JUPITER'S GALILEAN MOONS

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The Voyager, in March, 1979, found live volcanoes on one of Jupiter's Galilean moons, and different patterns of cratering (or lack of craters) on the four of them. These findings point to a recent creation of these moons, and thus disagree with the usual evolutionary ideas about the origin of the Solar System.

Introduction

The Voyager I space probe was launched from the Earth on September 5, 1977, aimed at the planet Jupiter. On March 5, 1979, Voyager I made the closest approach ever to the planet Jupiter. It came within 217,000 miles of Jupiter's surface, which is slightly less than the distance from our moon to the Earth. Voyager I took thousands of photographs and made thousands of measurements on Jupiter and its moons. The preliminary report on Jupiter and its moons appeared in the June 1 issue of *Science* magazine.[1] A popular description of the mission appears in the July issue of *Popular Science*[2] magazine.

Four of the five innermost moons of Jupiter are large enough to be seen by amateur astronomers using very low-powered telescopes. Galileo was the first one to observe these moons through his crude telescope centuries ago, and he named them Io, Europa, Ganymede, and Callisto, in order of increasing distance from Jupiter. The largest four of Jupiter's 13 moons are called Jupiter's Galilean moons. Although these moons are visible through earth-based telescopes they are so distant that no significant surface features are visible through even the most powerful earth telescopes. Part of Voyager I's mission was to fly by as many of these Galilean moons as close as possible, and to analyze them in as much detail as possible. The closest approach distances from Voyager I to the surface of each of Jupiter's Galilean moons were 12, 800 miles from Io, 456,000 miles from Europa, 71,300 miles from Ganymede, and 78,600 miles from Callisto.[3] These moons, like our own moon, have practically no atmosphere. The surface features of whatever events happened on them long ago should remain as a frozen museum of clues to the origin of those moons and of our solar system.

Volcanism on Io

Io, the innermost of Jupiter's four Galilean moons, was found to have at least seven active volcanoes. These volcanoes spewed plumes of ejecta from 60 to 160 miles high above the surface of Io.[4]

> The volcanic plumes shoot forth at speeds up to 2000 mph, 20 times faster than volcanic eruptions on Earth.[5]

A volcano powerful enough to blast a continuous stream of ejecta at a velocity of 2000 miles per hour is extremely violent. No other moon or planet besides the Earth in our solar system is known to have any active volcanoes.

The usual evolutionary model of the origin of the solar system[6-8] pictures the planets and moons four or five billion years ago as very hot condensing objects. During the next billion years, they were hot and volcanoes were active. About four billion years ago the smaller objects, i.e. the moons, cooled so that their volcanic activity stopped, and their surface features became essentially frozen. This evolutionary description fit knowledge of the motionless surfaces of the moon-sized objects (Mercury, the Earth's moon, and Mars' two moons) observed closely prior to Voyager I. However, active volcanism on Io does not fit this evolutionary model that predicts the extinction of volcanic activity four billion years ago. A better explanation is that Io did not go through the alleged evolutionary history. Rather, it was created recently enough so that its internal heat energy has not yet had time to cool.

The natural retreat for evolutionist is to blame the failure of their model on some principle that is an exception to it. One such possibility is radiogenic heating to maintain a molten interior for Io. However, even evolutionists admit this amount of radioactivity is unreasonable.

> What causes such violent volcanic activity? To keep a body the size of Io in a state of continuous volcanic activity through geologic time by radiogenic heating would require an unreasonably large fraction of long-lived radionuclides.[9]

Radioactive heating is not new to the creation-evolution question. It is the principle assumed by evolutionists to invalidate the proof of a young Earth from known cooling laws. Without an internal source of heat energy, the interior of the Earth would be much cooler than it is now, assuming it has been cooling for five billion years. Evolutionists assume that the energy released from postulated radioactive decay in the core of the Earth is responsible for keeping the interior of the Earth hot over geologic time. However, Dr. Slusher's recent study[10] has revealed this assumed radiogenic heating for the Earth to be inadequate. Thus, the Earth still must be younger than five billion years to be as hot as it is now.

Tidal heating is the modification of the evolutionary model for the origin of the solar system seized upon by evolutionists.

> A model for tidal heating of Io published by Peale et al. just before encounter seems to be the likely explanation. In this model, Europa and Ganymede induce a forced eccentricity in Io's orbit. This motion causes variations in the amplitude of the large fixed tides produced by synchronous rotation about Jupiter.[11]

The proposed tidal heating effect would generate heat energy throughout geologic time by continually stretching and deforming Io. The interior of Io should be hot just as a rubber band heats up when it is successively stretched and relaxed.

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It is left to the reader to decide which model better explains volcanism on Io: (1) the recent creation model or (2) the evolutionary model as modified by excessive radiogenic heating or by tidal heating.

