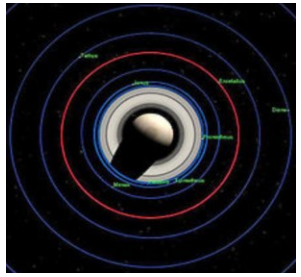
8 Enceladus, a moon of Saturn, shows evidence of a global impact event, which probably happened < 200 Ma ago

Enceladus was hit by a large impactor, with a diameter in the range of 10 to 40 km on it's leading hemisphere. This caused an impact crater (a circular impact structure) with an outer diameter of approx. 350 km and an inner diameter of approx. 200 km. This happend in the geological recent past, probably less than 200 Ma ago.

The current believe is that the so called Tiger Stripes in the southern pole area are caused by tidal pull from Saturn's gravity. But this is incorrect ! The tiger strips are the result of largescale global deformation on the small Saturn Moon Enceladus caused by the yet unknown global impact event. This impact event not only caused a global fracture pattern. It also caused expansion tectonics on the moon and largescale cryovolcanism in the southern hemisphere, which is still going on today. The jets coming out of the cryovolcanos mainly contain water out of the upper mantle of the moon

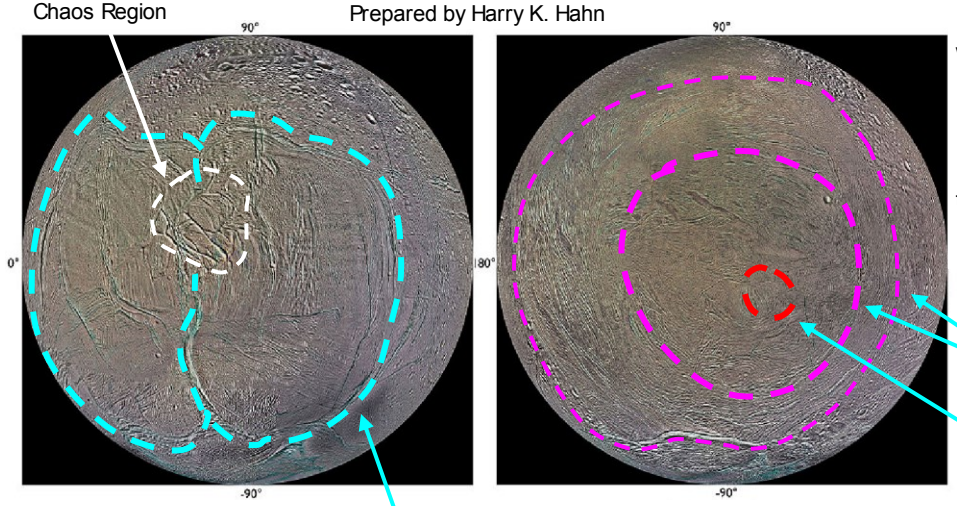
Diameter : 503 to 513 km
Orbital Period : 1.37 days
Semi-major axis : 237948 km
(orbit around Saturn)
Inclination : 0.019°
(to Saturn's equator)
Orbital velocity : around 12 km/s
Rotation Period : synchronous
(always faces same side to Saturn)



