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Based on their experience with the ancient surfaces of the Moon, Mars, and Mercury, scientists expected to see numerous impact craters in Voyager 1's first images of Io. The density of impact craters across Io's surface would have given clues to the moon's age. However, they were surprised to discover that the surface was almost completely lacking in impact craters, but was instead covered in smooth plains dotted with tall mountains, plats of various shapes and sizes, and volcanic lava flows.^[50] Compared to most works observed to that point, Io's surface was covered in a variety of colorful materials (leading Io to be compared to a rotten orange or to pizza) from various suffurous compounds.^[60] The lack of impact craters indicated that Io's surface is geologically young, like the terrestrial surface; volcanic materials continuous! bury craters as they are produced. This result was spectacularly confirmed as at least nine active volcances were observed by Voyager 1,^[52]

Surface composition

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Los color dapparance is the result of various materials produced by its extensive volcanism. These materials include silicat (such as orthopyroxene), sulfur, and sulfur dioxide.^[69] Sulfur dioxide frost is ubiquitous across the surface of lo, forming large regions covered in white or grey materials. Sulfur is also seen in many places across the satellite, forming yellow to yellow-green regions. Sulfur deposited in the mid-latitude and polar regions is often radiation damaged, breaking up normally stable cyclic 8-chain sulfur. This radiation damage produces lo's red-brown polar regions.^[19]

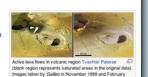
cyclic 8-chain sulfur. This radiation damage produces to's re-dorwan polar regions.¹¹ Explosive volcanism, often taking the form of umberlial-shaped plumes, paints the surface with sulfurous and silicate materials. Plume deposits on lo are often colored red or white depending on the amount of sulfur and sulfur dioxide in the plume. Generally, plumes formed at volcanic vents from degassing lava contain a greater amount of S2, producing a red "flan" deposit, or in extreme cases, large (often reaching beyond 450 km or 280 m from the central vent) red rings.^[70] A prominent example of a red-ring plume deposit is located at Pele. These red deposits consist primarily of sulfur (generally 3- and 4-chain necleur) sulfur), sulfur discide, and perhaps (SS2₀^[20]).^[20] Immes formed at the margins of silicate lava flows (through the interaction of lava and pre-existing deposits of sulfur and sulfur dioxide) produce white or gray deposits. Compositional mapping and lo's high density suggest that to contains little to no water, though small pockets of water ice or hydrated minerals have been tentatively identified, most notably on the northwest flank of the mountain Gish Bar Mons.^[71] This lack of water is killed us obtained water reaction of the solar system to drive off volatile materials like water in the vicinity of lo, but not hot enough to do so farther out.

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Jupiter's extensive magnetosphere.

See also: List of violance features on to The tidal heating produced by Io's forced orbital eccentricity has led the moon to become one of the most volcanically active works in the solar system, with hundreds of volcanic centres and extensive lava flows. During a major eruption, lava flows tens or even hundreds of kilometres long can be produced, consisting mostly of basati silicate lavas with either majic or utimmatic (magnesismi-rich) composition. As a by-product of this activity, sulfur, sulfur divid dioxide gas and silicate pyroclastic material (like ash) are blown up to 200 km (120 mi) into space, producing large, umbrelia-shaped plumes, painting the surrounding terrain in red, black, and white, and providing material for Io's patchy atmosphere and uplore's extensive magnetosphere.



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Active laws flows in volcanic region Treather Patienae decreassions known as paterae.^[72] Paterae generally have flat floors bounded by humages taken by Galleo in November 1999 and Feb 2000

though in this case the charged particles come moments brightest near its equator. Io lacks an intrinsic magnetic field of its own; therefore, more atmosphere. Nore electrons collide with the atmosphere, producing the brightest aurora, where the field lines are tangent to the satestime (r.e., near the equator), since the column of gas they pass through is longer there. Aurorae associated with these tangent points on Io are observed to rock with the changing orientation of Jupiter's tilted magnetic diple.^[16] Fainter aurors from oxygen atoms along the limb of Io (the red glows in the image at right), and sodium atoms on Io's night-side (the green glows in the same image) have also been observed.^[16]

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