

A Theory for the origin of volcanoes on Mars

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Background:

There is now evidence that the impact of a large meteor onto a planet can cause damage on the opposite side. Detailed images of Mercury show that a ~1500 KM crater (Caloris basin) has a region of chaotic terrain and lava flow on the opposite side.¹

The planet Mars has a landscape of volcanoes and craters. The volcanoes are mostly grouped into three general raised plateau areas: 1. Tharsis bulge, 2. Elysium Planitia, and 3. Alba Paterae. These comprise thousands of square kilometers of cracked, raised, area with some large volcanic cones and lava flows. Figure 1 shows the Alba Paterae. It is a large area of uplift with a cracked landscape and a volcano in the center. There has a theory that the plateaus of Mars could be caused by one Asteroid called Astra.² There has not been a good explanation of those raised plateaus from the standpoint of how impacts could have caused them.

Hypothesis:

This theory postulates that the plateaus and volcanoes of Mars were generated by the focusing of seismic waves from asteroid impacts on the exact opposite side (antipode) of the planet. These impacts resulted in mechanical waves that traveled concentrically outward from the impact and converged on the exact opposite side of Mars, which then caused major uplift and eruption of magma on a large scale.

Discussion:

The 18 tallest volcanoes are listed in table 1³. The largest known volcano in the Solar System is Alba Mons (highlighted in yellow). It located at +40.1° lat. X 250.2° long. Figure 2 is a copy of a map of Martian elevations.⁴ Overlain is the diameter tie-line of Hellas crater (lower right blue valley) to the antipode (end of line at upper right). The Hellas crater is located at -42° lat. X 70° long, so the Hellas crater antipode is located at +42° lat. X 70+180=250° long. As can be seen, the antipode is very close to the Alba Paterae (upper right white plateau).

The second largest impact crater on Mars is Isidis located at +12.9° lat. X 87° long (highlighted in green in table 1). Figure 1 has the diameter overlain, that is, Isidis crater (upper right blue valley) to the Isidis antipode at -12.9° lat. X 267° long (lower right white plateau). The antipode lies on the Tharsis bulge towards the Eastern side.

This coincidence of having the two largest bulges on Mars occurring approximately opposite the two largest impact craters is too high to be random chance.

There are other volcanoes on the Tharsis bulge (highlighted green in table 1), but they are seemingly not associated with any crater. The tallest volcano, Olympus Mons at +18° lat. X 227° long., has no apparent crater at the antipode.

Elysium Planitia volcano (red highlight in table 1) also has no crater at the antipode. But, if two impacts of asteroids occurred simultaneously in the past, this would have an average antipode near Elysium. The average of coordinates of craters Argyle and Schiaparelli has an antipode at +26° lat. X 150° long, which is very close to Elysium volcano at +25° lat. X 147° long.

¹ http://en.wikipedia.org/wiki/Caloris_Basin

² <http://www.thule.org/mars/index.html>

³ http://en.wikipedia.org/wiki/List_of_mountains_on_Mars_by_height

⁴ http://upload.wikimedia.org/wikipedia/commons/f/f3/MarsTopoMap-PIA02031_modest.jpg

Conclusion:

The coincidence of antipodal points of the two largest craters on Mars with the Tharsis and Alba bulges is too coincidental to be unassociated with each other. The seismic waves past asteroid impacts on Mars concentrated by the lensing of the planet itself caused massive volcanic eruption by the disruptive cracking of the surface and the subsequent lava flows as the hotter and therefore lighter magma was forced up.

