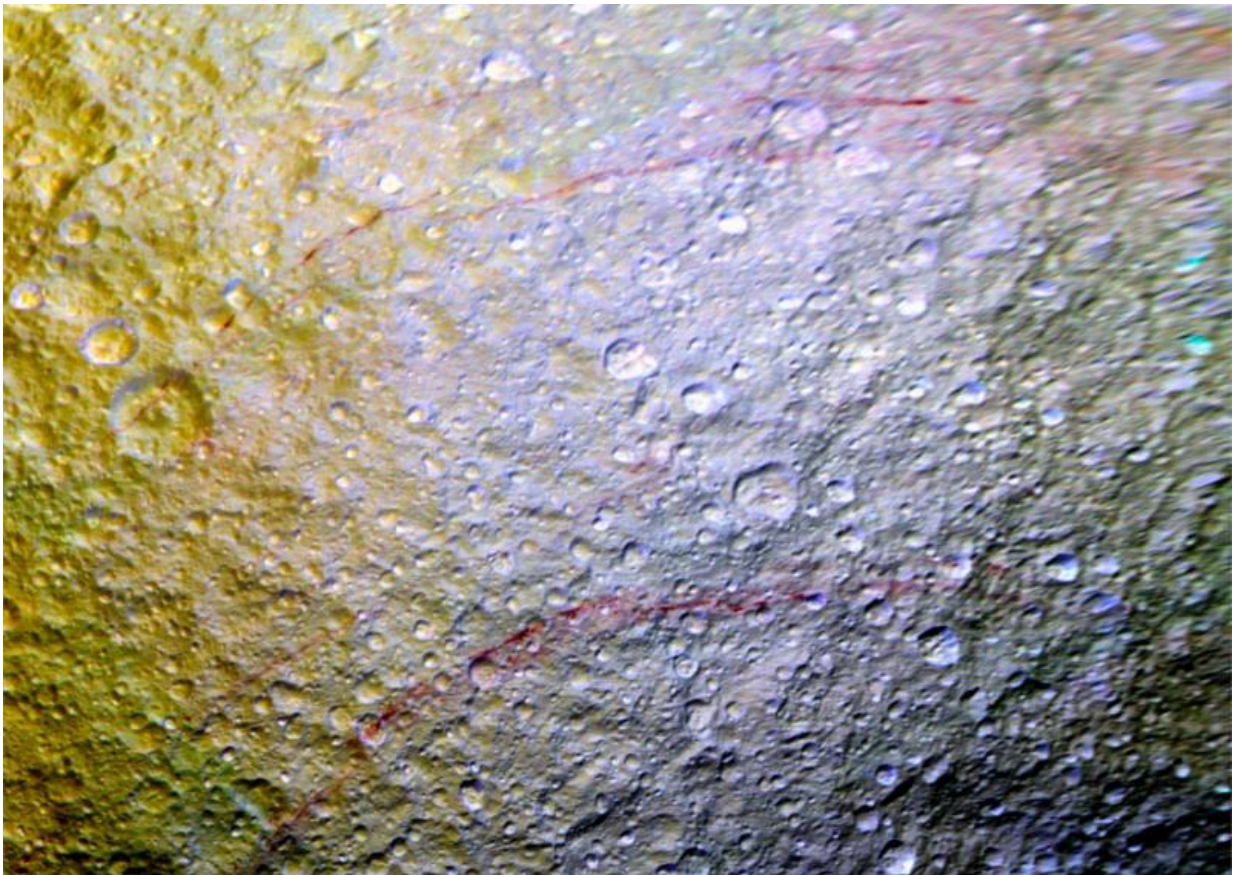


# Unusual red arcs spotted on icy Saturn moon Tethys

July 30 2015

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Unusual arc-shaped, reddish streaks cut across the surface of Saturn's ice-rich moon Tethys in this enhanced-color mosaic. The red streaks are narrow, curved lines on the moon's surface, only a few miles (or kilometers) wide but several hundred miles (or kilometers) long. The red streaks are among the most unusual color features on Saturn's moons to be revealed by Cassini's cameras. A few of the red arcs can be faintly seen in Cassini imaging observations made earlier in the mission, but the color images for this observation, which were obtained in

