EPSC Abstracts
Vol. 7 EPSC2012-47 2012
European Planetary Science Congress 2012

Vesta: its shape and deformed equatorial belt predicted by the wave planetology

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At EPSC2011 we stated: "Expected detailed images of Vesta sent by DAWN spacecraft certainly will show a prominent tectonic (must be also compositional) dichotomy of this large asteroid. The assuredness is based on some mainly the HST photos and the wave planetology fundamental conception: Theorem 1 – "Celestial bodies are dichotomous""[1]. Now a convexo-concave shape of Vesta is well known but the huge deep depression of the south hemisphere is assigned to two random large impacts almost at one place [2, 3]. This supposition has a very small probability, besides the largest asteroid Ceres also has a large depression at one side (the Piazzi basin). The theorem 1 of the wave planetology explains that all celestial bodies (not only small ones) are subjected to a warping action of the fundamental wave1 uplifting one side and subsiding (pressing in) the opposite one. This is a manifestation of the orbital energy acting in any body moving in keplerian non-circular orbit with changing acceleration (a). Arising inertia-gravity force $F= (a_1 – a_2) x m$ is very important because of large planetary masses (m) and large cosmic speeds. Increase and decrease of accelerations were much larger in the beginning of planetary formation when orbits were more elliptical. Thus, pressing in of the subsiding hemisphere-segment is so strong that it often squeezes out some mantle material appearing as elevation-mound (compare to the Hawaii in the Pacific basin and look at Hyperion with a large basin and a mound at its center, Fig, 1, 2).

Vesta's prominent subsiding equatorial belt with graben systems [4] (Fig. 4, 5) is a manifestation of another general planetary rule: "Rotating celestial body tends to even angular momenta of tropics and extra-tropics by regulating mass distribution and distance to the rotation axis " [5-7]. Often observed a sensible difference in appearance and structure between tropical and extra-tropical zones of various heavenly bodies including rocky and gas planets, satellites and Sun compels to look for a common reason of such phenomenon [5-7]. All bodies rotate and their spherical shape makes zones at different latitudes to have differing angular momenta as a distance to the rotation axis diminishes gradually from the equator to the poles (Fig. 3) (this is felt particularly when one launches rockets into space – preferable cheaper launches are from the equatorial regions – Kourou in the French Guyana is better than Baikonur in Kazakhstan). One of remarkable changes occurs at tropics. As a total rotating planetary body tends to have angular momenta of its tectonic blocks equilibrated it starts mechanisms leveling this basic physical property. At tropical zones (bulged also due to the rotation ellipsoid) the outer shell – crust as a consequence tends to be destroyed, sunk, subsided and shrunk; a density of crust material changes; the atmosphere reacts changing chemistry and structure; in terrestrial anthroposphere man looses its mass and stature (well known pygmioidness process). Extra-tropical belts, on the contrary, tend to add material and increase radius. Thus, a body tends to be like a cucumber but mighty gravity always makes it globular. Traces of this cosmic "struggle" very often are seen on surfaces of heavenly bodies as structurally distinguished tropical and extra-tropical zones (Fig. 4-6).

At **Earth** the wide planetary long tropical zone is marked by destruction of the crust. It is demonstrated by development of numerous islands of the Malay Archipelago (the Sunda Isls, Maluku Isls, Philippines) between the Southeastern Asia and Australia. In Africa and South America huge depressions of the Congo and Amazon Rivers develop. Seismicity of the tropical zone is significantly higher than outside of it that means more intensive destruction in the crust and the upper mantle of tropics [5-7]. At **Mars** the widespread enigmatic chaotic and fretted terrains at the highland-lowland boundary could be considered as traces of the crust destruction. At **Saturn** a wide tropical zone usually has higher albedo than extra-tropical ones. Relatively heavier methane clouds in the H-He atmosphere are absent around the equator and concentrated on the higher latitudes. In the subsided tropical zone of **Titan** the darker methane lowlands (Fig. 6) are normally rippled in at least two directions with spacing a few km to 20 km. This planetary pattern is comparable with a behavior of the basalt floor of terrestrial oceans [5-7].

Asteroid (mini-planet) **Vesta** also demonstrates drastic structural difference between equatorial and extra-equatorial zones. Folded and subsided equator shows troughs encircling most of Vesta and being up to 20 kms wide (Fig. 4). The north-south dichotomy is obvious in subsided southern hemisphere (less cratered) and uplifted the northern one (more cratered). Mars shows the inverse dichotomy, Earth the east-west one. Vesta's positive Bouguer anomaly at the tropics (Fig. 5, [4]) is due to uplifted denser material compensating angular momentum loss because of subsiding equatorial belt (Fig. 4).

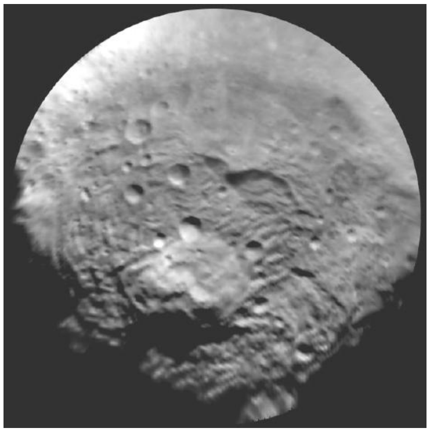

Fig. 1. Vesta, PIA14315.JPG, south hemisphere with basin and central mound

Fig. 2. Hyperion, PIA07761.JPG. 175 x 120 x 100 km. Hemisphere with depression and central mound (compare with the Vestan south hemisphere depression and central mound, Fig. 1).

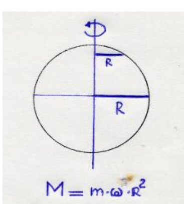

Fig. 3. Differing angular momenta (M) of the equatorial and extra-equatorial zones of a rotating globular body

Fig. 4 Vesta, 595403main_pia14894-43_946-710.jpg

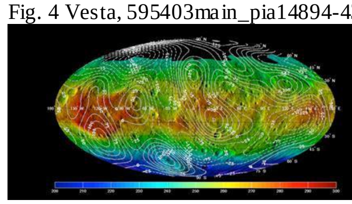

Fig. 5. Vesta- Bouguer anomaly [4]

Fig. 6. Titan: PIA08995, equatorial region (dark) with the bright region Adiri at center, IR-939 nm,.

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