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Theorems of the wave planetology imprinted in small bodies

G. Kochemasov
IGEM of the Russian Academy of Sciences (kochem@igem.ru)

"Orbits make structures" – the main point of the comparative wave planetology. Keplerian non-round orbits through alternating accelerations of celestial bodies produce in them warping standing waves of 4 directions. The longest of them fundamental wave1 is responsible for ubiquitous tectonic dichotomy (Theorem 1). Wave2 -the first overtone- gives octahedron shape and structural sectoring (Theorem 2) [1]. Then one observes tectonic granulation size of which is inversely proportional to orbital frequencies: higher frequency – smaller granulation, lower frequency-larger granules (Theorem 3). The 4^{th} theorem prescribes that subsiding blocks of wave warped bodies will be constructed by denser material than uplifting ones. That is for keeping angular momentum of different level blocks of rotating body equilibrated. The warping action of standing inertia-gravity waves is more effectively visible in small bodies (it is easier to bend small object than large one). That is why tectonic dichotomy and octahedron (diamond) shapes are more pronounced in small bodies [2]. Small satellites, asteroids and comet cores often have oblong convexo-concave shape with fractured convex hemisphere (development of a saddle and accompanying cracks). Recently Cassini acquired some images of small satellites of Saturn that demonstrate convexo-concave shape and polyhedron outlines. Very small Trojan satellite Calypso (PIA07633) 22 km long has prominent shape of this kind (even a saddle!) and fully resembles asteroid Eros (33 km long) confirming wave shaping. Two small saturnian satellites Prometheus and Pandora captured by one image frame(PIA07653) both have this peculiar oblong shape. Two recently observed bodies: comet Wild 2 and Tempel 1 both have convexo-concave shape with a depression on one side and bulging on the opposite one. Wild 2 (a core 5.4 km long) has a large depression – Shoemaker basin 1.6 km in diameter (almost 1/3 of the body size, this ratio being rather typical for other observed bodies with one prevailing large depression or crater) and also peculiar smaller depressions in form of

“foots” (wave2 structure) [3, 4]. Depressions are often filled with darker (presumably denser) material than surrounding terrains (Theorem 4).

References: **[1]** Kochemasov G.G (1999) Geophys. Res. Abstr., v. 1, # 3, 700; **[2]** Kochemasov G.G. (1999) “Asteroids, Comets, meteors” conf., Cornell Univ., USA; **[3]** Kochemasov G.G. (2005) IAU Symposium # 229 “Asteroids, comets, meteors”, Aug. 7-12, 2005, Rio de Janeiro, Brazil; **[4]** Brownlee D.E., Horz F., Newborn R.L. et al. (2004) Science, v. 304, #5678, 1764-69.