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Three “diamonds” in the sky – not enough to evoke interest in not before considered planetary processes?

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Abstract

Now, when already at least three “diamonds in the sky” are known, it is irresponsible to ignore planetary processes not mentioned in textbooks. Besides impacts to which one pays too much undeserved attention (the impact paradigm looses its grounds at least on Mercury [1] and the Moon [2]), there is one regular universal wave process obviously affecting shapes and structures of all heavenly bodies notwithstanding their sizes, masses, densities, classes, chemical compositions, physical states. There are common for all celestial bodies structurizing processes originated in their two fundamental properties. All bodies move in non-circular orbits and rotate. Moving in non-circular keplerian orbits means periodically changing accelerations (“+” speeding and “–“ braking).

These endless cyclic changes evoke in the bodies oscillations in form of standing warping waves propagating in rotating bodies (but they all rotate!) in four ortho- and diagonal directions. An interference of these waves produces uplifting (+), subsiding (-) and neutral (0) regularly disposed tectonic blocks. Their sizes depend on warping wavelengths. The fundamental wave 1 produces ubiquitous tectonic dichotomy - segmentation (2πR-structure, Theorem 1[3 & others]), the first overtone wave 2 produces tectonic sectoring (πR-structure, Theorem 2). On these most pronounced warping forms are superimposed tectonic granules (Theorem 3) size of which is inversely proportional to bodies’ orbital frequencies: higher frequency – smaller granules, lower frequency – larger granules. There is the following row of granule sizes equal to a half wavelength, inversely proportional to orbital frequencies, and starting from the solar photosphere: photosphere πR/60, Mercury πR/16, Venus πR/6, Earth πR/4, Mars πR/2, asteroids πR/1. (R is a body’ radius).

It was shown [4, 5] that 2πR-structuring tends to attach to a body a shape of tetrahedron, πR-structuring – shape of octahedron, πR/2-structuring – shape of a cube, and so on with forming polyhedra with many smaller faces approaching finally a sphere. All these geometric figures can exist in one body simultaneously and be revealed at different points of view (Fig. 1-3). Certainly, they are more or less clearly seen only in rather small bodies (less than 400 to 500 km in diameter) where gravity allows keeping peculiar shapes. In larger bodies mighty gravity rounds them off and only geology, geophysics and geomorphology can distinguish on “perfect” spheres traces of polyhedron’s vertices, edges and faces (The Earth’s octahedron, Fig. 4).

The saturnian system has many small icy bodies which can demonstrate their

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geometric shapes. Tectonic dichotomy is most clearly revealed in a bean or banana convexo-concave shapes, but sometimes flattened (concave) side is opposed to sharply protruding convex side by such a way that tetrahedron shape appears (Hyperion, PIA08904, PIA06645; Telesto, PIA07546; Amalthea, PIA01074). An octahedron is manifested in classic Amalthea (PIA01074)(Fig. 1), in Yanus (PIA08192) (Fig. 2), Prometheus (PIA07549). A cube is clearly seen in Epimetheus (PIA07531) and Helene (PIA07547) [5]. It is essential to note that the convexo-concave shape so typical for small bodies (satellites, asteroids, comets) is characteristic for small bodies of various sizes. In the asteroid belt between Mars and Jupiter flattened and dichotomous is even the largest asteroid Ceres as well as millions of other bodies of various sizes. And this is understandable as the fundamental wave 1 affects all bodies notwithstanding their sizes. A liaison between dichotomy and the tetrahedron structure can be understood if one mentally cuts any of 4 axes of this figure. At one end always will be a vertex – point to which narrow three faces (contraction). At another end always will be a face to which expand this three faces (expansion). The tectonic dichotomy in celestial bodies is an opposition of contracted and expanded segments (hemispheres). Recently a clear "diamond" shape was observed in small asteroid Steins (Fig.3, left), however having more like tetrahedron (or convexo-concave) shape under slightly different point of view (Fig. 3, right). In giant Saturn 's northern hemisphere a structural tetrahedron prints its faces in form of a giant hexagon (Fig. 5, left). In the opposite southern pole there is a trace of the tetrahedron vertex in a form of a giant hurricane (Fig. 5, right).