April 2015, were the first to show large northern areas of Tethys under the illumination and viewing conditions necessary to see the features clearly. As the Saturn system moved into its northern hemisphere summer over the past few years, northern latitudes have become increasingly well illuminated. As a result, the red arc features have become clearly visible for the first time. The origin of the features and their reddish color is currently a mystery to Cassini scientists. Possibilities being studied include ideas that the reddish material is exposed ice with chemical impurities, or the result of outgassing from inside Tethys. The streaks could also be associated with features like fractures that are below the resolution of the available images. Except for a few small craters on Dione, reddish tinted features are rare on other moons of Saturn. However, many reddish features are observed on the geologically young surface of Jupiter's moon Europa. Images taken using clear, green, infrared and ultraviolet spectral filters were combined to create the view, which highlights subtle color differences across Tethys' surface at wavelengths not visible to human eyes. The moon's surface is fairly uniform in natural color. The yellowish tones on the left side of the view are a result of alteration of the moon's surface by high-energy particles from Saturn's magnetosphere. This particle radiation slams into the moon's trailing hemisphere, modifying it chemically and changing its appearance in enhanced-color views like this one. The area of Tethys shown here is centered on 30 degrees north latitude, 187 degrees west longitude, and measures 305 by 258 miles (490 by 415 kilometers) across. The original color images were obtained at a resolution of about 2,300 feet (700 meters) per pixel on April 11, 2015. Credit: NASA/JPL-Caltech/Space Science Institute

Like graffiti sprayed by an unknown artist, unexplained arc-shaped, reddish streaks are visible on the surface of Saturn's icy moon Tethys in new, enhanced-color images from NASA's Cassini spacecraft.

The red arcs are narrow, curved lines on the moon's surface, and are among the most unusual color features on Saturn's moons to be revealed by Cassini's cameras.

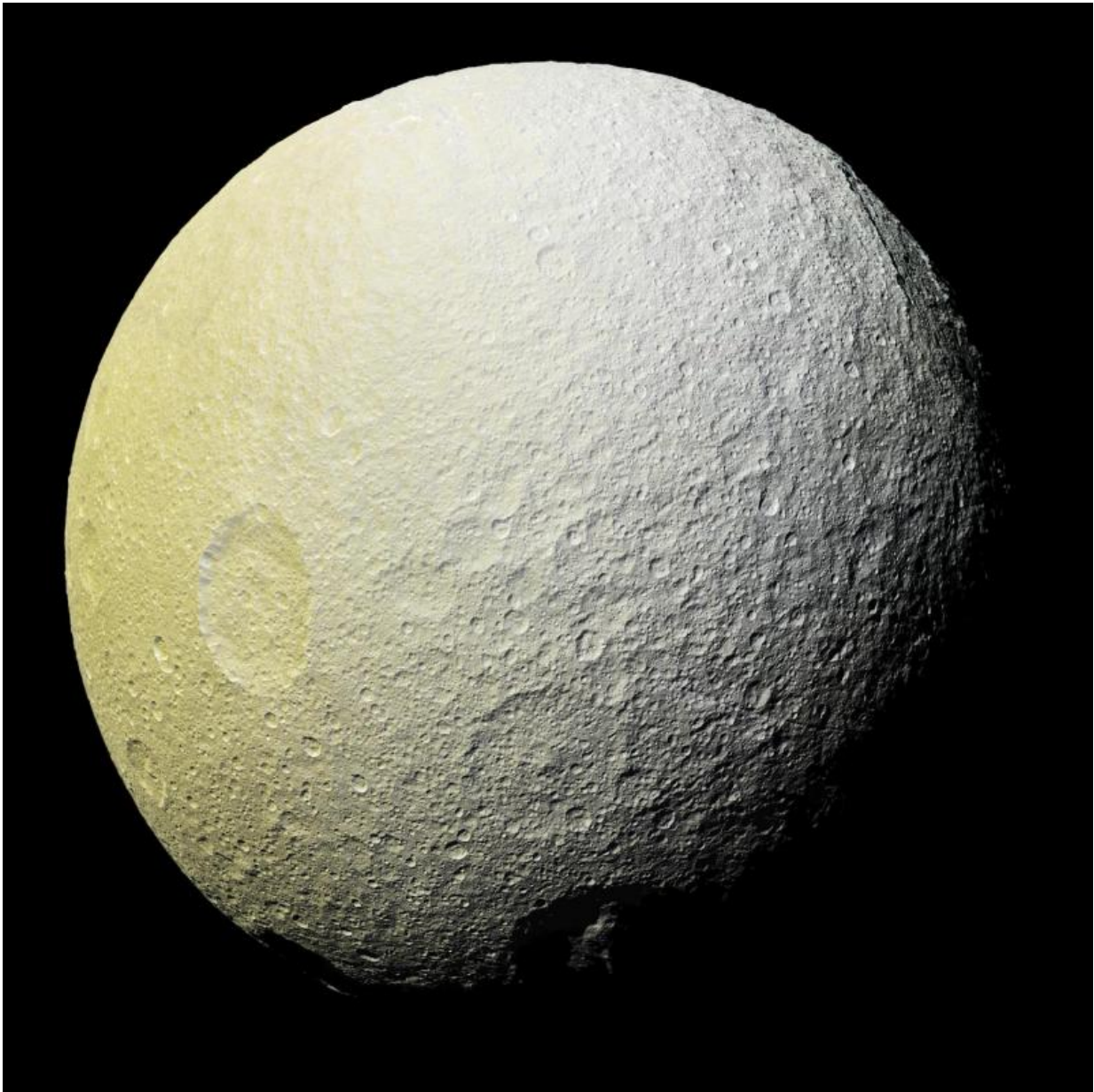
Images taken using clear, green, infrared and ultraviolet spectral filters were combined to create the enhanced-color views, which highlight subtle color differences across the icy moon's surface at wavelengths not visible to human eyes.