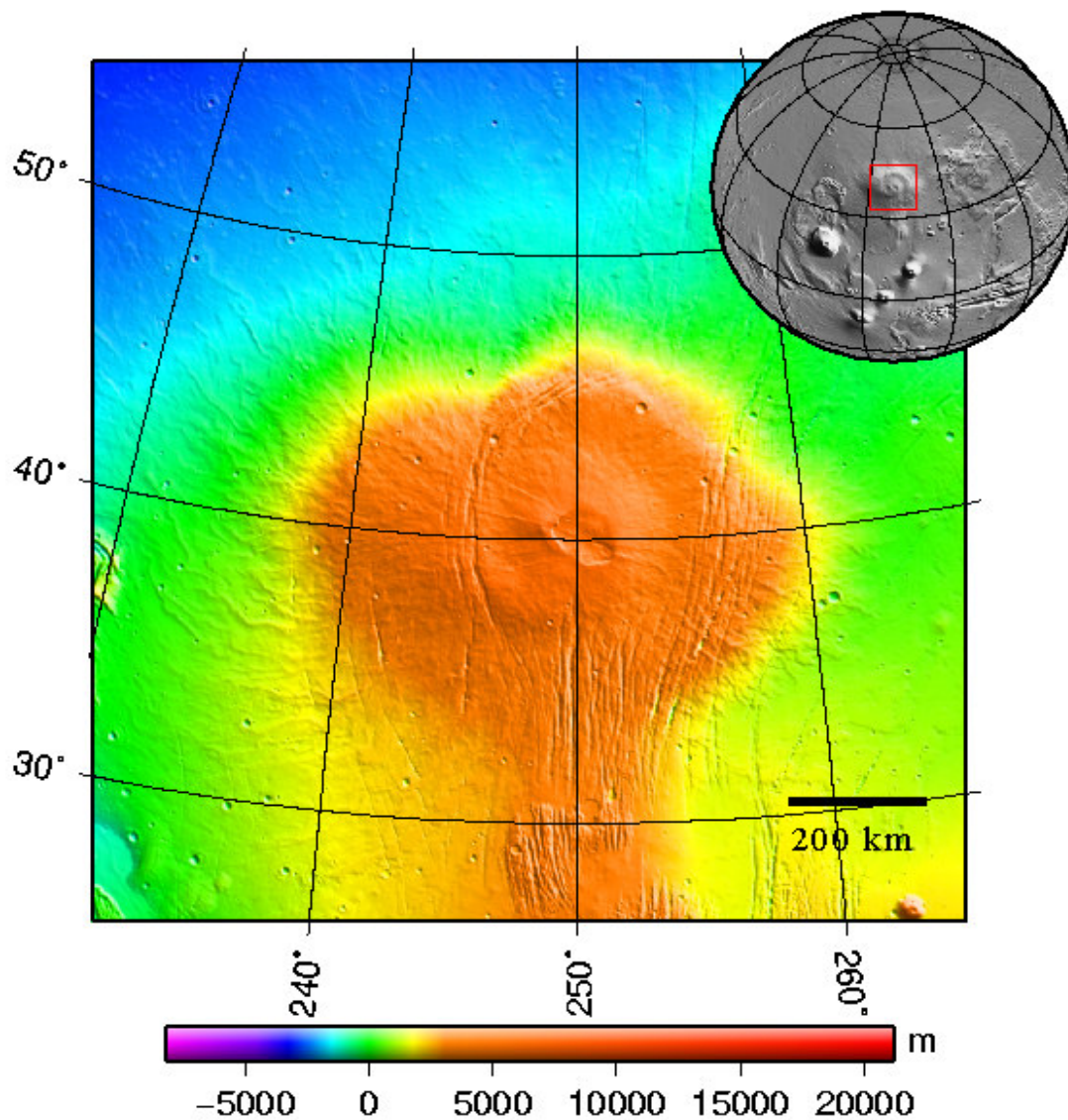


Figure 1 ⁵–

Alba Patera detail relief showing a large raised and cracked area with a volcano at 40° lat. X 250° long.⁶ This shows that the bulge occurred first, then the volcano. This is because the cracked crust ends at the lava flows. Something massive pushed the crust up. This was undoubtedly the breakup of the previously strong, intact crust permitting the light magma below to rise.

