Plausibility of Electrical Birth of Asteroid Belt

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Formation of the asteroid belt between Mars and Jupiter is traditionally assumed to have occurred primordially when a group of planetesimals formed protoplanets that, through gravitational perturbations from Jupiter, were imbued with too much orbital energy to accrete into a planet, until violent collisions shattered most of the protoplanets, thereby forming the asteroid belt. Electric Universe theory contends there was an electrical discharge interaction on a planetary scale when a planetesimal closely encountered Mars, causing not only Mars' material to be ejected, but also disintegrated much, if not all, of the planetesimal. The ejected debris eventually formed the asteroid belt; and possibly Valle Marineris which scars nearly 20% of Mars' circumference, is the 'smoking gun." Here I examine not the electrical discharge phenomena, but crudely estimate whether or not the total mass of the belt could have arisen from such an interaction.

1. Introduction

Formation of the asteroid belt is traditionally assumed to have occurred "from the primordial solar nebula as a group of planetesimals … formed protoplanets. Between Mars and Jupiter, however, gravitational perturbations from Jupiter imbued the protoplanets with too much orbital energy for them to accrete into a planet. Collisions became too violent … and most of the protoplanets shattered. As a result, 99.9% of the asteroid belt's original mass was lost in the first 100 million years …" [1] "The Electric Universe theory [EUT] of asteroid formation does not require that one object smash into another one for there to be craters. Electric arcs can gouge surfaces and scoop out material, accelerating it into space, leaving clean, deep pits. Comets also exhibit surface features that are the same as those observed on asteroids, so the conclusion is that the two are really one thing and not 'dirty snowballs' versus rocky bodies." [2]

As an example, EUT considers Vesta,

> "the second largest asteroid, with a diameter of approximately 530 kilometers … Vesta compares to [Saturn's moon] Enceladus or Mimas in size. There are indications that Vesta has experienced some powerful collisions in the past, since … [one] of the craters near Vesta's south pole is 460 kilometers in diameter, more than 80% of the asteroid's size. The crater is close to 13 kilometers below the mean elevation of the terrain, with a rim about 6 kilometers above. There is an 18 kilometer high central peak, as well. Why did an impact that removed more than 1% of the asteroid's mass not blast it into pieces?
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> The 'rubble pile' theory of asteroid composition was created to help explain the mass anomalies that have been seen in asteroid crater studies. Other asteroids, as well as small moons, exhibit craters that should have exploded them into fragments when they were hit. The only suitable explanation, according to gravity-based models, is that they are loosely compacted. It is presumed that they act like big sand piles and absorb the impacts without shattering. They have no hard crust to begin with so they haven't fractured despite repeated pounding ...
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> Plasma arcs do not disturb the surrounding surfaces when they are used in industrial applications. Based on laboratory analysis, that is what has occurred on Vesta and on all the asteroids, moons, and planets of the solar system: plasma discharge erosion. Planetary scientists ignore electrical explanations, which rectify the anomalies in other theories, because they know almost nothing about plasma and electric currents in space. Electricity can create the very things they are sending out probes to study." [2]

2. Is it Plausible that an Electrical Discharge Formed the Asteroid Belt?

Valle Marineris, shown in Figure 1, "is a system of canyons that runs along the Martian surface east of the Tharsis region. At more than 4,000 km (2,500 mi) long, 200 km (120 mi) wide and up to 7 km (23,000 ft) deep, the Valles Marineris rift system is one of the larger canyons of the Solar System, surpassed only by the rift valleys of Earth. Valles Marineris is located along the equator of Mars … and stretches for nearly a quarter of the planet's circumference … It has been recently suggested that Valles Marineris is a large tectonic 'crack' in the Martian crust. Most researchers agree that this formed as the crust thickened in the Tharsis region to the west, and was subsequently widened by erosion. However, near the eastern flanks of the rift, there appear to be some channels that may have been formed by water or carbon dioxide." [3]

As is evident, the 'standard' explanation for Valle Marineris is that it formed tectonically, with some later erosion due to water or CO_2. "In the 1970's the engineer Ralph Juergens first proposed that Valles Marineris is the scar left by a giant, interplanetary lightning bolt … Recently, geologic researcher Michael Steinbacher and experimentalist Billy Yelverton[, exploring the theory of planetary electrical scarring,] have collaborated to replicate the complex conditions that might have been present in an epoch of planetary instability." [4] The result from their experiment is shown in Figure 2. Even the most jaded skeptic should admit some resemblance to Valle Marineris.

