AOGS 2005

Pacific (Earth), Vastitas Borealis (Mars), Cassini Regio (Iapetus), structurally controlled craters on saturnian satellites – features created by planetary warping waves

KOCHEMASOV G. G.
IGEM of Russian Academy of Sciences

Waves warping planetary bodies appear in them in response to their movement in keplerian orbits with periodically changing accelerations. Inertia-gravity waves in rotating bodies have 4 ortho- and diagonal directions. Their interferences produce uplifting (+), subsiding (-) and neutral (0) tectonic blocks. Depending on wavelengths these blocks have various sizes. The longest fundamental wave1 is responsible for ubiquitous tectonic dichotomy, wave2 produces tectonic sectoring, individual waves, inversely proportional to orbiting frequencies, give tectonic granulation. Blocks "+" and "-"are composed of materials with different densities to level these blocks angular momenta. The wave cause of terrestrial and martian dichotomies was advocated in [1] and it seems that this cause can be applied as well to saturnian satellites Iapetus, Titan and small Phoebe which has an obvious convexo-concave shape. Iapetus trailing light hemisphere is due to ices, dark leading one is covered by denser material filling shallow planetary depression. It occupies about 1/3 of the Iapetus surface and by its shape also reminds depressions of Pacific and Vastitas Borealis. Tectonic granules of Titan were observed before the Cassini arrival and their size was calculated having in mind its two orbits: around Sun – 30 years, around Saturn – 16 days [2]. Successful "Huygens" performance allows us to see much smaller tectonic granules in perfect wave woven pattern. Their size also must obey the laws of wave modulation (the higher orbital frequency around Saturn is divided and multiplied by the lower orbital frequency around Sun). Perfect wave structures due to interference of waves of 4 directions were captured by "Cassini" having crossed rings during insertion. As was predicted in [3] the wave structurization is now observed on surfaces of many satellites under close viewing. The first was Phoebe and then large satellites and in particular Tethys. Its lucky view shows planetary scale grooves (waves) and formation of "craters" along grooves intersected by structural lines of other directions. This pattern is typical for surfaces of all satellites. Wave induced structural lines intersect and form chains of "craters" which are easily distinguished from impact craters by their regularity and structural control. This means that statistics of real impact craters must be seriously overseen with all consequences for planetology.

References

[1] Kochemasov G.G. (2004) In Workshop on "Hemispheres apart: the origin and modification of the martian crustal dichotomy", LPI Contribution #1203, LPI, Houston, p.37;
[2] Kochemasov G.G. (2000) Geophys. Res. Abstr., v.2,CD-ROM;
[3] Kochemasov G.G. (2004) 35th COSPAR Sci. Ass., Paris, CD-ROM.