Cratering

The general result of impact cratering studies[12] on the four Galilean moons is that one moon has none, one moon probably has none, and two moons have plenty. The surface of Io, the closest Galilean moon to Jupiter, bears many marks, pits and brightly colored areas, but Io has no recognizible impact craters. Europa, the second closest Galilean moon to Jupiter, has a rather uniform appearance all over. Europa had canal-like markings, but no visible impact craters. Europa was never as close as the other three Galilean moons to Voyager I, so that the details of its surface are still unknown. Yet it is fair to say that there are no large impact craters visible on Europa. The outer two Galilean moons, Ganymede and Callisto, both had a significant density of impact craters.

This varied cratering among the four Galilean moons does not square with the evolutionary model of the origin of the solar system. According to the evolutionary theory,[13] the rate of cratering never varied by more than a factor of two from Mercury to Jupiter at any given time in the past. It further postulates a time of very heavy cratering from Mercury to Jupiter approximately four billion years ago. These two postulates allow a reasonable evolutionary explanation of the similar impact crater densities and sizes on the surfaces of Mercury, our moon, Mars and Mars' two moons. Of course, the postulates were made precisely to explain those known features, so it is no wonder they work for them. The evolutionary expectation was that Jupiter's moons should have about the same impact crater density as the planets and moons just mentioned.

> The cratering rates estimated by applying these models to Ganymede and Callisto are roughly similar to the present cratering rate on the moon. The estimated cratering rate on Io is several times higher because of the greater effect of Jupiter's gravity.[14]

The actual densities of impact craters is about as far removed from the evolutionary expectations as possible. Io, the innermost Galilean moon, has no impact craters at all, instead of the very high density of impact craters predicted by the evolutionary theories. Europa, the second closest Galilean moon, probably has no impact craters either, in spite of the evolutionary predictions of high crater density. The outer two Galilean moons are the only ones with any craters, although the evolutionary model expects them all to be cratered. These results are so contrary to the evolutionary expectations that the investigators analyzing the photographs of Jupiter's Galilean moons write.

> The remarkable absence of recognizible impact craters on Io implies either that the flux of impacting bodies is extremely low or that Io's surface is extremely young.[15]

Geologist Laurence Soderblom of the U.S. Geological Survey at Flagstaff, Arizona, studying the Io photographs, continually revised the age of Io's surface. Originally he thought it was approximatley four billion years, similar to our moon. Later he estimated its age at 100 million years. The next day, he estimated its age at possibly no more than 10 million years. Then he later told Popular Science reporter Jim Schefter,

> I'm down to a million years or so for Io's surface. It just keeps looking younger.[16]

It seems much more likely that the simple recent creation model is correct. The surface of Io is young, because the entire moon, like everything else in existence, is young.

Conclusion

The volcanism on Io can be explained most naturally as the erupting internal energy of a moon that has not been in existence long enough to have dissipated whatever internal energy it was created with. Io's active volcanoes therefore point to a recent creation for Io. The general trend of cratering on the Galilean moons is the opposite of that predicted by the evolutionary description of the solar system. The lack of cratering on the two innermost Galilean moons is most naturally explained in terms of their recent creation. If the evolutionary description of the age of moons fails for Jupiter's Galilean moons, similar evolutionary presuppositions applied to our own moon should be discouraged. Since the Earth-moon system is believed by evolutionists to have formed at approximately the same time, Jupiter's Galilean moons point to a recent creation for the Earth and its moon, too.

Post-Script: Saturn and Titan

It would be interesting to know whether one of Saturn's many satellites exhibits properties similar to those of Jupiter's Io. Early in September, 1979, the Pioneer II spacecraft encountered Saturn. Although Pioneer II was much smaller than the Voyager spacecraft which have recently encountered Jupiter, still many of the Pioneer II data on Saturn were new and exciting. Pioneer II showed that: " . . . there are signs of a possible hydrogen cloud (though not a complete, Io-type torus) associated with Titan."[17] Unfortunately, most of the data on the atmospheres and surfaces of Saturn's satellites were drowned out by solar interference. We shall have to wait until the larger Voyager spacecraft which photographed Jupiter make their way to Saturn, before we can tell what the surfaces and atmospheres of Saturn's satellites are like.

References

[1]Volume 204 no. 4396, pp. 945-1008, 1 June 1979.

[2]Schefter, J., 1979. *Popular Science*, volume 215, pp. 54-59.

[3]Stone, E.C., and A.L. Lane, 1979. Voyager I encounter with the Jovial system. *Science* 204 (4396):945-948. See especially table 2, p. 947.

[4]Smith, Bradford A., et al., 1979. The Jupiter system through the eyes of Voyager I. *Science* 204 (4396):951-972. See especially table 3, p. 967.

[5]Schefter, *op. cit.*, p. 54.

[6]Smith, Elske v P., and Kenneth C. Jacobs, 1973. Introductory astronomy and astrophysics. W.B. Saunders, London. Section 5-3.

[7]Swihart, Thomas L. 1978. Journey through the universe. Houghton Mifflin, Boston. Section 7.2.

[8]Shipman, Harry L., 1978. The restless universe. Houghton Mifflin, Boston. Section 4.7.

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