Enceladus's orbit (marked in red) from above Saturn's north pole

Chaos Region

Prepared by Harry K. Hahn



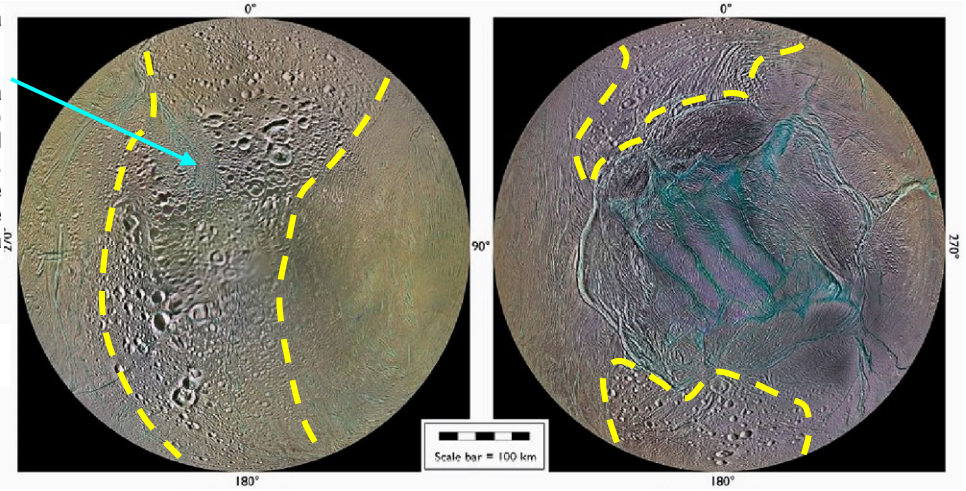
Trailing Hemisphere

Leading Hemisphere

Old surface area with many craters only within this belt-shaped area (marked in blue) The belt with old surface area is terminating on the borders of the Tiger Strips Area

Outer & inner impact area

Center of Impact



Northern Hemisphere

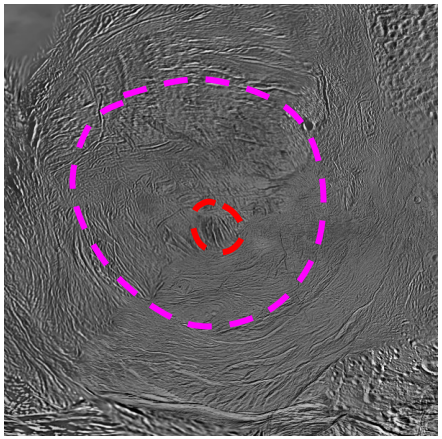
Southern Hemisphere

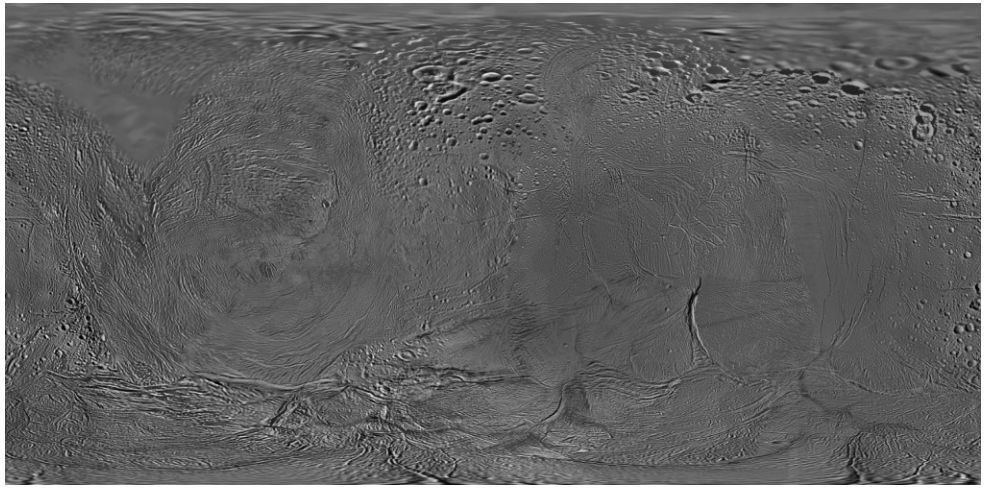
two kidney-shaped "tectonic-plates" caused by the impact shockwave

Detail view of the chaos region near the center of the Trailing Hemisphere.

