Satellites of the Saturnian system with clear signatures of the wave warpings producing alignments of "craters" of predictable sizes

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At previous COSPAR Scientific Assembly, Paris, 2004 we stated that numerous traces of wave warpings will be detected by Cassini on surfaces of the Saturnian satellites [1]. Now it is clear that all icy satellites notwithstanding their sizes and orbits are affected by warping action of inertia-gravity waves due to their movement in elliptical orbits (more pronounced in the past) with periodically changing accelerations. The warping is detected in 3-4 directions (ortho- and diagonal) producing at intersections chains (grids) of even-sized craters and separating them mounds (granules). The crater sizes or granulations are not random but depend on orbital frequencies of satellites [2]: higher frequency – smaller relative size. Earlier for terrestrial planets was demonstrated that their tectonic granules sizes are strictly inverse to their orbital frequencies: Mercury πR/16, Venus πR/6, Earth πR/4, Mars πR/2, asteroids πR/1 (R-a body radius). The Earth's frequency (1/1 year) and granule size πR/4 or $\sim$5000 km serve as a scale for comparison and calculating granule (crater) sizes on other bodies surfaces. Satellites have two orbital frequencies in the Solar system (around a planet and Sun). Thus, to 2 main frequencies (and corresponding to them granule sizes) should be added at least 2 modulated side frequencies (and corresponding to them granule sizes). The modulation is a division and multiplication of the higher frequency by the lower one. Some examples: 1) Entire surface of Hyperion is peppered with even-sized craters about 5 to 8 km across (alignment in grid is perfectly seen at the convex hemisphere, PIA06244). This size corresponds to its circumsaturnian orbital frequrncy 1/21.3d. 2) The highest resolution image of Enceladus, PIA06252, along with chess-board structure reveals chains of small regular mounds about 100 m across. This size one gets calculating one of the side frequencies and corresponding to it feature. 3) Titan's surface reveals widespread crossing wavings (PIA03567) with spacing about 1 to 2 km. Calculated modulated wave spacing is about 12 km. This discrepancy possibly could be explained by the following reasons: a) Cassini observes one of the resonating overtones of the modulated frequency; b) Observed spacing reflects previous more close to Saturn position of Titan as it –very volatile-rich – could have lost an important part of its mass by outgassing into space and increased its orbital radius to keep momentum. 4) Earth as a scale with its granule size πR/4 was recently observed by MRO from a distance of 1.2 mln. km (PIA04159) and revealed this granulation.

References: **[1]** Kochemasov G.G. (2004) Cassini experiment: what gains from new knowledge of the Saturnian system the wave planetology? // 35th COSPAR Scientific Assembly, 2004, Paris, France, Abstracts, CD-ROM. **[2]** Kochemasov G.G. (2005) Cassini' lesson: square craters, shoulder-to-shoulder even-size aligned and in grids craters having wave interference nature must be taken out of an impact craters statistics to make it real //Vernadsky-Brown Microsymp.-42, Moscow, Oct. 2005, Abstr. M42_31, CD-ROM.