A few of the red arcs can be seen faintly in observations made earlier in the Cassini mission, which has been in orbit at Saturn since 2004. But the color images for this observation, obtained in April 2015, are the first to show large northern areas of Tethys under the illumination and viewing conditions necessary to see the arcs clearly. As the Saturn system moved into its northern hemisphere summer over the past few years, northern latitudes have become increasingly well illuminated. As a result, the arcs have become clearly visible for the first time.

"The red arcs really popped out when we saw the new images," said Cassini participating scientist Paul Schenk of the Lunar and Planetary Institute in Houston. "It's surprising how extensive these features are."

The origin of the features and their reddish color is a mystery to Cassini scientists. Possibilities being studied include ideas that the reddish material is exposed ice with chemical impurities, or the result of outgassing from inside Tethys. They could also be associated with features like fractures that are below the resolution of the available images.





This enhanced-color mosaic of Saturn's icy moon Tethys shows a range of features on the moon's trailing hemisphere. Tethys is tidally locked to Saturn, so the trailing hemisphere is the side of the moon that always faces opposite its direction of motion as it orbits the planet. Images taken using clear, green, infrared and ultraviolet spectral filters were combined to create the view, which highlights subtle color differences across Tethys' surface at wavelengths not visible to human eyes. The moon's surface is fairly uniform in natural color. The color of the surface changes conspicuously across the disk, from yellowish hues to nearly white. These broad color changes are affected by a number of external

processes. First, Saturn's diffuse E-ring preferentially bombards Tethys' leading hemisphere, toward the right side of this image, with ice bright ice grains. At the same time, charged particles from Saturn's radiation belt bombard the surface on the trailing side, causing color changes due to chemical alteration of the materials there. The albedo -- a measure of the surface's reflectivity -- drops by 10 to 15 percent from the moon's leading side to the trailing side. Similar global color patterns exist on other Saturnian moons. On a much smaller scale, enigmatic, arc-shaped, reddish streaks also are faintly visible across the heavily-cratered surface, particularly if one enhances color saturation in the image. The origin of this localized color contrast is not yet understood. Mountains on the floor of the 280 mile- (450 kilometer-) wide Odysseus impact basin are visible at upper right, around the two o'clock position. This mosaic is an orthographic projection constructed from 52 Cassini images obtained on April 11, 2015 with the Cassini spacecraft narrow-angle camera. Resolution is about 1,000 feet (300 meters) per pixel. The images were obtained at a distance of approximately 33,000 miles (53,000 kilometers) from Tethys. Credit: NASA/JPL-Caltech/Space Science Institute

Except for a few small craters on Saturn's moon Dione, reddish-tinted features are rare on other moons of Saturn. Many reddish features do occur, however, on the geologically young surface of Jupiter's moon Europa.

"The red arcs must be geologically young because they cut across older features like impact craters, but we don't know their age in years." said Paul Helfenstein, a Cassini imaging scientist at Cornell University, Ithaca, New York, who helped plan the observations. "If the stain is only a thin, colored veneer on the icy soil, exposure to the space environment at Tethys' surface might erase them on relatively short time scales."

The Cassini team is currently planning follow-up observations of the features, at higher resolution, later this year.

"After 11 years in orbit, Cassini continues to make surprising discoveries," said Linda Spilker, Cassini project scientist at NASA's Jet Propulsion Laboratory in Pasadena, California. "We are planning an even closer look at one of the Tethys red arcs in November to see if we can tease out the source and composition of these unusual markings."

Provided by NASA

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