ON A SUCCESSFUL PREDICTION OF MARTIAN CRUST FRACTIONATION BASED ON COMPARATIVE WAVE PLANETOLOGY. G. G. Kochemasov, IGEM of the Russian Academy of Sciences, 35 Staromonetny, Moscow 109017, Russia.

A significant compositional difference between martian lowlands and highlands was predicted two years before "Pathfinder" landing /1/ and then two months before this event /2/. At that time the majority of planetologists considering spectral evidences believed that martian crust is mainly basaltic or "basic" as so-called "martian meteorites". Our confidence was based on regularities of wave planetology /3 and others/ indicating that with increasing solar distance (orbital periods) planetary bodies become tectonically "coarser grained", less spherical and more disrupted (relief range increases) and hence must acquire higher density (compositional) differences between highland and lowland rocks. All these regularities are consequences of elongated elliptical orbits of celestial bodies (much more pronounced in the geological past when much of body shaping occurred). They imply periodically changing orbital curvatures and body accelerations leading to arising in them standing inertia-gravity waves warping rotating bodies in four ortho- and diagonal directions. Interference of these waves leads to formation of uplifting /+/, subsiding /-/ and neutral /0, alternation of + and -/ segments, sectors and other polygonal blocks constructing surfaces and deeper spheres of any cosmic body.

The following theorems of planetary tectonics proved by laws of wave interference are formulated:

1. Celestial bodies are dichotomic.
2. Celestial bodies are sectoral.
3. Celestial bodies are granular.
4. Angular momenta of different level blocks tend to be equal.

The first theorem reflects interference of fundamental waves long $2\pi R$, where R is a body radius. The second one reflects interference of the first obertone waves long πR and subsequent harmonics. The third one concerns interference of waves lengths of which are proportional to orbital periods: characteristic size of formed by them rounded (polygonal in details) blocks-supergranulas is, i. g. , for Mercury $\pi R/16$; Venus $\pi R/6$; Earth $\pi R/4$; Mars $\pi R/2$; asteroids $\pi R/1$. The fourth theorem demands equilibration of angular momenta of hypsometrically (tectonically) different level blocks comprising one rotating body to keep its integrity.

Angular momenta equilibration requires light (not dense) martian continents standing high over lowlands. In the sequence Venus - Earth - Mars with in situ studied compositions of lowlands (Mg-basalts - tholeiites - Fe-basalts) and partially highlands (alkali basalts - andesites (on an average) - ?) the highest range between densities and hence compositions is expected for Mars. Discovered by the APX spectrometer of the Sojourner rover andesite rocks /4/ characterize contact zone between the northern lowlands and southern highlands. Else more acidic (less dense) rocks have to be expected in the highlands themselves.

Somewhat elevated potassium content in the Pathfinder soils, otherwise similar to the Viking soils, is due to contamination by the near continent (not an analitical error as suggested Prof. H. Wanke, oral communication). On the whole elevated chlorine content in the martian soils is possibly due to wide eolian contamination by wind (sand) eroded material of highlands. Preferentially eroded soft chlorine minerals, such as halite and sodalite, cannot be excluded from acid highland lithologiews (syenites, granites, albitites etc.).

Peculiar dumb-bell shape of martian spheres prescribed by the wave model ("granula" size $\pi R/2$, /5/) is reflected not only in the very characteristic areoid shape but was also discovered in unexpected structure of the martian thermosphere /6/ correlated with the structure of the solid body. One may suppose that two clear antipodal density bulges in the martian lithosphere and atmosphere played a certain role in the first failed attempt of the MGS aerobraking.

A sectoral structure prescribed by the wave planetology and more vividly observed on highlands (i.g., the uplifted sector of Arabia Terra) clearly manifested itself in the lowest and smoothest part of Vastitas Borealis (so-called an area within Contact 2 /7/). It has a triangular shape, smooth surface, a length of about 5000 km ($\pi R/2$) presenting thus a subsided sector of one of planetary wide sectoral structures.

References:

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