So, the polyhedron structure is one of common features of all celestial bodies allowing speaking about their "supertectonics" [7]. Another common feature of supertectonics is expressed as Theorem 5: "Rotating celestial body tends to equalize angular momenta of tropics and extra-tropics by regulating their masses and distances to the rotation axe". This tendency was discussed in [7, 8]. Thus, above regular traits of planetary supertectonics act against random features caused by impacts.

References: **[1]** Head J. W. et al. (2009) 40th LPSC, abstract 2198 pdf. (CD-ROM). **[2]** Norman M.D. (2009) Elements, v. 5, # 1, 23-28. **[3]** Kochemasov G.G. (1999) Geophys. Res. Abstracts, v. 1, # 3, 700. **[4]** Kochemasov G.G. (2006) 44th Vernadsky-Brown microsymposium "Topics in Comparative Planetology", Oct. 9-11, 2006, Moscow, Vernadsky Inst., Abstract m44_39, CD-ROM. **[5]** Kochemasov G.G. (2008) Geophysical Research Abstracts, vol. 10, EGU2008-A-01271. **[6]** Kochemasov G.G. (2005) 42nd Vernadsky-Brown microsymposium "Topics in Comparative Plantology", Oct.10-12, 2005, Moscow, Vernadsky Inst., Abstract m42_31, CD-ROM. **[7]** Kochemasov G.G. (2009) New Concepts in Global Tectonics Newsletter, # 50, March 2009, p. 23-34. **[8]** Kochemasov G.G. (2008) EPSC Abstracts, Vol. 3, EPSC2008-A-00030.

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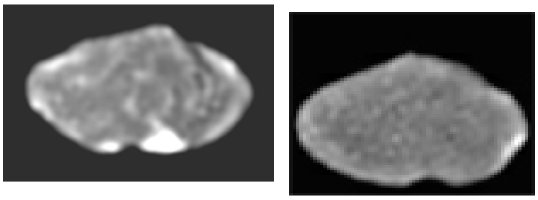

Fig. 1. "Diamond' of Amalthea , PIA01074, Long 270 km. Right image stresses a convexo-concave shape

Fig. 2. "Diamond" of Yanus, PIA08192 & PIA11469. Long 220 km. Left image develops its octahedron outlines, right image shows its convexo-concave nature.

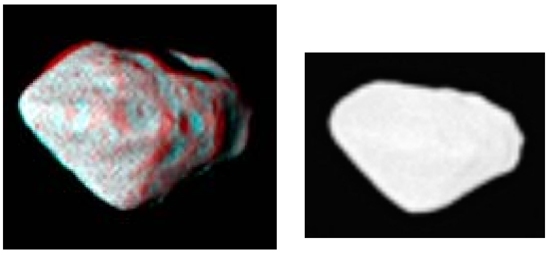

Fig. 3. "A diamond in the sky". Asteroid (2867) Steins. 4.6 km across. Right image stresses a convexo-concave (tetrahedron) shape. (ESA News. Steins: a diamond in the sky, 6 September, 2008 (http://www.esa.int/rosetta).

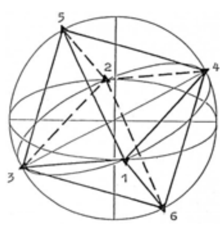

Fig. 4. Earth's octahedron. Antipodean vertices: 1- Equatorial Atlantic, 2- New Guinea, 3- Easter Isl., 4- the Pamirs-Hindukush, 5-Bering Strait, 6-Bouvet Isl.

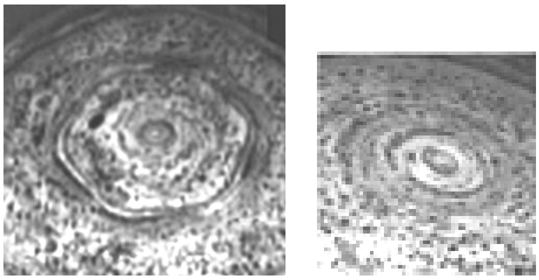

Fig. 5. Saturn. Northern hemisphere hexagon, PIA09188, 25000 km across. Southern hemisphere hurricane, PIA 08333, "Eye's" diameter is 1500 km.

Images 1, 2, 5 credit: NASA/JPL/Space Science Institute