CHARACTERISTIC "NECKS" OF SMALL COSMIC BODIES: FORMATION IN PROCESS OF BREAKING OR SMOOTH IMPACT (STICKING TOGETHER) OF TWO FRAGMENTS.

G. G. Kochemasov, IGEM of Russian Academy of Sciences, 35 Staromonetny, 119017, Moscow, RF, kochem.36@mail.ru

The wave warping of celestial bodies due to their movement in non-circular keplerian orbits with periodically changing accelerations is especially notable in shapes of small bodies (asteroids, comet cores, satellites).They are often bent by the fundamental wave 1 and acquire shapes of "dumb-bells', "bean", "peanut" and often are disintegrated into two or several peaces moving in an original or slightly different orbits. The disintegration is provoked by nearing deep fissures of the convex hemisphere with diminishing distance of the concave one to the fissures. Thus a "neck" develops (Fig. 1-18). The constant disintegration (self destruction) helps to replenish an asteroid belt population.

The classical planetology considers impacts as a main source of energy reworking celestial bodies. However a region or regions of impacting objects affecting all planetary bodies everywhere in the Solar system is poorly understood. But now planetologists have several tens of images of full discs of these bodies. Distribution patterns of "impact traces" – craters in many of them are surprisingly regular. They show alignments, regular grids not related to random hits expected from impacts but rather require more regular and ubiquitous structuring force. Moreover, such regular patterns appear in the outer gaseous spheres of some bodies including the Sun's photosphere.

It was shown earlier [1-4] that such regular patterns appear due to warping action of inertia-gravity waves affecting all bodies moving in keplerian elliptical orbits. Periodically changing accelerations of celestial bodies cause their wave warping having in rotating bodies (but all bodies rotate!) four ortho- and diagonal directions. An interference of 4 directions of standing waves brings about a regular net of uprising, subsiding and neutral tectonic blocks. Naturally polygonal in details they appear as rings in cosmic images. This is one of reasons why they are often confused with round impact craters and essentially disfigure their statistics.

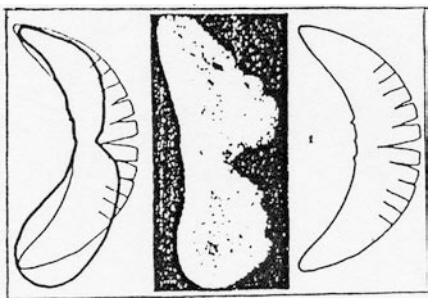
A fundamental nature of the wave woven nets of evenly sized round "craters" (granules) is dependence of their sizes on orbital frequencies of bodies. The lower frequency the larger sizes, the higher frequency the smaller granule sizes.

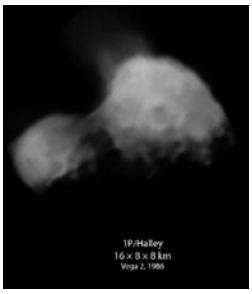
The correspondence between orbital frequencies and tectonic granulations proving the structuring role of orbital energy was earlier noted in comparative planetology of the terrestrial planets. The row of Mercury, Venus, Earth, Mars, asteroids with decreasing orbital frequencies is remarkable by increasing relative sizes of tectonic granules, relief ranges, iron content in lowland basalts and decreasing atmospheric masses from Venus to Mars.

In this spectacular row the position of asteroids is especially remarkable. The strongest amplitude fundamental wave1 embraces an asteroid body making it strongly bent. Its extended convex hemisphere is deeply cracked and the concave one from the opposite site approaches the deepest fissures (Fig. 1). As a result the body tends to disintegrates and two or several pieces move as binaries, polycomponent asteroids, and asteroids with satellites (Fig. 5-8, 18). Two-lobed dumb-bells shapes often are observed also among comet cores and small satellites (Fig. 2-3, 9-15). Examples of various stages of this destruction are asteroids Eros, Toutatis, Braille, Castalia, Hector, and recently observed P/2013R3 that shows enormous volumes of gas-dust clouds accompanying the process (Fig. 18). The orbiting clouds in the past may have been a media for gravity separation of M-, S-, and C-asteroids. The denser M-asteroids enrich the inner main asteroid belt and the less dense S-asteroids the outer part of the belt fragments.

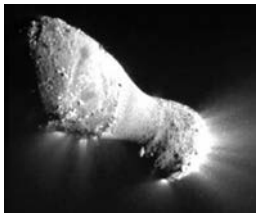
Numerous images of small cosmic bodies presented here (fig. 1 to 18) show characteristic bends producing thin parts – "necks" in the middle parts of the bodies and thickenings in their ends (two-lobed forms). Thus, necks are a result of breaking of a whole body. In some rare cases an assemblage of alien fragments also is possible. In future, cosmic robots placed at "neck" regions of various small bodies should resolve this question by measuring composition and structure of small pieces around. If they are uniform, they are fragments of one body, if not, two different bodies possibly are assembled.