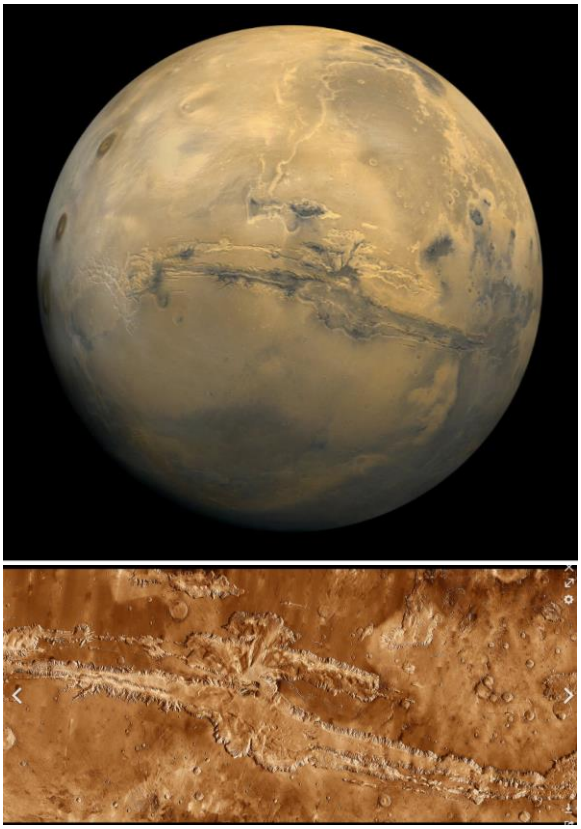

Figure 1. Valle Marineris [3]

Figure 2. Laboratory Recreation of Possible Planetary Electrical Scarring [4]

2.1 Analysis

I do not examine the phenomena associated with electrical/plasma arc discharge as the potential creators of Valle Marineris. Instead, I focus on the mass of Mars' surface potentially ejected during such an encounter with a closely-passing planetesimal, comparable in size to the largest of the known asteroids (dwarf planets), Ceres.

Generously, the maximum amount of Mars' surface ejected during such an encounter would have been roughly (4000 km)(200 km)(7 km)(3.934 g/cc)(1 kg/1000 g)[(100 cm/m)(1000 m/km)]^3 = 2.2 x 10^{19} kg, where 3.934 g/cc is the mean density of Mars. [5] The estimated total mass of the asteroid belt lies between 2.8 and 3.2 x 10^{21} kg, or an average of ~3.0 x 10^{21} kg [1], more than 100 times greater than the maximum estimated mass ejected from Valle Marineris. Therefore, ejection solely of Mars' surface material could not generate the asteroid belt. But, what about the contribution from the interacting planetesimal?

With a total mass of 3.0 x 10^{21} kg for the asteroid belt, <1% arising from Mars itself, this would be the minimal mass needed for the planetesimal if it were completely disintegrated and its debris contained within the belt. If it is assumed to have the same density as the largest asteroid (dwarf planet), Ceres, the corresponding radius would have been the cube root of (3)(3 x 10^{21} kg)/{(4π)(2.16 g/cc)(1 kg/1000 g)[(100 cm/m)(1000 m/km)]^3}, or 690 km, where 2.16 g/cc is the mean density of Ceres. Ceres has a mass of 9.393 x 10^{20} kg and radius of 473 km, so the postulated planetesimal would have been roughly three times as massive and 50% wider. [6] Mars itself has a mass of 6.417 x 10^{23} kg and radius of 3390 km, so the planetesimal would have been only ~0.5% as massive and 2% as wide, quite a small entity, but certainly not far out of line with the asteroid belt's currently known largest member. [5]

For some additional perspective, note that despite the Moon being roughly 25% the width of the Earth (1737 km vs. 6371 km), its mass is only slightly above 1% that of Earth (7.348 x 10^{22} kg vs. 5.972 x 10^{24} kg). [7,8] Thus, the ratio of the Moon's mass to that of Earth is only about twice the ratio of the proposed planetesimal to that of Mars, despite a much greater difference in size. Therefore, the planetesimal need only have been comparably as dense as other known asteroids to have generated the asteroid belt via an electrical discharge interaction with Mars despite being very small relative to Mars (but still reasonably comparable to Ceres).

3. Conclusion

Is the EUT's explanation for the formation of the asteroid belt plausible, at least from the perspective of the amount of mass involved? My crude analysis suggests a positive answer. I leave it to the EU theorists to continue their exploration of the phenomenology and its plausibility, toward which they appear to be off to a good start.

4. References

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