image).

The Cassini spacecraft flew through the plume seven times over its 13-year mission in Saturn orbit. During these penetrations instruments collected gas and both icy and dusty grains, finding frozen salt water, molecules including methane and also heavier organics (molecules containing carbon and hydrogen), hydrogen, and tiny silicon-bearing grains. Cassini also

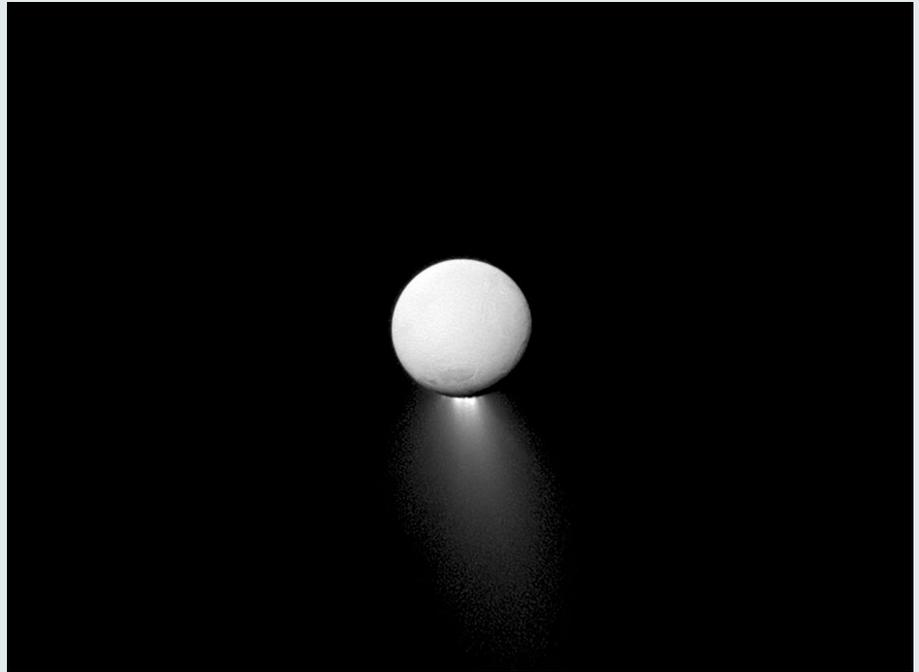


Image credit: NASA/JPL-Caltech/Space Science Institute

found large amounts of heat emanating from the south polar fractures, indicating that this tiny moon is being tugged and squeezed by tidal forces raised by Saturn — generating heat by friction. The Cassini results indicate that the ocean beneath Enceladus's icy crust can support microorganisms. Perhaps a future mission to Enceladus will snap an image similar to this one before plunging into the plume with instruments

designed to search for the molecular signatures of life.

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