⁵ Ibidem 4

⁶ http://en.wikipedia.org/wiki/Image:Alba_Patera_-_topography_map.png

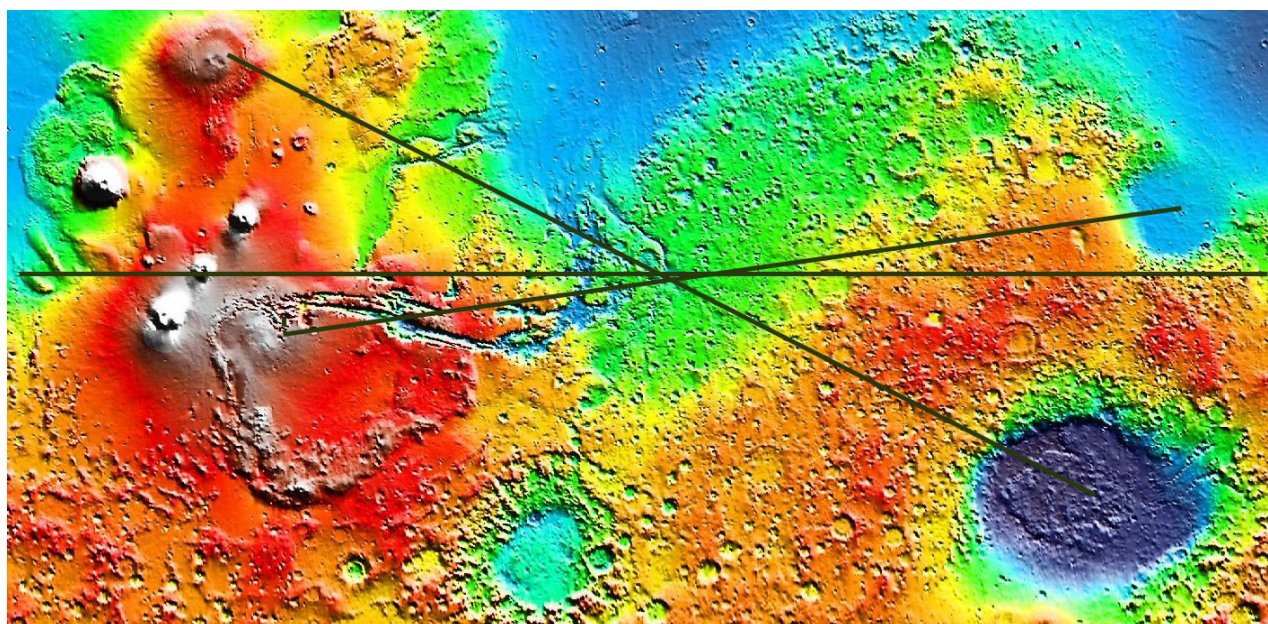


Figure 2 ⁷ Relief map of Mars – the horizontal line is the equator . The other two lines are the diametric lines through the center of Mars of the two impact craters Isidis and Hellas. The opposite end of each line is the antipode of each impact crater

Volcano	Volcano coordinates			crater	Antipode coordinates	
Name	Elevation (m)	lat (deg.)	long (deg.)	Name	lat (deg.)	long (deg.)
Olympus Mons	21171	18	227			
Ascraeus Mons	18209	11.3	255.5			
Arsia Mons	17779	-9.5	239.5	Isidis	-12.9	267
Pavonis Mons	14037	0.8	246.6			
Elysium Mons	13862	25	147			
Biblis Tholus (formerly Patera)	7198	2.7	235.4			
Alba Mons (formerly Patera)	6815	40.1	250.2	Hellas	42	250
Ulysses Tholus (formerly Patera)	5863					
Uranus Mons (formerly Patera)	4853					
Anseris Mons	3959			Argyre	49	136
Hadriacus Mons (formerly Hadriaca Patera)	3959			Huygens	14	124.4
Euripus Mons	3945			Schiaparelli	3	164
Tyrrhenus Mons (formerly Tyrrhena Patera)	3920					
Promethei Mons	3789			average of 3	26	150
Chronius Mons	3240					
Apollinaris Mons (formerly Patera)	3155					
Tharsis bulge						
Elysium Planitia						
Alba Paterae						

Table 1 The 18 largest impact craters know on Mars⁸

⁷ Ibidem 4

⁸ Ibidem 3