This is where the peak of the shockwave, which travelled through the deep mantle, hit the trailing hemisphere from the inside. The two kidney-shaped "tectonic-plates" on the trailing hemisphere indicate that the shockwave travelled around a solid core before focusing in a peak area on the trailing side

Detail view of the inner impact area

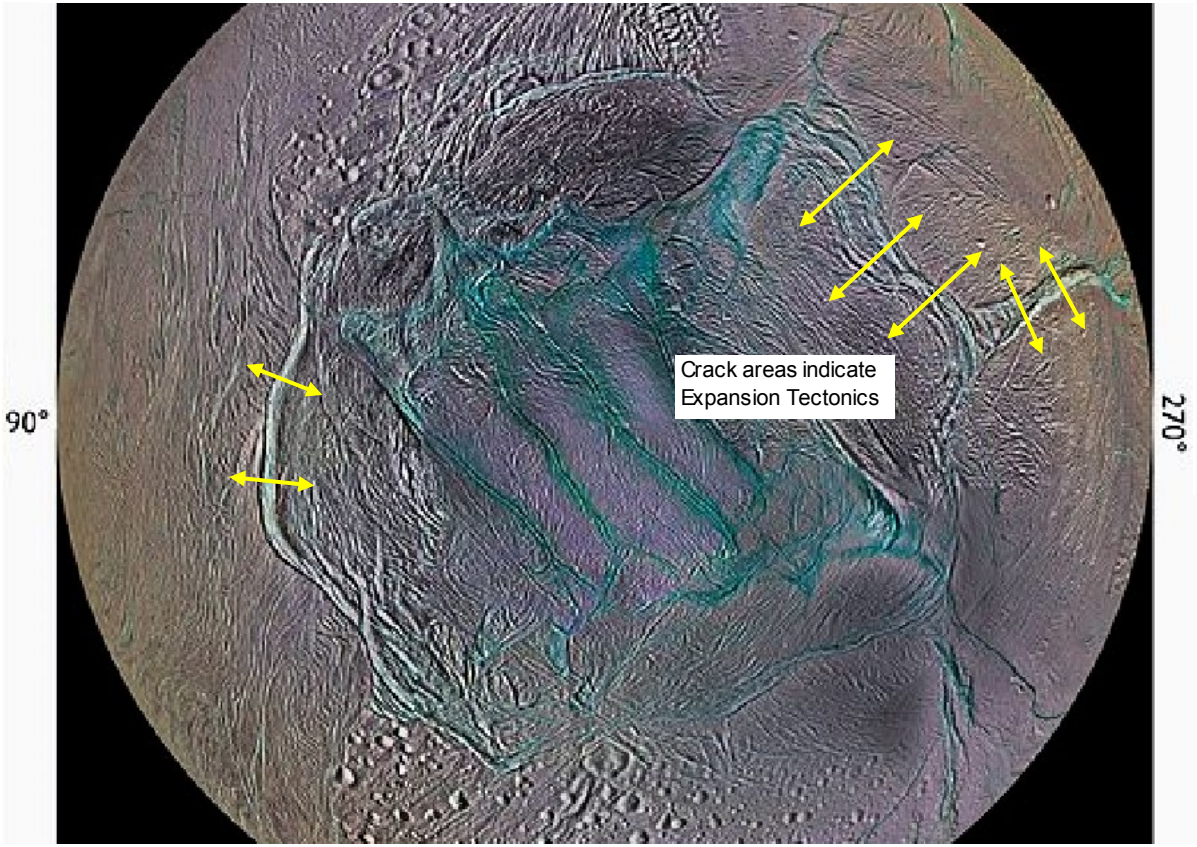




Enceladus Complete Surface Map

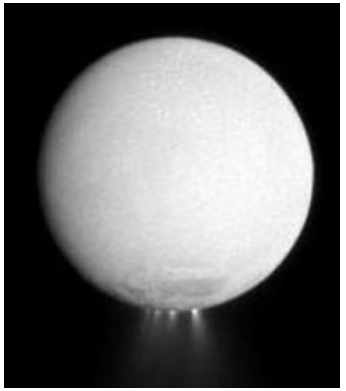
The “Tiger Strips” on Enceladus are the result of the described global impact event