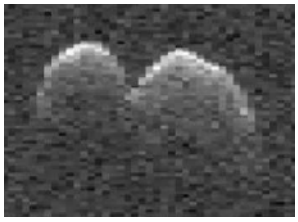
References: [1] Kochemasov, G.G. Tectonic dichotomy, sectoring and granulation of Earth and other celestial bodies // Proceedings of the International Symposium on New Concepts in Global Tectonics, "NCGT-98 TSUKUBA", Geological Survey of Japan, Tsukuba, Nov 20-23, 1998, p. 144-147.**[2]** Kochemasov, G.G. Theorems of wave planetary tectonics // Geophys. Res. Abstr. 1999. V.1, №3, p. 700. **[3]** Kochemasov G.G. "Diamond" and "dumb-bells"-like shapes of celestial bodies induced by inertia-gravity waves // The 30th Vernadsky-Brown microsymposium on comparative planetology, Abstracts, Moscow, GEOKHI, 1999, 49-50.
[4] Kochemasov G.G. Celestial bodies: relation between ubiquitous tectonic dichotomy and universal rotation //NCGT Journal, v. 3, # 2, June 2015, 155-157. **[5]** Ksanfomality L., Zelenyi L. Does regional surface morphology of comets 67P/CG and 1P/Halley carry any traces of their origin in low velocity collisions? // The seventh Moscow Solar System symposium, 10-14 October 2016, Space Research Institute (IKI RAS), Moscow, p. 135, 7MS3-SB-07.

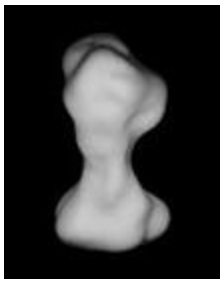

1

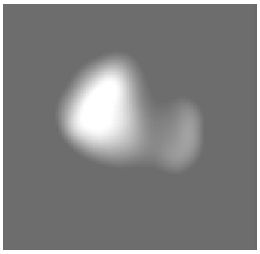


12


13


2

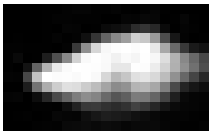

3


14

15

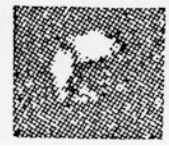

4

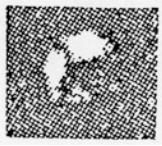

5

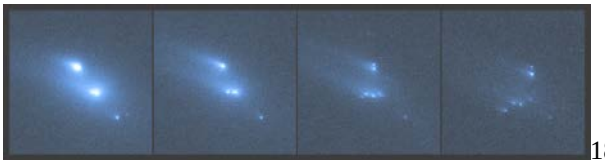

16


17

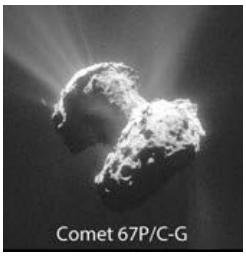

6


7


8


18


9



10

11

1. Asteroid (433)Eros. 33 km long.N EAR image & a model of body bending, destruction and two-lobed shape formation. **2.** Asteroid 1999JD6, 700_400985f8789ec19308d1b83b5a840ca9, PIA19647. **3.** Asteroid Cleopatra, 217 km long, dn13189-1_600 **.4.** Asteroid {25143}Itokawa. 0.5 km long. **5-8.** Disintegration of asteroid (4769)Castalia (radar image, S.J. Ostro & J.F. Chandler, 1990). Diameter 1,4 km. Two halves, each 800 m. **9.** Asteroid 4179Toutatis. Spectral type S. Chang'e 2 image. 4.75 x 2.4 x 1.95 km. Diameter 5.4 km, two halves 4.6 and 2.4 km. **10.** Comet 67P/C-G. (Churyumov-Gerasimenko). **11.** –"- , Churyumov-Gerasimenko, 4 x 3 km, Rosetta, 2014. **12.** Comet 1P/Hailey, 16 x 8 x 8 km, Vega 2, 1986. **13.** Comet 103P/Hartley 2, 2.2 x 0.5 km, Deep Impact/EPOXI, 2010. 495296main_epoxi-1- full_full-1. **14-15.** Satellites of Pluto (**14** - Nix, **15** - Hydra). **16.** Atlas, satellite of Saturn , 33 km long. **17.** Callipso, satellite of Saturn, 22 km long. **18.** Disintegration of asteroid P/2013R3 (Image credit: NASA, ESA, and D. Jewitt (UCLA).