Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01269, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01269
EGU General Assembly 2008

Grainy structures of saturnian satellites and rings

G. Kochemasov

IGEM of the Russian Academy of Sciences, Moscow, Russia (kochem@igem.ru)

The wave planetology [1& others] deals with relationship between orbital frequencies of planetary bodies and their tectonic granulation. The latter affects all celestial bodies due to their movements in non-round keplerian orbits with periodically changing accelerations causing planetary spheres warping from their core to the crust and atmospheres if they are present. Earlier was shown that there is an inverse relation between orbital frequencies and lithosphere granulations [1, 2]. Recently this relation was prolonged to atmospheres of planets and Titan [3]. Satellites present a special case as they move in two orbits in the Solar system: around their planets and at the same time around Sun. These two main frequencies are responsible for two main granule sizes. Besides, as it follows from the wave theory, the lower frequency modulates the higher one producing side frequencies. A division and multiplication of the higher frequency by the lower one give two side frequencies and corresponding them granule sizes. The saturnian system presents an opportunity to observe a wide range of satellites with high (Pandora 1/0.6285 days) and low (Phoebe 1/550.45 d.) orbital frequencies, rings and the planet's atmosphere rotating or orbiting the center of the system with a frequency $\sim$ 1/10 h.

In this sense the saturnian system is alike the solar system where the solar photosphere with its frequency of rotation (orbiting the center of the solar system) was included into the range of planetary frequencies and well fitted there with its orb.fr. 1/1month and long ago known supergranulation about 30-40 thousand km. Sun and Earth are thus two scales with known frequencies and granule sizes for all other heavenly bodies. The Cassini project already gave many examples of frequency – size relation which certainly will be multiplied in future. Just some examples [4]. Phoebe:main granule sizes 136-124 km and 2708-2473 km (some range due to sensibly different body's radii; the larger ciphers correspond to the circumsolar frequency and obviously are off the Phoebe size); side granule sizes 1021-932 and **18-17** km (bold figures mean already measured systematic grains in grids and lines on satellites surfaces). Iapetus: main granule sizes **122** and 16909 km; side granule sizes 918 and **16** km. Hyperion: main granule sizes **8.0-4.6** and 4121-2355 km; side granule sizes **60-34** and 1.1-0.6 km. Titan: main granule sizes **88** and 60641 km; side granule sizes **662** and **12** km; Rhea: main granule sizes **7.4** and 18016 km; side granule sizes **56** and 1.0 km. Diona: main granule sizes 3.3 and 13164 km; side granule sizes 25 and 0.44 km. Tethys: main granule sizes **2.1** and 12340 km; side granule sizes **16** and 0.28 km. Enceladus: main granule sizes 0.7 and 5911 km; side granule sizes **5.5** and **0.1** km. Mimas: main granule sizes 0.4 and 4639 km; side granule sizes **3.0** and 0.05 km. Yanus: main granule sizes 0.16-0.12 and 2590-1884 km; side granule sizes 1.2-0.9 and 0.022-0.016 km. Epimetheus: main granule sizes 0.10-0.07 and 1648-1178 km; side granule sizes 0.8-0.6 and 0.014-0.010 km. Pandora: main granule sizes 0.07-0.04 and 1295-777 km; side granule sizes 0.6-0.3 and 0.01-0.006 km. A very fine grainy texture of the outer B ring and near the inner edge of the Cassini Division can be seen in PIA08836. These grains probably correspond to one of modulated waves in rings.

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. Concerted wave supergranulation of the solar system bodies // 16^{th} Russian-American microsymposium on planetology, Abstracts, Moscow, Vernadsky Inst. (GEOKHI), 1992, 36-37. **[3]** Kochemasov G.G. (2007) Atmospheric wave granulation in the solar system: the star – planets – satellite // 46^{th} Vernadsky-Brown microsymposium on comparative planetology, 2-3 oct. 2007, Moscow, Russia, Abstr. m46_37, CD-ROM. **[4]** Kochemasov G.G. 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 // 42^{nd} Vernadsky-Brown microsymposium "Topics in Comparative Planetology", Oct.10-12, 2005, Moscow, Vernadsky Inst., Abstr. m42_31, CD-ROM.