Prepared by Harry K. Hahn , 24.09,2015



Detail view of the Tiger Strips area on Enceladus Southern Hemisphere

The Tiger Stripes on Enceladus southpole-area are the result of the largescale impact event and the following global deformation of the moon. The global deformation of Enceladus was caused by the shockwave which was triggered by the impact. This shockwave travelled through the interior of the moon and caused large scale fracture patterns on the leading- and trailing hemisphere. However a belt between the leading- and trailing hemisphere survived mostly without damage, with exception of the Tiger Stripes area. But because there is strong indication of Expansion Tectonics in this Tiger Strips area, it can be concluded that the whole moon expanded considerably after the impact ! And it seems that the expansion of the moon is still going on. The wide crack areas and the ongoing cryovolcanism are indicators for this ! The expansion of the moon must be driven by the mantle-volatiles ejected by the jets.

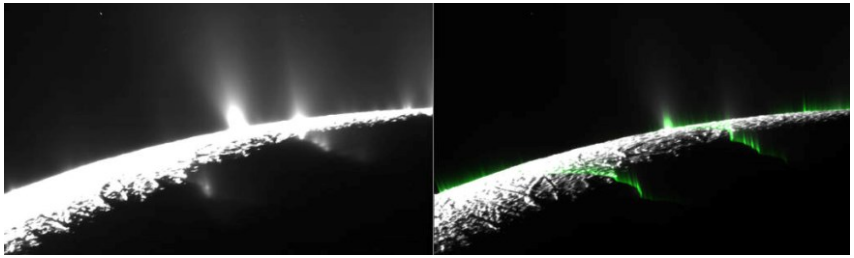


Jets of water and ice shooting up from “the Tiger Stripes” on Enceladus. The volcanoes along the fractures are known as cryovolcanos, meaning "volcanoes of ice". The jets are mostly water, they also contain ammonia, methane, carbon dioxide, nitrogen, and trace amounts of hydrocarbons as well as solid material including sodium chloride crystals and ice particles.
The jets (or plumes) at Enceladus seem similar in chemical makeup to comets (according to NASA scientists).
There is evidence for a large south polar subsurface ocean of liquid water within Enceladus with a thickness of around 10 km.

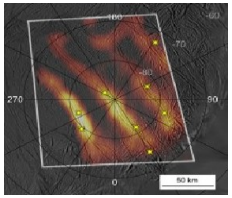
The Tiger Stripes (Enceladus) → From Wikipedia

The stripes are spaced approximately 35 kilometers apart. The ends of each tiger stripe differ in appearance between the anti-Saturnian and sub-Saturnian hemisphere. On the anti-Saturnian hemisphere, the stripes terminate in hook-shaped bends, while the sub-Saturnian tips bifurcate dendritically.
Virtually no impact craters have been found on or near the tiger stripes, suggesting a very young surface age. Surface age estimates based on crater counting yielded an **age of 4–100 million** years assuming a lunar-like cratering flux and 0.5-1 million years assuming a constant cratering flux

IImages from the ISS camera onboard *Cassini* revealed the 4 tiger stripes to be a series of sub-parallel, linear depressions flanked on each side by low ridges. On average, each tiger stripe depression is 130 kilometers long, 2 kilometers wide, and 500 m deep. The flanking ridges are, on average, 100 meters tall and 2–4 kilometers wide. Given their appearance and their geologic setting within a heavily tectonically deformed region, the tiger stripes are likely to be tectonic fractures. However, their correlation with internal heat and a large, water vapor plume suggests that tiger stripes might be the result of fissures in Enceladus' lithosphere.



Researchers modeled eruptions on Saturn's moon Enceladus as **uniform curtains** along prominent fractures that stretch across the icy moon's south pole. **(→ Compare this to the Mid-Ocean-Ridges on Earth ! → comment by Harry K. Hahn)**
The scientists found that brightness enhancements appear as optical illusions in places where the viewer is looking through a "fold" in the curtain. The folds exist because the fractures in Enceladus' surface are more wavy than perfectly straight. The researchers think this optical illusion is responsible for most -- but not all -- of what appear to be individual jets. Some discrete jets are still required to explain Cassini's observations.



The fractures are much warmer than surrounding area

Enceladus heat color map